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Unconventional Monetary Policy: Lessons from the Past Three Years¹

Thank you for the kind introduction and for giving me the opportunity to address this very distinguished group in the beautiful city of Zurich. The Swiss National Bank's annual research conference has established itself as one of the world's most substantive forums for discussion of monetary policy issues. The theme selected for this year's conference, "Policy Challenges and Developments in Monetary Economics," is particularly timely and relevant. In the past three years, there has certainly been no shortage of policy challenges and developments in the field of monetary economics.

Chairman Bernanke said, "Extraordinary times call for extraordinary measures."² Well, extraordinary measures *have* been taken. In the face of severe dislocations in financial markets and deep declines in economic activity, several central banks have lowered short-term policy rates essentially to their zero lower bound. A number of central banks—including the Federal Reserve—have also used nonstandard or "unconventional" monetary policies. By that I mean efforts to influence interest rates and economic activity using tools other than the short-term policy rate.

Before the financial crisis, most everything we knew about unconventional monetary policy came from studies of Japan's Lost Decade and a few scattered episodes in the United States. Now, as a result of the events of the past three years, we have numerous examples of

¹ I would like to thank Eric Swanson, Glenn Rudebusch, and Sam Zuckerman for assistance in the preparation of these remarks.

² Bernanke (2009).

unconventional monetary policy to study. Tonight I'd like to review some of the lessons gleaned from these experiences. I also want to highlight some of the key remaining questions regarding the implementation of such policies and their effectiveness as monetary stimulus.

In my remarks, I'll focus on two of these unconventional monetary policy tools—forward policy guidance and large-scale asset purchases, or LSAPs in Fed speak. There are two reasons for this focus. First, these are the policies that the Federal Reserve and other central banks have relied on most heavily over the past three years.³ As a result, they are also the policies that we've learned the most about. And second, these policies are ongoing, and therefore likely to be the most relevant for thinking about future policy. I suppose this is an opportune time to add that my remarks represent my own views and not necessarily those of others in the Federal Reserve System.

Forward policy guidance

Prior to the crisis, the theoretical literature on the zero lower bound was virtually unanimous on one point: A central bank with the ability to credibly commit to a future path of short-term interest rates could, except in the most extreme cases, circumvent the effects of the zero lower bound.⁴ This conclusion stemmed from two insights. First, the output gap and inflation rate in standard textbook New Keynesian models are completely determined by long-term interest rates. They do not depend on the short-term rate, except to the extent that the long-term rate is equal to the expected path of future short-term rates. Second, if a central bank can credibly commit to future policy actions, it can continue to control longer-term interest rates, even when the short-term rate is at the zero lower bound. It can do so by “managing

³ Another unconventional monetary policy, analyzed by Svensson (2001), is large-scale foreign currency purchases. Indeed, the Swiss National Bank's recent exchange rate announcement can be thought of as an unconventional monetary policy action in this respect. However, there is still relatively little empirical research on the effectiveness of this approach and so I do not discuss it further here.

⁴ See, for example, Reifschneider and Williams (2000) and Eggertsson and Woodford (2003, 2006).

expectations” about the *future path* of short-term rates. Thus, in theory, forward guidance about the future path of policy is a potentially powerful tool that can almost completely solve a central bank’s problems at the zero lower bound.

However, there are reasons to be skeptical that forward guidance would be such a panacea in practice. One of these caveats is implicit in the theory itself. The optimal forward guidance policy is not time-consistent. According to the theory, for this policy to have the desired effects, the central bank must commit to two things: keeping the short-term policy rate *lower than it otherwise would* in the future, and allowing inflation to rise *higher than it otherwise would*. However, when the time comes for the central bank to fulfill this commitment, it may not want to do so. It might find it hard to resist the temptation to raise rates earlier than promised to avoid the rise in inflation.⁵ Indeed, policymakers have generally shied away from policies that promise temporarily high inflation in the future, such as price level targeting, that are in theory effective at circumventing the zero bound. This reluctance arises in part out of a concern that such an approach could unmoor inflation expectations.⁶

A second caveat to the power of forward guidance is that the public may have different expectations of the future course of the economy and monetary policy than the central bank. The expectations channel is crucial for the effectiveness of optimal forward guidance policy. If the public has an imperfect understanding of the central bank’s intended policy path, then forward guidance may not work as well as advertised.⁷ Therefore, a key challenge for forward guidance is communicating the intended policy path to the public. Complicating this communication challenge further, optimal forward guidance is inherently state-contingent and depends on myriad factors and risk assessments. These are inherently difficult to convey to the public.

