What tools does the Fed have to manipulate the money supply?

1. Open market operations
2. Reserve requirements
3. Discount rate
   Federal funds target rate

The Fed is responsible for Monetary Policy, that is, controlling the money supply. So, therefore, the Fed can change μ, or the Fed can change B. The list above shows the policy tools the Fed has at its disposal.

Tool #1 - Open Market operations

The Fed can alter the level of the monetary base buy selling or buying US Federal Government bonds on the "open market".

The Fed holds a large portfolio of bonds. Bonds are financial instruments that pay interest. In their simplest form, you could buy a bond as follows. You would pay a price, say $95 dollars, for a bond, a piece of paper (claim). The bond entitles the holder of the bond to receive $100 one year from today.

Since you have paid $95 and get $100 in a year, you are earning an interest rate, in this case about 5%. A bond is essentially a loan.

The bonds the Fed owns are U.S. Treasury Bonds. These are loans, issued by the US Government. You can by government bonds that mature in 10 years, 30 years, 30 days, 90 days, etc.

- When the Fed buys bonds, we say the Fed is making an open market purchase of these bonds. To do so, literally, it creates new currency and reserves and gives them to the seller of the bond in return for the bonds.

  Open market purchase $\Rightarrow$ (C + R) $\uparrow$ $\Rightarrow$ B $\uparrow$ (B = C + R) $\Rightarrow$ M $\uparrow$ (M = B * μ) $\Rightarrow$ AD $\uparrow$ (Y = M / k).
  SR: **P** $\uparrow$, y $\uparrow$ LR, **P** $\uparrow\uparrow$, y back to y*

- When the Fed sells government bonds, it is called an open market sale. To do it, the Fed sells bonds out of its inventory, receiving in exchange some combination of currency & reserves, which it effectively destroys.

  Open market sale $\Rightarrow$ (C + R) $\downarrow$ $\Rightarrow$ B $\downarrow$ $\Rightarrow$ M $\downarrow$ $\Rightarrow$ AD $\downarrow$.
  SR: **P** $\downarrow$, y $\downarrow$ LR: **P** $\downarrow\downarrow$, y returns to y*

The transactions above are important because they literally create and destroy currency and reserves. For a purchase, it as if they have just printed money to purchase the bonds. For a sale, it is like they burn the money they receive for the bonds. Money (currency and reserves) is created or destroyed.

There is nothing magical about bonds. If the Fed wanted to increase the money supply, it could do it equally well by making an open market purchase of hockey masks or chainsaws. However, bonds are chosen because they are readily bought and sold on the active “secondary market” for bonds. It would likely be more difficult to re-sell a bunch of hockey masks. It is also nice that the Fed earns interest on these bonds to finance its expenses.

Why the quotes on the "open market"?

Mechanically, they buy these bonds from a special group of bond traders in NY who the Fed has developed a relationship with, rather than the truly general public. There are about 30 such traders. The Fed informs them there will be a purchase (or sale) of bonds, and the traders bid on the bonds. The lowest (highest) bids are selected and the bonds are transferred. These bond traders end up receiving a slightly better price that

they would receive if they had bought the bonds on the actual open market. They then are free to either hold the bonds themselves or re-sell them for a slight profit. If you are interested, you can go to the Fed's web pages and get a very detailed account of this process, including those firms that are amongst this group.

Tool # 2 - Reserve Requirement Ratio

Recall that the RRR (the required reserve ratio) is the minimum amount of reserves that a bank must have for each $1 of deposits. If RRR = 0.12, then for each dollar deposited, the bank must have $0.12 of reserves. These reserves are called required reserves.

When we discussed R/D above, we noted that banks usually would lend out all excess reserves. If indeed banks do this, the R/D ratio will be the same as the RRR. Banks will hold as reserves only what they are required to. Thus, for our purposes, they are essentially the same. Historically, banks only rarely hold more reserves than are required. Exception: times of banking panic

Thus, if the Fed is to increase RRR, they will be increasing R/D.
If the Fed were to decrease RRR, they will be decreasing R/D.

