Economics of Banking and Finance Markets
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Lecture - 51
IS-LM Framework - I

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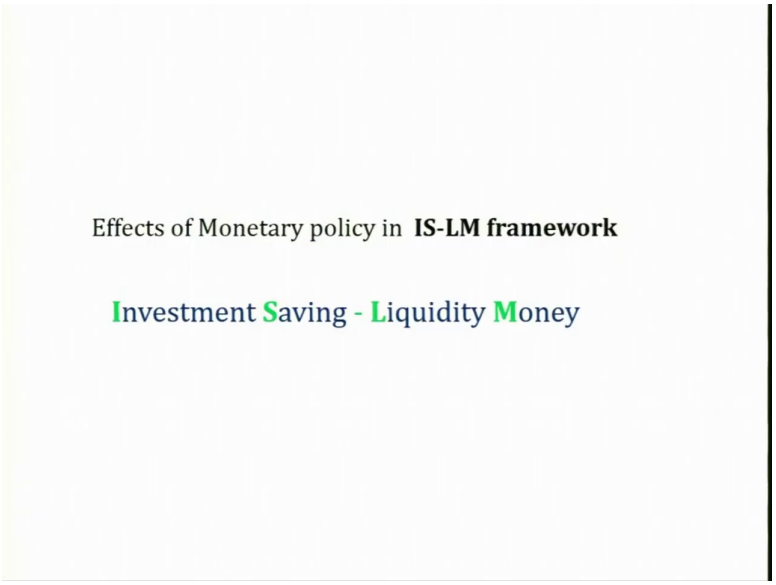

Hi, everyone. Welcome to this session. The main objective of this session and the following sessions is to discuss the effects of monetary policy on aggregate outcome, that is on GDP and employment, using the IS-LM framework. So, about the IS-LM the IS-LM is called as that Investment-Saving and Liquidity-Money. This is the expanded forms of IS-LM.

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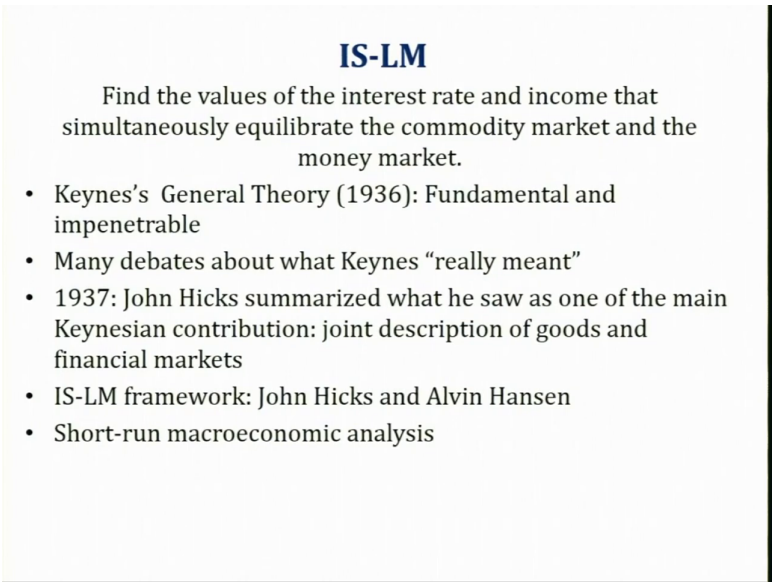

First, we will discuss what is IS-LM framework all about. Then once you get familiar with the IS-LM framework, we will introduce the monetary policy in the IS-LM framework and then we will see which way. using the IS-LM, it affects the aggregate demand and finally, the GDP. The main objective of IS-LM is to find the values of the interest rate and income that simultaneously equilibrate commodity market and the money market.

Prior to that as you may be aware that the Keynesian general theory; that means, as a response to the great depression of 1930s, the birth of Keynesians which also paved the way for the birth of macroeconomics. The Keynesian theory, simple Keynesian theory, mainly talked about that the use of fiscal policy to save the economy.

