

**Meeting of the Federal Open Market Committee on
January 30–31, 2018**

A joint meeting of the Federal Open Market Committee and the Board of Governors was held in the offices of the Board of Governors of the Federal Reserve System in Washington, D.C., on Tuesday, January 30, 2018, at 10:00 a.m. and continued on Wednesday, January 31, 2018, at 9:00 a.m.

PRESENT:

Janet L. Yellen, Chair
William C. Dudley, Vice Chairman
Thomas I. Barkin
Raphael W. Bostic
Lael Brainard
Loretta J. Mester
Jerome H. Powell
Randal K. Quarles
John C. Williams

James Bullard, Charles L. Evans, Esther L. George, Michael Strine, and Eric Rosengren,
Alternate Members of the Federal Open Market Committee

Patrick Harker, Robert S. Kaplan, and Neel Kashkari, Presidents of the Federal Reserve
Banks of Philadelphia, Dallas, and Minneapolis, respectively

James A. Clouse, Secretary
Matthew M. Luecke, Deputy Secretary
David W. Skidmore, Assistant Secretary
Michelle A. Smith, Assistant Secretary
Mark E. Van Der Weide, General Counsel
Michael Held, Deputy General Counsel
Steven B. Kamin, Economist
Thomas Laubach, Economist
David W. Wilcox, Economist

David Altig, Kartik B. Athreya, Thomas A. Connors, Mary Daly, David E. Lebow,
Trevor A. Reeve, Argia M. Sbordone, Ellis W. Tallman, William Wascher, and Beth
Anne Wilson, Associate Economists

Simon Potter, Manager, System Open Market Account

Lorie K. Logan, Deputy Manager, System Open Market Account

Ann E. Misback, Secretary, Office of the Secretary, Board of Governors

Matthew J. Eichner,¹ Director, Division of Reserve Bank Operations and Payment Systems, Board of Governors; Andreas Lehnert, Director, Division of Financial Stability, Board of Governors

Rochelle M. Edge, Deputy Director, Division of Monetary Affairs, Board of Governors; Maryann F. Hunter, Deputy Director, Division of Supervision and Regulation, Board of Governors

David Reifschneider and John M. Roberts, Special Advisers to the Board, Office of Board Members, Board of Governors

Linda Robertson, Assistant to the Board, Office of Board Members, Board of Governors

Joseph W. Gruber, Senior Associate Director, Division of International Finance, Board of Governors; Michael G. Palumbo, Senior Associate Director, Division of Research and Statistics, Board of Governors

Antulio N. Bomfim, Ellen E. Meade, Stephen A. Meyer, Edward Nelson, and Joyce K. Zickler, Senior Advisers, Division of Monetary Affairs, Board of Governors; Jeremy B. Rudd, Senior Adviser, Division of Research and Statistics, Board of Governors

William F. Bassett, Associate Director, Division of Financial Stability, Board of Governors

Andrew Figura, Assistant Director, Division of Research and Statistics, Board of Governors; Jason Wu, Assistant Director, Division of Monetary Affairs, Board of Governors

Penelope A. Beattie,² Assistant to the Secretary, Office of the Secretary, Board of Governors

Dana L. Burnett and Michele Cavallo, Section Chiefs, Division of Monetary Affairs, Board of Governors

David H. Small, Project Manager, Division of Monetary Affairs, Board of Governors

Andrea Ajello, Kurt F. Lewis, and Bernd Schlusche, Principal Economists, Division of Monetary Affairs, Board of Governors; Ekaterina Peneva and Daniel J. Vine, Principal Economists, Division of Research and Statistics, Board of Governors

Camille Bryan, Lead Financial Analyst, Division of International Finance, Board of Governors

Ellen J. Bromagen, First Vice President, Federal Reserve Bank of Chicago

¹ Attended through the discussion of developments in financial markets and open market operations.

² Attended Tuesday session only.

Jeff Fuhrer and Daniel G. Sullivan, Executive Vice Presidents, Federal Reserve Banks of Boston and Chicago, respectively

Todd E. Clark,² Evan F. Koenig, Keith Sill, and Mark L.J. Wright, Senior Vice Presidents, Federal Reserve Banks of Cleveland, Dallas, Philadelphia, and Minneapolis, respectively

Carlos Garriga and Jonathan L. Willis, Vice Presidents, Federal Reserve Banks of St. Louis and Kansas City, respectively

**Transcript of the Federal Open Market Committee Meeting on
January 30–31, 2018**

January 30 Session

CHAIR YELLEN. Good morning, everybody. This meeting, as usual, will be a joint meeting of the FOMC and the Board. I need a motion to close the meeting.

MR. POWELL. So moved.

CHAIR YELLEN. Thank you. Without objection. And, effective today, Presidents Barkin, Bostic, Mester, and Williams are voting members of the FOMC for the year. This will be the first time on the Committee for Presidents Barkin and Bostic, so a welcome is in order for them. And, of course, this is also Tom's first FOMC meeting since being appointed president of the Richmond Fed. Tom, we are delighted to have you onboard and look forward to working with you. Presidents Mester and Williams are old pros—welcome back.

MS. MESTER. Well, at least "pros." [Laughter]

CHAIR YELLEN. Young pros. Next, I'd like to take a moment to note that this meeting is David Reifschneider's 90th and last FOMC meeting, or at least that is the latest point estimate of our forecast. [Laughter] As you may know, Dave retired from the Board in 2013. At that time, Chairman Bernanke remarked that the 70 percent confidence interval around Dave's actual retirement date ranged from mid-2013 through 2017. Utilizing a prediction interval was wise, but as it turns out it was not quite wide enough.

In 2014 we managed to lure Dave back to serve as special adviser to the Board. In that capacity, Dave has been extraordinarily helpful to me personally and to the Board and FOMC. He has written many speeches, helped in innumerable ways in crafting FOMC communications, drafted numerous memos and papers, provided excellent analysis and advice on a broad range of

policy issues, and generally lived up to his well-deserved reputation as a brilliant macroeconomist and a guru of all things FRB/US.

Speaking for myself, Dave's insightful observations have greatly enhanced my understanding of the economy and monetary policy. More generally, over the course of his career, Dave's research and analysis have importantly shaped the views of this Committee, especially in evaluating approaches to provide additional accommodation at the zero lower bound, including forward guidance and asset purchases. So, thank you, Dave, for all your contributions during these past few years and for your many years of distinguished service to the Federal Reserve. We wish you the very best in the future. [Applause]

Finally, as you know, this happens to be my own last meeting as well. I haven't been told how many, but I have a feeling I do outrank Dave in terms of total meetings. [Laughter] All FOMC participants and staff members attending this meeting are invited to attend the reception this evening at 5:00 p.m., and I very much look forward to seeing all of you there. So with that, let's turn to the formal agenda.

VICE CHAIRMAN DUDLEY. Madam Chair, if I could—

CHAIR YELLEN. Oh, sorry.

VICE CHAIRMAN DUDLEY. If I could jump in and just recognize the fact that this is your last meeting. And we're all going to be recognizing your commitment to the Federal Reserve that stretches over many decades and the remarkable stewardship that you've shown in leading the FOMC, first as Vice Chair of the Board of Governors and then as Chair for the past four years.

Janet, you used the metaphor of driving across the country from the West Coast, I presume, toward the Committee's dual-mandate objectives of full employment and price

stability. In that vein, when we started that trip a number of years ago, we were very far away. Now we've gotten very, very close to our objectives after seeing many interesting sights along the way. Even though persistent headwinds caused the journey to take a little bit longer than we anticipated, we have had a successful journey. You've been a great driver and an excellent navigator—doing both jobs—and getting us safely to our destination.

I and many others are going to have much more to say this evening at our reception, and I'll speak some more tomorrow at the end of the meeting. But for now, suffice it to say, well done, Madam Chair.

CHAIR YELLEN. Thank you so much, Bill. [Applause]

VICE CHAIRMAN DUDLEY. Now we can do all the other stuff. [Laughter]

CHAIR YELLEN. I will have some remarks this evening, too, in rejoinder. Thank you. Okay. As you know, the Committee reviews a number of organizational topics every year at its January meeting. First up in this list is the election of the Chairman and Vice Chairman of the Committee. Following precedent, I will turn the floor over at this point to Governor Brainard to request nominations for these positions.

MS. BRAINARD. Thank you, Madam Chair. I will be calling for three sets of nominations and votes. First, I'd like to ask for a nomination for FOMC Chair to serve through February 2, 2018. [Pause]

MR. POWELL. I would like to nominate Janet Yellen. [Laughter]

CHAIR YELLEN. I was getting a little scared there. [Laughter]

MS. BRAINARD. Is there a second?

MR. QUARLES. Second the nomination.

MS. BRAINARD. Are there any other nominations or discussion? [No response]

Without objection. Now I'd like to ask for a nomination for the position of FOMC Chairman for a term that begins February 3, 2018.

CHAIR YELLEN. And I would like to nominate Jay Powell.

MS. BRAINARD. Is there a second?

MR. QUARLES. Second.

MS. BRAINARD. Any other nominations? [No response] Without objection. Finally, I'd like to ask for a nomination for the position of FOMC Vice Chairman.

MR. POWELL. I would like to nominate Bill Dudley.

MS. BRAINARD. Is there a second?

MR. QUARLES. Second.

MS. BRAINARD. Any other nominations? [No response] Without objection.

CHAIR YELLEN. Okay, thank you. Next we have the selection of staff officers by the Committee. Jim, could you read the list of nominees?

MR. CLOUSE. Sure. For Secretary, James A. Clouse; Deputy Secretary, Matthew M. Luecke; Assistant Secretaries, David W. Skidmore and Michelle A. Smith; General Counsel, Mark E. Van Der Weide; Deputy General Counsel, Michael Held; Assistant General Counsel, Richard M. Ashton. For Economists, Steven B. Kamin, Thomas Laubach, and David W. Wilcox; and Associate Economists, Thomas A. Connors, David E. Lebow, Trevor A. Reeve, William Wascher, Beth Anne Wilson, David Altig, Kartik Athreya, Mary Daly, Argia Sbordone, and Ellis W. Tallman.

CHAIR YELLEN. Is there a motion to approve these selections?

MR. POWELL. So moved.

CHAIR YELLEN. And a second?

MR. QUARLES. Second.

CHAIR YELLEN. All right. Without objection. Thank you. Next on the agenda is the “Selection of a Federal Reserve Bank to Execute Transactions for the System Open Market Account.” Do I have any nominations or volunteers?

VICE CHAIRMAN DUDLEY. New York volunteers.

CHAIR YELLEN. Fantastic. Without objection. Okay. Next, let me ask Vice Chairman Dudley, do you have any nominations you’d like to make for manager and deputy manager of the Desk?

VICE CHAIRMAN DUDLEY. Yes, I do. Simon Potter as manager and Lorie Logan as deputy manager.

CHAIR YELLEN. Is there a second?

MR. POWELL. Second.

CHAIR YELLEN. Thanks. Without objection. Our next item pertains to the Authorization for Domestic Open Market Operations and the Authorization for Foreign Currency Operations and the Foreign Currency Directive, and I’d like to ask Simon to introduce this item.

MR. POTTER. Thank you, Madam Chair. As part of the annual review of the Committee’s authorization for open market operations, and as discussed in the memo titled “Request for Votes on Authorization for Desk Operations” that you received before the meeting, the Desk recommends approval of the Authorization for Foreign Currency Operations and the Foreign Currency Directive without amendment. The Desk also requests approval of the Authorization for Domestic Open Market Operations with three changes, none of which we consider substantive.

The first proposed change is to incorporate small-value test transactions of securities lending into the existing operational readiness testing provision. By incorporating the securities lending tests into the existing provision on operational readiness, securities lending will be subject to the same conditions that exist for test transactions of temporary open market operations—specifically, a limit on the maximum amount of transactions outstanding at any given time and a requirement that the Desk provide the Committee with advance notice of any test activity. The

second and third changes are premised on the assumption that the first change is adopted and are aimed at improving the document's readability.

I would like to highlight another item for the Committee's consideration. In January 2009, the Committee suspended the Guidelines for the Conduct of System Operations in Federal Agency Issues in light of the Federal Reserve's programs to purchase agency debt and agency MBS. The SOMA contains a significant amount of agency securities, and it continues to conduct transactions in agency MBS securities as part of the reinvestment policy adopted by the Committee. Because of this, I recommend a continued suspension of these guidelines. No Committee vote is needed to continue the suspension.

CHAIR YELLEN. Are there any questions for Simon? [No response] Okay. Seeing none, is there a motion to adopt the domestic authorization with the proposed revisions and the foreign authorization and directive without revisions?

MR. POWELL. So moved.

CHAIR YELLEN. Second?

VICE CHAIRMAN DUDLEY. Second.

CHAIR YELLEN. Thanks. Without objection. Now let's move on to the next item, which is "Proposed Revisions to the Program for Security of FOMC Information." The staff have proposed several technical changes to this program, all of which simply update details in the program's references to other documents. Is there a motion to approve the proposed changes to the program?

MR. POWELL. So moved.

CHAIR YELLEN. Thanks. Second?

VICE CHAIRMAN DUDLEY. Second.

CHAIR YELLEN. Without objection. The next item is the approval of the FOMC's Statement of Longer-Run Goals and Monetary Policy Strategy. The only proposed change is the usual update to the reference to the median of the projections of the longer-run normal rate of unemployment. With that update, the relevant sentence will read "In the most recent projections,

the median of FOMC participants' estimates of the longer-run normal rate of unemployment was 4.6 percent.” This is an important document, and I would suggest that we proceed as in the past with a straw poll of all Committee participants. By doing that, the minutes of the meeting can report the strength of support for the statement. Following the straw poll, we will have a formal vote of the members of the Committee. But before I go to the straw poll, let me ask if there are any comments that people want to make about the consensus statement. President Bullard.

MR. BULLARD. Madam Chair, in a previous year I dissented on this on the grounds that I did not think the statement was sufficiently forward looking in its description of our symmetric inflation objective. I did not oppose the idea that the inflation objective is symmetric, but I did not like the wording of our approach. This year, I am not recommending any changes, but I'm hopeful that we can revisit this in future iterations of the statement. I do think it's an important issue for the Committee. But, for today, I'm going to support the long-run statement.

CHAIR YELLEN. Any other comments on the statement? [No response] Okay. If there are no further comments, I'd like to start, then, by asking for a show of hands of all participants if you support the statement. [Show of hands] Okay. Are there any opposed to the statement or abstentions? [No response] Okay. It looks like the statement, then, receives unanimous support among Committee participants. Now we need a formal vote of members. So can I ask for a show of hands among all members that support the statement? [Show of hands] Any opposed? [No response] No. Thank you.

Let me also note that our practices on releasing the statement have varied over the years. The plan this time is to release the statement as a separate press release at the same time that the policy statement comes out tomorrow at 2:00 p.m. And that completes our organizational items, so let me next call on Simon to begin the Desk presentation.

MR. POTTER.¹ Thank you, Madam Chair. Over the intermeeting period, broad U.S. financial conditions eased substantially, continuing the trend seen last period, as shown in the top-left panel of your first exhibit. This easing was reportedly driven by improving sentiment concerning the global economic outlook as well as the passage of the U.S. tax bill and was reflected in a substantial rise in equity prices, a tightening in credit spreads, and a significant depreciation of the dollar, which more than offset the rise in Treasury yields. Indeed, the widely tracked Goldman Sachs Financial Conditions Index is at record levels that were only previously seen in 1999 at the peak of the NASDAQ bubble.

As shown in the top-right panel, dollar depreciation over the period was both large in magnitude and broad based across major currencies. The depreciation accelerated last week following comments from Treasury Secretary Mnuchin that a weak dollar was good for the United States as it relates to trade. While market participants noted that he made similar comments in August, some reported that the secretary's remarks last week, along with others delivered at the World Economic Forum at Davos, may have increased uncertainty about U.S. dollar policy. Despite the magnitude of the dollar move last week, there were no reports of any market functioning problems. Short-dated measures of implied volatility did increase modestly but remain well below average levels over the past few years. Positioning data and risk reversals for major U.S. dollar currency pairs continue to point to expectations of further dollar depreciation.

While the dollar weakness was broad based, the moves in some currency pairs were particularly large. On a trade-weighted basis, a large contributor to the decline in the dollar was the Chinese RMB. The stabilization of capital flows and confidence in Chinese authorities' ability to manage the economy's transition to a slower growth regime have underpinned recent RMB strength, shown in the middle-left panel. Of note, the RMB's value against the U.S. dollar is now approaching its level following the surprise devaluation in August 2015 amid limited signs of official intervention. However, the currency remains substantially weaker on a trade-weighted basis since the time of the devaluation. The improved sentiment on the currency, along with announcements that several more advanced economy central banks have begun to add RMB to their foreign currency reserve portfolios, has led to some discussion of whether the RMB will resemble other reserve currencies in exhibiting greater market determination. Improved risk appetite, supported by stable Chinese growth, higher commodity prices, and robust global growth, has led to strong capital inflows into other emerging markets, supporting EM assets and currencies more broadly.

The euro appreciated nearly 6 percent against the dollar over the period, as shown in the dark blue line in the middle-right panel. Investor appetite for euro-denominated assets appeared to reflect a desire for exposure to the region's improving economic outlook and consequent expectations regarding ECB policy tightening. Although expectations are that tightening will be quite gradual, market participants have continued to cite the prospect of increasing monetary policy "convergence" of

¹ The materials used by Mr. Potter and Ms. Logan are appended to this transcript (appendix 1).

the United States and the euro area as supporting the euro against the dollar. In a manner similar to the experience in the United States, where the anticipation of a start to policy normalization supported the dollar in 2014 and 2015, the euro now appears to be experiencing strength well before an actual rise in rates.

One way of capturing expectations of increased convergence is through changes in the relative slope of euro-area and U.S. forward yield curves, shown in the red line in the middle-right panel. An increase in this line represents a steepening of the euro-area forward curve relative to the United States, as measured by the rates on EONIA swaps and U.S. overnight indexed swaps.

With regard to domestic financial developments, the increase in the level of U.S. interest rates—particularly at short- and intermediate-dated tenors—has been driven by the ongoing normalization of monetary policy in the United States amid a firming outlook for growth and inflation. This rise in short- and intermediate-term yields has driven most of the flattening in the Treasury yield curve seen since liftoff in 2015, as shown in the bottom-left panel. However, over this intermeeting period, the flattening trend largely paused and yields shifted up in near-parallel fashion—by around 25 basis points at 2- and 10-year maturities.

Greater optimism regarding global growth and higher commodity prices have fed through into market measures of inflation compensation. As shown in the bottom-right panel, five-year and five-year, five-year-forward TIPS-implied breakeven inflation rates widened more than 15 basis points over the period, returning to levels last seen after the 2016 U.S. presidential election but still below their average levels before the financial crisis.

As shown in the top-left panel of your second exhibit, however, spot and forward measures of inflation expectations from the Desk's policy surveys have remained little changed of late, suggesting that recent movements in market-based measures may in part reflect higher inflation risk premiums. That said, many market participants expect the Committee to note the increase in inflation compensation in its statement tomorrow, particularly as an intermeeting period increase of this size has prompted such notice before.

In addition to greater optimism regarding global real GDP growth and inflation, the effect on financial markets of U.S. fiscal policy developments continues to be in focus. As shown in the top-right panel, in the Desk's January policy surveys, respondents' expectations of fiscal deficits as a percent of GDP in coming years reached their highest levels since discussion of a tax reform bill began in earnest early last year. Respondents largely attributed the increase in their deficit estimates since the December surveys to both the precise details of the new tax law and expectations of further fiscal spending on defense and disaster recovery.

The effects of realized tax reform were strongly felt in domestic risk asset markets, with the S&P 500 index 7 percent higher since the bill was signed into law on December 22, outperforming other advanced-economy market indexes. Corporate

tax cuts have had a notable effect on 2018 earnings expectations. The step-up in earnings growth is expected to be temporary, however, with this growth expected to return to less elevated levels in 2019 and beyond. Nonetheless, the upward revisions to 2018 earnings have helped boost U.S. equity prices, despite numerous measures pointing to already-elevated valuations.

Consistent with the more positive outlooks for growth and inflation, market-based expectations of the pace of policy tightening in the United States increased over the period. While the likelihood attached to a rate increase at this meeting is essentially zero, the market-implied probability of an increase in the target range at the March FOMC meeting rose from roughly 60 percent to 85 percent over the intermeeting period. As shown in the middle-left panel, for 2018 as a whole, the market is pricing in around a 65 basis point increase in the federal funds rate, compared with around 45 basis points as of the December FOMC meeting.

The market-implied path of the policy rate for 2018 is close to both market participants' modal forecasts and the path implied by the medians of FOMC participants' projections, shown in the middle-right panel. Both of these indicate three 25 basis point hikes this year. Our survey respondents' mean expectations still imply minimal additional policy tightening in 2019 and 2020, but in the past few weeks, market pricing indicates some upward slope to the policy rate path. Of course, this difference could be the result of the appearance of positive term premiums at this horizon. It is encouraging that the market is starting to price a terminal rate above 2 percent, but the terminal rate still seems surprisingly low in view of the improved global outlook, fiscal stimulus in the United States, extremely buoyant financial conditions, and a widely held view that the neutral real rate will increase to around 1 percent over the medium term.

One reason we might not be seeing a more substantial shift in market pricing is that historical examples suggest that it is unusual to see a tightening cycle last more than a couple of years. Focusing more directly on the near term: Although the median of modal forecasts from the Desk's surveys were little changed from December, the probability distribution of respondents' expectations of the number of rate increases in 2018 did shift higher in the January surveys. As shown in the bottom-left panel, respondents placed a higher probability on the Committee increasing the target rate 100 basis points or more this year, though the probability of increases greater than 100 basis points in 2018 remains low.

One hypothesis as to why this likelihood remains low is that it would imply either raising the target funds rate at a non-press-conference meeting or raising it more than 25 basis points at a single meeting. The Desk's conversations with market participants indicate that such a course would be very surprising to the market, and that clear advance communication associated with it would be important. However, responses from recent policy surveys to a direct reaction-function question point to an expectation that the Committee *would* raise the target rate at a faster pace under certain economic conditions. Specifically, as shown in the bottom-right panel, in a scenario featuring a 50 basis point increase in core PCE inflation and a 50 basis point

decrease in the unemployment rate from the respective median year-end 2018 SEP projections, the median survey response implies 150 basis points of tightening over five quarters. This would obviously entail tightening either at a non-press-conference meeting or a move of greater than 25 basis points at a single meeting. This feature is also found in the responses from the surveys last July, which implied a median of 200 basis points of tightening over seven quarters. On the other hand, it is also notable that, on average, our respondents expected more overall tightening in response to higher inflation and lower unemployment in July than in the most recent survey. A non-inertial Taylor (1999) rule, assuming no changes in the natural rate of unemployment, would have implied 45 basis points more of tightening in the current responses than in July rather than the average decline of about 25 basis points between the two surveys that we actually saw. Thomas will discuss some of these issues more in his briefing. I will now turn the briefing over to Lorie.

MS. LOGAN. Thank you, Simon. I'll begin on your third exhibit with a discussion of money market developments and then turn to updates on the debt limit, reinvestments, and operational readiness.

As shown in the top-left panel, overnight unsecured rates smoothly shifted higher following the Committee's decision to increase the target range in December. The effective federal funds rate and overnight bank funding rate printed at 1.41 percent or 1.42 percent except at year-end.

Year-end conditions in domestic money markets were broadly in line with expectations and previous experience. Overnight unsecured rates declined while overnight secured rates and overnight RRP take-up rose, and on the next business day they returned to pre-year-end levels.

Conditions in some offshore dollar funding markets, however, were more volatile and began to deteriorate a bit earlier than in previous year-ends despite efforts by market participants to prefund earlier after unexpected year-end volatility in 2016. Indeed, as shown in the top-right panel, the premium for three-month dollar funding through euro and yen in the FX swap market over three-month U.S. dollar LIBOR spiked in mid-December, reflecting a sharp increase in the forward-implied cost of overnight dollar funding over the year-end turn. In particular, the forward-implied cost for overnight dollar funding over the year-end turn through the euro-dollar swap market, which is not shown, reportedly reached a peak of roughly 20 percent on December 15 and remained volatile in subsequent days.

While Desk contacts anticipated some increase in funding costs due to banks' typical desire to reduce intermediation activity for regulatory reporting purposes, they have speculated that U.S. G-SIBs might have reduced their dollar lending even more than usual in an effort to avoid moving to a higher G-SIB surcharge bucket. Although market participants were surprised by the sharp increase and subsequent volatility, they did not report any institutions experiencing market-access problems, and very near-term swap basis spreads quickly returned to levels prevailing before year-end.

Against this backdrop, take-up at central bank dollar swap operations covering year-end rose. Specifically, take-up at the ECB auction increased to \$11.9 billion, compared with \$4.3 billion at year-end 2016 and \$3 billion to \$5 billion on quarter-ends in 2017. Demand at the Bank of Japan’s final auction of the year was more modest, totaling just \$160 million. These figures are available as usual in the appendix.

With regard to other term unsecured dollar funding indicators, as shown by the gray line in the middle-left panel, the three-month LIBOR–OIS spread widened 16 basis points to 27 basis points over the course of December before retracing slightly in January. Contacts noted that the higher cost of funding in FX swap markets may have spilled over into higher LIBOR fixings, driving the spread wider in two ways. First, on account of the relative cost, foreign banks may have shifted to onshore funding through their U.S. branches, exerting upward pressure on term CP and CD rates and, in turn, their LIBOR submissions. Second, due to their lack of unsecured term issuance, LIBOR panelists rely more on expert judgment and related market instruments, such as FX swaps, in their LIBOR submissions. As a consequence, higher implied dollar funding costs through FX swaps may have had a direct effect on panel banks’ LIBOR submissions and the ultimate LIBOR fixings. While the three-month LIBOR–OIS spread is at its widest level since March 2017, it remains significantly narrower than the 44 basis point spread reached around money fund reform implementation.

With respect to overnight RRP operations, after increasing as usual into year-end, take-up dropped back to \$20 billion to \$30 billion—the lower end of the historical range. Low take-up was driven by the same factors mentioned in our briefing at the previous meeting—namely, increased supply of dealer repo, particularly from foreign dealers, and of Treasury bills. Indeed, as you can see in the middle-right panel, as private repo volumes, shown on the *x*-axis, increase, overnight RRP take-up, shown on the *y*-axis, tends to decrease. And the past two intermeeting periods, shown by the red and light blue diamonds, respectively, are clustered in the area corresponding to higher private repo volumes and lower overnight RRP take-up.

With regard to bill supply, despite the reinstatement of the debt ceiling in early December, net bill issuance increased \$46 billion over the intermeeting period as the Treasury has relied on extraordinary measures to maintain the total amount of debt outstanding below the statutory limit. However, bill supply is expected to decline modestly as the exhaustion of both the Treasury’s extraordinary measures and its cash balance draws nearer.

Market participants generally expect this to occur in early-to-mid March. Thus far, there has been limited sustained price action related to the debt ceiling. As shown in the bottom-left panel, the difference between the rate of the Treasury bill considered by market participants to be most “at risk” and the rates on neighboring bills—a measure of the premium required to hold the at-risk bill—is modest and in line with the most recent debt ceiling episode.

For the SOMA portfolio, we expect that, through continued implementation of the balance sheet normalization program this year, the SOMA will decline about \$390 billion, bringing the total size of the portfolio to roughly \$3.8 trillion at year-end. Specifically, under the current policy normalization plan, holdings of Treasury securities will decline approximately \$230 billion, and, using current market pricing, we project agency debt and MBS holdings to decline about \$160 billion. Still, the SOMA will continue to have sizable reinvestment activity this year.

On the Treasury side, we expect to conduct roughly \$200 billion in rollovers in 2018. We anticipate fairly sizable rollovers each month through August, ranging from \$8 billion to \$37 billion. However, after the caps reach their maximum amounts in the fourth quarter, reinvestments will largely occur in the midquarter refunding months when the SOMA has larger maturities.

On the MBS side, as shown in the bottom-right panel, we project that purchases will continue to decline as the caps increase and cease altogether following the September purchase period—just as the maximum cap is implemented. Of course, due to the prepayment option embedded in MBS, the pace of decline and the time when the MBS cap ceases to bind depend on the future path of interest rates, among other factors. And, even after ceasing to bind, the cap on MBS redemptions could become binding again if prepayments increase substantially—which would result in the Desk conducting reinvestment operations once more.

I should note that there was a temporary and modest widening in MBS option-adjusted spreads around the announcement of the January purchase period calendar. Since the cap increased from \$4 billion to \$8 billion in January, the reinvestment amount was smaller than in previous periods, as you can see in the bottom-right panel. However, the price action subsequently retraced, and market participants have not cited reduced purchases as having a meaningful or lasting effect on market pricing thus far.

Separately, following up on our discussion at the previous meeting, we've added a table to the appendix summarizing the marginal deviation from the targeted MBS purchase amounts implied by the caps that arises from operational constraints and differences between actual paydowns and estimated paydowns reported by mortgage agencies. Since the implementation of the caps, we have completed three reinvestment cycles, with a cumulative deviation of just \$19 million. From now on, this information will be part of the appendix, for your reference.

Finally, in the Desk's annual memo on small-value tests for operational readiness that was circulated to the Committee, we provided advance notice of all small-value exercises planned for this year. We will continue to provide updates on the results of any small-value exercises from the previous period and inform you of the upcoming exercises at each FOMC meeting. As usual, our plans are also summarized in a table in the appendix. There were no exercises conducted in the previous intermeeting period to report. During the upcoming intermeeting period we have five small-value exercises planned—two on the domestic side and three on the foreign side.

Thank you, Madam Chair. That concludes our prepared remarks. We'd be happy to take any questions. But before we do, we'd like to say, on behalf of our colleagues on the Desk, it's been an absolute privilege to serve under your leadership.

CHAIR YELLEN. Thank you so much. Before we go to questions, there is one item I wanted to mention. Simon noted during his presentation that the inflation compensation has moved up quite a bit. According to the Board's measure, as of yesterday at 5:00, the Board's five-year, five-year-forward measure over the intermeeting period was up 20 basis points over the past two meetings. Since the October–November meeting, it's up 29 basis points. The five-year inflation compensation in the intermeeting period is also up 21 basis points.

Now, in recent years, the Committee's postmeeting statement has noted every move of 20 basis points or more in the five-year, five-year-forward measure. So, seeing that, I asked the staff to include in the alternative B that we'll discuss tomorrow and that Thomas will distribute either later today or it may be tomorrow morning—I did want to warn you that I asked him to include some bracketed proposed statement language that would recognize this fact.

So, just to give you time to think about this, let me tell you explicitly what the new proposed statement language will be. Currently, at the end of paragraph 1, the language in alt-B reads “Market-based measures of inflation compensation remain low. Survey-based measures of longer-term inflation expectations are little changed, on balance.” And the new proposed language would read “Market-based measures of inflation compensation have increased in recent months but remain low; survey-based measures of longer-term inflation expectations are little changed, on balance.” So I wanted to let you know about the proposed changes we'll see in alt-B and give you a chance to think about it before we discuss it tomorrow morning. Let me now open the floor to questions for Simon or Lorie. President Evans.

MR. EVANS. Thank you, Madam Chair. Somewhat related to that point, Simon, on chart 7 on exhibit 2, I think I missed the punchline or the discussion. So the average applied

point estimate of annual average CPI inflation rate—so the five-year, five-year looks like it's 2.05 for the CPI. So if I take some off of that for the PCE, it looks like that's coming in under 2 percent—that's inflation, 6 years to 10 years in the future. What's the story there? Or is there a story?

MR. POTTER. The story is, after the 2016 U.S. election, you saw an increase in inflation expectations measured this way. There was a corresponding increase in inflation compensation in financial markets. This time we've seen an increase in inflation compensation, which is relatively sizable. Over the past few months, we've seen no change in the average estimates from our survey respondents. And that's consistent with other evidence, which is from surveys. But inflation compensation is something like 70 to 80 basis points above its lows over the past two years. So it's been a pretty big move, which is just not reflected in the surveys that we look at.

MR. EVANS. Okay. Thank you.

CHAIR YELLEN. Any further questions? [No response] Okay. Seeing none, we now need a vote to ratify the domestic open market operations conducted since the December meeting. Do I have a motion to approve?

MR. POWELL. So moved.

CHAIR YELLEN. All in favor? [Chorus of ayes] Any opposed? [No response] Thank you. Okay. While people are moving around, let me note that our next item is the staff presentation on inflation dynamics. The staff provided a number of background documents for this discussion, and this morning Katia Peneva of the Board staff, Todd Clark from the Federal Reserve Bank of Cleveland, and Jeff Fuhrer from the Federal Reserve Bank of Boston will be

making presentations. There will then be a Q&A period and, following that, an opportunity for FOMC participants to comment. So with that, let me call on Katia to begin.

MS. PENEVA.² Thank you, Madam Chair. I will be referring to the materials labeled “Material for Briefing on Inflation Dynamics.” In my presentation, I will review the Board staff’s conceptual framework for explaining and forecasting consumer price inflation and will talk about some of the issues associated with it. I will also discuss the Board staff’s interpretation of recent inflation behavior and give our assessment of a few alternative explanations for the relatively low rates of inflation seen over the past several years.

The staff’s starting point for thinking about inflation dynamics is an expectations-augmented Phillips curve, an example of which is given by equation 1 on slide 1. In this equation, π denotes core PCE price inflation; π^e denotes the inflation expectations that are relevant for wage and price setting; GAP is a measure of resource utilization (for example, the difference between the actual unemployment rate and a measure of its natural rate); Z is a set of supply shocks (such as changes in the relative prices of energy and imported nonfuel goods); and ε is a residual. The lagged inflation term, which in practice usually involves multiple lags, is intended to capture the idea that it takes time for inflation to respond fully to movements in expected inflation, changes in resource utilization, or supply shocks.

In this framework, permanent changes in expected inflation eventually pass through one-for-one into actual inflation. In addition, if expectations are perfectly anchored, transitory supply shocks and temporary changes in slack will generate only short-term movements in inflation. To better understand the role of anchored inflation expectations in the staff’s framework, it is useful to compare our baseline model with an alternative model, commonly referred to as an “accelerationist” Phillips curve. An example is given by equation 2 on slide 2.

In an accelerationist model, inflation expectations are based on actual past inflation and so are embodied in the lagged inflation terms. The assumption that the coefficients on lagged inflation sum to one implies that even transitory shocks will leave a permanent imprint on inflation, as *any* change in inflation is eventually fully reflected in the proxy for expectations.

The chart on slide 3 illustrates why, in the aftermath of the Great Recession, the staff moved to the anchored-expectations framework and away from the accelerationist characterization of inflation. The chart plots actual core PCE inflation, the black line; a long-run trend estimate from a VAR model with time-varying parameters, the blue line; and long-run inflation expectations from the Survey of Professional Forecasters, the green line.

² The materials used by Ms. Peneva and Messrs. Clark and Fuhrer are appended to this transcript (appendix 2).

Since the mid-1990s, core inflation has been well characterized empirically in terms of transitory fluctuations around a stable long-run trend, where these fluctuations in turn reflect changes in slack, supply shocks, and other temporary innovations. In particular, the Great Recession appears to have left little, if any, permanent imprint on inflation's long-run trend. In broad terms, movements seen in measures of long-run expected inflation appear to roughly parallel those in inflation's long-run trend. As you can see, the SPF measure leveled off at about the same time as the estimated long-run trend. Hence, in providing a structural characterization of inflation dynamics, we see the trend as being ultimately determined by long-run inflation expectations and use the observed behavior of measured inflation expectations to inform our judgmental estimate of trend inflation in the Tealbook projection.

The current framework, however, leaves unresolved a number of issues that are relevant for explaining and forecasting inflation. One issue, discussed in slide 4, is the role of inflation expectations and how they are formed. As I just noted, inflation expectations are a key element of the framework that we employ to analyze inflation developments. However, several concerns are associated with how we use and forecast inflation expectations. For example, evidence that long-run expected inflation drives actual inflation is largely circumstantial and, in addition, the idea has weak theoretical support. In empirical inflation models, one can find a role for survey measures of long-run expected inflation, but most of the identification comes from the period before the mid-1990s.

Another concern is that economic theory does not clearly identify which inflation expectation measures should be most informative for inflation—the ones of households, businesses, professional forecasters, or expectation measures derived from TIPS. Because inflation expectations have generally been so stable recently, constructing a meaningful empirical model of expectations—and identifying how they are determined—has become essentially impossible.

As previously mentioned, we view inflation's trend as being ultimately determined by long-run inflation expectations. We judge that the underlying inflation trend has been stable for many years at a little below 2 percent, which is about in line with the model estimate of the trend that Todd will present shortly. In the Board staff's baseline forecast, the inflation trend will edge up toward 2 percent; however, this projection is not grounded in any formal econometric model.

Another central question is noted in slide 5—namely, what is the response of inflation to slack? Empirically, the Phillips curve appears relatively flat at present. The flatness of the Phillips curve and the noise in the inflation data imply that price inflation is not very informative about resource utilization. The staff could be mismeasuring slack—say, because our estimate of the natural rate of unemployment is wrong or because some other measure of resource utilization, such as the short-term unemployment rate or real marginal costs, is the appropriate one for analyzing inflation behavior. The staff could also be wrong about the current or prospective response of inflation to slack. For example, the relationship between slack and

inflation may have persistently changed, or may depend on the state of the business cycle.

Another complicating factor, considered in slide 6, is that the relatively short sample used for our empirical inflation models implies that influential observations—in particular, those associated with the Great Recession and its aftermath—can importantly affect the models' estimated coefficients. For example, a comparison of the red and black lines in the chart reveals that time-varying estimates of the slack coefficient noticeably diverge after the Great Recession and depend on whether the relatively small category of financial services prices is included in the inflation measure, the black line, or excluded, the red line. The reason appears to be that, in the aftermath of the recession, the price index for these services was increasing much faster than its average pre-recession rate, despite the unemployment rate remaining well above its natural rate.

Slide 7 notes two additional issues associated with the staff's price inflation framework. The first is the role, or apparent lack thereof, played by wages. Labor costs should be very important for firms' pricing decisions. In the aggregate, labor costs represent about two-thirds of firms' total production costs, and economic theory suggests that increases in labor costs in excess of productivity gains should put upward pressure on prices. Empirically, however, we find little evidence that independent movements in average labor costs have had a material effect on aggregate price inflation in recent years. Hence, the staff tends to take little direct signal for price behavior from movements in wages.

Finally, how to interpret unexplained movements in inflation is another question with which we often struggle. Such movements might reflect an incorrect assessment of the effects of fundamental factors, the influence of a fundamental factor that is missing from our model, idiosyncratic price shocks, or simple noise. These various possibilities are hard to assess in real time.

In the staff's framework, monetary policy influences inflation through its effects on real activity; the exchange value of the dollar, which affects import prices; and inflation expectations. The bar chart on slide 8 quantifies the relative importance of various determinants of inflation by showing their contributions to core PCE inflation from one representative empirical model used by the staff.

The gray bars reflect the staff's assumption that anchored long-run expectations have kept underlying inflation constant at 1.8 percent over this period. As the red bars indicate, from 2008 up through 2016—when the unemployment rate was running above the staff's estimate of its natural rate—slack made negative contributions to core inflation. The pass-through of energy and import prices—the blue and green bars, respectively—can also be important. For example, in 2015 and 2016 the effect of these influences was much larger than that of slack.

As indicated by the yellow “Other factors” bars, there are typically movements in inflation that this model cannot explain even when it conditions on the actual paths of

fundamentals. Moreover, these unexplained movements in inflation can be large. In some cases, these other factors reflect idiosyncratic relative price changes that carry little signal for future inflation. For example, large and unusual movements in the nonmarket component of PCE prices, which are typically not persistent, can often help explain a portion of the other factors.

Last year, core PCE inflation was 1½ percent, about 0.2 percentage point lower than what the model can explain with fundamentals. The magnitude of the other factors in 2017 is not especially large—for example, it was larger in absolute value in 2016. In addition, the negative contribution of the other factors in 2017 follows a period in which they made positive contributions to core inflation. The staff attributes some of the unexplained weakness in last year’s core inflation reading to idiosyncratic price movements, such as the unusual drop in prices for wireless telephone services.

Due to all the uncertainties regarding the staff’s inflation analysis, we cannot rule out that there are influences at play that will hold down inflation more persistently than we are anticipating. Some of these are listed on slide 9. One potential influence is greater competition. While plausible, this possibility is hard to square with the observed downward trend in labor’s share of income—which is often attributed to increased market power of firms—and other evidence that seems to be consistent with declining competition in recent years. Another hypothesis is that foreign slack and other global factors might be putting downward pressure on domestic prices beyond the amount that is already captured in the staff framework through the effects of exchange rates and import prices. However, the staff continues to find little empirical support for this claim.

The Board staff also examined specific categories of consumer prices that have contributed to low inflation in recent years. For example, medical services prices are importantly influenced by government policies, and their increases have been held down by budgetary developments and pressures at both the federal and state levels. The possibility that these sources of downward pressure on medical services price inflation could intensify is a source of downside risk to the staff forecast. Thank you. Todd Clark will now continue our presentation.

MR. CLARK. Thank you, Katia. The persistent and unexpected shortfall of inflation from the FOMC’s 2 percent objective raises a number of questions. One broad issue is whether the standard frameworks used by many FOMC participants to forecast inflation are much less useful than they once were. More specific questions surround the usefulness of the conventional Phillips curve, econometric estimates of inflation’s long-run trend, and survey measures of long-run inflation expectations for forecasting inflation.

In my part of the presentation, I will draw on the large body of research on inflation forecasting to provide some perspective on these issues. I will first present a simple, general forecasting model and summarize the established research findings on the components of the model. I will then report estimates of a specific version of the

model to shed some light on recent inflation, its trend, and long-run inflation expectations. After then discussing the importance of model uncertainty, I will finish up with a brief summary.

The inflation models commonly considered in the forecasting literature take the form shown on page 10 of the handout in equation (1). These models relate inflation, denoted by the letter π , to a time-varying measure of trend inflation or long-run inflation expectations, denoted by π^* ; a set of economic drivers, denoted by X , that typically include measures of economic activity; and past inflation and its trend. The basic idea behind the model is that inflation contains a slow-moving trend component and a cyclical component. Over time, as cyclical influences dissipate, inflation reverts to its trend. This general model is closely related to the one Katia described.

