Economics of Banking and Finance Markets
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Lecture - 40
Deposit multiplier

Hi everyone, welcome to this session. In the previous session, we have discussed how does a central bank can influence its monetary base by conducting open market operations and discounting of loans to the commercial banks.

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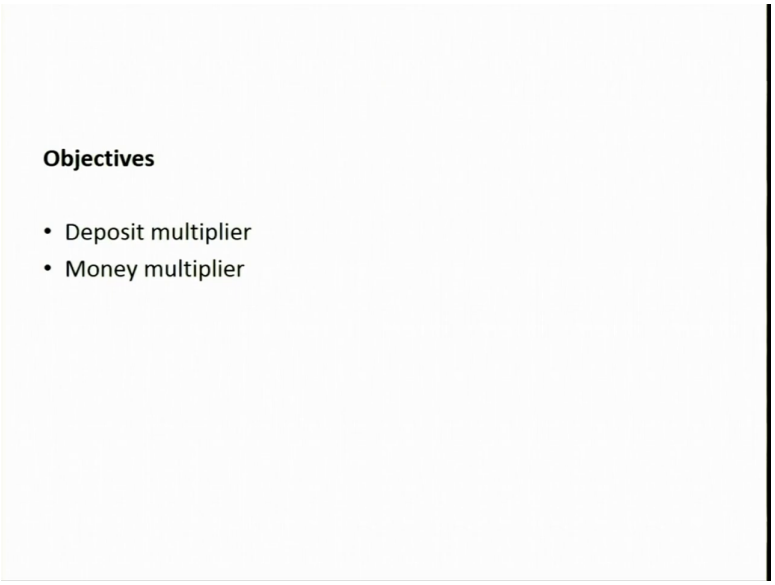

In this session, we will discuss how the action taken by a central bank, suppose through open market operation or through the discounting of loans to the banking system, further affects the expansion of money supply in an economy. So, we will discuss two important aspects. One is how does it lead to multiple expansion of deposits in banks. And, then subsequently, we will discuss how does it lead to multiple expansion of money supply in an economy.

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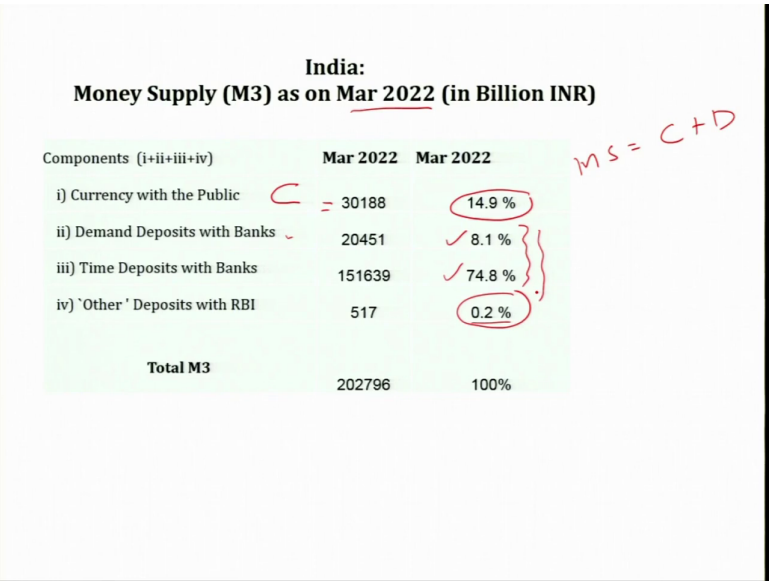

So, as a motivational factor, let me put this data, that is the total money supply in India on March 2022, within this you can see that the C, because money supply we have defined that money supply is equal to C plus D. Out of the C, you can see that that is 14.9 percentage. And, the deposits you can see that the demand deposits, this is 8.1 and time deposit is 74.8 percentage. So, these constitute the total deposits, demand deposit and time deposits.

Another deposits, mainly by the president, PM, Ex-PM etcetera with the central bank, that constitutes 0.2 percentage. So, what we are going to see that, with this currency in circulation, how they can attain the multiple expansion of deposits; because this currency is coming to the economy through the banking system, from central bank mainly through the open market operations and discounting of loans.

