Economics of Banking and Finance Markets
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Lecture - 44
Fed fund rate determination I

Hi everyone, welcome to this session. The main objective of this session is to discuss the mechanism of Fed fund rate determination.

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I am here showing you one newspaper clippings where the Fed increasing the Fed fund rate. The Fed fund target rate is now increased to 2.25 to 2.5 percentage. So that means, the lower limit is 2.25 and the upper range is 2.5 percentage. So, in the previous session we have seen that this is the target rate, but the rate is determined by the demanding banks and supplying banks. Because Fed fund rate is nothing but a short-term interest rate in the context of inter-bank overnight loans, that is, overnight bank loans.

And, the effective Fed fund rate will be determined by the market forces, that the demand and supply for inter-bank loans. But Fed is going to have a say on the upper limit and the lower limit, it cannot go below 2.25 percentage and it cannot go above 2.5 percentage.

In today's session we are going to see how Fed can achieve this lower limit and upper limit; that means, the effective Fed fund rate is going to be somewhere between 2.25 and 2.5

percentage and is determined by the market forces. Then our focus is how Fed is going to influence the lower limit and the upper limit, how they ensure that the effective Fed fund rate is going to fall between this lower and upper limit.

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Importantly, one question that we have a little bit touched upon in the previous session was that why would banks trade in Fed fund market and how their transactions have been settled. we answered the first question that the banks trade in the Fed fund market, because some banks face their reserve deficit because they need to keep required reserve with the Central bank, and they borrow from other banks when they have a deficit.

And at the same time some other banks who are having some surplus, who are having excess reserve, they would make some profit by lending to the needy bank facing deficit. And since these member banks they have account with the Federal Reserve System, all the transaction can be easily settled through the Fed through the Fed account, so it will be easy for the member banks to engage in the Fed fund market.

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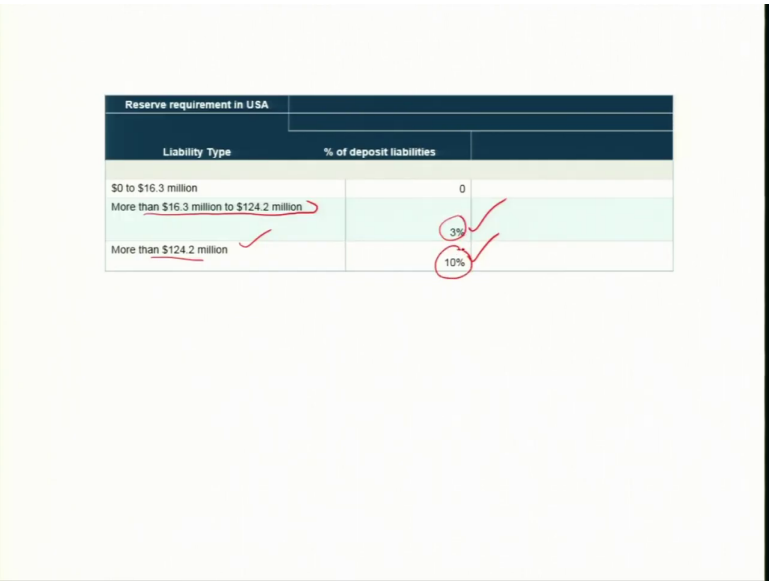

Why banks trade in Fed fund market, because some banks with their liabilities falling this range must keep only 3 percentage of their total deposit as required reserve with the Federal reserve system. At the same time, banks with a high balance sheet; that means, with a high liability falling above 124.2 million and they are mandated to keep 10 percentage of their total demand and time liabilities, with the Federal reserve system.

Let us take the case of two banks. So, because we saw here is that the small banks must keep only 3 percentage and the large banks must keep 10 percentage. So, normally all these banks in addition to required reserve, they also they can also have to keep some excess reserve as a cushion against deposit outflow.

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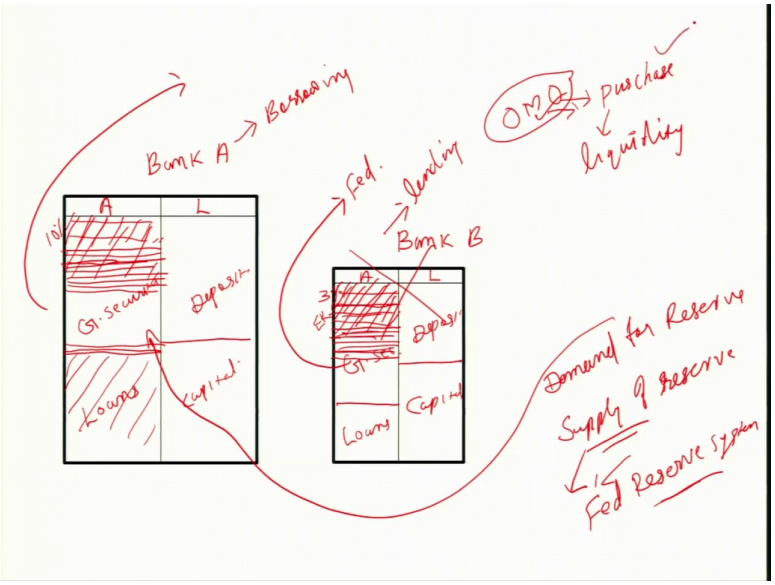