Historically, the errors of forecasts obtained with these models have been sizable, but so have the errors of judgmental forecasts. But forecasts have generally been more accurate since 1990 than for most of the 1970s and 1980s. Although forecast errors of the past several years appear modestly larger than those observed during much of the 2001–07 economic expansion, they are similar in size to the errors of the 1990s. That said, the variation of inflation explained by the model appears to have been relatively small for the better part of a decade. While the average size of the unpredictable component of the model—the forecast error—hasn't changed very much, the size of the predictable component captured by the model's explanatory variables has declined. Therefore, with regard to recent frustrations with inflation forecasts, one might view the glass as either half-full or half-empty.

So what do we know about the usefulness of the model's components for forecasting inflation? As noted on page 11 of the handout, many studies have examined the efficacy of output gaps, unemployment gaps, and other measures of economic activity for forecasting inflation. The literature has also considered a wide array of other indicators that might have predictive content for inflation, including asset prices, import prices, and measures of supply shocks to food or energy.

Despite the crucial role of economic drivers in structural models of inflation, the body of evidence in the forecasting literature indicates that including these drivers typically harms, rather than helps, forecast accuracy. Although some indicators may help forecast inflation in particular periods, they don't consistently improve accuracy over long periods. The literature has yet to provide a definitive explanation for why this is the case. One possibility among others is that a Phillips curve relationship does exist but is weak enough to be difficult to consistently see in forecast comparisons over 10 to 30 years.

Page 12 of the handout turns to another key component of the model: the time-varying long-run trend. Forecasting studies typically use one of two approaches to measuring the trend. The first simply defines the trend as a long-run expectation from a survey such as the Federal Reserve Bank of Philadelphia's Survey of Professional Forecasters. Conceptually, this approach is consistent with a common econometric definition of trend as a long-horizon forecast. The second approach

treats the trend as unobserved and estimates it as part of a combined model for actual and trend inflation, taking the form given in equations (2) and (3) on page 12. The inflation equation (2) is the same as in the basic model I already described. The trend equation (3), which relates the current trend to its previous value and an error term, serves to capture a smoothly varying trend in inflation. Some studies have extended this approach by adding other indicators to the model, such as survey-based measures of inflation expectations or bond yields.

Although the literature has established that including a time-varying inflation trend improves historical forecast accuracy, I should acknowledge that the model can't address economic questions surrounding trend inflation, inflation expectations, or monetary policy. It is also possible that, if inflation remains broadly stable and as the upward trend in inflation from the mid-1960s through the early 1980s and the subsequent disinflation fade further into the past, the importance of modeling a time-varying trend in inflation could become less important than it has been historically.

To provide perspective on the recent behavior of inflation, its trend, and survey measures of long-run inflation expectations, I will now present results from a particular model that fits within the class I have described. The model, detailed on page 13 of the handout, includes as observed variables not only PCE inflation, but also long-run inflation expectations from both the Survey of Professional Forecasters and the University of Michigan Surveys of Consumers. The equations for inflation and for trend inflation—equations (4) and (5)—take the same basic form as I described a few minutes ago. As before, in the model, inflation has trend and cycle components. In this case, though, I have dropped economic drivers—the x variables—out of the model for simplicity; in the research that developed the model, the inclusion of an unemployment gap had little effect on trend inflation estimates and reduced historical forecast accuracy.

The model adds in equations (6) and (7) to relate the SPF and Michigan expectations to trend inflation. The idea is that the survey expectations, along with inflation itself, may provide useful information on trend inflation. This model structure permits an empirical assessment of how closely inflation expectations reflect long-run trends in actual inflation. The survey expectations can move more or less than one-for-one with trend inflation or differ from the trend by wedges that vary over time, captured by the intercept and slope coefficients of equations (6) and (7) that are allowed to vary smoothly over time. But, again, to be clear about limitations, this is an econometric model, and it lacks the economic structure that would be needed to address questions of causality.

In the study of Chan, Clark, and Koop that developed the model, historical estimates obtained with various measures of inflation and inflation expectations show that long-run survey expectations provide information that improves both the model's ability to fit actual historical inflation as well as the precision of the trend inflation estimates. But the survey expectations cannot simply be equated with trend inflation: although the surveys do move with the trend, persistent differentials exist. Finally,

for forecasting inflation, this model is as accurate as the best-performing benchmarks from the literature.

Page 14 of the handout provides the current estimate of trend inflation obtained with the model, using quarterly data through 2017. The chart displays the point estimate of the trend as the black line and the 68 percent confidence band with the gray region. The red and blue lines provide, respectively, the Michigan and SPF expectations. The green line marks the FOMC's 2 percent objective.

The model's current point estimate of the long-run trend in PCE inflation is 1.8 percent. Of course, that trend estimate is uncertain, and the top of the 68 percent confidence interval is 1.96 percent—essentially encompassing the FOMC's 2 percent objective. Both the SPF and Michigan expectations measures exceed the estimated trend, Michigan more so than SPF. As to recent evolution, after edging down from 2008 to 2015, the estimated trend has been stable. Looking ahead, medium-run forecasts from the model directly reflect the trend estimate. For 2019 and 2020, the model's point forecast is 1.8 percent, with a 68 percent confidence interval of about 1.0 percent to 2.6 percent.

I will now turn to page 15 of the handout and to model uncertainty. While model-based confidence bands like the ones I just mentioned capture the uncertainty in a forecast associated with parameter estimation and the model's error term, they don't reflect the considerable uncertainty surrounding the choice of the forecasting model. Many specific models are viable, and we don't know which one is "true."

One important element of model uncertainty is the choice of which, if any, economic drivers to include in the model. As I described earlier, despite the crucial role of economic drivers in our structural models, the inclusion of economic drivers such as output gaps in inflation models has had a fairly poor track record in improving forecasting accuracy, and many such indicators perform comparably.

The choice of a time-varying trend measure represents another important source of forecast uncertainty. Although some studies have advocated particular measures of trend, in broad comparisons over 20 to 30 years, there is little to distinguish the performance of different time-varying trend specifications. Nonetheless, at any particular point in time, models with very different trends can yield very different forecasts of inflation. For example, studies by Stock and Watson and by Faust and Wright have developed models that have historically been successful in forecasting inflation. The Stock-Watson model incorporates an econometric trend, whereas the Faust-Wright model measures the trend with a survey-based expectation. Updated estimates of the Stock-Watson model project PCE inflation of 1.6 percent in 2019 and 2020. In contrast, a Faust-Wright forecast obtained using SPF expectations puts PCE inflation at 2 percent in 2019 and 2020.

I will conclude with a brief summary. While historical precedent may be cold comfort, it is the case that in the context of the literature on inflation forecasting, the recent challenges in forecasting inflation are not all that unusual. With any given

model, forecast uncertainty is sizable, and recent uncertainty appears consistent with historical norms. As a result, it seems premature to conclude from recent experience that something has gone wrong with all of our forecasting models. The models are probably no more limited now than they were in earlier periods. Better models would of course be a great help, but developing them remains a big and ongoing challenge. I will stop there and turn the floor to Jeff.

MR. FUHRER. I hope you don't mind if I make a couple of brief prefatory comments. The first is that I think I speak on behalf of "Team Inflation" when I say that it has been a great privilege to serve in the Federal Reserve System under your leadership, Madam Chair.

CHAIR YELLEN. Thank you so much.

MR. FUHRER. The second—less serious—is that I want to note that the views represented in this briefing are my own and do not necessarily reflect those of any other "old pros." [Laughter] So, on to the substance.

The most recent reading for the 12-month percentage change in the core PCE index—that's through December 2017—is 1.52 percent. It has come to this: The second decimal place matters, because we're looking for signs that earlier declines in inflation were indeed transitory, and that inflation is on its way back to 2 percent. Evidence so far consists of a move upward from a low of 1.30 percent in August to 1.35 percent in September, to 1.49 percent in November, and to 1.52 percent in December. Thus, the ups and downs of a few basis points matter as we look for validation of the expectation that inflation will not remain five- or six-tenths of a percentage point away from target but instead move to just two- or three-tenths away. That is a level of precision in inflation targeting that, earlier, we likely would have thought unattainable.

Now, as page 17 in your packet shows, core PCE inflation, the blue line, has remained stubbornly below 2 percent since 2012. Of course, during a good part of that period, the unemployment rate and labor market slack more generally were elevated, which in most models would imply an inflation rate below the central bank's target. As shown in the red dots, two-year-ahead SEP submissions have consistently overpredicted inflation during this period. Some of this error likely reflects the fact that earlier assessments of the natural rate of unemployment were higher than current estimates—a topic to which I will return in a moment. Some also likely reflects unexpected dollar appreciation. It is important to note that both the SEP inflation forecast errors and the even smaller Tealbook forecast errors during this period, which are not shown in the exhibit, have been quite a bit smaller than the average errors in earlier decades. This is not a first-order miss.

Taking that perspective onboard—that this puzzle is not one of biblical proportions—a number of explanations have been forwarded to explain low inflation as itemized in exhibit 18 of your handout. These include temporary factors such as outsized declines in the prices for cell phones, prescription drugs, and imported

goods; a very small, or perhaps zero, Phillips curve slope; a very low natural rate of unemployment; unanchored long-run expectations; or a change in the behavior of the markup of prices over unit labor costs. Some of these explanations are already reflected in our models of inflation, such as the small Phillips curve slope and a lower estimated natural rate.

Before we examine evidence bearing on some of these explanations, it may be worth reviewing the inflation frameworks that are commonly used by Federal Reserve staff, along with their implications for current inflation. Page 19 reviews three commonly used frameworks: the older “accelerationist” model; the standard New Keynesian Phillips curve, or NKPC model, as we affectionately call it; and the more recent “anchored expectations” model of inflation. As indicated in the exhibit and discussed by Katia, the accelerationist model suggests that the activity gap, along with shocks, drives the *change* in inflation. As a result, this model implies that recent low readings on inflation may be consistent with an unemployment rate that has only recently fallen below the natural rate; while inflation should have increased in recent quarters, it should not necessarily have reached its target according to this model. The New Keynesian Phillips curve model gives an important role to short-run inflation expectations, which essentially stand in for the influence of current and expected gaps. Thus, the New Keynesian Phillips curve model also puts the activity gap at the center of our conceptual framework for inflation. This standard model implies that inflation should converge to its trend—usually assumed to be the central bank’s inflation goal—as the gap closes, in contrast to the implication from the accelerationist model.

Finally, the more recent anchored expectations model makes inflation a function of long-run inflation expectations and current and lagged activity gaps. Like the expectations-augmented model, it implies that inflation should converge toward target as the gap closes. This model blurs somewhat the line between a structural model, which is explicit about underlying economic relationships, and a reduced-form model, which captures key statistical regularities without taking as strong a stand on fundamental relationships. This distinction is the subject of your next exhibit on page 20.

A schematic of a canonical structural model is displayed in the green-outlined boxes on page 20. As the diagram suggests, the model traces linkages from the Committee’s setting of the policy rate to asset prices to the real economy to inflation, noting the influence of policy actions, realized inflation, and the inflation goal on long-run expectations. Of course, the diagram is not a complete depiction of all the interactions. But it stands in contrast to a reduced-form model, in the next blue-outlined set of boxes. This schematic is a simple rendering of a forecasting model from Jon Faust and Jonathan Wright’s 2013 paper in the *Handbook of Forecasting*. This model simply implies that inflation tends to revert toward long-run expectations, with a speed of adjustment that is estimated over a specific sample. And it is hard to beat the forecasting performance of this model, but the model is silent on how monetary policymakers should act to achieve convergence of inflation toward their goal. For that reason, one must exercise care in the inferences one draws from

models of this type. For example, if one were to infer from the empirical regularity that is captured in that model that inflation will revert toward long-run expectations regardless of the central bank's actions, one might commit serious policy errors.

With regard to the potential explanations for recent low inflation, page 21 presents stylized evidence bearing on the slope of the Phillips curve, the link between inflation, and activity gaps. As the exhibit suggests, and as discussed in the staff memos, estimation of this relationship is a difficult task, as many other factors can cloud the underlying relationship between inflation and economic activity. As the exhibit also suggests, the slope of the Phillips curve—which is indicated here by the regression lines that run through the scatter plots of inflation against an unemployment gap—appears to be shallower in recent years than it was earlier, although it is not zero. This chart is shorthand for a wealth of empirical evidence that documents a relatively small but probably significant influence of the gap on inflation in recent years.

The difficulties in estimating the Phillips curve slope have prompted some to suggest that there is no longer a link between gap variables and inflation, as discussed on page 22. Thus, some have said inflation is driven solely or almost entirely by expectations. But, in this case, it's important to ask where the relevant expectations come from. And, more importantly, how does monetary policy influence expectations and inflation—that is, how does the transmission channel of monetary policy work? Alternatives to gap-based models include simple monetarist models—just set monetary growth at the proverbial k percent and nominal GDP growth will follow—as well as Neo-Fisherian models, which say that nominal rates of course equal inflation plus real rates, so just set nominal rates at 2 percent plus the real rate and we will attain the desired inflation rate. In my view, both of these alternatives are probably best thought of as long-run models, with limited implications for medium-run inflation dynamics. The key point here is that if inflation is truly decoupled from the real economy, we have some serious thinking to do.

Page 23 considers the possibility that inflation remains low because the natural rate of unemployment is lower than we think. As the top figure in the exhibit shows, median SEP submissions for the long-run unemployment rate have declined a full percentage point since 2012; thus, most participants already estimate a low natural rate of unemployment. As the bottom figure shows, compensation measures have been rising gradually over the past few years. At current levels, these measures are broadly consistent with an economy characterized by low productivity growth, inflation under 2 percent, and an unemployment rate somewhat below its natural rate. This evidence is, of course, not conclusive, but it suggests that it is unlikely that we are above the natural rate today. A corollary to this observation is that assuming a natural rate that begins with a “3” is pretty risky.

Some participants have expressed concern that long-run inflation expectations may have become “unanchored”—that is, they are no longer firmly centered on the Committee's 2 percent inflation goal—and that this will pull down realized inflation and slow its return to target. Page 24 displays several alternative measures of long-

run inflation expectations, from the Michigan survey's 5- to 10-year inflation expectations, the blue line, to the TIPS 5-year, 5-year-forward breakeven rate, the red line, to the SPF-based "PTR" measure, the black line. These measures have exhibited different trends in recent years, as indicated by the dashed lines, with the TIPS measure displaying the most notable downward drift. However, as noted in the memo distributed to the Committee last week, none of these measures has added much over a simple constant term in predicting core PCE inflation in recent years. We should no doubt continue monitoring measures of long-run expectations, but the fact that forecasting models do not suggest a consistent pass-through from these measures of long-run expectations into core PCE inflation in recent years may allay, to some extent, concerns about unanchored expectations, if indeed these measures capture adequately the relevant expectations.

Page 25 raises the possibility that inflation responds differently to activity gaps when they are negative, or positive, or just small in absolute value. The figure plots a Phillips curve in which inflation responds most vigorously to larger negative unemployment gaps, modestly to small gaps, and less vigorously to larger positive unemployment gaps. The memo distributed before the meeting develops evidence that the shape depicted in the figure is about right for the past 25 years—the slope coefficient for large negative gaps is negative 0.4 versus negative 0.12 for larger positive gaps. Gaps that are near zero respond modestly to the level—and, more significantly, to the change—in the unemployment gap than to its level. A number of Federal Reserve researchers have found similar results, as noted in the memo. These results suggest that inflation may have lingered below 2 percent, not responding clearly to tighter labor markets, simply because the response to the unemployment gap is small when we are quite close to full employment. However, the results also highlight the risk that inflation may respond more vigorously if unemployment falls even further below our estimates of the natural rate.

What to conclude? As suggested at the outset and summarized on page 26, it is wise to put recent inflation puzzles in historical context. This is not an event the size of the Great Depression, the great inflation, the great disinflation, or the Great Recession—it's just not that "great." Inflation has fallen short of our target by a margin that we would have thought quite difficult to attain earlier, and which in fact may be difficult for us to attain in the future. Tentatively, and with all due humility, it seems likely that inflation remains linked to real activity and costs, with a linkage that could become stronger as unemployment falls further. As a result, it seems likely that if unemployment declines further, we will see more tangible evidence of that linkage in the form of gradually rising inflation. The most recent monthly readings for total and core PCE appear broadly consistent with that view.

Your final exhibit repeats the questions about your thinking on inflation dynamics that were posed in the cover note that accompanied the three memos. Katia, Todd, and I would be happy to answer any questions you may have.

CHAIR YELLEN. The floor is open for any questions. President Rosengren.

MR. ROSENGREN. Thank you very much for the presentations. I thought they were quite useful and really enjoyed all of the papers that we were provided before this meeting. All three presentations highlighted that the forecast errors aren't particularly large during the most recent period, and yet we've been in a period in which, for a decade, we've more or less missed our 2 percent inflation target. Could you talk a little bit more about those two observations and how you would weigh those two observations? And could you maybe talk a little bit about whether there are any biases in the errors that would indicate that there's some kind of fundamental process that we're missing? You illustrated a number of possibilities, but is there anything in the error structure that would be consistent with that?

MR. CLARK. Excellent questions. From a forecasting perspective, regarding bias, it does depend in part on the model and the horizon. So, as Jeff noted, the SEP at a 2-year horizon has tended to underpredict inflation and not so much at a 1-year horizon. Some of the econometric models I described have not had a substantial, consistent bias over the past 10 or so years. Others have. The Faust and Wright forecast is an example of one, because it quickly moves to 2 percent, and we've been below 2 percent. It is biased.

In connection with Jeff's point, in a broader historical perspective, it's not clear this is really something fundamentally different in the broader context of our challenges in forecasting inflation. It doesn't mean that it's not different, but that it's, I think, too soon to say. It's one of those cases of "We'll continue monitoring, we'll see." You know, the decline in predictive content of our models—there aren't great explanations that exist in the literature yet. One possibility is that policy has gotten better at stabilizing inflation, and we first saw that in the debate on the Great Moderation. As it applied to economic volatility, it applies to inflation volatility to some degree, at least, if not a large degree. So it's possible that we're a victim of

our own success. It's an area of ongoing work. We certainly know inflation persistence has fallen, and that has a lot to do with the predictability changing—a little bit smaller slope in the Phillips curve, possibly.

So, at this point, it's a combination of things, and no single factor really jumped out at us—either econometrically, this is it, or, more importantly, economically, this is it—other than those kinds of forces.

MR. FUHRER. You know, I had a feeling you were going to ask that question, Eric. [Laughter] Call it “man’s intuition.” So I think, just for a different take on that question, some folks have noted that, over the past 10 or 12 years, inflation has been persistently below our target and said, “Well, that’s a big policy failure. How could that have happened?”

I think, from the perspective of the model that I draw in the memo and that’s similar to the one that the Board staff uses, there are good reasons why you would expect to see the inflation rate below target for an extended period of time, not necessarily the past four quarters. But during that time the unemployment gap was elevated, and even with a small coefficient, you would expect that, other things being equal, to pull inflation below the central bank’s target or long-run expectations. In addition, there were significant and somewhat persistent movements in import prices that, in many years during that period, did probably pull the inflation rate down. I think that if you take those into account, then the forecast errors from that model are not particularly biased. And, again, and related to Todd’s point, not to say that we know that nothing has changed—we never know that, unfortunately, but—I would say, there are good reasons that explain a good portion of that period’s shortfall of inflation from the central bank target.

MS. PENEVA. And I would just echo the point that in the decomposition on slide 8 of the presentation, the yellow bars in the past five or six years are actually positive, which means

inflation was actually higher than what this model can explain, knowing the actual fundamentals. So, if anything, the model is confused by higher inflation over the past five or six years, excluding 2017, which came in in the opposite direction. If you average this over a longer period, that will be close to zero. I don't think that there is a persistent bias. But, from 2011 to 2016, they are pretty much positive.

CHAIR YELLEN. Further questions? President Bullard.

MR. BULLARD. Thank you, Madam Chair. I'm looking slide 4 here. And this might be a comical clash of "fresh water" and "salt water" positions. But the slide says that the idea that inflation depends on long-run inflation-expectations has weak theoretical support. This clashes with my reading of Michael Woodford's book *Interest and Prices*. If I recall correctly, in the introduction to that book, he says that the management of expectations is almost all that matters for actual inflation outcomes. So if you look at the premier book that's been written in recent times on determinants of inflation, it says that management of inflation expectations is critically important. Then we come here, and we say, "Well, this idea has weak theoretical support." So what are we talking about? What's the disconnect here?

MS. PENEVA. This is about the long-run expectations—

MR. BULLARD. Okay, but you can write—it says, in the Woodford model, "expected π in period $(t+1)$." But then you can solve that equation forward. So it's really the whole horizon of inflation expectations.

MS. PENEVA. Right. I think what we were trying to say here is that, if anything, it should be the short-term inflation expectations that matter. Ultimately, for longer horizons, it's long-term, but over the medium term, it should be the short-term expectations. We have been using long-run expectations because they work better recently, though we have models that show

that short-term expectations might work better. But the suggestion that it has weak theoretical support was more in reference to the long-run versus the short-run expectations.

MR. FUHRER. I would say, on that point, that the thing that's a bit surprising is that the Woodford model does not write down that inflation equals long-run expectations plus some stuff. As you note, the expectations that it writes down are short-run expectations. And if you iterate those forward, what that implies is that the future sequence of output gaps or marginal costs—those expectations are what matter most, and those are central. So when Mike Woodford—I will speak for Mike now [laughter]—when Mike Woodford talks about managing expectations, he, implicitly, in that model, is talking about managing expectations, about the way in which monetary policy can affect the future course of the real economy and real marginal costs. So that's really important.

I would say, there are people sitting in this room, including Argia, who have done work that shows that trying to account for the longer-run movements in inflation using an inflation trend measure or the like is really important for modeling inflation. But, as Katia noted, that is a much more important phenomenon for the 1970s, '80s, and '90s. Today, it is much less important in terms of explaining variation in inflation. That's a finding consistent with Todd's work as well. I don't know if it's fresh water or salt water that's important. We're in the same ocean, more or less—the same body of water—but it's how you interpret those implications.

MR. BULLARD. Okay, but the model also has an inflation target, and it's built around the idea of a credible inflation target, and nothing will work in the model if that inflation target isn't credible.

MR. FUHRER. Indeed.

MR. BULLARD. All of the results are dependent on that.

MR. FUHRER. Absolutely.

MR. BULLARD. So in that sense, long-run expectations are absolutely critical.

MR. FUHRER. Yes. And so in all those models, the assumption is that the central bank has made a credible commitment to an inflation goal. And then, if you solve out the implications of that, what it means is that all agents in the model's expectations in the long run will be centered on that inflation goal. Absolutely, you can work that out as well. Whether that is true today or not is hard to say. A much more difficult thing to answer, too, is: At a practical level, to what extent does the central bank's inflation goal figure into actual price-setting decisions by firms in the economy? That it does enter is an assertion that the model makes. I would like to be open minded about how much effect that has. It may play a role, but how much it does in practical terms is, in my mind, a somewhat open question, despite the theoretical premise.

CHAIR YELLEN. President Kashkari.

MR. BULLARD. I had others.

MR. FUHRER. More questions?

MR. BULLARD. More questions. So I'm on now page—have I only gotten up to page 8 here? [Laughter] In this picture we look at our core PCE price inflation and decompose it into components—especially the blue components—that you'd like to not actually be in this measure of inflation and maybe some of the others as well. I mean, is there any prospect that we can go to something like the Federal Reserve Bank of Dallas trimmed mean or some other more reliable statistical measure that's going to clean out the effects that we want to clean out of highly variable prices and get to some better underlying measure of inflation?

MS. PENEVA. The blue lines give the energy price pass-through. So this is our estimate of how much we think changes in energy prices feed into core prices themselves. So it doesn't

include energy or food—it's only core. When we try to figure out how much signal to take from the 1.9 percent in 2016 that was much higher than we expected and than what the model can explain, or how much signal do we take from 2017, we look at a variety of measures, including the trimmed mean from the Federal Reserve Bank of Dallas and diffusion indexes. We utilized a lot of indicators and models to give us an indication about the trend. So this is just one—the decomposition, that informs us about what we think has been driving inflation more recently. But there can be other ways this can be done, for sure.

MR. BULLARD. Okay. I'm fine.

CHAIR YELLEN. President Kashkari.

MR. KASHKARI. Thank you, Madam Chair. I'm just curious. The memos didn't speak much about the international experience. If you were to look at Japan, as an example—very tight labor markets, low inflation for a long time, low nominal wage growth—is there anything you can look at Japan and take from that that we should consider as we think about inflation in the United States?

MR. FUHRER. So, I've written a couple of papers on this and visited the Bank of Japan and talked to them about this.

MR. KASHKARI. I'm asking the right person.

MR. FUHRER. Well, I don't know. You're asking a person who has written a bit about the Bank of Japan. You know, what I can see there is that it's striking how long-run expectations did not move toward the target very quickly throughout a long, long, long period. And short-run expectations tended to revert toward what the long-run expectations were measured as, but there was a stubborn persistence of fairly low inflation expectations.

It seems, econometrically, that you can find some link between those expectations and the realizations of inflation—that seems to be the case—but I would be hesitant to draw strong parallels between the experience in Japan . We made fun of their monetary policy—glibly, I think—a couple of decades ago. Today I would just say, we have sympathy for the difficulties they have faced trying to move inflation as high as they would have liked it to have been.

Our problems, in comparison, are probably an order of magnitude smaller. There are still problems, and there's a rough parallel there, but I think they faced challenges that are an order of magnitude larger. And, in that respect, I have great sympathy for them, because they've been trying a lot of things to try to make that work.

It's interesting that the expectations do seem to feed into the behavior of inflation, but understanding how the long-run expectations are formed in Japan and the extent to which they deviated in some periods from the target, announced or implicit—that's an interesting area of study that I think we need to look at more, and I don't think we have quite the same order of problem here.

MR. KASHKARI. Can I follow up?

CHAIR YELLEN. Please.

MR. KASHKARI. In your paper, you had a stylized nonlinear Phillips curve. As you study Japan, does that inform you at all about the nonlinearity of the Phillips curve?

MR. FUHRER. I haven't looked at the nonlinearity in Japan *per se*, but I would say that both the simple exercise in the memo and some earlier work by some of my colleagues who looked at previous episodes in the United States suggest that we don't know, but there is a possibility that there's a nonlinearity there. This is econometric work that's reasonably good. Is it super-robust and everything? I doubt it. But, as a risk manager, I'd say I would take that

onboard as a possible risk—that when you get to very low levels of unemployment, you may see that nonlinearity, because there’s some evidence that it’s been there both in the past 25 years and, even more powerfully, in decades that include the 1960s.

MR. KAMIN. President Kashkari, if I could add to that—just the point that Japan is a really extraordinary outlier at the moment. There’s been no period that it hasn’t been an outlier. But at the moment, the labor markets are extraordinarily tight, and there is a well-understood consensus throughout the economy that there are these severe labor shortages. And firms are actually—certain retail establishments are cutting down on hours for lack of employees and steadfastly resisting substantial raises. So it appears that either this low inflation expectation is so ingrained in their way of setting prices or there’s some other factor we don’t understand is at play that’s really preventing this natural adjustment.

Now, our anticipation is that the dam will break and that eventually you will get the wage and price increases that we naturally expect, and so that’s why it is hoped that it’s an extraordinary situation that will not have implications for other economies. Conversely, that may not happen, and it might continue to see this in Japan or the tendency might spread to other economies—in which case you Japan would be more like a harbinger. But that’s not our expectation.

CHAIR YELLEN. President Evans.

MR. EVANS. Thank you, Madam Chair. I think this has been a terrific discussion. The papers are really very helpful for the discussion the Committee is contemplating having today. And I hadn’t thought about asking this question, but I think there’s a real challenge here on Jeff’s page 17 of the handout, looking at the SEP two-year-ahead forecast and noting that, while the forecast had been a lot closer to 2 percent inflation, the overall size of this error really isn’t that

large. So, you know, how good a job can we do? And I guess what I'm struggling to come to grips with is the policy response and how we thought about these things at the time, because I'm going to take the view that it's economic activity and the size of the gap that is kind of important for all of this, as we've talked about here. And the policy response in 2010 was to recognize, "Gee, this forecast isn't going to happen. We need a lot of additional accommodation." And in 2011, "Oh, again, it didn't happen. We need trillions of dollars of more asset purchases by the time we do open-ended QE3." So underlying all of this are misestimates of the size of monetary policy accommodation. That's where I'm coming out here. How does our current evolutionary thinking on r^* —I can't believe I said that, John—

MR. WILLIAMS. Music to my ears. [Laughter]

MR. EVANS. —have an interplay with the inflation forecasting, because it's that risk of lower r^* and how much accommodation we're really providing that I think is kind of important here.

MR. FUHRER. All right. I'll take a crack at that. So as suggested earlier, part of the misses, with the benefit of hindsight, likely have to do with too high an estimate of the natural rate of unemployment. That's part of the learning process that makes the use of the Phillips curve subject to some error and hazard. We can't use it well without having some decent estimate, and that estimate apparently moves around over time. So I think that should be taken as a feature of the Phillips curve that makes it complicated.

With respect to r^* , again, with the benefit of hindsight, some estimates at our bank would say that, given where the natural rate is, apparently, if we look back over recent years, it's still the case that monetary policy was stimulative—that is, the real federal funds rate was below the

equilibrium r^* . And, as a consequence, that is part of what explains the significant declines in unemployment relative to the estimate of the natural rate during that period.

There's a person sitting to my right who probably has even more to say about evolutionary r^* than I do, but from that simple perspective, I'd say, yes, it is important, and, yes, some of this is done with hindsight. So we want to be careful about what implications we draw for real-time policy. That said, you know, I'm still sticking to the story that not everything has collapsed in a heap. But it isn't easy doing monetary policy when key variables move over time and we have to estimate those. That's a fact of life.

CHAIR YELLEN. President Kaplan.

MR. KAPLAN. Let me just ask a follow-up question. And, again, thank you for these great papers and the great presentations. If, in fact, the Phillips curve is flatter, and we're trying to figure out what those other factors are that make it flatter, is it possible, then, that you would take from that that it means inflation may turn out to be less susceptible to monetary policy actions than we might have thought?

MR. FUHRER. That's an implication. It's less susceptible to monetary policy actions in the sense that, yes, for any given change in the federal funds rate that delivers a given change in, say, the output gap, we expect to see already a somewhat smaller response of inflation—not zero, however. And one of the issues is, depending on your estimate of the size of the unemployment gap and where it's going to go over time, a larger gap multiplied by even a small coefficient makes some difference. And if you take onboard the risk of the nonlinearity as we get into a region of lower unemployment rates, it could have noticeable effects on inflation.

MR. KAPLAN. Because one of the risks—and we've talked about it a little bit—we may have a tool that is highly influential on the unemployment rate and on economic slack but less

effective in generating a response of inflation. That would mean we've got to be careful how we use this tool. And I'm hearing you think that thinking may have merit or that it does have merit.

MR. FUHRER. Those observations are completely consistent with what we've said so far, yes.

MR. KAPLAN. Okay.

CHAIR YELLEN. Further questions? [No response] Okay. Seeing none, there is an opportunity now to comment on inflation, and a number of you have indicated a desire to do so. Let's begin with President Bullard.

MR. BULLARD. Okay. Thank you, Madam Chair. I appreciate the opportunity to comment on the staff's inflation framework as outlined in the background memos for this meeting. I know these memos are time-consuming projects, and I thought they provided a good starting point for the Committee discussion today.

In most contemporary discussions, the term "Phillips curve effects" is taken to encapsulate the idea that the level of real resource utilization is a primary determinant of inflation at a business cycle frequency. My main comment is that Phillips curve effects of this type are overemphasized in the deliberations of this Committee as well as in financial market commentary.

It is often implicitly assumed, and sometimes explicitly stated, that faster real GDP growth, lower unemployment, robust job growth, or similar factors will mechanically lead to more inflation in the U.S. economy. I interpret the staff as wishing to have a clean empirical model of this process. They want to relate business-cycle-frequency inflation to measures of real resource utilization in a regression context.

Empirical models of inflation of this general type, however, have struggled over the past 25 years. My reading of the literature is that, in a regression of this type, the essential finding is that inflation has not been reliably—statistically speaking—related to much of anything except the constant term in recent years. A variant of this result is that the constant term is not actually constant but is, instead, slowly drifting over time. In any case, measures of real resource utilization do not appear to play an important role. I label this empirical phenomenon “The Case of the Disappearing Phillips Curve.” This is not just a U.S. phenomenon. Inflation has been low in many countries around the world, with generally low volatility compared with the high-inflation 1970s and early 1980s.

The disappearing Phillips curve has been documented rather well in the 2017 annual report of the BIS. They plot estimates of the coefficient on resource utilization, in their preferred specification of a Phillips curve regression, in rolling 15-year samples from the 1980s to the present day, averaged across G-7 economies. I reproduced this figure in a recent speech, “Allan Meltzer and the Search for a Nominal Anchor,” which is available on my webpage. The coefficient in question was clearly negative in the 1980s but has been converging toward zero since then, and in the past seven years it has been statistically indistinguishable from zero.

The Case of the Disappearing Phillips Curve is an international mystery. Why has this occurred? A likely reason not extensively discussed in the memos, but mentioned just now by Todd Clark, is the success of inflation targeting over the past 25 years. Inflation targeting came on the international central banking scene in the 1990s and gained wider and wider acceptance as time went on. Many countries adopted inflation-targeting precepts, either implicitly or explicitly, including, in my opinion, the United States. In addition, inflation targeting has been quite successful compared with the monetary policy experience in the 1970s and early 1980s.

Countries generally achieved lower, closer-to-target inflation, with less inflation variability and less variability of inflation expectations. This success did not come about because of better understanding of empirical Phillips curve relationships. It came about because of a better understanding of the overwhelming importance of expectations—and especially expectations of future monetary policy—in the determination of today’s inflation outcomes.

The success of inflation targeting is also the lead suspect in *The Case of the Disappearing Phillips Curve*. As central banks have become better and better at inflation targeting, they have been able to keep inflation closer and closer to their targets. The theoretical limit of this process is one in which inflation is exactly at target all the time and never moves. In that case, attempts to regress inflation on resource utilization variables are likely to show no relationship at all. Instead, the regression will correctly say that inflation is best described as a constant. That seems to be what is happening today in the empirical inflation literature.

What should we do, confronted with the empirical reality of a flat Phillips curve? The inflation-targeting success story, along with the leading contemporary theory, suggests that inflation expectations are the key to understanding actual inflation dynamics. In simple versions of the New Keynesian Phillips curve, for example, inflation expectations enter as the determinant of inflation with a coefficient very close to 1. In other words, we might reasonably expect a nearly one-to-one mapping between inflation expectations and actual inflation if everything was working according to theory. If, furthermore, inflation expectations are not moving much, then it will appear that actual inflation is a constant.

Of course, in models, everything is simple, and expectations are rational. In reality, everything is messy, and expectations are not always exactly rational. Yet expectations are, nevertheless, very important. This is why I like to focus on market-based measures of inflation

expectations. I understand that there can be measurement issues and interpretation issues. I think those can be dealt with in a reasonable way. I like the fact that these measures of inflation expectations are moving a little bit each day in response to news and economic conditions.

I see the TIPS breakevens as a type of sufficient statistic for policymakers, encompassing all information and possibly alternative theories about future events that may influence actual inflation. I'm glad to see that these types of inflation expectations measures have risen in importance here in FOMC deliberations during my 10 years on the Committee and are mentioned prominently in FOMC communications. I realize that the inflation-expectations part of the New Keynesian Phillips curve is not the component that many may wish to emphasize. But that is the reality of where we are, in light of the empirical evidence of a flat Phillips curve.

An approach appropriately focused on market-based inflation expectations would have fared rather well over the past five years. During this period, market-based inflation expectations tended to be low, as did actual inflation outcomes. Markets were saying, in effect, that our policy was appropriate during this period—whereas Phillips curve– and Taylor rule–type approaches were saying that we should have normalized years ago.

I have just two other comments. In the Fuhrer memo, Jeff states, “One cannot use a shortcut that inflation is now just expectations-based.” I say, why not? We have direct measures of these inflation expectations from TIPS markets. These are observed expectations, and they aggregate what is likely a heterogeneous set of models and beliefs in the minds of market participants. We need to know what they are thinking day by day because expectations are so fundamental to our policy process.

I might mention, parenthetically, that New Keynesian models with heterogeneous expectations and learning produce very different inflation dynamics from those of the standard

model. I have a paper on this jointly with Jasmina Arifovic and Olena Kostyshyna in *The Economic Journal* in 2012. Those who are interested might want to look at that.

There is also theoretical support for the expectations-only view. The sticky price assumption in the New Keynesian model is summarized by a parameter, κ . As κ goes to zero, prices are becoming less and less sticky, and more of the burden of inflation determination is falling on inflation expectations. I think it is quite plausible that today's prices, with the increasingly dominant role of internet pricing, are substantially more flexible than prices were in the 1980s and 1990s. In the New Keynesian Phillips curve, this means that actual inflation is β times expected inflation.

Finally, Neo-Fisherian theory gets a bad rap in these memos and merits at least some consideration. The leading example in favor of Neo-Fisherian theory is Japan. Japan's policy rate has not been above 50 basis points for 20 years, and inflation has remained near zero or below zero for almost all of this period. By pegging the nominal interest rate at such a low level, instead of getting a lot of inflation, the Japanese actually got very little inflation, and this would seem to confirm Neo-Fisherian theory.

Also, Neo-Fisherian ideas are embedded in the New Keynesian model. So this theory is not a foreigner to conventional theory. For those who are interested, you might see the paper by John Cochrane in 2016 on interest rate pegs titled "Do Higher Interest Rates Raise or Lower Inflation?" Why does this happen? It happens because the Fisher equation is in every single model that we work with. And so, in the long run, the Fisher equation has to hold, and so he gets Neo-Fisherian effects in that analysis.

Finally, it may come as a surprise to many of you that the FOMC is about to embark on a Neo-Fisherian sequence: proposing to raise the policy rate during 2018 and expecting inflation to rise in tandem. This is exactly what the Cochrane model predicts. Thank you, Madam Chair.

CHAIR YELLEN. Thank you. President Williams.

MR. WILLIAMS. Thank you, Madam Chair. I, too, welcome this in-depth discussion of inflation and appreciate all of the supporting staff work from around the System. I think one of the great strengths of these kinds of discussions is, you bring in economists from across the System and the Board of Governors and share ideas and contrast ideas, and I think that's very helpful for us.

So I'll cut to the chase. I remain convinced that the Phillips curve is a useful tool for understanding inflation dynamics and the conduct of monetary policy. The fundamental insight of the Phillips curve, that a robust economy tends to push inflation up, provides an indispensable link connecting our policy actions to the attainment of our inflation objective.

Of course, the real world is a far more complicated place than what is described in any of the models that we use, and a multitude of observed and unobserved factors influence economic variables like inflation, and these cloud underlying macroeconomic relationships, like the Phillips curve. In the parlance of economics textbooks, these represent shifts in the Phillips curve rather than movements along the curve. Such shifts make it hard to pin down precisely the response of inflation to economic slack.

Now, this difficulty is made worse by our very success in delivering low and steady inflation in recent decades. The more successful we are in stabilizing inflation and inflation expectations, the weaker is the correlation between inflation and economic activity. So a good analogy is an autonomous vehicle. For those not in the San Francisco Bay Area, just think of

driving a car with cruise control for this. [Laughter] In the autonomous vehicle, you go up and down hills. The car will maintain a steady speed, as the accelerator is automatically adjusted by the computer. Therefore, it looks like the car speed, which is absolutely constant, is unrelated to the terrain you're driving over or to how hard the engine is working.

Despite these challenges in estimating the Phillips curve using time-series data, there are two empirical strategies that I think provide convincing supporting evidence in favor of the standard model estimates. First, the examination of past episodes that were largely demand-driven can be informative. Such episodes filter out some of the extraneous noise—these shifts in the curve, if you will. For example, if you look at those times when monetary policy created sustained unemployment gaps, either positive or negative, there was a significant response of inflation in accord with the standard Phillips curve.

A second source of supporting evidence comes from studying more granular data. That approach can also reduce the influence of confounding factors. For example, a number of researchers from around the Federal Reserve System have examined the variation in unemployment and inflation across states or metro areas and found support for a Phillips curve relationship. So, again, summing up, I maintain that there's still a strong relationship between inflation and economic activity as represented in the Phillips curve.

I do want to add some concluding comments about forecasting as an end in itself, and I'm going to pick up on something that Jeff said in his presentation in talking about this. We know that getting better forecasting models is valuable, and, of course, we want to have the best forecasting models that we can. But the reality is, a well-known regularity in economic forecasting is that, for a litany of variables, including the exchange rate, the stock market, bond yields, and inflation, actually, the best forecast is that it will stay at or near its current value.

That's the so-called random walk forecast. And this is intellectually fascinating for economists. It has spawned an enormous research literature that tries to understand why a random walk—just saying that things will continue on wherever they are today—is better than a sophisticated model.

But if I'm thinking about this from a business person's perspective, my only question is, "What's inflation likely to be next year?" So that I can make my pricing and other decisions, I may be satisfied with knowing that. Just give me the best forecast that you can, and I really don't care what macroeconomic relationships may or may not be embedded in that. And, again, I'd maybe even be content with a model that treats inflation as an exogenous process like a random walk or one of the more sophisticated variants that Todd presented in his discussion of his research, along with the work of Stock and Watson and others. But I think it's important that we remember that we are not passive observers of the economy. Our actions shape the economic environment, and they directly affect the future path of the economy and inflation. In contemplating policy actions, we need models that tell us how our actions affect financial conditions and how those, in turn, affect employment and inflation, our dual-mandate goals.

And the fact that there are models—whether for bond yields and stock values or the effects on spending or the Phillips curve—that are imperfect is certainly humbling, and it shouldn't be lost on us. But it should not be construed to imply that we're flying blind or are without a firm basis for our understanding of the economy and, in particular, of inflation and the effect that monetary policy has on it. As the title of a paper by Christina and David Romer from five years ago put it, "The Most Dangerous Idea in Federal Reserve History" is that "Monetary Policy Doesn't Matter." And we must avoid repeating that mistake. Thank you.

CHAIR YELLEN. Thank you. President Mester.

MS. MESTER. Thank you, Madam Chair. Those words actually have quite a nice ring to them, and I'm really honored that I've been able to say them to you for 30 meetings. You know, as a Governor and Reserve Bank president and Chair, you've long provided dedicated and inspiring leadership. As a member of the public, I want to thank you for your public service, and as a member of this Committee, I want to thank you for serving as a role model to many of us in the Federal Reserve System. And I wish you all the best in your future adventures.

And now let me thank Dan Sullivan, Ellis Tallman, and Bill Wascher for organizing today's briefing and also the presenters today and the System staff for their ongoing research on inflation dynamics. I agree with John Williams that the memos and background papers demonstrate once again the fine work going on in the System—Reserve Banks and the Board—in support of the FOMC policymaking.