⁵ See Adam and Billi (2007), who show that the effects of the zero lower bound are much larger when the central bank cannot commit to future policy actions.

⁶ Evans (2010) is an exception. See Walsh (2009) for a discussion of this issue.

⁷ See Reifschneider and Roberts (2006) and Williams (2006).

Moreover, the public and the media tend to gloss over such nuances and take away simple sound bites.

There are a number of examples of central banks using forward guidance on monetary policy. A few central banks—New Zealand, Norway, and Sweden—provide explicit forward guidance in the form of policy rate projections. Other central banks providing guidance have limited themselves to short statements indicating the direction and time frame of future policy actions, rather than full descriptions of an intended policy path.⁸ The Federal Reserve’s public use of phrases such as “considerable period,” “measured pace,” and “extended period” falls into this category. The Bank of Canada and the Bank of Japan have also used forward guidance regarding the timing of and conditions for rate increases.⁹

Let me conclude my discussion of forward guidance by summarizing the evidence of its effectiveness. Several studies have examined the effects of central bank communication more generally.¹⁰ They found that the Federal Reserve’s policy statements have significant effects on financial market expectations of future policy actions and on Treasury yields. Only a few studies have looked at the effectiveness of forward guidance policies *at the zero lower bound*. One example was the Bank of Canada’s April 2009 statement that it expected to hold the policy rate constant until the second quarter of 2010, which had an immediate effect on financial market expectations regarding short-term interest rates. The conditionality of the guidance worked as well. When the Canadian economy appeared to be recovering from the recession more quickly

⁸ Rudebusch and Williams (2008) provide a discussion of these attempts.

⁹ Bank of Canada (2009). In 1999, the Bank of Japan announced that it would continue its zero interest rate policy “until deflationary concerns are dispelled.” In 2010 it said, “The Bank will maintain the virtually zero interest rate policy until it judges, on the basis of the ‘understanding of medium- to long-term price stability’ that price stability is in sight, on condition that no problem will be identified in examining risk factors, including the accumulation of financial imbalances.”

¹⁰ See Gurkaynak, Sack, and Swanson (2005); Kohn and Sack (2004); and Bernanke, Reinhart, and Sack (2004).

than anticipated, market participants began to expect interest rates to rise ahead of the previously announced date.¹¹

Of course, we at the Fed have our own recent case study that speaks to the effectiveness of forward guidance. The Federal Open Market Committee's statement issued following our August meeting said, "The Committee currently anticipates that economic conditions—including low rates of resource utilization and a subdued outlook for inflation over the medium run—are likely to warrant exceptionally low levels for the federal funds rate at least through mid-2013." As Figure 1 shows, two-year Treasury yields fell by about 10 basis points and ten-year Treasury yields fell by about 20 basis points following the announcement. This provides prima facie evidence of the powerful effects of forward guidance at the zero bound.

Large-scale asset purchases

Let me turn now to large-scale asset purchases, or LSAPs, the main alternative to forward guidance in the unconventional monetary policy arena today. LSAPs are central bank purchases of securities funded by an increase in reserves. Their history is older than forward guidance. It goes back at least to Operation Twist, the 1961 joint initiative of the Kennedy Administration and the Federal Reserve to purchase longer-term Treasury securities. More recently, the Bank of Japan began its so-called quantitative easing policy in 2001. It ultimately resulted in Bank purchases of almost 35 trillion yen of Japanese government bonds. In March 2009, the Bank of England announced it would purchase 200 billion pounds of U.K. gilts. And the Federal Reserve carried out three rounds of large-scale asset purchases during the Great Recession. Two rounds of "QE1" took place in November 2008 and March 2009, during the financial crisis. The third round followed the "QE2" announcement in November 2010.

¹¹ See Chehal and Trehan (2009).

A number of theories consider the channels by which LSAPs affect Treasury yields and financial conditions more broadly.¹² I will highlight two: signaling and portfolio. The signaling channel works through the effects asset purchases have on public expectations of future short-term interest rates. The portfolio channel works through the effects on factors that affect yields other than expectations of future short-term interest rates.

The basic idea of the signaling channel is that, when the central bank conducts asset purchases, it is signaling its strong intention to add monetary stimulus by other means as well. Such signaling may lower longer-term yields in two ways. First, it could lower the expected future path of short-term rates. Second, it could reduce the uncertainty around this path, which may reduce the interest rate risk associated with holding longer-term securities.

