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***“Early Observations on  
Gradual Monetary Policy Normalization”***

Eric S. Rosengren  
President & Chief Executive Officer  
Federal Reserve Bank of Boston

*Presentation to the  
Greater Boston Chamber of Commerce*

Boston, Massachusetts  
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Good morning. Thank you for the invitation to speak with you today. As we begin 2016, we should acknowledge the significant improvement we saw in the U.S. economy over the past year, which enabled policymakers to raise short-term rates in December. That good news continued with last Friday’s release of the latest employment report; the economy produced 292,000 jobs in December, and we saw an average of 284,000 jobs added per month over the past quarter. Since the unemployment *rate* remained at 5 percent, it suggests that people previously not in the labor force are entering the labor force and finding jobs. In addition, tighter

labor markets have helped reduce unemployment in some segments of the labor market that still have elevated unemployment rates.<sup>1</sup>

While the last employment report was quite strong, other news around the start of the New Year has been less positive. Stock markets in much of the world began the year on a decidedly weak note, with declines in the Chinese stock market generating particular attention. These declines have been accompanied by weak oil and commodity prices, furthering the concern that global growth has slowed significantly. In addition, estimates of growth for fourth quarter real GDP in the United States have been falling, raising the possibility that domestic growth could be slowing. While monetary policy should not overreact to short-term, temporary fluctuations in financial markets, policy makers should take seriously the potential downside risks to their economic forecasts and manage those risks as we think about the appropriate path for monetary policy.

Also, since I will be covering a lot of ground and some key charts, data, and nuances of the financial system, I would like to preview my “punch line,” so to speak:

- The economy has reached an important milestone: the central bank raised short-term rates last month, reflecting the significant progress the U.S. economy has made over the course of the last year.
- In terms of the monetary policy actions taken by the Federal Reserve in mid-December, the initial monetary policy tightening was rather uneventful. The effective federal funds rate has largely traded within the new target range. Other short-term rates in the marketplace have moved up as expected, and long-term rates were little changed.

- The future path of the federal funds rate will depend on incoming economic data, most importantly on how that incoming data affects policymakers' outlook for the economy for the next year or two. I hope the economy continues to improve, so that further normalization is appropriate. It is important, however, to carefully manage risks to the economy, including those emanating from abroad.
- Further increases in rates are in my view likely to be gradual.

Let me note that the views I will express are my own, not necessarily those of my colleagues at the Federal Reserve's Board of Governors or on the Federal Open Market Committee (FOMC).

### **The Beginning of Policy Normalization**

The national unemployment rate started 2015 at 5.7 percent, and, over the course of the year, fell to 5.0 percent. Much of this decline resulted from new job creation, with 2.65 million jobs created from January 2015 through December. This is clearly good news for the economy, and it provided the conditions necessary for the Federal Reserve to finally begin removing some of the extraordinary monetary policy accommodation that was the necessary, appropriate, and effective response to the financial crisis, recession, and painfully slow recovery.

With continued improvements in the economy, it is now appropriate for the U.S. central bank to gradually return to a more normalized monetary policy. The first step in that gradual

process was December's increase in the federal funds rate target – the first rate increase since the Great Recession.

My own assessment is that the first increase went quite smoothly. At the December meeting, the FOMC set a target range for the federal funds rate of 0.25 to 0.50 percent, up a quarter of a percent (25 basis points) from the prior range of zero to 0.25 percent. Since then, the federal funds rate has tended to trade in the market around 0.36 percent, about the middle of the new target range. In addition, financial markets did not suffer any extreme swings around the rate increase, as some observers had predicted. Short-term rates moved roughly in line with the federal funds rate, and long-term rates such as the 10-year Treasury rate remained near their levels as of the middle of December, presumably because the Fed's action was so widely anticipated. All in all, the response to the increase was quite uneventful and not much different than expected.

Despite this solid start, the extraordinarily high level of reserves in the banking system impacts the monetary policy normalization process, and will likely cause this tightening cycle to be somewhat different than previous tightening cycles. These reserves, I would point out, are the consequence of the accommodative monetary policy that was necessary after our policy rate dropped to essentially zero (or hit the zero lower bound).

