

## \* IS-LM Model

- Keynesian cross model treats investment as autonomous or as dependent merely on income.
- But, any rational firm's decision to invest will depend on income as well as interest rate.
- for the rational behaviour of the firms, planned investment varies inversely with the real interest rate.
- Reasons
  - Rise in  $r$  makes investment in plant and machinery becomes less attractive as the cost of the borrowing rises.
  - Interest is called the cost of factors of production  $\therefore$  when cost rises, demand for factors of production decrease  $\therefore$  investment decreases.
  - when interest rate will increase, cost of borrowing capital will increase  $\therefore$  demand for borrowing capital will decrease  $\therefore$  investment will decrease.

- A firm instead of borrowing capital or floating bonds, can sometimes use ~~the~~ its retained earnings or internal funds to utilize in investment.
- Retained earning is the profit from previous business.
- There can be 2 types of investment:
  - (i) Investment in plant and machinery (physical investment)
  - (ii) ~~Financial~~ Financial investment (lending to bank, buying shares of a company or buying govt. bonds).
- If the firm utilizes its internal funds in ~~the~~ physical investment at high interest rate then it is at loss ~~but~~ because it could have earned more by financial investment.
- ∵ The opportunity cost is high in case of physical investment.
- If internal funds are utilized, investment in plant and machinery becomes less attractive, as higher interest rates push up the earnings on competing financial investment (lending).

- When rate of interest is high, it's not desirable on the part of the firm to spend in physical investment as it can earn more money by depositing the money in bank.
- Higher the rate of interest, lower is investment.
- A rise in  $r$  makes the number eligible investment projects ( $NPV > 0$ ) to fall.
- Present value of an income stream
- Present value of an amount available in the future is the present value of that amount subject to  $r$ .
- The present value (PV) of Re. 1 available in  $n$  years time = Rs.  $\frac{1}{(1+r)^n}$ .
- The expression  $1/(1+r)^n$  is the discount factor for period  $n$ .
- A company undertakes a project & estimates returns it is going to get in subsequent years.
- The PV of an income stream of (Rs.) R<sub>1</sub> in period 1, R<sub>2</sub> in period 2, ..., R<sub>n</sub> in

period  $n$  is:

$$PV = \frac{R_1}{1+r} + \frac{R_2}{(1+r)^2} + \frac{R_3}{(1+r)^3} + \dots + \frac{R_n}{(1+r)^n}$$

- PV is inversely related with  $r$ .
  - If an investment project generates cash flows per period over a known and fixed lifetime. The cost is incurred in the current period. In order to decide whether to accept or reject a project the NPV has to be positive (where,
- $\text{NPV} = \text{cost } PV.$

$\text{NPV} = PV - \text{cost}$
- ∵ Interest rate is used as a discount rate to derive the present value of an amount accruable in future.
  - and the future amount is derived from the same interest rate.
  - ∵ NPV should be greater than or equal to the cost of investment spent today.
  - A company keeps on selecting projects until NPV remains +ve.
  - When rate of interest will decrease, more ~~investment~~ even after adding more

investment projects, NPV will remain +ve i.e. number of eligible investment projects will increase. and vice-versa.

- With the recognition that interest rate is important in investment function, the IS-LM model comes into existence.
- This involves introduction of 2 markets:
  - Goods market (IS)
  - Money market (LM)
- We cannot determine eq. incomes until rate of interest is given & we cannot determine eq. rate of interest unless income is given. We need the money market.
- As interest rate is a determinant of investment, interest rate itself has to be determined.
- Classical argument: Interest rate is determined by the intersection of saving and investment.
- Keynesian argument: Interest rate is not determined by goods market, it is determined by money market.

∴ In order to determine both eq. income and interest rate, both markets have to be solved simultaneously.

- \* Fixed price model.
- John R Hicks transformed the Keynesian model into simultaneous eq. model (IS-LM)
- In this case, two conditions are considered
  - (i) Fixed price
  - (ii) A closed economy
- In Keynesian cross, we consider aggregate supply curve of output to be a horizontal straight line parallel to x-axis until full employment is reached.
- Until full employment is reached, price of goods and services remain unchanged.
- The economy doesn't have export & import.
- Good Market Equilibrium : IS Curve.
- Either  $y = \text{Total demand}$   
i.e.  $y = C + I + G$

- Consumption function,  $C = C_0 + b(Y - T_0)$ .

$C_0$  = autonomous consumption

$b$  = MPC.

$Y \rightarrow$  original income

$Y - T_0 \rightarrow$  Disposable personal income

$T_0 \rightarrow$  Lumpsome tax.