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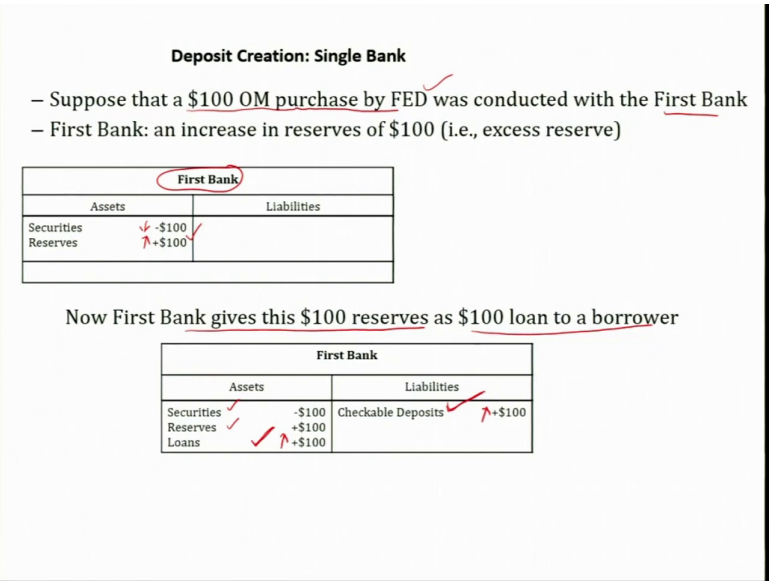

So, let us analyze this process using a T account. So, the starting point here is that let us bring back what we discussed in the previous class; that means, suppose that a 100-dollar open market purchase by the central bank was conducted with the First Bank, that is one, the First Bank is our representative commercial bank here.

And, as a result and you know that the immediate effect is going to be a decline in the balance sheet, the T account of the First Bank; we can see that the securities going to decline by 100 dollars. And immediately, you can see that the proceeds of the sale, it will be credited to the account of this first national bank by the central bank. And there would be an increase in reserves of 100 dollar here, that is the first change that we can see here.

So, here subsequently, you know that because the bank has no increase in checkable deposits, because this money came to this bank, this First Bank not by anyone deposited this amount to the bank. But, because it sold out its securities, government securities to the central bank, to the Fed, and as a result there was an increase in these 100 dollars. So, because of that the First Bank does not need to keep any cash reserve.

Let us assume, that suppose that the First Bank gives this entire 100 reserve as 100 loans to a borrower.

So, when the bank makes the loan, how does a bank give loan? So, to give loan, it opens a checking account for the borrower and put the proceeds of the loan into these accounts. So, in

this way, what we can see that the bank alters its T account balance sheet by increasing its liabilities with a 100 dollar of checkable deposit, that is this one. You can see that the liability has increased, and the asset also increased by 100 dollars.

So that means, we keep the initial one, exactly like the securities, reserves, and the loans, it increases like this. So, the checkable deposits increase. So, in this way, the bank alters its balance sheet by increasing its liabilities with a 100-dollar checkable deposit and at the same time increasing its assets with 100 dollars. So, this is how the resulting T account looks like.

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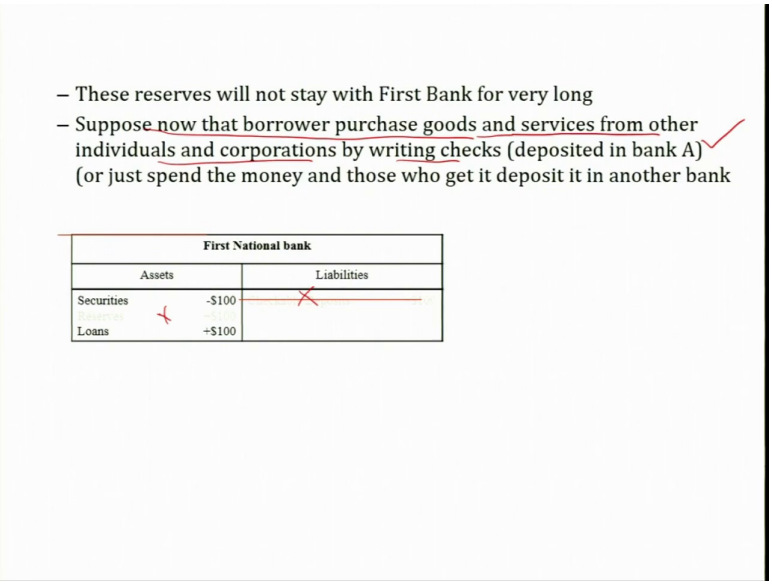