Now, reading this work, one either could come away discouraged or encouraged: encouraged because the conventional models relating inflation to past inflation resource utilization and inflation expectations still work as well as they have in the past, or discouraged because those models don't work particularly well and inflation forecasting has always been and continues to be a challenge. I choose to be encouraged because, despite the limitations in the model, the FOMC has been able to make policy decisions that have helped the economy get to a good place. So I think we have to recognize that our forecasts of inflation have wide errors in them and then stay humble, do some model averaging, and continue to foster more research on inflation dynamics.

I think a basic Phillips curve model that relates inflation to past inflation, inflation expectations, and some measure of real activity is at the foundation of the New Keynesian model, which is a structural workhorse model for monetary policy. So I view it as a useful way

to think about inflation, despite the weaknesses of the reduced-form Phillips curve as a statistical forecasting model for inflation.

And I think the FOMC was successful in bringing inflation and inflation expectations down since the '80s and in generally maintaining price stability and stable inflation expectations over the past two decades. As a number of other people have mentioned, the lack of variation in the data has made it more difficult to estimate those reduced-form Phillips curve models, but I don't view that as conclusive evidence against the structural relationship between inflation, inflation expectations, and resource utilization.

In the recent period, while inflation has been below 2 percent for the past five years, much of the undershoot can be explained by weak growth and high unemployment early in the recovery, consistent with the model. Most recently, the undershoot appears to be related to the sharp drop in prices of cell phone service plans, the administrative part of healthcare costs, and other idiosyncratic factors.

Now, these changes affect the measured inflation rate but are not price changes to which monetary policy should react. And I would welcome more research into how changes in relative prices affect aggregate inflation in an economy in which some prices are sticky; how to assess whether a change in relative prices is supply- or demand-driven; and whether alternative measures of core inflation, like an index of sticky prices or market-based prices, will give us a better sense of the persistent component of total inflation.

As a practical matter, I like to look at forecasts from several models and several measures of inflation, accepting the fact that even the best forecasts will sometimes miss. And I value the staff's work in seeking to understand the causes of those forecast misses, because they may tell us something about the future path of inflation.

Putting inflation readings into context is also important. I would take a different signal if I saw weakness in a broad range of inflation and inflation expectations measures when economic activity was soft and if there was weakness in a few measures of inflation or inflation expectations when economic growth was strong. I view inflation expectation as an important factor that helps anchor actual inflation rates over the longer run. I think this stability has already proved its value during this business cycle.

The collapse of demand during the Great Recession could have led to deflation because the pullback in activity was so deep. But deflationary conditions did not develop, because monetary policy responses helped maintain people's expectation of price stability over the longer run and that inflation would eventually return to goal.

To assess changes in inflation expectations, I like to look at a variety of measures, including the Federal Reserve Bank of Cleveland's model, which is based on survey-based measures and market-based measures. Unlike President Bullard, I tend to put less weight on the market-based measures derived from TIPS, because changes in these measures are affected by changes in liquidity and risk premiums, which are unrelated to changes in inflation expectations. At the same time, they do provide more timely measures. So I certainly look at them and consider them.

In view of the importance of anchored expectations as a factor in inflation dynamics, I would welcome more research on how households, firms, financial market participants, and professional forecasters formulate their expectations of longer-run inflation and on the role that monetary policy communications play in anchoring expectations, something that Jeff Fuhrer mentioned in his remarks. So, again, let me thank the staff for their ongoing work on these

issues. It's very important work that's very helpful for the Committee. Thank you, Madam Chair.

CHAIR YELLEN. Thank you. President Rosengren.

MR. ROSENGREN. Thank you, Madam Chair. Like Presidents Williams and Mester, I do find a Phillips curve framework useful. Variants of the framework highlighted by the Fuhrer paper have been the basis of models that the Federal Reserve Bank of Boston staff regularly utilize. In particular, while I certainly acknowledge that the slope of the Phillips curve has diminished from its value in earlier periods so that the slope is now small, work by my staff finds that, under most reasonable specifications, it is not zero. That is an important distinction, because otherwise it is not clear how we should characterize the transmission channel from central bank actions to inflation.

In terms of understanding why inflation has not increased in recent quarters, I think it's important to consider our forecasters in the context of historical uncertainty about inflation, which is precisely why we choose to include the fan charts in the SEP. To paraphrase Jeff, we have had a Great Moderation and a Great Recession, but this inflation miss is not that great.

The staff papers and the fan chart highlight the fact that misses of the size we have experienced recently are well within the confidence bands one would expect from even the best inflation forecasts, even after taking into account a short period of same-sided errors. In general, Tealbook and private inflation forecasts have not persistently missed in one direction, and one would expect persistent misses in one direction if we were omitting something fundamental from the equations we run.

My own view is that, once some large relative price changes drop out from annual changes in inflation, the inflation rate will be only slightly below our inflation target. On the

contrary, my concern is that, as we continue to push the unemployment rate well below our estimates of the natural rate of unemployment, we risk significantly exceeding our inflation goal as wage and price inflation ultimately respond to unusually tight labor and product markets.

Also, I view the role of inflation expectations in inflation dynamics as a poorly developed area of economics. First, how households and firms form their expectations that are relevant for wage and price setting is an area that requires far more theoretical and empirical work than has been done to date.

Relying on any one expectation measure for our inflation specifications is potentially problematic, as measures of inflation expectations can differ significantly, depending on how they are measured and whether they are derived from consumer surveys, financial market pricing, or professional forecasters.

In response to President Bullard, I would just highlight the fact that the five-year, five-year-forward has moved quite a bit since the previous meeting. The 10-year Treasury rate has moved a lot since the previous meeting. Most inflation surveys have not. I wouldn't put much weight on financial markets. I think they move way too much to put too much weight on them when we're trying to model inflation expectations and to draw policy conclusions from that.

In fact, while firms' expectations about inflation may be most relevant, the United States does not have a quantitative survey of firm-level price expectations. Experiments we have done at the Federal Reserve Bank of Boston indicate that many individuals—even ones working at a central bank—do not have well-formed views on current inflation, much less future inflation. In addition, whether and how short- or long-run expectations, or both, should enter our inflation specifications remains an area of debate on both theoretical and empirical grounds. It is not yet clear how firms and households at the individual level take into account near-term prospects for

inflation and central banks' inflation goals in setting wages and prices, especially in a low-inflation environment.

Our uncertainty about how inflation should be modeled, including significant uncertainty about how monetary policy actions affect inflation, is one of several reasons why I would be in favor of the FOMC adopting an inflation range rather than an inflation target. It is also very unlikely that a fixed inflation target is going to be optimal in a world in which productivity and demographic trends and, thus, equilibrium interest rates can change. Hence, due to our limited ability either to forecast inflation or to control it with current monetary policy tools, a point target is too precise and too stable. I do hope that in coming months we can have a broader discussion of our framework. Today's discussion of the difficulties in understanding inflation dynamics provides one good reason for having such a discussion. Thank you, Madam Chair.

CHAIR YELLEN. President Harker.

MR. HARKER. Thank you, Madam Chair. Let me begin by echoing President Mester's thanks to you for your leadership not only of the FOMC and the Board of Governors, but also for the model of leadership that you provide not only to this institution but throughout a city that, frankly, is sorely in need of such a model.

CHAIR YELLEN. Thank you.

MR. HARKER. I also want to thank you personally. In the meeting with you that I had when I was a director and you came to Philadelphia, and you convinced me to think about this opportunity, you saved me from the bane of a university president's existence [laughter], including athletics, because the Federal Reserve Bank of Philadelphia's football team is still undefeated, untied, after all of these years. So thank you, and thank you for putting your trust in me.

I also want to thank “Team Inflation”—also undefeated, untied—for all the work that you have done on these memos. But in thinking about these issues and working with the staff of the Federal Reserve Bank of Philadelphia, I think we’re increasingly skeptical about the Phillips curve as a reliable framework on which to base monetary policy. Empirically, it doesn’t seem to offer reliable guidance. And, theoretically, at least as it is employed, it appears flawed. The empirical failures are well documented in the literature-review section of a recent paper by three members of our staff at the Federal Reserve Bank of Philadelphia—Mike Dotsey, Shigeru Fujita, and Tom Stark. And their subsequent analysis confirms those earlier findings.

Existing theoretical work indicates that the traditional Phillips curve is likely to be unstable. Additionally, it is well known that the statistical measures of gaps that underpin it are poor proxies for the theoretical gaps that are present in New Keynesian settings, especially those that refer to output gaps. That point is made in numerous papers in the literature. Also, labor market conditions that reflect tightness in employment-to-employment transitions may be better aligned with wage and price pressures than is the unemployment gap itself.

Perhaps of greater significance than the absence of any slope in the Phillips curve is the systematic shortfall in inflation, as others have noted. Over the past 20 years, inflation has rarely exceeded 2 percent—2005 and 2006 are the only years that come to mind. While recent shortfalls are a bit more serious, the larger question for me is the persistence of lower-than-target inflation rates. Although we didn’t always have an explicit target, it was arguably implicit and no lower than 2 percent.

Now, look, I have no answer, but it would be unfortunate if there was something about our implementation of a point target that is leading to inflation that is asymmetrically being

below target. And I am also sympathetic to President Rosengren's—and Professor Rosengren's [laughter]—comment about a range as opposed to a point target.

When thinking about policy, my motivating framework is underpinned by the DSGE framework that incorporates labor search models into the basic model. So I am sympathetic to the view that there is a relationship between real and nominal variables. I just do not believe that the relationship is well captured by standard Phillips curve analysis. The mapping between statistical gap measures and key theoretical variables that are most closely linked with inflation is inexact at best.

The challenge appears to be especially dramatic today. Fundamentally, policy has made inflation into approximately white noise while statistical gap measures are extremely persistent. Statistically, it is unlikely that one will find much of a relationship between two variables with such different representations.

Due to the current difficulty with interpreting slack, I have been increasingly drawn to the Wicksellian interpretation, or usage, of the models. While I realize this merely involves some algebraic dexterity, I find that thinking about a low natural interest rate is easier than trying to think about the current value of slack. Basically, if you push interest rates below the natural rate, you should see inflation rising. A lack of any acceleration in inflation then implies that interest rates are not below the natural rate, or at least not too far below the natural rate.

Although the Laubach-Williams measure is not a measure of this natural rate, the Laubach-Williams measure is quite low and would likely be quite low if the natural rate in these models were low for a considerable period of time and monetary policy was appropriate. So my current policy views are being influenced by this alternative way of employing a New Keynesian framework.

The second question that was posed was a very open one, in my mind. But, first, I was drawn to take a rational expectations approach, in which expectations are as fundamental to the model as any other endogenous variable. But, honestly, that is really punting, because it is silent on how agents become fully aware of the economic model. One then naturally thinks about learning—and the literature on this is vast, and I have nothing of substance to offer along these lines and look to the experts in the room, including Presidents Bullard and Williams, for guidance.

It is, however, obvious that stable and policy-consistent inflation expectations are crucial to the conduct of monetary policy. In that regard, we should, through constant communication, make the public aware of our goals and the methods we intend to use to accomplish those goals. By being transparent, we help anchor expectations and, thus, help ensure the consistency of those expectations with our goals. Currently, I think we are doing a pretty good job at keeping expectations of inflation anchored at or near 2 percent. It should be perhaps a measure of our success that aggregate inflation does not feature prominently in the public's mind. Thank you, Madam Chair.

CHAIR YELLEN. Thank you. President Evans.

MR. EVANS. Thank you, Madam Chair, and thanks again to everyone who contributed to this really useful analysis. I think the three memos and the discussion here really covered so much of the space of what needs to be talked about for us to have a useful discussion. So it set the table well for our discussion of this important topic.

With regard to the first question, I generally find a Phillips curve framework to be informative for assessing inflationary pressures. I regularly cite the Board framework that the Chair spelled out in her speech at the University of Massachusetts, Amherst, in 2015 in which

slack, inflation expectations, cost shocks, and inertia determine inflation. Of course, as in any empirical enterprise I am aware of, there are compromises. But I find the basic structure quite useful.

At the Federal Reserve Bank of Chicago we maintain our version of this model, but it is just one of many that we use. The others are a DSGE model, an affine term structure specification that includes inflation factors, and averaging across a host of indicator models in the spirit of Stock and Watson. And many of these are close cousins of the models studied by Todd Clark and his coauthors.

Of course, even this eclectic approach can't predict inflation with the precision that we would like. Indeed, inflation forecasting is a difficult subject for central bankers. Achieving low and stable inflation is half of our mission, but we have all heard policymakers and top monetary economists lament in moments of frustration or candor that we really don't understand inflation. I think we have a decent idea of the possible theoretical determinants of the inflation process. Some are discussed in the three memos circulated by the staff, and others are provided by a more monetarist tradition. But evaluating the actual determinants and dynamics of inflation empirically is especially difficult.

It is likely that many of the so-called structural, or fixed, parameters in our econometric models are really reduced-form stand-ins for some, we hope, slow-moving collection of structural parameters, and our statistical models might simply omit other key factors that change only rarely in response to discrete phenomena. While identifying such slow-moving and rarely changing factors is challenging, at least theory tells us where to look. So we may eventually be able to explain more.

Now, to address the question of why I think inflation has been low in recent quarters, I'd like to turn to the strong challenge that Jeff Fuhrer makes to the unsophisticated use of long-term inflation expectations measures in our inflation models. I particularly enjoyed this memo. It takes a very serious look at the New Keynesian model.

Jeff provides a careful investigation of the New Keynesian Phillips curve. In particular, in that model, the current resource gap, cost shocks, and short-run inflation expectations are sufficient to determine inflation. There is no independent role for long-run inflation expectations. However, as Jeff mentions, this result depends crucially on the public firmly believing that the central bank will ultimately steer inflation to its target and that this target is known to the public. This is not an innocuous assumption. In our current environment, I don't think we can take it for granted that the public believes we will deliver 2 percent inflation on average. As I have noted here before, some of our communications and actions could suggest we view 2 percent as a ceiling on inflation. For example, we have raised rates when inflation is well below target and is showing few signs of moving up. So the public's long-run inflation expectations could well be below our symmetric 2 percent target. And when the zero-lower-bound risk is also considered, the public may have doubts as to our ability to achieve it.

The point is, the public's long-run inflation expectations have to be an important determinant of actual inflation. I didn't read Jeff's memo as suggesting otherwise, but I see the role more broadly. I think that's why surveys and market measures of long-run expectations can be useful in forecasting. They also inform us about the degree of misperception that policy needs to correct. And if we don't do it, inflation won't settle out at target once cyclical dynamics have run their course.

And I note that other central banks, like the ECB in 2014 and 2015, explicitly cited deterioration in these long-run inflation expectations, and I think that these are indications of an important role beyond resource gaps, at least in their policy calculation. And I see the strong public and market responses when central bankers do whatever-it-takes actions as important evidence for a separate role for credible long-run expectations in the inflation process. And so to answer the question, I think, in some part, the low inflation in recent quarters reflects slippage in these long-run expectations below our inflation objective. That's debatable, of course.

I have a couple other comments to make on Jeff's exploration of the non-accelerationist Phillips curve. The non-accelerationist feature is important and perhaps underappreciated, I think. First, Jeff reproduces the well-known flat estimates for the slope of the Phillips curve using data since 2000. He notes that the flatter slope than in the 1970s and '80s may reflect the public's understanding and faith that the FOMC is going to be doing a better job of maintaining price stability than it did back then. This is a very plausible explanation. It is also an important example of reduced-form model parameters changing over time in the context of this specification. And the lesson for today is that we must keep in mind the influence that lower r^* , greater zero-lower-bound risks, and policy misperceptions may be exerting on our models' parameters.

My second comment concerns Jeff's segmented non-accelerationist Phillips curve. Using data since 1990, he finds that the very low unemployment segment is four times as steep as the baseline linear model. Let's take that. Ironically, this section in the memo actually reduced my fear of outsized inflation. I have to explain that.

If I understand correctly, his results say that if long-run expectations stay anchored near our target—and Jeff cites this often—to reduce the role of long-run inflation expectations

independently, then unemployment could drop pretty low without inflation getting all that high. For instance, suppose unemployment dropped to $3\frac{1}{2}$ percent. Under a natural rate of $4\frac{1}{2}$ percent, it would be an unemployment gap of minus 1 percent, which would put us on the steep portion of the Phillips curve. Still, running the numbers through his model, inflation would go up to only about 2.5 percent the way we calculated it. That's noticeable, but it sure isn't 4 percent. Indeed, it's the same size miss we've suffered to the downside, on average, over the past 10 years. And if the slope is steep on the way up, it's steep on the way down, too. So as soon as unemployment rises back to the natural rate in this exercise, inflation would come back down quickly.

Now, you can also do this kind of back-of-the-envelope analysis in a simple forward-looking Keynesian model, with the marginal cost effect on inflation summarized by the Phillips curve coefficient times the unemployment rate gap. You solve it forward so that inflation today equals the known constant long-run target plus the discounted sum of current and future gap effects, like what Jeff has in his memo. For beta, it equaled 0.95—this is an annual calculation. And Jeff's largest Phillips curve coefficient, a 1 percentage point unemployment rate gap for five years, then reverting to zero after that, would get inflation up to 3.7 percent. That's a big number. If the unemployment gap lasted three years—three years at $3\frac{1}{2}$ percent, that's a long time—inflation would rise to 3.1 percent. Now, these quick reversions may be unrealistic dynamics— $3\frac{1}{2}$, then up to $4\frac{1}{2}$ —but this is just illustrative. And also, I haven't taken into account any recession dynamics that might come about once you do that transition, which would lower your inflation expectations.

The first-order point is this: Under a non-accelerationist structure, with fixed long-term inflation expectations, inflation just isn't going to get out of hand. That's what I came away with. This is an environment without an accelerating vehicle. Of course, if I saw $2\frac{1}{2}$ percent

inflation experience in the real world, then, taking an eclectic approach, I'd be on the lookout for indicators suggesting greater inertia to keep inflation high or upward drift in inflation expectations—that independent role of long-run inflation.

So if we saw worrying signs of these, then policy would need to respond accordingly. For me, this is a reminder that we need to take similar precautions today. In particular, we need to respond appropriately to the downward drift we have seen over the past several years and in several measures of inflation expectations, just to be safe. If ignored, these could keep us from achieving our inflation objective. Thank you, Madam Chair. I thought those were great memos.

CHAIR YELLEN. Thank you. I suggest we take a lunch break at this point until about 1:00, and then we'll resume our round of comments on inflation.

[Lunch recess]

CHAIR YELLEN. Okay. Thanks. Let's resume, and our next speaker is President Kaplan.

MR. KAPLAN. All right. Thank you, Madam Chair, and thanks again to the group for the three papers and the presentations. So, regarding inflation frameworks, do I believe in and subscribe to the Phillips curve type? The answer is "yes." Even though the Phillips curve admittedly is probably flatter, I still think—and we think at the Dallas Fed—it's a valuable framework, and we are using this framework on our own inflation forecasts, although our forecasts tend to be more about the Dallas Fed trimmed mean. So that's point number one.

Number two, on the issue of missing on our forecasts: I'm a business person, so I'm used to missing on forecasts. [Laughter] And so, on a serious note, it doesn't bother me at all, and I look at our performance. I don't view it critically at all. I'll tell you what I do worry about, though. I worry about what we learn from deviations from our model. That's the part I'm

focused on. And, in particular, what do you learn from the inputs and the outputs about economic dynamics—that is, how does the economy work, but, more importantly, what’s the effect of our policy tools?

We hit on this a little earlier, for example. If these forecasts and these errors tell you that maybe our policy tool is much more influential on labor slack than it is on inflation, that is a very valuable thing to learn as we go from here, especially at this stage in the economic cycle, as we’re worried about overheating, overshooting, imbalances building. How should we think about the use of these tools? That’s what I’m more focused on. And I think this Committee is learning from it, but that’s what I’m focused on.

On the second question about inflation expectations in wages and prices, I actually think, for me, now, that’s two separate questions, and we struggle a lot on this at the Federal Reserve Bank of Dallas. I think the wage-setting process among businesses is very influenced by inflation expectations. I am less certain today about the price-setting process in that I think today, as I’ve said before, companies are much more preoccupied, in setting prices, on industry dynamics and their lack of pricing power because of technology enabling consumers, which has shifted the balance of power from businesses to consumers; new models for selling and distributing goods and services; and, lastly, technology capability not previously foreseen and widely distributed, which is having an effect of dramatically causing industry restructurings.

The way businesses are dealing with this is, number one, as we’ve talked about, replacing people with technology, but, number two, they are striving for scale—mergers, consolidations—not, though, because they’ll have more pricing power, but simply because they recognize they don’t have pricing power. In order to maintain margins, they need more scale. And so, I’m very

interested and we're very interested in doing more work on some of these structural changes. In particular, I'll make two final points.

Aggregate data—and I'll say this from my own point of view—aggregate data are very useful. I'm not certain how useful they are for this purpose, though, and I think we would be very well served to disaggregate data, certainly maybe by industry, by sector, and I'll give an example of why.

We make an assumption that industry concentration means less competition and more pricing power. I think that used to be true. I don't think it's true anymore. I think industry concentration is much more today, and the zeal for it, an outcome of lack of pricing power. I could go through, industry by industry, cases in which they are far more concentrated today. For example, we've all bought a car. You go to a car dealership. That industry is an example of an industry that has dramatically consolidated over the past 5 or 10 years. I think you will not see much evidence, if any, of pricing power for new cars, mainly because of TrueCar and other engines that allow you to bypass them. They're consolidating, not because they believe it's going to help their pricing power, but because it's going to help their margins through scale.

So, again, I would love to see more research. We certainly don't have the answers in Dallas. I know we're doing a conference with the Atlanta Fed in May on technology-enabled disruption. These are some of the questions we want to spur more work on, to understand this nonlinearity in the Phillips curve, especially as it relates to setting prices—you know, dig more into what the structural drivers are and how we can better understand them.

Again, for me, the only reason I want to do it, and I keep raising this, is to help us better understand the effect of our tools in achieving our dual mandate, because I think they

increasingly may have more effect on one mandate than the other. And I think the better we understand that, the more effective we'll be with monetary policy. Thank you, Madam Chair.

CHAIR YELLEN. Thank you. Governor Powell.

MR. POWELL. Thank you, Madam Chair. I found the three inflation memos to be exceptionally interesting and enlightening and useful, and the same is true of the presentations. So my kudos to all involved.

The framework that we use in thinking about inflation that is reflected in your memos and that the Chair has used in her speeches, I think, is a very reasonable way to think about and understand inflation and changes in inflation, and I think it has explained pretty well the path of inflation over the years. That said, forecasting inflation with any precision is very difficult, and there's no perfect or, I gather, better framework for doing so. There are many, many challenges that you talk about in the memos, and I'll mention just two aspects of the framework that present challenges.

The first is the role of slack as a driver of movements in inflation. There seems to be broad agreement that the influence of slack on inflation's slope of the Phillips curve has diminished over time, although not to zero, and this has led to the suggestion that policymakers should move away from the Phillips curve in thinking about the inflation mandate. I don't see that as consistent with the evidence. Furthermore, if slack were truly unrelated to inflation, it is unclear to me what that would imply for the conduct of monetary policy.

With low inflation and a flatter Phillips curve, non-slack factors have come to account for more of the variation in inflation. To the extent that some of these factors tend to be less connected to monetary policy actions, we will need to approach the pursuit of our inflation

objective with even greater humility than in the past, recognizing our limited ability to guide inflation to precisely 2 percent.

Instead, success could be defined as providing conditions for inflation to fluctuate around the 2 percent objective, with relatively frequent misses on both sides. It may even be that we should revisit the statement language that says that we expect inflation to stabilize around the Committee's 2 percent objective. I hasten to add, Madam Chair, that I'm not offering that for today.

A second challenge for the basic framework is that the trend itself is not observable and, thus, very difficult to identify with confidence. One approach to accounting for the trend has been to replace it with proxies for long-term inflation expectations, either from surveys or from breakevens, and I find these approaches intuitively appealing, although they pose questions of their own. In particular, we need a better understanding of what causes longer-term inflation expectations to move. To me, the credibility of our inflation objective stands out as part of the answer to this question. But what else causes inflation expectations to move? Further grounds for humility.

So what are the policy implications of all of this uncertainty? It is possible that the combination of a flat Phillips curve and below-target inflation and downward pressure on expectations means that the unemployment rate can fall substantially further without risking an excessive increase in inflation or other imbalances down the road. I have some misgivings about that view. There is some evidence—call it a possible risk, as Jeff did—that inflation may react more strongly when unemployment is well below u^* for an extended period. Other extended periods like that have not tended to end well, and that does suggest to me that our path of gradual rate increases is generally the right one. More on that tomorrow. Thank you, Madam Chair.

CHAIR YELLEN. Thank you. Governor Quarles.

MR. QUARLES. Thank you, Madam Chair. It appears as though everyone is making a different decision as to what point over the two days they will make their comments with regard to you. [Laughter] So I will make mine now.

As the most junior person around the table—well, maybe with the exception of President Harker [laughter]—I know that every one of you will have richer and more credible tributes to the privilege we have had of working with our current Chair, and it's certainly true that for all the reasons you will offer over the next two days, I expected when I arrived at the Federal Reserve that working with Janet Yellen would be intellectually stimulating, professionally rigorous, and personally inspiring.

But what I wanted to add today is something apart from those professional encomia that I had not necessarily expected about working with Janet Yellen, which is that it would be such a great pleasure. In the run-up to my arrival there were press reports—mistaken, of course, but not implausible—that I was being sent here to engage in some big mud wrestle with the Chair [laughter] over the course of regulation, which could naturally have engendered a certain reserve, caution, [laughter] and suspicion. Instead, she has been, from the day I walked through the door, patient, funny, open minded, gracious, and sharing both of her experience and her expertise while being genuinely interested in, if not always persuaded by, other points of view. None of that have I taken for granted, and all of that I will greatly miss.

CHAIR YELLEN. Thank you. Thank you so much.

MR. QUARLES. Now, inflation. The papers are great, as everyone has said. I appreciated the historical perspective on inflation forecasting. If the question is, have changes in well-understood macroeconomic relationships made us worse at predicting inflation, thus

accounting for our persistent misses, it looks as though the answer is “No, because we’ve always been quite bad at it.” [Laughter] Which is, I suppose, a certain comfort, and I do take comfort from that fact. Forecasting inflation has always been difficult, subject to large errors, and, in part because it has always been a tricky business, I believe it is too soon to give up on the Phillips curve model that currently underpins our inflation-targeting framework.

I continue to believe that transitory factors are likely responsible for the current shortfall in inflation. As these factors fade—and we all know that we expect an important reduction in March—I expect inflation will move back up to its 2 percent target. As I said in December, and as I will presumably repeat often, I would characterize the recent weakness of inflation as a surprise within our current framework rather than a mystery that necessitates reexamination of our framework.

Finally, I wanted to pick up on something that President Kaplan had said. I thought the discussion of the relationship between inflation expectations and actual inflation was quite interesting, particularly in light of the concerns that have been expressed that our undershooting of our inflation objective may be resetting inflation expectations, with potentially dire consequences. While I think we should continue to monitor inflation expectations closely, I think we should also acknowledge, as the presentations have, that the relationship between inflation expectations and actual inflation has not always been clear. And it makes sense to me that it would be especially apparent in the low inflation era that we’ve been in since the mid-1990s.

One definition of price stability is that inflation doesn’t enter into economic decisionmaking, and nowadays people just might not think that much about inflation, and hence

their expectations of inflation may be less important for price setting. That was certainly true of my own economic decision-making in the private sector.

During this whole discussion, I've been reflecting on various decisions I've made or participated in as an executive of various companies, as a board member of various private or public firms. Our pricing decisions were driven by a number of things: assessment of the competition, our cost structure, our perception of our quality relative to alternatives, technological developments. But our inflation expectations never entered into it. Now, perhaps that's more of an indictment of my perspicacity than an indication of the absence of role of inflation expectations in price setting, economic decisionmaking, in determining actual inflation.

But in the current environment, I would be skeptical of heroic efforts to make a difference in a factor that may not itself make any difference at all, although I would note that the same was probably not true around the time of the Volcker disinflation, when shifting the public's expectations was quite important for lowering the rate of inflation and also particularly costly to bring about. That's just not the world we're living in currently, and I think that many of these models or expectations or concepts were created during a much different time. Thank you, Madam Chair.

CHAIR YELLEN. Thank you. Governor Brainard.

MS. BRAINARD. I want to start by expressing my admiration for Chair Yellen. Under her leadership, millions of Americans have secured productive employment and our businesses have thrived, while policy has deftly navigated the uncharted territory of liftoff from the effective lower bound and initiation of balance sheet runoff. This is truly a remarkable record of achievement.

The topic that the staff have so well prepared us for is an important and timely one. I think the materials you put together and the presentation that you gave us have been extremely helpful. I wanted to start by flipping the questions on their head for just a minute. The question that I occasionally get stuck on is why we, as policymakers, are so attached to the classic price Phillips curve when its empirical performance is so weak.

The simple answer may be that the convenience of the Phillips curve is even stronger than its empirical performance has been weak. If the Phillips curve actually worked in practice as it does in theory, it would essentially allow us to collapse our dual mandate to a tightly linked target. We could steer by the unemployment gap, confident that inflation would move in the predicted direction with a lag.

Because we have one key instrument, it would greatly simplify our task to have a single comprehensive target. We could then be confident that, as unemployment moves below its natural rate, inflation would rise with a lag—conveniently enabling us to accomplish both objectives by adjusting the policy rate path in the same direction. It would also allow us to place great reliance on unemployment data, which conveniently are released at high frequency and are seen as highly reliable and subject to relatively more modest revisions than many of our other aggregate data series.

One lesson I've drawn over many years as a policymaker is that, as often as not, at the interface between economic theory and economy policy, things that seem too simple to be true often are. And that's why we're having this discussion today—because inflation dynamics are complex, and policy needs to grapple with that complexity.

My own views on the inflation process are heavily informed by the empirical work surveyed in the staff memos as well as lessons learned from a variety of episodes, both here at

home and globally. First, put simply, the Phillips curve is currently very flat. Although it does inform my assessment of appropriate policy, I would not rely on it alone in any tight sense.

Second, underlying trend inflation appears to exert a very important gravitational force. A range of estimates suggests it has drifted down since the financial crisis, and it is currently running below 2 percent. My personal estimate is a bit lower than that in the staff analysis.

Third, while it's clear that temporary factors were a contributing factor in holding down inflation last year, because I view the underlying trend to be low and the Phillips curve to be very flat, I'm not confident that inflation will be as close to our objective by the end of the year as it is in the Tealbook baseline. Against this, of course, the depreciation of the dollar associated with stronger-than-expected growth abroad should work to bolster inflation in the near term.

So let me spend a moment on the second point. Insofar as the level of underlying inflation is an important determinant of inflation, I believe we need to be attentive to the extent to which policy might be able to influence that underlying trend. There is actually not a lot of work on how monetary policy adjustments can affect that slow-moving trend of underlying inflation.

Although, in the simplest versions of the canonical framework, there is always a perfect alignment between our inflation target and the public's perception of where inflation is headed in the long run, this framework can accommodate a wedge between those longer-run inflation expectations and our inflation target. And I think it's somewhat useful to think about that. In particular, if the public's perception of our target is determined by our actions and the public's resulting experience of inflation, there may not be perfect alignment. The implications of such a framework have been worked out in research papers.

In this framework, in order to raise longer-run inflation expectations, monetary policy would need to run a bit looser than the public might expect, given the current perception of the credibility of the target. The resulting surprise would lead to an upward revision in the public's assessment of our target. Of course, such a policy would also lead to lower unemployment, and this of course could, in turn, help boost actual inflation. But, in this framework, that channel is mostly a sideshow. What is key is the effect of monetary policy on underlying inflation.

So, looking at the current situation through this kind of lens, it appears the Committee, as represented by the median SEP response, has shown some willingness to run policy looser than would be predicted by conventional policy prescriptions, and that, in turn, may tend to boost the public's perception of our inflation objective back toward our 2 percent target.

In looking beyond the medium-term path of policy, an important role for expectations in inflation dynamics also has important implications for our longer-term framework. The past few years have been characterized not only by a flat Phillips curve and an important role for trend underlying inflation, but also by a decline in the long-run neutral interest rate to historically low levels. In this environment, the extended experience of low inflation during a time when policy was seen as constrained in its ability to respond may be a factor in the downward movement of the inflation trend.

As we look ahead, with long-run r^* anticipated to be low for some time, the low average level of interest rates increases the likelihood of hitting the effective lower bound on nominal interest rates, which, under conventional policy prescriptions, could impart a downward bias to inflation.

So how might a longer-term strategy address this challenge? A variety of approaches have been suggested. One is a substantial increase in the inflation target to, say, 4 percent. The

main argument is pretty straightforward. If real interest rates remain low in the longer run, maybe between 0 and 50 basis points, 4 percent inflation would provide the room to ensure that nominal interest rates would be high enough at their peak to support the kind of cuts we have seen in past recessions, on the order of 400 basis points or more. I don't tend to favor this kind of an approach. I think it could be very difficult to explain to the public. It could risk unmooring inflation expectations from values whose achievement was hard won. And it would be a very difficult decision to reverse. I am also not sure this approach is going to be necessary.

An alternative group of policies would, instead, strive to make up for past inflation misses. In this class of approaches, the FOMC would retain our 2 percent target and would operate policy in such a manner that any shortfall from the target that occurred, for example, during an effective lower bound episode would be made up in a future period.

Examples of policies that incorporate such a makeup feature include flexible price-level targeting and nominal income targeting. And one important variant is the temporary price-level targeting approach advocated, or at least put forward, by President Evans and Ben Bernanke. This approach would aim to hit the inflation target, on average, over a multiyear period and would make up any target shortfalls that occur during an ELB period via a compensating temporary overshoot, in effect delaying the departure from the ELB.

One key benefit of this kind of approach is to soften the blow of recessions by promising relatively easy policy to “make up” only in the immediate aftermath of recession—making up persistent misses that occurred only during the times when policy was constrained by the ELB. The promise of easier future policy would, in turn, tend to lower longer-term interest rates and, thus, eases overall financial conditions during the recession and its aftermath.

From this perspective, a policy along these lines could be thought of as a systematic, preannounced plan for forward guidance. The milder recessions would help reduce the asymmetry that makes the low interest rate environment so difficult to navigate. And by allowing somewhat higher inflation after the effective lower bound has been reached, such policies may help better anchor inflation expectations, because there would be confidence that any shortfall during the effective lower bound episode would be made up for.

At a future meeting, I would be interested in hearing the pros and cons of various makeup-type proposals as a forerunner to a Committee discussion of how we may want to modify the statement on longer-run goals. Thank you, Madam Chair.

CHAIR YELLEN. Thank you. President George.

MS. GEORGE. Thank you, Madam Chair. Also, my thanks to the staff for three excellent briefings on inflation dynamics. I found them a helpful reminder of what we know and what we don't know about the determinants of inflation and how monetary policy affects inflation over the medium to longer run.

As I think about our mandate for price stability, distinguishing between the short to medium run and the long run is key. I start from the perspective that, in the short to medium run, inflation depends on a wide variety of factors, only one of which is economic slack. Over the longer run, I view inflation as being determined largely by market expectations, anchored by a monetary policy that is committed to price stability.

Recent evidence suggests that economic slack, either in the labor market or product markets, has been a weak influence on inflation. More important has been something that Jon Faust and Eric Leeper referred to in their 2015 Jackson Hole paper as “disparate confounding dynamics.” These disparate factors would include highly transitory changes in relative prices,

such as the steep decline last year in telecom prices, as well as structural and persistent changes in price dynamics, such as what we saw the past several years with healthcare prices.

In the presence of these confounding dynamics, it is probably unrealistic to expect that monetary policy can tightly control inflation in the short to medium run. In fact, our Statement of Longer-Run Goals and Monetary Policy Strategy recognizes this by referring to our inflation objective as a “longer-run goal.” In support of that longer-run objective, it seems quite reasonable to view small and even possibly persistent deviations within a range around that objective, both higher and lower, as inevitable in the short to medium run.

Finally, I take some comfort in the fact that several consecutive years of low inflation readings do not appear to have undermined inflation expectations. Recent research by Lee Smith and Brent Bundick of my staff, which was included in the background material on inflation for this meeting, suggests that long-term inflation expectations, as measured by bond prices, remain well anchored.

Following the formal adoption of our numerical inflation objective in January 2012, measures of long-term inflation compensation no longer move in response to unexpected changes in core CPI. In particular, their research notes that the response of inflation compensation following the weaker-than-expected CPI readings last year remains consistent with anchored inflation expectations.

They find that the process of the anchoring of inflation expectations occurred gradually and likely benefited from the introduction of longer-run inflation projections in the SEP in 2009. Whether those long-run inflation expectations are anchored below 2 percent, as the Board staff assumes, is of course unclear. This research, however, would suggest that, just as low inflation in the past year does not appear to have moved inflation expectations down, inflation moving

somewhat higher than 2 percent may not, by itself, raise underlying inflation expectations either. Thank you.

CHAIR YELLEN. Thank you. President Kashkari.

MR. KASHKARI. Thank you, Madam Chair. In answer to the questions the staff posed, yes, I do subscribe to a Phillips curve type of inflation framework. I do believe resource utilization must at some point have some influence on inflation. As I will discuss tomorrow, I believe inflation is low because there may still be slack in the job market and because inflation expectations and trend inflation have slipped somewhat.

I believe the Phillips curve is flat because of central bank actions. I distinguish between what I call a measured Phillips curve and what I call the underlying Phillips curve. Starting with the measured Phillips curve, as advanced-economy central banks have gotten better at managing inflation, the measured Phillips curve has flattened. This is obvious. If we are perfect at controlling inflation, the measured Phillips curve will appear perfectly flat.

With regard to the underlying Phillips curve, here, too, I think central banks have influence through the expectations channel. As advanced-economy central banks have gained credibility and as inflation expectations have become solidly anchored, I believe the behavior of firms and workers has adjusted, and they are now less responsive to changes in output. The more credibility we have and the more solidly anchored expectations are, the flatter the underlying Phillips curve will be.

And just to respond a little bit to Governor Quarles's and President Kaplan's comments, when I talk to businesses, they never talk about inflation driving their price setting. That, to me, is an expression of anchored inflation expectations. If inflation expectations were higher or unanchored, it would be front and center. But they are, in a sense, taking the monetary

environment for granted, and they don't have to worry about it. So I actually think that that does represent anchored inflation expectations.

We have seen the flattening of Phillips curves in advanced economies around the world all at the same time, over the past 30 years or so, and I don't think that's a coincidence. I think this is a direct result of advanced economies pursuing similar monetary policy strategies and gaining independence and credibility with the public.

So, finally, what do I think would cause a Phillips curve to steepen? Well, one option is, we use up the remaining slack, and if the response of inflation does end up being nonlinear, we start walking up the nonlinear curve, which I think we will see and we will respond to. Second, if I'm right that it is central bank actions that are largely responsible for flattening the Phillips curve, then it would require us to lose our conviction to achieve our dual-mandate goals or lose our conviction in maintaining political independence or lose our credibility with the public.

I'm not worried about those because, frankly, I have great confidence in everybody around the table, that we are all committed to maintaining those. And so I'm not worried that one day we're going to wake up and find a steeper Phillips curve, because I think that's within our control. I think, as I'm going to talk about tomorrow, continuing on our current policy rate path will likely further flatten the Phillips curve and continue to anchor expectations below our 2 percent target. I will return to this tomorrow.

The last thing I will comment on is, I acknowledge—I have called it a ghost story—this risk of a nonlinearity. You cannot completely dismiss it. But we also cannot completely dismiss following Japan's path. That's also possible. And so as we weigh these low-probability events, we shouldn't just weigh the low-probability event by the nonlinear Phillips curve. We should also look at the experience of other countries around the world. Thank you, Madam Chair.

CHAIR YELLEN. Thank you. Vice Chairman.

VICE CHAIRMAN DUDLEY. Thank you, Madam Chair. I agree with everybody else. Excellent papers. Excellent presentations. Very well done. My views on the inflation process are pretty mainstream and broadly consistent with the staff presentation that we heard today. I believe the degree of labor market tightness does affect nominal wage growth. However, the relationship between wages and prices is considerably looser. Keep the unemployment rate well below its natural rate for a period of time, then nominal wage growth should begin to climb. Sustain that long enough, the increase in nominal wage growth should eventually get into price inflation.

I also believe that the linkage between wages and prices is much more evident in the prices for services than in goods. Goods prices are determined mostly on a global basis, and there are many factors, such as currency movements, that weaken the linkage between wages and prices. Services prices and contracts are more generally determined locally and typically have a higher labor component, which makes these prices more sensitive to increases in nominal wages.

In the current environment, I don't think we should be very surprised that inflation hasn't become more visible yet. First, we've only recently gotten to the vicinity of full employment. So the mystery, if there is one, is not why inflation was low before 2017, only why we haven't seen an uptick in inflation lately. If inflation doesn't move up over the next few years, then I think the mystery will deepen considerably.

Second, I think nominal wage growth has only moved up a small amount. The current trend seems to be around 2½ percent compared with the 2 percent trend a few years ago. Even if we had a tight relationship between wages and prices, such a modest move in nominal wage growth would produce only a response of price inflation.

Third, the inflation data are noisy. There's measurement error. In the aggregate, the figures that we saw last March can be pushed around by transitory factors. It's even possible that the unobserved underlying inflation trend might be already moving up, but it might be obscured by noise in the data.

Fourth, there is probably a lag between reaching full employment and observing the response of inflation. Many prices tend to be sticky, so it takes time for higher wages to be reflected in higher prices.

Fifth, observing an increase in inflation might also take some time because the relationship between wages and prices is so weak, so it's hard to discern signal from noise in the data. There are several reasons for why that relationship between wages and prices is so weak. And, as others have said, the main one is the fact that inflation expectations are so well anchored, presumably at or below our 2 percent objective.

So, to put it all together, we shouldn't be surprised that inflation hasn't moved up yet. It doesn't necessarily mean that our inflation framework is broken. The Phillips curve may be quite flat, but that doesn't mean it's completely flat or nonexistent. The fact that we do see higher nominal wage growth in states with lower unemployment rates does help confirm, at least to me, that the Phillips curve framework still works.

Finally, if you don't believe there's a relationship between the degree of tightness and the U.S. labor markets and inflation, then what is the inflation process? If inflation just depends on inflation expectations alone, then what drives inflation expectations? I think for those who are critical of the Phillips curve framework, I think they have an obligation to articulate what they prefer in its stead. If there were no relationship between labor market utilization and wages and prices, then we should actually be doing more to push the unemployment rate even lower. But

historical experience—and this is something that John Williams alluded to—would tell us that’s a very bad idea. Eventually, inflation would head up, we’d have to respond by tightening monetary policy aggressively, and we would precipitate the next recession. That would not be consistent with our dual-mandate objectives.