The theories underlying the portfolio channel are more diverse. In part, this is because the workhorse models of asset pricing—the representative-agent consumption CAPM model and the affine arbitrage-free model—generally do not allow the supply of a security to affect its price. In those frameworks, the supply of the asset is irrelevant for asset pricing.¹³ Instead, one has to go back to older, more eclectic theories of asset pricing, such as Tobin’s “portfolio balance” model or Modigliani and Sutch’s “preferred habitat” theory. These assume that a range of heterogeneous investors have different preferences for different asset classes and that arbitrage across these asset classes is limited. This approach has been integrated into a modern, no-arbitrage, asset-pricing framework and has been used to guide empirical analysis of LSAP effects.¹⁴

¹² See Krishnamurthy and Vissing-Jorgensen (2011) for a thorough discussion.

¹³ Piazzesi and Schneider (2007) explore quantity effects in the consumption-CAPM framework, whereby changes in the relative supplies of different assets affect the household’s consumption process and optimal portfolio decision. However, this channel results in only very small effects on asset prices.

¹⁴ See Vayanos and Vila (2009) for a recent theoretical model, and Greenwood and Vayanos (2008) and Hamilton and Wu (2011) for empirical applications.

There has been a profusion of studies estimating the effects of LSAPs on asset prices. Table 1 summarizes a number of these studies. In order to facilitate comparison, the estimated effects in each analysis have been renormalized to correspond to the estimated effect on longer-term bond yields of a \$600 billion LSAP operation. That, of course, was the size of the Federal Reserve's asset purchase program completed earlier this year.

Except for a few outliers, the estimated effects on Treasury yields are remarkably close, especially when you consider the wide variety of sample periods and methods employed. Specifically, the estimated effects typically lie in the neighborhood of 15 to 20 basis points. Generally, the estimates are reasonably precise. Although some might argue that 15 to 20 basis points is small, keep in mind that the typical response of the 10-year Treasury yield to a 75 basis point cut in the federal funds rate is also about 15 to 20 basis points.¹⁵ I've never heard anyone argue that a 75 basis point cut in the funds rate is small potatoes!

Although there is general agreement regarding the magnitude of LSAP effects on Treasury yields, there is less agreement regarding the channels LSAPs work through, as discussed in the paper by Bauer and Rudebusch¹⁶ presented at this conference. One way to distinguish between the signaling and portfolio channels is to examine the responses of a variety of yields and asset prices to LSAPs. If the main effect is through signaling, then we would expect a strong co-movement among all classes of longer-term yields. In contrast, a relatively muted response of assets that are not close substitutes for Treasury securities would be evidence of a portfolio effect.

The evidence is far from conclusive, but it does tentatively support some role for the portfolio channel. First, by some measures, expected short rates fell by less than government

¹⁵ See Chung et al. (2011, p. 24).

¹⁶ Bauer and Rudebusch (2011).

securities of equivalent maturity.¹⁷ Second, there is some evidence in the literature that the pass-through from purchases of Treasury securities to private borrowing rates, such as corporate bond rates, may be relatively low.¹⁸ To the extent that this is true, it would argue against a strong signaling effect. That said, there remains a great deal of uncertainty regarding the relative importance of these channels.

Moreover, there is also uncertainty regarding how the portfolio channel actually works. In particular, to what extent is it the *size* or the *composition* of the central bank's balance sheet that matters? This question is no mere theoretical curiosity, but has very real practical relevance. For example, it is critical for gauging the efficacy of a maturity extension program that lengthens the maturity of securities holding with no change in the quantity of holdings, such as the policy announced earlier this week by the FOMC. This program contrasts with a policy that simply increases the holdings of Treasury securities, such as the Fed's second asset purchase program initiated late last year. The size-versus-composition question bears directly on the relative effectiveness of the two policy variants. In addition, the question is relevant for comparing the effects of a policy of purchasing Treasury securities with one of buying mortgage-backed securities.

Further research

As I have discussed, researchers have made great strides in improving our understanding of the effects of unconventional policies. The evidence from the experiences of the past few years convincingly demonstrates that both forward guidance and large scale asset purchases are useful policy tools when short-term interest rates are constrained by the zero bound. Despite this

¹⁷ See Gagnon et al. (2011) and Joyce et al. (2011).

