

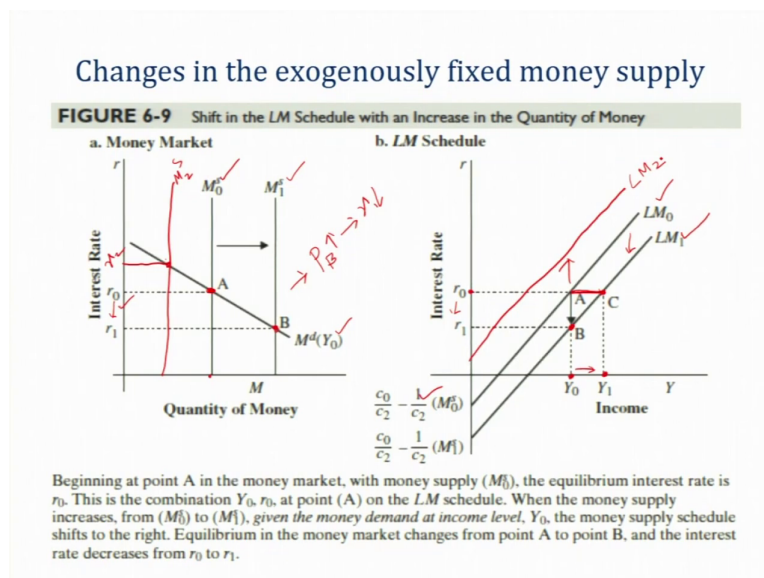
**Economics of Banking and Finance Markets**  
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**Lecture - 53**  
**Policy Effects in IS-LM Framework - I**

Hi everyone, welcome to this session, the main objective of this session is to discuss the factors that shift the LM schedule.

There are 2 factors that shift the LM schedule: one is changes in the exogenously fixed money supply and the second factor is shift in the money demand function.

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Let us discuss one by one. Coming to the first part, that is, the changes in the exogenously fixed money supply, the money supply assumed to be a policy variable. And when we consider an increase in money supply, for example, we mean a policy action setting this policy instrument at a new level.

So, from this diagram what you can see that, the money supply curve, initial money supply curve is  $M_0^s$ , and at this stage the quantity money demanded is this much; that means, point A is the equilibrium given money demand curve at  $Y_0$ .

$M_d$  at when the level of income is  $Y_0$  and you can see that the rate of interest is  $r_0$  at this position. So, what is going to happen when the money supply increases? When the money supply increases you can see that the money supply curve shift to right; that means,  $M^s_1$  is the new money supply curve. As a result, you can also see that other things remaining constant; we assumed here that the level of income remaining same.

That means,  $Y_0$  income remain same, at this position when money supply increases, then the rate of interest decreases; that means, the rate of interest become  $r_1$ , rate of interest falls to  $r_1$  from  $r_0$ , the rate of interest decreases here. So, the mechanism behind why rate of interest decrease?

You know that when money supply increases for the given level of income, people are having more money, now people are content with more money. And assuming that there are only two assets, bonds, and money, where money do not pay interest and whereas bonds pay interest income as well as capital gain or capital loss. So, as a result when the money supply increases, for the given level of income, people are having more assets, it means, they will demand more bond.

So, in the bond market, the demand for bond increases and as a result the price of bond increases. Price of bond increases means, due to the inverse relationship between bond price and the rate of interest, you can see that the rate of interest decrease. So, that you can see that in this diagram the rate of interest falls from  $r_0$  to  $r_1$ . So, this is for a given level of income.

Now when we want to plot a LM curve at this position, because our income level is same what will be the new rate of interest? The new rate of interest falls from  $r_0$  to  $r_1$ . When the money supply increases for the given level of income then the LM curve will be shifting right wards to the down.

So, as a result you can see that rate of interest for the same given level of income, the equilibrium is possible only at this position; that means, at the point B, at this position only equilibrium is possible, the rate of interest must decline and the new equilibrium point will be here so; that means, that is possible not at the initial LM curve.

On the initial LM curve, the rate of interest was  $r_0$  when the money supply was  $M_0^s$  you can say that  $LM_0$  is the initial LM curve, now the LM curve will be shifting down.

The LM schedule will shift down if the money supply decreases, and the LM curve will be shifting rightwards when the money supply increases.

Let us now discuss when the money supplies increase. An increase in money supply from  $M_0$  to  $M_1^s$  can be seen here; that means, a decline in the equilibrium rate of interest rate to  $r_1$  for a given level of income.