Today I plan to discuss some of the key features of the current gradual normalization process, and highlight how these differ from previous practice. I think it is important to take some time to describe them today – since some of the elements are new and different; and since the mechanics of monetary policy are not especially well understood, but are deployed in the

public interest and to achieve the Fed's dual mandate from Congress (maximum employment and stable prices).

I will also discuss the outlook for the economy, particularly the lack of significant inflationary pressures in the United States and the weakness in many other parts of the world. Usually the tightening cycle is, at least in part, a reflection that inflationary pressures have already begun to build. In contrast, today, core inflation has yet to show a clear movement towards the Federal Reserve's 2 percent target, and real GDP is projected to grow only somewhat faster than potential. All this should result in a monetary policy that moves more gradually than in past tightening cycles.

### **Changes in Monetary Policy Implementation**

Monetary policy affects everyone, and for about eight years now monetary policymaking has been in quite an extraordinary period of change and innovation – of necessity, given conditions in the U.S. economy and around the world. Today I would like to walk you through some of the recent and ongoing changes in monetary policy implementation in the U.S., where, I would suggest, aggressive action led to results that have actually been more favorable than in many other industrialized countries.

**Figure 1** reflects the dramatic increase in the Federal Reserve's balance sheet that was a consequence of the central bank purchasing Treasury and mortgage-backed securities, with the aim of lowering long-term interest rates and offsetting some of the weakness brought on by the financial crisis and Great Recession. In the mechanics of central banking, we paid for these

assets by crediting banks with newly created reserves, which is how all those reserves got into the banking system.

Prior to the financial crisis, monetary policy operated by setting the target for the federal funds rate, a short-term interest rate on overnight loans between banks. It did so by adjusting the amount of money in the banking system – by adding or removing reserves through open market operations – and thus lowering or raising the rate at which banks were willing to lend and borrow in this overnight market.<sup>2</sup> For example, the Federal Reserve could increase the supply of reserves by buying privately held Treasury securities, paying for the securities with reserves and thus injecting more reserves into the banking system. Because the amount of reserves in the system was relatively modest, small purchases and sales were sufficient to alter the target (and actual) federal funds rate.

In response to the financial crisis, the Federal Reserve repeatedly lowered the federal funds rate, eventually reducing its target to effectively zero by the end of 2008. But the economy remained weak. To further stimulate the economy with the federal funds rate at the zero lower bound, it was necessary to employ different monetary policy tools.<sup>3, 4</sup>

With the intent to lower long-term interest rates, the Federal Reserve purchased Treasury securities and mortgage-backed securities. As shown in **Figure 2**, the purchase of these assets dramatically changed the Fed's balance sheet composition – from holding primarily short-term Treasury bills to holding a large quantity of mortgage-backed securities and long-term Treasury securities. As desired, this had the effect of lowering long-term rates in the marketplace – with the most direct impact on Treasury and mortgage-backed securities.

As shown in **Figure 3**, prior to the financial crisis there were relatively few excess reserves in the financial system, and the federal funds rate could be adjusted with very small changes in the Federal Reserve's balance sheet – the buying (or selling) of securities mentioned earlier. After the financial crisis, the desire to influence interest rates required purchasing large quantities of securities. And because the Federal Reserve paid for these assets with bank reserves, there was now a large quantity of excess reserves in the financial system.<sup>5</sup> This large supply of excess reserves constitutes a tremendous surplus, which would tend to keep the federal funds rate at or very near zero.

As the economy improves, however, a federal funds rate close to zero is no longer appropriate. But as I've described, the usual way of raising the federal funds rate is not available to policymakers. Simply put, no modest sale of securities will remove enough excess reserves from the system to tighten borrowing conditions in the overnight federal funds market, because of the extremely large volume of excess reserves.

So, to increase the federal funds rate this time, the Federal Reserve needs to use new tools. These new tools are essentially borrowing facilities for which we control the interest rate, rather than relying on changing the balance of reserves in the banking system to influence interest rates.

These administered rates help us create the top and bottom of the new target range for the federal funds rate. Bear with me for a moment while I describe the mechanics.

