

## Macro Lecture 16: Quantitative Easing

### Quantitative Easing

#### What is quantitative easing?

Quantitative easing is a policy pursued by the Federal Reserve Board 2008 to 2014. The Fed has been purchasing financial assets, MBSs, bonds, etc., from banks and other private financial institutions. The Fed has implemented this policy in three steps:

- **QE1:** November 2008 to June 2010. The Fed purchased \$1,800 billion of mortgage-backed securities (MBSs), Treasury bonds, etc.
- **QE2:** November 2010 to June 2011. The Fed purchased an additional \$600 billion.
- **QE3:** September 2012 to October 2014. The Fed authorized the purchase of up to \$40 billion of mortgage-backed securities (MBSs) and Treasury bonds per month.

In total the Fed purchased a total of \$4.5 trillion of financial assets. First we explain the rationale behind this policy. Then we will use the bank's balance sheet to explain the nuts and bolts of the policy.

### Rationale behind Quantitative Easing

**Question:** Could the Fed pursue an autonomous expansionary monetary policy to mitigate the contractionary effects of business and consumer confidence? That is, could the Fed shift the aggregate demand (AD) curve right to offset the leftward shift caused by the decline in business and consumer confidence?

To address this question recall that an autonomous expansionary monetary policy shifts the Fed policy (FP) curve left, which in turn shifts the aggregate demand (AD) curve right as shown in figure 16.1.

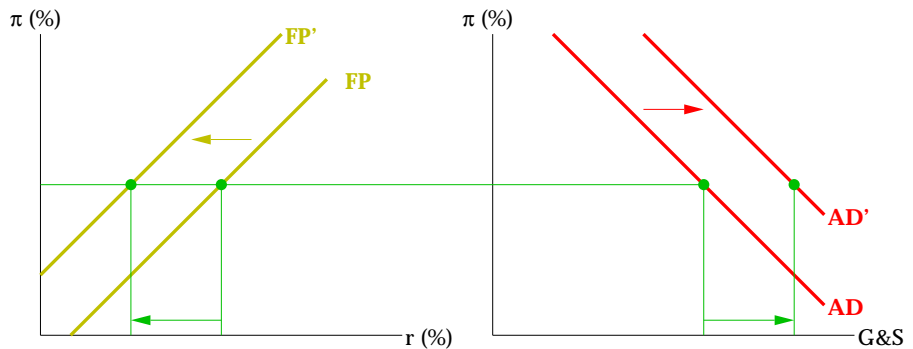


Figure 16.1: Expansionary monetary policy

Macro Lab 16.1 provides some numbers to make the discussion less abstract. Recall that series of questions answered by the aggregate demand (AD) curve:

**AD Question:** What would GDP equal if the actual inflation rate ( $\pi$ ) were \_\_\_\_\_ percent, given that all other factors relevant to demand remain the same?



Macro Lab 16.1: AD Curve Shifts – Autonomous Monetary Policy

An autonomous expansionary monetary policy, that is, a rightward shift of the Fed policy (FP) curve, causes the AD curve to shift right as shown in figure 12.3. This would tend to offset the contractionary effect of the loss in business and consumer confidence. This explains the rationale behind quantitative easing (QE). Quantitative easing is an autonomous expansionary monetary policy pursued by the Fed recently. The Fed's purchase of MBSs, bonds, etc., from banks and other private financial institutions is an effort to shift the aggregate demand (AD) curve back to the right.

### Nuts and bolts of quantitative easing

#### Example: Fed purchases \$5 of MBSs from the bank

As before, the required reserve ratio equals 10 percent. We begin with the bank being loaned up as a benchmark:

Benchmark:

Assets			Liabilities	
Reserves		50	Deposits	500
Vault Cash	30			
Dep at Fed	20			
Securities		70	Borrowing	10
Stock&Bonds	60			
MBSs	10			
Loans		440		

Let us confirm that the bank is loaned up.

$$\begin{aligned}
 \text{Required reserves} &= \text{Required reserve ratio} \times \text{Deposits} \\
 &= 10\% \times 500 \\
 &= 50
 \end{aligned}$$

(Actual) reserves equal required reserves. Since there are no excess reserves, the bank cannot issue any additional new loans. The bank is loaned up.