We have already done the logic for this change. See discussion of R/D in earlier notes.

- $\uparrow$ RRR $\Rightarrow$ R/D $\uparrow$ $\Rightarrow$ $\mu \downarrow \Rightarrow$ M $\downarrow$ (M = B * μ) $\Rightarrow$ AD $\downarrow$ (Y = M / k)
  SR: **P** $\downarrow$, y $\downarrow$ LR: **P** $\downarrow\downarrow$, y back to y*

- $\downarrow$ RRR $\Rightarrow$ R/D $\downarrow$ $\Rightarrow$ $\mu \uparrow \Rightarrow$ M $\uparrow \Rightarrow$ AD $\uparrow$
  SR: **P** $\uparrow$, y $\uparrow$ LR: **P** $\uparrow\uparrow$, y back to y*

Tool #3 - Discount Rate

Discount Rate (DR) - this is the interest rate the Fed charges member banks when they borrow reserves from the Fed. The Fed chooses (sets, picks) this rate.

As we will see below, for a couple of reasons, banks may want to borrow reserves temporarily. It might be the case that the bank does not have enough reserves to cover its legal reserve requirement. It might need to borrow reserves to meet customer withdrawals.

- A reduction in the discount rate, relative to the market rates of interest, makes it less costly for the banks to borrow reserves. They will borrow more reserves from the Fed.

  $\downarrow$ DR $\Rightarrow$ R $\uparrow \Rightarrow$ B $\uparrow$ (B = C + R) $\Rightarrow$ M $\uparrow$ (M= B * μ) $\Rightarrow$ AD $\uparrow$ (Y = M / k)
  SR: **P** $\uparrow$, y $\uparrow$ LR: **P** $\uparrow\uparrow$, y back to y*

- An increase in the discount rate, relative to the market rates of interest, will make it more costly for the banks to borrow reserves. They will borrow fewer reserves from the Fed.

  $\uparrow$ DR $\Rightarrow$ R $\downarrow \Rightarrow$ B $\downarrow \Rightarrow$ M $\downarrow \Rightarrow$ AD $\downarrow$
  SR: **P** $\downarrow$, y $\downarrow$ LR: **P** $\downarrow\downarrow$, y back to y*

More on the discount rate – what is the federal funds rate? – Tool 3B

We said above that banks would borrow reserves from the Fed. In fact, for fairly complicated reasons, the Fed would prefer that banks borrowed reserves from each other.

For their part, the banks avoid borrowing from the Fed. If the banks borrow using the discount rate too often, banks fear the Fed may view this as a signal of financial weakness. In addition to conducting

monetary policy, the Fed is also responsible for monitoring and regulating banking activities. Too frequent use of discount rate borrowing might cause the Fed to increase their scrutiny of the banks activities.

Thus, banks mostly borrow reserves from each other. Some banks have extra reserves; some banks have too few reserves. When banks loan each other reserves, the interest rate charged is called the **federal funds rate**. It is a market determined interest rate (determined by supply and demand).

Notice, however, that federal funds rate borrowing is simply a rearrangement of existing reserves. No new reserves are created. If everyone in the banking system needs additional reserves (say during a banking panic), the federal funds borrowing will not be extremely helpful.

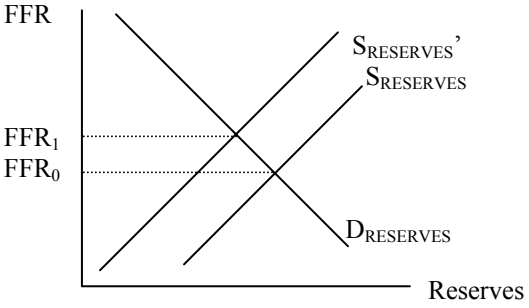
However, borrowing at the discount rate (from the Fed) actually creates new reserves. During a panic, discount rate borrowing will be more helpful. This was the purpose that the discount rate was originally intended for, to inject reserves during times of banking panic. This is why the Fed is some times called the "lender of last resort". It will inject reserves and provide temporary liquidity when all other options have failed for the bankers.

