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An Update on the Outlook, Liquidity, and Resilience

Remarks by

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This is a fitting moment to take stock of economic and financial developments, following a volatile start to the year. I will begin by reviewing the outlook, then provide a brief recap of how financial market liquidity has fared, and finish by commenting on the resilience and resolvability of the large interconnected banks.<sup>1</sup>

### **Outlook for the United States**

I am heartened by the continued strong progress on employment and the resilience of American consumers, which stand out against a considerably more challenging global backdrop. I am pleased with the continued strength in the U.S. labor market, which is drawing people back into the labor force. In February, the unemployment rate was 4.9 percent--a level that is one-half its peak during the depths of the recession in 2009. Last Friday, we learned that employment growth has averaged 223,000 per month over the past 12 months. And there likely is some room to go: The prime-age employment-to-population ratio remains 1-3/4 percentage points below levels prevailing prior to the financial crisis, while a relatively large share of employees who are working part time would prefer to work full time. In addition, wage growth remains relatively slow.

Domestic activity continues to grow at a moderate pace. The pace of consumer spending, after slowing some at the end of last year, looks to have picked up in January, and auto sales remained strong in February. Over the past two years, consumption has increased at about a 3 percent pace, on average, and I expect to see growth to continue at close to this pace based on solid job and income growth--together with elevated readings on consumer confidence and the boost to household purchasing power from persistent declines in energy prices.

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<sup>1</sup> These remarks represent my own views, which do not necessarily represent those of the Federal Reserve Board or the Federal Open Market Committee.

The housing sector has also contributed steadily to growth over the past year. With housing activity well below pre-recession norms, it appears there is still scope for continued growth in construction activity.

In contrast, sectors of the economy that are sensitive to energy prices or international demand have been a drag. In response to the plunge in oil prices, investment in drilling and mining structures fell 50 percent last year, and continued reductions in the number of drilling rigs this year suggest that further declines are likely.<sup>2</sup> At the same time, firms and workers in the energy sector have experienced extreme financial difficulties and severe job losses.

Although the euro area and Japan are recovering, their demand growth remains very low, despite extraordinary monetary accommodation. In emerging market economies growth last year came in at only one-half the average rate from 2009 to 2013. Because China has accounted for one-third of the growth in world Gross Domestic Product (GDP) and trade, the recent slippage in Chinese economic growth is having an important effect globally. Even if Chinese growth does not slide further, the changing composition of its growth toward consumption and services and away from resource-intensive manufacturing and investment will pose important challenges to commodity exporters and other emerging economies, especially since China had previously accounted for upwards of one-half of global imports of many base metals.

Weak foreign demand relative to the United States has pushed down net exports and contributed to a nearly 20 percent strengthening of the real trade-weighted dollar since mid-2014. As a result, net exports subtracted a little more than 1/2 percentage point

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<sup>2</sup> Despite the drop-off in drilling investment, oil production has been surprisingly resilient, as producers have increased the productivity of established wells.

from GDP growth in 2014 and 2015, and econometric models suggest that past appreciation will lead to close to another 1 percentage point subtraction this year.<sup>3</sup>

These effects are especially prominent in the U.S. manufacturing sector, where output is sluggish, and the agricultural sector has also been hit hard by the rise in the value of the dollar. In addition, with profits at many firms adversely affected by the rise in the dollar and weak demand abroad, business fixed investment increased only 1-1/2 percent last year after contributing significantly to growth earlier in the recovery.

On balance, in recent months, financial conditions have tightened somewhat with equity prices moving lower and corporate risk spreads widening, although conditions have improved in recent weeks. In addition, progress on inflation has been slow. Prices for personal consumption expenditures (PCE) have increased 1.3 percent over the 12 months through January, well below the Federal Open Market Committee's (FOMC) 2 percent target. Reductions in energy prices are, in part, responsible for this low rate, and if energy prices stabilize, top-line inflation should move higher. Still, a stabilization in energy prices is not assured. Market participants have been repeatedly surprised by the depth and persistence of oil price declines: Both spot and far futures oil prices, for example, have fallen in five out of the past six quarters since mid-2014.