As a part of risk management, to save the economy from recession or economic macroeconomic disequilibrium, Keynesian theory supported for the use of fiscal policy, that is increased government expenditure and as a result increase aggregate demand and then increase aggregate demand which would finally, lead to an increase in GDP.

And in the Keynesian general theory, it is very fundamental impenetrable and there were many debates around what Keynes really meant in his general theory. So, in 1937 the Keynesians, especially John Hicks summarized what he saw as one of the main Keynesian contributions, is the joint description of goods and financial market.

This had led to the development of IS-LM framework by John Hicks and Alvin Hansen. The IS-LM framework is a tool to understand the short run macroeconomic analysis, then how changes in policy, for example, fiscal and monetary policy would affect different economic variable, and finally, the aggregate demand and GDP.

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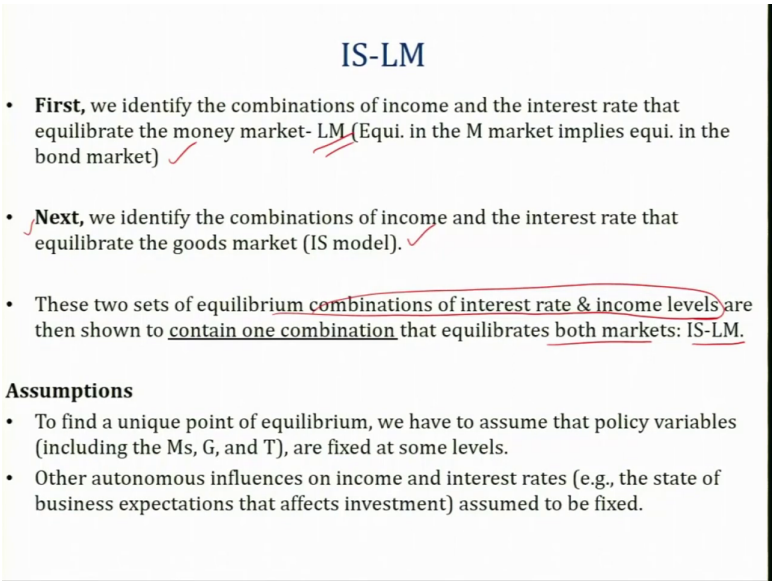

In our session, the focus is that first we identify the combination of income and interest rate that equilibrate money market that is LM; that means, LM means the equilibrium in the money market which implies again the equilibrium in the money market which we have seen in the previous session that if money market in is in equilibrium; that means, bond market is also in equilibrium.

First, we identify the combination of income and the interest rate that equilibrate the money market; Money market means the demand for money is equal to the supply of money. And subsequently we identify the combination of income and interest rate that equilibrate the goods market. We are going to call it IS model.

These two sets of equilibrium combinations of interest rate and income levels are then shown to contain one combination that equilibrate both markets; that means, IS-LM. So, in the IS-LM model we find out the equilibrium combination of interest rate and income levels. When IS market is in equilibrium, that is, goods market is in equilibrium, money market is in equilibrium, then finally, when both markets will be at equilibrium at a combination of interest rates and income levels.

So, before proceeding further in the IS-LM, we make few assumptions. One assumption is that to find a unique point of equilibrium where goods market and money market are equilibrium with a combination of equilibrium interest rate and income level, we must assume that policy variables such as money supply, government expenditure, tax are fixed at some levels and other autonomous influences on income and interest rates. For example, state of business expectation that affects investment that also assumed to be fixed.

