

Notes on Issues Related to the Zero Lower Bound on Nominal Interest Rates

December 12, 2008*

* The notes included in this document were originally distributed separately on December 5th. Minor typographical corrections were made to the notes before inclusion in this document.

Table of Contents

1.	Summary	3
2.	Federal Reserve Experiences with Very Low Interest Rates: Lessons Learned	8
<i>Lessons from the Japanese Experience</i>		
3.	Overview of Japan’s Monetary Policy Responses to Deflation	27
4.	Japanese Money Markets During Periods of Low or Zero Interest Rates	40
5.	Effects of the Bank of Japan’s Communication Strategy at the Zero Lower Bound	48
6.	Implications of the Health of the Japanese Banking Sector for the Effectiveness of Monetary Policy	55
7.	Effects of the Bank of Japan’s Quantitative Easing Policy on Economic Activity	61
8.	Japanese Fiscal Policy: A Bridge to Nowhere?	67
<i>Potential Effects of Very Low Policy Rates on Financial Markets and Institutions</i>		
9.	Effects of Very Low Policy Rates on Money Market Funds	72
10.	Effects of Very Low Policy Rates on the Profitability of Commercial Banks and Other Financial Institutions	83
11.	Treasury Market Functioning and the Zero Bound	94
12.	Potential Effects of Very Low Policy Rates on Federal Funds & Other Money Markets	102
13.	The Federal Funds Target Rate and Business and Household Borrowing Rates	108
14.	Assessing Inflation Expectations and the Risk of Deflation	115
<i>Nonstandard Central Bank Policy Tools</i>		
15.	Purchases of Conventional SOMA Assets	122
16.	Purchases of Longer-Term Treasury Securities	128
17.	Purchases of Agency MBS and Debt	138
18.	Liquidity Facilities as Policy Tools at the Zero Bound	145
19.	Targeting Term Funding Conditions in U.S. Depository Institutions	151
20.	Communication and Commitment Strategies at Very Low Interest Rates	157
21.	Quantitative Analysis of Policy Alternatives Using the FRB/US Model	172

December 5, 2008

1. Summary

Brian Madigan, Steve Meyer, and Dave Reifschneider¹

Background

Over the past 16 months, the Committee has cut the federal funds rate somewhat more aggressively than estimated policy rules would have suggested. Even so, economic activity in the United States has slowed sharply in recent months. Moreover, Board staff and many private-sector forecasters now project a sizable decline in real GDP during the current quarter and in the first half 2009, followed by a period of sub-par growth with unemployment rising to or beyond 8 percent, despite substantial fiscal stimulus and a federal funds rate close to zero next year. One reason forecasters expect a protracted period of sluggish performance is that many think that conventional monetary policy will be constrained by the zero lower bound (ZLB) on nominal interest rates and so will be unable to provide enough stimulus to generate a robust recovery, perhaps for a protracted period.

The optimal-control policy simulations presented in the October Bluebook illustrate the problem. Those simulations (which took the October Greenbook forecast as their starting point) showed the funds rate dropping to zero in the near term and remaining there into 2012. Unconstrained optimal control simulations would have called for the nominal funds rate to go as much as 3 percentage points below zero for a time; our inability to make the funds rate negative means higher-than-desired unemployment and lower-than-desired inflation for several years. The consequences of recent economic and financial developments for the economic outlook have made the projected shortfall in monetary stimulus even larger.

Moreover, confidence bands around the staff forecast and optimal control simulations suggest a sizable probability of a deep and prolonged economic slump that could result in deflation. Board staff is not alone in seeing a significant risk of such a dire outcome; many private-sector forecasters think the United States faces some risk of a severe downturn and deflation, though such an outcome is not the modal forecast. And, as discussed in Note 14 in the attached package, some survey measures not only indicate that respondents expect the price level to fall in the near term as energy prices decline but also suggest that the perceived risk of longer-term deflation has increased.

Given the risk of a prolonged recession and deflation, the agenda for the December FOMC meeting includes a discussion of issues related to the zero lower bound. As background for that discussion, Board and Reserve Bank staff prepared 21 short notes that summarize current knowledge and thinking about the benefits and costs of pushing the funds rate to zero and about the potential efficacy of a variety of unconventional monetary policy tools, including quantitative easing (defined as a very

¹ Madigan and Meyer: Division of Monetary Affairs; Reifschneider: Division of Research and Statistics.

large expansion of excess reserves generated by conventional open market operations), targeted purchases of specific securities such as long-term Treasuries or agency debt and MBS, targeted lending, and communication strategies. The remainder of this note provides a high-level overview of that work, focusing on key issues that may be relevant for the discussion of which, if any, unconventional tools the Committee might want to implement or use more heavily.