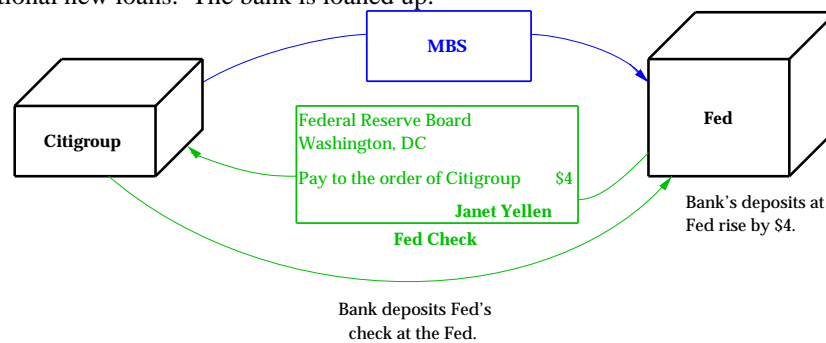


Figure 16.2: Fed purchases \$5 of MBSs from Citigroup

Now, let us see what happens when the Fed pursues its quantitative easing policy. As figure 16.2 illustrates, when the Fed purchases \$4 of MBSs from the bank, the bank gives the Fed the MBSs in exchange for a \$4 Federal Reserve Board check. The bank then deposits the Fed's check in its account at the Fed. The bank's securities have decrease by \$4 and since the bank's deposits at the Fed are part of its reserves, reserves increase by \$4.

Fed purchases \$4 of MBSs from the bank:

Assets			Liabilities	
Reserves		54 <del>50</del>	Deposits	500
Vault Cash	30			
Dep at Fed	24 <del>20</del>			
Securities		66 <del>70</del>	Borrowing	10
Stock&Bonds	60			
MBSs	6 <del>10</del>			
Loans		440		

(Actual) reserves have risen from 50 to 54 while required reserves have remained at 50; consequently, the bank has excess reserves.

Now, we would expect the bank to increase loans, thereby increasing deposits, shifting the money supply curve to the right, and reducing the nominal interest rate as shown in figure 16.3.

Macro Lab 16.2 illustrates this:



Macro Lab 16.2: Quantitative Easing – Banking System

Recall the relationship between the real and nominal interest rates:

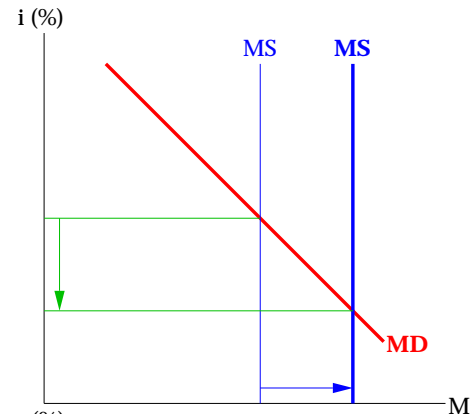


Figure 16.3: Quantitative Easing and the money market

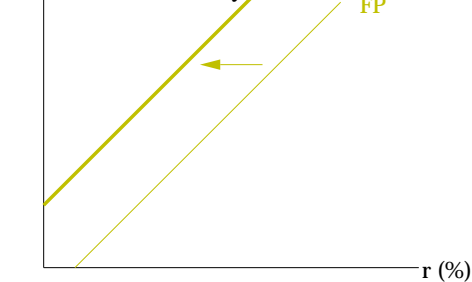


Figure 16.4: Quantitative easing and the MP curve

$$\begin{matrix} \text{Real} & & \text{Nominal} & & \\ \text{Interest} & = & \text{Interest} & - & \\ \text{Rate (r)} & & \text{Rate (i)} & & \text{Inflation} \\ & & & & \text{Rate } (\pi) \end{matrix}$$

At a given inflation rate ( $\pi$ ),

- the nominal interest rate is lower consequently,
- the real interest rate is lower

$$\begin{matrix} \text{Real} & & \text{Nominal} & & \text{Inflation} \\ \text{Interest} & = & \text{Interest} & - & \text{Rate } (\pi) \\ \text{Rate (r)} & & \text{Rate (i)} & & \\ \downarrow & & \downarrow & & \downarrow \\ \text{Decrease} & & \text{Decrease} & & \text{Constant} \end{matrix}$$

That is, the Fed policy (FP) curve will shift left as illustrated in figure 16.4.

But wait, what if banks chose not to increase loans despite the fact that they had positive excess reserves? Would quantitative easing have the envisioned effect? Figure 16.5 illustrates that excess reserves have risen to unprecedentedly high levels in the last few years.