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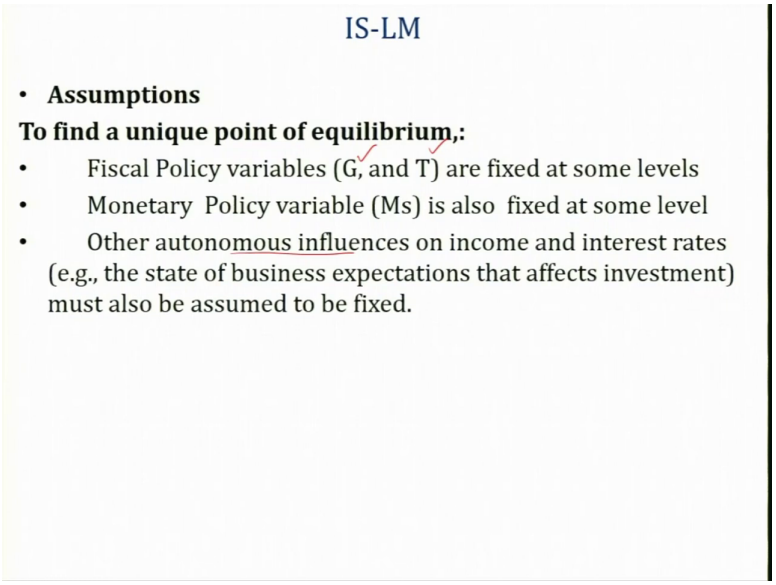

Thr main assumptions here is that to find a unique point of equilibrium we assume that clearly the fiscal policy variable, that is government expenditure and tax, are fixed at some levels. Coming to the monetary policy variable we assume that money supply is also fixed at some levels.

So, as I mentioned, other autonomous way influences on income and interest rate that the state of business expectations and that affect investment also must also be assumed to be fixed.

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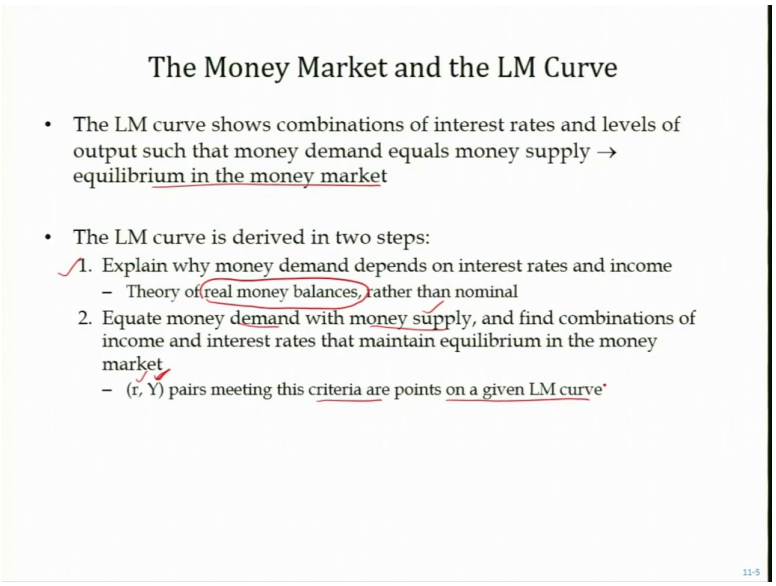

Let us first discuss the money market and the derivation of the LM schedule and LM curve. The LM curve shows the combination of interest rates and the levels of output such that money demand equals money supply; that means, there is equilibrium in the money markets. You know that equilibrium in the money market happens when the money demand is equal to money supply.

The LM curve is derived in two steps. One first we explain why money demand depends on interest rates and income. This also called as the theory of real money balances rather than nominal because people demand money not for just for the sake of demanding money, but for the purchasing power or to the real money balances; what people can do with that money. So, that means, the real purchasing power that the theory of real money balances.

Second one, equates the money demand with money supply, and money supply anyway is exogenously determined, equate money demand with money supply and find combinations of income and interest rates that maintain equilibrium in the money market. So, here rate of interest and income, that the small letter r rate of interest, capital letter Y that is the income (GDP), these are points on a given LM curve.