Now, see these reserves will not stay with the First Bank for very long because, they just have given the loan. And this reserve that the even the money credited in the checkable deposit account, it will not stay there for a long. Now, suppose that, now the borrower, purchase goods and services from other individuals and cooperation.

And they finance it by writing checks and those who got this check, they deposit this check in another bank called bank A. So that means, we are assuming here that it is going to another bank. Look at the first national bank's T account again; that means, the reserve disappeared.

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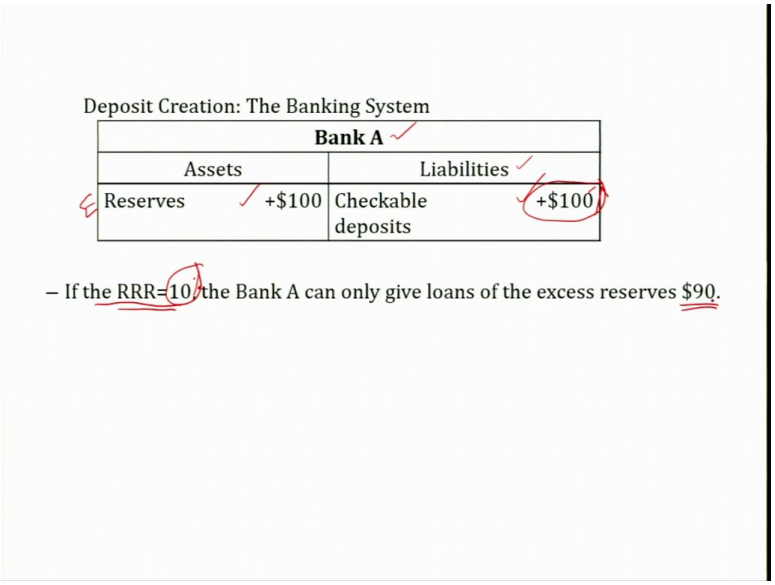

We can see here is that another bank, the entire banking system is coming to the picture; that means, when the money has been deposited in bank A, and how does the bank A's assets T account look like?

So, we can see here is that the 100-dollar loan by First Bank banks is now deposited at bank A and assume that this bank and all other banks hold no excess reserve. Then, accordingly, this bank's reserves are going to increase to 100 dollar and, checkable deposit is going to increase by 100 dollars.

And here now what we can see is that the bank A, now their asset has increased, and the liabilities also have increased. And, since bank is a financial institution, it wants to maximize its profit, in keeping these liabilities and that is this 100-dollar deposit, it needs to pay some interest income to the depositors as well as incur some operating costs.

Obviously, you know that this bank will employ this fund to make income. So, in this case, obviously, we can see that. There is different way it can spend; it can give a loan, or it can buy a bond. Suppose the bank gives a loan to a customer here. So, assume that here the required reserve ratio is 10 percentage, suppose the RR is 10 percentage.

So, the bank A can only give loan of about 90 dollars right because, in the previous case if the first national bank, it does not need to keep any RR because that money has come from

the federal reserve system by selling security. But here, of these 100 dollars, it cannot give the entire amount as loan. (Refer Time: 09:19)

They must keep 10 percentage as the required reserve, that means, 10 dollars. So, this bank can give only the excess reserve 90 as loan.