CHAIR YELLEN. Right. Well, thanks to everybody for very interesting comments, and thanks to the staff for terrific papers and presentations. I think this has been a great discussion. Let’s now turn to item 9, which is our review and discussion of the economic and financial situation. David Wilcox, Steve Kamin, and Andreas Lehnert will provide the briefings this morning.

MR. WILCOX.³ Thank you, Madam Chair. I’ll be referring to the packet labeled “Material for Briefing on the U.S. Outlook.”

As you can see from panel 1, our outlook for real GDP growth is much stronger than we had it in the December Tealbook. Last Friday’s first estimate of fourth-quarter real GDP growth (shown by the blue dot) surprised us to the downside by about 1 percentage point and might seem, on the surface, to cast doubt on our upgraded assessment. However, most of our forecast miss was in the contributions from net exports and inventory investment—two categories that generally are less informative about the underlying momentum in aggregate demand. Final demand from households and businesses—a category of aggregate spending that usually provides a somewhat better indicator of that momentum—increased a robust 4.6 percent at an annual rate, only a little less than our Tealbook projection.

In response to the GDP news and the other indicators that have become available since we sent you the Tealbook forecast, we’ve nudged up our forecast of GDP growth over the medium term, offsetting the shortfall implied by the lower-than-expected growth last quarter.

Compared with the December Tealbook, the bulk of the upward revision in our outlook for real activity is attributable to our having folded in the projected effects of the Tax Cuts and Jobs Act. These effects are summarized in line 1 of panel 2, which gives the cumulative percent change in the level of real GDP that we think will result from the tax cuts by the end of 2020.

The tax act was enacted after the December Tealbook was closed. Just before the December FOMC meeting, we sent you a preliminary workup of the projected effects

³ The materials used by Mr. Wilcox are appended to this transcript (appendix 3).

of the act; this estimate—shown in line 6 of the table—was considerably larger than the placeholder we were maintaining at the time, line 7. But our latest assessment is a little larger still, partly because—on closer inspection—the tax cuts turned out to be more front-loaded than we had anticipated.

As shown on line 1, we now think the tax cut will boost the level of GDP by about 1¼ percent at the end of the medium term. The resulting increase in the output gap—line 8—is nearly 1 percentage point, which is roughly ½ percentage point larger than the increment to the gap that we had projected in the December Tealbook.

In his pre-FOMC briefing last week, Travis Berge had a nice discussion of the many sources of uncertainty surrounding our assessment of the effects of the act, and we also included two alternative scenarios illustrating some aspects of this uncertainty in the Risks and Uncertainty section of the Tealbook.

In total, we now have the level of real output about 3¼ percent above potential by the end of the medium term. As a result, the unemployment rate—shown in panel 3—is projected to be 3.2 percent at the end of 2020, 1½ percentage points below our estimate of its natural rate. The last time the unemployment rate was as low as 3.2 percent was in the early 1950s.

As we noted in the Tealbook, we tempered the extent of the decline in the unemployment rate in our projection a couple of tenths on the assumption that the extremely tight labor market will induce a greater-than-usual increase in labor force participation and the workweek as labor demand rises further. Because we're operating so far out into the tail of historical experience for the unemployment rate, evidence on how the economy will operate under these conditions is necessarily thin, but there are some hints in the historical record that the coefficient on the output gap in Okun's law tends to be smaller in magnitude when the labor market is very tight.

Panel 4 gives the most recent available data on unemployment rates across different racial and ethnic groups. In line with the aggregate measure, the unemployment rates for blacks and Hispanics have continued to improve, on net, in recent months. I'll have more to say a little further on about the comparison between the unemployment rates for blacks and whites.

Panels 5 and 6 summarize the inflation outlook. On net, the core consumer price inflation data that we received since the December Tealbook have come in about as we expected, with the November data a little softer and the December data a smidge stronger. The more notable near-term news has been an upward revision to the path of crude oil prices, which is the main reason for the upward revision to the projection of top-line PCE inflation in the near term.

Over the medium term, our inflation forecast is boosted a whopping 0.1 percentage point in light of the considerably tighter conditions that we now expect will prevail over the next few years. This projection is largely based on the average behavior of inflation over the past two decades or so. As we have noted many times,

and as Jeff Fuhrer pointed out in his briefing earlier today, inflation could prove to be more sensitive to resource utilization over the next few years as the labor market continues to tighten.

Turning to panel 7 on the next page, the BEA's estimates of monthly PCE price inflation through December imply that the 12-month change in total PCE prices was 1.7 percent last month, while the 12-month change in the core index was 1.5 percent. Both of these figures were a few basis points higher than our January Tealbook estimates, in large part because of higher nonmarket prices.

As you can see from the red line in the panel, we expect the 12-month change in core PCE prices to remain around 1½ percent in January and February. In March, when the low reading from a year ago drops out of the calculation, we expect the 12-month change in the core index to step up to 1.8 percent; by June, we anticipate that it will be running at 1.9 percent. The 12-month change in total PCE prices—the black line—is expected to reach 2¼ percent by June as higher consumer energy prices temporarily boost overall inflation above the core measure. But given the downward-sloping futures curve for oil, we expect the total 12-month change to move back down and to be in line with core by year-end.

Panel 8 shows four of the various measures of labor compensation growth that we follow. Even more than usual, the available measures of comp growth seem all over the map. However, we would probably put the most weight on the ECI, shown by the black line; among the bunch, the ECI seems to have a relatively high signal-to-noise ratio. Tomorrow morning, the BLS will publish the ECI for December, and if there's anything surprising to report, I'll provide a brief summary of the release at the start of tomorrow's session.

On the occasion of Chair Yellen's final FOMC meeting, I thought it would be fitting to take a step back and review how labor market conditions have evolved in the aftermath of the Great Recession and since Janet took office four years ago. Panel 9 shows the unemployment rate once again. Just before the financial crisis, this rate reached a low of 4.4 percent. Over the next 29 months, it would rise to a peak of 10 percent—in percentage point terms, the largest run-up since the 1930s. By the time Janet took office four years ago, it had declined to 6.7 percent. It's since declined another 2½ percentage points and now is at the 15th percentile of the rates recorded over the series' postwar history.

The next panel focuses on changes in payroll employment. As shown by the leftmost bar, payroll employment fell 8.7 million from its peak in January 2008 to its trough in February 2010. Since Janet took office, another 9.7 million jobs have been added.

In sum, overall conditions in the labor market today are about as strong as they've been in a very long time. That said, there remains, of course, no shortage of unfinished business. The next several panels focus on some respects in which recent

prosperity has not been universally shared and on some respects in which the gains have been more meager than one might have hoped.

Panel 11 plots the relationship between the unemployment rates for blacks and whites. As I've reported to you previously, African Americans have long experienced a high-beta version of the unemployment experience of whites: When the unemployment rate for whites goes up 1 percentage point, the rate for blacks goes up nearly 2 percentage points. The good news is that that relationship has operated in reverse in recent years—as the rate for whites has come down, the rate for African Americans has come down more than one-for-one. And, at present, the rate for blacks—6.8 percent—is the lowest in the history of this series, which dates back to 1972. The bad news is that there are only just the barest hints that the average unemployment experience of African Americans might be converging to that of whites. For the most part, one is left with the conclusion that when the next recession comes, the spread between African American and white unemployment rates will widen once again, much as it has in the past.

The panel to the right focuses on another major challenge that the country will confront in coming years, namely the labor force participation of prime-age workers. Much of the attention has been on the erosion of the participation by men, shown by the red line. But that risks overlooking a concerning development with respect to women. As Janet noted in her speech at Brown University in May of last year, “In 1990, the labor force participation rate in the United States of prime working-age women, 74 percent, was higher than in all but a few industrialized nations. But in the intervening years, while the participation rate of U.S. women was roughly stable, elsewhere it increased steadily, and by 2010 the United States fell to 17th place out of 22 advanced economies with respect to female labor force participation.” By 2016, the female participation rate of prime-age workers had slipped to 20th place. Over the same quarter century, from 1990 to 2016, the relative standing of men's labor force participation fell from 13th out of 22 to 21st out of 22—in other words, next to last place. And, for your reference, at the end of the packet I've provided tables that show rates and rankings for, in exhibit 16, for prime-age women in 22 countries, and exhibit 17, for prime-age men.

The top two panels labeled number 13 and 14 on the next page describe another worrisome divide, this one highlighted in recent research by Alison Weingarden, an economist in the Division of Research and Statistics here at the Board. As you can see from panel 13, there's been a substantial further divergence during the past decade in prime-age labor force participation rates between large urban areas and those in other areas of the country. And, as shown in panel 14, a marked divergence in unemployment rates for prime-age workers has opened up between larger urban areas and elsewhere. The divergence in unemployment rates could be partly cyclical; as you can see, somewhat similar gaps opened up late in the previous two expansions.

Finally, there is the enormous challenge of income inequality. As shown by the blue line in panel 15, incomes in the lower tail of the distribution have lagged only slightly behind those in the middle of the distribution over the past two decades. But

at the same time, the red line indicates that there's been a substantial further pulling away of incomes at the 90th percentile, and other data show an even greater separation in the yet higher reaches of the distribution.

All in all, my take on the legacy of the past four years is that not every problem has been fixed. Some worthy challenges have been left both to your successor and, more generally, to decisionmakers of all kinds, political and otherwise. But the state of the labor market today is very strong, and much stronger than it was four years ago. It's a legacy to be proud of. Steve Kamin will now continue our presentation.

MR. KAMIN.⁴ Thank you, David. I'll be referring to the handout titled "Materials for Briefing on the International Outlook."

I'd like to start by thanking Chair Yellen, on behalf of the International Finance Division, for her service. As you all may know, Chair Yellen started her illustrious career at the Fed in the International Finance Division, so we take pretty much full credit. [Laughter] Indeed, subsequently, both inside and outside the Fed, she's made meaningful contributions to global policy debates. She's also served as a superb ambassador for the Fed and the United States, explaining our policies to officials from around the world and patiently sitting through lengthy international meetings, some of them even longer than the FOMC meetings. [Laughter] And, of course, her careful stewardship of U.S. monetary policy has helped safeguard the recovery of the global economy, which also looks to be in much better shape now than it was four years ago.

My review of international developments begins with the dollar, shown in panel 1 of your first exhibit. As Simon has discussed, despite the recent tax package and increases in U.S. interest rates, the dollar has registered the largest decline over an intermeeting period in decades. We attribute this to the growing optimism about the foreign outlook, on which I'll say more presently, which has boosted prospects for monetary tightening abroad and perhaps also muted some of the risk aversion that we think had buoyed the dollar in previous years. Over the period ahead, we see the dollar bottoming out, as market participants are surprised by the pace of increase in the federal funds rate, and the faster tightening in our current forecast leads to a bit steeper rise in the dollar than we were forecasting back in December. Nevertheless, the current dollar path remains below its earlier trajectory.

Although the lower dollar provides a boost to net exports, the stronger domestic outlook pushes up imports, leaving our projection of net exports, shown in panel 2, little changed. I should add that the advance NIPA data for Q4 that we received last Friday indicated much stronger imports than we projected in the January Tealbook and thus a greater negative contribution of net exports to GDP growth. Even so, we have not taken much signal from the recent Q4 data for future trade. The Q4 import surge was concentrated in a few categories such as consumer durables and likely will not be sustained; moreover, because of its weakness in previous quarters, import

⁴ The materials used by Mr. Kamin are appended to this transcript (appendix 4).

growth for 2017 as a whole was relatively subdued. All told, net exports continue to exert a slight drag on GDP growth over the forecast period.

Panel 3 focuses on the key driver of the dollar as of late, the continued strength of the global economy. Data on activity across a broad range of countries have come in strong. Foreign stock markets (not shown) are ebullient. Oil and metals prices, panel 4, rose to three-year highs on stronger global demand. Taken together, these signals suggest more momentum than we anticipated back in December. We now have total foreign growth, the black solid line in panel 3, rebounding to just over 3 percent in the first half of this year and edging down only gradually thereafter. This projection is revised up about $\frac{1}{4}$ percentage point in 2018 and a little less after that, partly because of the momentum I referred to earlier, but also reflecting the likely spillovers of the U.S. fiscal package, which boosts U.S. demand and imports. Of course, having been repeatedly surprised by the strength of foreign growth in recent quarters, we would not be surprised if we were *again* surprised [laughter] on the upside. We included an alternative scenario in the Tealbook exploring that possibility.

Despite the stronger economic outlook abroad, we see only a bit more tightening in foreign monetary policy, panel 5, than we assumed in December. This principally reflects our view that underlying inflation in most advanced foreign economies, or AFEs, will only slowly come back toward target as resource slack tightens. To be sure, the recent rises in oil and other commodity prices will provide a near-term boost to headline inflation (panel 6), but core inflation, shown in panel 7, generally remains quite muted.

In our discussions of AFE inflation, we usually focus on the four largest economies depicted here—the euro area, Japan, United Kingdom, and Canada. But the AFEs span many more economies than just those four, and the euro-area aggregate hides a considerable diversity of experience. Your next exhibit widens out our focus to look at inflation in 18 advanced economies. Panel 1 compares the most recent reading on 12-month core CPI inflation in all of these economies (shown on the y -axis) with their average in the pre-Global Financial Crisis period of 2000 to 2007 (shown on the x -axis). The solid 45 degree line represents points where the most recent inflation reading is exactly equal to its pre-crisis average. Dots below that line indicate economies whose inflation has fallen from before the Global Financial Crisis, or GFC, to the present.

The chart makes clear how widespread and deep is the disinflation that has taken place in the advanced economies since the GFC. Almost 10 years after that event, most of the countries shown are below their pre-GFC levels (that is, they are below the 45 degree line) and also below the 2 percent target for many countries (as indicated by the dashed horizontal line).

In the narrative underlying our forecast, the economic contraction and anemic recovery that followed the GFC were the key factors driving core inflation downward in previous years. Therefore, the reductions in economic slack accompanying more

robust growth in the period ahead should push inflation back up toward target. The presentations you saw this morning explained some of the difficulties in identifying the role of slack in recent inflation dynamics in the United States. To what extent can we identify the role of slack in the cross-country data?

In panel 2, we relate the change in core CPI inflation since the GFC to the change in the unemployment gap over the same period. More precisely, on the y -axis, for every country, we plot the latest reading for 12-month inflation minus its average value in the 2000–07 period preceding the crisis; on the x -axis, we plot the average unemployment gap (that is, the actual unemployment rate minus its natural rate) less the value of that gap during the 2000–07 period. As we would expect, there's a negative relationship between the two variables: Countries whose unemployment rates rose more in relation to their natural rates—that is, countries in which labor market slack increased more—experienced larger declines in inflation.

This result may not be altogether surprising, as the OECD takes inflation into account when it calculates the natural rates used to construct these unemployment gaps. For this reason, measures of the output gap, or the percentage difference between actual GDP and potential GDP, might be a better measure of resource slack for our purposes. Measures of potential GDP, also calculated by the OECD, primarily reflect its estimates of trend productivity and factors of production, although estimates of the natural rate of unemployment also inform these estimates to some extent.

Panel 3 relates the change in core CPI inflation since the GFC, on the y -axis as before, to the change in the output gap since the GFC, on the x -axis. Here, the relationship between the two variables is even tighter, with those economies that experienced larger declines in the output gap also experiencing larger declines in inflation. Moreover, the dotted regression line nearly passes through the origin—implying that for countries whose output gap is the same as it was, on average, before the GFC, inflation would also be close to its pre-GFC average.

The results shown in panels 2 and 3 complement earlier time-series analysis we've shared with the Committee supporting a role for economic slack in the behavior of foreign inflation. All told, our research provides some comfort that the Phillips curve is not dead, and that increases in resource utilization should indeed push inflation rates upward over time. But how quickly and to what extent inflation will rise remains quite uncertain. As emphasized in the presentations this morning, even if resource slack is fundamentally linked to inflation, its influence may be outweighed by other factors over short periods of time. This can be seen in the final panel of your exhibit, which focuses on developments just in the past year. On the y -axis is plotted the change in inflation between 2016 and 2017; the x -axis plots the corresponding change in the output gap. As you can see, there is no relationship between these two change variables—a result that highlights the difficulty of predicting inflation over moderately short horizons. Andreas will now continue our presentation.

MR. LEHNERT.⁵ Thank you, Steve. My briefing will refer to the handout titled “Material for Briefing on Financial Stability Developments.” Today I’ll summarize our recent assessment of the stability of the U.S. financial system. We continue to view overall vulnerabilities as “moderate”—that is, about at their average level when looking over a long horizon.

Of the vulnerabilities that we track, recent attention has focused on valuation pressures. At the top of your first exhibit, I’ve summarized the history of our judgmental assessments of the level of this vulnerability to emphasize its recent dynamics. Each bar gives you the level we judged valuation pressures to be at the relevant quarterly assessment, on a scale of 1 to 5, with 1 as the lowest, or, in the language of the QS, “extremely subdued,” and 5 as the highest, or “elevated.” A few background notes: First, we didn’t start grading the level of vulnerability on a numerical scale until July 2014. Second, our framework is based on the assumption that our assessment of vulnerabilities should be at each of these levels about 20 percent of the time, implying that “elevated” isn’t an unusual condition, especially for this stage of the business cycle. Third, when we assess valuation pressures, we incorporate all the usual valuation measures, such as estimates of the equity risk premium, but we also take into account nonprice measures, such as the volume of IPOs, to arrive at a holistic assessment.

As you can see from the orange bars to the left, in mid-2014, we judged that valuation pressures were at a notable level. Following widening spreads and declining asset prices amid the doubts about global growth that intensified in late 2015, we took our assessment down a notch to “moderate,” shown by the yellow bars. This situation continued until the run-up in asset prices that began in late 2016. Accordingly, in early 2017 we increased our assessment back to “notable.” In mid-2017 we increased again to the current state of “elevated,” where we remain.

Current high asset valuations appear to reflect a broad-based increased appetite or tolerance for risk among investors. Such appetite must be part of the explanation for the extraordinary rise in the price of Bitcoin, shown in panel 2. I graphed the price on a log scale to emphasize that we are now in the second crypto boom, the first one having ended following revelations of a cyberattack on, and subsequent collapse of, a major Bitcoin exchange in February 2014. During David’s presentation I realized that that also coincides with the arrival of Janet Yellen as Chair of the Federal Reserve. [Laughter] I’m going to have a few things to say about Chair Yellen’s contributions and accomplishments in this field, but this is not one of them. [Laughter]

While Bitcoin has grabbed recent headlines, property and credit markets have historically been of greater financial stability concern. Panel 3, to the right, shows the spread of the investment yield on newly purchased apartment buildings over risk-free rates. As shown, this spread is at the lower end of its post-crisis range but remains notably above its historical lows leading up to the financial crisis. It’s important to

⁵ The materials used by Mr. Lehnert are appended to this transcript (appendix 5).

note that while prices are certainly high, other markers of speculative pressure are absent—for example, banks have been tightening terms on CRE lending in recent years.

Panel 4 shows the spread on high-yield corporate bonds. This spread is near the bottom of its historical range. While some of this can be explained by low credit risk in the corporate sector, staff estimates of the risk premium built into these spreads are also at the low ends of their historical ranges.

The valuation measures in panels 3 and 4 are spreads over 10-year Treasury yields. As shown in panel 5, estimates of the term premium embedded in these Treasury securities are quite low by historical standards. One risk highlighted by this configuration is that, should Treasury yields increase, perhaps because of a jump in term premiums, asset prices could fall sharply. However, should valuation pressures persist, leverage in the system could build up. That's examined on the next exhibit.

I'm going to focus on borrowing by businesses, specifically nonfinancial corporations. This is a sector in which debt has grown significantly since the financial crisis. As shown in panel 1, net leverage among speculative-grade and unrated firms began to rise in 2012 and peaked at record levels in late 2015, about when we judged valuation pressures to have fallen. Since then, leverage has roughly stayed constant even as our assessment is that valuation pressures have picked up.

Panel 2, to the right, shows recent trends in net issuance of risky debt—that is, the sum of junk bonds and leveraged loans. This picked up in the fourth quarter, suggesting that leverage among these risky firms could be increasing. With parts of the business sector unusually exposed, credit losses from a slowing economy might be greater than expected. A weak financial system could amplify these credit losses. The next two panels are concerned with this possibility.

Panel 3 shows the Common Equity Tier 1 ratio, a key measure of resilience, among the banks that participate in our annual stress tests. These institutions account for roughly 80 percent of banking system assets. Capital ratios at these banks remain substantially above pre-crisis norms. Moreover, our stress-testing regime contemplates scenarios in which credit losses—including especially credit losses on loans to highly leveraged businesses—would be greater than expected even in a severe downturn. Participating banks must demonstrate their ability to continue to function through such scenarios.

Banks, however, directly fund only about one-third of nonfinancial credit outstanding. Vulnerabilities among nonbank financial institutions would therefore be a serious concern. Although it's difficult to track leverage consistently among the range of financial institutions outside the banking sector, indications are that leverage there has been roughly stable. Panel 4 shows responses to SCOOS questions about the use of leverage by the clients of participating primary dealers. Since about 2015, responses suggest no increase in the use of leverage by dealers' hedge fund or REIT clients. However, supervisory information on the use of margin credit by equity-

focused hedge funds suggests that leverage among these funds did increase in late 2017. The statistics based on the most comprehensive data, the SEC's Form PF, are only available through the middle of last year. We'll obviously be closely examining these data as they come in.

The bottom two panels discuss maturity and liquidity transformation—that is, how vulnerable the financial system is to destabilizing runs. I'll focus on the nonbanks that engage in substantial maturity or liquidity transformation because they are particularly vulnerable to funding disruptions.

Panel 5 reviews developments among money funds. Following the 2016 implementation of reforms, assets in prime institutional funds fell sharply, mostly moving into government-only funds. Since then, assets in prime institutional funds have crept up. In principle, the reforms reduced the first-mover advantage in such funds, though that principle has yet to be tested. Regardless, the marked decline in assets in such funds has boosted the resilience of the financial system.

Panel 6, to the right, shows a range of alternative vehicles, which might attract institutional or retail funds but which have some of the same fragilities as money funds. Data on some of these vehicles arrive infrequently or only with a substantial delay. However, so far as we can tell, assets in these vehicles have not increased appreciably—suggesting there is little, if any, increase in the system's vulnerability to run risks. That's an area on which we're keeping a particularly close eye, especially as rising short-term rates may increase the incentive for investors to move to such funds.

Our usual heat map is on exhibit 3 for your reference. Let me sum up. We judge overall financial vulnerabilities to be moderate. In other words, they're about in the middle of their historical range. Asset prices could surely fall a great deal, or credit losses on risky corporate loans and securities exceed expectations. However, as far as we can tell, the financial system, including the constellation of nonbanks, appears positioned to absorb such shocks rather than to amplify them. Thus, the second-round effects of such developments should not be unusually large.

Like my colleagues, I'm going to conclude by highlighting just a few of the key achievements of the Chair's tenure in my area of expertise. As Chair, you oversaw some important innovations in the Fed's stress-testing regime, including the first CCAR exercise in which we used our own, rather than the firms', projections of their balance sheets. Under your leadership, the Board approved its framework for setting the countercyclical capital buffer and chose to take affirmative votes on its setting each year. Finally, and, I think, most importantly, the attention you gave to financial stability in numerous speeches, testimony, and press conferences was extremely important in explaining to the public the nature and role of our monitoring and assessment program. Indeed, it was under your watch as Chair that the Board's Committee on Financial Stability came into being. On a personal note, your commitment to the Fed and work ethic have been an inspiration to all of us on this side of the table. My colleagues and I are happy to take your questions now.

CHAIR YELLEN. Questions for the presenters? Vice Chairman.

VICE CHAIRMAN DUDLEY. I have two questions. The first one is—and I'm not sure you're going to get these. I don't expect an exact answer, but I'd just like an order of magnitude. So the output gap has increased 0.9 percent because of the fiscal package. If one decided that one wanted to not have that increase in the output gap of 0.9 percent, what would it imply for the interest rate trajectory, roughly? Is it 50 basis points, 100 basis points? I know you have to make a lot of assumptions about how those interest rate hikes play into the dollar and the stock market, but do we have any sense of the order of magnitude, how hard it would be to push back against that? That's my first question. You can—

MR. WILCOX. Dave Reifschneider, have you done the FRB/US model simulation in your head yet? [Laughter]

CHAIR YELLEN. He's done more than that in his head.

VICE CHAIRMAN DUDLEY. I mean, you can come back later. I'd just be curious how much would—

MR. WILCOX. So the 0.9 percentage point is at the end of 2020. So let's call it three years from now.

MR. REIFSCHNEIDER. So I think it would be 1 percentage point of the funds rate in FRB/US. The FRB/US model has a relatively low interest elasticity of aggregate demand, compared with other models, but not compared with the staff forecast, in which I think the interest elasticity is, in effect, lower than in the FRB/US model. So—I'm just guessing. I don't know what—

VICE CHAIRMAN DUDLEY. That's a good answer. [Laughter]

MR. REIFSCHEIDER. I don't know what the Tealbook would do if you told the Tealbook something like, "Ah, change the monetary policy assumptions to get that result." Maybe it would be a bigger interest rate rise than in FRB/US.

VICE CHAIRMAN DUDLEY. I just want to get a rough order of magnitude. Remember last time when we came forward with our Summary of Economic Projections? People remarked on how they hadn't changed even though there was a fiscal package. I just want to get a sense of how big that effect was.

MR. WILCOX. I think Dave raises an interesting question about what the difference is—I hope we'll never run that experiment. My own guess would be that the characteristics of FRB/US wouldn't be too different from those of the judgmental projection, because our forecast coordinator is importantly guided by multipliers that are derived from FRB/US. Now, whether it would work out precisely the same, I think it'd be very hard to know.

VICE CHAIRMAN DUDLEY. Thank you. That's a great response.

MR. LAUBACH. One place in which you can see a similar result is the Monetary Policy Strategies section of Tealbook A, when you look at the Tealbook-consistent r^* . That measure has been revised up just a bit over 1 percentage point since the December Tealbook. So I think it is consistent with that ballpark.

VICE CHAIRMAN DUDLEY. Okay. Thank you. My second question was on the household savings rate. So the household savings rate declined to the lowest since 2005. I don't know if this is a growth question or a financial stability question, but how much risk do we think that holds?

MR. WILCOX. Risks to households?

VICE CHAIRMAN DUDLEY. Well, I mean, it is a financial—you could argue it's sort of on the real side, but you could also argue it's financial. The household sector is assuming some sort of a sustainment of the housing prices and equity market trajectory, presumably to support that household savings rate. So, how should we think about it? I guess that's my question.

MR. LEHNERT. I can go first. So I'm remembering, somewhat imperfectly, a very nice four-quadrant diagram produced by David's colleague, Jae Sim, which is based on the integrated macroeconomic accounts and relates asset price moves and flows, saving to saving. And we have been in an "Asset Price Appreciation but Saving" quadrant for a long time, which, in his taxonomy, is the top right. The dangerous one is the top left, which is "Asset Price Appreciation and Dissaving or Borrowing." So I think, as I highlighted in my remarks, at this point we don't see a lot of leverage built up in the system, but that's obviously the risk that we're focusing on.

VICE CHAIRMAN DUDLEY. It's a net number, though. So presuming you're not seeing much borrowing, but you're also not seeing much saving either, right? I mean, to get that net number, it's got to—

MR. LEHNERT. No, you're quite right, and of course, it doesn't include businesses and so forth. But the household sector has its portions that have high debt-to-income ratios still, and that are otherwise under stress, but, very broadly speaking, debt has been growing less quickly than income for a long, long time in this sector.

VICE CHAIRMAN DUDLEY. I've taken some comfort from that, because what I worry about is, we think that asset valuations are elevated. We're also seeing it now manifest in the household savings rate. What happens if asset valuations come down? Does that create a

vulnerability for our ability to generate a smooth landing for the economy? That's really the issue.

MR. LEHNERT. Yes.

MR. WILCOX. So a name for that is the "wealth effect," and I guess I'd just add two comments. One is, the wealth-to-income ratio is at a historic high. It looks here like the ratio of wealth is at about 6.8 multiples, and that's higher than in any other period on this chart, which goes back to 1970. That historically has been negatively associated with the saving rate. So, periods of high wealth to income have encouraged households to believe that they have the wherewithal to spend and, therefore, have driven down saving out of current income.

I guess the other comment I'd mention is, we've learned through not-very-happy experience over the years to take the preliminary real-time estimates of household income with a very big grain of salt. They're subject to very large revisions. So, it is something for sure we'll keep an eye on, but we've loosened up the tethers quite a bit of our spending projection to the household budget constraints. It's taken us a long time to get to that conclusion, but that's what our experience with real-time data suggests.

VICE CHAIRMAN DUDLEY. I was also thinking it might be understated just for the reasons that Andreas said. I mean, we do observe the debt numbers. They are probably pretty accurate in terms of debt. We probably measure that pretty well. So maybe that should make us feel a little bit more comfortable. Thank you.

CHAIR YELLEN. Thank you. President Rosengren.

MR. ROSENGREN. This is a question for both David and Andreas. As David highlighted, with the Tealbook baseline, we get down to 3.2 percent unemployment. On the inflation side, Jeff Fuhrer talked about the risk if we have nonlinearities in the Phillips curve.

Could you talk a little bit about the financial stability risk? I assume when we do our financial stability framework, we're doing it with the macro conditions as they are now, but the Tealbook highlights macroeconomic conditions that we haven't seen since the '50s. So how do you think about the financial stability risk that that poses in the longer run, or do you see that as a significant risk?

MR. LEHNERT. Well, by "significant risk," I hope you don't mean "likelihood," because we don't comment on the likelihood of various events occurring, having learned that lesson from the pre-crisis experience. But we do think about inflationary scenarios. There have been repeated—not to always bring up the stress tests—but there have been repeated stress tests over the years in which inflation went above the Committee's target and short rates rose significantly. So the way this tends to manifest itself in our models or in our framework is through the potential for a large drop in asset prices, although that is cushioned somewhat. If you think inflation is increasing, then real prices of things like houses and buildings can go down, and the debt contract is obviously pegged to the nominal value of it. So that's sort of falling by less.

Financial institutions that fund themselves short are going to be grappling with a higher cost of funds because, presumably, the Committee will be tightening policy. At the same time, the potential for the risk premiums, and term premiums on Treasury bonds to return, for whatever reason, to levels seen in the 1990s means that longer-term interest rates could be rising sharply.

So those sorts of rate shock exercises are things that we conduct periodically, that we box into our assessment about the potential capital losses in the banking system on their securities. My recollection is that it's something like a 100 basis point shock gives you something like

7 percent of their equity. And you can get about as much as that on the sort of market value of the loan book as well. So I'd say it's a not an inconsiderable loss. On the other hand, this is the sort of thing that the system is capitalized to withstand.

CHAIR YELLEN. President Kashkari.

MR. KASHKARI. Thank you. Thank you, Madam Chair. David, can we talk about the staff's updated labor force participation forecast? This is on page 29 of Tealbook A. This meeting, there's a pretty big change, as LFP is projected to be flat over the forecast horizon instead of falling along the trend line. I, for one, find that compelling. I look at the labor market over the past couple of years, and this makes sense to me. I don't see why it would be declining. But the trend has not been adjusted. So my impression, looking at this graph, is that the increasing wedge between the forecast and the trend line is really what's driving this large output gap. Could you just talk me through that? I see people who have chosen to work today in a low-wage-growth environment. Why does that feel unsustainable? That feels sustainable to me. So I don't see why this would be driving an ever-increasing output gap.

MR. WASCHER. Maybe I'll take the first stab at it.

MR. KASHKARI. Sure.

MR. WASCHER. And David can add what he wants to add. I guess the first thing to note is that our trend is a little bit flatter than it was before. That's mainly due to our assumptions about the effects of the tax act on trend labor supply: that the tax cuts will generate a little bit more labor supply over time, and that adds a little bit to the participation rate.

I think the other reason that it's flatter—so, basically, right now the downtrend is all due to demographics. There's nothing else. Everything else is—it's really the aging of the

population into their retirement years. There's no other effects going on contributing to the downtrend. The other reason that it's flattened out and is higher than it had been before is that—

MR. WILCOX. Are you speaking about the actual or the trend?

MR. WASCHER. I'm speaking about the trend.

MR. WILCOX. Trend. Okay.

MR. WASCHER. The other reason that the actual LFP is flatter than before and looks flat now relative to the downtrend—

MR. KASHKARI. Do you mean the forecast? I'm sorry. I just want to make sure I know—

MR. WASCHER. The forecast, yes, sorry—in the forecast is that as the labor market gets tighter and tighter, we've assumed that that's going to pull more people into the labor market because wages are going to rise enough to do that. That leads us to believe that the participation rate will be above its trend as the labor market tightens further and the output gap is higher—is more positive—and the unemployment rate is much more below the natural rate. And as David noted in his presentation, we've put a little bit more of that effect into this forecast on the notion that a really, really tight labor market in the past looks like it's been associated with a labor force participation rate a little further above trend, and we've got some other factors as well.

MR. KASHKARI. I appreciate that. I guess I'm just questioning—I'm not questioning the forecast. I'm questioning that this represents a “hotter and hotter” economy. To me, it could represent people choosing to work, and there's nothing unsustainable about it.

MR. WASCHER. So that's possible, but in our forecast we've assumed that it's associated with accelerating wages and a little bit more inflation, but, obviously, with the flat Phillips curve, there's not a lot there.

MR. KASHKARI. Thank you.

CHAIR YELLEN. President Bostic.

MR. BOSTIC. Yes, I had some questions for Andreas. I was actually going to start along the same lines as President Rosengren in terms of thinking about the relationship between the macroeconomic shocks and then sectors of the economy. He went macro to the economy, so I was going to go the economy to macro. In thinking about these overvaluations or commercial real estate, what kind of adjustments do you think we would need to see in order to expect there to be a feedback into the macroeconomy? Is it a 10 percent drop in commercial real estate prices? Is it a 20 percent drop in valuation? And just as some backdrop for this, you know, I like the heat map a lot. I like the concept and the conception. I'm trying to figure out, in the context of that, what my triggers for concern are. What are the signals that should tell me, given this—is this a situation that we need to be worried about, or I need to be worried about? So help with that would be useful.

MR. LEHNERT. Okay. I think it depends on whether you're wearing your—as a policymaker, you are concerned both with financial stability and with macro performance. Our focus in the financial stability framework is on larger-than-expected or larger-than-normal responses to shocks. So if the price of some key asset falls a lot, there would be the normal wealth effects and financial accelerator effects, right? The fact is that households and businesses cannot borrow as freely as they would like under any circumstances because of limited commitment, moral hazard, or whatever.

That's fundamentally in the economy, so drops in asset prices are always going to generate some additional effects through that channel. But the multiplicative sorts of problems emerge when you get a situation, as in 2006, in which the price of an asset, residential housing, falls 20 percent, and the response is far out of line with things like the normal macroeconomic dynamics. And that was due to a household and business sector that was very vulnerable, to a financial system that was highly leveraged, and to some inherent fragilities in the funding structure of the financial system at the time. That's sort of the genesis of what we are looking for.

It is true that—research by economists here at the Board suggests that in times of elevated valuations, the left tail of asset prices has larger declines, like the 10th percentile—the 1-in-10 bad outcome looks worse in times of elevated valuations than in times of moderate valuations. So, straying a little bit into statements about likelihood. A situation like this is one in which it's not inconceivable that asset prices could fall a great deal. However, the response to that price drop would not be one that we think would be accelerated or amplified by the features that financial systems had 10 years ago and that were a problem.

MR. BOSTIC. And then a second question, looking at the four measures you have here. Two of them are green, and two of them are in the more troublesome range. I see that as like a credit cycle, a financial position of the private sector. And what we've seen over the past couple of years is that things have happened. Those two alone haven't triggered concerns about systemic risk. Does that imply, then, that we've got to get all four of these into some kind of yellow or red zone before we should expect to see a problem? I'm curious to hear your thoughts on that.

MR. LEHNERT. When I prepare a Governor's designate for confirmation hearings, it's a rule that they never answer hypothetical questions. [Laughter] I mean, I notice the— obviously, what—the sort of configuration that you're describing is something that we've thought about a lot. I'd say, you know, the things that we are attentive to and that would probably lead us to raise our assessment relate to a situation in which borrowing really began to accelerate against a backdrop of loosening credit standards.

Right now we have a situation in which, for example, in commercial real estate, prices are extremely high. The prices of certain apartment buildings are almost 40 percent above their pre-crisis peaks. So they've gone and exceeded the levels that they were at 10 years ago. And yet, at the same time, we are seeing the average loan-to-value ratio on loans made against these properties falling. We have reports that underwriters are tightening standards. CMBS deals are adding additional sort of protections. So the CRE story is not one in which there is this toxic cycle of ever-loosening standards that is only possible because credit is expanding at the same time.

MR. BOSTIC. And one last question, and then we can move on. The financial-sector leverage and the liquidity transformation are both green?

MR. LEHNERT. Yes.

MR. BOSTIC. How much of a role do you think the regulatory structure has played to put us in that position?

MR. LEHNERT. Right. So to what extent are these not really cyclical but, rather, really slow-moving quasi-structural factors? Is that a fair interpretation of your question? I would say that it's obviously played a really important role. The post-crisis increase in resilience requirements among the largest financial institutions plus—sort of combined with the analysis

that is provided by the stress tests to determine whether—you know, it's not just that capital is higher. It's that capital is enough.

In the maturity and liquidity transformation space, for a long time we flagged the potential run risk embedded in money market mutual funds. But once that had been fixed, we took our assessment down. It seems like a very—right now, it seems like—there just isn't a lot of the kind of deal transformation or curve transformation that was so popular in the pre-crisis environment.

MR. BOSTIC. Thank you.

CHAIR YELLEN. Great. Any further questions? Okay—

MR. BULLARD. Oh, I do have one question.

CHAIR YELLEN. President Bullard.

MR. BULLARD. Thank you, Madam Chair. This is on the international outlook, exhibit 2. This is back to Phillips curve evidence. Chart number 1 plots a lot of countries on here, but a lot of them are European countries, all of which have the same monetary policy. So it seems like the evidence here would be that we've got one policy for a bunch of different countries, and you might have country-specific shocks. And so that's a little bit different from, say, the United States, which has a country-specific shock and a monetary policy that covers that country-specific shock, so that you get different results for—you should get different results, it seems to me, for the United States than you would get for the components of the euro area.

MR. KAMIN. Well, yes. Let's put it this way. I think you certainly would expect that the euro area and its component countries might respond differently from the United States to different types of shocks. The premise of this exercise is not necessarily that all economies have the exact same model and that all economies' inflation rates would respond identically to

particular shocks. It's more just, let's see what we can tease out of long-term movements across a range of countries as an alternative to focusing on one economy and looking at the time-series evidence on inflation.

That said, let's just say that if you were wedded, literally, to some of the Phillips curve inflation models that our previous presenters showed that relate inflation to past inflation or inflation expectations, and to a gap measure; something like that. If you wanted to interpret those literally, you could say, "Well, there's not too much of a role for monetary policy per se in that equation, except insofar as it might affect the gap measure and inflation expectations." So if you took that approach, then you might say it really doesn't matter too much whether different countries have different monetary policies or the same monetary policy. We're looking at the effect of shocks to unemployment, output, and so on, and looking at their effect on inflation. So depending on how literally you want to interpret the inflation model, you could abstract from the fact that different countries have different monetary policies or not.

MR. BULLARD. Well, I guess I just think you—this chart is mixing cross-country evidence with in-country evidence. So the analogue for the United States would be to plot U.S. states, which has been done also. But when you compare full countries with their own central banks, compared with—especially if you look at Italy, Spain, and Portugal here, which are the outliers in this first—

MR. KAMIN. Right. Well, that exercise has been done. And, in fact, in a raft of papers that were circulated to research directors as preparation for this meeting, a number of those papers actually used data from different cities—

MR. BULLARD. Yes.

MR. KAMIN. —and used panel regression approaches to tease out what information their comparative experiences might shed. And they came to a conclusion, using more sophisticated techniques, similar to this, which is, using the geographical dispersion of experiences, you could tease out some evidence of resource slack influencing inflation.

MR. BULLARD: We did that for the Eighth District, and we didn't find any of this.

MR. KAMIN. If you separate it into different suburbs within the—

MR. BULLARD. Yes, maybe. Yes.

CHAIR YELLEN. Okay. There's now an opportunity to comment on financial stability-related issues. A few people have indicated a desire to do so. Let's start with President Rosengren.

MR. ROSENGREN. Thank you, Madam Chair. While there is wide debate about whether macro policy or regulatory tools are most appropriate to address risks to financial stability, at this point we have very little capacity to offset a significant financial instability shock. One needs to build capacity in good times in order to use such tools during bad times. In some ways, this is like building up a policy buffer, using some combination of monetary, fiscal, and regulatory policies, which can cushion the economy and the financial system against diverse shocks, should they occur.

While these policies should be interrelated, having inadequate cushions provided by each of our monetary, fiscal, and regulatory policies is certainly not where we want to be in the next recession. On the fiscal policy side, the recent tax cuts and the likely resultant increase in the ratio of debt to GDP have depleted the fiscal policy buffer. If an adverse shock occurs, we now will have less capacity to implement expansionary fiscal policy.

On the monetary policy side, the current environment of low real interest rates and low inflation also leaves the monetary policy buffer quite low. On the regulatory side, the countercyclical capital buffer is designed to be a buffer that, ideally, could be drawn down during bad times. However, in the United States, unlike many other countries, the countercyclical capital buffer is currently set at zero. While the supervisory stress tests do provide some buffer, they have limitations and cannot consider the full range of outcomes and broader economic factors that are intended to be captured with this tool.

The lack of a meaningful buffer available in monetary and fiscal policy makes the potential regulatory buffer more important. In addition, gradually building a buffer during good times is consistent with increasing the buffer during a time of a low unemployment rate and when many asset classes are experiencing relatively high valuations—an environment in which we currently find ourselves.

If, on the other hand, we choose not to build this regulatory buffer, then there is all the more reason for us to have a discussion of whether our current monetary policy framework can serve as the primary buffer against a recession or a financial stability shock. If we cannot confidently rely on our current framework to do the job, we need to consider other frameworks that might do it better. Thank you, Madam Chair.

CHAIR YELLEN. Thank you. President Kaplan.