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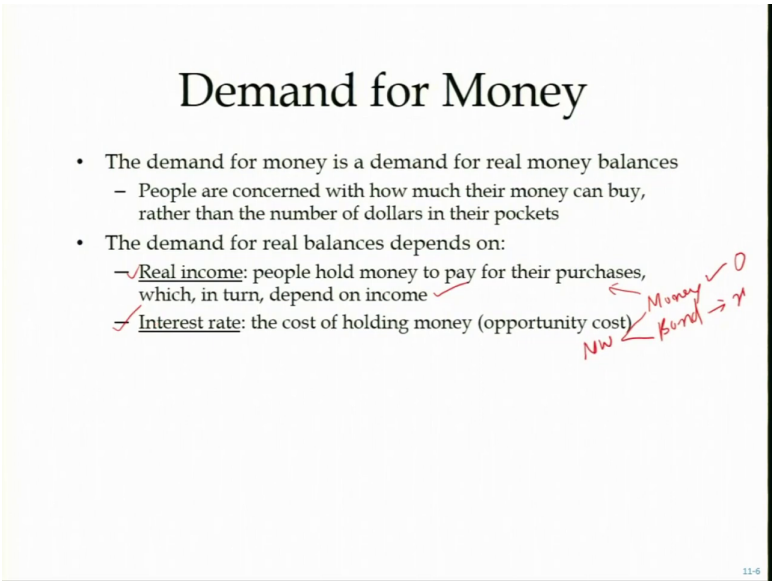

So, coming to the first aspect, demand for money as we mentioned, the demand for money is a demand for real money balances. It means people are concerned with how much their money can buy rather than the number of dollars or rupees in their pockets.

So, the demand for real balances depends on, one is, the real income that the people hold money to pay for their real purchases which in turn depend on their income, that is one. And, the second variable is the interest rate, that is, the cost of holding money, the opportunity cost of holding money.

So, we know that in a market when we put all the assets into money and bond, we know that for holding money, demanded mainly for transaction purpose and precautionary motive, and by holding money you would not get any interest income.

So, but when you alternatively suppose when you distribute your assets between money and bond, for money that is for transaction purpose, when you keep it for transaction purpose you get zero interest income. But, when you keep more money of your net worth or assets, then actually you are foregoing your interest income. That means here, if you invest in bond, you are going to get interest income.

So, that means, the interest rate here is the opportunity cost of holding money, right. So, when the demand for money, these two things matter, one is the real income then higher your level

of real income; that means, the more will be the demand for money because you need more money for to meet your transaction and precautionary purposes.

However, the interest rate, that is, the opportunity cost; that means, the cost of holding money, higher the rate of interest means the money demand will be low.

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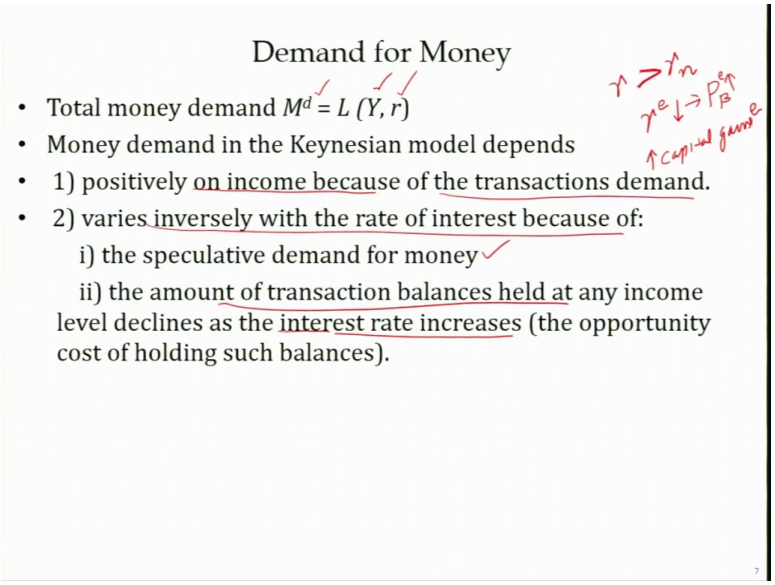

So, the total money demand we can write as a function of real income and the rate of interest. And, where you can see that money demand in the Keynesian model depends positively on income because of the transaction demand; that means, higher the income then higher the transaction demand for money. And, however, it varies inversely with the rate of interest.