Since the income is fixed for the new higher money supply to be equal to the money demand, the interest rate must be lower to increase the speculative demand for money and transaction demand for money for a given level of income. So, in general what we can see here is that with a higher money supply for a given level of income, the interest rate that equilibrates money market will be lower.

The new LM schedule that we can see here will lie below the initial LM schedule of  $LM_0$ , it will just lie below this one. So, it will be shifting down rightwards. Alternatively, consider the point on the new LM schedule that gives the equilibrium level of income corresponding to, for example, at this point.

So, you can also look at here; suppose if the initial rate of interest must be kept there; that means,  $r_0$  must be retained in this case, considering that given the equilibrium level of income; if you want to retain the initial rate of interest income must increase. So, you can see that this can be the new equilibrium position if the rate of interest to be same  $r_0$ .

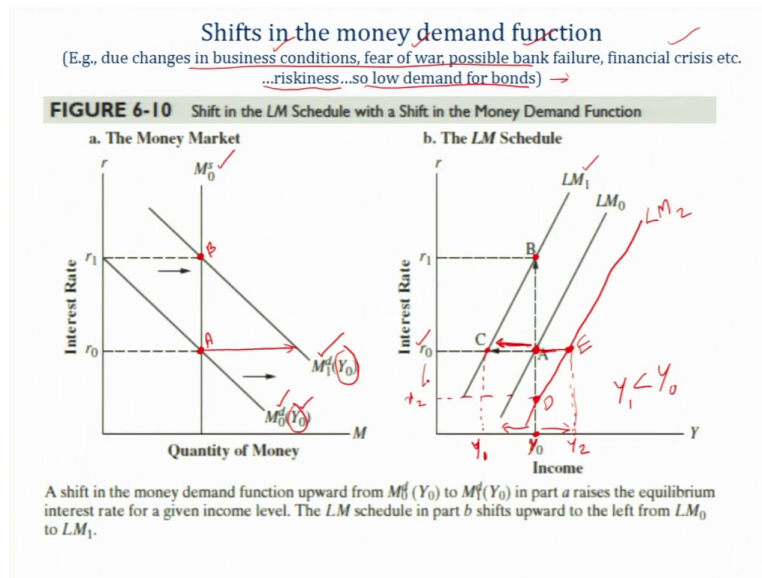
Then the money market equilibrium is possible only at a higher level of income, that is  $Y_1$ . So, there are two interpretations about money market equilibrium when the money supply has increased. If the income remaining same, then the rate of interest must reduce from  $r_0$  to  $r_1$  for money market equilibrium where money demand is equal to money supply. In contrast if the rate of interest needs to be constant then equilibrium is possible only if income is increased from  $Y_0$  to  $Y_1$ . What we can see from this diagram is that an increase in the money supply shift the LM schedule to the right.

Similarly, if there is a decrease in money supply, suppose money supply decreases to  $M_2^s$ . So, in this case rate of interest will increase. So, whatever the points that we have discussed now, you can apply in this context as well; that means, money supply decrease people are having less money and then their demand for bond declines.

Demand for bond declines means bond price declines and as a result rate of interest increase. So, this is going to be the new rate of interest. So, accordingly we can draw the new LM schedule like this is LM2.

Let us now discuss another factor called change in the demand for money function.

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A shift in the money demand function means a change in the amount of money demanded for a given level of interest rate and income. Keynes called it as a shift in the liquidity preference.

The changes or shift in the money demand function happen, for example, due to changes in business conditions or fear of war, look at all these factors changes in business conditions suppose that is the business conditions become very pessimistic, very dark future ahead.

For example, in the economic scenario future pessimistic business conditions, fear of war or possible bank failures or financial crisis and as a result you know that the overall riskiness in the economy increases, the uncertainty level increases.

So, people will be making less investment in bond market and stock market. So, that you can see here that there will be low demand for bonds because of the adverse business condition and fear of war etcetera, there will be low demand for investment in bond market and security market and that means, as a result people will be demanding more money. So, due to these adverse business condition, the liquidity preference increases.

That means, people are demanding more money, when they demand more money, this situation would be a shift in individual portfolios away from bonds toward money for a given level of interest rate and income. So, in this case how does it look like? So, here assume that this is the given money supply, and the income is  $Y_0$ .

At the same income level, that is,  $Y_0$ , assume that there are adverse business conditions, as a result people will be demanding more money. So, the new money demand curve  $M_d$  is shifted to rightward, this is the new money demand curve is  $M_{1d}$ . So, now, people are demanding more money at the same rate of interest.