- Investment function,  $I = I_0 - dr$ .

Here, we consider  $r$  to be the factor to determine investment.

$I_0 \rightarrow$  Autonomous investment

$d \rightarrow$  Marginal propensity to invest wrt rate of interest.

(Slope of investment func<sup>n</sup> wrt  $r$ ).

Slope  $\rightarrow$  -ve.

- Equilibrium Condition  $Y = C + I + G_0$ .

- To present it in  $S = I$  form

$$S = S(Y)$$

$$I = i(r)$$

Equilibrium condition  $S = I$

- The goods market has three ~~two~~ equations and four unknowns:  $C, I, Y$  and  $r$ .

$$Y = \frac{1}{(1-b)} \underbrace{(C_0 - bT_0 + I_0 + G_0)}_{\text{Autonomous demand}} - \left(\frac{d}{1-b}\right) r.$$

$\downarrow$   
Multiplier      Autonomous  
                  demand.

$C_0 \rightarrow$  consumption autonomous consumption demand.

$I_0 \rightarrow$  autonomous investment demand

$G_0 \rightarrow$  autonomous govt expenditure

$bT_0 \rightarrow$  autonomous tax (leakage  $\therefore -bT_0$ )

$$Y = KA_0 - dKr \quad (\text{IS Equation}).$$

where,  $K = \text{Multiplier}$

$A_0 = C_0 - bT_0 + I_0 + G_0$  (autonomous expenditure)

- Equation for IS curve shows the locus of all combinations of income and interest rate at which  $S=I$ . (As  $Y=C+I+G_0$  is the same as  $S=I$ ).
- It also shows that  $Y$  &  $r$  have an inverse relationship: it shows all combinations of  $Y$  &  $r$  at which  $S=I$ , i.e. at which goods market is at equilibrium.
- There is not one point of eq. but there are several points of eq.
- As rate of interest increases, income ( $Y$ ) decreases.

- For each  $r$ ,  $\exists$  a  $Y$  which satisfies  $S = I$   $\therefore$  there is a curve and at each point on that curve  $S = I$ .
- IS curve contains points with diff. combinations of  $r$  &  $Y$ .
- An economy cannot realise higher income unless rate of interest is low because as  $r$  rises  $Y \downarrow$  falls & vice-versa.
- If an economy realises higher ~~economy~~ income then rate of interest should be low.
- $* Y - C = I + G_{T_0}$   
(where  $Y - C$  is the unconsumed income which may be used for paying taxes and household).
- Or we can say, a household spends on consumer goods only when it has payed tax & saved money i.e.

$$C = Y - T - S.$$

$$S_h + T = I + G_{T_0}$$

$S_h \rightarrow$  household saving

- When tax revenue ~~is~~ collected is more than the govt. expenditure, then there is some govt. saving as tax revenue is the govt.'s income.
- $T - G_o$  is government saving ( $S_g$ ).

$$\cancel{S_f} S_h + T - G_o = I.$$

$$S_h + S_g = I. \quad S = I$$

$S_h + S_g = \text{Total saving.}$

- IS curve is -vely sloped. and it ~~represents~~ represents good market eq.

$y$  will keep changing ~~with  $\alpha_1$~~  with  $\alpha_1$ .  $\therefore$  For each combination of  $Y$  and  $\alpha_1$ , we will get a point of eq. in the goods market where  $S = I$  or  $Y = C + I + G$

$\therefore$  We cannot find out ~~unique~~ unique  $Y$  to be produced so that eq. is achieved.

Higher is the rate of interest, lower is the income of the economy.

$\therefore$  IS curve derived from this IS equation is -vely sloped.

## \* Money Market Equilibrium: LM Curve

Based on ~~the~~ Keynesian &

- Investment is the inverse function of rate of interest.
- Rate of interest has to be determined.
- A/c to classical proposition:  
Eq. rate of interest is determined in the goods market when saving & investment curves intersect.
- Saving curve is +vely sloped & investment curve is -vely sloped.
- Either saving or investment change, or change and again the obtained value is the new eq. interest rate.
- A/c to Keynes:  
Interest rate is a money market phenomena and it is ~~determined~~ determined by the ~~intersection~~ intersection of demand and supply of money.
- LM curve will be derived from money market eq.
- IS-LM model is mixed classical and Keynesian

- As  $r_1$  is derived is determined by money market,  $\therefore$  this phenomenon is Keynesian.
- Based on the Keynesian Liquidity Preference Theory.

$L \rightarrow$  Liquidity preference (Demand side of money)  
 $M \rightarrow$  Money supply (Supply side of money).