Because the point we discussed here, when the rate of interest is high, suppose the rate of interest is higher than the natural rate of interest, suppose let us call it natural rate of interest; that means, the current rate of interest is greater than the natural rate of interest.

There is an expectation that in the future rate of interest will come down. So, as a result there will be less speculative demand for money because you know that when the rate of interest is going to decline in the future, this would lead to capital gain, then as a result the people will demand less money.

When the current rate of interest is greater than the natural rate of interest, people anticipate that in the future the expected rate of interest is going to decrease in the future because currently it is above the natural rate.

Then when the rate of interest decline then you know that the expected price of bond going to increase, the price of bonds is going to increase; that means, people are going to make capital gains in the future. So, the expected capital gains increase the expected capital gains.

So, as a result, of the total assets they will be keeping more money in the bond market; that means, the money meant for speculative demand decreases when the rate of interest is greater than the natural rate of interest.

So, higher rate of interest means low speculative demand for money, and the other one when the rate of interest is high, the amount of transaction balance held at any given income level also declines because high interest rate means increase in the opportunity cost of holding such balances increases, then people will reduce their transaction demand for money.

To summarize this one, the demand for money is inversely related to the rate of interest because higher the rate of interest lower the speculative demand for money. And, secondly, higher the rate of interest and lower will be the transaction demand for money because of the opportunity cost of holding money, because money does not pay any interest, but investing in bond market gives them interest income.

So, higher the interest rate, people will invest more money in the bond market; that means, they will reduce transaction demand for money.

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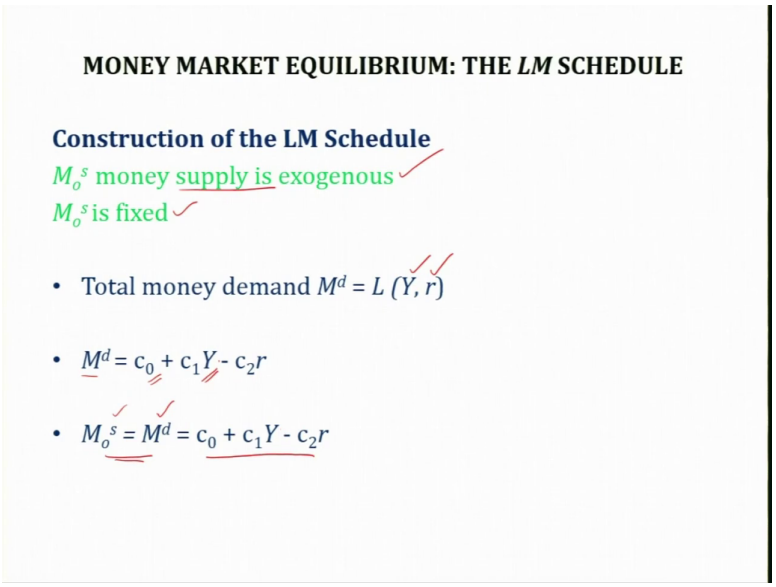

Let us now construct the LM schedule. I mentioned at the beginning money supply is exogenously determined, this is a policy variable. And, the Central Bank, the monetary authority, their decision to increase the money supply is a policy decision, not depend upon the rate of interest.

It depends on the economic conditions and the objectives of the monetary policy to fulfill their objective; they will be changing the money supply accordingly. So, in our discussion, since money supply is exogenously determined in our analysis, we assume that money supply is fixed.