Figure 16.6 focuses on the role quantitative easing has played.

- **QE1:** November 2008 to June 2010. The Fed purchased \$1,800 billion of mortgage-backed securities (MBSs), Treasury bonds, etc.
- **QE2:** November 2010 to June 2011. The Fed purchased an additional \$600 billion.
- **QE3:** September 2012 to October 2014. The Fed authorizes the purchase of up to \$40 billion of mortgage-backed securities (MBSs) and Treasury bonds per month.

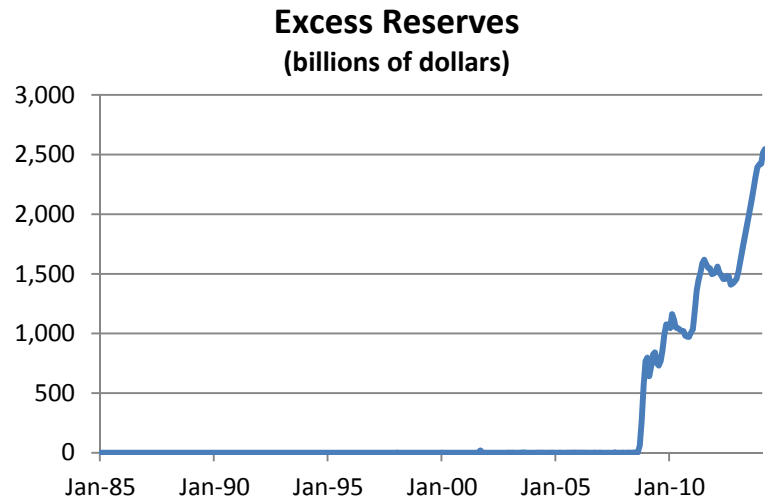


Figure 16.5: Excess reserves: Jan 1985-Apr 2014

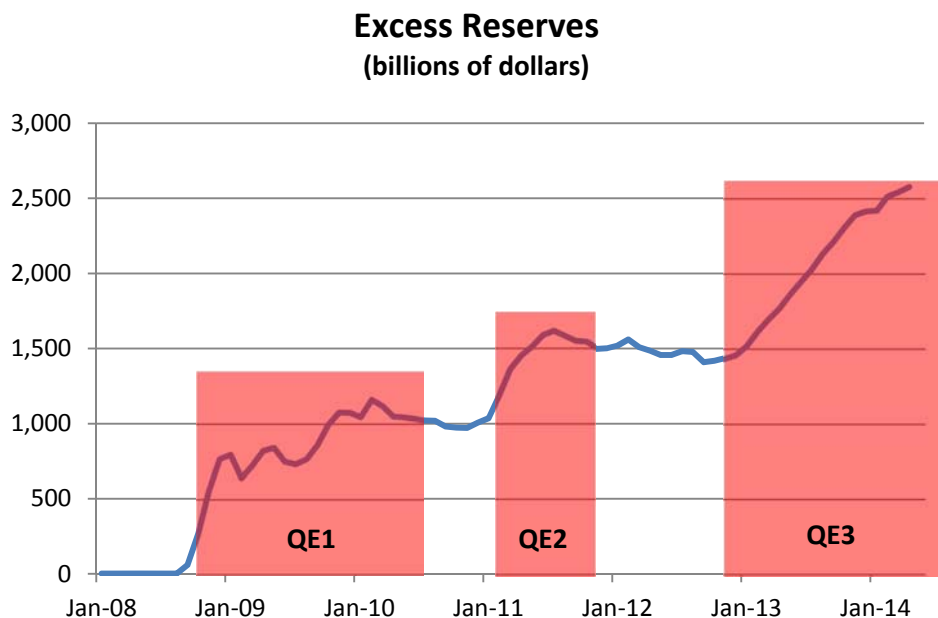


Figure 16.6: Excess reserves: Jan 2008- Apr 2014

As we can see, the jumps in excess reserves coincide with the implementation of QE1, QE2, and QE3. Banks have chosen to hold large amounts of excess reserves rather than increasing loans as much as they could have. Most economists believe that while quantitative easing did shift the money supply curve right, the rise in excess reserves suggests that quantitative easing was not as effective as was hoped.