So, let us look at the small banks, let us put that bank B, and then the bank A who must keep 10 percentage of their total demand and time liabilities with the Federal reserve system. So, let us see these are the assets and these are the liabilities, So, what we can see that the assets, the large bank needs to keep 10 percentage as required reserve.

These are the government securities, and these are the loans that they have given. So, same way let us see here, this bank B has to keep only 3 percentage then this much is the government security (G.Sec) and this much is the loan, like that. And here let us see for example, this much is the deposit, that is the liability, and the other component of liabilities is equity capital.

So, here again let us make this much is the deposits and this is the equity capital. In practice this is the ideal situation, so we can say that if they must keep only three percentage, but what happens that sometimes the bank B will be having excess reserve with them.

As compared to the large banks, small banks have limited investment opportunities. In addition to serve as a cushion against deposit outflow, they will be keeping more reserve with them; so, in addition to required reserve they also have excess reserve as well.

This bank, the large bank, who is supposed to keep 10 percentage may not be able to keep these 10 percentages with the Fed. Sometimes, they will be having for example, 7 percentage

as reserve with Fed because they might have given more loans as they have more investment/loan opportunities.

Now let us assume that Central bank come up with open market operations; that means, they are purchasing these government securities; when Fed is purchasing securities from banks, you know that this securities component comes down this much.

We have seen in the previous session that immediately as an outcome of open market purchase, the proceed of this transaction will be credited into the member bank. For example, bank B is selling their government securities to Fed then; obviously, you can see that their excess reserve will be increasing.

So, this is a bank-wide open market operation, its not only increase the reserves of bank A, bank B, bank C, we can see that the liquidity of the entire banking system the liquidity in the banking system increases right; the liquidity in the banking system increases.

That means, all the banks who are participating in this open market sale will see a decline in their government securities, and as a result we can see that their reserves will be increasing, so that liquidity in the entire banking systems is increasing. We have also seen that that reserve is one of the most liquid assets of the bank.

So, the overall, the liquidity increases because of open market operation. So, the important thing we need to remember here that when Federal reserve system is doing an open market purchase, the reserves of the banking system increase, and, thus, liquidity with the entire banking system also increases. This has implications when we are going to discuss the demand for reserve.

So, when the open market operation happened, then lots of fund will be injected into the banking system, it means their demand for reserve also will come down.

Because they are getting excess reserve now, they are getting more reserve due to the open market purchase. This is an illustration to show that this is the reserve borrowing bank, and this bank is the lender in the Fed fund market.

But whenever it comes to the market for reserve, we are going to discuss two things. One we are going to say demand for reserve, then second one is supply of reserve. When we talk

about the demand for reserve, we are talking about this bank who is having deficit to meet their reserve requirement.

But when it comes to supply of reserve, in fact we are not going to talk about this bank because supply of reserve is coming from Federal reserve system; the supply of fund is done by Federal reserve system; in that way we will be developing our supply and demand framework here. So, simply demand is from the banks who is demanding the Fed fund market.

So, the supply of reserve, please keep in mind, this is done by the Federal reserve system. So, here in this example when they are making open market purchase, the supply of reserve by Fed is increasing.

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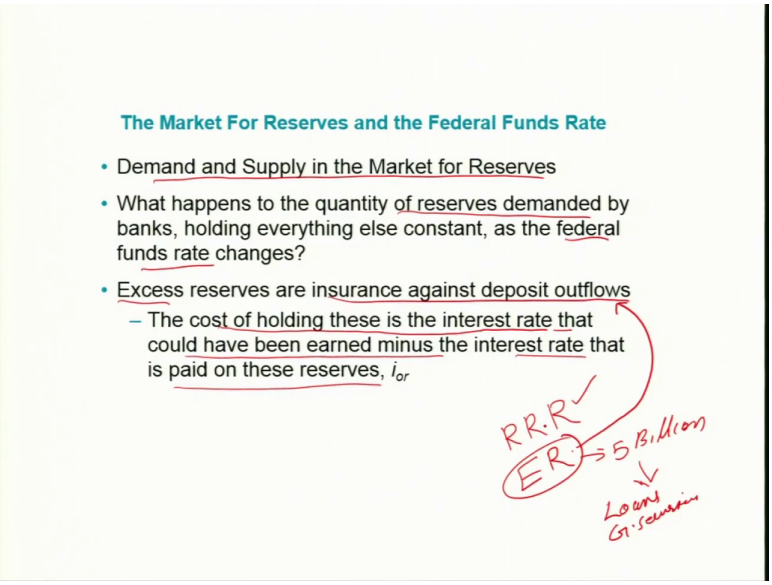