What does the Fed say their policy is?

The actual policy that the Fed says they follow is to set a target range for the Federal Funds rate. They set a target, say 5.5% and some range, say between 5.3% and 5.7% that they would like the federal funds rate to lie within.

If the Fed decides that the federal funds rate is “too low”, the Fed would increase the discount rate. As discussed above, increasing the discount rate will decrease the amount of reserves. This, effectively, reduces the supply of reserves in the federal funds market. As with a reduction of supply, it causes the price, or in this case, the federal funds rate to rise. The federal funds rate will rise. (See graph below)

FFR “too low”: $\uparrow$ DR $\Rightarrow$ R $\downarrow$ = $\downarrow$ Supply of reserves $\Rightarrow$ $\uparrow$ FFR



Likewise, if the Fed decides the federal funds rate is “too high”, it will lower the discount rate. This will increase reserves, and thus will increase the supply of reserves. The increase in supply will lower the federal funds rate back into the target range.

FFR “too high”: $\downarrow$ DR $\Rightarrow$ R $\uparrow$ = $\uparrow$ Supply of reserves $\Rightarrow$ $\downarrow$ FFR (draw the graph)

Notice that the result of increasing the discount rate is that the federal funds rate increases. Likewise, decreasing the discount rate will result in a decrease in the federal funds rate. The media will often talk about how the Fed raises interest rates. This is misleading if not entirely false. The only interest rate the Fed controls directly is the discount rate. But we have just seen how the DR can affect the federal funds rate. It also turns out, that many other short term, and to a lesser extent long-term interest rates, will *often (not always)* move in the same direction along with the DR and the FFR. Perhaps your car loan, your savings account, your student loans, you credit cards, etc. However, the Fed does not have direct control over these rates.

More on the Discount Rate – is there more to the DR/FFR story?

I have already told two stories about the discount rate. The first, the textbook sort of story, suggests that lowering the discount rates lowers the cost of borrowing reserves and increases reserves. This then affects the base and aggregate demand. True, but this isn't the whole story.

Then I talked about the Fed's stated policy of targeting the FFR. It used the DR to lower (or raise) the supply of reserves to keep the FFR within its target range.

The real kicker is that there isn't a great volume of borrowing at the discount rate. Remember before that Fed prefers that banks use the FFR, and for their part, banks avoid borrowing at the DR because of fear of increased Fed scrutiny. Since there is little borrowing at the discount rate, a change in the discount rate isn't likely to shift the supply curve of reserves a great deal. So, in order to actually shift the supply curve of reserves, the Fed will have to do something else. What is that something else? It is open market purchases or sales.

What then, is the real story (see example below)?

While indeed the discount rate has all of the effect above, and while it is true that the Fed attempts to keep the federal funds rate within the target range, in fact, the discount rate is mostly used a signal that the Fed is going to change its policy on open market purchases or sales.

An increase in the discount rate is a signal that the Fed intends to reduce the money supply. Hence, it is a signal that the Fed will make open market sales, and thus reduce the monetary supply.

A decrease in the discount rate is a signal that the Fed intends to increase the money supply. Hence, the fed will make open market purchases, and thus increase the money supply.

OK, one time, from the beginning?!?!?

Suppose the Fed thinks the FFR is "too high" (how, I am not sure).

The Fed thus needs to somehow lower the FFR. The Fed can't do much with the demand curve for reserves, as this is a result of which banks need to borrow reserves. But it can affect the supply of reserves.