So, what does it mean? They are demanding more money; that means, there is a shift in the money demand function so; that means, the liquidity preference has increased. So, you can see that this is the new money demand curve. So, you can see that new equilibrium position. So, the initial equilibrium position for money supply equal to money demand at this position.

At the same level of income that  $Y_0$ , now people are demanding more money for transaction purpose or maybe they may be keeping it for speculative purpose as well, this is the new equilibrium position, new money demand curve is this at the same given level of income you can see that the rate of interest increases.

Because at the new equilibrium position, money supply is equal to money demand, at this position the rate of interest is  $r_1$ . As a result, when the liquidity preference has increased the new LM schedule is going to be  $LM_1$  from  $LM_0$ .

The LM curve shifts upwards, and this is going to be the new LM schedule. So, the equilibrium position is here; that means, from A new equilibrium position is B where you can see that the income remaining constant at the same level of income, money market will be in equilibrium, not at the not at the point of A anymore because increase in the money demand function or liquidity preference the new equilibrium position is going to be B.

So, as a result the rate of interest must increase and that will discourage them to reduce their money demand. So, that money supply is equal to money demand; that means, money demand is restored with the initial money demand; that means, before the change in this liquidity preference; so, to do that the rate of interest must increase.

So, at the given level of income this is going to be the new equilibrium position; that means, you can see that for a given level of income  $Y_0$ , the new LM curve, that is  $LM_1$  will be above the old LM schedule of  $LM_0$ . You can see here that this is one option: the rate of interest must increase.

Similarly, maintaining equilibrium in the money market at  $r_0$ , what if we want to keep this  $r_0$  constant? Maintaining equilibrium in the money market at  $r_0$  after the shift in the money demand schedule would require a fall in income.

If you look at the horizontal axis, you can see that to maintain any equilibrium in the money market at  $r_0$  rate of interest requires a fall in income to a level below the  $Y_0$ .

So, suppose here, the income level  $Y_1$ ; where we assume  $Y_1$  is less than  $Y_0$ . This would shift the LM to the left of the  $LM_0$ . This point on  $LM_1$  at  $r_1$  is to the left of the  $LM_0$ . So, this is shown at point C in this diagram. So, here shift in the money demand function, that increases the demand for money at a given level of both interest rate and income shift the LM schedule upward and to the left.

And a reverse change in money demand; that means, decrease in the money demand function, or decrease in the liquidity preference; that means, lowering the amount of money demanded at a given level of income and interest rate, the LM schedule shift downward to the right.

The liquidity preference will come down if the business conditions are very optimistic and very bright, and there is increased certainty and people are having more trust on the financial institutions. People, instead of demanding more money, they will be investing in bond market and stock market, it means demand for money decline. So, in this case equilibrium is possible in this way.

This position, same level of income and rate of interest, now the rate of interest will decline to this position, if same interest rate has to be restored then income has to be increased this is going to be the new income; that means, this is A B C D E. So, when the money demand function shifts or liquidity preference declines, the LM curve shifts downward to the right, and new equilibrium position is E; if we want to retain the initial rate of interest  $r_0$  then the income must increase.

Otherwise, if income must be kept at the same position that the  $Y_0$ , then the rate of interest must decline to  $r_2$  from  $r_0$ .

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### **The *LM* Schedule: Summary**

- 1.** The *LM* schedule is the schedule giving the combinations of values of income and the interest rate that produce equilibrium in the money market.
- 2.** The *LM* schedule slopes upward to the right.
- 3.** The *LM* schedule will be relatively flat (steep) if the interest elasticity of money demand is relatively high (low).
- 4.** The *LM* schedule will shift downward (upward) to the right (left) with an increase (decrease) in the quantity of money.
- 5.** The *LM* schedule will shift upward (downward) to the left (right) with a shift in the money demand function that increases (decreases) the amount of money demanded at given levels of income and the interest rate.

So, let us summarize what we have discussed so far. The *LM* schedule is the schedule giving the combination of values of income and interest that produce equilibrium in the money market and the schedule slopes upward to the right.

*LM* schedule will be relatively flat if the interest elasticity of money demand is relatively high and *LM* schedule will shift downward to the right with an increase in the quantity of money. So, similarly *LM* schedule will shift upward to the left with a shift in the money demand function that increases the amount of money demanded at a given levels of income and interest rate.

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## IS schedule

Objectives:

- 1: Finding the set of interest-rate and income combinations that produces equilibrium for the product market.
- 2: Examining the factors that determine the slope of the IS
- 3: Examining the factors that determine the position of the IS.

