NOTES 4: The Banking System, Money Supply and Money Demand

The Role Of The Banking System In The Economy

Pretend you are a bank. If you wanted to make as much money as possible, you would loan as much as possible. So suppose on day 1, I deposited money in the bank. On day 2, the bank loaned all that money out. On day 3, I went to get my money out of the bank and it was not there because the bank loaned it out. If I thought this would happen, I probably would not have kept my money in the bank.

For this reason, the government decided that it would require that all banks keep a minimum percentage of the deposits on hand in their vault. That way, if people come in to get some money, their money would be there.

Bank accounting

In accounting, total assets must equal total liabilities. Assets for a bank are the amount of money they have in reserves (in their vault and at the Federal Reserve) plus the amount of loans they make. The total liabilities are the deposits that people make in their bank.

Total deposits must equal total loans plus total reserves or

\[ TD = TL + TR \]; (EQUATION 1)

\[ TD = \text{Total deposits} \]
\[ TL = \text{Total Loans} \]
\[ TR = \text{Total Reserves} \]

If this relationship holds, then the change in total deposits must equal the change in total loans plus the change in total reserves. (The change in assets must equal the change in liabilities):

\[ \Delta TD = \Delta TL + \Delta TR \] (EQUATION 2)

Equations 1 and 2 are very important to the analysis of the banking system.

A simple example of the banking system

With all the above stuff on the banking system in mind, let us look at how bank accounting works. Suppose that I deposit $100 into bank A (suppose further that I am the only one in the economy with money that was previously NOT in the banking system – it was under my mattress). Also assume that the required reserve ratio set by the government is .2 (the bank has to keep 20 percent of all liabilities as deposits) The following would be the accounting statement for the bank.
<table>
<thead>
<tr>
<th>Assets</th>
<th>Liabilities</th>
</tr>
</thead>
<tbody>
<tr>
<td>Change in TR</td>
<td>Change in TD</td>
</tr>
<tr>
<td>20</td>
<td>100</td>
</tr>
<tr>
<td>Change in TL</td>
<td>Change in Liabilities</td>
</tr>
<tr>
<td>80</td>
<td>100</td>
</tr>
</tbody>
</table>

Change in Assets = 100

Notice that total assets equal the total liabilities. (Total Assets = 100; Total liabilities equal 100).

How do we get the numbers in the above chart. TD is easy. I put 100 into the bank. Total deposits should increase by 100. In other words, ΔTD = 100.

The change in reserves is also not difficult. The government requires that the bank keep some of that deposit in the vault. The amount they keep will be the required reserve ratio times the initial deposit.

ΔTR = m * ΔTD; where m = reserve ratio. (EQUATION 3).

In this example, ΔTR = 0.2 * 100 or 20.

If ΔTD = ΔTL + ΔTR then the change in TL = 80. We are assuming that the bank will lend out all the money that it can. Of the $100 in new deposits, the bank only has to keep $20 as required reserves. The remaining $80 can be loaned out to other economic agents.

Suppose that they lent the $80s out to you. ($80 was created by the banking system – consumption was NOT created, but purchasing power was!). Now suppose you bought a bike and the bike shop that you purchased it from put the revenues from the sale of the bike into their bank. (We will assume your bank is the same as mine. This is not necessary, but it is just easier to think about. If it makes you feel better, think of the banking system that we are analyzing as being for the banking system as a whole). Let us look at the accounting record for this transaction:
The bike shop puts 80 into their bank. TD increases by $80. The bank has to keep $16 in required reserves. It could loan out the remaining $64 to someone else. Again, the banking system has created $64 of purchasing power by making loans.

From my initial deposit of $100, let us look at the effects on the banking system.

<table>
<thead>
<tr>
<th>ASSETS</th>
<th>LIABILITIES</th>
</tr>
</thead>
<tbody>
<tr>
<td>Change in TR = 16</td>
<td>Change in TD = 80</td>
</tr>
<tr>
<td>Change in TL = 64</td>
<td></td>
</tr>
</tbody>
</table>

Change in Assets = 80
Change in Liabilities = 80

The two transactions have created $144 in new loans. The banking system has created $144 of money. The last $64 that was loaned from the bank will be redeposited and the process will continue. How much money will be eventually created? To answer this question, we must look at the money multiplier.

(Remember, the banking system does not create spending; it creates money - the ability to spend. When we talk about monetary policy, it is not the creation of money that stabilizes the economy. The money supply just affects interest rates that affect investment. Don’t get bogged down in thinking about what if people have to pay it back. That is true that they do have to pay it back. So, the consumption balance sheet doesn’t change. They borrow $10 today, but pay it back tomorrow. This is just negative savings. We are just interested in how the amount of money affects interest rates!!!!!)
The money multiplier ($\mu_m$) can be defined $1 / m$, where $m = \text{reserve ratio}$. For those of you who know math: Deposits initially increase by ID, then $(1-m) \text{ID}$, then $(1-m)^2 \text{ID}$, + ……………+ (out to infinity) (where ID = the initial deposit). Using some math tricks, the total change in TD = ID (the initial deposit)* $\mu_m$ ; (if you don’t know the math trick, just trust me).

