

Even when the policy target rate approaches zero, central banks have powerful tools at their disposal. However, the impact of these tools on inflation and the real economy is unusually difficult to anticipate. It also may be more challenging to alter policy quickly than is the case with interest rate targets. Consequently, policymakers reserve these tools only for extreme circumstances.

Quantitative easing (QE) is perhaps the most well-known mechanism to relax the monetary stance when the policy target rate is already very low. QE occurs when the central bank expands the supply of aggregate reserves to the banking system beyond the level that would be needed to maintain its policy rate target. The central bank uses the proceeds from this reserve expansion to buy assets, thereby expanding its overall balance sheet. In the example in Figure 1, the central bank adds \$1 billion to bank reserves and acquires \$1 billion in Treasury bonds.

Figure 1. Changes in the Central Bank Balance Sheet

<u>Assets</u>		<u>Liabilities</u>
Treasury Bonds (+\$1 billion)		Bank Deposits (+\$1 billion)

Figure 18.1 shows that the demand for reserves increases as the policy interest rate declines. Consequently, additions to the supply of reserves by the central bank lower the interest rate. The downward slope of the demand for reserves allows the central bank to target an interest rate by adjusting the supply of reserves.

QE occurs whenever the aggregate supply of reserves exceeds the level needed for the policy rate to sink to its target. To illustrate, imagine that the interest rate target is zero. When the fed funds rate is zero, an addition to aggregate reserves no longer reduces the fed funds rate (see the Chapter 18 module: Taylor Rule, Financial Conditions and the Zero Bound). The reason is that banks can hold cash (which pays zero interest) rather than lend in the fed funds market at a rate below zero. As a result, a central bank can add limitlessly to reserves and to the assets on its balance sheet without depressing the fed funds rate below zero. QE arises when the central bank adds more reserves than are needed to keep the funds rate at zero.

A simple thought experiment shows that QE *can* shape the economic growth and inflation outlook, even if the financial system is impaired. Imagine that the central bank were to expand reserves sufficiently so that it could purchase *all* the goods and services in the economy. For QE to be ineffective, it would imply that the central bank could purchase the entire economy without influencing the level of prices! This nonsensical outcome makes it clear that QE, applied with sufficient vigor, can alter economic and inflation prospects.

Nonetheless, it is difficult to forecast the effects of QE. Limited experience with QE means that we have little data on which to base such a forecast. Moreover, the

mechanism by which QE affects economic prospects may not be clear. When rates are at zero, banks should be largely indifferent between holding cash, deposits at the central bank, and short-term government debt, because these assets have the same risk characteristics. An increase in the supply of reserves (QE) may simply lead banks to hold more of these riskless assets, rather than lend more.

Such a claim of QE ineffectiveness was common when the Bank of Japan expanded the supply of reserves beginning in the late 1990s. Banks accumulated massive excess reserves, but lending continued to decline. Faced with insufficient capital after devastating losses, banks still sought to *deleverage* – that is, to lower the ratio of their assets to bank capital (recall the discussion of leverage and risk in Chapter 5).