We have shown that all three policies, TARP, the Stimulus bill, and quantitative easing, were designed to shift the aggregate demand (AD) curve right. Let us now see what actually occurred. Table 16.1 reports data from 2009 to 2013:

Year	Unemp Rate (%)	Real GDP	Actual Infl Rate (%)	Expected Infl Rate (%)	Govt Purch	Productivity Growth (%)
2008			2.0			
2009	9.3	14,420	0.8	≈2.0	3,090	
2010	9.6	14,780	1.2	≈0.8	3,090	3.3
2011	9.0	15,050	2.0	≈1.2	2,990	0.5
2012	8.1	15,520	1.7	≈2.0	2,965	1.5
2013	7.4	15,760	1.5	≈1.7	2,895	0.5

Table 16.1: Recovery: 2009-2013

Figure 16.7 uses the AD/AS framework to analyze these years:

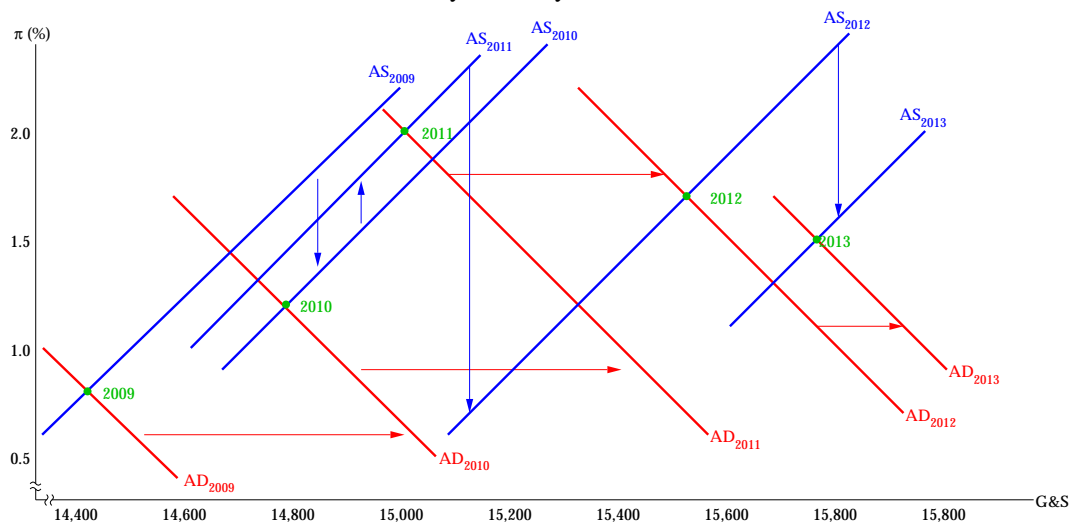


Figure 16.7: Recovery: 2009-2012

### Aggregate Supply (AS) Curve

First, we focus on the aggregate supply (AS) curve. As before, we use the adaptive expectations principle to estimate the expected inflation rate. With the exception of 2011-2012, we can explain the shifts of the aggregate supply (AS) curve by the changes in the expected inflation rate.

	2009-2010	2010-2011	2011-2012	2012-2013
Inflationary expectations	Fell	Rose	Rose	Fell
AS curve	Shifts down	Shifts up	Shifts down	Shifts down

Since the aggregate supply (AS) curve is upward sloping, it had to shift down between 2011 and 2012, but the expected inflation rate rose from about 1.2 percent to about 2.0 percent. A possible explanation is that productivity growth offset the rise in inflationary expectations.

### Aggregate Demand (AD) Curve

Next, we turn to the aggregate demand (AD) curve. Since the aggregate demand (AD) curve is an upward sloping curve, it had to shift right between 2009 and 2011. Also, as figure 16.7 illustrates we believe that the aggregate demand (AD) curve has continue to shift right thereafter. We will now consider how the three recovery programs undertaken by the Federal government influenced these shifts.

**TARP:** Figures 16.8 and 16.9 reveal that consumer and business confidence rebounded. This can be credited in part to TARP.