- And  $r_1$  is the intersection of demand & supply of money.
- Law of demand says that other things remaining constant, when the price of the good increases its demand decreases & vice-versa.
- Demand for money is in other terms holding ideal balances.
- Money is the most liquid asset.
- Other assets: Bond, House, car, etc are illiquid asset.
- Money can be used immediately when we need it. People prefer liquidity over illiquidity.

## \* Motives for Holding Money

- i) Transaction demand for money
  - ii) Precautionary demand for money
  - iii) Speculative demand for money.
- Transaction demand for money.
- Cash money with the person is the liquid asset as it is available for day to day transactions.
- On the other hand, having money as a fixed deposit in bank is an asset but not liquid.
- Average ideal balance in pocket or in ~~current~~ current account such that it is easily redeemable is used for transactions.
- But holding money gives no interest or return. Instead, if the money is used in buying bond or as fixed deposit then a person can get interest or return.
- But people like to make day to day transactions ∵ they hold ideal balances ~~as~~ for transactionary purposes.
- This transaction demand for money is dependent on the income of the individual.

- Higher the income of the individual, higher is the transaction demand for money.  
i.e. higher are the day to day transactions made by people.
- And similarly, higher is the income of the economy, higher is the transaction demand for money in the economy.
- Transaction demand for money is an increasing function of the income.
- Precautionary demand for money.
- People hold money for precautionary purposes for unforeseen contingencies.  
(Emergency situation in future).
- Also, the precautionary demand for money is dependent on the income of the individual.
- Higher is the income, of an individual, higher is the money kept for precautionary purposes.
- As higher is the income, most insecure or ~~more~~ uncertain the individual is about the future ∵ higher is the precautionary demand for money.

- Keynes has classified the demand for money in broadly 2 categories:
  - i) Motive behind active balance
  - ii) Motive behind ideal balance.
- Motive behind active balance is transactional and precautionary demand for money. And both are increasing func's of income.
- $M_t = \text{Transaction} + \text{precautionary demand}$   
 $\Rightarrow \text{func}' \text{ of income. (Ad (Active balance))}$
- Nominal active balance is the func' of income.
- Nominal active balance is the func' of nominal income & real active balance is the func' of real income.
- Real income is the nominal income deflated by the price level.

Nominal money demand:  $M_t = ePY$   
 $e \rightarrow$  slope coefficient  
 $Y \rightarrow$  real income.

Real money money demand:  $\frac{M_t}{P} = e Y$

- Speculative demand for money.
- A/c to classical economists, money is only a medium of exchange.(transaction)
- A/c to Keynes, money is not only a medium of exchange but it is a store of value & an asset which has to be stored.
- Speculation refers to the expectations regarding the price of the bonds.
- There are two ways of utilizing money:
  - i) Use money as an asset.
  - ii) Convert it to bond. by purchasing private or gout. bond.
- If a person holds money as an asset then he/she doesn't get any interest or returns on the money.
- But when a person hold bonds, then the person is sure to get an interest on the bond.
- Bond market
- There are 2 kinds of bonds:
  - i) Government bond
  - ii) Private or corporate bond.

- Bonds are a source of raising capital from the market. Govt. raises funds for itself by floating bonds. It is a kind of borrowing on the part of govt. & it assures returns to the people who purchase those bonds.
  - Corporate sector also ~~sells~~ sells bonds.
  - There are 2 markets:
- 1) Primary market:
    - It is the market where a company sells bonds for the first time to some designated people at diff. ~~per~~ prices assuring certain rates of interest.
    - It is a kind of initiation ~~in~~ of buying & selling of bonds.
  - 2) Secondary market:
    - In this market bonds are bought and sold until they are bought back by the company to which the bond belongs.
    - A person can either hold money or hold bond.
    - Buying and selling of bond is guided by the price of bonds.

- Changes in these expectations induce shifting the wealth between bond and real balance (money).
- Current price of the bond depends on the current interest rate. Expectations are determined by current rate of interest.
- If a bond is bought at 10000 rupees at an interest rate of 10%. After 5 years, the bond will mature & ~~price will become~~ 15000 the person will get 15000 rupees from the company.
- If the bond is to be sold in the secondary market, then it will be sold at the present rate of interest.  

$$\text{Current price} = \frac{P}{(1+r)} + \dots + \frac{P}{(1+r)^5}$$

$\therefore$  If lower is the rate of interest, higher is the bond price.
- No buyer will buy for more than the bond price & no seller will accept lower than the bond price.
- Present value of the bond is the price at which ~~so~~ the bond can be bought or sold.