¹⁸ See Swanson (2011), Krishnamurthy and Vissing-Jorgensen (2011), Joyce et al. (2011), and Wright (2011) for analysis of the effects on private rates. Neely (2011) finds strong pass-through from the Fed's LSAPs to yields on foreign sovereign debt.

progress, I see at least four important issues that are in need of further study. First, what are the effects of LSAPs on the overall economy? Specifically, does lowering Treasury yields through LSAPs have the same effect on the economy as an equivalent movement in the federal funds rate? Or, are the effects of LSAPs attenuated owing to limited pass-through to other asset prices or limited duration of LSAP effects?¹⁹

Second, what approach should central banks take in formulating and communicating unconventional policies, whether forward guidance or LSAP programs? For example, what are the advantages of targeting a specific quantity of LSAPs as opposed to targeting a level or ceiling on interest rates at a particular point on the yield curve? This question is, of course, a new take on Poole's (1970) analysis of the choice of a monetary policy instrument. And, if a quantity approach is preferable, should LSAP programs be formulated more like a policy rule rather than discrete lump-sum announcements?²⁰

Third, should unconventional policies be a regular part of our toolkit or should they be reserved only for extraordinary times? That is, should forward guidance and LSAPs complement standard short-rate policies at all times or only at the zero lower bound? These policies are still relatively unfamiliar to the public. Consequently, their effects on the public's inflation expectations, appetite for risk, and so forth are difficult to predict. This adds an element of uncertainty and raises concern about unintended consequences. In addition, LSAPs may create distortions to asset prices or financial market functioning. These negative effects have received scant attention in the research literature and are not well understood. Of course, these costs must be weighed against the value of asset purchases for macroeconomic stabilization.

Finally, how do these policies change our thinking about the optimal rate of inflation? In particular, if unconventional monetary policies can effectively circumvent the zero lower bound,

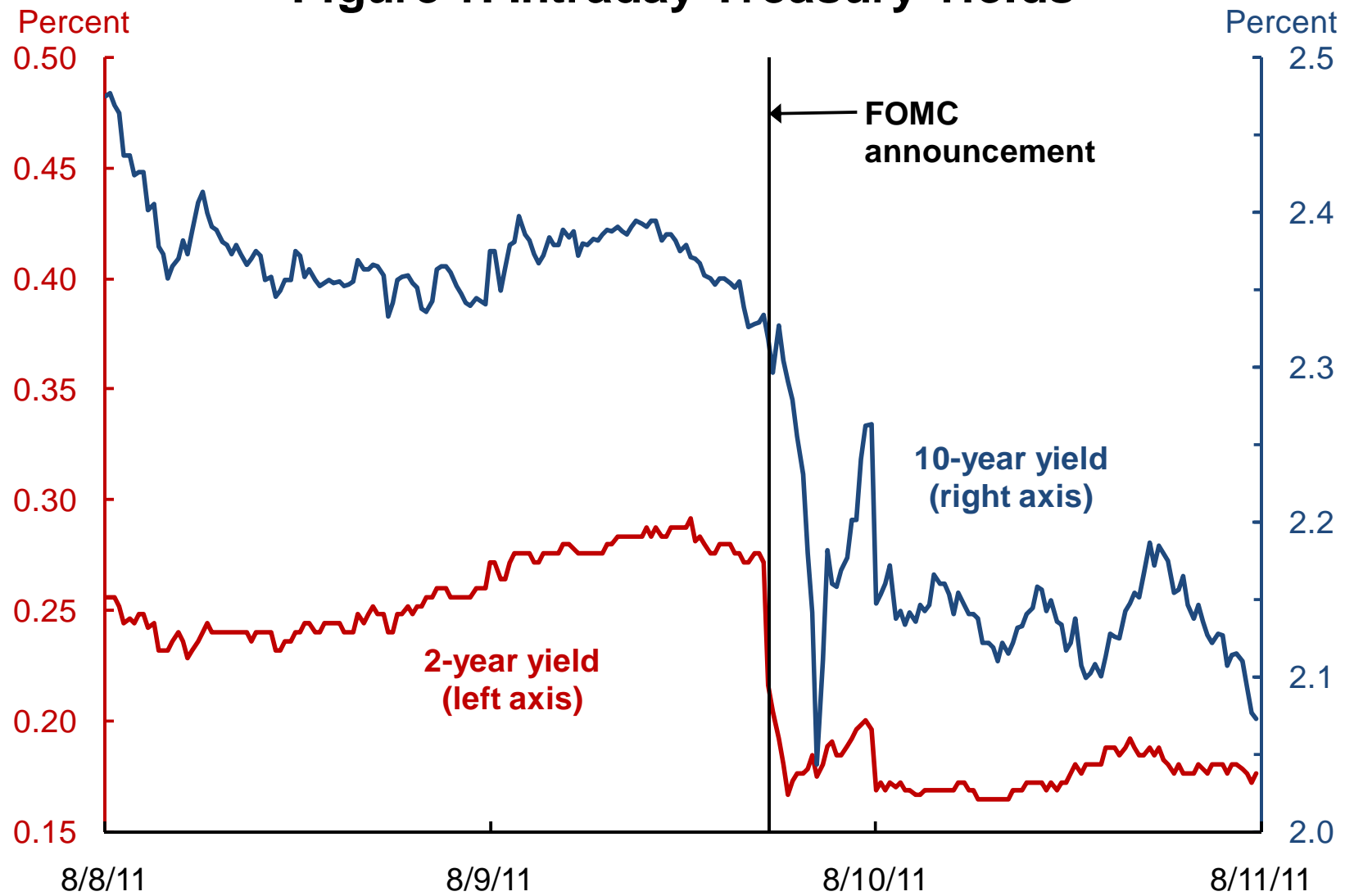
¹⁹ See Baumeister and Benati (2010) and Chung et al. (2011) for analyses of the macroeconomic effects of LSAPs. See Wright (2011) for a discussion of the duration of LSAP effects.