### University of Michigan Index of Consumer Sentiment: 2006-2013

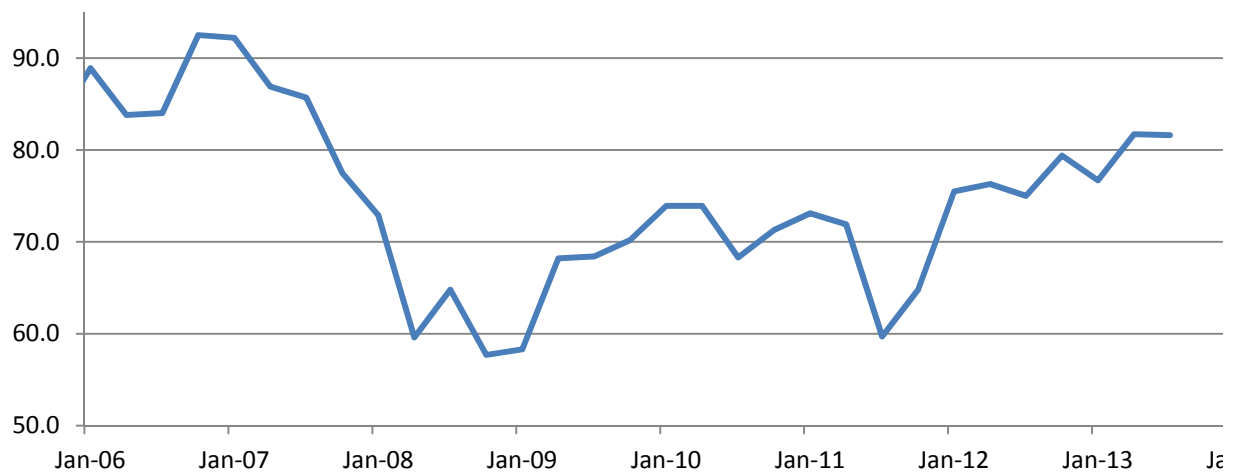


Figure 16.8: Consumer confidence

### OECD Manufacturing Confidence Indicators for U.S.

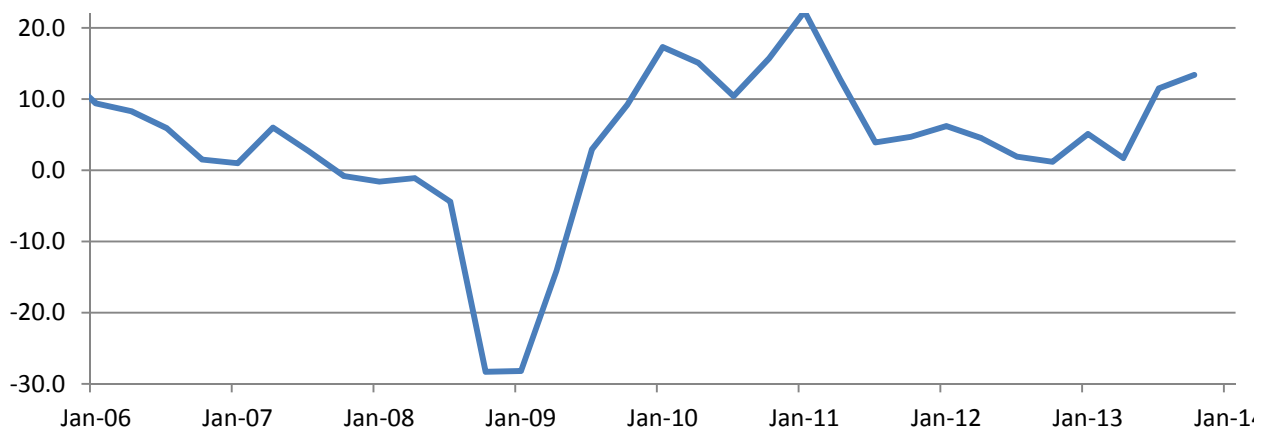


Figure 16.9: Business confidence

Just as the decline in consumer and business confidence caused the aggregate demand (AD) curve to shift left between 2006 and 2009, the resurgence in consumer and business confidence caused it to shift right between 2009 and 2013.

**Quantitative easing:** Most economist believe that quantitative easing was also partially responsible for the rightward shift of the aggregate demand (AD) curve, despite the fact that excess reserves have grown to high levels.

**Stimulus bill:** Both the tax cuts and the increases in government purchases mandated by the Stimulus bill were expansionary. But as table 16.1 reports, government purchases overall fell during this period. Consequently, while the Stimulus bill increases government purchases in some areas, Congress and the President reduced government purchases in other areas. Why were Congress and the President so timid when the unemployment rate exceeded 9 percent? The answer was a concern about the Federal deficit. So we will now study the effects of the Federal government incurring a deficit.