But even after discounting the influence of energy prices, core PCE inflation has been stubbornly stuck in the vicinity of 1-1/4 to 1-1/2 percent since 2012.<sup>4</sup> Most

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<sup>3</sup> See Gruber, McCallum, and Vigfusson (2016).

<sup>4</sup> Core consumer price index (CPI) inflation has been 1/2 percentage point higher than core PCE inflation over the 12 months through January. Over the past 15 years, core CPI inflation has averaged about 1/4 percentage point more than core PCE inflation. Much of the recent larger gap is due to differences in the coverage of health-care services and to differences in the weight accorded to housing services and health-care services. The CPI only covers out-of-pocket expenditures for health-care services, while the PCE index covers a much broader range of spending. Expenditures on housing are a larger share of the CPI than of the PCE index, and prices for housing services have increased at an above-average pace recently.

recently, the dollar has played an important role in holding down non-oil import prices, which fell 3-1/2 percent last year and subtracted an estimated 1/2 percentage point from core inflation.<sup>5</sup> Should the dollar stabilize, the downward influence on inflation should dissipate. But, as with oil prices, the movement in the value of the dollar has been more persistent than markets and many observers expected, with increases in every quarter since mid-2014.

If the labor market continues to improve, higher resource utilization should also put some upward pressure on inflation going forward. However, the effect of resource utilization on inflation is estimated to be much lower today than in past decades.<sup>6</sup>

An important concern about persistently low inflation is that it can lead to a fall in longer-term inflation expectations, making it much more difficult to achieve our inflation target. For the most part, longer-term inflation expectations appear to have remained reasonably stable, though there are some concerning signs. Longer-term inflation expectations of professional forecasters and primary dealers have held quite steady in recent years at levels consistent with the FOMC's target. However, households' inflation expectations appear to have moved down somewhat recently. Five-to-10-year inflation expectations in the University of Michigan Surveys of Consumers have edged lower over the past year or two with the level in February nearly 1/2 percentage point below the 10-year average. Three-year inflation expectations in the New York Federal Reserve's Survey of Consumer Expectations have also moved steadily lower over the past two years, though the recent decline in energy prices may explain much of this drift.

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<sup>5</sup> See pp. 8-9 of the February 2016 *Monetary Policy Report* (Board of Governors, 2016).

<sup>6</sup> See Blanchard (2016); Blanchard, Cerutti, and Summers (2015); and Kiley (2015b).

Notably, market-based measures of inflation compensation based on Treasury Inflation-Protected Securities (TIPS) and nominal Treasury yields are at historically low levels. At the five-year, five-year-ahead horizon, inflation compensation is 1 percentage point lower than mid-2014 levels. Declines in swap-based measures of inflation compensation have been similar. However, these declines appear correlated with oil prices, and it is not clear to what extent these declines reflect a change in inflation expectations, changes in investor demand for TIPS versus nominal Treasury securities, or an improvement in the risk characteristics of nominal Treasury securities versus other assets.

Over the next couple of years, there are reasons to expect energy prices and the dollar to eventually stabilize, output to increase at around the moderate pace it has averaged over the recovery thus far, foreign growth to recover somewhat, the U.S. labor market to improve further, and inflation to move toward our 2 percent target. However, there are risks around this baseline forecast, the most prominent of which lie to the downside. For example, China faces risks as it navigates a sharp slowing in its goods sector, a large buildup in corporate debt, and an apparent surge in demand for foreign assets, although China possesses resources to deal with these challenges. More broadly, sources of robust demand around the globe are few, and sources of weakness relatively greater, as evidenced by persistently below target inflation in all of the major advanced economies.