To lower the FFR, the Fed must then somehow increase the supply of reserves. To do this, the Fed lowers the discount rate. In theory, this alone would increase the supply of reserves, but we know that this is just a signal. Not many banks actually borrow at the discount rate, so this doesn't affect the supply curve of reserves much. The signal means that the Fed will indeed increase the supply of reserves by making open market purchases. This creates new reserves, increases the supply of reserves, and thus lowers the FFR, which was the whole point in the first place.

Can you tell the story for the FFR being "too low"?

How often do these policy actions occur?

RRR - rarely. This is a very swift and powerful reaction to changes in RRR. Used sparingly. More later during the lecture on the depression.

Discount rate - not very often, but occasionally. At most a few times a year. See below.

Base - often. This is the primary tool. This occurs almost on a daily basis. The average open market purchase or sale is $4 billion.

May I have some more terminology? Please? Sure...

I will some times refer to monetary policies as either expansionary or contractionary.

Expansionary monetary policies ("looser") are policies that lead to higher levels of the money supply and hence higher levels of aggregate demand.

Contractionary monetary policies ("tighter") are policies that lead to lower levels of money supply and hence lower levels of aggregate demand.

Why are we spending oodles of time on this monetary stuff?

Don't forget, that $M = B * \mu$, and that $Y = M / k$. Thus, by affecting the money supply, the Fed affects aggregate demand. Thus, in the short run, with unanticipated monetary policy changes, the Fed (Alan Greenspan) can affect the price level and real output (and hence unemployment).

Expansionary policies will lead to short run increases in **P** and y. These include open market purchases, decreasing reserve requirements, decreasing the discount rate.

Contractionary policies will lead to short run decreases in **P** and y. These include open market sales, increasing reserve requirements, increasing the discount rate.

But in the long run, output will return to the long run level. Thus, in the long run, the effect of expansionary monetary policy will be a higher price level (inflation), and contractionary monetary policy will be a lower price level (deflation).

Summary

Open market purchases	$\uparrow (C + R) \Rightarrow \uparrow B \Rightarrow \uparrow M \Rightarrow \uparrow AD$
Open market sales	$\downarrow (C + R) \Rightarrow \downarrow B \Rightarrow \downarrow M \Rightarrow \downarrow AD$
Increase in RRR	$\uparrow RRR = \uparrow R/D \Rightarrow \downarrow \mu \Rightarrow \downarrow M \Rightarrow \downarrow AD$
Decrease in RRR	$\downarrow RRR = \downarrow R/D \Rightarrow \uparrow \mu \Rightarrow \uparrow M \Rightarrow \uparrow AD$
Increase in DR	
(textbook)	$\uparrow DR \Rightarrow \uparrow$ cost of borrowing $R \Rightarrow \downarrow R \Rightarrow \downarrow B \Rightarrow \downarrow M \Rightarrow \downarrow AD$
(Fed says)	$\uparrow DR \Rightarrow \downarrow R = \downarrow S_{RESERVES} \Rightarrow \uparrow FFR$
(really)	$\uparrow DR \Rightarrow$ signal Fed to make open mkt. sales $\Rightarrow \downarrow R \Rightarrow \downarrow S_{RESERVES} \Rightarrow \uparrow FFR$
Decrease in DR	
(textbook)	$\downarrow DR \Rightarrow \downarrow$ cost of borrowing $R \Rightarrow \uparrow R \Rightarrow \uparrow B \Rightarrow \uparrow M \Rightarrow \uparrow AD$
(Fed says)	$\downarrow DR \Rightarrow \uparrow R = \uparrow S_{RESERVES} \Rightarrow \downarrow FFR$
(really)	$\downarrow DR \Rightarrow$ signal Fed to make open mkt. purch. $\Rightarrow \uparrow R \Rightarrow \uparrow S_{RESERVES} \Rightarrow \downarrow FFR$

Expansionary: Open market purchase, decrease RRR, decrease DR.
Contractionary: Open market sale, increase RRR, increase DR.