The Committee last confronted ZLB issues in 2003. Having reduced the federal funds rate to 1 percent by mid-year, and judging that the risk of inflation falling below levels consistent with the dual mandate to promote maximum employment and price stability was its predominant concern, in August of 2003 the Committee communicated its intent to keep the federal funds rate at 1 percent “for a considerable period.” In 2004, as disinflationary forces appeared to diminish, the Committee first stated that it would “be patient in removing its policy accommodation” and later said it believed that policy accommodation could be “removed at a pace that is likely to be measured.” The Committee did not pursue other unconventional policies. As discussed in Note 2, FOMC communications during that period appear to have been reasonably successful in aligning the policy expectations of financial market participants with those of the FOMC itself, although some analysts argue that the Committee’s communications did not sufficiently emphasize the conditionality of its commitment to a policy path.

The current economic and financial environment differs in several key respects from the situation in 2003. First, the economy now appears to be contracting markedly, whereas a severe contraction did not appear likely in 2003. Second, the effective federal funds rate is closer to zero now. Third, the U.S. financial sector is under far greater stress now, increasing the downside risks to the economy. Fourth, the Federal Reserve already has begun to pursue nonstandard policies by creating new liquidity-providing facilities and extending credit on a much larger scale than earlier.

Summary of issues

The zero lower bound raises complicated questions for monetary policy. Many of those questions have been investigated in the voluminous research literature on the topic and in the accompanying notes. A number of key points relevant to the current situation can be drawn from that work.

Research supports accelerating rather than delaying reductions in the funds rate whenever economic activity becomes so weak that, under conventional monetary policy, the risk of hitting the zero lower bound in coming quarters becomes material.² The logic behind this strategy is that driving the funds rate quickly to zero at such times provides more up-front stimulus to real activity, thereby limiting the future fall in inflation that

² Reifschneider and Williams presented evidence on this point to the FOMC in January 2003. They considered two different policy rules—the standard Taylor rule, and a modified Taylor rule that, whenever the standard rule prescribed cutting the funds rate to 1 percent or less, immediately dropped the funds rate to zero. Based on stochastic simulations of the FRB/US model, they found that the modified rule delivered superior macroeconomic performance.

would occur otherwise. As a result, real short-term interest rates will be lower, when nominal rates are at the zero lower bound, than they would have been if policymakers had delayed cutting the nominal funds rate; lower real rates, in turn, help mitigate the weakness in real activity. This motivation for accelerated rate cuts is relevant even if current problems in financial markets diminish the stimulus from further reductions in the funds rate. As Note 13 indicates, large shares of consumer and business loans carry floating interest rates linked directly or indirectly to money market rates; interest rates on these loans likely would decline if the funds rate target were cut to zero (though perhaps not one-for-one), providing some impetus to consumer spending and business investment.

Reducing the federal funds rate to zero or nearly zero likely would degrade the functioning of certain financial markets and cause difficulties for some money market mutual funds. On the other hand, it appears that cutting the funds rate further would benefit banking institutions on average. All told, the potential costs to financial markets and institutions do not appear large enough to militate against reducing the funds rate to a very low but still positive level, say 25 basis points. As discussed in Note 11, reducing the funds rate to zero (or nearly zero) would leave T-bill yields and the Treasury general collateral repo rate at or near zero, likely generating a substantial increase in fails-to-deliver in the Treasury and Treasury repo markets.³ Persistently high fails would result in increased counterparty credit exposures, reduced liquidity, and increased volatility in the Treasury markets, making it more difficult for investors to use the Treasury markets to hedge the interest rate risk associated with positions in other fixed-income securities and reducing their willingness to take such positions. Note 9 indicates that near-zero yields on short-term Treasuries and Treasury repos would also have adverse consequences for Treasury-only and Treasury-repo money market funds. The number and size of such money market funds likely would shrink as a result, potentially reducing the availability of repo financing. In contrast, few prime money market funds would face difficulty in covering their costs while paying positive returns to their shareholders unless currently wide spreads between yields on the assets held by such funds and Treasury yields were to narrow dramatically. Note 12 indicates that trading volumes in some short-term funding markets might decline appreciably, causing traders with specialized human capital to exit those markets—a development that could create problems once the economy began to recover. However, as discussed in Note 4, Japanese experience suggests that trading in such markets rises fairly quickly once short-term rates rise above zero, although in Japan volumes have not returned to earlier levels. Econometric estimates in Note 10 suggest that cutting the funds rate toward zero potentially would increase the price of financial institutions' equity shares as it provides some macroeconomic stimulus; such estimates also suggest that FOMC communications that reduce expected future levels of the funds rate also would have a positive effect on banking institutions. On balance, the macroeconomic consequences of any disruption to

³ Market participants have identified relatively straightforward changes in institutional arrangements and trading practices in the Treasury and Treasury repo markets that would prevent or mitigate a substantial increase in fails, but these changes are unlikely to be implemented before mid-2009, and perhaps not until 2010, because they require coordinated changes in complex back-office systems. Alternatively, problems associated with high fails could be avoided if the Treasury were to receive statutory authority to create and lend new Treasury securities.

market functioning seem likely to be modest. Moreover, some of the disruption to financial markets could be mitigated by changes to market practice. Nevertheless, the likelihood of some market disruption means that the net benefit of pushing the effective federal funds rate all the way down to zero is open to question—although staff analysis suggests that cutting it to 25 basis points would not be unreasonable.