- If  $r_1$  is high, bond price is low.
- If  $r_1$  is high, it would be expected to fall (bond prices to rise), the bond holders would like to hold more bonds to reap the benefits of the capital gain, hence the demand for money will be low.
- As the demand for bonds is high, then demand for money will be low because a person can either hold money or bond. i.e. there is a trade-off b/w money and bond.
- If  $r_1$  is low, the demand for money will rise.
- ~~If  $r_1$  is low, then bond prices will be high, the bond holders will sell their bonds~~ ∵ the demand for money will rise.
- Higher is the rate of interest, lower is the speculative demand for money & vice-versa.
- Hence,  $M_{sp}$  is inversely related to  $r_1$ .

$$M_{sp} \propto \frac{1}{r_1}$$

- ∵ speculative demand for money is -ively sloped & is dependent on  $r_1$  while other demands of money are dependent on

income.

- Eventually, demand for money is a func<sup>n</sup> of both income & rate of interest. as 2 components : transactionary & precautionary demands depend on income & the 3rd component speculative demand depends on rate of interest.
- Being a medium of exchange, money demand becomes a func<sup>n</sup> of income & being a store of value, it becomes a func<sup>n</sup> of rate of interest.
- In the absence of speculative motive, a high  $r$  also implies that one forgoes a lot of interest income by holding money instead of interest bearing assets.
- When rate of interest is high, then people will prefer depositing the money in bank instead of holding ideal balances as they can earn more via interest income.

$$\text{Demand for money} \propto Y,$$

$$\text{Demand for money} \propto \frac{1}{r}$$

- Hence, the demand for real money balances varies directly with the real income & inversely with the rate of interest.

- Real demand is nominal demand deflated by current price level.

$$\boxed{\frac{L}{P} = eY - fr} \quad (\text{Real demand})$$

where  $L$  = nominal amount of money demand (liquidity demand).

- $e, f$  = parameters denoting sensitiveness of the money demand to changes in income and interest rate, respectively.
- Equilibrium,  $L = M_0$ . where  $M_0$  is the money supply.
- $M_0$  is considered fixed and is ~~also~~ decided by the monetary authority of a country.

$$\text{Real money supply} = \frac{M_0}{P}$$

- Money market has 2 equations and 3 ~~endes~~ endogenous variables ( $L, Y, r$ )

$$\boxed{\frac{M_0}{P} = eY - fr}$$

$$\boxed{Y = \frac{1}{e} \left( \frac{M_0}{P} \right) + \left( \frac{f}{e} \right) r} \quad (\text{LM equation})$$

- LM curve shows the combinations of money income and interest rate at which money

market is in equilibrium.

- In case of IS curve i.e. in perspective of goods market

$$Y = KA_0 - dK\alpha r$$

- $\therefore Y$  &  $r$  are inversely related. Lower is  $r$ , higher is the economy's income.

- But in case of LM curve or in perspective of money market

$$Y = \left(\frac{1}{e}\right) \left(\frac{M_0}{P}\right) + \left(\frac{f}{e}\right) r$$

- $\therefore Y$  &  $r$  are directly related. Higher is  $r$ , higher is the economy's income.

$$r = \frac{e}{f} \left[ Y - \frac{1}{e} \left( \frac{M_0}{P} \right) \right]$$

- $Y$  is also directly related to money supply, higher the money supply, higher is the income.

$$Y = KA_0 - dK \left[ Y - \frac{1}{e} \left( \frac{M_0}{P} \right) \right] \left[ \frac{e}{b} \right]$$

$$Y \left[ 1 + \frac{deK}{b} \right] = K \left[ A_0 + \frac{d}{b} \left( \frac{M_0}{P} \right) \right]$$

$$Y = A_0 + \frac{d(M_0)}{f(P)} + \frac{1}{k} + \frac{de}{b}$$

- IS-LM model helps us to determine eq. Y & r together.
- Observations regarding IS curve

$$Y = kA_0 - dKr$$

Negatively sloped straight line with positive intercept.

- Intercept determines the position of the line & slope determines the steepness or flatness of the line.
- $d$  &  $K$  affects the slope of the IS curve. While the position of the curve depends upon  $A_0$  &  $K$ .  
 $A_0 \rightarrow$  autonomous demand.
- The curve will shift toward right or left a/c to  $A_0$ .
- Multiplier value  $K$  determines both the slope & position of the curve.
- $d$  is the slope of the investment function & it is also a determinant of the <sup>slope of the</sup> IS curve.

- The position of the IS curve depends:
  - Positively on  $K$
  - Positively on  $A_0$  (autonomous demands).
- If I curve is more elastic than IS curve is more elastic because of  $d$ .