MR. KAPLAN. Thank you, Madam Chair. I agree with Andreas. Excessive valuation at this point in and of itself doesn't unduly worry me. It is from here, though, that the accumulation of debt is likely to accompany excess valuation. I think this is likely going to be in the nonbank financial sector, which is a sector in which we don't have as great a visibility. And it may well occur because of a sudden rise in rates—that is, a rate shock—because I do think we're at a point

at which low rates have been a big part of the asset run-up. Earnings have improved, but valuations have improved much more than the improvement in earnings.

I'm talking to more and more people who are suggesting that leverage is increasingly needed to be used to generate returns, which helps explain why margin debt is at record levels. Again, I think this is manageable at this point. It may be less transparent how much increased leverage there is in derivative form. We already talked about high-yield debt spreads and the issuance of high-yield debt.

In addition, everything I see out there suggests that covenants in these securities are lighter than they've been historically, and we all know these funds offer daily liquidity, which means that, should you have a problem in a sector, like we saw for a couple of years in energy, you can have a very quick gapping out. Again, I don't think this sector alone is big enough to create this systemic risk right now—right now.

And then there are our discussions we've had here about risk parity strategies, and, again, these are strategies in which you not only leverage the asset, but the lower the volatility of the asset, the higher the leverage. This works great on the way up, or kind of a linear way on the way up, because when prices go up, volatility can be low and you can keep your leverage on the way up. The issue is on the way down. When prices go down, volatility goes up. Not only do you need to cut your leverage because the price declined, but you need to cut your leverage because the dollar allowed—the leverage per unit of asset has to go down because volatility is higher, which accelerates the decline.

I don't have a good feel—and I know we've talked about this. I know we're monitoring how much of this strategy is out there. You talk to people, and I think they still reassure you in the markets. They think it's going on, but it's not out of control, and I buy that. And so, all in

all, if we could just stop the music right here, it strikes me that we're in pretty good shape, and I'm not terribly worried.

The issue is, where do we go from here? And I think 2018 and 2019 are going to be years when we need to be on our toes. And I hate to harken this, but they remind me of 2005 and 2006 or 1997 and 1998. And I hope that turns out to be wrong, but—where the volume of mortgage securitizations and credit default swaps were at the end of 2005, we could have stopped there and we would have been fine. I think we were having this discussion around the table—fairly manageable. At the end of '06, a little more questionable, and '07, dramatically worse. And I was stunned myself at the rate at which these risks built up, at how fast they built up, and I think we were surprised here. It's the last year or two of the cycle that you just—it doesn't mean it'll happen. We just have to be on our toes. So to me, the lessons would be, keep doing our financial stability work and let the rest of the team do a great job.

Number two, it does strike me that phone calls and discussions with contacts at this stage in the cycle may be as important as, if not more important than, data that we can measure. This means talking to people who are raising issues. And I know the New York Fed has talked to a number. I won't mention their names. In view of the number of prominent money managers who have said, "Hey, I'm starting to get nervous," I think those discussions are great, and I've said to my own team, if we could increase those discussions here, I think that would be wise. I don't think measured data are likely going to tip us off. I think it's going to have to be discussions with contacts that will give us clues as to where to dig in deeper.

I agree completely that for the big banks—and if I could include the insurance companies, I would, but I know we can't—tough capital requirements and tough stress testing are needed at this stage of the cycle. In addition, regular stress testing, I think, is critical.

I do agree with the idea of reviewing the Volcker rule, because I worry that if you do have this selloff, trading volumes are lower. It could be because of low volatility, and some of it might be due to the Volcker rule. I just wouldn't mind if we did a review and asked the question. If it turns out to be mainly low volatility, fine. But if there is a big selloff, there is a question mark on whether we have the market infrastructure to accommodate the volume, question mark.

And this last thing—it is one reason why I am glad the FOMC is working to wind down its balance sheet, because in this kind of scenario, if it happened two or three years from now, it's hard to believe that the FOMC would need its balance sheet with all this liquidity in the world. I could envision, if this scenario happened, that you could have a drain of liquidity very rapidly when we may actually need to use that balance sheet a couple of years from now. So it's worth keeping in mind. And this is one of the reasons why I've shifted in the past six months to saying that removal of accommodation patiently but deliberately may well keep that rate shock from happening down the road. Which is why I believe in that strategy. Thank you, Madam Chair.

CHAIR YELLEN. Thank you. Governor Brainard.

MS. BRAINARD. Thank you, Madam Chair. Asset valuation pressures in a broad set of markets are elevated above historical norms. This is true not only for equities, but also for credit. Across a broad range of markets, risk premiums and spreads remain narrow by historical standards. Measures of volatility of both equity prices and long-term interest rates remain near multidecade lows, although this could be consistent with a positive economic outlook. The low volatility may instead reflect undue complacency.

U.S. price-to-earning ratios have reached their highest levels outside the dot-com era, particularly for smaller firms. Corporate bond yields remain near historical lows, and spreads of

yields on junk bonds to those on comparable-maturity Treasury securities are near the bottom of their historical range. These elevated valuations reflect in part the low level of Treasury yields and historically low levels of term premiums, but this could pose risks if term premiums were to rise sharply—for instance, if investor perceptions of inflation risks increased or investor appetite for risk fell. I will return to this risk shortly.

Against the flashing red signs in asset prices and measures of risk appetite, muted risks in liquidity and maturity transformation and in financial-sector leverage, along with relatively low leverage in the household sector offsetting rising leverage in the business sector, lead the staff to assess vulnerabilities as moderate overall. On net, they assess financial stability risk to be close to the middle of the distribution. What does that imply for policy?

Well, the QS assessment is a critical input into the Board's financial stability processes for adjusting our two macroprudentially oriented tools: the supervisory CCAR stress test and the countercyclical capital buffer. It might be useful, in order to help give context for the FOMC's deliberations on financial stability, to provide an insight into the Board's financial stability processes as they pertain to the stress test scenarios and the countercyclical buffer.

First, the supervisory stress tests are intended to ensure that minimum capital requirements can be met under severely adverse macroeconomic conditions, and they also assess the resilience of the largest trading firms to risks of a large disturbance to global financial markets and the failure of firms' largest counterparties. The in-depth assessment of financial vulnerabilities and the quarterly surveillance that you just heard is a critical input into the development of scenarios for the stress test each year to strengthen resilience against particular risks that may be building. By design, the CCAR stress test is expressly intended to incorporate some elements that make the test more stringent when the financial markets are heating up.

These countercyclical features are intended to give the stress test some utility as a macroprudential tool.

The most prominent countercyclical feature, of course, is the setting of the unemployment rate in the severely adverse scenario, when the baseline unemployment rate starts at levels below 6 percent. The ultimate level of the unemployment rate that is reached in the stress scenario stays fixed at 10 percent. Similarly, the Board has put out a proposal for comment to introduce a systematically countercyclical mechanism into the component of the scenario that shocks house prices.

In addition to these systematic elements, the annual stress test design can take into account particular financial vulnerabilities that are identified by the QS process. For example, scenarios for this year's stress test, which aren't yet public and will be announced shortly, will feature large decreases in asset prices, including CRE prices, along with a rise in Treasury term premiums.

Although the scenarios always include severe recessions and sharp declines in asset prices, in past years they've also featured large declines in Treasury yields. In contrast, in this year's scenarios, yields on longer-maturity Treasury securities are flat despite short-term rates falling to zero. Thus, some banks with big portfolios of these securities that in past years would have projected large capital gains are less likely to see such gains in this year's stress scenario. In this way, this year's scenarios will address one of the most salient risks facing the financial system that were identified in the QS analysis. By encouraging institutions at the core of the system to build resilience against such an episode, we seek to lessen the severity of the distress to the overall system should asset prices fall and term premiums rise sharply in a challenging macroeconomic environment.

Even with these attempts to give the CCAR process a countercyclical bias, the experience with the stress tests thus far is that they have become less binding on banks as the recovery has gathered strength, undercutting somewhat this countercyclical value. Of course, that's not surprising, and we know that capital requirements that are based on stress tests alone are unlikely to attenuate completely the financial system's natural procyclicality. For that reason, we also have a specifically countercyclical tool in the eponymous countercyclical capital buffer, or the CCyB. The Board can require the nation's largest banks to build an additional margin of capital at times of rising cyclical pressures, helping to augment resilience, and it can then release that capital as the economy weakens.

The QS report is a key input into the decisions surrounding the setting of the CCyB, and as you know, on December 1, with the QS report assessing overall risks as moderate and with other measures that we routinely assess sending a similar signal, the Board announced its decision to leave the CCyB at its minimum value. As a rough rule of thumb, the criteria for setting the countercyclical buffer that were finalized in September 2016 are calibrated so that the countercyclical buffer will be above its minimum value about one-third of the time.

A simple criterion for raising the countercyclical buffer above its minimum value of zero is that financial risks are assessed to be in the upper one-third of their distribution. That threshold so far hasn't been met in the staff's quarterly assessment, although assessed risks are rising. I think it's also worth noting that, in our system, structural buffers are calibrated to a higher level than, for instance, in jurisdictions that have calibrated their countercyclical buffer to be above zero half of the time.

So, in sum, the QS assessment is an important input into the policymaking processes directly informing our macroprudential and countercyclical tools that are our first line of defense,

and, of course, informing FOMC deliberations because of the important feedback loop between financial conditions and our dual-mandate goals. Thank you, Madam Chair.

CHAIR YELLEN. Thank you. Governor Quarles.

MR. QUARLES. Thank you, Madam Chair. First, I have some comments with regard to the overall assessment of financial stability. The overall configuration of the financial system is basically the same as it has been for some months now: elevated asset prices, a business sector that's taken on a lot of debt at the same time that the household-sector debt growth remains modest, and a financial system that is very strong by historical standards, at least. It's not particularly surprising that asset prices should be rich at this point in the business cycle. Households and businesses have naturally shed some of the posttraumatic stress that was in place following the deep recession. There are a few obvious risks on the horizon: They're willing to pay higher prices for longer-lived assets, such as Bitcoin. [Laughter]

The ability of the financial system to absorb shocks is dramatically stronger than it has been in the past. That's true for both banks and nonbanks, and the result of regulatory action as well as improved risk management since the crisis. Investors have abandoned, at least for now, practices and arrangements that led to unexpected losses, and the crisis provided a new high-water mark for risk managers to use in benchmarking their models.

So that's where we are. What are the risks? The most obvious risk is that asset prices fall dramatically. And, despite the low levels of actual and implied volatility, work by the staff suggests—as Andreas mentioned in response to a question, I think, from President Bostic—that at current valuations, the left tail of the distribution is fatter than normal. Again, that makes sense. When asset prices reflect strong fundamentals and a very optimistic outlook, bad news will have a stronger-than-usual effect on them.

Term premiums are also particularly important at the moment, and this goes to the point that Lael was making about what we're doing in the stress test this year. As the staff report on financial stability highlighted, term premiums are very low by historical standards. There are good reasons for that, not least the success of the “worthies” around this table in controlling inflation risk. Nonetheless, investors could revert to an earlier view, and in doing so push up Treasury yields and force down the prices of risky assets. And the consequences of such a decline in wealth, occurring alongside an increase in borrowing cost, could be quite painful.

Now, the strength of the financial system means, I believe, that these consequences wouldn't be amplified by the system. So if you look in the Tealbook, the “Global Market Correction” alternative scenario features a version of this result. Term premiums on Treasury securities tick up even as U.S. equity prices fall 20 percent. Corporate bond spreads widen. But the macroeconomic consequences in this alternative scenario are only moderate, with the unemployment rate only three quarters of a percentage point above its value in the Tealbook baseline projection.

So our job as financial stability policymakers is to be sure that the system is, indeed, positioned to absorb losses stemming from this kind of a scenario, as to which there would seem to be a heightened risk in the current circumstances—that is to say, a material decrease in asset prices at the same time, unusually, as an actual increase in Treasury yields.

And so, as Lael was pointing out, the bank stress test, the scenarios that we're using this year are designed precisely to build resilience against that risk, and this year the stress test—which again, I'll stress, are not yet public, they'll be announced tomorrow—will feature a severe recession, larger-than-expected decreases in asset prices, but a rise in Treasury term premiums. Thus, as a consequence, banks that in the past have had a significant contribution to their ability

to pass the stress test from the increase in value of their interest-sensitive assets will, in fact, not have that contribution. So it will be materially harder to pass the stress test this year. Yet this year's stress test is constructed in a way that we think is designed to address an actual real risk, as opposed to just making the test harder for the sake of making it harder.

Those are my comments on financial stability.

CHAIR YELLEN. Thank you very much. President George.

MS. GEORGE. Thank you, Madam Chair. I appreciate the staff's work on this report and the special memo on the relationship between macroeconomic overheating and financial vulnerability. But irrespective of whether these financial imbalances associated with an overheating economy suggest less concern than those associated with leverage, I am conscious of the limits of our ability to anticipate fully the source of shocks that can ultimately elevate seemingly benign conditions to systemic concern.

As the QS report's valuation pressures metric shows, asset valuations look quite stretched right now, according to historical benchmarks, even after taking into account low interest rates. According to the University of Michigan survey, consumers now believe there is a two-in-three chance, on average, that a stock market investment will be worth more one year from today—a higher assessment of the probability than we saw at the peak of the previous business cycle expansion.

Likewise, the monthly change in the S&P 500's total return index has been positive for the longest monthly streak in the past 30 years. Key vulnerability indicators for the nonfinancial business sector—such as debt-to-income ratio and net leverage for speculative-grade and unrated firms—remain near historical highs, and leveraged loan covenants are weaker than at the peak of the previous credit cycle in 2007.

So a shock to corporate earnings could easily translate into increased credit losses at banks. The signs of financial market froth bear careful monitoring, especially in the current environment, in which monetary policy remains accommodative and regulatory relief for banks is contemplated. To be clear, every effort should be made to reduce regulatory burden in cases in which it's evident that rules and regulations unfairly and disproportionately affect commercial banks, and I think this is particularly important for community banks.

We should not lose sight of the risks that cost the economy dearly a decade ago, especially those that relate to capital levels at the largest banks. Despite these banks' systemic risk to the economy and the U.S. taxpayer, their Tier 1 leverage ratio remains well below that of the nation's smaller banks, albeit considerably higher than it was at the time of the financial crisis. Proposals that aim to reduce the leverage ratio have the potential to undermine the strength of this critical backstop and an important buffer to the inevitable vulnerabilities to financial stability. Thank you.

CHAIR YELLEN. Thank you. Vice Chairman.

VICE CHAIRMAN DUDLEY. Thank you, Madam Chair. This is very short. I just want to encourage the staff to investigate the possible financial stability implications of the tax legislation. I suggest that for two reasons. First, in the past, when we've seen major tax legislation, at times it has had important consequences for financial stability. One good example of that was the effect of the Tax Reform Act of 1986 on commercial real estate. Changes in the depreciation rules in that act contributed to that commercial real estate bust that occurred in the late 1980s and early 1990s, and I think it can be tied directly back to the act. This legislation makes significant changes to the corporate tax regime, so I guess the question is, will there be some important unintended or unanticipated consequences? The second area that I think would

be worth further investigation is whether the tax legislation, by changing the rules, could create stress on particular sectors.

So two areas I think are worth at least looking into. The first is downward pressure on high-end housing prices in states with high income taxes and property taxes, due to the limits placed on the deductibility, and the second is the consequences of the limitations imposed on the deductibility of interest for corporations. What I'm interested in there is that, presumably, during the next economic downturn, EBITDA and EBIT will fall quite a bit, and so people will then find something that was not constraining to be constraining in the middle of an economic downturn. And I'm interested in what the consequences of that would be. Are they significant enough to pose financial stability risks; are they significant enough to increase the pro-cyclicality of the business cycle? My intuition is that the answer is "probably not," but I'd be happy to not just rely on my intuition. Thank you, Madam Chair.

CHAIR YELLEN. Thank you. I suggest we take a 20-minute break, get some coffee, and then resume and begin our economic round.

[Coffee break]

CHAIR YELLEN. Okay. Let's resume and begin our economic go-round, starting with President Mester.

MS. MESTER. Thank you, Madam Chair. Reports from contacts in the Fourth District indicate that economic conditions are improving and the economy is growing at a moderate pace. The January reading of the Cleveland Fed staff diffusion index measuring the percentage of business contacts reporting better versus worse conditions improved 6 points, to 40, its second-highest reading since mid-2014. The Cleveland staff has begun to collect information on firms' expectations about future conditions. This information helps predict next month's diffusion

index, and it currently suggests that next month we'll see another increase. We have been trying to assess the effects of the tax package on District firms, but isolating the tax effects is challenging.

Business contacts remain upbeat about the economy in 2018. Some of this optimism appears to be driven by the tax package, but some stems from a pickup in activity seen in the fourth quarter of last year. Few business contacts mentioned the NAFTA talks as a concern. Several contacts reported their customers seem less cautious about pursuing capital projects than they've been in the recent past. A District engineering firm reported that clients have been approving major projects more quickly in the past six months. These changes may reflect reactions to the tax package, but most contacts said it was too soon to tell what the effects of tax changes will be on their firms, and many said that, while they welcome lower taxes, they aren't planning to make significant changes to their capital or hiring plans in response.

Readings from the Cleveland Fed staff capital expenditures diffusion index have been relatively stable over the past six months. Some District firms applied one-time bonuses and wage increases to the tax cuts, but some have told us that these wage increases were being contemplated for some time. In fact, District labor market conditions have tightened further, and reports of increasing wages are becoming even more common. The District unemployment rate has fallen gradually over the past five months. In December it was 4.7 percent, its lowest level during this expansion.

The year-over-year growth in payrolls has remained steady at 0.8 percent in October and December. That's an above-trend pace, although down slightly from 1 percent growth over the past three months. In January, the Cleveland Fed staff wage diffusion index increased to 53. The staff has only been calculating this index since March 2016, but the January reading was the

highest in the index's short history, and its level means that a majority of the respondents reported raising wages in the past two months.

Nonlabor costs for District firms also continue to rise. The Cleveland staff nonlabor cost diffusion index is back up to levels seen in early 2017. At our December meeting, I reported that some contacts had said that despite rising input costs, they didn't expect to be able to raise their own prices because of the competitive environment. That appears to be changing. Anecdotal reports suggest that firms facing higher input costs, including freight carriers, manufacturers, and construction companies, now appear to have some pricing power to pass those cost increases on to customers. The Cleveland staff price diffusion index has been rising since last autumn.

With regard to the national economy, incoming data have been consistent with my view that the economy entered 2018 with positive momentum. For the first time in a while, there are some more salient upside risks to the forecast. According to the advance estimate, both consumer and business spending expanded at solid rates in the fourth quarter of last year, and GDP growth for the year was 2½ percent, above the projections of all participants in last March's SEP and a noticeable improvement on the 2 percent growth we had in 2015 and 2016.

Earlier in the expansion, while consumer spending was relatively good, business spending was weak and net exports were a drag on growth. Last year, household spending and nonresidential and residential investment made positive contributions. This balance should help to sustain the expansion.

With positive momentum, healthy underlying fundamentals, accommodative financial conditions, fiscal stimulus, and improving economies abroad, I expect above-trend growth will continue this year. I am continuing to assess what the effects of the tax package will be in terms of consumer and business spending. This is complicated, because past expansionary tax

packages were enacted at a different point in the business cycle as part of a fiscal package meant to stimulate weak demand, while today's economy is growing above trend.

I am somewhat skeptical about the effects on the supply side of the economy, especially in the near term. The productivity of the workers drawn into the labor market then is already strong, maybe lower than when a tax package is enacted in a weak labor market, so the supply-side effect would be lower. Full expensing provisions will increase investment, but the effects on productivity may be small, due to the size of the capital stock, and the effects are likely to take considerable time to be realized.

I projected that the package will add a $\frac{1}{4}$ to $\frac{1}{2}$ percentage point to fourth-quarter-over-fourth-quarter GDP growth this year and next year. But I have been somewhat surprised by firms' reactions so far, so the effects could be larger, and I see that as an upside risk to my forecast. The ongoing trade talks pose some downside risks, but these may take longer to realize. The effect of the tax cuts on fiscal deficits is another downside risk, but in the longer run.

Labor market conditions continue to tighten. Payrolls continue to grow at a pace well above trend, with monthly job gains averaging about 170,000 jobs over the past six months and over the past year. The unemployment rate remains at its lowest level since December 2000. The broader U-6 measure is near the lowest seen in the previous expansion, and the participation rate has remained essentially unchanged, even though demographics suggest its longer-run trend is declining. Surveys indicate that household and small business perceptions of labor market tightness are near all-time highs. With growth above trend, I expect the labor market to tighten further, with the unemployment rate falling under 4 percent this year, well below most estimates of its longer-run level.

Aggregate measures of wages have accelerated from under 2 percent growth earlier in the expansion to about 2½ percent more recently. Given the tightness in labor markets, the acceleration to date looks relatively modest. Anecdotal reports of rising wages may eventually translate into higher wage growth in the aggregate measures, although how much remains to be seen. Federal Reserve Bank of Cleveland staff research shows that, across industries, wage growth continues to correlate with productivity growth. We have seen a low level of productivity growth over this expansion. Wage growth may remain modest until productivity growth picks up.

Recent news on inflation has been positive. Core and headline PCE inflation have moved up from the lows seen last summer. We will likely see higher inflation numbers once the March data drop out of the year-over-year measures, but we shouldn't overreact to those increases just as we didn't overreact to the midyear decline. Longer-run inflation expectations remain well anchored. The market-based indicators have moved up since our last meeting. Reflecting stable inflation expectations, above-trend growth, and tight labor markets, conditions are in place for inflation to gradually rise over the next couple of years.

I project that inflation will reach our 2 percent goal on a sustained basis in the first half of 2019 but realize there are both upside and downside risks to this forecast. The downside risk is that the continual undershoot of our goal might destabilize inflation expectations, making it considerably harder to raise inflation back to our goal. The upside risks have grown more salient since last fall. With the economy already beyond full employment, if growth turns out to be stronger than expected, this could translate into a stronger inflation outlook, especially if there are nonlinearities in the Phillips curve that kick in as unemployment falls further. Also, while the association of consumer price inflation with either wage growth or commodity price inflation

isn't tight, there is some possibility that firms will become more willing and able to pass rising costs through to prices. In addition, if growth abroad picks up more than expected, the dollar could continue to depreciate, spurring faster growth in import prices and in broader inflation. Overall, relative to my outlook, I see the risks to inflation as broadly balanced and risks to growth as tilted slightly to the upside this year. Under my outlook and my assessment of the risks, I believe that choosing a gradual upward path for the funds rate remains appropriate and manages the risks with respect to both of our goals.

The Cleveland Fed website provides a set of seven simple monetary policy rules and their outcomes across several forecasts. Consistent with my December SEP policy rate path, the median path in the rules has the funds rate rising 100 basis points in 2018. I note the rules have incorporated a lower r^* , but this median path was based on economic forecasts made before passage of the tax package and the arrival of the most recent data. The path is going to steepen once new forecasts are available.

We see that looking at the Tealbook. The Tealbook's funds rate path in its baseline from its simple rules and from the optimal control exercises have all steepened since our previous meeting. The Tealbook baseline has the funds rate ending the year at 2.7 percent, 150 basis points above its current level. Over the next couple of months, we will get a better handle on the effects of the tax package and how the economy is evolving relative to the outlook. The funds rate may need to rise more this year than the 75 basis points in the December SEP's median path and expected by market participants. We will need to position ourselves to be able to do that should it become necessary. Thank you, Madam Chair.

CHAIR YELLEN. Thank you. President Rosengren.

MR. ROSENGREN. Thank you, Madam Chair. Both financial and economic data are consistent with continued robust growth. While the 2- and 10-year bond rates reflect our recent tightening to some degree, they are now approximately 25 basis points higher than at the December meeting. The exchange rate has depreciated 4 percent since the previous meeting. During the same time period, domestic stock markets are up more than 5 percent, and emerging stock markets are up more than 10 percent.

With strong fourth-quarter consumption and investment data and a tax cut that will provide further support to these spending components in the period ahead, it is not surprising that the Tealbook expects real growth in 2018 to exceed that of 2017 despite an assumption of six 25 basis point increases in the federal funds rate this year, three more increases than was assumed in the median December FOMC submissions. Even with this assumed removal of accommodation, the policy outcomes are asymmetric. At the end of this year, the Tealbook expects inflation to be 1.9 percent, only 0.1 percent below our inflation target, but the unemployment rate is assumed to end the year at 3.4 percent, 1.2 percent below the unemployment rate that the December SEP suggests is sustainable in the long run. In this regard, the optimal control simulations in the Tealbook that, in accordance with the balanced approach advocated in our statement on longer-run policy objectives, weigh equally deviations of inflation and the unemployment rate from their long-run values are especially instructive.

Monetary policy in these simulations, using the Tealbook's assessment of the underlying strength in economic activity, prescribes a noticeably tighter stance for monetary policy than what is embedded in the Tealbook baseline. The balanced approach produces much more aggressive removal of policy accommodation than even the Tealbook baseline with its six tightenings. The Tealbook implicitly assumes that the tightening of policy above and beyond

what the markets are currently expecting is not associated with adverse financial outcomes. The adverse effect of the surprise tightenings in the Tealbook are offset by the more optimistic real outlook, which, if realized, would represent good news to the markets. I agree with the Tealbook that markets may understate the strength of the economy. However, unlike the Tealbook, I doubt the additional tightening of policy associated with a stronger outlook will be so well digested by financial markets.

My own forecast has the fast removal of policy accommodation leading to a larger increase in longer-term rates and thus a more negative reaction in equity and house price valuations. Higher rates and weaker asset prices, together with somewhat more conservative assumptions about the effect of the fiscal stimulus on activity, result in a higher projected trajectory for the unemployment rate than in the Tealbook. Nevertheless, I fully agree with the Tealbook projection that the solid pace of growth this year is likely to push the unemployment rate down to levels that are lower than the ones witnessed in even the late 1990s expansion. Such an outcome is, as in the Tealbook, conditioned on significantly more tightening than was assumed in the December median SEP projections.

I would also note that while our recent policy discussions have centered mostly on the inflation forecast miss, still, when one considers, for example, the December 2016 median SEP forecast for 2017, it is apparent that the miss by the SEP on the unemployment rate has also been sizable. This should give a significant pause to those who view the Tealbook real outlook, which features an unemployment rate dropping to 3.2 percent by 2019, as unduly optimistic. What may turn out to be too optimistic is the muted projected response of inflation to the low levels of the unemployment rate.

My staff have begun investigating how likely it is that the strong economy can continue to attract significant numbers of those not in the labor force to seek employment. Focusing on prime-age males, they divide those not in the labor force into those who are continuously out of the labor force from those who are just more attached to the labor force—those who follow a pattern of frequent exit and entry into the labor force. Unfortunately, those continuously out of the labor force have accounted for an increasing portion of the total, while the portion that repeatedly enter and exit accounts for a smaller and shrinking share. In addition, the prime-age workers dropping out of the labor force appear to be concentrated in the 45-to-54 age bracket, and for these people the move into and out of the labor force could turn out to be a more absorbing state.

Consequently, if we run a “hot” economy, it may be increasingly difficult to coax workers back into the labor force, with the potential for more upward pressure on wages and prices than what is currently in the forecast. Overall, I view it as a risky strategy to push the economy so far below what is the sustainable unemployment rate. Such strength could shorten the recovery as financial stability and wage price pressures begin to build. Thank you, Madam Chair.

CHAIR YELLEN. Thank you. President Bullard.

MR. BULLARD. Thank you, Madam Chair. Eighth District contacts were generally upbeat during the intermeeting period. They see 2018 as potentially a very good year for the U.S. economy. Reactions to tax law changes at the federal level were positive and feed into general optimism about economic growth prospects. District labor markets remain on solid footing. The Eighth District unemployment rate remains below the national average, according to the latest reading. District firms with international operations are reporting strong earnings

and robust business both inside and outside the United States. District bankers report improving conditions and are anticipating some improvement in profitability in 2018. For the national outlook, real GDP growth printed softer than we had expected for the fourth quarter but still left the year-over-year growth rate at about 2½ percent, a value that has steadily increased since 2016.

Given that trend growth remains near 2 percent, a natural prediction at this point is that the year-over-year growth rate will now gradually return to the 2 percent value. That remains my base case, along with an assumption that changes in business investment plans resulting from the recent federal tax law changes will be modest. However, I recognize that consumer and business optimism is high, perhaps too high, and that there is some significant probability that the tax act will create a business investment boom that will feed into real GDP growth and other aspects of the economy. This is not my base case at this point, but I am watching the situation carefully, and I would not be too surprised if such a situation developed during 2018.

One aspect of the recent GDP report that caught my eye was that the personal savings rate has declined again to the very low level last seen in 2005. This could be a harbinger of a return to the low-saving, high-consumption behavior pattern associated with that era. Not that somewhat faster real GDP growth and the presumably lower unemployment it may bring is a good basis for predicting higher inflation; recent data indicates that core PCE inflation remains at 1.5 percent year over year, and headline is 1.7 percent year over year.

The Committee's preferred measure of inflation has been below target since 2012. The below-target period has really gone on too long, and our explanations for the miss are becoming badly strained. During the intermeeting period, I looked at what a price-level targeting approach to policy might prescribe, given our current situation. Price-level targeting would do a better job

of pinning down inflation expectations because it calls for higher inflation in the future to make up for lower inflation in the past.

In view of the fact we have missed our inflation target since 2012, what would price-level targeting call for today? The starting date matters for this exercise, but I'd like to start in 1995, which is when this Committee started achieving 2 percent inflation on a sustainable basis following the Volcker disinflation. We draw a 2 percent price-level path from 1995 to 2012. Actual inflation was very close to the path as of January 2012. Today the price level is about 4.6 percent below the 1995 2 percent price-level path. To make up for that and return to the path, inflation would have to average 2.5 percent over the next decade. That may sound like a lot, but it shows the cumulative extent of our misses since 2012.

The reason price-level targeting comes up at these meetings is because it has theoretical support as optimal monetary policy. At a minimum, I think this type of perspective counsels patience in allowing inflation developments to unfold—as opposed to a preemptive stance that may continue to hold inflation below target. Nominal yields have moved up during the intermeeting period. I interpret these moves as consistent with better economic data, passage of the tax bill, and optimism both in the United States and globally for 2018. Both 2-year and 10-year yields rose and by approximately the same amount, keeping the slope of the yield curve approximately constant.

So far, so good on this issue. However, many on Wall Street are predicting further flattening of the yield curve during 2018, and so I think this issue should remain on the radar as we proceed through the year. Most analysis seems to argue that most or all of the flattening is because of this Committee's normalization program. Our analysis at the Federal Reserve Bank of St. Louis suggests that, should the yield curve invert, the probability of recession will rise to

about 40 percent for a recession within 12 months after that. That is not a huge risk, but it is an unnecessary one, as inflation is low. I urge the Committee to proceed with caution on this issue.

Thank you, Madam Chair.

CHAIR YELLEN. Thank you. President Williams.

MR. WILLIAMS. Thank you, Madam Chair. And thank you for everything you've done in your many years of service to the Federal Reserve and the nation. I want to tell you that my board of directors, not only in San Francisco but all the Branches, said I've got one thing to do at this meeting: express their gratitude to you for all you've done for the San Francisco Fed and also for the Federal Reserve System and the country. They very much appreciate everything you've done.

You know, we've already gone over the statistics. David went through the 9.7 million jobs created during your time as Chair, the 2½ percentage point fall in the unemployment rate, navigating the start of the monetary policy normalization process—and those were all obviously really important things. I think the thing that you may actually underappreciate is the effect you have on the people who work with you. Your legacy, truly beyond these accomplishments, is how you've affected—inspired—all of us not only in the San Francisco Fed, but I think around the System, your dedication to our mission, the integrity that you bring to everything you do, and really challenging us.

I go back to June 2004 when you came to the San Francisco Fed, and you talked to us in research about how we can make a difference to contribute to the FOMC policy discussions in Washington. You know, we are 2,500 miles away, sometimes feeling distant from that, and I think that you set a very high standard for all of us. I'm very proud of our team in San Francisco and what we've done in the last 13½ years to try to live up to those expectations, and I assure

you that we will continue to do that as long as we can. I also know that we really want you to come back and visit us. So here are the things I'm putting down on the table. First of all, I've gotten you the cafeteria discount so you can get that when you come to the cafeteria. [Laughter]

CHAIR YELLEN. Oh, wow. [Laughter]

MR. WILLIAMS. Second, we're going to make a new badge. We need to get a new photograph, but we'll have a badge for you. And also, whenever you've got a little itchy finger about running monetary policy, remember we have the "Chair of the Fed" game, and it's now—

CHAIR YELLEN. I've never been able to win that game. [Laughter] I've tried many times.

MR. WILLIAMS. Well, none of us wins that game. You'll now have some time to practice. [Laughter] We've now got it as an app. And that is something I have not shared with other people in the media—about your begging. [Laughter] So again, thank you very much.

CHAIR YELLEN. Thank you so much.

MR. WILLIAMS. Okay, back to work. Recent data confirm the economy is on a solid growth path, with strong demand across a wide range of sectors. Consumer and business spending have been especially robust, supported by a surging stock market, expanding employment, and buoyant confidence.

The strength and breadth of economic activity is reflected in the comments I'm hearing from my contacts. I can't remember a time during the expansion when our conversations have been so overwhelmingly positive. Across the District they are strikingly upbeat about their businesses, the region, and the outlook for the national economy. That said, all this exuberance is creating some anxiety, and some of my contacts note that conditions are frighteningly reminiscent of the late '90s tech boom. And we all know how that ended.

Looking ahead, expect continued above-trend economic growth this year and next, and my outlook reflects the underlying momentum in the economy as well as some tailwinds that are likely to persist. One such tailwind is the strong financial conditions. We talked a lot about that already. The rising stock market and housing values have boosted wealth and support greater spending by consumers and businesses alike. The tax overhaul is providing additional lift. I expect tax cuts to add about 0.3 percentage point of growth this year, 2019 and in 2020. And, finally, a much improved global economy is a big plus for U.S. exports and for overall growth. I expect that these factors, along with the still accommodative stance of monetary policy, will push the economy further above potential by a significant degree. And I also see the unemployment rate drifting down to 3.6 percent by the end of this year and remaining below 4 percent through 2020. Now, such a prolonged period of significantly overshooting full employment is highly unusual and has not occurred since the late 1960s, back when I was in elementary school and dreaming of becoming an astronaut. [Laughter]

So, for inflation, as I mentioned in our earlier discussion, I hold to the fundamental insight of the Phillips curve: a robust economy tends to push inflation higher. Applying this logic to our current situation, I expect that, with the persistent and significant undershooting by the unemployment rate of its natural rate, inflation will reach our 2 percent longer-run goal by the middle of next year. Indeed, analysis by my staff shows that, after we remove the transitory effects of idiosyncratic factors, inflation already has been gradually rising as slack has diminished.

Overall, I see an economy with considerable momentum and broad support for continued growth, and the result will be greater pressure on capital, land, and labor, which will show through to wages and prices. Indeed, in some respects, this late-cycle acceleration of the

economy creates its own concerns and challenges. In that vein, let me conclude with some remarks on the slope of the yield curve, a topic that has gotten a lot of attention of late, including in this room and by President Bullard just a moment ago.

Before I start, I want to make it clear that my remarks are not about the likelihood of recession this year or next year, which I see as quite low. Instead, my concern is several years down the road when the federal funds rate may need to significantly overshoot its neutral level. As I mentioned in our October meeting, a large literature, including work by Glenn Rudebusch and me, shows that yield curve inversions are one of the most reliable indicators of future recessions. My staff has updated and expanded this analysis, and they've confirmed several key results and uncovered a few new ones as well. First, they find that a yield curve inversion remains a remarkably accurate predictor of recessions. Since 1955, there have been 10 yield curve inversions, and 9 of them have been followed by a recession within two years. The one miss was back in the mid-1960s, when the yield curve inverted just briefly and the economy slowed markedly, but it didn't quite stall.

Furthermore, there were no false negatives—that is, recessions that were not preceded by a yield curve inversion. The U.S. record of almost perfect recession forecasting from yield curve inversions is also mirrored in the international evidence. There's a broad consensus in the research literature that in developed countries, a steeper slope of the yield curve signals stronger economic activity, and a flat or inverted yield curve forecasts economic slowdowns and recessions. Of course, there is some variation across countries, and this was noted in the Tealbook's box on long-duration inversions. But among the major industrialized nations, Japan is the only country for which the yield curve has not been a reliable guide to downturns.

Despite this evidence, a natural question to ask is whether this time will be different. Are there special circumstances that might disrupt the link between the slope of the yield curve and the economy in the years ahead? Thus, special factors could include a low r^* or a low term premium. My staff incorporated these various factors into their analysis, and they found that the predictive power of the standard yield curve remains intact. In particular, splitting the term spread into the expected path of interest rates and the term premium did not change the recession predictions. That is, it's the inversions of the yield curve that matter for predicting recessions, not the level of interest rates or the reason for the inversion.

So what lesson do I take from all this? Well, as I already said, this is not a concern for the near term. After all, the yield curve isn't inverted. So that's not an issue now. However, it does suggest some caution before dismissing outright future signals we may get from the yield curve under the guise that "This time is different." And an important lesson from my paper with Glenn Rudebusch is that the yield curve is, in fact, a far better predictor of recessions than economic forecasters. Thank you.

CHAIR YELLEN. Thank you. Governor Brainard.

MS. BRAINARD. Thank you, Madam Chair. In many respects, the circumstances we're facing today are the mirror image of those we were facing in 2015 and '16. Today synchronized growth in economies around the world is providing tailwinds to our own growth, in contrast to this earlier period when our economy faced severe headwinds from anemic demand and downside risks abroad.

Today, foreign currencies are strengthening against the dollar, providing support to U.S. inflation in sharp contrast to the drag on inflation posed by the 25 percent appreciation of the dollar in the earlier period. Similarly, oil prices and commodity prices have strengthened as

global demand has strengthened—in contrast to sharp decreases in the previous period. The combination of higher oil prices and robust global demand is providing strong support to business investment—in contrast to the sharp decline in the earlier period. And today, from a position close to full employment, the economy is poised to absorb \$1½ trillion in front-loaded fiscal stimulus, whereas in the earlier period, the economy was coming off a difficult adjustment to a sharp withdrawal of fiscal support.

Let me touch on each of these items in turn. This past week, for a third consecutive time, the IMF revised up the outlook for the world economy, in contrast with the three consecutive downward revisions from 2015 to 2016. And the Board staff forecasts show a similar pattern at the country level. Just as earlier we found our policy rate path weighed down by strong headwinds from abroad, today the U.S. economy is seeing tailwinds from stronger growth abroad. Higher foreign demand abroad should lead to increased demand for U.S. exports, as well as continued improvement in the foreign earnings of U.S. companies. In addition, upward revisions to the foreign growth outlook are leading to some pull-forward of expectations of monetary policy tightening abroad, and thus are showing through to some appreciation of foreign currencies against the dollar. That's been the case both over the intermeeting period, in which the dollar has depreciated about 4 percent across a broad basket, and since the end of 2016, over which time we've seen a 10 percent depreciation.

At home we're seeing continued strength in underlying private final domestic demand, although we saw real GDP rising only 2.6 percent in the past quarter, somewhat below expectations. The downward surprise reflected a large drag from both net trade and inventories. But private domestic final purchases, which are more closely tied to the spending decisions of U.S. firms and households, rose at a robust 4.6 percent annual rate last quarter—the fastest pace

we've seen in the past few years. Personal consumption expenditures also posted a solid 3.8 percent annualized gain, while business spending on equipment and intangibles posted a nearly 9 percent gain.

This follows several years of anemic growth dragged down by drilling and mining. Indeed, one lesson from that earlier period is the renewed importance to the United States of oil production. While in previous cycles, falling oil prices had been a net plus for the U.S. economy, we learned in 2015 to '16 that the drop in oil prices was a drag, on net, through the investment and production channels, and that's reversed over recent months.

The labor market has continued to post solid readings. Payrolls rose 148,000 in December, and payroll gains now have averaged about 160,000 over the most recent four months, smoothing through the hurricane swings. That's certainly sufficient to keep the unemployment rate moving lower from its 4.1 percent level that we've seen in recent months, and as you know, the Tealbook now projects the unemployment rate to drop to 3½ percent by late summer. On the other side, we do see some remaining slack. The prime-age employment-to-population ratio remains more than 1 percentage point below its pre-crisis peaks, and readings on wage growth show little signs of acceleration despite broad anecdotal evidence of labor market tightening.

A number of factors should contribute to solid growth in the year ahead, first and foremost, of course, the recently enacted stimulus on the order of 1½ percentage points. The staff estimates this could boost real GDP growth by ½ percent this year and next. These projections are much greater than the preliminary estimates they provided in December. Outside estimates vary, but many estimate somewhat less of an effect on aggregate supply, and the

bullish outlook is supported by financial conditions, with the stock market up 6½ percent since we last met and a stunning 25 percent since the end of 2016.

Progress is slower on the second leg of our dual mandate. Over the course of 2017, core PCE prices rose only 1½ percent, and this follows a long period of underperformance. The very latest data provide some evidence that inflation is moving back up to trend, with core PCE prices posting an annualized 1.9 percent increase on a three-month basis. But because high-frequency price-level data can be volatile, we typically focus on changes over the year, and I will want to see further confirmation of higher inflation before I'm convinced we're on track to reach our target. Indeed, the latest data on wages give little indication of support for overall price inflation, although we may see stronger data tomorrow. While there's been an encouraging uptick in inflation compensation, it remains below levels that prevailed only a few years ago, and I would want to see more evidence from other measures of underlying inflation to be convinced that underlying inflation is also moving up in a manner consistent with our 2 percent objective.

The tension between the strong labor market and stubbornly low inflation continues in the latest data, but the sizable front-loaded fiscal stimulus, coming at a time of full employment and synchronized global growth, tips the balance of considerations, in my view, and gives me greater confidence in the achievement of our inflation target. As we'll talk about more tomorrow during the monetary policy discussion, if the economy strengthens as much as projected in the Tealbook forecast, there may be room to demonstrate our commitment to the symmetry of our inflation objective while still delivering on the SEP path of rate increases. Thank you, Madam Chair.

CHAIR YELLEN. Thank you. President Harker.

MR. HARKER. Thank you, Madam Chair. Over the intermeeting period, growth in the Third District has picked up, and contacts are as optimistic as I have ever seen them. The Philadelphia metro area economy looks increasingly strong. Indeed, over this recovery, real per capita income growth is running neck and neck with Boston for the best metro area in the nation, and I anticipate that we will edge into the lead with the forthcoming Super Bowl bonus checks. [Laughter] Go Eagles.

So, to get back to business, employment in Pennsylvania is growing robustly, and firms appear to have some increasing pricing power. Manufacturing in the region continues to perform above its expansionary average, with notable strength appearing in shipments. Inventory building has also appeared to have resumed.