So, the total money demand is a function of real income and rate of interest. So, we can write it that the money demand is equal to a fixed component plus positively related to the GDP that the coefficient c_1Y that is positively related to the income and negatively related to the rate of interest. So, let us call it that is the inverse that is minus c_2r.

So, c_1 and c_2 are the coefficients that we are going to estimate later. So, that is the coefficient of related to income and rate of interest. So, the money demand is equal to c_0 plus c_1Y minus c_2r, that is exactly replicating the positive relationship with the income and negative relationship with the rate of interest.

Since the money supply is already given so, to attain equilibrium, money supply should be equal to money demand, where money demand is, but we already know, c_0 plus c_1Y minus c_2r,. Later, we will be using this equation while continuing our discussion with the LM schedule. For the moment let us take that, this is money supply is equal to money demand.

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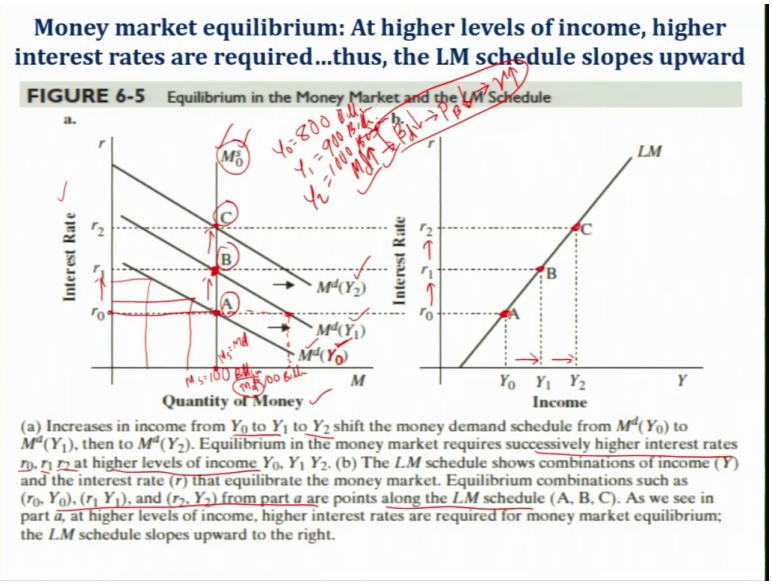

To attain the money market equilibrium, we are going to show that at higher levels of income, higher interest rates are required, then we are going to show that LM schedule slopes upward. So, since our assumption is that money supply is fixed, in this diagram I am putting here the rate of interest on the y-axis, the quantity of money on the x-axis.

And about the money supply diagram, it is a vertical one this, is interest in inelastic, this is exogenously fixed, and it is arbitrarily fixed by the monetary authority. At a given point of time, this is the money supply that is M^s_0. Then let us begin at a given level of income, for example, Y_0. So, here, this is the given level of income and at a given rate of interest for example, r_0, we can see that this is the money demand curve.

So, you can see that at a given income level Y_0, the money demand curve is M_d. So, M_d is the money demand curve, a downward dropping demand curve, you know that higher the rate of interest, then lower the money demand. When the rate of interest declines, then the money demand will increase; that means, when the rate of interest declined means the transaction demand for money increase because opportunity cost of holding money decrease.

And again the speculative demand for money also increases. You know why? Because when the rate of interest, there is an expectation that in the future rate of interest will increase. When the rate of interest rate of interest is going to increase in the future, people are anticipating a capital loss from bonds.

Then there will be less demand for bond; that means, increased demand for money; that means, speculative demand for money also increases. So, then finally, you can see that the equilibrium will be attaining where money demand is equal to money supply, that is at point A. So, this demand curve is drawn that the demand curve Md when the income is Y_0.