### **Monetary Policy**

In today's circumstances, policy could usefully follow two simple guidelines. First, we should not take the strength in the U.S. labor market and consumption for

granted. Given weak and decelerating foreign demand, it is critical to carefully protect and preserve the progress we have made here at home through prudent adjustments to the policy path. Tighter financial conditions and softer inflation expectations may pose risks to the downside for inflation and domestic activity. From a risk-management perspective, this argues for patience as the outlook becomes clearer.<sup>7</sup>

Second, we should put a high premium on clear evidence that inflation is moving toward our 2 percent target. Inflation has persistently underperformed relative to our target. Moreover, measures of inflation compensation and some survey-based measures of inflation expectations suggest that inflation expectations may have edged lower. Given the currently weak relationship between economic slack and inflation and the persistent, depressing effects of energy price declines and exchange rate increases, we should be cautious in assessing that a tightening labor market will soon move inflation back to 2 percent. We should verify that this is, in fact, taking place. In this regard, core PCE inflation increased 1.7 percent over the 12 months ending in January, a noticeable step-up from an increase of 1.3 percent over the preceding 12 months.<sup>8</sup>

## **Liquidity**

In addition to raising uncertainty around the outlook, the recent financial market volatility has underscored the importance of ongoing attention to the resilience of market liquidity. Although it is fair to say that the recent uptick in volatility has in part reduced

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<sup>7</sup> To the extent that the neutral rate of interest--the rate that keeps output at its potential level and inflation at its target--has fallen in the United States and is low around the world, this may weigh on the policy path. See Laubach and Williams (2015), Hamilton and others (2015), Kiley (2015a), Johannsen and Mertens (2016), Del Negro and others (2015), Brainard (2015), and chapter 3 of *World Economic Outlook* (International Monetary Fund, 2014).

<sup>8</sup> Because the most recent 12-month change in core PCE prices includes several relatively large monthly increases in core PCE prices in the first part of 2015, it is possible that 12-month core PCE inflation will move lower in coming months as these relatively large monthly increases drop out of the 12-month window.

earlier concerns about prolonged low volatility and associated reach-for-yield behavior, it has placed added focus on the resilience of liquidity, particularly in markets, such as the market for corporate bonds, that may be prone to gapping between liquidity demand and supply in stressed conditions.

The Federal Reserve's surveillance of liquidity conditions in financial markets has broadened and deepened considerably since the "taper tantrum" in mid-2013 and the events of October 2014 in the Treasury market. The analysis so far suggests a few preliminary observations. While it does not appear that day-to-day liquidity has declined notably, some characteristics of liquidity provision are changing. Broadly, traditional price-based measures of liquidity such as bid-asked spreads and the price effect of a given trade size generally remain in line with pre-crisis norms in most markets. In contrast, both anecdotes from market participants and the declining size of trades in some markets suggest it may have become more expensive to conduct, and may take more time to implement, large trades.<sup>9</sup>

Moreover, there may be some deterioration in the resilience of liquidity at times of stress, along with a greater incidence of outsized intraday price movements. Relatedly, liquidity appears to be more segmented based on the characteristics of the securities being traded and the underlying structure of the markets in which they are traded. Based on granular disaggregation of the traded securities, liquidity appears little changed in secondary markets that have traditionally been highly liquid, such as on-the-run Treasury bonds and highly rated corporate bonds. By contrast, there has been some reduction in liquidity in the segments of these markets that have historically been less liquid.<sup>10</sup>

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<sup>9</sup> See Adrian, Fleming, Shachar, and Vogt (2015); and Adrian, Fleming, Vogt, and Wojtowicz (2016b).

<sup>10</sup> See Adrian, Fleming, Vogt, and Wojtowicz (2016a); and Fleming (2016).