If  $d > 1$ , I curve is more elastic  $\Rightarrow$  IS curve  
 If  $0 < d < 1$ , I curve is less elastic.

- Any autonomous expenditure will affect the position of the IS curve.

$$Y = \frac{1}{e} \left( \frac{M_0}{P} \right) + \left( \frac{f}{e} \right) r$$

- ~~If  $e$  will affect the slope of the LM curve~~  
~~&  $e, M_0 \& P$  will affect the position of the LM curve.~~
- ~~Higher~~ when  $M_0$  will rise, LM curve will go away from the axis.
- The slope of the IS curve:  
 IS curve is steeper, lower the value of  $K$ .  
 IS curve is steeper, lower the interest sensitiveness of investment ( $d$ ).

## • Observations regarding LM curve

### • Position

- Positively on nominal quantity of money supply
- Negatively on the price level ( $P$ ).
- Negatively on the sensitivity of the money demand to the changes in income.

### • Slope

The curve is flatter, larger the interest sensitivity of money demand

The curve is flatter, lower the income sensitivity of the money demand

## ★ Derivation of the IS curve

IS curve is -vely sloped.

(A) Investment function  $I = I(r)$ .

This is -vely sloped. It is taken from classical ~~economy~~ economics ∵ it is ~~is~~ an inverse func' of  $r$ .

(B) Saving investment equality ( $S = I$ )

It shows money market equilibrium.

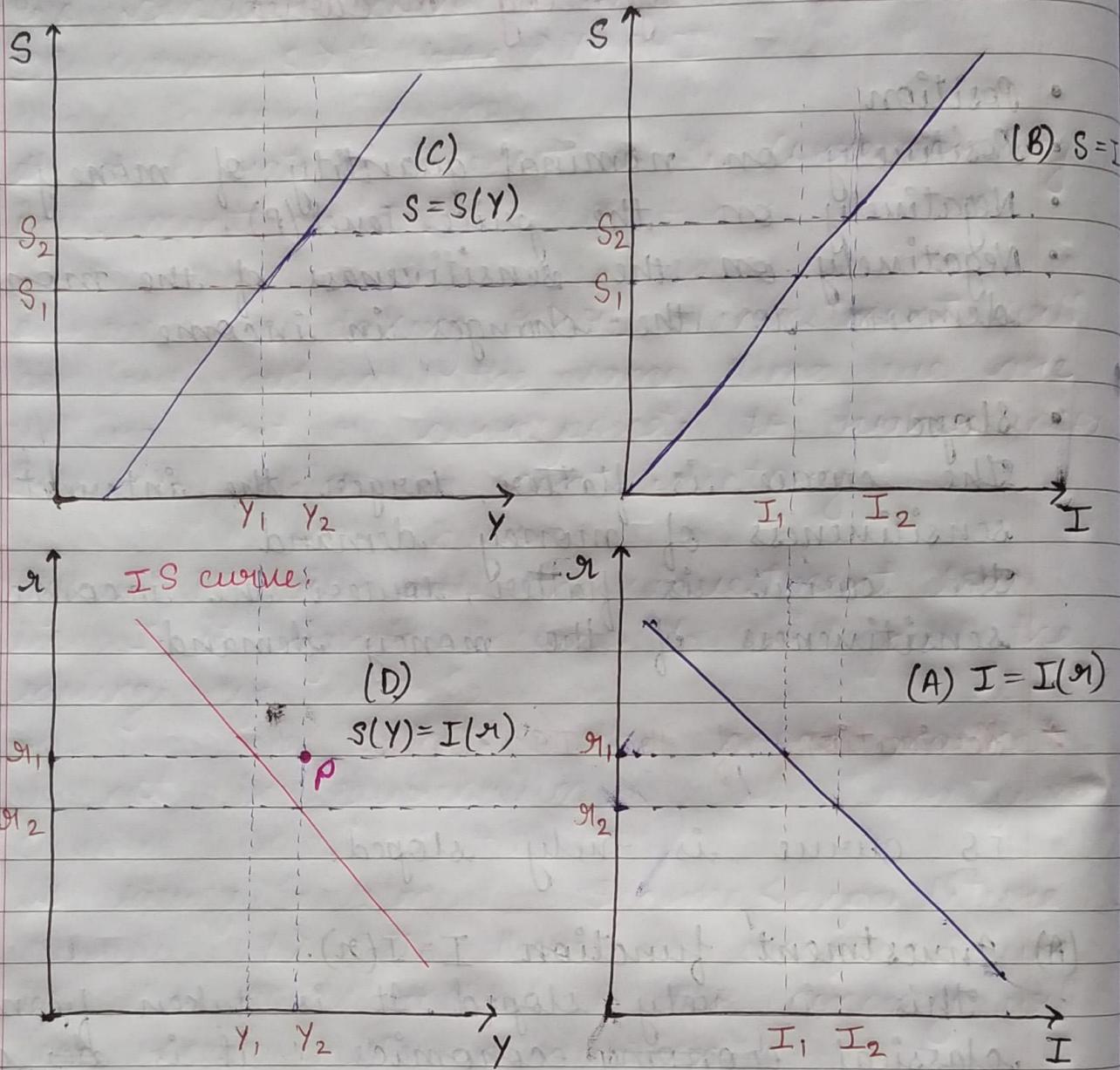
∴ Saving becomes equal to investment.