Let us now discuss the IS schedule. IS schedule means the product market equilibrium. So, in this section while discussing IS schedule we are going to see what the necessary conditions are so that the product market is in equilibrium. We are going to derive the necessary the conditions that make a product market is in equilibrium. So, we will identify what are the components of product market, what makes the product market in equilibrium.

So, the main objective here is to be finding the set of interest rate and income combination that produces equilibrium for the product market. And subsequently we will examine the factors that determine the slope of the IS curve. In addition, we will also discuss the factors that determine the slope and the position of the IS curve; that means, the factors that determine the shifting of the IS curve.



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A Quick Overview

$$Y = C + I + G$$

- $Y_{AS} = Y_{AD}$
- **Aggregate Output (AS) must equal Aggregate Demand (AD)** or desired aggregate expenditures on output.
- $Y_{AD}$  (that is,  $E$ ) consists of  $C$ ,  $I$  and  $G$   
 $Y_{AD} = E = C + I + G$  .....(2)  
 $Y_{AS} = C + S + T$  .....(3)  
(National product = factor income which in turn used for  $C, S, T$ )
- Since  $Y_{AS}$  is national product,  
 $Y = C + I_r + G$  .....(4)  
( $I_r$  is realized investment)

About the first part, let us make a quick overview of the simple Keynesian model that will help us to discuss the IS curve. So, in the simple Keynesian model in a closed economy we make that the aggregate demand, means,  $Y$  that is aggregate demand, aggregate demand is equal to consumption plus investment plus government expenditure.

So, consumption means, the expenditure on goods and services by households, investment means expenditure on capital goods by firms,  $G$  means, government expenditure that is the government expenditure in the economy so, that is the aggregate demand. So, for the macroeconomic equilibrium, one of the main conditions of macroeconomic equilibrium is aggregate supply is equal to aggregate demand.

So, aggregate output must equal to aggregate demand or desired aggregate expenditure should be equal to the aggregate supply. So, here  $Y_d$  is  $AD$ ; that means, aggregate demand, let us denote it with the capital letter  $Y$  and  $AD$ . The aggregate demand consists of consumption plus consumption expenditure investment expenditure and government spending; that means,  $AD$  is equal to aggregate expenditure is equal to  $C$  plus  $I$  plus  $G$  this is equation number 2.

Aggregate supply: looking from the supply side of the economy we can see that aggregate supply is equal to consumption plus savings plus tax. So, this is the macroeconomic way we look at the supply side of the economy, using this identity; that means, aggregate supply is equal to consumption plus saving plus  $T$ . So, here what we can see that national product, the

aggregate supply, we can also say that national product is equal to factor income which in turn used for C plus S plus T.

Since Y AS is national product, we can write that Y is equal to C plus I<sub>r</sub>. I<sub>r</sub> here means, realized investment because there is a desired investment by the firms, but when we want to make it equal to Y AS, the I<sub>r</sub> we need to write instead of I<sub>0</sub>, that the desired one we need to write it as the actual investment made by the firms (the productive sector) plus government expenditure. So, that means, we are rewriting it Y is equal to C plus I<sub>r</sub> plus G.

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**S + T = I + G**

- $\overset{AS}{\cancel{C}} + S + T \equiv Y = \overset{AD}{\cancel{C}} + I + G$   
(in equilibrium, Y must equal C+I+G, and Y is defined as C+S+T)

or, equivalently,

$S + T = I + G \dots\dots\dots(5)$

- (the amount of income that households do not spend on output,  $S + T = \underline{Y - C}$ , and therefore the amount of output that is produced but not sold to households, is just equal to the desired purchases by the other two sectors, I + G.)

The aggregate supply means C plus S plus T, that is aggregate supply, and is approximately equal to C plus I plus G, this is aggregate demand. In the macro economy we can say that the aggregate supply equation identity is consumption C plus S by all households, then the tax T paid by the households to the government is equal to total consumption C plus the investment expenditure I made by firms and the government expenditure G.

So, in equilibrium Y must equal C plus I plus G, and Y is defined as Y plus C plus T where you can see that the C that this is cancelled out. So, finally, equivalently we can see that the necessary condition for macroeconomic equilibrium is S plus T (savings plus tax) is equal to investments I plus government expenditure G. Saving means that the amount of income that the household do not spend on output.