The move toward somewhat greater segmentation of liquidity, in conjunction with ongoing electronification and acceleration of trade execution, might be contributing to increased linkages across markets. Anecdotally, it appears market participants may be using relatively more liquid instruments to hedge exposures in other less liquid market segments, perhaps unintentionally contributing to increased correlation across markets.<sup>11</sup>

From a broader financial stability perspective, the possible deterioration in the resilience of liquidity suggests a special focus on segments where price gaps are most likely to arise at times of stress between holders of relatively illiquid or thinly traded securities that want to sell and dealers with an apparently reduced willingness to take the other side of the trade, as indicated, for example, by leaner dealer inventory holdings.<sup>12</sup> Mutual funds holding relatively less liquid assets is one area of focus. Despite having share prices that move with market prices, these funds can give rise to first-mover advantages for redeeming shareholders and create the potential for destabilizing waves of redemptions and asset fire sales if liquidity buffers and other tools to manage liquidity risk prove insufficient.<sup>13</sup> In this regard, our surveillance has been closely monitoring for any signs of liquidity strains associated with the recent increases in spreads for high-yield corporate bonds, as well as for idiosyncratic events affecting particular funds in this segment, such as the events surrounding the abrupt closing of Third Avenue Management's Focused Credit Fund last December.

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<sup>11</sup> See Dobrev and Schaumburg (2016).

<sup>12</sup> See Bank for International Settlements (2016).

<sup>13</sup> In particular, research has suggested that corporate bond funds exhibit herding behavior--that is, a tendency for waves of sales or purchases of common securities across funds. This herding appears more significant for less liquid bonds, which could exacerbate the concerns noted above. See Cai and others (2015). Also, see Cetorelli, Duarte, and Eisenbach (2016) for estimates of the effects of asset fire sales.

More broadly, the regulatory agencies in the United States and the Financial Stability Board internationally have work under way focusing on possible fire-sale risk associated with the growing share of less liquid bonds held in asset management portfolios on behalf of investors who may be counting on same-day redemption when valuations fall. The recent proposal by the Securities and Exchange Commission (SEC) to ensure mutual funds have ample liquidity buffers under stressed scenarios and undertake measures to address the risk of heavy redemptions and fire sales is notable in this regard. Our surveillance will continue to undertake more granular analysis of liquidity resilience and associated risks.

Across financial markets, it is difficult to disentangle the effects on liquidity of changes in technology and market structure and changes in broker-dealer risk-management practices in the wake of the crisis on the one hand and enhanced regulation on the other. While the leverage ratio and other Dodd-Frank Act requirements likely are encouraging broker-dealers to be more rigorous about risk management in allocating balance sheet capacity to certain trading activities, the growing presence of proprietary firms using algorithmic trading in many of these markets, which predated the crisis, is also influencing trading dynamics in important ways.<sup>14</sup> The Request for Information issued by the U.S. Treasury and the recent proposals from the Commodity Futures Trading Commission and the SEC will be important in deepening our understanding. While acknowledging the role of regulation as a possible contributor, it is important to recognize that this regulation was designed to reduce the concentration of liquidity risk

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<sup>14</sup> See Adrian, Fleming, Stackman, and Vogt (2015).

on the balance sheets of the large, interconnected banking organizations that proved to be a major amplifier of financial instability at the height of the crisis.

### **Resilience and Resolvability**

This brings me to the last item on my agenda: an update on efforts to strengthen the resilience and resolvability of these systemic banking organizations. With recent and upcoming proposals, much of the new regulatory architecture will be in the process of implementation or in train. Even so, I would expect the rules and their application to continue to be strengthened and modified as financial risks evolve, just as I would expect these rules to be increasingly tailored over time to better reflect risk profiles.

As a result of the capital and liquidity regulations already in place as well as the associated stress tests, the eight most systemic U.S. banking organizations are now holding \$800 billion more in high-quality liquid assets than they were in 2011 and \$500 billion more in common equity capital than they were in 2008. These liquidity and capital buffers are designed to strengthen the going-concern resilience of systemic banking organizations during periods of market volatility and financial stress. In addition, we recently released our proposed framework for determining the application of an additional countercyclical buffer to our large banking firms and made the first determination under the rule.