The slope of the line is 1.

(C) Saving function  $S = S(Y)$ .

It is Keynesian saving function, direct func' of income.

Date \_\_\_ / \_\_\_ / \_\_\_



- Corresponding to a value of rate of interest ( $r$ ), there is a value of investment ( $I$ ).
- There is one combination of  $S$  &  $I$  such that goods market is in equilibrium  
 $\therefore S_1 = I_1$
- Corresponding to  $S_1$  value, a/c to Keynesian

saving func", there is value of income  $Y_1$ .

- For  $I_1$  to be equal to  $S_1$ , income has to be  $Y_1$  as saving is a func" of income.

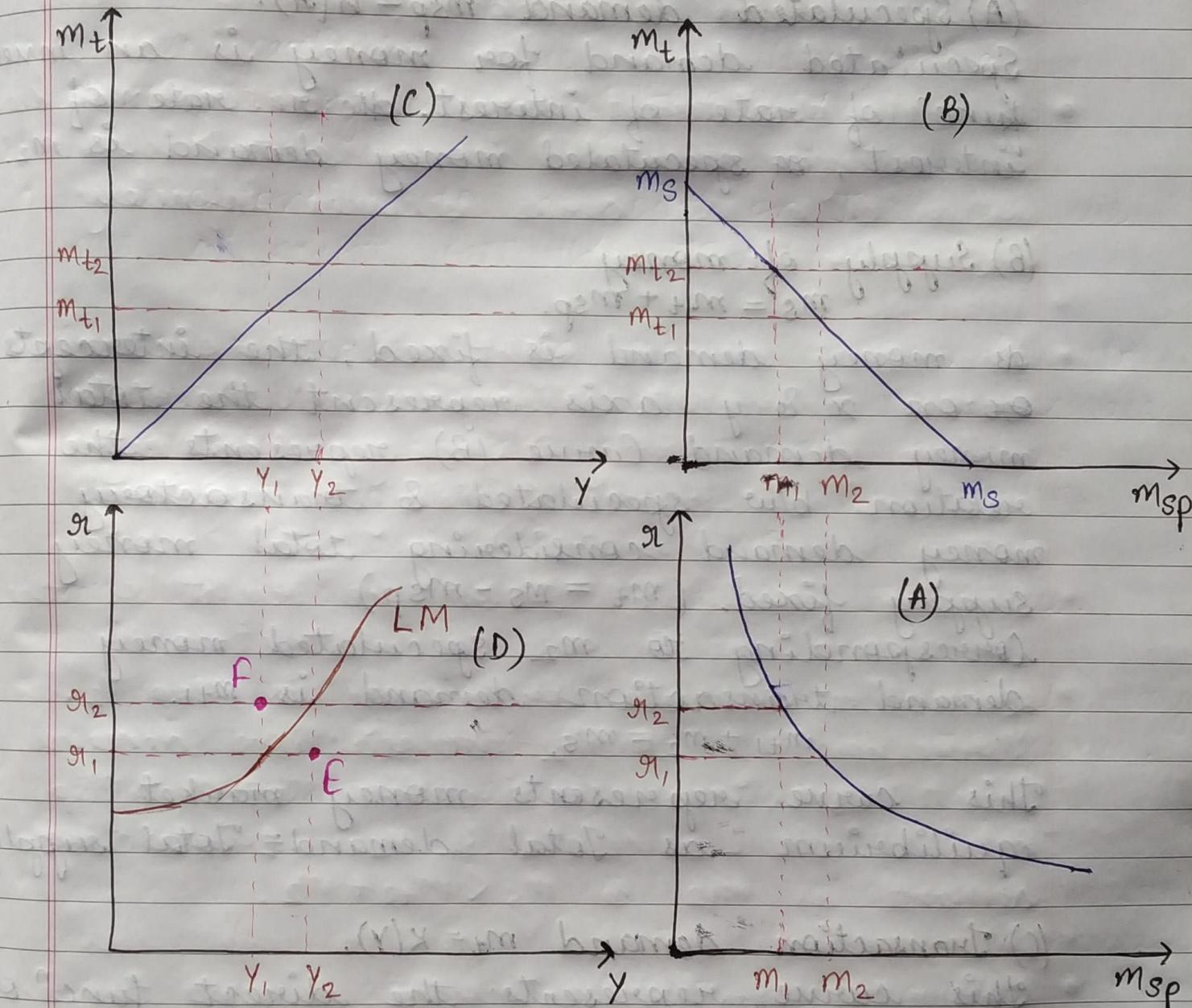
For a particular value of  $r$ , there is a corresponding value of  $I, S \& Y$ .