In response to a special question included in our January manufacturing survey, 66 percent of manufacturers indicated that Q1 production is expected to outperform last quarter's, while only 21 percent expected a decline. As well, almost 72 percent of respondents reported increased demand over the past several months, with a mere 12 percent reporting a decline. In line with this evidence, the future capital expenditures subindex remains elevated. Hard data on nonresidential construction supports this report. We are seeing active construction, in particular, of warehouses and pipelines.

A contact who runs a diversified manufacturing company reports an absolute surge in orders, with double-digit growth across all geographic areas and almost all product lines, ranging from automotive parts to medical equipment to organic dog food. Growth is especially robust in Europe, he says. He now regrets not raising prices last quarter, and his company is planning midyear price increases, the first increases in five years. A number of other Directors report wage pressures, especially in the range of \$15 to \$25 per hour. Retention of employees for a

number of our contacts is becoming increasingly problematic, and contract workers are being converted to full time. One banker is even partially paying off student loans to help solve retention problems. Midyear raises are on the table at a number of companies, and we have not seen that for a long time.

A staffing firm reports that they are now screening people in rather than screening people out, making the application process easier. They are also diversifying into higher-end jobs, adding training and looking to grow 7 to 12 percent in 2018. All in all, I have not witnessed this level of enthusiasm in the six years I have been associated with the Philadelphia Fed's Board of Directors.

Finally, we are seeing some pickup in residential investment, with a bit more strength in multifamily than in single-family housing.

To conclude, there is a lot of economic momentum in the District. Price and wage pressures are starting to show through, and there is a lot of optimism among our contacts. This information, along with what we are seeing at the national level, has led me, like the staff, to upgrade my outlook for 2018. I see near-term output growth firmly above trend, and my median inflation projection is for inflation to return to target by 2019. However, I still remain concerned about inflation's continued below-target performance. And as I mentioned in my earlier remarks, I am skeptical that the Phillips curve is a good model, in theory or in practice, on which to base policy. So I don't have a great deal of confidence that the current tightness in labor markets will inevitably lead to higher rates of inflation in the planning horizon. I will discuss this further in the policy go-round. Thank you, Madam Chair.

CHAIR YELLEN. Thank you. President Barkin.

MR. BARKIN. Thank you, Madam Chair. I am privileged to be here to participate in this final meeting under your leadership, and maybe also I can speak for the humble business people in the world who have benefited from your leadership over the past four years. So thank you for that.

CHAIR YELLEN. Thanks so much.

MR. BARKIN. Speaking of humility, I am humbled to be here at this table and be a part of this thoughtful conversation. I hope at the end of my remarks you won't think that I have a lot to be humble about. [Laughter]

The Fifth District economy continues to expand at quite a good pace. Labor markets remain tight, with persistent reports on how difficult it is to fill open positions. Manufacturers are particularly positive about the near term, reporting strong growth in orders, sales, and profits. The national labor market is already tight and tightening further, as everyone has said. I did find quite striking the Tealbook's stronger forecast for the national economy, even in the face of a steeper federal funds rate path. I want to focus a little bit on the tax cut. I do believe the tax cut will be stimulative, but perhaps—and, particularly, I'll speak for the large corporate side—in ways that will be hard for us to fit into our models.

Specifically, I fear we may see some near-term distortions of our inflation metrics. Let me try to explain. I have talked to a number of CFOs. They did not include tax reform in their budgets. Recognizing that assessing the precise effect of a corporate tax cut is difficult, CFOs have guided their shareholders conservatively. As a consequence—and I think this is good news for the economy—while much of the tax cut is priced into the markets already, a part of it is not. And companies are starting the year with a pot of income for which they have the ability to evaluate competing uses.

Granting the new incentives for accelerating capital investment, I still think the allocation of this pot of income is where we're likely to see the near-term stimulative effect. Some of this will surely go to shareholders, and a lot of CFOs would like to see that happen. But with labor markets continuing to tighten, I would expect wages to accelerate somewhat as well, especially where workers have skills in high demand or some degree of bargaining power. Many firms are trying to do that right now in a one-off fashion—for instance, by paying special bonuses. But these payments could also lead to conditions that have a longer-lasting effect on compensation, and some CFOs I've spoken to expect that. They expect to come back to it at the end of the year and following.

I wouldn't be surprised to see similar bargaining dynamics on pricing as well. Along the supply chain, firms that face relatively more competition or have relatively less leverage with their buyers may be compelled to pass some of their gains on to buyers in the form of lower prices. I have heard this intention from purchasing managers at one of the most significant retailers. They aren't accepting price increases and will be looking for more in the context of suppliers who have just gotten an increase to the bottom line. In consumer-facing industries in which competition among a few large retailers is already pressuring costs and compressing margins, the gains in income from the tax cut could create space for even more aggressive consumer pricing.

So I see the tax changes as potentially moving wage and price inflation in opposite directions. I'd emphasize that this would be a temporary phenomenon that plays out as the income windfall from the tax cut gets divvied up. But, again, it could distort our metrics. While these forces, by themselves, shouldn't permanently hold inflation below our 2 percent goal, it's hard to predict when they will abate, so I wouldn't be too concerned about PCE inflation

continuing to run somewhat below our target in the near term. I'm reasonably confident, given the state of inflation expectations and the broad strength of the economy and especially labor markets, that, over a longer horizon, trend inflation will settle around our target.

CHAIR YELLEN. Thank you very much. President Evans.

MR. EVANS. Thank you, Madam Chair. On the occasion of your final FOMC meeting, I'd like to share a memory with everyone. It was back in 1996, 20-plus years ago, that you came to the Federal Reserve Bank of Chicago to visit—Governor Janet Yellen—and we sat around the conference table, and the economists talked about their research. And you were very polite and engaging and asked penetrating questions. So then, after you left, we all just said, “That was terrific. I mean, she is such a good colleague. We are really going to enjoy working with her.” Then, a few weeks later, President Clinton announced that he was nominating you to become the Chair of the Council of Economic Advisers, and we were extremely sad [laughter], because you were leaving the Federal Reserve.

We were very lucky when you came to lead as the San Francisco Fed president, in particular. I really enjoyed the time when you were sitting in John's chair. [Laughter] But then you moved to the Vice Chair and the Chairship, so it's really been terrific working with you, and I look forward to the next installment of what you are going to contribute.

CHAIR YELLEN. Thanks so much. Thank you, Charlie.

MR. EVANS. The comments from my Directors and other contacts about economic activity continue to be upbeat. There is little doubt that business sentiment is strong, and I continue to hear more about rising labor compensation and other indications of building resource pressures. Yet there is still not much talk of higher costs feeding into consumer prices.

Business demand for capital equipment is strong. The CEO of one heavy equipment manufacturer remarked that, for the first time he could remember, every market in the world in which they operate is growing or at least flat. And in light of the IMF global forecast, that's not surprising. I have actually heard that from a number of multinational corporations. In addition, ArcelorMittal said that there were a number of very large gas pipeline orders out for bid in the steel industry—enough that meeting them all would strain hot-rolled steel capacity. So the energy industry appears poised for another noticeable upturn in activity.

Other manufacturers also noted the challenges they are facing keeping up with demand. We have been hearing about many of these for some time, but they seem more pressing now: selective capacity constraints, difficulties ramping up the supply chain, and problems in moving product to market particularly due to the shortage of trucking capacity—drivers to drive the trucks. And, of course, they also pointed to a dearth of skilled workers. The view across my contacts more broadly was that labor markets were tightening throughout the employment spectrum, and there were a few more reports this time of increases in compensation: wage gains, bonuses, increased profit sharing, and more generous benefits. Some of these developments were couched in terms of spreading the largesse from the corporate tax cuts. Nevertheless, they still indicate that the labor market continues to tighten.

Speaking of the tax cuts, our Beige Book team asked some special questions this round related to the tax bill. The responses indicated that, on average, about one-fourth of the tax savings is expected to go to capital spending, and about 15 percent to labor, so most is planned to be used to pay down debt, M&A, and returning funds to shareholders. In addition to higher labor costs, I heard several reports of increased materials costs, largely for aluminum, steel, and related inputs. But there was little to suggest these were having a meaningful effect on consumer prices.

For example, Ford indicated it did not see their higher commodities costs translating into any meaningful price increases at the retail level. Indeed, they noted that auction prices of used cars were falling, something that could exert downward pressure on the new vehicle market.

Our financial market contacts had some interesting commentary about the yield curve. There was a fair amount of agreement about the familiar forces holding down the long end of the curve. Conspicuously, although these contacts expect the yield curve to flatten further over the next year or so, they do not see this as signaling an increased risk of recession. They do not perceive that policy has yet tightened too fast or is likely to do so over this period. And, more generally, a flat curve is not, by itself, seen as a huge driver of risk-taking. Notably, they think banks are reasonably well insulated from cyclical swings in interest rates.

Before I turn to the national outlook, we are missing a key piece of data, and I really have to say that in Philadelphia and Boston, you're dropping the ball. You know, if John Williams were the president of the Boston Fed, I would know exactly what the likelihood is of the U.S. economy growing after a New England Patriots Super Bowl win. [Laughter] After all, there is a shockingly large number—the sample size is very large. [Laughter] But on the other hand, given the last 10 years, I mean—I'm not sure how that's going to come out.

Overall, the tax package that has passed is not very different from the one we assumed in December. And, consequently, we made only small adjustments to the fiscal policy impulses in our forecast. Our aggregate GDP effects of the package are pretty close to those in the Tealbook analysis. The incoming data on consumer and business spending and the labor market also suggest the economy is firing on all cylinders and has plenty of momentum heading into this year. Putting all of this together, we see growth in 2018 coming in 1 percentage point above

potential before slowing over the next two years. So the contours of our growth forecast are quite close to the Tealbook.

With regard to inflation, the incoming data generally have been positive and hint that we might be at the beginning of a turnaround. But this is far from definitive, and I still think policy accommodation has a role to play in order for us to achieve our target over the medium term and beyond. Indeed, inflation expectations remain uncomfortably low. For example, although they have moved in the right direction, as you mentioned, Madam Chair, TIPS five-year, five-year-forward breakevens are still about 50 to 60 basis points below where they were before they started their downward slide in 2014, and survey measures haven't budged.

We did not change our core PCE inflation forecast this round. It has a slight overshoot in 2020, one similar to that in the Tealbook, but gets there more slowly. Furthermore, in order to get there at all, we think monetary policy will need to move more slowly. We have only two rate hikes this year and then a gradual path up to 2¾ percent in 2020. We should not be in a hurry to raise rates. Until we see inflation expectations actually move up, I don't see how we can be confident that the inflation outlook is solidly symmetrically situated around our 2 percent target. And that is what's required to achieve our inflation mandate. Thank you, Madam Chair.

CHAIR YELLEN. Thank you. President Kaplan.

MR. KAPLAN. Thank you, Madam Chair. And I will say thank you for your leadership and your service to our nation. It's been an honor and privilege to serve with you, and, most importantly, congratulations on a job well done.

CHAIR YELLEN. Thanks so much. I appreciate it.

MR. KAPLAN. The Texas unemployment rate now stands at 3.8 percent, which is approaching the lowest level since the 1970s. We expect 2¾ percent job growth in Texas for

2018. This is driven by continued migration to the state, improvement across industry sectors, and an expectation of a strong level of drilling activity in the oil and gas sector.

Business optimism is extremely strong. With regard to energy, with prices in the 60s, it is our current expectation that the Permian Basin will grow production by approximately 700,000 barrels a day in 2018, and we currently expect the Permian to continue to comprise about 70 to 75 percent of U.S. drilling activity. So if you back into what that means for the United States, we expect U.S. oil production to be as much as 900,000 to 1,000,000 barrels a day in 2018. Those are stunning levels of production—very strong.

While analysts are very bullish right now about the outlook for oil prices, we do continue to believe that this is going to be a volatile period in which prices vary still between the 50s and 60s, even though we're in the 60s right now. And the forthcoming increased U.S. production is certainly going to put, in our judgment, some downward pressure on prices.

One key positive, though, that's underpinning oil prices is the firming of expectations regarding global demand. Because of the synchronous expansion globally, you may have heard me say before that we previously had thought that global demand was going to grow about 1.3, 1.5 million barrels a day. We have now upgraded that to approximately 1.6 million barrels a day. This is a substantial strengthening and is an underpinning to the price.

As we've said previously, and I've said before, over the next five years Dallas Fed economists and our contacts would expect price risks to the upside as major oil companies continue the trend of avoiding investment in long-lived projects. They are instead focusing on shale, which, on the positive side, is more bite-sized and nimble but has a much more rapid decline curve than long-lived projects. Given this decline curve and a continued strengthening, if that continues, with global demand, U.S. shale at some point is not going to be able to keep up

and grow sufficiently in order to keep pace with global demand growth even after factoring in growth in alternative forms of energy. So this is going to be an upside risk: probably not for a few years, but three to five years from now we could have a spike to the upside. We still believe that.

For the United States, we have marked up our first-half real GDP growth estimates to about $2\frac{3}{4}$ percent and our full-year forecast to somewhere between $2\frac{1}{2}$ and $2\frac{3}{4}$ percent. On the basis of this forecast, and as has been said by many others and the Tealbook, we expect headline unemployment to dip below 4 percent sometime in the first half of this year. We would also note that, in 2017, the number of new jobs created was slightly net lower than 2016. The growth in GDP in 2017 was supported by a resurgence in average hours worked. The issue is, we question whether hours worked will continue to rise at the same pace in 2018, which to us means even more pressure likely on the labor force.

On the basis of this forecast, I believe that cyclical inflationary pressures are likely to build in 2018, even with a flattened Phillips curve. And because of technology-enabled disruption and, to some extent, globalization, we think that will still create some offset. As we continue to further overshoot, though, full employment, I do believe—as I've said earlier—that excesses are likely to build in the economy as well as in financial markets. And I continue to believe that the best chance to extend this expansion would be for the FOMC to act deliberately, though gradually, by continuing the process of removing accommodation. Three quarter-point increases over the next 12 months is my base case, and if I'm wrong, I would guess that a fourth increase may turn out to be appropriate. Time will tell.

And we've talked about and I've called out that I'm not sanguine about creating an inverted yield curve, and I was listening carefully to what President Williams said about their

work on this. A flattening yield curve may be okay, but I am very concerned about an inversion. Having said all that, with a federal funds rate at 125 to 150 basis points and a 10-year yield in either the 260s or the 270s, I think we certainly have enough operating room to execute our base case in 2018. It's also quite possible, if our forecast turns out to be accurate, that the market will address this issue by further backing up the yield on the 10-year during 2018. I may not be as bold as the Tealbook at how far the 10-year yield is going to back up, but I do think some backing up would not be surprising. So while I'll be watching the 10-year rate and the shape of the yield curve, I don't see anything about the shape of the yield curve right now that causes me to back away from wanting to see at least three funds rate increases in 2018. We'll talk more about this tomorrow.

Last comment—echoing what President Barkin said, a word on the way companies are dealing with the tax legislation. There is no question corporate profits are going to be higher in 2018 and beyond—by most estimates, as much as \$10 a share in 2018 for the S&P 500. This translates into substantially greater cash flow and share prices for many companies.

The interesting issue is the CEO playbook for dealing with this positive challenge. First, most companies, you may notice, are making announcements about deferred tax writeoffs—lower tax rate, deferred tax assets. That's basically not terribly relevant. It's just balance sheet adjustments.

Second, they are also announcing—in many cases, sequentially—that they expect higher EPS, to an extent even more than people may have anticipated previously. They are also, in a very choreographed way and not by accident, announcing one-time bonuses and higher wages, particularly at the low end of the wage scale—between \$10 and \$15 per hour. And I think some of these wage increases they might have had to do in any event. And they are announcing some

increased capital spending. It's not clear how much of it is actually incremental as opposed to an aggregation of what they might do, and I think companies are being deliberately vague about the difference.

These announcements are choreographed, as I said, and should continue for the next number of weeks. And while you'll see a few companies talk about dividend increases and share buyback, I think you're going to see discussion of this very muted, deliberately, in the first quarter of the year. And I think they're going to also be very careful and very muted, with some exceptions, about discussing head-count reduction plans, even though they are making these plans. We'll come back to that.

I would expect that, some number of months from now, there are going to be a number of quiet announcements about dividend increases and share repurchases, probably as quiet as possible. While some of these might have occurred in the first quarter, I would expect to see most companies would push these off to later in the year or the second quarter and be muted about this discussion.

Third, most companies I speak with are lamenting their lack of pricing power and the challenge of maintaining gross margins. And I'd emphasize, not net profit margins, but gross margins—that is, selling price less cost of goods sold. I agree with Tom that, if anything, a lot of them are concerned that this tax legislation will accelerate this, and there are even some industries—airlines being an example—that we thought two weeks ago had good pricing power, and I think some of the tax legislation has induced at least one airline to announce more capacity expansion, which now has set off fears of a price war. We'll see if that happens.

Most companies I speak with do plan to pay their workers more, but they also have quiet plans to focus on investments in technology that will allow them to reduce their workforce

through attrition, mainly, and buyouts and some involuntary reductions, if necessary. This is a multiyear plan, and increases in cap-ex will only accelerate this. And the reason they are doing it, again, is fear about maintaining gross margin.

More companies than I have spoken to in years are also actively looking at M&A activity in order, again, to create more scale to be able to support and protect gross margins, due to their concern about lack of pricing power. Those mergers will also likely further lead to workforce reductions.

The challenge in this puzzle is going to be, what's going to happen to the worker, probably with a high school education, who is making \$55,000 a year, maybe working in a call center, who loses his or her job most likely over the next three years? Our guess is—and we've debated this a lot at the Dallas Fed—this worker will probably, in this market, be able to find a job, but, unless they get retrained, they are likely to see their productivity and their income decline.

By our estimate, there are some 50 million workers in this country with a high school education or less. President Rosengren talked about even the upper-age element of that, which will be most acutely affected. This situation is going to heighten the need for middle-skills training and retraining and improving educational attainment levels in the United States where we lag significantly other countries.

The past number of years, I don't need to tell you, have been marked by a divergence between the fortunes of the S&P 500 index and the notable sluggishness of real GDP growth and nominal wage growth. It's possible that this divergence will come into even sharper relief over the next two to three years. Companies will certainly increase their level of productivity. I think that is highly likely. Workers, though, with high school and lower levels of educational

attainment, will likely also experience their jobs either restructured or eliminated and may well see their incomes decline. The question we have at the Dallas Fed, and I have, is, what will be the corresponding effects on overall productivity and the economy, in view of the fact that we measure productivity workforce-wide, not by industry? And I think this will be one of the big challenges of our time over the next two or three years. Thank you, Madam Chair.

CHAIR YELLEN. Thank you. Governor Quarles.

MR. QUARLES. Thank you, Madam Chair. During the December meeting and in my inaugural SEP submission, I presented an economic outlook that was materially more optimistic than the staff's, in part because I put more weight on the capacity of the fiscal package to boost both aggregate demand and the supply side of the economy. With this Tealbook, it looks as though the staff has caught up. [Laughter]

Overall, we look to be in a pretty good place. We have had solid growth for three quarters running, suggesting that the economy has some momentum. The effect of the tax bill is likely to help sustain this momentum. Many—I think all—of the presidents around the table have talked about the economic optimism around the country. And apparently, according to recent survey data, consumer confidence is near post-crisis highs. Business optimism is apparent in the strength of investment. Investment in capital equipment increased last year at the fastest pace since the post-crisis recovery, accelerating to a double-digit pace in the second half of 2017.

Maybe it's a little early to say, but it's possible that the investment drought that has afflicted the U.S. economy for the past decade may finally be breaking, perhaps in significant part because of the incentives in the tax bill. The labor market remains strong, with data since the previous meeting leaving the unemployment rate unchanged at 4.1 percent.

And as many have remarked, it's not just the United States that's showing strength. Global growth is at its fastest pace since the post-crisis rebound and is showing considerable momentum. As Governor Brainard mentioned, after years of serial downward revisions, the IMF has had to revise its outlook up several times since the middle of last year.

Despite the improved outlook, financial conditions have loosened on balance. Treasury yields have climbed, thereby tightening conditions, but the dollar has fallen sharply, loosening conditions. Why is the dollar down even as the domestic outlook has improved? Well, obviously, robust growth in the rest of the world is a factor, and, moreover—a related but slightly different point—the dollar generally appreciates when global risks seem elevated and depreciates when risks abate. Thus, part of the dollar's decline probably reflects a fading of some of the tail risks that have afflicted the global economy in recent years.

The increase in Treasury yields has been about uniform across maturities, leaving the yield curve about as flat as it was in December. I still am not clear in my mind whether this is a heuristic projection or an actual prediction, but the staff are, nonetheless, anticipating that the yield curve will invert in 2020 and then remain inverted for a number of years.

In the previous meeting, a number of us asked that the staff think about the implications of such a prolonged yield curve inversion for the health of the U.S. financial sector and the aggregate economy altogether. The Tealbook A box on foreign experiences with prolonged yield curve inversions—of which there have been, somewhat to my surprise, quite a few—was interesting, and apparently in none of those cases did the Earth get hit by an asteroid. [Laughter]

However, the box and other staff discussions suggest that differences in the operation of U.S. commercial banks from that of foreign commercial banks could mean that the foreign experience may not be directly comparable. In particular, foreign banks are more likely to both

borrow and lend at rates linked to the short end of the curve. U.S. banks lend more at rates tied to the long end and, therefore, could be more vulnerable to yield curve inversions. And so I share the skepticism and concern that many have expressed around the table that if we were actually to face a prolonged yield curve inversion, we could do so with the equanimity that might be implied by the Tealbook's foreign comparison box. Thank you, Madam Chair.

CHAIR YELLEN. Thank you. President Bostic.

MR. BOSTIC. Thank you, Madam Chair. The current sentiment of my directors and business contacts is decidedly upbeat with respect to 2018 growth. The combination of tax reform and continuing improvement in the global economy has convinced most of our contacts that the U.S. economy has, at least in the near term, shifted into a modestly higher gear. To paraphrase one of my directors, "Solid, but nothing crazy."

Nonetheless, viewing the incoming hard data, survey results we have collected, and anecdotal reports in their totality, I'm not persuaded that we know enough to say whether the broad economic picture has changed much from the modest bump I added to my SEP submission in December. To begin with, the fourth-quarter GDP report indicated end-of-year growth that was a little weaker than I expected, and even that number may be inflated somewhat by the hurricane recovery effects. One of my directors, representing a large global package delivery company, noted, in his words, "a dynamic shift in consumer spending related to the timing of the initial distributions of FEMA relief payments." Consistent with the underlying detail in last week's consumption expenditure data, this director indicated that deliveries of larger household items, like furniture and appliances, jumped in mid-to-late November, and that these deliveries were especially noticeable in hurricane-affected areas.

The belief in a discrete ramp-up in spending attributed to the hurricane recovery phase was shared by several other contacts who have a presence in disaster-affected areas. Notably, this included contacts and service-related businesses. The disbursement of both public and private funds for disaster relief is far from complete, so any material effect on aggregate activity could well persist into the first half of this year.

The broader point is that the hurricane effects have made it a bit more difficult to interpret the incoming statistics, but my judgment, based on the anecdotal reports I have been receiving, is that the Tealbook assessment that hurricane-recovery effects provided a substantial boost to fourth-quarter growth seems quite plausible, with the implication that underlying growth at the end of the year was softer than the top-line GDP number.

Even if underlying growth did step down at the end of last year, however, the optimism expressed by my contacts is not so much related to momentum coming out of 2018, but rather their views on the prospective effect of the tax reform. On this score, my sense is that the businesses' responses to the tax legislation are not fully clear—certainly not clear to me and, according to their feedback, not clear to the businesses themselves either. As one director put it, “We’re still working with wet cement.” On balance, my contacts echoed exactly what they told us in the lead-up to the December meeting: Optimism hasn’t yet morphed into any significant expansion of capital investment plans.

Business decisionmakers seem to be mulling over how to divvy up tax savings between stock buybacks, debt reduction, compensation to employees, and expansionary or productivity-enhancing investment. And, as President Kaplan noted, buybacks and debt reduction will take a significant share of these funds. A contact from the nation’s leading supplier of rail-based freight transportation noted that the tax act has significant complexity, and that future investment

plans would be dependent on, and I quote, “implementation guidance from the IRS, clarifications of state tax law, and the completion of the company’s 2017 tax return filings.” None of these things is currently in place.

I think the feedback we received indicates that we will be beyond the first quarter before there is much clarity about how businesses are likely to respond to the new tax environment. Visibility into the likely effects of the tax package could take even longer, to the extent that stimulus effects will ultimately rely on directing increased cash flows to shareholders or workers rather than directly prompting an investment boom. We simply have no reliable models on how household consumption, saving, and investment are likely to respond to the newly-enacted tax changes.

On this latter point, I’ll note in passing that our contacts in the nonprofit sector are the one group that systematically expresses downside concerns about the tax act. I think it is an open question as to whether those concerns will prove to be justified, and the extent to which negative effects on the population served by these entities is a counterweight to any positive effects elsewhere.

For all of these reasons, I am reluctant to take onboard a growth forecast that embodies much beyond my SEP submission. I don’t reject the notion that we could see the larger boost to GDP envisioned in the Tealbook projections. I view the risks to growth weighted to the upside, for sure. But I believe it is just too early to be folding these effects into a baseline view.

To reinforce the theme that it’s too early to tell whether the economy is fundamentally shifting into a higher gear, we’ve heard little to suggest that a pickup in wage growth is in the offing despite the continued reports of tight labor conditions. Contacts persist in their beliefs that acceleration of wage hikes is imminent but only sporadically report that such an acceleration is

actually happening. We've detected a pickup in reports of variable pay as a targeted way to reward employees, but, as President Kaplan noted, it's almost always been in the context of avoiding building permanent increases into wage structures. When queried, our contacts do not indicate that they perceive anything significant in the way of building inflationary momentum. My own reading on the latest inflation report is that, other than in shelter, price pressures in the rest of the retail market basket are still a bit soft.

In sum, I'm left with the impression that it is premature to buy into a notion that the outlook for growth, wages, or inflation is significantly changed from where it stood in December. This influences how I'm thinking about our positioning for future policy moves, which I will return to tomorrow.

As a final comment, I must say that I very much appreciated the staff's presentations today. All were informative, clear, and thought-provoking. I was particularly struck by David Wilcox's Yellen retrospective, noting the progress during her tenure as Chair, which was substantial. But what especially stuck with me was his observation that not every problem has been fixed. The United States lags in a number of key performance metrics: the labor force participation rate, income and wealth inequality, and gender and racial equality. I hope that we do not overlook these in formulating policy. They should be key signals for us in assessing how the market is performing and how our economy is as well. Thank you, Madam Chair.

CHAIR YELLEN. Thank you. President George.

MS. GEORGE. Thank you, Madam Chair. The 10th District economy continues to expand at a moderate pace. Across manufacturing, services, and energy sectors, our business contacts were optimistic, reporting increases in activity and generally anticipating positive effects from tax cuts. Within the services sector, retail and restaurants have reported notable

increases in activity. The latest Kansas City Fed Energy Survey indicates that we saw slightly faster growth in energy firm activity in the fourth quarter amid higher prices. The outlook for future activity continued to improve, with most firms anticipating increased spending levels in 2018. Energy firms in our District reported needing WTI prices of \$62 per barrel, on average, to substantially increase drilling activity, a higher threshold than reported last year. However, as short-cycle U.S. production reacts to rising prices, oil production forecasts have been revised up, contributing to a slight global oil supply surplus for 2018. The District's ag economy has remained stable after several years of adjusting to lower farm income. Commodity prices are likely to stay low in the coming months as supplies remain high, and District contacts are focused on NAFTA trade negotiations as a potential downside risk for this sector.

With regard to the national economy, my outlook now incorporates details of the tax changes that were not available at the time of our previous meeting. As a result, I see stronger growth and an even lower unemployment rate than reflected in my December SEP. Encouraging signs of global growth also bolster confidence in this outlook. Consumer and business spending remain positive, and even though net exports were a drag on real GDP in the fourth quarter, strong growth in capital goods imports may be a positive sign for future growth. Real imports of capital goods excluding the automotive sector rose 12 percent in the four quarters of 2017, the strongest rate of growth since 2011.

This welcome strength in the U.S. economy, though, is not without signs of risk. With the federal deficit projected to climb as a share of GDP during a period in which the unemployment rate has likely fallen below its longer-run level, the experience of the 1960s serves as a reminder of the implications of procyclical fiscal policy. Depending on how consumers and businesses respond to the tax changes, the tax bill may well provide an

unexpectedly large boost to the economy, with the potential for further stimulus associated with infrastructure or defense spending.

As labor markets tighten, our business contacts also continue to offer anecdotes of higher wages to retain workers and ongoing pressures to source qualified workers. Whether more workers can be drawn into the labor market to meet demand remains to be seen. While the labor force participation rate has remained stable over the past year, the downward trend from an aging population will be difficult to continually offset with sidelined workers.

Finally, current levels of inflation remain low and within range of the Committee's target. Market-based measures of inflation breakevens have been increasing recently, and I expect inflation to move higher as price pressures from commodities and imports work their way through the producer pipeline and the effects of transitory factors that held down inflation last year fade away. Additionally, my outlook for inflation is supported by measures of inflation for healthcare services and housing services. Annualized growth of 2.5 percent in inflation for healthcare services in December was consistent with my staff's expectation that higher Medicare reimbursement rates will pass through to consumer prices. Also, with builders likely to continue facing supply constraints in 2018, I also expect inflation for housing services to continue putting upward pressure on aggregate inflation. Thank you.

CHAIR YELLEN. Thank you. President Kashkari.

MR. KASHKARI. Thank you, Madam Chair. Moderate growth continues in the Ninth District. Tight labor availability continues—most recently, complaints of difficulty finding temporary workers to staff the Super Bowl. I would note that we are happy to be hosting the Super Bowl, but we would much rather be playing in it. [Laughter]

Unemployment rates are low across the District: around 3 percent in Minnesota, 3.1 percent in Wisconsin, 2.6 percent in North Dakota. Some firms are reporting using the proceeds from the tax package to pay for increased wages without having to raise prices. Now, anecdotal evidence of rising wages is not entirely consistent with surveys. Average hourly earnings are rising at about 5 percent in 2016 and early 2017 in Minnesota, but wage growth appears to have since slowed to around 3 percent, with no evidence of increasing price inflation. The tax reform does appear to be positively affecting investment, especially in the healthcare sector. In line with what others have noted, I was surprised at the boost in sentiment from our directors and our business contacts. It's actually quite remarkable. We hope it'll be sustained.

For the national economy, the real economy has been reasonably strong—Q4 GDP numbers, with consumer spending and equipment investment strong. I do think that, as in the Tealbook assessment, the tax reform is likely to have a significant positive effect. I think the markup in the Tealbook's 2018 GDP forecast seems reasonable.

With regard to the labor market, continued strong job numbers are showing up—a continued improvement in labor force participation, while the unemployment rate has been flat at 4.1 percent since October. There have been no significant changes in nominal wage growth or in inflation and some evidence of a wealth pickup in market-based measures of inflation expectations—I'm happy to see that. I hope to see it sustained. Rising oil prices and a weakening dollar are likely to offer a temporary boost to inflation. Oil is up around 50 percent from its recent low, and the broad dollar is down 8½ since its peak at the start in 2017.

Now, how do we reconcile this real economy strength and nominal weakness? As I said in the inflation discussion earlier, I think there's uncertainty about how much slack is still left in the economy. On the one hand, the unemployment rate is low. On the other hand, the prime age

of employment and prime-age labor force participation remain well below pre-recession levels. We are uncertain about the natural rate of unemployment. We are even more uncertain about the natural rate of labor force participation. As we discussed, the Tealbook notably changed its labor force participation forecast this round to a higher and flatter path. I think the staff is right to be more optimistic about the path for LFP, but I disagree that the current LFP is unsustainable. Conventional wisdom is that LFP is not very cyclical, but the experience of the Great Recession and the recovery strongly suggest a large cyclical component of LFP.

Prime-age LFP fell from 83.1 percent in December 2007 to 81 percent in December 2013 and has since risen almost a full percentage point to 81.9 percent in December of last year. Cyclical is especially strong for those without a college degree, and the recovery since December '13 has been especially dramatic for women and for African Americans. To me, there's no reason to think that the recovery in prime-age labor force participation is unsustainable or that it is running above potential. On the contrary, there are several good reasons to think that prime-age LFP is still below potential. First of all, we've not seen any rapid wage growth, and as I've said before, if you want to assess supply and demand in a market start by looking at the price, and the price is not accelerating. Second, growth of prime-aged LFP over the past year has been steady and shows no sign of cooling. Third, the level of prime-age LFP is still far below pre-recession levels, and interestingly—I think David Wilcox noted this—in most other countries, prime-age LFP today now matches or exceeds pre-recession levels, contrary to the United States. It's true for both men and women in France, Germany, Japan, the United Kingdom, and Canada but not true in the United States, and I don't have a good explanation for that.

The bottom line is that an important part of labor market slack during the recession showed up as depressed LFP, not just as unemployment. There's a good chance the current LFP is still below potential, so labor market slack may still remain. In light of this uncertainty, I think we need to pay close attention to nominal wage growth. If modest wage growth continues, that to me will indicate the economy still has room to run. If we do see nominal wage growth pick up, then I think rate increases could be appropriate. Thank you, Madam Chair.

CHAIR YELLEN. Thank you. Governor Powell.

MR. POWELL. Thank you, Madam Chair. The economy is starting the year with more growth momentum than anticipated at our December meeting, with strong spending data and gains in employment showing a further tightening in the labor market. While inflation is still falling short of our 2 percent inflation objective, incoming data have increased my confidence that inflation will move up this year.

I have tentatively marked up my real GDP growth expectation for the year to around 3 percent, on the basis of three factors. First, spending by households and businesses was stronger in the past few months. Second, the fiscal package turned out to be larger and more front-end loaded than expected in December. And, third, tailwinds coming from abroad have intensified.

In addition, financial conditions have remained highly supportive of economic activity, with narrow risk spreads, still- low long-term interest rates, favorable lending conditions, and rising equity prices. Consumer and business confidence and fundamentals have been strong. Fourth-quarter GDP, as David Wilcox pointed out, rose at what appeared to be a disappointing headline rate. But if you look into the inner workings of that, by taking out the effects of inventory and imports, consumer demand and business demand actually were quite strong.

I anticipate that the momentum shown in the spending data will be significantly reinforced by the recently enacted fiscal package. In that regard, I found the staff analysis of the economic effect of the package to be very helpful. The staff's estimate is that the Tax Cuts and Jobs Act will raise annual GDP by roughly ½ percent this year and next, mostly by inducing higher spending by households and businesses. This seems like a reasonable estimate, although, of course, there's high uncertainty. I also agree that lower marginal tax rates and the move to full expensing of some capital spending are likely to boost both the supply of labor and investment, contributing to some increase in the productive capacity of our economy. Again, the size of these effects is highly uncertain.

The pace of economic activity in a broad cross section of countries has also surprised to the upside. Looking ahead, I see financial conditions and monetary policies abroad as being supportive of continued strengthening of foreign GDP growth.

The degree of synchronization in global growth is quite striking. As Lael mentioned, the recent IMF update noted that 120 or more economies accounting for three-fourths of world GDP have seen a pickup in growth in year-on-year terms in 2017. And, in addition to boosting demand for our exports, the more upbeat outlook for our trading partners should help counter some of the upward pressure on the dollar as we continue to normalize the stance of our policy.

The prospect of stronger U.S. growth this year and next points to a further tightening of our already-tight labor market, with monthly gains averaging 162,000 over the past four months. That is substantially in excess of the pace consistent with a stable unemployment rate. My expectation is that unemployment, in line with the staff's forecast, should fall well below 4 percent by the end of this year and thus below most estimates of the natural rate, including mine. I would add, though, that I see the natural rate as subject to great uncertainty. Labor force

participation has now been flat for roughly four years despite a downward trend arising from demographics and other factors, and this sideways movement amounts to a further indication of a tightening labor market. I expect that strong growth will continue to support labor force participation in the medium term. My overall assessment is that we are near full employment, although a few indicators, notably nominal wage growth, appear to suggest that there may be some remaining slack in the labor market.

Despite last year's favorable surprises on growth and employment, inflation has disappointed, continuing to fall short of our 2 percent objective and even declining during part of this year. The performance of inflation has been the skunk at our garden party, so to speak, on what would otherwise have been a very good year for any central bank.

I continue to see that the staff's assessment that transitory factors have largely accounted for the softness in inflation this past year. Indeed, I do take a bit of solace from the data over the past couple of months, which have shown a rise in inflation from the very low readings at midyear. Inflation breakevens have also moved up meaningfully since the fall, and all of that adds very modestly to the degree of confidence I have that inflation will move up this year.

So, to sum up, the information received since our meeting in December has led me to upgrade my view of the growth outlook, reinforced my assessment that the already-tight labor market is likely to get meaningfully tighter, and helped ease concerns about inflation remaining too low for too long. As unemployment seems headed well below 4 percent, probably for an extended period, this is a time to remain patient, while also being alert to buildups in both inflation pressures and financial vulnerabilities. More on that tomorrow.

Now, Janet, I will have more to say in a little while, but I would just offer a few thoughts. A summary from my perspective might be that your leadership of this Committee and this

institution has been a resounding success. And the beneficiaries of that success are the American people—tens of millions, hundreds of millions of people, really, who benefit from this remarkably strong economy that we have. Hindsight has a way of making things look easy. It wasn't easy. It wasn't easy at all. You've led us with courage, integrity, principle, and intelligence through a tricky, sometimes treacherous, path to the economy we see today.

You've been a great colleague. You've been a great friend. It's been a tremendous honor to serve with you. Congratulations, and thank you.

CHAIR YELLEN. Thank you. Thank you so much, Jay. Vice Chairman.

VICE CHAIRMAN DUDLEY. Thank you. We continue to upgrade our growth forecast for 2018 for many of the reasons that Governor Powell laid out. The economy has entered 2018 with greater forward momentum than we had anticipated. One good example of that is the strength that we saw in consumer spending in the fourth quarter. Second, the economy will get an added boost from the tax legislation, which turns out to be more front-loaded than we had anticipated. Third, financial conditions remain buoyant despite our recent actions to remove monetary policy accommodation. Some well-known financial indexes are actually easing, with the rise in the stock market and the weakness of the dollar more than offsetting the rise in short- and long-term interest rates. And, finally, the global economy is strengthened, and this implies more demand for U.S. goods and services. So, to put it all together, we're very confident that the economy will continue to grow at an above-trend pace in 2018, and that will lead to some further tightening in the U.S. labor market.

On the inflation side, a number of factors also make us more confident that inflation will move higher in the year ahead. For instance, on a sequential basis, the inflation data are firmer. Now, that's no surprise, we were expecting that, but it does provide some confirmation that the

weakness that we saw last spring was, in fact, due mainly to transitory factors. Second, the labor market continues to tighten, which should eventually lead to some further pickup in wage compensation. It's not visible yet, but anecdotal reports are consistent, I think, with greater wage pressures. Third, the dollar has weakened, and this should cause import prices to firm a bit. Fourth, inflation expectations are, at worst, steady and, at best, are starting to move up. Although the University of Michigan's five-year-forward inflation expectation measure hasn't budged yet, the New York Fed's three-year median inflation expectation has moved up in the most recent reading to 2.9 percent, which is the top of its range in recent years. In addition, as other people have noted, inflation compensation measured by the spread between nominal and TIPS yields has moved up considerably since our previous meeting. Finally, there is the potential for policy actions on trade and immigration that also could lead to increased price pressure. The imposition of tariffs on certain goods imports will tend to push up goods prices, and more-stringent immigration rules could tighten labor supply and constrain the productive capacity of the economy.

In stepping back and assessing the economic outlook from a broader vantage point, one way to frame the issue is to assess whether we think we're in a secular stagnation regime or not. Up until recently, the secular stagnation story seemed pretty compelling. Despite the very low level of short-term interest rates, economic growth was slow, and one could point to demographic factors as an important reason why this expansion was different.

More recently, however, I think there's a compelling narrative that deserves attention—namely, that it's just taken time for the damage from the financial crisis to dissipate fully. This would be consistent with the Reinhart-Rogoff work that suggests that, following a major financial crisis, it takes a long time for that damage to abate fully. The strengthening of the

global economy nearly nine years after the Great Recession reached its trough, and the current buoyancy of financial markets seem broadly consistent with this narrative.

Now, which narrative is correct really does have important implications for monetary policy. If the “secular stagnation” thesis is right, then the neutral real short-term interest rate, r^* , is low and will stay low in the future. In that case, we’re probably not very far away from a neutral monetary policy setting, and there’s not much risk that the expansion will get away from us. If, instead, the Reinhart-Rogoff story is correct, then r^* has actually been rising over time. This means there’s likely a bigger gap between our federal funds rate target range and r^* than maybe what we fully appreciate.

Perhaps we’ve maybe not even begun to close the gap between the federal funds rate target and r^* . If true, this would indicate the risk of overshooting a sustainable level of employment. It also might require moving to a tight monetary policy setting well above r^* in the future. Too much caution now in removing monetary policy accommodation could necessitate a much more aggressive approach down the road, and that would increase the risk of a hard landing.

By adding fiscal stimulus at a time when the economy is already operating at or beyond a sustainable employment rate, the Tax Cut and Jobs Act also increases the risk that we will be behind the curve in removing monetary policy accommodation. Now, one can debate whether the tax cut legislation will have any persistent effect on r^* in the long run, but in the shorter run it does strike me that it’ll almost certainly necessitate a tighter monetary policy.

Speaking of the tax cut legislation—some people around the table touched on this—I also think it’s worth considering how this legislation is going to potentially influence the trajectory of

equity prices and financial conditions and of inflation. I can imagine a number of possibilities here, but let me lay out one that might be worthy of consideration.

Let's assume, for the sake of argument, that corporations initially capture the benefits of the corporate tax cuts in the form of wider margins, but over time the benefits of the corporate tax cuts are mostly competed away. If you thought that was right, then that has two important implications. First, it implies that corporate earnings growth will be strong this year but then much weaker thereafter. This suggested to me that there's some prospect for disappointment in the equity market in 2019 and beyond. Second, to the extent that the increase in margins generated by the corporate tax cuts are competed away over time, this actually does have a disinflationary consequence. Now, presumably it won't be very large in any given year because presumably the adjustment process will be somewhat lengthy, but it seems to me that this is worth at least exploring in the context of the medium-term inflation outlook.