On top of this, the capital surcharge we have proposed, which is designed to ensure the largest, most systemic banking organizations internalize the risk they pose to the system, is estimated to range from 1.0 to 4.5 percent of risk-weighted assets, based on 2013 data, over and above the 7 percent minimum and capital conservation buffers under

Basel III. Indeed, it appears that some institutions may have already reduced their systemic footprint in anticipation of these additional charges.

Of course, the crisis starkly illustrated that what seem like thick capital cushions in good times can become uncomfortably thin in the face of financial stress. Our Comprehensive Capital Analysis and Review (CCAR) stress-testing framework is arguably our most powerful tool for ensuring that these capital buffers remain robust to a variety of possible shocks to the trading and banking book exposures of the large, interconnected banking organizations. Therefore, as we work to fine-tune and strengthen this framework, I would hope to see the capital surcharge for systemic banking organizations integrated into CCAR to ensure robustness, even as adjustments might be made on other parameters of the framework.

Although today's greatly enhanced common equity capital requirements should materially reduce the probability that a large bank might fail in response to a severe economic downturn or financial stress, it is not enough to reduce the risks of failure. In parallel, our supervisory and regulatory efforts are raising the bar on ensuring that the large, interconnected banking organizations have in place credible plans and preparations as well as properly calibrated and positioned liquidity and loss absorbing capacity to ensure failure can take place in an orderly manner.

To that end, we have proposed a Total Loss-Absorbing Capacity rule that contains a long-term debt requirement that is critical to the feasibility of bankruptcy for the systemic banking organizations. It is a necessary counterpart to the Dodd-Frank Act requirement that large banking organizations have credible resolution plans and undertake preparations to make those plans operationally feasible. In particular it

requires the top-tier holding companies of systemic banking organizations to maintain a sufficiently large buffer of long-term debt that can be converted into equity and used to fully recapitalize their important operating subsidiaries in the event of bankruptcy. The proposed levels of long-term debt are calibrated to the specific riskiness and scale of each institution's activities, taking into account the likely shrinkage of the operations of their subsidiaries in resolution.

The requirement is designed to mitigate contagion, fire-sale, and run risks by providing comfort to depositors, short-term debt holders, and counterparties of the operating subsidiaries of the firm, since the long-term unsecured debt issued by the top-tier holding company would be structurally subordinated to the claims on the operating subsidiaries. The presence of long-term debt holders that will be bailed in ensures that taxpayer resources will not be used and should provide incentives to preserve the firm's value as it approaches insolvency, thus aligning the firm's interests with the public's broader interest in financial stability.

The Board has received many detailed comments on the proposed long-term debt rule. Some have commented on the existing stock of outstanding long-term debt with acceleration clauses that might not qualify under the rule's criteria and have proposed grandfathering as a possible solution. Others have raised questions about whether the leverage ratio or the risk-based capital framework provides the more appropriate calibration benchmark for the minimum long-term debt requirement. Comments from foreign banks have also addressed our proposal to impose internal long-term debt requirements on the U.S. intermediate holding companies of foreign banks and have asked, among other things, whether the proposed requirement should vary more

depending on the resolution strategy of the parent foreign bank. We are currently carefully reviewing these comments. One thing is clear: the long-term debt requirement is a critical component in ending too big to fail.

The long-term debt requirement together with rigorous resolution plans and operational preparedness, the capital surcharges along with the capital stress tests, and the availability of sufficient amounts of high-quality liquidity where it is most likely to be needed will all substantially decrease the risk that a large financial institution's distress could pose to the broader financial system and help ensure that no banking institution is too large and too complex to fail. They will move us closer to our goal of a safer, more responsible, and more resilient financial system.