- Corresponding to a point on  $I$  curve, we get a point on the  $IS$  curve.
- If  $r$  decreases from  $r_1$  to  $r_2$ , then investment increases from  $I_1$  to  $I_2$ . Saving should increase from  $S_1$  to  $S_2$  in order to make saving = investment. When  $S$  increases from  $S_1$  to  $S_2$ ,  $Y$  must increase from  $Y_1$  to  $Y_2$ . We get another point  $(r_2, Y_2)$  on the  $IS$  curve.
- As  $r$  increases,  $Y$  decreases.  $\therefore$   $IS$  curve is -vely sloped and at each point on the  $IS$  curve, goods market is at equilibrium.
- When  $r$  decreases, investment ~~decreas~~ increases and via multiplier effect income will increase more than the investment  $\therefore$   $IS$  curve is -vely sloped.
- Any point to the right or left of the  $IS$  curve, shows disequilibrium in the goods market.

- We consider point P on the right of the IS curve,  $S > I \Rightarrow Y > C + I$ .
- At pt. P, rate of interest is  $r_1$ . Corresponding investment is  $I_1$ .
- As we are taking  $r_1 > r_2$ , investment will be low but at the same time we are telling that  $r_1$  corresponds to higher income i.e.  $Y_2$  which is contradictory
- Higher  $r$  will ~~pull~~<sup>push</sup> the investment down i.e.  $I_1$  & higher income  $Y_2$  will pull the savings up  $\therefore S_2$   
 $\& S_2 > I_1 \therefore$  the goods market is not in equilibrium.
- As saving > investment  $\therefore$  Income < expenditure  
 i.e.  $Y > C + I$ , there is disequilibrium in the goods market & the economy will face recession. (Overproduction)
- Similarly, any point on the left of the IS curve represents a lower income & lower rate of interest  $\therefore$  saving < investment  
 $\therefore$  Income > expenditure &  $\therefore Y < C + I$ . This is the stage of ~~over~~ overdemand or underproduction.

★ Derivation of LM Curve.

$$Y = \frac{1}{e} \left( \frac{M_0}{P} \right) + \left( \frac{e}{f} \right) R.$$



Money market equilibrium:

Demand for money = Supply for money.

Supply for money  $\rightarrow$  fixed in a particular time period.

Transactionary & precautionary money demand are taken together as they depend on the same factor, income.

(A) Speculated demand  $m_{sp} = h(i)$ .

Speculated demand for money is an inverse func<sup>n</sup> of rate of interest. At  $i_1$ , rate of interest, speculated money demand is  $m_2$ .

(B) Supply of money

$$m_s = m_t + m_{sp}$$

as money demand is fixed, the intercepts on x & y axis represent the total money demand. Curve (B) represents the relation b/w speculated & transaction money demand considering total money supply fixed. ( $m_t = m_s - m_{sp}$ )

Corresponding to  $m_2$  speculated money demand, transaction demand is  $m_{t1}$ .

$$m_{t1} + m_2 = m_s$$

This curve represents money market equilibrium as Total demand = Total supply.

(C) Transaction demand  $m_t = k(y)$ .

This curve represents the direct func<sup>n</sup> of transaction demand to income. Corresponding to  $m_{t1}$  transaction demand, income is  $y_1$ .

- Corresponding to  $i_1$  rate of interest, there is a value of income  $y_1$  for which money market is in equilibrium.

- If rate of interest increases from  $r_1$  to  $r_2$ , then speculative demand for money will decrease from  $m_2$  to  $m_1$ . And as the speculated demand decreases, transaction demand will rise from  $m_{t1}$  to  $m_{t2}$ . and correspondingly income will rise from  $y_1$  to  $y_2$ .  $\therefore$  we get another point on LM curve  $(r_2, y_2)$  at which money market is at equilibrium.
- LM curve has initially a flat region & then it becomes upward sloped. In the +vely sloped part, higher is the rate of interest, higher is income & vice-versa.
- Higher is the rate of interest, lower is the speculated demand for money.
- If speculated demand for money is high, less money is kept as ideal balances. On the other hand, if speculated demand is high, more money is kept as ideal balances i.e. people prefer liquidity over illiquidity.