About the market for reserves and the Fed funds rate determination we need to talk about the demand and supply in the market for reserves. So, what we are going to answer here is that what happens to the quantity of reserves demanded by banks holding everything else constant when the Federal funds rate changes, due to market forces or due to Federal reserve systems intervention. Suppose Fed fund rate changes, then how the quantity of reserve demanded by banks change, what happens to the demand for reserves by banks?

So, here also we need to talk about reserves, we are not only just talking about the demand for required reserve only, but we also need to also need to include excess reserve as well. So,

sometime bank prefers to keep excess reserve on top of the required reserve as an insurance against a deposit outflow.

But at the same time, to make our demand and supply analysis more meaningful, (Refer Time: 13:10) we also need to think that there is a cost of holding this excess reserve. That is the interest rate that could have been earned minus the interest rate that is paid on this reserve by Federal reserve system.

So, importantly when the member banks keep their reserve with the Federal reserve system, they get interest rate on a required reserve ratio, they also get interest rate on excess reserve as well, both get same interest rate. So, when they are keeping excess reserve, they can keep more and more excess reserve as a cushion against, as an insurance against, deposit outflow.

But there is an opportunity cost, this is the cost of holding, this is the interest rate that could have been earned. Suppose they are keeping 5 billion, suppose this is excess reserve, they could have spent this money for giving loans, for example, or buying government securities. So that means, this interest rate is going to be greater than the rate of interest that they are getting from Federal reserve system, that the interest rate on reserve.

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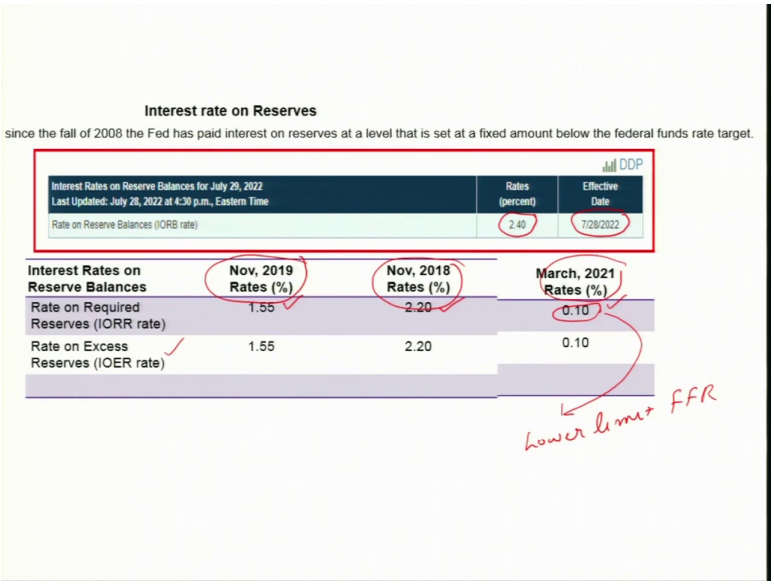

Now, I am showing you the interest rate since the fall of 2008 the Fed has paid interest on reserves at a level that is set at a fixed amount below the Federal funds rate target. So, I am showing you here this is the effective interest rate on reserve balances. So, that is 2.4

percentage, that is being given by the Federal reserve system to the member banks who are is keeping their reserve with the Federal reserve system.

This is same for both required reserve and for excess ratio, this is as on 28 July 2022. So, before I also showing you the interest rate on required reserve and excess reserve on other dates; that means, November 2019, November 2018 on March 2021. So, you can see that the required reserve it was 1.55 on 2019 but 2.20 on November 2018.

But almost one year before March 2021 the interest rate on a reserve was only 0.1 percentage. So, it has implication, the interest rate on reserves, on the Fed fund rate determination especially when we are going to talk about the lower limit of the Fed fund rate. In determining the lower limit of the Fed fund rate, the interest rate on these reserves is going to play an important role.