## References

- Adrian, Tobias, Michael Fleming, Or Shachar, and Erik Vogt (2015). “Has U.S. Corporate Bond Market Liquidity Deteriorated?” Federal Reserve Bank of New York, *Liberty Street Economics* (blog), October 5, <http://libertystreeteconomics.newyorkfed.org/2015/10/has-us-corporate-bond-market-liquidity-deteriorated.html#.VthyIOY-WXE>.
- Adrian, Tobias, Michael Fleming, Daniel Stackman, and Erik Vogt (2015). “What’s Driving Dealer Balance Sheet Stagnation?” Federal Reserve Bank of New York, *Liberty Street Economics* (blog), August 21, <http://libertystreeteconomics.newyorkfed.org/2015/08/whats-driving-dealer-balance-sheet-stagnation.html#.Vthd5-Y-WXE>.
- Adrian, Tobias, Michael Fleming, Erik Vogt, and Zachary Wojtowicz (2016a), “Corporate Bond Market Liquidity Redux: More Price-Based Evidence,” Federal Reserve Bank of New York, *Liberty Street Economics* (blog), February 9, <http://libertystreeteconomics.newyorkfed.org/2016/02/corporate-bond-market-liquidity-redux-more-price-based-evidence.html#.VthxFeY-WXE>.
- (2016b), “Further Analysis of Corporate Bond Market Liquidity,” Federal Reserve Bank of New York, *Liberty Street Economics* (blog), February 10, <http://libertystreeteconomics.newyorkfed.org/2016/02/further-analysis-of-corporate-bond-market-liquidity.html#.Vthw5eY-WXE>.
- Bank for International Settlements, Committee on the Global Financial System (2016). “Fixed Income Market Liquidity,” CGFS Papers, no. 55. Basel, Switzerland: BIS, January, <https://www.bis.org/publ/cgfs55.pdf>.
- Blanchard, Olivier (2016). “The U.S. Phillips Curve: Back to the 60s?” Policy Brief PB16-1. Washington: Peterson Institute of International Economics, January, <https://www.piie.com/publications/pb/pb16-1.pdf>.
- Blanchard, Olivier, Eugenio Cerutti, and Lawrence Summers (2015). “Inflation and Activity--Two Explorations and Their Monetary Policy Implications,” NBER Working Paper Series 21726. Cambridge, Mass.: National Bureau of Economic Research, November, [www.nber.org/papers/w21726.pdf](http://www.nber.org/papers/w21726.pdf).
- Board of Governors of the Federal Reserve System (2016). *Monetary Policy Report*. Washington: Board of Governors, February, [www.federalreserve.gov/monetarypolicy/files/20160210\\_mprfullreport.pdf](http://www.federalreserve.gov/monetarypolicy/files/20160210_mprfullreport.pdf).
- Brainard, Lael (2015). “Normalizing Monetary Policy When the Neutral Interest Rate Is Low,” speech delivered at Stanford Institute for Economic Policy Research, Stanford, Calif., December 1, [www.federalreserve.gov/newsevents/speech/brainard20151201a.htm](http://www.federalreserve.gov/newsevents/speech/brainard20151201a.htm).