~~The more ideal balances a person has, the more likely he is to lose income while when ideal balances are less, then there might be a possibility of increasing the income.~~

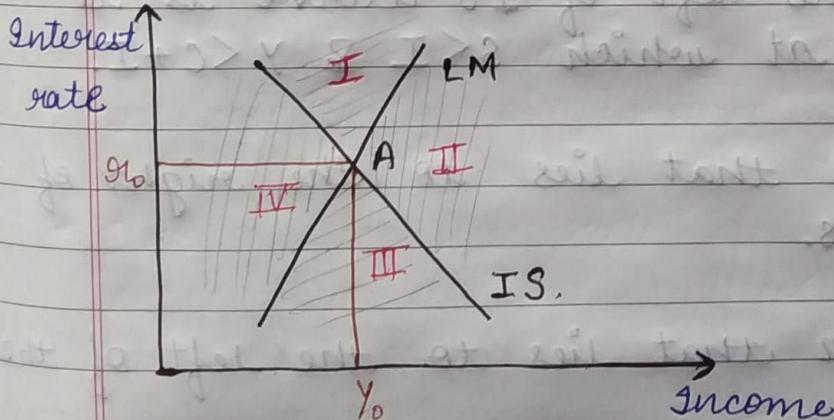
- Higher is the rate of interest, lesser is the speculative demand, higher is the transaction demand, more the ideal balances a person

have, more is the income.

- The  $M_{SP}$  curve is horizontal at a very low rate of interest and correspondingly the LM curve becomes ~~is~~ horizontal.
- As rate of interest keeps decreasing,  $M_{SP}$  keeps increasing ~~at~~ and at a certain low value of  $r$ ,  $M_{SP}$  curve becomes infinitely elastic or flat.
- Any point on the right or left ~~of~~ of the LM curve represent disequilibrium. either  
 Demand of money  $>$  Supply of money  
 Demand of money  $<$  Supply of money
- Consider ~~point~~ point E on the right of the LM curve. At E, rate of interest is  $r_1$ , speculative demand for money is ~~is~~  $m_2$ . Corresponding to  $m_2$ , transaction demand must be  $m_t$  in order for  $m_s = m_t + M_{SP}$ . But at pt. E, income is  $y_2$  so transaction demand is  $m_{t2}$  &  $m_s < m_{t2} + m_2$ .
- When one ~~to~~ type of money demand is high, ~~the~~ other type of money demand should decrease as total money supply is fixed for maintaining equilibrium.
- Similarly any point on the left side of the LM curve represents supply of

money > demand of money.

- At point F, higher  $r$  will push speculative demand ( $m_s$ ) down i.e.  $m_s$  & lower income  $Y$  will pull transaction demand ( $m_t$ ) down i.e.  $m_t$ .  $\therefore m_s > m_t + m_g$ .  $\therefore$  Supply > Demand.
- IS curve**
  - To the right  $\Rightarrow$  Saving > Investment,  
Income > Expenditure ;  $Y > C + I$
  - To the left  $\Rightarrow$  Saving < Investment,  
Income < Expenditure. ;  $Y < C + I$
- LM curve**
  - To the right  $\Rightarrow$  Supply Money supply < Money demand
  - To the left  $\Rightarrow$  Money supply > Money demand.
- IS & LM curves are super-imposed on one graph to explain the simultaneous determination of income and interest rate.
- The curves are assumed linear and they are plotted in the following figure.



- The two curves divide the plane in 4 diff. quadrants.
- Disequilibrium in IS-LM will be at any where other than the intersection of curves.
- All those combinations that do not lie on a line, are identified under these four conditions.
- Four spaces:

Space	Goods market	Money market
I	$I < S, (C+I) < Y$	$M_d < M_s$
II	$I < S, (C+I) > Y$	$M_d > M_s$
III	$I > S, (C+I) < Y$	$M_d > M_s$
IV	$I > S, (C+I) > Y$	$M_d < M_s$

- Any combination of  $Y$  and  $r$  that lies anywhere to the right of the IS curve is a combination at which  $S > I$  and  $Y > (C+I)$  and vice-versa.
- Any combination of  $Y$  and  $r$  that lies anywhere to the left of IS curve is a combination at which  $S < I$  &  $Y < C+I$ .
- Any combination that lies to the right of LM curve,  $M_d > M_s$ .
- Any combination that lies to the left of the