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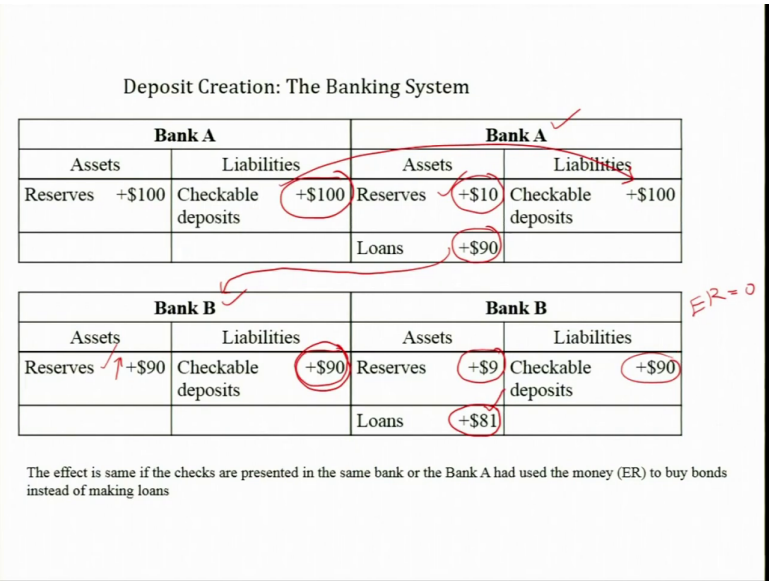

So, in this process let us discuss that the reserve ratio is required reserve ratio is 10 percentage. So, this bank will now find itself with a 10 million increase in required reserve leaving 90 million of excess reserve. So, it does not want to hold excess reserve.

And it gives the remaining 90 loans that is also an asset. Now, when this loan, received by another borrower deposit in another bank, say such as for example, bank B. And this amount that the loan through the economic transaction, we are going to see that this has been deposited in another bank such as bank B here.

So, the T account for the bank will be like this; that means, the immediately when the amount is deposited here, the reserves will increase. We can see that this is nothing but excess reserve 90 increase in 90.

And the liabilities; obviously, you know that somebody depositing this money, immediately the checkable deposit increased by 90 dollars; that means, 90 is the liability. So, equivalent increase of reserve, that is 90, that is the increase in asset. And, again what we can here see

that the checkable deposits in the banking system have risen by another 90 million, though what we can see that for a total increase of 190 million.

So that means, 100 million at bank A, and now that is this one, that 100 million in bank A and 90 million in Bank B. So, in fact, the distinction between bank A and bank B is not necessary to obtain the same result on the overall expansion of deposit.

Suppose if the borrower from bank A write checks to someone who deposit them at bank A itself, the same change in deposit occurs. So, the T accounts for the bank B would just apply to bank A in and its checkable deposit would increase by the total amount of 190.

So, again the point here is that bank B has million that is the liability. Anyway, it wants to employ this fund and you know that, by now it cannot lend the entire amount, 10 percentage that comes 9 and remaining 81, it can give as loan.

So, how does when it is making a loan, the T account look like this, that the asset reserve is 9 and loans are loans is 81 and the liability that we have seen that it is 90.

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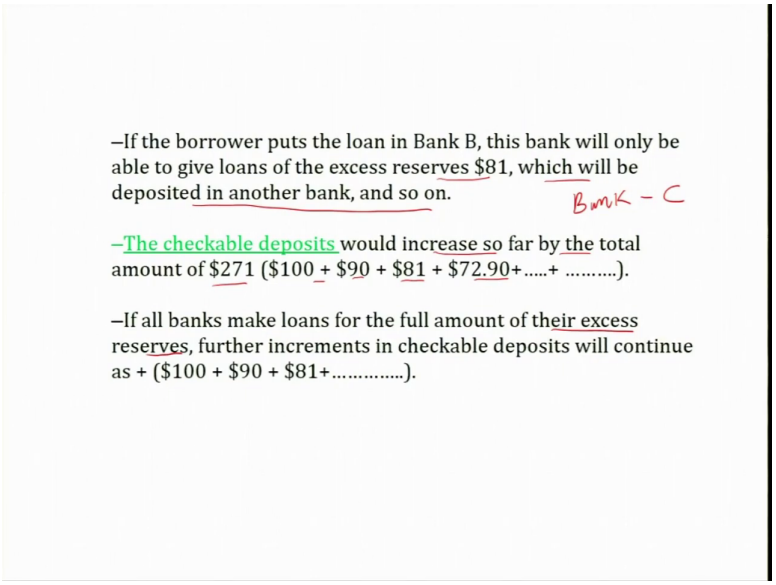

Let us continue this story; if the borrower puts the loan in bank B and this bank will only be able to give loans to excess reserve that 81 which will be deposited in another bank and so on. So, we continue this story in a way that the 80 million spend by borrower from bank A will be deposited in another bank, that is in bank C.