Congress gave the Federal Reserve the authorization to pay interest on reserves, effective October of 2008.<sup>6</sup> Paying interest on reserves is an important tool as the Fed works to raise rates

– because banks can receive interest on reserves held overnight with the Federal Reserve, banks will not want to lend at a rate below what they can get from holding funds with the Fed.

There is a caveat, however, worth a short digression. Non-banks do not hold funds at the Federal Reserve, and as a result, some non-banks are willing to lend overnight funds slightly below the interest rate banks get on reserves. This means that the federal funds rate has traded a bit below the interest rate on excess reserves (the IOER).<sup>7</sup> Arbitrage plays a role, however, in pulling rates in the market towards the IOER: Since banks can earn the IOER, if overnight rates fall too far below the IOER, banks can make money by buying overnight funds below the IOER and holding those funds at the Federal Reserve where they receive the IOER.<sup>8</sup>

To insure that overnight rates will remain close to IOER and maintain the bottom of the new target range for the federal funds rate, the Federal Reserve has created another facility that purchases funds from non-banks at a rate slightly below IOER, currently at a rate of 0.25 percent, in a reverse repurchase agreement transaction. Since the reverse repurchase agreement transaction is collateralized and transacted with the central bank, and thus essentially riskless, these investors should be unwilling to lend at a rate less than the reverse repurchase rate to any other borrower.

Because this option is available not only to banks, but also to money market funds and other financial institutions, this more widely available facility insures that, normally, overnight rates will trade between the rate the Fed pays on the reverse repurchase facility and the interest rate the Fed pays on excess reserves.<sup>9</sup> Again, the rate on the reverse repurchase agreements establishes the bottom of the Fed's target range for the federal funds rate.

**Figure 4** provides the interest rate paid on reserves, the overnight reverse repurchase rate, and the effective federal funds rate in the marketplace. Prior to the December FOMC meeting, the interest on reserves was set at 0.25 percent. After the December FOMC meeting, the interest on reserves was set at 0.50 percent (the upper end of the target range) and the reverse repurchase rate was set at 0.25 percent (the lower end). The effective federal funds rate has traded in between those two rates – with the exception of December 31 – with the effective federal funds rate since the December FOMC meeting generally trading in the market at 0.36 percent.

The figure shows that the effective federal funds rate has adjusted just as desired, almost exactly in the middle of the target range established by the Federal Reserve, with the only exception being that rates fell below the floor on the last day of 2015. This largely reflects firms looking to shrink their balance sheet or make their positions look less risky for end-of-year reporting. That situation aside, the policy-relevant interest rate moved as anticipated.

**Figure 5** shows the volume of Federal Reserve overnight reverse repurchase agreements. With the federal funds rate trading well above the floor on most days, the volume of reverse repurchases has been generally in line with the experience prior to raising rates. Granted, there was elevated volume for one trading day at the end of the year, as firms adjusted balance sheets with end-of-year reporting in mind. But the end of year activity was only somewhat higher than the volume experienced at recent quarter-ends.<sup>10</sup>

## The Broader Impact of the First Tightening on Interest Rates

While the short-term interest rate targeted by the Federal Reserve did act as expected since the first increase, the goal of policymakers is of course to influence the broader economy. That goal requires that our short-term interest rate changes are transmitted to a much broader array of interest rates and asset prices. It is important that other short-term rates that are available to a broader set of investors also begin the process of normalization. **Figure 6** provides several one-month rates – a commercial paper rate, the London Interbank Offered Rate (LIBOR), and the Eurodollar deposit rate. These rates increased during the month of December, likely because markets widely anticipated the Fed’s action. This indicates that rates which normally respond to short-term expected changes in the federal funds rate have responded to the first tightening, beginning the normalization process for a broader set of short-term rates in the marketplace.

Long-term rates are less directly impacted by the overnight federal funds rate. While tighter monetary policy generally increases long rates over time, other factors can significantly influence longer-term rates – things like prospects for inflation, the exchange rate, and the demand for long-term Treasury securities. Furthermore, the expectation of some tightening may already have been built into longer-term rates, which are likely to be affected by the *likely path* of rates as well as the current overnight rate. As **Figure 7** shows, longer-term rates did not respond significantly to the first tightening, likely reflecting the fact that the FOMC statement indicated strongly that the path of tightening was expected to be “only gradual.”