- Cai, Fang, Song Han, Dan Li, and Yi Li (2015). “Institutional Herding in the Corporate Bond Market,” working paper, Board of Governors of the Federal Reserve System, December, available at the Social Science Research Network, [http://papers.ssrn.com/sol3/papers.cfm?abstract\\_id=2693717](http://papers.ssrn.com/sol3/papers.cfm?abstract_id=2693717).
- Cetorelli, Nicola, Fernando Duarte, and Thomas Eisenbach (2016). “Are Asset Managers Vulnerable to Fire Sales?” Federal Reserve Bank of New York, *Liberty Street Economics* (blog), February 18, <http://libertystreeteconomics.newyorkfed.org/2016/02/are-asset-managers-vulnerable-to-fire-sales.html#.Vthxh-Y-WXE>.
- Del Negro, Marco, Marc Giannoni, Matthew Cocci, Sara Shahanaghi, and Micah Smith (2015). “Why Are Interest Rates So Low?” Federal Reserve Bank of New York, *Liberty Street Economics* (blog), May 20, [http://libertystreeteconomics.newyorkfed.org/2015/05/why-are-interest-rates-so-low.html#.VI3qUSuK\\_yE](http://libertystreeteconomics.newyorkfed.org/2015/05/why-are-interest-rates-so-low.html#.VI3qUSuK_yE).
- Dobrev, Dobrislav, and Ernst Schaumburg (2016). “High-Frequency Cross-Market Trading and Market Volatility,” Federal Reserve Bank of New York, *Liberty Street Economics* (blog), February 17, <http://libertystreeteconomics.newyorkfed.org/2016/02/high-frequency-cross-market-trading-and-market-volatility.html#.VthxuuY-WXE>.
- Fleming, Michael (2016). “Is Treasury Market Liquidity Becoming More Concentrated?” Federal Reserve Bank of New York, *Liberty Street Economics* (blog), February 11, <http://libertystreeteconomics.newyorkfed.org/2016/02/is-treasury-market-liquidity-becoming-more-concentrated.html#.VthwreY-WXE>.
- Gruber, Joseph, Andrew McCallum, and Robert Vigfusson (2016). “The Dollar in the U.S. International Transactions (USIT) Model,” IFDP Notes. Washington: Board of Governors of the Federal Reserve System, February 8, [www.federalreserve.gov/econresdata/notes/ifdp-notes/2016/the-dollar-in-the-us-international-transactions-model-20160208.html](http://www.federalreserve.gov/econresdata/notes/ifdp-notes/2016/the-dollar-in-the-us-international-transactions-model-20160208.html).
- Hamilton, James D., Ethan S. Harris, Jan Hatzius, and Kenneth D. West (2015). “The Equilibrium Real Funds Rate: Past, Present, and Future,” NBER Working Paper Series 21476. Cambridge, Mass.: National Bureau of Economic Research, August, [www.nber.org/papers/w21476.pdf](http://www.nber.org/papers/w21476.pdf).
- International Monetary Fund (2014). “Perspectives on Global Real Interest Rates,” chapter 3 in *World Economic Outlook: Recovery Strengthens, Remains Uneven*. Washington: IMF, April, pp. 81-112, <https://www.imf.org/external/pubs/ft/weo/2014/01>.
- Johannsen, Benjamin K., and Elmar Mertens (2016). “The Expected Real Interest Rate in the Long Run: Time Series Evidence with the Effective Lower Bound,” FEDS Notes. Washington: Board of Governors of the Federal Reserve System,

- February 9, [www.federalreserve.gov/econresdata/notes/feds-notes/2016/the-expected-real-interest-rate-in-the-long-run-time-series-evidence-with-the-effective-lower-bound-20160209.html](http://www.federalreserve.gov/econresdata/notes/feds-notes/2016/the-expected-real-interest-rate-in-the-long-run-time-series-evidence-with-the-effective-lower-bound-20160209.html).
- Kiley, Michael T. (2015a). “What Can the Data Tell Us about the Equilibrium Real Interest Rate?” Finance and Economics Discussion Series 2015-077. Washington: Board of Governors of the Federal Reserve System, August, <http://dx.doi.org/10.17016/FEDS.2015.077>.
- (2015b). “Low Inflation in the United States: A Summary of Recent Research,” FEDS Notes. Washington: Board of Governors of the Federal Reserve System, November 23, [www.federalreserve.gov/econresdata/notes/feds-notes/2015/low-inflation-in-the-united-states-a-summary-of-recent-research-20151123.html](http://www.federalreserve.gov/econresdata/notes/feds-notes/2015/low-inflation-in-the-united-states-a-summary-of-recent-research-20151123.html).
- Laubach, Thomas, and John C. Williams (2015). “Measuring the Natural Rate of Interest Redux,” Working Paper Series 2015-16. San Francisco: Federal Reserve Bank of San Francisco, October, [www.frbsf.org/economic-research/files/wp2015-16.pdf](http://www.frbsf.org/economic-research/files/wp2015-16.pdf).