So, consequently, what we can see that from the initial 100 increase of reserve in the banking system, the total increase of checkable deposit in the system so far is 271 right. How does it look like? It goes like that the checkable deposit would increase so far by the total amount of 271, it keeps increasing like this.

So, following that the same reasoning if all banks; so, if all banks make loans for the full amount of their excess reserve; that means, without keeping any excess reserve, they only keep the required reserve ratio. And they make loans for the full amount their excess reserve, further increment in checkable deposit will continue at a bank C, bank D, E and so on. So, therefore, the total increase in deposits from the initial 100 increase in the reserve will be equal to 1000. So, the increase is tenfold here, which is a reciprocal of the 10 percentage reserve requirements.

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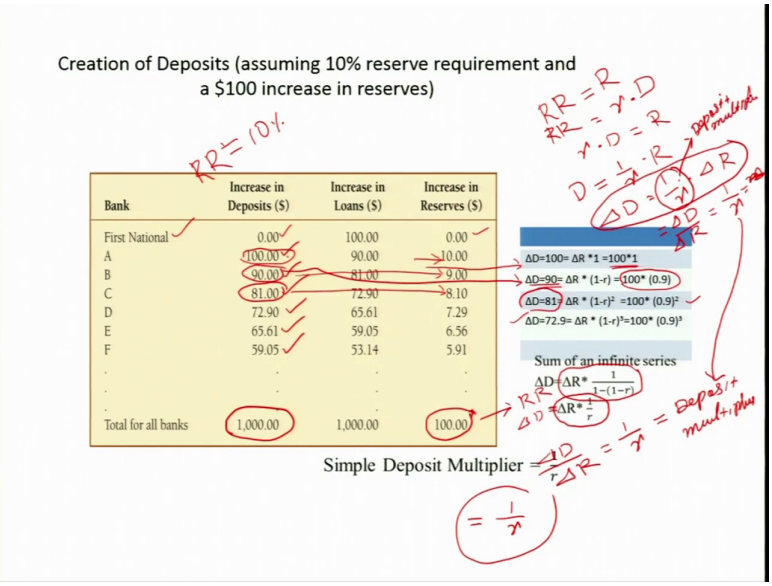

It looks like this. We started with the First Bank, then increase in deposit was 0 there because they got the money by selling security to the Fed and then we can see that the increase in reserve, we say that here 0. And, then the bank A got 100 dollars, then bank B, we have seen that assuming that RR is equal to 10 percentage, that is our assumption we can see that this sequence of events, the increase in deposits will be like this right.

So, in correspondingly we can see that when here 100 increases in deposit, then we can see that increase in reserve is 10. Here, in this case increase in reserve is 9, increase in reserve is 8, like that. So, at the end, the total for all banks, we can say that if the required reserve ratio is 10 percentage, the total increase in deposit is going to be 1000. So, the corresponding increase in reserve, that the reserve with the banking system, that reserve with the central bank as part of the RR, required reserve, is going to be 100 right.

So, here what we can say that, how this increase in deposit 100 happen, that we can write in the del D that the change in the deposit, that is 100 and is equal to del R times 1, 1 is equal to 100 dollars, that is the first one. Second one what you can say that this one, increase that is del D 90 happen here is equal to del R times 1 minus r; that means, 100 times 0.9, that is 90 percentage.

So, this is by multiplying, we are getting change in deposit is equal to 90, and in this case 81, we can see that is getting 81, but; that means, del R times 1 minus r square, this is the process. So, if we continue this, what we can see here is that this is an infinite series. The sum of the infinite series is del D is going to be del R times 1 by 1 minus times 1 minus r. So, this is the del D.