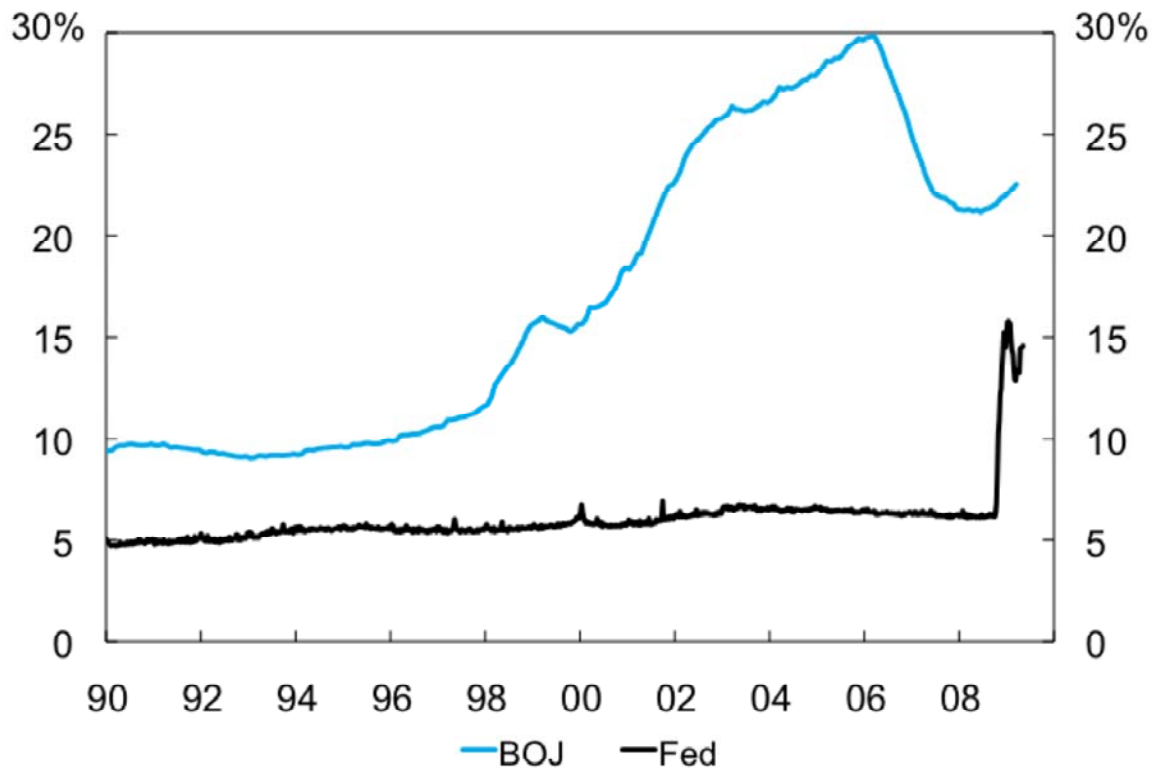
How might QE work, short of a central bank acquiring a large portion of the goods and services in an economy to alter the price level? One mechanism is to add credibility to a central bank's promise to keep interest rates low (see the Chapter 18 module: Policy Duration Commitments). Suppose that a central bank will exit QE *before* raising its policy rate from the zero floor. Then, announcements of an expansion of aggregate reserves (QE) extend the period over which bondholders expected a zero policy rate, helping to lower bond yields, or to keep them low. In this way, QE may help reinforce the impact of another unconventional policy tool.

A key problem with QE is that a central bank cannot anticipate the level of reserve supply (or the size of its asset position) that will be effective. This level can only be learned by experiment as the central bank boosts aggregate reserves (and expands its balance sheet) and observes the effect on financial conditions and the economy. Naturally, this lack of predictability makes policymakers uncomfortable because the experiment might result in an undesirable pickup of inflation.

How has the Federal Reserve used QE? Its first and only application in the postwar period occurred as the financial crisis deepened in 2008. The Federal Reserve's shift to QE – after the Lehman failure in September 2008 – prompted a jump in the size of its balance sheet that was sharper and more sudden than had occurred a decade earlier in Japan (see Figure 2). While the Fed's shift probably helped over time to counter depressed U.S. financial conditions, policymakers remain highly uncertain about the impact and appropriate dosage of QE.

Ultimately, QE is a risky procedure with uncertain effects that central banks avoid except when the conventional policy toolbox is empty. When central banks expect a return to economic normality, they must plan an eventual exit from QE (see the Chapter 18 module: Exit Strategies). Otherwise, they would risk a large and costly inflation. Yet, when conventional alternatives have been exhausted, QE is a powerful tool for central bankers to prevent a sustained deflation.

Figure 2. Central Bank Assets (Percent of GDP), 1990-March 2009



Sources: Bank of Japan and Board of Governors of the Federal Reserve System.