²⁰ See Federal Reserve Bank of St. Louis (2009).

then there is less of a need for an inflation cushion. But, if these policies cannot in practice be used as substitutes for reducing the short-term rate, then there is greater need for an inflation cushion.

These questions offer a wealth of important topics for researchers to explore. The lessons we learn from this research will be critically important when central bankers consider unconventional policies in the future. On that note, let me end with a little forward guidance: I expect we will have an extended period of policy challenges, and that developments in monetary economics will be crucial to the future success of monetary policy. Thank you very much.

Figure 1: Intraday Treasury Yields



Note: Trading data from 9:30am to 4:00p m EDT, at five-minute intervals (source: Bloomberg)

Table 1: Empirical Estimates of LSAP Effects

| Study | Sample | Method | Estimated Effect of \$600 billion LSAP (± 2 std errs if avail.) ^a |
|--|---|-------------------------------|---|
| Modigliani-Sutch (1966, 1967) | Operation Twist | time series | 0 bp (± 20 bp) |
| Bernanke-Reinhart-Sack (2004) | Japan, U.S. | event study | 400 bp (± 370 bp), 40 bp (± 60 bp) |
| Greenwood-Vayanos (2008) | postwar U.S. (pre-crisis) | time series | 14 bp (± 7 bp) |
| Krishnamurthy-Vissing-Jorgensen (2010, 2011) | postwar U.S., QE1, and QE2 | time series | 15 bp (± 5 bp) |
| Gagnon-Raskin-Remache-Sack (2011) | QE1 | event study, time series | 30 bp (± 15 bp), 18 bp (± 7 bp) |
| D'Amico-King (2010) | QE1 Treasury purchases | security-specific event study | 100 bp (± 80 bp) |
| Hamilton-Wu (2011) | QE2 | affine no-arbitrage model | 17 bp |
| Hancock-Passmore (2011) | QE1 MBS purchases | time series | depends, roughly 30 bp |
| Swanson (2011) | Operation Twist | event study | 15 bp (± 10 bp) |
| Joyce-Lasaosa-Stevens-Tong (2011) | U.K. LSAPs | event study, time series | 40 bp |
| Neely (2011) | effect of U.S. QE1 on foreign bond yields | event study | 17 bp (± 13 bp) |

^aSource: Modigliani-Sutch (1966, Sections 3-4), Bernanke-Reinhart-Sack (2004, Table 7, Figure 6, and author's calculations), Greenwood-Vayanos (2008, Table 2), Krishnamurthy-Vissing-Jorgensen (2011, Section 4), Gagnon et al. (2011, Tables 1-2), D'Amico-King (2010, Figure 3), Hamilton-Wu (2011, Figure 11), Hancock-Passmore (2011, Table 5), Swanson (2011, Table 3), Chung et al. (Figure 10), Joyce et al. (2011, Figure 9), Neely (2011, Table 2). Almost all of these estimates involve author's calculations to renormalize the effect to a \$600 billion U.S. LSAP.

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