So, then del D, we can see that del D is equal to del R times 1 by r. So, here this is actually del D divided by del R, I is equal to 1 by the reciprocal of a required reserve. This is nothing but the deposit multiplier, this is the deposit multiplier here. So, we can see here that the simple deposit multiplier is equal to 1 by r, that is the simple deposit multiplier.

Simply, we can say that this is the reciprocal of required reserve ratio. So, in addition the same formula, we can also derive it using algebra. So, our assumption here is that banks do not hold any excess reserve. Means, that the total amount of required reserves in the banking system RR will equal the total reserves in the banking system; that means, total reserve R is equal to only reserve required reserve, not the excess reserve. So, that is our assumption.

The required reserve is equal to the total R. We assume here that the excess reserve, this bank keeps is going to be 0. So, the total amount of required reserves equals the required reserve ratio RR times, that is the small r times the total amount of checkable deposit. So, we can say that RR is going to be r, this is the required reserve ratio the percentage r times D.

So, substituting r times D for RR, because we already say that RR is nothing but equal to R. So, we can rewrite it that r times D is equal to R because we assume excess reserve is equal to 0 here. And, dividing both sides of this equation by R, we are going to get D is equal to 1 by r times R. And, then what we are going to see that we are going to see the change in D due to change in R right. So, that is the change in R, our starting point.

So, taking changes in both side of this equation, then just using delta to indicate a change, we can say that del D is equal to 1 by r times del R. So, here you can see that del D by del R is equal to 1 by r. This is nothing but the multiplier.

Finally, we can say that del D is equal to 1 by r and then this 1 by r, this 1 by r is nothing but the deposit multiplier. This is what we have derived here.

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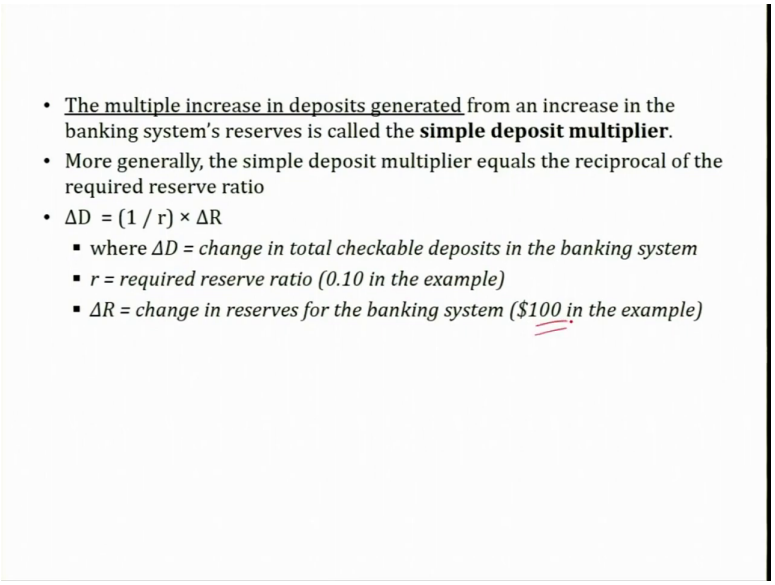

What we have seen here is that the multiple increase in deposits generated from an increase in the banking systems reserve is called a simple deposit multiplier. More specifically, the simple deposit multiplier equals the reciprocal of the required reserve ratio.

Here, I am just putting everything in one slide; that means, del D is equal to 1 by r time so, del R, with all that del D means change in total checkable deposits, r is the required reserve ratio. And del R the change in reserve for the banking systems, in our example this one is 100 dollars.