That means, S plus T because aggregate supply is equal to C plus S plus T; that means, S plus T means, that the do not spend on output, do not spend on consumption that is S plus T is equal to, we can also rewrite it like that, S plus T is equal to Y minus C and therefore, the amount of output that is produced, but not sold to household is just equal to the desired purchases by two other two sectors.

That means at equilibrium S plus T should be equal to I plus G, canceling C out from both sides.

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**A Quick Overview**

**Determining equilibrium Income**

- $Y = E = C + I + G$
- Equilibrium income (Y) is the endogenous variable to be determined
- The autonomous variables I, G and T are exogenous variables, determined by factors outside the model.
- Consumption is, for most part, induced expenditure determined endogenously by the consumption function
- $C = a + bY_d = a + bY - bT$  .....(6) (as  $Y_d = Y - T$ )
- $Y = C + I + G$
- $Y = a + bY - bT + I + G$  (solving for Y)
- $Y - bY = a - bT + I + G$
- $Y(1-b) = a - bT + I + G$
- $Y = (1/(1-b))(a - bT + I + G)$ .....(6)

What we can see here is that, determining the equilibrium level of income; that means, Y that the aggregate supply is equal to aggregate demand, that is E is equal to C plus I plus G. So, the equilibrium income is the endogenous variable to be determined. So, what is the equilibrium income here?

So, the autonomous variables; that means, I, G and T are exogenous variables determined by variables, the determined by factors outside the model.

The variable I here, initially in the simple Keynesian model, we consider investment as an autonomous variable that is not a function of rate of interest, but when we derive IS model, we are going to decompose I into 2 component: that is autonomous component and rate of interest determined component.

In the simple Keynesian model, we say  $I$  is autonomous, and government expenditure is also autonomous that is not a function of level of income or rate of interest or any other function. Investment here also only a function of business condition,  $T$  means, tax that is also exogenously determined; that means, autonomous variable this is determined outside the model.

So, consumption is for most part induced expenditure determined endogenously by the consumption function because consumption is plus ' $bY_d$ ' and ' $a$ ' means the intercept that the autonomous component; that means, even income is 0 still some consumption will be there, then the induced component is ' $b$ ' that we can see the marginal propensity to consume,  $b$  is the marginal propensity to consume when income increases,  $Y_d$  is the disposable income.

So, rewriting we can write that  $C$  is equal to ' $a$ ' plus ' $b$ ' times  $Y$ , and  $b$  means the marginal propensity to consume because the total the MPC ' $b$ ' plus ' $1$  minus  $b$ ' it should be equal to 1.  $1$  minus  $b$  means the marginal propensity to save,  $b$  means marginal propensity to consume;  $1$  minus  $b$  is marginal propensity to save, both should be equal to 1.

We are rewriting  $Y_d$  as  $Y$  minus  $T$ . So, we can see here is that  $Y$  is equal to  $C$  plus  $I$  plus  $G$ . So, rewriting that is  $C$  replacing  $C$  with this, we can rewrite it like this plus  $I$  plus  $G$ , then solving for equilibrium level of income we can say that  $Y$  minus  $bY$  is equal to ' $a$  minus  $bT$ ' plus ' $I$ ' plus ' $G$ '; then  $Y$  times  $1$  minus  $b$  is equal to  $a$  minus  $bT$  plus  $I$  plus  $G$  finally, solving it for the equilibrium level of income we can solve it like that the first part by ' $1$  minus  $b$ '.

That is the reciprocal of  $1$  minus  $b$  means nothing but the reciprocal of marginal propensity to save times all these components ' $a$ ' means, the intercept in the consumption function that is determined autonomous, not determined by income or rate of interest;  $b$  times  $T$ , this also autonomously determined, tax is a government determined variable, not a function of income or rate of interest.

' $I$ ' means, the autonomous determined autonomous component of investment,  $G$  also an autonomous component. So, here this part is called the multiplier, the change in income will be multiplier times of all these autonomous variables. So, finally, this is the equilibrium condition in the simple Keynesian model and based on this, in the next session we will see how we can derive IS schedule in the ISLM framework.

So, the simple difference between the simple Keynesian and the IS model is that in the simple Keynesian we consider 'I' as autonomous variable; that means, it is not a function of rate of interest, but in the IS schedule we are going to discuss investment with two components: one is autonomous component, and second is investment as a function of rate of interest.

Thank you for watching this video, in the next session we will continue this discussion.

Thank you.

**Keywords:** LM schedule, money supply, rate of interest, income, money demand function, restoring equilibrium, aggregate demand, aggregate supply, consumption, investment, government expenditure, tax, autonomous variables