So, this is the equilibrium point, and the rate of interest is determined at r0 and this is the money supply and money demand. So, money supply and money demand are at equilibrium at this point. For example, let us call it money supply is one hundred billion, just at this point assume that money supply is equal to 100 billion. So, the money demand is also going to be equal to 100 billion, that is the Md. So, at this point you can see that Ms is equal to Md.

Now, assume that there is an increase in income from Y0 to Y1, then further from Y1 to Y2. Let us assume that there is increase in income from Y0 to Y1, when there is an increase in income, as we have discussed in our session that increase in income lead to increase in the transaction demand for money.

Suppose initially the GDP suppose take the GDP is for example, 800 billion suppose that is initial GDP that is Y0 is 800 billion. Now, become Y1 becomes for example, 900 billion, then you know that here our assumption is that Ms is already fixed. Ms is fixed then to transact this 900 billion of goods and services, in real terms, they need more money for transaction purpose.

So, as a result they will be demanding more money, then you know that when the demand for money increases, because their total asset total assets is money and bonds, when the demand for money increases the demand for bond decreases, when the demand for bond decreases means the price of bond decreases.

When the money demand increases you can see that demand for bond demand decreases. So, when the bond demand decreases the bond price also decreases, when the price of bond decreases means rate of interest increases. So, in this diagram what we can say that when there is increase in income, people demand more money, so that means, money demand increases, then the channel that we mentioned that decrease price of bond increases the rate of interest.

We can see that the money demand curve will be shifting rightwards. So, because of the increase in income, at the given rate of interest, people should be demanding this much

money, but because the increase in money demand and all the points that we discussed here, we can see that the curve will be shifting anyway the new demand curve is Md Y1. This is the new demand curve.

But, because of the channel that we discussed here, you can see that the rate of interest is increasing but the money supply is anyway already fixed, for example, 100 billion. So, the new point of equilibrium is going to be at point B where you can see that people demand more money because they need more money a higher level of income, however, because of the mechanism that we discussed here the rate of interest increase.

Rate of interest increase is nothing, but the opportunity cost of holding money, that is, opportunity cost of demanding money increases. So, because of that, though initially there is a pressure of increase in money demand, finally, they will be contained with whatever they are having, that the initial money supply, because increasing rate of interest increases the opportunity cost. So, as a result the money demand will be equal to the initial position.

So, that means, they will be contained with the initial money supply, that the 100 billion, then the money demand also become 100 billion because of the high rate of interest. That means, a high rate of interest is required in the money market to attain equilibrium; high rate of interest is required; that means, successively higher interest rates that is r0 and r1. So, here the rate of interest is required to make money market in equilibrium.

Similarly, further if there is increase in income Y2, again the same mechanism will work. Suppose Y2 is for example, 1000 billion, then again, the same mechanism holds here, then you know that the rate of interest increase, then finally, money demand is equal to money supply at this point, then again the money market is in equilibrium.

So, what we can see here is that a higher the level of income, these points, higher the level of income when GDP increases, money demand increases. However, due to increase in rate of interest money demand will be equal to the initial position because we equate with the money supply so, the rate of interest increase. Importantly, to ensure the money market is in equilibrium, an increase in income leads to successively higher interest rate at a higher level of income.

So, because of that we can see that a higher level of income, when the GDP increases, for the money market equilibrium, it requires higher rate of interest. So, that means, the equilibrium points are like that higher the GDP, the rate of interest also increases.

So, that means, at higher levels of income for the equilibrium in the money market, the equilibrium combinations such as this one points along the LM schedule, we can see that as a result higher income requires successively a higher rate of interest where money market is in equilibrium, that the money demand is equal to money supply, then accordingly, we can see that the LM curve is upward sloping. So, the LM curve is upward sloping.