**Figure 8** shows that the Treasury curve remains well below that of 10 years ago, before the financial crisis. Thus while December's first increase was the beginning of normalization, rates remain well below their pre-crisis levels.

### **The Recent Policy Statement**

While long-term Treasury rates reflect a variety of influences, the Federal Reserve's earlier decision to purchase significant quantities of long-term Treasury securities is, in my view, one reason for the low long-term rates we now see. It is important to point out that in the statement announcing the first rate increase, the FOMC said that it would continue to reinvest principal payments until normalization of the federal funds rate was well underway.

The logic is to try to move short-term interest rates first, because we have greater confidence in the likely effects of such a move on the economy, and also, because we will then have the flexibility to respond if necessary to a large unexpected negative shock by reducing short-term rates.<sup>11</sup>

Reducing the size of our balance sheet would also be a form of tightening, with more impact on longer-term rates. If we were to tighten in that way, we would presumably not need to raise short-term rates as much. I am fully supportive of the strategy of focusing on short-term rates first, before allowing the balance sheet to shrink.

The FOMC statement also said that "The Committee expects that economic conditions will evolve in a manner that will warrant only gradual increases in the federal funds rate."

This gradual notion reflects our best understanding of the current economic landscape:

that the economy is growing relatively slowly for a tightening cycle, that the unemployment rate is expected to gradually hit full employment, and that inflation remains well below our 2 percent target – and will gradually approach it as labor markets improve further and other factors that are temporarily depressing inflation recede.

### **Unemployment, Inflation, and Rates: Policymakers' Forecasts**

**Figure 9** provides the unemployment rate projections through 2018 from Federal Reserve policymakers. These projections are provided in the Federal Reserve's Summary of Economic Projections (SEP) on a quarterly basis. The median forecast of Fed policymakers is for the unemployment rate to gradually drop to 4.7 percent and then remain there through 2018. The 4.7 percent unemployment rate is consistent with my own estimate of full employment.

The unemployment rate forecast carries some risks. **Figure 10** shows the path of the unemployment rate relative to the Congressional Budget Office's (CBO) estimate of full employment (the "natural rate" of long-term unemployment). You can see that it is relatively unusual to have long periods of unchanged unemployment. Rather, the unemployment rate tends to fall well below the CBO estimate of full employment during most recoveries. Similarly, once the unemployment rate begins to rise, it tends to increase well above the estimate of full employment.

An unemployment rate falling more rapidly than in the forecast could potentially call for a faster increase in the policy rate. However, such a risk should be managed within a context in which inflation has been typically lower than expected.<sup>12</sup> Indeed, one reason for moving quite

gradually on rate increases is that low rates may be necessary to achieve our inflation target over the next several years.

**Figure 11** compares the core PCE rate of inflation with the Federal Reserve's 2 percent inflation target. The core PCE inflation rate is currently 1.3 percent, and has remained below the 2 percent inflation target for most of the recovery.

The projections in **Figure 12** suggest that Fed policymakers expect to reach our inflation target by 2018. However, this path reflects only a gradual movement to the target, likely informed by the "misses" we have experienced (see **Figure 11**).

**Figure 13** shows the federal funds rate projections provided by Fed policymakers in the SEP. The median interest rate observation for each year is designated by a black diamond. **Figure 13** suggests that the median forecast is for increases in the federal funds rate that sum to roughly 1 percentage point (100 basis points) in each of the next two years. However, there are a number of participants that expect the rate to be below or above the median projection. I should note that if rates did rise at the rate of the median projection, they would rise much more gradually than during the previous recovery.

While the median forecast provides a reasonable estimate of the likely path of the federal funds rate, my own view is that such a forecast does have downside risks. These downside risks reflect continued headwinds from weakness within countries that represent many of our major trading partners, and only limited data to support the projected path of inflation to target seen in the SEP, at least to date. Further tightening will require data continuing to be strong enough that growth will be at or above potential, so that Federal Reserve policymakers can be confident that inflation will reach our 2 percent target.

## **Concluding Observations**

In summary and conclusion, the economy has reached an important milestone. The Federal Reserve raised short-term rates last month, reflecting the significant progress made by the U.S. economy. Labor markets have tightened, and there is an expectation that we will begin to see the inflation rate move towards the Federal Reserve's 2 percent target over the course of 2016.