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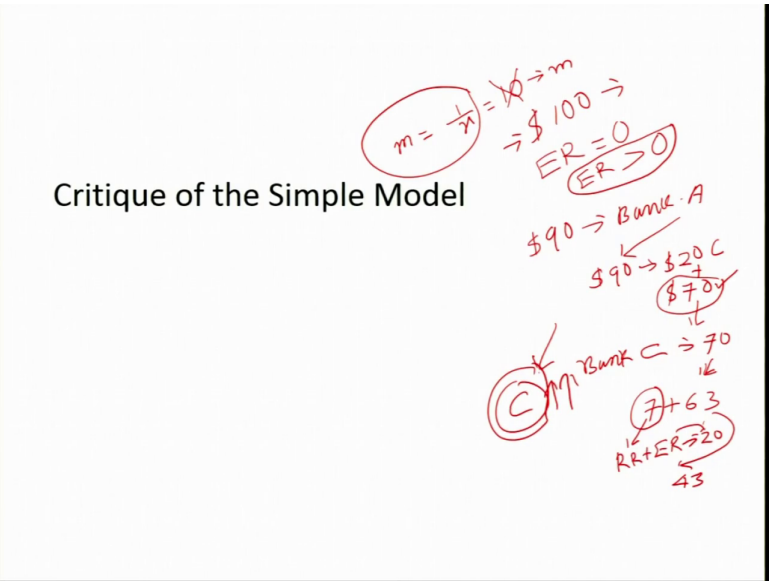

What are the critiques of this model? So, the thing here is that what we can see our model of deposit multiple creation seems to indicate that federal reserve is able to exercise complete control over the level of checkable deposits by setting the required reserve ratio. But the actual creation of deposit is much less mechanical than the simple model indicates.

We assumed that ER is equal to 0 here, that is our assumption. We assumed that ER is equal to 0, but it not necessary. We have seen in the previous sessions that; the ER depends how much ER the banking system want to keep. It also depends on the liquidity management of the bank. If they see a liquidity crisis and uncertainty in the economy, that there is unexpected deposit outflow.

In that case, you can see that this ER may not be 0, ER is going to be greater than 0. And similarly, we have seen that the 90 million from bank A bank as loan. Those who got this loan, instead of spending this money and depositing in bank B, what if they keep the entire 90 as cash with themselves. Or, what if they keep, some part of this, suppose, they keep 20 as cash.

And, if the bank keeps 20 as the excess reserve, then they will be left out with only 43. So that means, the way we saw in the formula, the deposit will be expanding exactly the reciprocal of the reserve ratio. But it not necessary that it happen in the same way. And, in another words, suppose the households who got this loan, if they want to keep more and more currency, if they want to keep more and more currency with them, then it does not lead to

multiple deposit expansion whereas. Thus, if some proceeds from loans are not deposited in banks, but instead are used to keep as currency, then we can see that less multiple expansion occurs overall. And the money supply does not increase by the amount predicted by our simple model of deposit creation.

We saw the deposit multiplier, that is 1 by r, is going to be 10. So, 10 is the multiplier that we saw here, but if banks begin to keep excess reserve greater than 0 and also people increase the currency holding and this one, if they keep more currency holdings, then, there will be less multiple expansion or occurs, it may not increase from 100 to 1000 and; that means, it will be less than that; that means, the multiplier value is not going to be 10. So, another situation that we ignored in this model is, one in which banks do not make loans or buy securities in the full amount of their excess reserve. Suppose bank A decides to hold on to all 90 million of its excess reserve.

No deposits will be made in bank B, and this will stop the deposit creation process. The total increase in deposits will be only 100 million, suppose if bank A does not make a loan. That means, if the bank A does not give any loan so; that means, the total multiple expansion of the deposit will not happen. Whatever the initial 100 dollar came to the bank through the open market operation, it just stays there.

So, that the total increase in deposit will be only 100 million, not the 1000 million increases in our example. So, hence if bank choose to hold on to all or some of their excess reserve; then we can see here that the full expansion of deposits predicted by the simple model of multiple deposit creation again does not occur. So, what we can see from here that from our discussion that, the Fed is not the only player whose behavior influence the level of deposits and therefore, the money supply.

The simple deposit multiplier is equal to 1 by r. So, based on this we only see that the central bank decides everything on money supply. But we can also see that other stakeholder is also come in the picture, that is the depositors those who decide that they must deposit. Another is the borrowers, what if the people, the people, individual and institution not borrowing.

Similarly, the banking system, their financial position, their bank management, how much excess reserves they want to keep. All these lead to another model, an extension of this model, that is called money multiplier, which we are going to discuss in the next session ah.

Thank you for watching this video and see you in the next section.

Thank you.

Keywords: money supply, deposit creation, open market operation, discount loan, required reserve, excess reserve, deposit multiplier, currency holdings