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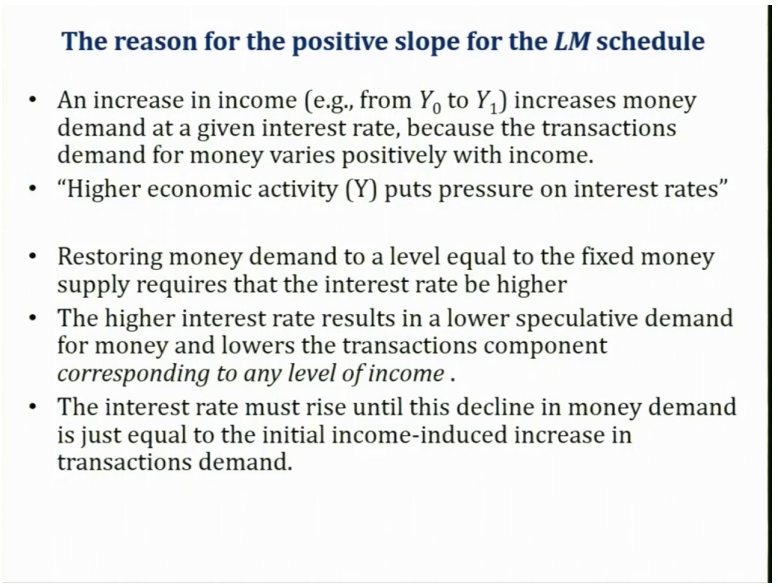

So, just to summarize this point; the reason for the positive slope for the LM schedule: an increase in income increases money demand at a given interest rate, because transaction demand for money varies positively with the income. And higher economic activity puts pressure on interest rates. So, to restore money demand to a level equal to the fixed money supply requires the interest rate be higher.

The higher interest rate results in a lower speculative demand for money and lower transaction component corresponding to at any given level of income. The interest rate must rise until this decline in money demand is just equal to the initial income-induced increase in transaction demand for money.

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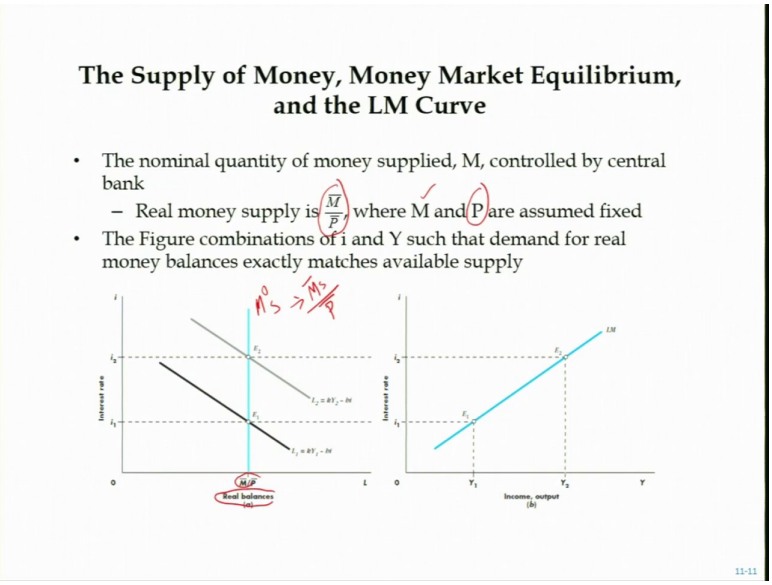

Let me also show you here, this diagram the money supply which we mentioned here, this is the real balances. It should be expressed in real terms of the money supply divided by the price level. This is another way because we are talking about the real money supply; that means, real money supply M divided by P.

So, again to do that what we say that we also assume that the price level is also fixed, this is another way of presenting that is the Ms, it also can be written as Ms divided by the price level. So, here our assumption is that money supply is fixed and again the price level is also fixed.

So, in the next session we will continue this discussion, there we will also see what are the factors that affect shifting of LM curve and subsequently we will also derive the IS schedule and IS curve.

Thank you.

Keywords: money market, goods market, IS-LM, rate of interest, level of income, equilibrium, opportunity cost, transaction demand for money, speculative demand for money, upward sloping