The total change in TD for our example = 100 (my initial deposit) * 5

= 500

(The money multiplier is 1/.2 = 5)

We are not only interested in the change in TD, we are also interested in the total change in TL because making loans is creating purchasing power. To get the change in loans, we start with the change in TR.

The total change in TR = $m \times$ the total change in TD.

= .2 * 500

= 100 = the initial deposit

NOTICE: The change in total reserves is equal to the initial deposit. Anything that enters into the banking system, eventually ends up in the banking system as reserves (MONEY CANNOT JUST SIMPLY DISAPPEAR).

The total change in TL = the total change in TD - the total change in TR (equation 2 from last time).

= 500 -100

= 400

My 100 initial deposit into the banking system created $400 in loans.

**What is the Change in the Money Supply?**

Money Supply is the amount of money in circulation defined as both CURRENCY in circulation held outside the banking system + Total Deposits in the Economy.

MS = TD + TC

TD = the money in the banking system

$TC = \text{the total currency held by the private sector outside the banking system (i.e. the cash that we may keep in our wallet or under our mattress).}$

**The change in the money supply ($\Delta MS$) = $\Delta TD + \Delta TC$.**
In this case, TC fell by $100. I started with a $100 under my mattress and no currency outside of the banking system. Total deposits increased by $500. So, putting my money into the bank increased the money supply by $400. Notice - the change in reserves = m * change in deposits. In this case, the change in reserves = $100. The whole $100 I put in the banking system ended up in the banking system as reserves (this had to happen!!!! - if no one holds cash, where else would it end up?)

As noted in class, the money multiplier only equals 1/m if the following assumptions hold:

1. Banks only keep required reserves in their vaults.
2. People always deposit the money back into the bank. They hold no money as cash.

A question you should think about? Would the money multiplier be more or less effective if some individuals hold cash or if some banks kept more than their required reserves?

As we went over in class - anything that prevents ‘more loans’ from occurring would cause the money multiplier to be smaller.

**Why is this important?** Because the Fed - if it wants to increase the money supply by $X, does not have to buy $X worth of bonds on the open market. If the assumptions we have hold, the Fed only has to buy (m*$X) bonds. Doing so, they can let the money multiplier work.

The Fed sets the money supply curve!!! If they want the money supply to be $Y - they make it $Y. The Fed is the only one who has real control over the money supply (the Treasury, by printing money, could also have control - printing more money will increase the money supply - but, this will only happen if the Fed lets it - the Fed can simply undo the actions of the Treasury by selling bonds on the open market (which will reduce the money supply).

**If the Fed controls the money supply, who controls the money demand?** Households and firms control money demand. We are talking about the demand for money as opposed to the demand for some other asset. We can choose to hold our savings in many forms - money in the bank - stocks, home equity, etc… We are talking about money in the bank - cash, checking accounts, saving accounts. What are the benefits of money - we can transact with it (it is hard to go to Dominick’s and buy groceries using equity in your home). We like money because it is liquid - we can buy stuff with it. The cost of money is that it offers a really low return. In terms of cash and checking accounts - it may even earn a zero nominal return (a negative real return). So the cost of holding liquidity (money) is the forgone interest we would lose. With money in our pocket and in most checking accounts, we lose both the real return and the expected inflation return! This is one of the few places in our class where nominal returns matter. When you think about the demand for money, think about checking accounts and cash in your pocket (this is M1 definition of money for those who like to read the book). We are going to talk about real money demand - the effect of money demand once we account for price changes. For a given amount of Y you would like to buy, if the price of Y increases - you need more money. If the price of Y increases by Z%, the amount of additional money you would need would increase by Z%. As a result, we are going to talk about the real demand for money.
As seen in class - there are only three things that affect the real demand for money:

Y, r and expected inflation.

We draw money demand in real money, real interest rate space. As r increases, for a given Y and expected inflation, nominal interest rates will increase. It is more expensive to hold money. As a result, our demand for money will fall. This is why the money demand curve slopes down!!!!

**What shifts the money demand curve:** Y and expected inflation (again, the only things that effect the money demand curve are the costs and benefits of holding money - the benefit of holding money is the ability to transact - the cost is the forgone interest of holding money in liquid form which usually earns a zero return).

If Y goes up, that means there are more goods in the economy. The more goods in the economy, the more we need to transact (we have to buy those goods somehow). We need more money. The benefit of money is the transaction demand. That says, when we want to transact more, we want to hold more money. An increase in Y will increase our demand for money at every given real interest rate (holding expected inflation fixed).

When expected inflation increases, for a given Y and r, the cost of holding money increases. Why? If r is fixed and expected inflation increases, nominal interest rates will increase. Increasing nominal interest rates will make holding money more expensive - as a result, the demand for money will fall!!!!

Basically you should realize that the Fed controls M - the nominal money supply. The real money supply = M/P. The money demand is a function of Y and expected inflation. Money demand = money supply which will set the interest rates in the economy (actually, the Fed is targeting interest rates and sets money supply accordingly). This interest rate also has to clear investment and savings.