So, to sum up, under our current stance of monetary policy, I believe that the balance of risks is shifting toward growth being stronger than what is sustainable and away from inflation persistently undershooting our 2 percent objective. As I see it, the risks are growing that we're going to be behind the curve in removing monetary policy accommodation. And this is especially, to me, the case, in view of the fact that broad financial conditions have not tightened at all in the two years that we've been removing monetary policy accommodation, and that's at a time when fiscal policy is now becoming more accommodative. I'll have more to say on monetary policy tomorrow.

CHAIR YELLEN. Well, my thanks to everyone for a very thoughtful discussion of the outlook and also for your very kind words on the occasion of my final FOMC meeting. I'll have more to say this evening, but for now let me just say that it has been an incredible privilege and

an honor to serve on this Committee and to work with all of you—a smart, collegial, dedicated group of colleagues and staff members.

To wrap up the round, I'd like to quickly reflect on the progress that has been made over the past few years toward our goals and then consider some of the challenges this Committee will face in sustaining and building on that progress. Four years ago, the labor market was far from having recovered from the Great Recession. The unemployment rate was still high at 6¾ percent, millions were working fewer hours than they desired, and depressed readings on quits, job openings, and job availability showed that opportunities for finding work or better jobs were quite poor.

But after several years of moderate growth in overall activity, labor market conditions have improved markedly. At 4.1 percent, the unemployment rate is at its lowest level in 17 years. The share of involuntary part-time employment is essentially back to its pre-crisis level, and firms have become noticeably more aggressive in trying to attract and retain workers, even if overall wage growth still remains fairly subdued.

This return to a strong labor market has made millions of Americans much, much better off, and I am heartened to see firms ramping up training programs and hiring individuals who, four years ago, wouldn't have passed an initial job screening. This improved performance substantially reflected a fortuitous fading of the headwinds, both domestic and foreign, that arose in the wake of the financial crisis. As these headwinds faded, households and firms regained their confidence and took the steps needed for real activity to recover fully.

But this recovery was not inevitable. It could have been derailed had this Committee removed monetary accommodation too quickly, perhaps by being less willing to revise our assessments of the outlook and appropriate policy in response to incoming data. But we didn't,

and for that reason we can take some satisfaction in how things have turned out, while remaining cognizant that the ultimate credit goes to the American people.

On the inflation leg of our dual mandate, progress has been less satisfactory. As the staff presentations this morning stressed, the reasons for the continued shortfall from 2 percent are murky. Thus, it is not clear, even in hindsight, what, if anything, this Committee should have done differently. In any event, it is important to put the shortfall in perspective. From the public's perspective, low and stable inflation, combined with a strong labor market, is hard to beat. And as Jeff Fuhrer noted in his briefing this morning, past Committees might have been envious of what we've managed to achieve. If not for the loss of credibility that would accompany a failure to follow through on our 2 percent commitment, something that would diminish our ability to stabilize inflation over time and exacerbate the problems posed by the zero lower bound, we might be tempted to say: "Close enough."

The challenge for this Committee is, of course, how to best sustain and build upon this good performance, and I see several key issues. First, in line with Vice Chairman Dudley's comments, there is a question of whether r^* really is as low as the Laubach-Williams model and some other estimates suggest. If it's close to zero, then the stance of monetary policy is now close to neutral. And after a few additional hikes, short-term rates will only have to move up to keep pace if and as r^* rises over time.

Yet monthly payroll gains continue to run well ahead of estimates of the sustainable longer-run trend. The failure of job gains to slow more than modestly could conceivably reflect lags in the monetary policy transmission mechanism, but it could instead be a sign that monetary policy is still fairly accommodative, perhaps because the neutral rate has moved up in recent quarters. After all, overall financial conditions eased even as we tightened over the past year,

with stock prices up almost 25 percent from late 2016 and the dollar down almost 9 percent. In addition, fiscal policy has now turned stimulative, and the boost to spending from the new tax legislation may prove to be unexpectedly big. On top of that, global growth is coming in stronger than we had earlier anticipated. These are all factors that serve to boost r^* .

In light of these developments and uncertainties, stabilizing the labor market to prevent the economy from overheating markedly may require a faster pace of tightening than was envisioned in our December SEP submissions and than market participants currently anticipate. Another issue is whether current labor market conditions are actually consistent with inflation moving up to 2 percent over the next couple of years. Although recent indicators have increased my confidence in this forecast somewhat, the jury is still out on this assessment.

For the reasons discussed this morning, we cannot rule out the possibility embodied in the Tealbook forecast that resource utilization will need to tighten appreciably further to achieve our inflation goal. Incoming data may clarify the situation in coming quarters, but until they do, this possibility should temper the policy signal that would otherwise be coming from the labor market and real activity. That said, inflation may well surprise to the upside. Unexpected movements in energy prices and the dollar, together with idiosyncratic price shocks, could easily boost inflation appreciably. In addition, the upward pressure on costs and profit margins from a strong labor market could prove to be greater and more persistent than expected. I consider this a significant risk.

Even so, I'd urge this Committee to be careful not to overreact if inflation rises modestly above 2 percent for a time. A decision to tighten very aggressively in response to inflation moving above 2 percent, particularly if there is no accompanying rise in measures of expected inflation, will cement the unfortunate view that our 2 percent inflation goal is actually a 2 percent

ceiling—a view that many in the market hold, although it runs contrary to our consensus and public statements. Moreover, to the extent that inflation expectations have slipped some in the past few years, a modest overshoot for a time in actual inflation might serve to re-anchor expectations at a level consistent with our 2 percent goal. Finally, I view the welfare cost of inflation running modestly above 2 percent for several years as small. Of course, if the sustainable long-run rate of unemployment is indeed about 4½ percent, as our SEP submissions suggest, that will not be enough to stabilize the unemployment rate to stabilize inflation around 2 percent. Eventually, labor market conditions will have to cool moderately, with the unemployment rate moving higher.

But, due to the flatness of the Phillips curve, it could be quite a long time before inflation pressures intensify sufficiently to warrant deliberately using monetary policy to push up the unemployment rate. In fact, well before that situation developed, some nonmonetary disruption could easily occur that would send the economy into a slump that would call for easing, not tightening.

In any event, if it eventually does become necessary to check the emergence of a persistent inflation problem by actively trying to push up the unemployment rate, I believe the best approach would be to tighten cautiously and gradually, in order to reduce the risk of inadvertently triggering a recession. Moreover, there would be no point in slamming on the brakes in such a situation, because the Committee would be trying to manage a slowly evolving problem.

Finally, I would note—and President Rosengren mentioned this in his remarks—that the simulations in Tealbook B do indicate that a far more rapid increase in the federal funds rate than is called for even in the staff baseline would be appropriate under the standard quadratic loss

function. But let me say that I don't really personally believe that it is appropriate to use such a function. I don't think it's appropriate to assign a significant welfare cost to the unemployment rate declining below the estimated natural rate. The cost in that circumstance has to do with inflation rising above our 2 percent objective, and, absent such a rise, I think you can be quite sure that no member of the public would react negatively to very low unemployment.

And, in that regard, I appreciate very much Tealbook B having incorporated simulations that involve an asymmetric weight on the unemployment gap. Those are the ones that I pay most attention to, and those optimal control simulations do confirm that a gradual approach—an even more gradual approach than in the Tealbook baseline—is appropriate.

So let me stop there. And we have a reception downstairs. All FOMC participants and all of the staff members attending this meeting are invited. We will then reconvene tomorrow morning at 9:00 a.m. for Thomas's briefing and the monetary policy go-round.

[Meeting recessed]

January 31 Session

CHAIR YELLEN. Good morning, everybody, and thank you for a lovely tribute last night. That was fantastic. It meant the world to me. Okay. Starting off this morning, let me ask David: Would you like to discuss the data release?

MR. WILCOX. This morning at 8:30 the employment cost index for the 12-month period through December 2017 was published. The estimate for private industry workers is that total employment cost, hourly compensation, increased 2.6 percent over the 12-month period. That was just a little softer than we had expected. Wages and salaries came in at a 2.8 percent rate of increase. Benefit costs were at 2.3 percent. The wage-and-salary number was right in line with our expectation. The benefit cost increase was just a little softer than we had expected. We don't yet have the detail on benefits, so we don't know what the breakdown is and the source of the shortfall.

Looking over the past three years, there has nonetheless been some increase in nominal rates of growth in total hourly compensation—1.9 percent in 2015, 2.2 percent in 2016, and 2.6 percent in 2017—so, some modest acceleration in nominal compensation costs.

CHAIR YELLEN. Any questions for David? [No response] Okay. Let's move along to monetary policy. Let me call on Thomas for his briefing.

MR. LAUBACH.⁶ Thank you, Madam Chair. I will be referring to the handout labeled "Material for the Briefing on Monetary Policy Alternatives." As David and Steve reported, the economic data received over the intermeeting period pointed, on balance, to greater-than-anticipated strength in economic activity here and abroad. Moreover, although the provisions of the tax bill were becoming clear at the time of your December meeting, in the period since its enactment, both the staff and outside analysts have refined their estimates of its likely economic effects. All forecasters we are aware of have meaningfully upgraded their outlook for the next few years.

Although the immediate financial market response to the passage of the tax bill was muted, the tax changes, alongside strong economic data, fueled further sizable

⁶ The materials used by Mr. Laubach are appended to this transcript (appendix 6).

stock market gains. Add to this the large dollar depreciation and some other changes in key financial indicators—shown in the first column of the table in the top-left panel—and overall financial conditions eased notably further over the intermeeting period. I should note that I selected the series shown in the table using some preliminary staff exploration of which financial indicators might be the most useful predictors of economic activity. That said, financial conditions indexes prepared by Goldman Sachs and the Chicago Fed give the same message.

The second column of the table shows the movements in these series since the Committee started raising the federal funds rate. All else being equal, the easing in overall financial conditions would call for raising the federal funds rate at a somewhat faster pace to deliver financial conditions consistent with the Committee's modal outlook for inflation and employment. Put differently, the stimulative impulse to economic activity from an easing in financial conditions, all else being equal, is equivalent to an increase in the neutral federal funds rate. The panel to the right shows the Laubach-Williams measure of r^* . Despite the easing in financial conditions, this measure shows no notable uptick so far, largely because it interprets the recent softness in inflation as a sign that resource utilization hasn't been tightening substantially. But, as shown in the yellow-shaded region, when the Laubach-Williams model is presented with the Tealbook projections for real GDP, core PCE inflation, and the federal funds rate for the current and next two years, r^* is projected to rise nearly 1 percentage point. Incidentally, this trajectory is quite similar to that of the median respondent to the Desk surveys. While survey respondents seem to have factored into their outlook a rising path for the neutral rate, that path has barely changed since the middle of last year.

A key question is to what extent financial markets understand and are prepared for the possibility that strong economic data and the further easing of financial conditions since the December meeting might require a more rapid increase in interest rates than market participants have been expecting. Especially at a time of change in Committee leadership and composition, you confront the challenge of how to communicate the message that a stronger outlook would call for a steeper funds rate path without creating the impression that the Committee's reaction function has changed substantially—an impression that might jolt financial markets.

As shown in the middle-left panel, the probability distribution of the level of the federal funds rate at the end of 2018 implied by options quotes, assuming zero term premiums, shifted to the right over the intermeeting period. That distribution now indicates that market participants attach the highest odds to the federal funds rate being in the 2 to 2¼ percent range at year-end. The perceived probabilities of both three and four 25 basis point hikes have increased noticeably, with the highest odds now on three. As Simon noted, averaging across respondents, the probability distribution for the same horizon in the Desk's January surveys also shifted to the right. Beyond the current year, the futures-implied path for the federal funds rate shifted up over the intermeeting period but remains remarkably shallow. That said, the futures-implied path is probably being held down by negative term premiums, or

by downside risks that pull the mean below the modal outlook for the federal funds rate.

The panel on the right addresses the question of whether financial markets are pricing in too low a probability that economic circumstances might lead to a substantial increase in longer-term interest rates. In particular, it shows, at each point in time, the probability, derived from swaptions prices, that the 10-year swap rate could rise more than 100 basis points over the next year. As the panel shows, this probability stands currently at only 8 percent, lower even than in April 2013 on the eve of the taper tantrum. This low probability may reflect a strong conviction among market participants that the funds rate will rise only gradually, possibly informed by the experience of a low-volatility economic and financial environment in recent years.

Leaving aside the communications challenge I mentioned earlier, there are a number of important uncertainties that could generate an unexpected reversal in financial conditions. In the bottom-left panel, I highlight a few that appear relevant to the current environment. First, the experience of recent years has accustomed investors to subdued inflation. While 5-to-10-year-forward inflation compensation has increased about 30 basis points since your November meeting, a sustained increase in inflation combined with declining unemployment may lead investors to rapidly reprice inflation risk. Second, policy normalization abroad could spill over to U.S. interest rates to a greater extent than anticipated. And high levels of leverage in the nonfinancial corporate sector create the risk that interest–expense ratios could rise rapidly if longer-term interest rates rose quickly.

The final panel summarizes how the draft policy alternatives would communicate the Committee’s views of the current situation and implications for future policy. Alternative B would acknowledge the strength in the incoming information on the labor market and economic activity and would suggest greater confidence that inflation will move up this year. By stating that further gradual adjustments in the stance of monetary policy underlie the Committee’s outlook for the economy, alternative B would likely reinforce market expectations of an increase in the target range for the federal funds rate at your March meeting. While the addition of the word “further” may caution that the policy rate path might turn out to be steeper than previously thought, alternative B would not communicate a change in the Committee’s modal outlook at this time. Under alternative C, in light of the strength of economic activity and a shift in risks to the upside, the Committee would communicate greater urgency in tightening policy in order to move growth of economic activity and employment to sustainable rates, beginning with an increase in the target range for the federal funds rate at this meeting. With alternative A, the Committee would emphasize that its principal concern is the persistent shortfall in inflation and that it intends to keep policy appropriately accommodative as it assesses the prospects of achieving a sustained return of inflation to 2 percent.

Finally, my colleagues on this side of the table highlighted in their briefings several important developments during the Chair’s tenure, and I would like to add to this list by noting a few on the monetary policy side. Of course, Chair Yellen, your

contributions to the theory and practice of monetary policy span several decades by now. Focusing just on your latest stint in Washington since the fall of 2010, you played a central role in bringing about the consensus statement that the Committee reaffirmed yesterday for the sixth time. You set new standards in communicating clearly to the public, in speeches, testimony, and press conferences, about key issues such as the role of simple rules and optimal control in policymaking and about the implications of a lower neutral rate. And on your watch as Chair, the Committee managed to begin normalizing both interest rates and the balance sheet without a hitch, thereby preserving the FOMC's ability to again use its crisis tools if need be. For us on the staff, the openness of your interactions with us and the collegial atmosphere you promoted were an inspiration and role model. We are honored and grateful to have had the opportunity to serve under your leadership.

Thank you, Madam Chair. That completes my prepared remarks. The December statement and the draft alternatives are shown on pages 2 through 12 of the handout. I will be happy to take any questions.

CHAIR YELLEN. Thank you so much. Questions for Thomas? President Bullard.

MR. BULLARD. Thank you, Madam Chair. I'm looking at the time-varying natural rate, r^* , graph here, and—a thought experiment for you. So let's take the yellow part off and not pay any attention to that. And I'm going to draw a horizontal line through the left part of the graph, and then there's a big shift at the time of the crisis, and I'm going to draw a horizontal line through the data from 2010 or so, and it's about zero. And not only that, but before you get to the yellow part, it's actually declined recently.

So I think that, from a policymaking perspective, a better model would just say that probably this is going to stay low, and we shouldn't predict that we're at an inflection point. There's no real good reason, just looking at this statement. I mean, you're talking about seven, eight years of low rates. It really hasn't gone away. I see no reason to predict an inflection point—on my characterization, anyway—of this data. And that would also go with the middle-right graph, which says that markets are not really too worried, or maybe less worried than they've ever been, about a rapid repricing. So it's just a “low rate” world, and from a policymaker's perspective, we should make policy taking that on board.

MR. EVANS. Can I get to that? I was going to ask on exactly that point.

CHAIR YELLEN. Please. President Evans.

MR. EVANS. And it's a bit of a technical angle, but it's quite related to what Jim is saying.

MR. BULLARD. I love tech talk. [Laughter]

MR. EVANS. And since you raised it, I might do it on the side, but since it's important here—so, as I understand it, the Laubach-Williams implementation treats the natural interest rate as a nonstationary, $I(1)$, process, right? Which is in line with what Jim is sort of saying: “Well, gee, I kind of expect it to be low until I found out something important.” So what you found out is something about the staff forecast. And so I guess my question is, what is it in the staff forecast that's telling me about $I(1)$ behavior? Stationary data can change my opinion of $I(1)$ behavior, I suppose. Or is this sort of more symptomatic of misspecification, or something like that?

MR. LAUBACH. Let me take a stab, and, of course, maybe President Williams would like to weigh in at some point as well. [Laughter] So, of course, the Laubach-Williams model, as you know, is really—and I highlight that—only just looking at real GDP, inflation, and interest rates. So it doesn't know about a whole lot of things that we might know about—for example, factors the staff will take into consideration in putting together its projection.

Now, in the back of our minds, of course, we are always thinking about the question, what are the fundamental drivers of this? One should understand that Laubach-Williams is a black box, it's a statistical thing. But we think that there are some structural stories going on here in the background. Most of the stories that we like to tell involve variables like trend productivity growth, demographics that tend to be very gradually moving processes, we think.

So this rapid decline during the financial crisis seems somewhat unusual, and, in fact, if you look at the entire 50 years of our estimate, it is a unique development. We don't see any such sharp movement anywhere else in the series, which could point to the possibility that there are also other factors that make it into our estimate such as, for example, a sudden sharp increase in risk aversion. That would be one possibility.

And then the question is, okay, is this now a permanent factor or not? Well, our model, of course—as you understand, right?—needs to take a very mechanistic approach. It just looks at the constellation of the data, and it lumps a certain amount of the unexplained, one-step-ahead forecast errors, technically speaking, into the persistent component, and that's r^* , and the rest it basically lets the error terms in the equations absorb.

So when I look at this one possible interpretation, it is that, in addition to the secular factors that we are frequently emphasizing—like trend growth and slow productivity growth and demographics—there was a very persistent and unusual development during the financial crisis. It could be a sharp increase in risk aversion. It could be, as I think was also highlighted yesterday, that the recovery from this recession was just taking much, much longer because the recession was so much driven by the need to deleverage, which is a much slower process, and the model would basically assign a certain portion of that weakness to the permanent component.

So then, when you think about that, you might say, “Well, okay. In some sense, the model here isn't quite getting this bit right, because some of these, I may think of them as 20-, 30-, 40-year developments, like demographics, and about others, like deleveraging, I may think of them as 10-year developments. Okay?” And then it's conceivable that, after a while, you've worked through something that, by historical standards, has been just unusually persistent, and therefore, the model just sticks it into this component.

But at some point that starts unwinding. So I would just be cautious and not take too literally the $I(1)$ specification of r^* in the Laubach-Williams model. It's an econometric device. It is not as though the world really consists exclusively of either white noise or $I(1)$ shocks. There are probably many things in between.

MR. EVANS. If I could just follow up to make sure I understood this. I mean, the way you described it makes sense. Now, the model is not seeing that data, right? That's an explanation for this. And so I guess, in evaluating the usefulness of this measure of r^* , I've put a lot of weight on "Well, it's very persistent." Now, is it the case that, at any point along this path, if I had fed in an expectation of future real GDP growth that had this upward trajectory, would it also have sort of said, "Oh, that's $I(1)$, I'm going to step back on that"? That changes how I think about this measure, I think, if it's got those dynamics. You're giving me a historically—"Sometimes it's permanent and sometimes it's not, so I'm going to try to figure out the signal here." But if every time it sees something upward, it might be going, "Well, maybe it's going to up, then," I shouldn't have put as much weight on it being zero for as long as I might have thought. That's why I asked the question.

CHAIR YELLEN. President Williams.

MR. WILLIAMS. I'm very sympathetic to both President Bullard's and President Evans's questions and perspectives on this, and I agree. So we're going to get the diversity of views of the Laubach-Williams estimate right now, I think. [Laughter]

First of all, it has not gone up. Let's just be clear on the facts of the data that we have. I mentioned this at the last FOMC meeting. In not only our models, but the model with Kathryn Holston and the model with my colleagues at the Federal Reserve Bank of San Francisco using

real bond yields, at least at the last meeting, there are no signs, actually, of a significant rise in r^* , and you see that Thomas's picture.

And President Evans is right. I mean, this is a statement about the Tealbook forecast. The Tealbook forecast is amazingly optimistic. It's got growth—I wrote it all down here—3 percent this year, 2.5 percent next year, 2 percent the year after, roughly, rounding off, with the funds rate going to 4.8 percent by the end of 2020. Well, I don't think actually there's a lot of people around this table who have that same view: that if we're going to raise rates, at least I think, according to the December SEP, to 4.8 percent, we would still deliver that growth. Now, the staff may be completely right. I'm not criticizing their view, but it is a very optimistic view of a strong, above-trend economy, with the funds rate getting up to well above neutral in the next few years.

And what I think the Laubach-Williams model is showing is that, hey, if you feed in a really optimistic view of the economy with a lot of rate increases, the model is going to tell you the underlying strength in the economy must be higher than the original estimate. I don't think I've said anything different from what Thomas is saying. But I am very sympathetic to the view that we haven't seen this, and the discussion that the Vice Chairman brought up yesterday about secular stagnation versus Reinhart-Rogoff—I mean, that's a possibility, but there's nothing in the data yet that supports that.

And it's clearly possible that we're going to see a fundamental shift upward, whether it's arising from fiscal policy or global growth or some of the other things that we talked about. But I do think that it's really important to separate short-term cyclical dynamics—which are positive, absolutely—from the longer-term trends in demographics, productivity, and the demand for safe assets. For these trends, I don't—at least not yet—really see such shifts. So I think actually this

is a great chart, to get to President Evans's point, that we probably would have had these positive views of r^* with a lot of our forecasts. As we know, those forecasts haven't always played out. And this is just a way to think about, if we really get such a strong outlook with very tight monetary policy, then that would be telling us something about these longer-term trends. That's how I view the question. Thank you.

CHAIR YELLEN. Vice Chairman.

VICE CHAIRMAN DUDLEY. Can I ask President Williams just a quick question? So how do you—and Thomas, too—take in the whole constellation of what is happening, in terms of financial markets, in informing your view of which regime you're in? Now, it's possible that financial markets are just reacting to the fact that real rates are really low, and it does take a long time for financial markets to adjust to that low level of rates. Or, conversely, it could take a view that, no, the financial conditions that are easing are due to the fact that the headwinds associated with the financial crisis are abating. How do you fit all the things that we're seeing in financial conditions into the process of trying to discriminate between different views of which regime we're in?

MR. WILLIAMS. Let me start.

VICE CHAIRMAN DUDLEY. Because your model doesn't really have any of them in it.

MR. WILLIAMS. Right. No, absolutely. That's why I do look at the other models. And the New York Fed has their DSGE model with r^* , which I think is great, and the Richmond Fed has their own model. So there are a lot of ways to look at this.

You know, let me just do the secular stagnation story. I'm not a supporter of the strongest version of the secular-stagnation view, but I think that that view is informative for how

to think about this. If you believe that r^* is essentially zero, or half a percentage point, or something very low, then you would expect asset valuations to be basically where they are today. I can't explain why they went up and down in different periods, but I think the analysis that the Board staff has done on commercial real estate, house prices, and the stock market is all basically consistent with the notion that prices make sense if you have a view of a very low value of r^* and a very low value of the term premium. So I think there is consistency in that world.

I also would just mention that, as you know, when Larry Summers has described secular stagnation in the past, his point has been not that the economy never can recover or grow in a healthy way, but instead that it only happens when you get these really strong asset prices or maybe animal spirits or things like that.

And so that was kind of my reaction also to what you said yesterday, which is, well, even in a secular-stagnation world, it's maybe not surprising that the economy is doing well when you've got confidence high and the stock market really high and things like that. But it could also be a sign that we are in an unsustainable situation, in terms of fiscal policy or financial markets or both. So that's why I'm not convinced that it's the fact that we're in a frothy economy, and we're growing 2.5 percent doesn't convince me that we're not in something similar to a low r^* world.

VICE CHAIRMAN DUDLEY. I'm not convinced either. I'm just putting it on the table. I think there's more tension between those two views than there was before.

MR. WILCOX. Could I add one element of ambiguity to the picture, please? [Laughter]

MR. QUARLES. Better than anyone we know.

MR. WILCOX. I agree with the observation that the Tealbook is very optimistic in comparison with the spectrum of current outside forecaster opinion. However, I do think it's

good to look at the track record of our forecasts lately. And I would note that, for example, as recently as the middle of 2015, we were expecting the unemployment rate at the end of 2017—so, at that point, two years hence—we were expecting the unemployment rate to finish 2017 at 5 percent. In fact, as you well know, it finished very close to 4 percent.

Now, what's also true is that the FOMC delivered a more accommodative monetary policy than what the staff had incorporated into the forecast. That's the element of ambiguity that I was referring to. So, unemployment declined faster. On the other hand, that was in the context of a monetary policy that was more accommodative than we had assumed. So how the balance of those two factors works out I can't perform for you right now, but the chart I'm looking at for reference is on page 33 of Tealbook A, and I'm looking at the 2017 evolution of the unemployment rate forecast.

So past performance is no indication of future outcomes in this regard, but I agree that we are currently at the optimistic end of the spectrum. I'm not sure, actually, that we were that far off, stepping back to 2015. With regard to the progress on the unemployment rate, that's been more rapid than we had anticipated a couple of years ago.

CHAIR YELLEN. President Bullard.

MR. BULLARD. Well, I appreciate the comments on this, and I do think that this is really the crucial issue, I think, for the Committee. And I liked Bill's comments yesterday also about comparing and contrasting the secular-stagnation idea with the Reinhart-Rogoff idea.

I have just felt that, for the purposes of what we're doing around the table here, when you look at a picture like this, you should just assume that you are going to stay in the low regime at least over the next 18 months or two years, that kind of horizon. It could be, and you have to be alert and pay attention, and I understand we might want to hedge our bets, but I just felt that it's

conceptually better than saying that, well, all of a sudden, the mean reversion is going to kick in after it hasn't kicked in for quite a while.

And also, on this characterization of the fundamental factors that are driving this, which have already been mentioned—I think there are three of them: productivity, demographics, and demand for safe assets—we've done a back-of-the-envelope type of calculation in which all three of those have regime-switching processes driving them. And I think productivity looks like it's still in the low state. It's moved up, but it's not enough to say you're going to the high state yet. Demographics is ambiguous, and the demand for safe assets is really the big kahuna. And, you know, whether that's abating now—that would get to the Reinhart-Rogoff idea—maybe it is, but I'm not sure we should bet on it as a Committee. That's been my thinking.

If you take those three factors and have them switching up and down, it's the demand for safe assets that has been so high and has kept this thing so low. And maybe the world is changing. We do have coordinated global growth. Yes, we'll keep an eye on that. But if you look at the picture right now, this black line is actually negative as of today. Thank you, Madam Chair.

CHAIR YELLEN. Thank you. Any other comments or questions? [No response] Okay. Let's begin our round, and let me—again, I mentioned yesterday, if you'd turn to alternative B, that there is bracketed blue language indicating that inflation compensation has increased in recent months. We need to discuss whether to put that in. My recommendation is that we do put it in. It would be consistent with our past practice of mentioning movements in inflation compensation when it has reached a certain threshold, and, certainly, in recent days it has reached that threshold. But I would appreciate it, as we go around, if you would comment on whether that change is acceptable. So let's start the go-round with President Williams.

MR. WILLIAMS. Thank you, Madam Chair. I support alternative B with the bracketed language. Now I know that's music to your ears. So I wonder whether you have had that nightmare that almost everyone has, that you come unprepared to an exam. It seems completely implausible that you would have that nightmare. [Laughter] But I had that nightmare for decades after finishing college and graduate school, and so I wonder, as you leave your current position as the Chair, how long will it take—first of all, will you continue to have dreams of hearing everyone say, “I support alternative B”? Or, worse, I think, knowing you, that your real nightmare is, “I support alternative B with a little language from paragraph 4 of alternative C, a little language from paragraph 1 of alternative A, and some new language that we put together this morning.” [Laughter]

CHAIR YELLEN. We've tried to organize things to diminish—

MR. WILLIAMS. Very effectively.

CHAIR YELLEN. —the odds of that. [Laughter]

MR. WILLIAMS. The data continue to exceed expectations. The economy is growing at an above-potential rate, and labor markets are tight, as we have all discussed. Furthermore, the tax changes overall will add more stimulus to growth for the next few years. And while inflation remains somewhat below target, I expect that we will reach our goal by next year.

In my forecast, the unemployment rate is below 4 percent even as we reach our inflation goal. And under those conditions, we will need to rein in the economy somewhat to achieve the soft landing that we are seeking. And I expect that this will eventually entail some overshooting in our policy rate relative to long-run levels. Given this outlook, I strongly endorse the language in alternative B that I believe signals continued gradual normalization and leans into a rate hike at our March meeting.

Looking ahead further this year, as normalization continues, I think we do need to revisit the forward-guidance language in paragraph 4. In particular, the current language states that the federal funds rate is likely to remain for some time below levels that are expected to prevail in the longer run. Now, although this language is clearly accurate, at least on the basis of the SEP submissions that we put in in December, and it will be true for another year or so, I do think this language is starting to become a bit shopworn. I do believe it proved useful in the wake of the crisis, in order to convince skeptics about the Committee's lower-for-longer projected policy rate path. But now our challenge is likely going to be the opposite. That is, namely, clarifying that economic conditions will likely require a somewhat tighter path for the policy rate than is reflected in financial market expectations. So I suggest later this year that we consider dropping this particular phrase. And this will prepare us for the possibility, perhaps late this year or next year, that we may need to actually state the reverse—namely, that the federal funds rate is likely to move for some time above levels that are expected to prevail in the longer run.

And I think the thing we want to avoid is that the language-switching happens very abruptly: we go from saying that we are going to be below normal for quite some time to then saying we are going to be above normal. So there should be at least a meeting or two, something for—

CHAIR YELLEN. We wouldn't want that to happen. [Laughter]

MR. WILLIAMS. Just trying to be provocative. [Laughter] In addition, I do think we need to refresh the language in paragraph 2 on the economic outlook—again, looking further into the future this year—which has become stale as well. I think paragraph 2 is really important for providing a clearer view of the Committee's overall outlook and the important factors that shape that outlook, including, say, for today, we would say global conditions, more accommodative

financial conditions, and things like that. I think this is really important in helping the public understand how the Committee is viewing the economic medium-term outlook and also the rationale for our policy decisions. Thank you.

CHAIR YELLEN. Thank you. President Mester.

MS. MESTER. Thank you, Madam Chair. I support alternative B in the statement as written, with the recommended amendment on inflation compensation.

The economy entered 2018 with positive momentum. Growth is expected to remain above trend, labor markets are expected to tighten further, and inflation is expected to firm and gradually move back to 2 percent over the next one to two years. Financial conditions remain accommodative. In this context, a gradual upward path in the funds rate continues to be appropriate, and I view it as the best strategy for sustaining the expansion and balancing the risks to achievement of our dual-mandate goals. The actual path of the funds rate will depend on how the economy evolves. I don't think we are behind the curve yet, but I think pausing today to assess how the economy is evolving relative to our outlook, including collecting more information on how firms and consumers are reacting to the tax package, is sensible.

At the same time, there are more salient upside risks to the forecast than we have seen in some time. I think we need to be prepared to act more quickly should some of the upside risks be realized. The question is, how to do that without causing an oversteepening of policy rate path expectations. The idea that the Committee can move the funds rate by 50 basis points at a given meeting or make a move at a non-press-conference meeting needs to be better socialized. The opportunity may come in the next press conference, especially if the median policy rate path in the next SEP round steepens. Taking into account my outlook and the risks to the outlook, my

expectation is that if economic conditions evolve as expected, then it will be appropriate to increase the funds rate in March.

So, in my view, the goal of today's statement is to give the Committee the flexibility to do so, and to keep market expectations in alignment. I believe alternative B does that. Compared with our last statement, alternative B is, appropriately, more positive about the real economy and perhaps a bit more positive about the inflation outlook. It indicates that the Committee expects that further gradual increases, rather than gradual increases, in rates will likely be warranted. The Tealbook indicates that this will signal that the Committee sees a higher rate path or steeper path or both as likely. I'm not convinced that the words themselves actually mean anything different, but the fact that the Committee has made a change to this wording will be noticed and may very well be interpreted as the staff expects.

I take to heart what Thomas Laubach said about the challenges in our communications, and in fact my heart does long for the day that we can actually say what we mean in the statement rather than hinting. A challenge, I know. But, for today, I support both the action and language in alternative B. Thank you, Madam Chair.

CHAIR YELLEN. Thank you. President Rosengren.

MR. ROSENGREN. Thank you, Madam Chair. It's been an honor to use that term for the past four years.

CHAIR YELLEN. Thank you so much.

MR. ROSENGREN. I support option B at this meeting, but we potentially have communication challenges in the future. If the Tealbook forecast actually unfolds as predicted, I expect that we will need to tighten more than 100 basis points over the course of this year. This implies not only an increase in the March meeting, but also calls into question how much longer

we can use the word “gradual” in the statement to describe future Committee policy. The six increases assumed by the Tealbook would entail raising rates at six of the next seven meetings by 25 basis points or by 50 basis points at some meetings. In either case, it may be misleading to describe policy as “gradual,” as in both B and C alternatives, in view of how slowly we have removed accommodation to date using that phraseology.

If I combine the policy rate path embedded in the Tealbook with the Federal Reserve Bank of Boston’s inflation models, the path risks overshooting inflation, which is somewhat at odds with the balanced approach we adopted again yesterday. Such an overshooting might be appropriate if our policy framework were different—for example, if we had chosen to adopt one that provided more of a monetary policy buffer, giving us more room to react to adverse shocks. In fact, I am concerned that we have insufficient policy buffers—monetary, fiscal, and regulatory—to avoid a serious downturn when the next recession occurs, as I discussed yesterday.

To build such a monetary policy buffer by raising inflation, monetary policy tightening would indeed need to be more gradual than under the current policy framework. However, if we choose to follow such a new framework, we will need to be transparent about it, with significant public studies and communication that justify why a monetary policy buffer is needed when demographic and productivity trends imply low equilibrium interest rates. In the current framework, I remain concerned that a too gradual removal of accommodation will risk bringing an end to the recovery one way or the other. Thank you, Madam Chair.

CHAIR YELLEN. Thank you. President Bullard.

MR. BULLARD. Thank you, Madam Chair. Let me join with all my colleagues in congratulating you in your tenure as Chair of the FOMC. I first met Janet at a conference at

Stanford University in 1994. It was a Saturday, as I recall, a beautiful day. The conference was rather sparsely attended, and I recall turning around, and there was Janet Yellen and George Akerlof. And I remember thinking, why is this nice couple spending their entire Saturday sitting through all of these paper presentations? But I later learned that it was their idea of an enjoyable day. [Laughter]

After I joined the FOMC in 2008, the crisis was on. I distinctly remember a specific intervention by Janet during this period when she was sitting over here, not over there. She was trying to get the Committee to avoid thinking narrowly about what was happening, and she made the all-hands-on-deck intervention at this meeting, which I think was one of the most effective interventions that I heard in the last 10 years during which we've served together.

CHAIR YELLEN. Thank you.

MR. BULLARD. Janet can be funny and playful. In 2010, I became an advocate for QE2 as a way to defend the then-implicit 2 percent inflation target from the low side. And I remember being at a Conference of Presidents meeting during this period and hanging out with some of the more “hawkish” members of the Committee, probably Plosser and Lacker, and Janet happened to be standing with some of the more dovish members of the Committee. And she started kidding me that I had become a dove and that I should join their group. What was memorable about it was that she actually grabbed my arm and started pulling me over to the group. [Laughter] She pulled very, very hard, and I had to really dig in my heels. [Laughter]

I did just want to mention that, as Chair, Janet has so much background and experience with the Fed that she's just been excellent as a Chair and has handled many situations brilliantly. And I just wanted to put on the record one of those that just happened in the past year, which is the wind-down of the balance sheet. I think it was a very sensitive issue for the Committee—a

lot of different ideas about what might happen, fraught with danger in financial markets, but it was classic Janet Yellen. I think she, first, decided that we needed to do something, then we had a lot of discussions here at the Committee, we put together a plan, and we announced it in June. That whole process really only took six months, but it was a deliberative process, and it was a way to communicate to markets and has worked out very well. That was something that could have gone very differently had we had less organized leadership, I think, than what we had on that. So, Janet, congratulations, and thank you for your service to the FOMC and to the nation.

CHAIR YELLEN. Thank you so much, Jim. I really appreciate that.

MR. BULLARD. So for today's policy choice, I am going to line up with John here and say I support option B. But I do have a few comments.

CHAIR YELLEN. Just a few changes. [Laughter]

MR. BULLARD. I do support the TIPS language in option B. I do think we should acknowledge that they have moved up. They are not at levels quite that are, I think, consistent with our 2 percent inflation target on a PCE basis. So I think we should include the blue phrase in paragraph 1.

And then, in paragraph 4, I would oppose adding the word "further." I think the "further" language is going to be taken as quite "hawkish" in this situation. Bonds are selling off as we speak, and this word addition here, I think, is going to line up Wall Street on a four-rate-hike world for 2018, and I just don't think it's necessary to commit to that at this point. We want to keep our options open and see what happens. I think the perception is already that the Committee is becoming a lot more "hawkish" and is thinking about a steeper pace of increase. I don't think we need to fan the flames here by including this word.

I continue to think, along with President Williams, that we do need to fix paragraph 4, especially the phrase “federal funds rate is likely to remain for some time below the levels expected to prevail in the longer run.” My preferred approach is actually to take this whole sentence out, which is what option A does, because I think we’re beyond the point at which we’re coming off the zero bound and moving up. We’re more in a normal phase in which we might move the interest rate around in various ways, depending on what happens. So I don’t think we need this kind of guidance in the statement any more, and I think we do need to do something about it.

I also think it’s time to get going on the press-conference issue. That’s limiting our ability to move. I think the Committee will now need to be more nimble and need to have more options open, depending on what happens with the economy. I see an approach in which every meeting is, ex ante, identical as being the more normal mode of behavior for the Committee. It allows the Committee to make intertemporal tradeoffs. We might not do something at one meeting, but we might do it at the next meeting, depending on how developments come about.

I think that’s often how decisions have been made here in the past. And I think, if we can make every meeting look exactly the same, then we will be able to move closer to making the right decision at the right time. I think in the past few years, we have been in situations in which we basically penciled in moves, and then in the run-up to the meeting, the data might not have been cooperating quite the way we anticipated, and then we felt like we had to go ahead anyway because that was our opportunity to do it. So I am hopeful that we can move in that direction and go to a press-conference-at-every-meeting mode, which is what other central banks do around the world. Thank you, Madam Chair.

CHAIR YELLEN. Thank you. Governor Brainard.

MS. BRAINARD. Thank you, Madam Chair. The disconnect between the signals we have received of continued strengthening in the labor market and the step-down in inflation after many years of below-target performance has posed a conundrum for policy over the past few quarters. But the addition of sizable and front-loaded fiscal stimulus at a time of full employment, synchronized global growth, and a weakening dollar gives me greater confidence in the outlook for inflation.

While the incoming data suggest the economy has been growing strongly and the recently enacted tax cuts should impart still further stimulus, the strength on the real side isn't reflected yet in prior inflation. Core PCE inflation moved down and was only 1½ percent in 2017. Moreover, as the data this morning again show, there has been little upward movement in wage gains over the past year or so, and survey measures of inflation expectations remain subdued. On balance, for those reasons, I think it's appropriate to hold rates steady at this meeting, as in alternative B.

Measures of inflation compensation have moved up in the intermeeting period, which is very welcome. Nonetheless, it wouldn't be my preference to add the bracketed language noting that upward movement in inflation compensation. That is just inconsistent with the approach we adopted earlier, in 2017, when we did not move or comment as inflation compensation moved down by more, and the downward movement was sustained for many months. We never acknowledged the downward movement, and the recent movements in inflation compensation, while welcome, only partially retrace the downward movement we saw in 2017.

Now, why does that matter? I worry that it may be part of a broader pattern in which we tend to be a bit asymmetric in taking on board data developments—particularly inflation, for which we tend to take note of developments that confirm our biases, but we're slower to take on

board developments that move in the other direction. So although I will be comfortable going along with the Committee, I do think we need to be attentive to that inadvertent bias. I'm guessing that if we count the number of times we used the word "transitory" in the minutes to discuss the downward surprise in inflation last year, it would greatly exceed any discussion of the transitory nature of the upward surprise in inflation in 2016, even though the staff's decomposition suggests that transitory upward movement was actually much larger. This matters for the reasons we discussed yesterday. Insofar as inflation expectations matter importantly in determining underlying trend inflation, we'd want to be careful about any possibly inadvertent biases and regarding what data developments we choose to acknowledge might communicate about the priority that we place on addressing the inflation undershoot.

I don't think we actually need to comment on inflation compensation. The language on the future rate path signals clearly the upside risk to the rate path. The change in language to emphasize that we now expect further gradual increases in the federal funds rate, not just once but twice in both paragraphs 2 and 4, is significant and will be noted. And, indeed, as we look to coming quarters, the risks seem tilted to the upside. Growth in private final domestic demand looks likely to remain robust. The sizable fiscal stimulus totaling 1½ percentage points of GDP will likely give the economy a further boost. Global growth looks likely to remain a tailwind, and financial conditions are exceptionally supportive.

As I noted yesterday, the conjunctural mix today in many respects is the mirror image of what we encountered in 2015 and '16. In that earlier period, anemic global demand and downside surprises, together with a soaring dollar, a sharp downward movement in oil prices, and waning fiscal support posed strong headwinds that sapped the momentum of the recovery. Today, with global conditions and considerable fiscal stimulus generating tailwinds, the reverse

could hold true. Just as, in the earlier period, the combined headwinds conspired to slow and soften the policy rate path in relation to the rate projections in the SEP, the tailwinds likely to prevail over coming quarters may pose upside risks to the SEP's projected path of the policy rate.

But I'd emphasize that any such adjustment is likely to be tempered. Inflation continues to run below our target and has had a long period of underperformance. As our discussion yesterday highlighted, it can be difficult to raise the slow-moving underlying inflation trend that's been running below our objective for several years, but the anticipated boost to the economy may well present us with a chance to provide opportunistic reflation.

We have already seen the hint of such an approach with the release of the December SEP. Many observers remarked that, despite a notably stronger median outlook for the real economy, the median funds rate path was unchanged. In that regard, the December SEP certainly spoke volumes. Thus, while I certainly stand ready to adjust the path as warranted, I think it's also important to continue to emphasize our commitment to meeting our inflation objective and, in particular, to emphasize its symmetric nature.