Research suggests that central bank communications can help stimulate economic activity further once short-term interest rates have fallen to their lower limit. As discussed in Note 20, articulating a firm long-run objective for inflation, if deemed credible by the public, can help stop inflation expectations from drifting down while the economy is in a protracted slump with monetary policy unable to provide further stimulus through additional rate cuts. Beyond this, central bank pledges to keep short-term rates at or near zero for some time can promote an earlier and more vigorous recovery once short-term rates are driven to the zero lower bound, because such communications can increase agents' valuations of longer-term assets and improve their expectations about future economic activity and prices, leading to higher current consumption, investment, and prices than would otherwise be observed. Of course, the efficacy of this approach rests on the credibility of the central bank's promises; economic agents may not find such promises entirely credible partly because they recognize that discretionary policymakers may have an incentive to renege on their promises once the economy starts to recover. However, as discussed in Notes 2, 5, and 20, the historical experience of the United States, Japan, and Sweden suggests that central bank communications can be effective in reducing medium- and long-term interest rates and stabilizing inflation expectations. The credibility of central bank statements that monetary policy will remain accommodative for an extended period might be enhanced if the central bank also were to announce that it is implementing other unconventional policy tools.

Unconventional policy tools offer a way to provide additional stimulus when further cuts in the funds rate are not possible. Along these lines, the Committee might consider several options. As discussed in Note 18, one possibility is to expand ongoing efforts to support credit extension by increasing the scale and scope of the Federal Reserve's targeted liquidity-providing facilities. Another possibility is to engage in quantitative easing by greatly expanding the volume of excess reserves via purchases of conventional SOMA assets (Note 15). The Japanese experience suggests this approach may not provide much macroeconomic stimulus when the banking system and potential borrowers have weak balance sheets (Note 6). The Committee might instead choose a targeted approach by instructing the Desk to purchase a large volume of long-term Treasury debt (Note 16), or to expand the purchases of agency debt and MBS that have already been announced (Note 17), with the objectives of reducing term spreads and credit spreads. Note 19 suggests a way to use discount window facilities and the Federal Reserve's authority to pay interest on reserve balances to control 3-month interbank rates rather than the overnight rate. In principle, the ability to pay interest on reserve balances should allow the Federal Reserve to expand further its credit-granting facilities or its asset purchases while targeting a positive funds rate. In practice, however, the Committee may find it difficult to engage in unconventional policy actions that expand

its balance sheet, without pushing the effective funds rate toward zero, even if it pays interest on reserves (Note 12).

In theory, unconventional policy tools will provide additional economic stimulus by increasing the availability of credit and reducing borrowing rates. Unfortunately these tools have not been used to any great extent here or abroad, so we have little practical experience from which to judge their effectiveness. Limited experience with these tools implies marked difficulties in calibrating their appropriate usage. Note 21 presents simulations of various strategies for stimulating the economy when the funds rate is stuck at zero. These results suggest that unconventional tools may have a sizable stimulative effect, particularly if they are used in combination with expansionary fiscal policy and communication strategies intended to influence expectations about the future stance of monetary policy. The evidence from one of the few implementations of unconventional monetary tools—the Bank of Japan’s zero interest rate and quantitative easing policies, discussed in Notes 3 through 8—suggests their effects were modest, but the Bank of Japan did not employ these tools aggressively.

While unconventional tools offer potential benefits, they are not without costs. All of the nonstandard tools except communicating future policy intentions would entail a further expansion of the Federal Reserve’s balance sheet and of bank reserve deposits. A sizable further expansion of Federal Reserve lending to financial institutions and nonfinancial borrowers would expose the Federal Reserve to additional credit risk. Large purchases of long-term securities would expose the Federal Reserve to risk of capital losses as the economy recovers and long-term interest rates rise. Moreover, some of these tools may be seen as appropriate in the midst of deleveraging, financial stress, and increasing slack in the economy, but not as the economy recovers. It follows that exit strategies are important. Policymakers will need to be prepared, for example, to raise the price of Federal Reserve credit and to reduce the amounts being auctioned as markets return toward more normal functioning and the economy begins to recover so that the Fed becomes a relatively less attractive source of funds as the need for unconventional policies diminishes. Similarly, the FOMC might choose to reduce SOMA holdings of long-term Treasury securities, agency debt, and MBS as financial markets recover. Some unconventional tools blur the line between providing liquidity and allocating credit. Providing central bank credit to particular sectors may be essential when the sectors’ usual sources of funding shut down, but providing central bank credit at a subsidized rate could slow price discovery and adjustment to a new equilibrium in asset markets. Communication strategies have their own problems. In principle, any communication about the future path of monetary policy should be conditioned on future outcomes. In practice, it is not easy to make statements about future policy and its dependence on the evolution of financial markets and the overall economy that are both clear and complete.