In determining the lower limit of the Fed fund rate the interest rate on reserve is going to play a crucial role. So, let us discuss that one while deriving the demand for reserves.

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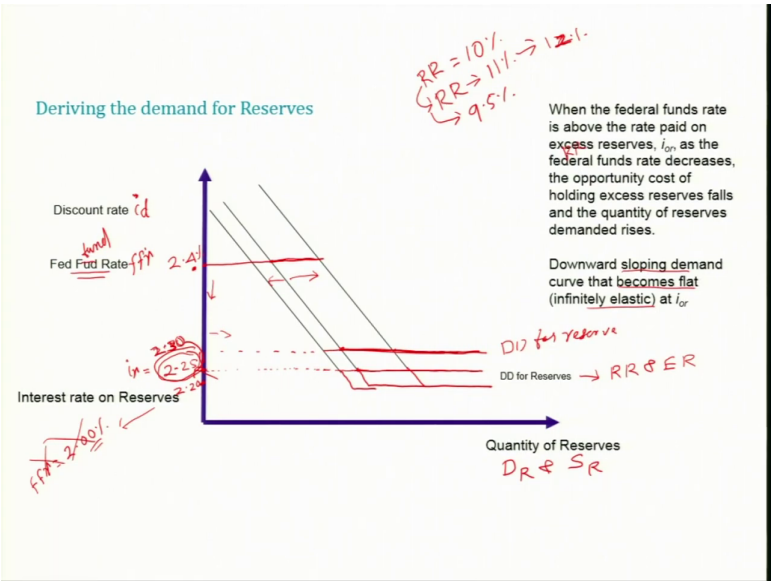

So, in this diagram, on the X-axis we are going to measure the quantity of reserves; that means, we will be talking about the demand for reserve and as well as the supply of reserves, we are going to measure both on the X-axis that is on the horizontal axis. And on the Y-axis, the vertical axis, we are going to measure mainly the Fed fund rate, that is our interpretation will be mainly in terms of Fed fund rate.

But in addition to that, we are also going to talk about the interest rate, that is Central bank is charging on the commercial bank for their loan that is the discount rate. So, that is the discount rate or interest rate on discount loans, let us denote it with id.

So, then Fed fund rate, let us call it as ffr, then interest rate on reserve let us call it as interest rate on reserve. So, what we are going to see here is that our demand curve and going to be a downward sloping demand curve; that means, on the downward sloping demand curve we can see that when higher the Fed fund rate in the market, then the demand for reserve will be coming down, you know the reason is that when there is increase in Fed fund rate, the opportunity cost of holding excess reserve will come down and the demand for reserve will come down. In this demand curve always remember that demand for reserve, it includes both the RR and ER.

From this downward sloping demand portion of the demand curve what we can see that higher the Fed fund rate lower will be the demand for reserve. When the Fed fund rate keeps on decreasing, then banks, especially the large banks will demand more reserve. They will be making a portfolio reallocation in a way that, they will be spending their money in the form of loans and buying government securities. Because they see that when they want to meet the RR, they can borrow from the Fed fund market. So, lower the Fed fund market, the opportunity cost of holding excess reserve declines.

So, they will be spending more of their fund for buying government securities and giving loans. So that means, when lower the Fed fund rate they will be demanding more. Then another thing you might have observed here that the demand curve, become horizontal after certain point of time, this point is here, this is, let us connect it through a dotted line.

So, this line is the interest rate on reserve, suppose this one is 2.25, this is the lower bound in the recently announced Federal fund target rate, this is what the Central bank or the Federal reserve system is going to give when banks keep their reserve in the Central bank. That means, for required reserve and excess reserve, banks are going to get a 2.25 percentage, if they keep their money with the Central bank.

So, since the Central bank is going to give 2.25 percentage as the reserve on required reserve and excess reserve, the effective Fed fund rate will never go below the interest rate on reserve. That means, we are going to see that, here when interest rate on reserve has been fixed at 2.25 percentage, we can see that Fed fund rate will never go below this.

After that the demand for reserve is going to be elastic, that means what does it mean? What is the implication of this? So that means, the downward sloping demand curve becomes flat, you know why, because when the Federal funds rate is above the rate paid on excess reserve; that means, above 2.5 whenever the Federal funds rate is above the rate paid on excess reserve, the opportunity cost of holding excess reserve falls and the quantity demanded rises right. So, is keep on demand the quality demanded keep on rising, but it would not go below 2.25 percentage. Because suppose what if suppose we assume that Fed fund rate became for example, due to some forces, but suppose what if fed fund rate is 2.2 percentage.