I guess the final thing I'd say is, I have said in previous meetings that I agree with the points made by President Williams and President Bullard that the forward guidance in paragraph 4 is stale and needs to be adjusted. And I think the question is just when to do that in a way that is clear in our communications and does not create inadvertent sharp reactions. Thank you, Madam Chair.

CHAIR YELLEN. So before we go on, I'd just like to clarify the issue of what we've done in the past. Were you referring, Governor Brainard, to late 2014, when inflation compensation moved down?

MS. BRAINARD. No. I'm referring to 2017. So I think we got a boost to inflation compensation as we went into 2017, perhaps associated with expectations of fiscal stimulus. We then saw a movement down in inflation compensation in 2017—again, perhaps as market participants were taking on board a lower probability of fiscal stimulus that they had previously anticipated. And the most recent movements, I think, retrace, not quite fully, the earlier movements we saw in 2017. I think in 2017 we had a discussion and decided not to take on board or note in the statement those downward movements, and so, in that sense, this movement is over one meeting as opposed to over two or three meetings. But I do think that it's a bit asymmetric, since in effect we are getting back to where we were early in 2017.

CHAIR YELLEN. Thomas.

MR. LAUBACH. This may be perhaps a little bit driven by the fact that the Committee has typically focused on intermeeting movements, and maybe the way the decline over May to June 2017 took place was in intermeeting movements such that, overall, there was a sizable decline, but it didn't show up during one particular intermeeting period. So I can tell you that, by the measure that we are typically looking at, the largest decline occurred in the intermeeting period leading up to the June meeting, and that was on the order of about 16 basis points. And so, you know, this is arbitrary, but when we just look at what the Committee has done in the past, it typically commented on these movements when they reached 20 basis points or more over the intermeeting period. This is not hard science, but this is the precedent that seems to be established.

CHAIR YELLEN. And that is certainly what we did in 2014. In October, we said that they had "declined somewhat." In December, there was a 22 basis point fall. We said they "declined somewhat further." By January, there was a further 18 basis point fall, and we said

“have declined substantially in recent months.” As Thomas said, the largest downward move in 2017 was 16 basis points. We didn’t comment at that point. So—

MS. BRAINARD. I understand the difference between 16 and 20. It seems small to me. Two meetings—

CHAIR YELLEN. Well, we never—

MS. BRAINARD. —of movements exceeded 20. I understand there is a desire to take note of the change. I would just caution that I do worry about this movement as simply retracing the earlier downward movement that we had seen, and we’re not quite back to where we were in early 2017.

CHAIR YELLEN. Vice Chairman.

VICE CHAIRMAN DUDLEY. I think, fundamentally, rather than go into how many basis points it moved, I think the real question is, does the Committee take some signal from this? Does it make the Committee more optimistic that inflation is more likely to go back to our 2 percent objective? I think paragraph 1 is factual. We talk about things that are factually correct. But the decision to put in things that are factually correct reflects our actually having put some weight on those factually correct things, in assessing the outlook. And I think that is really the fundamental question.

Now, speaking for myself, I take a little bit of signal from the increase in inflation compensation. It makes me a little bit more optimistic that we are going to make progress toward our 2 percent objective, and so that’s why I think it’s appropriate to highlight it. But it’s not so much the 16 versus 20. It’s really more the fact that I would actually take some signal from it. And different people could—you know, it’s completely reasonable for you not to take a

signal from it, if that's how you interpret it. But that, to me—I think it can't just be mechanical. It has got to be how it actually informs our view, our outlook.

MS. BRAINARD. So I took signal from the earlier moves down in inflation compensation, which happened to occur at a time when inflation data actually surprised quite a bit to the downside, and that downside surprise persisted. But, again, we were very cautious in that period and did not acknowledge the downward movement. So I just want to make sure that we are not inadvertently signaling that we take more seriously data that move in one direction, which happens to confirm our bias, rather than the other. But, again, I am obviously going to support the consensus on this.

CHAIR YELLEN. President Evans.

MR. EVANS. Thank you, Madam Chair. I'm in favor of holding the funds rate at its current target range today. My view continues to be that we got ahead of ourselves in December, but I still see how our current range could support an increase in inflation toward 2 percent. However, to do so I would favor keeping policy on hold until June in order to assess the inflation data for the first few months of the year. If we get to our June meeting and we have more confidence and inflation is moving up substantially, then further rate increases would be warranted.

On the basis of the information in hand today, I still think that only two moves would be appropriate for 2018. But waiting until June would not preclude us from increasing the funds rate three times this year at press conferences, if that turned out to be appropriate. I continue to think that risk-management considerations warrant such a brief pause. There is no pressing need to move sooner solely on the basis of our inflation forecast, while there are heavier costs to moving prematurely if the actual data turn out to be disappointing.

I don't see the benefit of adding language like "further" in paragraphs 2 and 4 to modify future increases in funds rates. That's just my opinion. That being said, I don't really expect the additional language to have as much weight by itself on the markets as the staff analysis suggests. I guess we'll see.

I'm okay with adding the inflation compensation language. It says it has increased but is still low. I mean, that seems to be a factual statement. The issue of what the appropriate threshold for whether you include it or not is going to be a bit arbitrary, I guess, but I'm comfortable with it. Thank you, Madam Chair. I can support alternative B.

CHAIR YELLEN. Governor Quarles.

MR. QUARLES. Thank you, Madam Chair. I support alternative B as written, with the addition of the bracketed language. I completely agree with the point that was made by the Vice Chairman, which is, whether it's 16 basis points, whether it's 20 basis points, the real question is, do we think that it is significant and telling us something? And I believe that it is currently. So I think that that's the right way to express the facts in paragraph 1.

In view of recent economic performance and the size of the upward revision of the staff outlook, and at least not discouraging inflation data, I think it's important that we communicate our view that further policy tightening is on the horizon. And so the addition of the word "further" and the upgrading of the inflation outlook will send that signal. Again, with the outlook as strong as it is, I thought that some of the language in alternative C was appealing. Particularly, I think we should start giving some thought to removing the phrase "the federal funds rate is likely to remain for some time below levels that are expected to prevail," as many other members of the Committee have noted. In view of the shallowness of the federal funds rate path expected by the markets, I think it's time to start conditioning markets to the possibility

that the increase in rates could be a bit steeper than they currently seem to be expecting, but I acknowledge that the removal of that phrase could be potentially momentous and it would be best to coincide that removal with a press conference.

Another potential communication challenge that I would like to raise is one that was discussed at the very beginning of this session regarding r^* . Markets and the public seem to have taken to heart the argument that the real equilibrium interest rate is likely to be low for some time, in part because there are many compelling narratives as to why that would be so, including low productivity growth, demographics, foreign developments, and increased uncertainty. But now some of those factors are beginning to turn. Fiscal stimulus should boost equilibrium interest rates. Conditions are improving in foreign economies. Faster growth overseas should also work to push up r^* . As I mentioned yesterday, the investment drought that has afflicted the U.S. in recent years may be lifting, heightened by the impetus from expensing under the tax bill—another factor that would push up equilibrium interest rates.

And, finally, the slowdown in productivity growth, which is likely the largest factor that has been dragging down r^* , has eluded a compelling explanation. Not knowing what has held it down could make us uncertain about when and what will pick it up. The strength of recent investments should boost productivity and improve business prospects. Tight labor markets could lead to an acceleration. All in all, we should be attuned to the possibility that r^* might be on an upswing, even more so than discussed in Thomas Laubach's briefing. Thank you.

CHAIR YELLEN. Thank you. President Harker.

MR. HARKER. Thank you, Madam Chair. I can support alternative B at this meeting with the bracketed language. But, akin to the suggestion that others have made around the table,

I would be more comfortable if more of the corresponding paragraph language of alternative A substituted— particularly that one sentence that many have discussed.

Inflation has rarely been above 2 percent over the past 20 years, so I believe that we should await firm evidence that inflation is accelerating toward our target before we commit to a steeper path of the federal funds rate. The current language in alternative B can be interpreted as making a funds rate increase in March a virtual certainty. While I think a March increase is, indeed, possible, if we fail to see a noticeable firming in inflation by then, we should definitely contemplate softening our forward guidance in future statements along the lines of paragraph 4 in alternative A.

Madam Chair, I'm sorry to add to your sleepless nights with changes in the language.

[Laughter] I guess you can rest easy, because we are now Governor Powell's nightmare.

[Laughter]

CHAIR YELLEN. Happy to pass the baton.

MR. HARKER. In addition to that, I believe there is elevated uncertainty regarding the appropriate path for the policy rate, largely stemming from uncertainty over future political actions. I can easily envision outcomes calling for a steeper pace of tightening. But I can also envision outcomes that would call for a prolonged pause. Thus, we may need to adopt language that enhances future flexibility.

Now, as I mentioned yesterday, my and my staff's view on the Phillips curve leads me to have reservations regarding its value as a guide for policy. While there is some scant evidence that the Phillips curve may be lurking in the shadows, there's too much evidence that it is unreliable both empirically and theoretically. Therefore, I am uncomfortable basing my policy decisions largely on current and forecast trajectories of low and declining unemployment.

Policy appears to have been fairly accommodative for some time, yet we have not seen any meaningful acceleration in inflation. As I discussed yesterday, from a Wicksellian point of view, this may indicate that the natural rate of interest is “unnaturally” low and that we can be unusually patient in removing accommodation. Further, because of the increased political uncertainty, I see no reason to tack aggressively into windy conditions. While the anecdotes I’ve been hearing give me comfort that we are seeing growth and we are seeing movement toward our 2 percent target, I prefer to wait until anecdotes transform themselves into data. Thank you, Madam Chair.

CHAIR YELLEN. President Kaplan.

MR. KAPLAN. Thank you, Madam Chair. I support alternative B with the new language. I do believe, as I’ve said before, that the best opportunity for extending this expansion would be for this Committee to remove accommodation in a consistent and gradual manner in 2018, and for me that means starting in March. I think three increases is a good base case, but if the three is wrong, in my judgment, there may need to be a fourth. And I do think it’s critical to start in March, so we have the opportunity realistically to have that fourth increase as an option, taking into account the press conference meetings.

While we have to be cognizant regarding the shape of the yield curve, as I said yesterday, at 125 to 150 on the federal funds rate and 270-ish on the 10-year, we’ve got operating flexibility for this year, and the market might provide us with more flexibility as 2018 unfolds. In short, I think we should be moving toward a neutral stance. The question is about the neutral rate, and I’ll weigh in here also. I am a skeptic about the neutral rate moving up materially over the next few years. I do believe 2018 will be very strong, and there’s no question that there is excitement, if not euphoria, in the markets and optimism in the business community. But I am a believer, at

least, in the shape of the Tealbook forecast, meaning that 2019 growth will be slower and 2020 growth will, indeed, trail off.

The big factors that I'm concerned about are not going away. One is slowing workforce growth—we've all talked about it, due to aging. Another is productivity, and on this issue, I do believe, as I said yesterday, industry will become, has been more productive and will continue to get more productive, particularly with more cap-ex. What I'm worried about—and this is the difference between the United States and most developed countries—is our lagging level of skills and educational attainment levels. I do believe it is one factor that may help explain—despite aging demographics in other countries also, in some cases, worse than ours—why our labor participation rates lag theirs, because our skill levels and educational attainment levels also lag. And I think, while we're talking about it, we're doing it very slowly and not nearly fast enough, and we continue to fall behind.

I do also believe that there will continue to be more demand for safe assets. And then I would add a last factor—and Thomas talked about it as an unspecified factor—which is in terms of deleveraging. It is true the consumer has spent the last seven of eight years grinding down leverage, at least relative to income, and we know the financial sector has deleveraged. The only caveat is, there's another sector that has dramatically increased leverage. Yes, the business sector is more leveraged, but the government sector, while this has been going on, is dramatically more leveraged.

It feels good while we're incurring the leverage, as we are right now. I think this is part of the reason for the current euphoria. It feels good on the way up. The question I have is, what will happen in the future when we actually need to deleverage at the government level? I don't think that's going to feel so good, and that may be putting some downward pressure on

everything, and we may well face that eventuality at some point here. It's not a great combination for out-year growth, even though, again, I think 2018 will be very strong.

So, for me, I would like to see us get to neutral. For me, "neutral" probably is in the neighborhood, as I said before, of $2\frac{1}{2}$, or maybe it's $2\frac{3}{4}$ percent. I think we'll wrestle with what to do once we get there. I do agree, as we approach it, depending on what we decide—I agree with President Williams's comments about flagging that in the language. I'm just not sure exactly how much beyond that we're going to get.

So, last comment. Because I do believe the neutral rate or the terminal rate may be lower than we're historically accustomed, I am again very pleased that we're making progress in running down the balance sheet, because I think we're going need it. While the world has substantial liquidity right now, I could certainly envision a scenario in which the FOMC is going to certainly need more tools beyond the fed funds rate, and we're going to need a usable balance sheet in a world that might be experiencing, as hard as it is to imagine right now, a credit crunch, a liquidity crunch, and widening credit spreads, and I think our balance sheet will be very, very critical. Thank you, Madam Chair.

CHAIR YELLEN. Thank you. President Barkin.

MR. BARKIN. Thank you, Madam Chair. I support alternative B with the added language. The anchored nature of long-term expectations presumably derives from our credible commitment to act when the time is right. The Tealbook forecast, particularly vis-à-vis labor markets, will, I believe, call this question for us if it proves out. Due to the real possibility that it does, I agree it makes sense to modify the statement language with the aim of bringing up the public's expectation of the funds rate path. The addition of "further" to paragraphs 2 and 4 seems like a reasonable step to try to achieve that goal.

CHAIR YELLEN. Thank you. President Bostic.

MR. BOSTIC. Thank you, Madam Chair. I support the policy decision outlined in alternative B, including the additional bracketed language. However, as I noted in the economy go-round, while I accept that there is a risk that the tax reform bill will result in stronger growth and a greater decline in unemployment than in my current outlook, I'm not yet ready to incorporate that possibility fully into my forecast. The information that I've gathered over the past few weeks from businesses has remained very much more speculative than concrete. I certainly don't get the sense from contacts that we are behind the curve on rates.

In that regard, my preference would have been not to insert the word "further" in paragraphs 2 and 4. I do see the merit of it from a risk-management perspective. If there is a significant risk that we will need to raise rates faster, then it's a good idea to signal that possibility. I just think we may be a bit premature in needing to do so. To be clear: This is a concern, not an objection.

If, on the other hand, we are not being premature in our signal and do eventually need to raise rates more rapidly, I would strongly encourage using non-press conference meetings for some of this movement. Currently, it seems that nobody believes we will move rates at anything other than a press conference meeting. Like President Bullard, I don't think this is a good thing.

And I concur with President Mester. We need to retrain the public so that they understand that policy moves are an option more than four times a year. Otherwise, I think this body should seriously consider revising either our meeting schedule or the press conference frequency so that every meeting carries the same perceived weight from a policy perspective.

I'd like to close with some words to Chair Yellen. I echo my colleagues in expressing what a privilege and honor it's been to serve with you. Though we've worked together formally

for a short time, I feel like I've been under your guidance and tutelage for many years. You've offered career advice, informed my teaching—and were the subject of it—and taught me about leadership. The many adjectives you've been feted with over the past day and a half—"strong," "steady," and "collaborative" among them—are all on point. You provide an example we all would do well to emulate.

But I most want to say that what you have done is all the more remarkable in the context. As another "first," I understand the intensity of the scrutiny that you have had to work under, and yet you didn't blink, never buckled, and always showed grace as your excellence shone through. You're nothing short of amazing. Our country is so much better for your service, and it will never be the same. So I thank you, and we'll miss you. Thank you, Madam Chair.

CHAIR YELLEN. Thank you so much. That's wonderful. Thank you. President George.

MS. GEORGE. Thank you, Madam Chair. I support alternative B with the bracketed language, and I continue to support removing accommodation at a gradual pace. I do think we may be reaching a point, though, at which it would be appropriate to revisit the forward guidance associated with a gradual rate path and, as others have noted, the language in paragraph 4.

The Monetary Policy Strategies section of Tealbook A notes that the stronger outlook for economic activity over the medium term has widened the projected output gap considerably and contributed to noticeably higher funds rate prescriptions from both simple rules and optimal control policies, as well as an upward shift in the Tealbook baseline funds rate assumption. With the unemployment rate in the Tealbook now projected to bottom out a full 1½ percentage points below its estimate of the longer-run level and inflation projected to move above the longer-run

objective, the Tealbook baseline federal funds rate peaks at 5 percent in 2021, a rate well above current market pricing.

The Committee has previously emphasized headwinds as a rationale for deviating for an extended period from prescriptions of standard monetary policy rules. As those headwinds begin to shift, we should take stock of these ongoing deviations.

My own view is that at this stage in the expansion, with the Tealbook outlook showing the unemployment rate projected to reach 3.2 percent, its lowest level since 1953, our communications may need to shift from ensuring a gradual path of rate adjustments over the forecast horizon to language that gives the Committee more flexibility to respond to the outlook and its uncertainties while maintaining a long-run focus.

I'd like to close, Madam Chair, with some of my own comments and to join my colleagues in thanking you for your service to and your leadership of the Federal Reserve. I was reminded recently of the important influence that you've had in the public's confidence in this institution and its work. I met with one of our local labor union leaders last month. He pointed to a photo on his bookcase of you and him, and he offered his appreciation that the central bank would connect at the grassroots level to better understand the economy and to give voice, in his view, to thousands of workers in the region that he represents. I think that's a great tribute, both to you and this institution.

Also, yesterday, when Vice Chairman Dudley recalled your memorable analogy of a driving journey from California to New York, if my memory serves me, you made a stop in Kansas City on that symbolic trip.

CHAIR YELLEN. I did. I did, indeed. [Laughter]

MS. GEORGE. And I just want to say, whatever route you choose after your service here, I invite you and welcome you on behalf of the employees of the Kansas City Fed to make that stop again any time.

CHAIR YELLEN. Thank you, Esther. President Kashkari.

MR. KASHKARI. Thank you, Madam Chair. Let me follow my colleagues in adding my thanks. I feel extraordinarily lucky in my brief public service career to have been able to work with you, with Chairman Bernanke briefly, and with Secretary Paulson. I mean, in this country that we're in, with a lot of anger and division, it's remarkable, the leadership that you have shown.

CHAIR YELLEN. Thank you.

MR. KASHKARI. You know, we work very hard, all of us, to be nonpolitical and nonpartisan, and yet we exist in a partisan, political world. That tension falls on your shoulders more than anybody else's, and I think that you've navigated that tension brilliantly and with grace. And we're all absolutely grateful for your leadership. So thank you.

The last thing I'll say is, I hope that, in whatever you choose to do next, you will keep your voice active. I think the country will benefit to continue to hear your wise counsel on important policy matters.

CHAIR YELLEN. Thank you so much.

MR. KASHKARI. With regard to the policy decision, I support alternative A at this meeting. I think the real-side economy is looking stronger—and I'm happy about that—and the unemployment rate is low. But inflation does remain low, and expectations remain low.

I do take some signal from the recent moves, but I also took signal when they moved in the other direction. And I think that Vice Chairman Dudley and Governor Brainard can both be

correct, because I do think that we see inflation as an asymmetric risk. I think we are more concerned as a Committee about high inflation than we are about low inflation, and that's why this tension was revealed in this discussion.

The most plausible way for me to reconcile the strong real economy and the modest inflation environment is that I think that labor slack may still remain, as I mentioned yesterday, expressing itself in a low prime-age labor force participation. Because slack may remain and inflation remains below target, I think some monetary accommodation remains appropriate. The Tealbook estimates a current neutral real federal funds rate of 0.5 percent. The current federal funds rate is 1.4 percent, and core PCE is around 1.5 percent. So the real rate right now is around slightly negative 0.1 percent. Thus, by this estimation, we're currently providing about 60 basis points of accommodation, which doesn't seem excessively accommodative to me today.

Looking forward, we discussed this morning the Tealbook's Taylor rule-based federal funds rate path. And this isn't a criticism of the staff—I know they're going through a mechanical exercise—but it strikes me as very aggressive. Penciling in six increases in 2018, with the federal funds rate reaching 4.8 percent at the end of 2020—I think that this reminds me of why none of us want to be constrained to following religiously a Taylor rule-type forecast because it leads to these kinds of outcomes.

We've discussed at previous meetings, I think, that if we inverted the yield curve for four or five years, we would likely trigger a recession. All for what? To prevent the inflation rate from getting above 2.1 percent. That's just not a credible scenario.

I think that the staff's output gap forecast is too optimistic. With labor force participation where it is, I think the output gap is probably smaller than they think. And I am concerned that,

with two or three more rate increases, it is possible that we could invert the yield curve and increase the risk of recession. So we should pay close attention to that.

The last comment—I want to spend a moment talking about the various alternative policy frameworks that many members of the Committee have been speaking out about. In a low r^* environment in the proximity of the zero lower bound, I understand the intellectual rationale for these alternative frameworks. I've said previously that I don't think the public will ever support us raising our inflation target. So I view this as a somewhat academic discussion.

But I think something like a 2 percent price-level target or nominal GDP target would be maybe more palatable with the public. But I don't think these discussions are removed from our current policy stance. I think our current policy stance is actually enormously relevant to these discussions.

So we're on a path to raise the federal funds rate in a low-inflation environment. And why are we doing that? We're doing that because people are concerned about the unemployment rate getting too low, nonlinearity in the inflation process, and asset prices getting too high. Now, imagine we adopt, for example, a price-level target. We have a future recession. We're coming out of the recession, and we have a big inflation shortfall to make up. Now, imagine that inflation is above 2 percent. Aren't we going to be just as concerned about the unemployment rate getting too low, about nonlinearity in the inflation process, and about asset prices getting too high?

I think our current behavior reveals that these theoretical frameworks are not going to be credible because of the concerns that we're expressing right now in the current inflation environment. We're not comfortable using the full flexibility of a symmetric 2 percent inflation

target. I don't believe we're going to be comfortable using the added flexibility of one of these alternative frameworks. Thank you, Madam Chair.

CHAIR YELLEN. Thank you. Governor Powell.

MR. POWELL. Thank you, Madam Chair. I will support alternative B, and I'll come back to the language at the end.

Since the December meeting, expectations regarding real GDP growth have meaningfully strengthened, and the already tight labor market is likely to become even tighter. At the same time, the modest rise in inflation in recent months and the increase in breakevens since the fall have somewhat increased my confidence that inflation will move up this year. That, of course, remains to be seen, and the risk remains that inflation will continue to disappoint on the downside.

But the risks to inflation are now two sided. We have no recent experience with unemployment falling meaningfully below 4 percent for a sustained period. I hasten to add that low unemployment itself is not a problem. There is a lot to like about very low unemployment. The question is whether, deep into a very long expansion with buoyant sentiment, high and rising asset prices, a big tax cut, and still-accommodative monetary policy, we will begin to see some form of overheating in the economy in the form of either inflation or financial imbalances. And I would be in agreement with President Kaplan and, I think, some others in suggesting that the record shows that we are likely to see such buildups at some point.

So I continue to think that a gradual pace of rate hikes strikes a reasonable balance between avoiding an overheating economy and bringing inflation back up to 2 percent on a sustained basis. And in my view, the improved outlook could well call for a pace of hikes that is a bit faster than that implied by the median dots in December.

Coming back to the language, as I mentioned, I do think that the outlook for growth has really strengthened quite meaningfully since December, and I felt that it was important to take that into account in the statement. It does raise the possibility that the median dots will be four in March. Since I get to socialize that at the next press conference, I was eager that other forms of communication before that do some of the work of getting the market there, and I think the statement as written does a nice job of that. I'm okay with all of the language. I think the one thing that people have said that gives me a little bit of pause is what Jim Bullard said at the very beginning, on "further." You know, I can live with it in, but it's worth pondering whether that—I mean, what does it mean? If it means anything, it means four. I think the market is already thinking about that and has moved, so I think I can live with that or without it. And I think the rest is fine.

In terms of when to lose the sentence in paragraph 4, I think there are two times when I would not want to do it—the first is today [laughter], and the second time I don't want to do it is in March, at the March meeting [laughter]. But the time is clearly coming, and the time will come for that sometime later this year. And I think when we get ready to do that, we should probably be dropping hints and that sort of thing.

I'll gratuitously offer a brief comment on r^* , which is just that the very sharp drop in Thomas's picture is hard for some of us to square with the thought that very long-term, slow-moving things like demographics and productivity are really responsible for it. It's easier to think about it in terms of appetite for safe assets. And I don't make the argument that we see any increase in r^* today. I guess I would just say I'm open to the thought that some of that very sharp decrease of basically 2 full percent in a year could be reversed in—even a significant

amount could be reversed. I don't see it. I'm not saying it's going to happen, but I'm open to the idea that it could.

Finally, as Neel just shared, many around the table have expressed a thought that r^* will remain low for a long time, and that will imply more time at the zero lower bound, and, therefore, it's a good time to look at our framework. I agree with that sentiment, and I think this is a good time to embark on a process of looking at that. And, you know, when we look like we're seeing a couple of good years, we have time to do this carefully and thoughtfully, so I do intend that we'll have discussions of the FOMC of our existing framework and possible changes and alternatives beginning later this year and, undoubtedly, stretching well into next year.

I would point out, as you know, we're in the early stages of a transition here at the Board and on the FOMC, with two more new Vice Chairs and several other new faces up and down the hall. So I think the timing for getting started on something like that would be around midyear when we start to fill out the new team.

For now, I would stress that I think every beginning Chair wants the message to be one of continuity, and I certainly do, at least at the beginning. So I think launching an in-depth discussion about framework without the team fully in place can be confusing and unsettling. I don't think it has been so far, but I think we all need to keep that in mind and be a little patient and proceed carefully.

It's such a fundamental change. It's just as big as or bigger than adopting the inflation target. It's going to be highly consequential, so we need, first of all, a really careful plan. We're devoting a lot of thought about that here, and we'll be in a position to come back and consult with the Committee pretty soon, I think. There's also going to be a need to consult with external

constituencies, definitely including the Congress. So, again, we're devoting thought to a careful plan, and we'll want everyone's thinking on that pretty soon.

Finally, we don't know what the outcome is going to be or that there will be, really, a decisive outcome. So I think we should remain cautious in our messaging, which I think has been fine so far. I think we should highlight that the current framework is working well, the economy is strong and growing, and, in evaluating our framework, we're just making sure that we've got the tools to fulfill our mandate in all states of the world. So that's what I had to say on that. Thank you, Madam Chair.

CHAIR YELLEN. Thank you. Vice Chairman.

VICE CHAIRMAN DUDLEY. Thank you, Madam Chair. I support alternative B as amended with the bracketed language. I think it's important to signal that our reading of the economy is a bit more upbeat on growth, and that we're becoming somewhat less worried about the prospect for inflation persistently undershooting our 2 percent objective.

I think the statement does this. Paragraph 1 upgrades the assessment of consumption and business fixed investment, and it acknowledges the increase in inflation compensation. I actually favor the insertion of the word "further" in paragraphs 2 and 4 because I think it reinforces the message that more monetary policy tightening lies ahead. It may not change, necessarily, the median, but I think we're more confident that we're going to be having to raise rates in the year ahead. Paragraph 2, I think, notes that inflation is expected to move up this year, which I think will be taken as a signal that we are a bit more optimistic about making progress to our inflation objective.

So, taking all of these changes together, I hope this will be taken as the Committee being even more inclined to tighten monetary policy in 2018 and hinting at the possibility that maybe

four 25 basis point rate hikes in 2018 are possible, rather than the three hikes that we signaled in our Summary of Economic Projections.

I'm going to switch gears and just want to flag one issue that may be pretty relevant to us before our March FOMC meeting, and that's the debt limit. You know, most observers expect that the Treasury will exhaust its cash balance and extraordinary measures sometime during the first two weeks of March. There's a lot of uncertainty about the precise timing because tax refunds are quite large and variable this time of year. So that could move around a lot. But probably before the next FOMC meeting, it could be a really substantive issue.

Now, obviously, I hope that this follows the normal course, that we have the fire drill and the fire drill is resolved in time, cooler heads prevail, and the debt limit gets raised substantially in a timely way. But with the polarization in politics that I see today, I actually am a little bit more worried about this than I have been in the past—that there would just be a risk of a miscalculation or a mistake, or the legislation won't arrive on time to prevent a disruption of the nation's ability to meet its obligations, which I view as terribly damaging. And I think we'd really need to, as a Committee, just be very consistent in that message that this is not something to mess around with. Regardless of what actually ultimately occurs, this is going to require quite a bit of attention within the Federal Reserve System over the next few weeks just to make sure that we're able to cope with any eventuality.

Finally, some further closing remarks about our Chair. Yesterday evening, we had a chance to honor you, Janet, and recognize your commitment to the Federal Reserve and to the country and your achievements at the Fed. I think it's a view broadly shared that, in the modern era of the Federal Reserve, you have a record that is unrivaled not only in terms of both duration and endurance, but also in terms of, which is more important, success.

Starting as a member of the Board of Governors in the mid-1990s, you made a compelling intellectual case for a price-stability target with inflation above zero. I went back recently and read the July 1996 FOMC transcript. I was struck by two things: first, not only by how easily you held your own—you were the least-tenured Governor at the FOMC that day—but, second, also by how much weight your comments carried that day in both influencing and foreshadowing how the FOMC's thinking on inflation and price stability would evolve over time. You showed great foresight in your comments that day, recognizing even back in 1996 the dangers of too-low inflation and the risks of being pinned at the zero lower bound for interest rates.

You know, after you went away to the Council of Economic Advisers after that too-short time here and then went back to University of California, Berkeley, you came back as the president of the Federal Reserve Bank of San Francisco in 2004. In that role, you provided very strong support for the aggressive policy response that we had during the financial crisis. When I joined the Federal Reserve in 2007, I was really pleased to see where I got to sit at the FOMC table. I was sitting right where Simon is sitting, right next to where you were sitting as president of the San Francisco Fed. That was a good place to start—to have someone who had a lot more experience than I did whom I could learn from.

In 2010, you became Vice Chair of the Federal Reserve Board. I was very pleased about that because it meant we were going to be able to work even more closely together. You certainly had big shoes to fill with Don Kohn's retirement, but you obviously did so very ably. It was really gratifying for me to have the chance to work with Ben Bernanke and you as we dealt with some pretty interesting problems during that time—the constraint of the zero lower bound, innovating with forward guidance, and successive rounds of quantitative easing.

Finally, in 2014, you succeeded Ben as Chair. I think everyone accepts that you have consistently shown not just disciplined leadership, but also creative leadership, and that's a very unusual combination. You've reached out to others on the FOMC, which I think forged a strong consensus. This is really a very united Committee, in my opinion, and I think you contributed greatly to that.

Most important, you've gotten us very, very close to our dual-mandate objectives. It's not a bad time to take a well-deserved bow and to move on to your next endeavor—one, I hope, in which there'll be a little bit less pressure, one in which you'll have room to speak a little bit more freely, and one in which you won't have to "prep" for quarterly press conferences or listen to people around this table telling you that you need to do press conferences at every meeting. [Laughter] Those suggestions now go to Governor Powell. Thank you, Madam Chair.

CHAIR YELLEN. Well, I want to thank everyone for your wonderful comments. I can't tell you how much they mean to me. As I said last night, it has been an incredible honor and a privilege to serve the Federal Reserve in so many different capacities over such a long time, particularly as Chair. And this is a wonderful group. I have thoroughly enjoyed interacting with all of you and with our terrific staff, and it has been an incredible honor and privilege.

I know the current state of the economy is good. Nevertheless, as the policy discussion indicates, life is not going to be simple. And Jay is going to have his share of challenges, as all of you will, in managing things. But I have great confidence that this group will make wise choices as you go forward, and I will be looking carefully from the outside. So thank you all.

Okay. Back to policy. I have heard considerable support during the go-round for alt-B as written, with the change proposed. But before I put that forward, let me say that that's sort of the

default for what I'll put forward as a vote. But I do want to consider the changes that have been proposed to see if there is broader support for them.

So I guess, starting with the simpler one about the measures of inflation compensation that Governor Brainard mentioned, I think my own preference would be to include it—and, I suppose, not just for mechanical reasons, but also because I do think it's indicative of a stronger outlook. But I recognize that it's not something that's necessary to do, and I guess I would like to see, are there other people who share Governor Brainard's concerns and would feel more comfortable leaving that language out? Please let me—

MR. KASHKARI. I don't feel strongly. I mean, I have a slight preference to leave it out, because I do think it signals we have slightly biased concerns on inflation. But I don't have a strong view.

CHAIR YELLEN. Okay. Yes.

MR. BULLARD. Yes, I mean, I think it's feeding into the “hawkishness” of this statement, and I am a little concerned that we're going to be overly “hawky” here, with both the “further” in there and flagging rising inflation compensation. So I can live with it either way, but my preference would be to do something to tone this down just a little bit.

CHAIR YELLEN. Okay. So let's discuss that larger issue, which also pertains to the second suggestion, President Bullard—that you suggested removing “further.”

Now, you mentioned removing “further” in paragraph 4. There are actually two “further's” here, one of which is in paragraph 2. In both places in which the language about gradual adjustments or gradual increases in the federal funds rate is referred to, we added the term “further.” And, as Governor Powell indicated, there is an intention here to be slightly “hawkier.” So that's not an accident. That is by design, in that the data have been a lot stronger.

I suppose, although nothing obviously is set in stone, there's going to be a pretty strong inclination in the Committee to increase the funds rate in March.

The minutes, if you have listened to the discussion around the table, are likely to signal greater concern with upside risks, and perhaps there'll be further changes in the statement in March and perhaps an upward shift in the SEP rate path. Rather than have things look as though there was a discontinuous change—you know, “I left, and you've got a new sheriff in town who has a much “hawkier” stance”—we're trying to provide some continuity. So I think some slightly “hawky” shift here is appropriate. But, nevertheless, I want to make sure that we do have this right, and that the Committee is comfortable with what you have here.

I suppose one possibility would be to use “further” in paragraph 2 and to omit it from paragraph 4. I mean, there was a reason to include it in both places, and it does seem to be the case that we have seen a big upward shift in Treasury yields and concern in the market. I mean, I think we should think about whether we might be projecting too “hawky” a stance. But, you know, I do think that it's appropriate to have a somewhat “hawkier” statement, and that it does reflect the underlying reality of the forecast and likely path of monetary policy. So I would appreciate your comments as to whether you think we should just stick with what we have or make an adjustment. Vice Chairman.

VICE CHAIRMAN DUDLEY. I completely agree with how you stated it—that, I think, it's really important that the Committee be perceived as having a very smooth transition from one Chair to the other. What I worried about going into this meeting was, we would have a statement that was very bland, and then the March meeting would arrive, potentially with four rate hikes as our SEP median—we don't know, but potentially—and that could have been viewed as a pretty big lurch in policy. Then there would be press reports about how, “Oh, the

Powell Fed is very different from the Yellen Fed”—which I don’t think is actually true in terms of how we’re going to evolve. So I think it’s really important not to send a misleading message to the market as we go through the transition.

You know, the Committee is, I think, pretty united. I think we’re arguing about, really, timing of rate hikes as opposed to what direction we’re sort of going in. So I think it’s really important that this be a little bit “hawkier.” Let’s say that the data come out weak over the next six weeks. Then we dial it back in March, we’ll be able to dial it back in the SEP, and, you know, no harm done.

So if you think about the risk–reward here, if we could make this a little hawkier and then dial it back in March, it seems the damage is much less than the other way around—that we’re very, very, you know, not hawkier now, and then there’s a big change in March. I think that would not be helpful for the transition.

CHAIR YELLEN. President Bullard.

MR. BULLARD. Thank you, Madam Chair. Let me just try to make my case here. I think the market is already doing our work for us. They’re already perceiving the Committee as shifting in the “hawkish” direction. There is a bond selloff going on already. I’m just saying you don’t really need to feed into that in this situation.

Also, if you say the Committee is “hawkier” today and then Jay comes on board and the perception is, because of nominations and other things, that the Committee is even “hawkier,” then you’re kind of doubling up on, you know, the transition. So it was another way to read this, which is: No one is expecting anything out of this statement. We don’t have to do anything. The markets is already doing the adjustment for us. So just leave it alone, and I don’t think we need to feed into that.

VICE CHAIRMAN DUDLEY. I don't think that's really accurate, Jim. I think the market is actually expecting us to make some adjustments to the statement. I don't know if—
Simon, do you want to address that?

MR. POTTER. They are expecting some changes. The inflation comp is one of the ones that they've noticed. They tend to look at a slightly different measure from what we look at.

MR. BULLARD. But we would be doing that. We just wouldn't be hinting that we're going to four.

MR. POTTER. The other thing that's happened in the past week after we did our survey is, if you read some of the reports, they are looking at the balance of risks, and we see some people thinking that that would change. That's consistent with the discussion you've had over the past two days of what's happened with the outlook and the global growth picture, and that's just firming up. So I wouldn't call it a bond selloff—I'd call it more of an adjustment to what might be a steeper rate path.

MR. POWELL. Simon, how do you see the word "further" in this context, in terms of what the market's thinking and how they'd react to that?

MR. POTTER. It's either the most obvious word you could add, or they can think it actually means something. And our experience in trying to predict how they're going to read things—we're, at best, 50 percent accurate. So I think there are some options—

MR. POWELL. So you're saying it's either a big deal or it's not. [Laughter]

MR. POTTER. No, no. I don't think it can really be that big a deal, because everyone expects two to three rate increases already. So, saying you're going to do what you've already said you're going to do is not a big deal. Then they're going to say, "Well, why did they bother

saying that?” And then you do all of this stuff. “Well, the Fed doesn’t like to change the statement too much. Maybe they’re trying to hint.”

So that’s one version. That could steepen things. Or they could just say, “This is the Fed trying to do things, but we don’t really believe them.” We have seen that. When we put things that we think are “hawky” in the statement, sometimes they don’t have any effect whatsoever.

CHAIR YELLEN. Governor Quarles, were you going to—

MR. QUARLES. Yes, just to add, I think it’s actually a very good balance, Both from the point of view of communicating continuity and, as President Bostic had said, from the point of view of risk management. It will be easier and less confusing communication in the event that this would be dialed back in March. I mean, the press wants to write the story “Change at the Federal Reserve,” so if we give them the opportunity to write that story, they will do it. I don’t think that that is what’s happening, and it would certainly be not what we want to communicate with this. This statement, the way it’s crafted, communicates the message that there will be continuity as we go forward. And if it has to be dialed back, then that is a different communication, one that’s opposed to the story they want to write. We’re pushing against that story. I think it’s very wise.

MS. BRAINARD. Could I just ask a question?

CHAIR YELLEN. Sure.

MS. BRAINARD. As our incoming Chairman thinks about this language becoming evergreen, are you then contemplating that you’ll just keep the “further’s” in future? And is that a better mechanism than, for instance, going back to language that looks at the balance of risks, which would be the more customary way of doing it—to simply say “near-term risks to the economic outlook appear tilted to the upside,” which would be a more traditional approach? I’m

just wondering how, a meeting from now, you're going to think about the two "furthers" relative to that kind of language.

VICE CHAIRMAN DUDLEY. If I could just interject, I think one of the issues, of course, in terms of language changes is, you've got to be careful how big the language changes are at a non-press-conference meeting, because if the market misinterprets it, it's hard to correct that, right? I am actually very sympathetic with the idea of talking about how the balance of risks has changed, but, boy, I'm not sure I'd want to do it at a non-press-conference meeting.

CHAIR YELLEN. It might be something you would want to do in March.

MS. BRAINARD. So do you have in mind that the "further" language is going to—

VICE CHAIRMAN DUDLEY. I mean, my view is, that's subtle enough.

MS. BRAINARD. For today.

VICE CHAIRMAN DUDLEY. For today, yes.

MS. BRAINARD. I'm thinking—so does "further," then, just remain, and we then have the awkwardness of trying to figure out when to drop it later? That's the question I'm really asking.

VICE CHAIRMAN DUDLEY. There is always this problem of the statement language.

CHAIR YELLEN. President Kaplan.

MR. KAPLAN. My own view is, in looking at the markets, they're running in a way that is concerning, to such a degree that I think even people in the markets, you probably hear, are concerned themselves. I felt very strongly in our conversation. I feel very strongly—it's not a close call for me. I think we should keep in both "furthers."

If the market does pay attention, I think that actually may be a constructive thing. My fear is, the market won't take much from it. But I think if it did, it would be positive, and I

wouldn't want to put it off until March. March is an eternity from now in market life. I'd want to put the stake in the ground here, and I think we'd be well served by doing that. I feel that pretty strongly.

CHAIR YELLEN. Further comments? [No response] Okay. Well, hearing this discussion, I think my inclination would be to vote on alt-B with the bracketed language included and to keep the "furthers." I recognize that there is some risk in doing it, but, on balance, I think it's the preferable course. So let me ask Jim Clouse to make clear what the FOMC will vote on and read the roll.

MR. CLOUSE. Thank you, Madam Chair. The vote will be on the monetary policy statement as it appears on pages 5 and 6 of Thomas Laubach's briefing materials, with the bracketed blue language included. The vote will also encompass the directive to the Desk as it appears in the implementation note shown on pages 9 and 10 of Thomas's briefing materials.

Chair Yellen	Yes
Vice Chairman Dudley	Yes
President Barkin	Yes
President Bostic	Yes
Governor Brainard	Yes
President Mester	Yes
Governor Powell	Yes
Governor Quarles	Yes
President Williams	Yes

CHAIR YELLEN. Now we have two sets of related matters under the Board's jurisdiction: corresponding interest rates on reserves and discount rates. I first need a motion from a Board member to leave the interest rates on required and excess reserve balances unchanged at 1½ percent.

MR. POWELL. So moved.

CHAIR YELLEN. Thank you. Second?

MS. BRAINARD. Second.

CHAIR YELLEN. Without objection. Finally, I need a motion from a Board member to approve establishment of the primary credit rate at the existing rate of 2 percent and the establishment of the rates for secondary and seasonal credit under the existing formulas as specified in the staff's memo to the Board dated Friday, January 26. Do I have a motion?

MR. POWELL. So moved.

MS. BRAINARD. Second.

CHAIR YELLEN. Thank you. Without objection. Finally, let me confirm that the next meeting will be on Tuesday and Wednesday, March 20 and 21. And we have boxed sandwiches next door. I don't know if you think it's too early for lunch. I'm good for it, but [laughter]— As you wish. Thank you, everybody, and thank you for the terrific sendoff. [Extended applause] Thank you, everybody. It's really been an honor and a pleasure. Thank you for this great sendoff.

END OF MEETING