The initial increase in short-term rates was rather uneventful. The Federal Reserve's target rate moved as expected, and the effective federal funds rate has largely traded within our band with the exception of a single day at year-end. Other short-term rates have moved as expected, and there was little change in long-term rates.

The future path of the federal funds rate will be highly dependent on our evolving outlook, which will, of course, respond to the incoming economic data. My hope is that the economy continues to improve, so that further normalization is appropriate. Further increases in rates are in my view likely to be gradual. Importantly, I will remain highly attentive to foreign economic conditions, any weakening of the domestic economic situation, and the path of U.S. inflation.

Thank you, and best wishes for a successful 2016.

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<sup>1</sup> For example, those having less than a high school diploma.

<sup>2</sup> Banks are required to hold bank reserves on transactions accounts, and banks with excess reserves would sell reserves to banks that were falling short of the reserves needed to meet their reserve requirement.

<sup>3</sup> At first, in response to the events in the fall of 2008, the Federal Reserve created liquidity programs that facilitated transactions in markets where there were no buyers, in order to unfreeze financial markets that had become essentially paralyzed.

<sup>4</sup> And although the federal funds rate target was essentially zero, other longer-term rates remained noticeably above zero.

<sup>5</sup> The Federal Reserve determines the total volume of reserves. Thus when the Federal Reserve expands its balance sheet, the banking system must hold these reserves.

<sup>6</sup> The Financial Services Regulatory Relief Act of 2006 originally authorized the Federal Reserve to begin paying interest on balances held by or on behalf of depository institutions beginning October 1, 2011. The recently Emergency Economic Stabilization Act of 2008 accelerated the effective date to October 1, 2008. See <http://www.federalreserve.gov/monetarypolicy/20081006a.htm> and <http://www.frbsf.org/education/publications/doctor-econ/2013/march/federal-reserve-interest-balances-reserves>.

<sup>7</sup> This can be explained, in part, because a number of key entities with excess funds to lend cannot by law receive interest on reserves. But there is likely a limit to how far below the IOER the federal funds rate can fall, as the incentive to park money in reserves rather than lend at the funds rate becomes large as the IOER rises significantly above the funds rate.

<sup>8</sup> Banks will not want to hold assets that don't pay at least the interest rate on reserves, but other institutions that do not hold reserves at the Federal Reserve (for example, money market funds) or do not receive interest on their reserves (for example, Fannie Mae) may lend funds at a rate somewhat below the Fed's rate of interest on reserves. Thus, the federal funds rate has traded below the rate of interest paid on reserves, because these non-bank firms are lending overnight funds at a rate slightly below the interest on reserves available to banks. If their rates fall too low, banks could always arbitrage the market by providing funds to those market participants and holding the funds as excess reserves, which would earn them the Fed's rate of interest on reserves. However, because of regulatory requirements, including capital requirements, banks will only do this arbitrage at a rate somewhat below the rate of interest on reserves. In the absence of regulation, with costless arbitrage, everyone would receive the interest on reserves as the floor at which they were willing to lend.

<sup>9</sup> The reverse repurchase agreement is, in effect, a loan to the Federal Reserve collateralized by Treasury securities, in which the Federal Reserve sells Treasury securities and agrees to buy them back the next day at a slightly higher price. The difference between the sale price and repurchase price of the securities is essentially the interest earned on the reverse repurchase agreement. It, in effect, provides a risk-free rate at which counterparties, including non-banks, can invest their funds.

<sup>10</sup> The jump at year-end looks less unusual relative to the previous quarter-end (September 30, 2015) when term reverse repurchase agreements (RRPs) are also included. Aggregate overnight and term RRP's outstanding at the end of September totaled approximately \$450 billion, only somewhat less than at year-end. Because overnight RRP's had no limits on usage, there was no demand for term reverse repurchase agreements at year-end.

<sup>11</sup> Moving short-term rates represents the tool we have had the most experience with, and as a result there can be more confidence in how it influences the economy.

<sup>12</sup> The tendency for core inflation to be lower than forecast could reflect the fact that the equilibrium unemployment rate is lower than my current estimate.