So, if Fed fund rate is 2.2 percentage and, but the Federal reserve system is giving 2.25 percentage as the interest rate on the reserves, for both the excess reserve and required reserve. So, all the member banks particularly those who are lending their reserve in the Fed fund market, they would not prefer to lend at the rate of 2 percentage instead they can deposit their money in the Fed and earn 2.25 percentage as interest on reserve.

That means already they are having account with the Federal reserve system, because and then they will be getting the interest rate of 2.25 percentage. So, there is no point in lending this money in the Fed fund market at a 2.2 percentage. Simply to summarize this point: when the lower limit of Federal fund rate equals the interest rate on reserve then, the Fed fund rate can cannot go below, as it does not make sense for the lending banks to lend below the interest rate on reserve in the Fed fund market.

That means, instead of lending in the Fed fund market, they can just keep their money idle with the Federal reserve system, they will be easily getting these 2.25 percentage return. So, in this way, what we have seen here is that below the point of the interest rate on reserve, the demand curve for reserve becomes perfectly horizontal.

That means infinitely elastic; that means, Fed fund rate will never go below or ir that is 2.25 percentage in our example.

What if suppose we are drawing this one, suppose the initially the required reserve is for example, suppose required reserve is 10 percentage. What if the Federal reserve system is going to increase the required reserve to 11 percentage or increasing to 12 percentage. So, what you can see that when Federal reserve system increases the required reserve, the demand curve will be shifting rightwards so; that means, suppose the Fed fund rate is suppose here, the market determined Fed fund rate is for example, 2.4 percentage.

So, here when the Federal reserve system is increasing the reserve from 10 percentage to 11 percentage, then at the same rate, they must demand more reserve because the reason that now the Federal reserve system has increased the required reserve ratio. As a result, there will be more demand for a reserve, event at the fed fund rate, the curve will be shifting rightwards.

And similarly, what if they reduce the reserve, from 10 to 9percentage. Then the demand curve will be shifting from right to leftwards. So, these are the changes going to happen when there is change in required reserve; that means, when the required reserve is increasing the curve will be shifting rightwards. And when they reduce the curve will be shifting leftwards.

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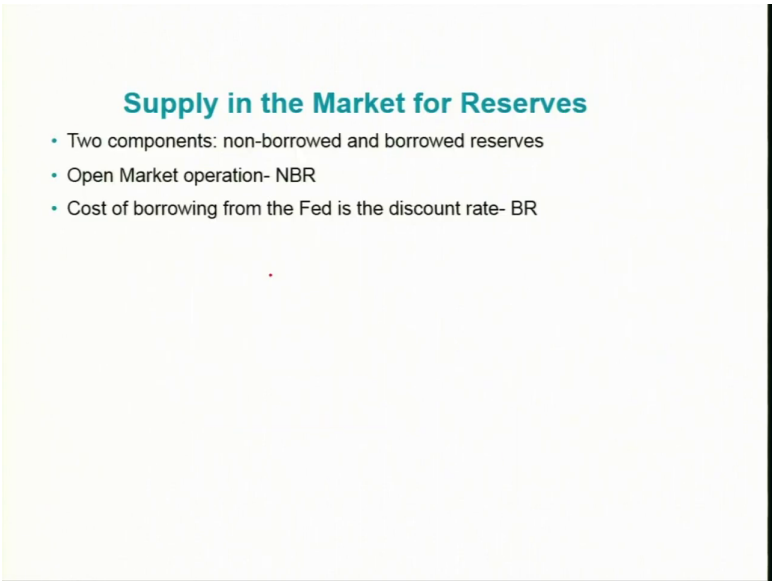

So, having discussed the demand part, the two things we need to remember here, one is the position. The position that means, you shift like rightwards and leftwards that is due to the change in required reserve, and the second one is slope of the demand curve we are going to say that the slope of the demand curve is negatively sloping, until the interest rate on reserve.

Suppose if they increase the interest rate to 2.3 percentage, then suppose from here then what we can see that then the demand curve will be like that, from here, it is going to be like that, the demand for reserves, new curve will look like this. Suppose this is the original curve, is the central one, then we can draw the horizontal part here.

Similarly, if they reduce it further suppose, if they make suppose they reduce interest rate on reserve to 2.20 percentage, then what we can do that we need to draw the diagram like, this is going to be like this; so accordingly, it will be like this.

In this session we have completed our discussion about the demand for reserve and in the next session let us discuss the supply of reserves, and subsequently how the Fed fund rate is determined in the market.

Thank you, see you in the next session.

Keywords: fed fund market, fed fund rate, lower limit, upper limit, required reserve, supply of and demand for fed fund, interest rate on reserve