

(Secular stagnation hypothesis).

- ~~Household~~ Households with higher incomes:

$$MPC > 0$$

$$MPC < 1$$

$APC \uparrow$ as well as $Y \uparrow$.

- Very strong correlation between income & consumption
 \Rightarrow Income seemed to be the main determinant of consumption.

* Keynesian Investment Function

- Investment is defined as an addition to capital stock.
- Investment is related to capital.
- Investment is a flow and capital is a stock.
- Capital is the cumulative net investment

$$K_i = \sum_{t=1}^n I_t$$

where K_i = capital stock in time period t
 I_t = Net investment in time period t .

$$I_t = K_t - K_{t-1}$$

$$I_{n,t} = I_{g,t} - D$$

- I_t can represent the investment done in time interval of 1 year.

$I_t = K_{30} - K_{29} \Rightarrow$ Investment done in 30th year.

$I_{n,t} \rightarrow$ Net investment

$I_{g,t} \rightarrow$ Gross investment

- Net investment = Gross investment - ~~Depreciation~~ Depreciation
- $\therefore I_{n,t}$ is the actual capital stock added to the stock, i.e. the actual investment or net investment.
- Net investment is the actual investment & it can be positive, negative or zero. even if gross investment is positive as ~~depreciation~~ depreciation can be greater, lesser or equal to the gross investment.
- \therefore Net investment has to be +ve for real growth of the economy.
- Even if net investment is 0 or negative, +ve gross ~~investor~~ investment matters because the gross investment in the

current time period creates employment in the current period.

- Even if there is only replacement capital (i.e. all the capital that is lost is being replaced), it is also necessary to ~~not~~ create employment and it also helps maintain the statoscope, as the capital stock is not deteriorating, the statoscope is being maintained.
- Positive net investment is very favourable but even positive gross investment is important.

* Types of Investment

(On the basis of sectors in which it is carried out)

- Business fixed (Non-residential) investment
 - Residential investment
 - Inventory investment.
- * Business fixed investment: any kind of business that is undertaken apart from the ~~reality~~ sector, real estate sector.
e.g. in manufacturing sector.
- * Residential investment: apartments or multi-storeyed buildings, etc.



* Inventory investment

Any manufacturer manufactures more than what he ~~expects~~ expects to sell. This extra quantity is often kept in ~~inventories~~ inventories.

Planned inventory - Firms willingly & knowingly keeps finished goods in inventories to ~~not~~ meet unforeseen contingencies.

- Inventory investment is a stock piling investment on the part of the firm & it is not a basic investment as without the other two, this investment would not occur.
- The firms manufacture more than what they are expected to sell on the basis of predicted demands.
- The company can have finished goods inventories, semi-finished goods inventories, raw materials inventories or even cash in hand.

* Decision to Invest & Marginal Efficiency of Capital (MEC)

- New investment is determined by marginal efficiency of capital (MEC) in conjunction

with the rate of interest (r).

- A/c to classical economists, investment is an inverse funcⁿ of rate of interest (r) & there is no other factor.

Marginal efficiency of capital

- MEC is the highest rate of return over cost expected from producing an additional unit of capital.
- When a new investment happens then some capital stock is added to the firm/institution & MEC is the highest rate of return expected from that additional capital stock or investment.
- MEC refers to the rate of discount which makes the present value of the expected net returns from a capital asset just equal to its supply price.
- MEC depends on 2 elements:
 - (i) Prospective yields or expected returns from an income yielding asset.
 - (ii) Supply price or Replacement cost.
- Rate of interest is the cost of raising capital.

- Supply price or Replacement cost is the total cost required to set up the new additional capital stock or it is the investment.
- Then the net return that is expected from the new project over the life of the project is estimated. The life of the project is estimated, then the total return expected from the project is estimated. This is prospective yields or expected returns from an income yielding asset.
- And given the life of the project, net annual returns are estimated, over the whole period.

Derivation of MEC.

- $C_0 \rightarrow$ Supply price / initial amount of invested capital.
- $R_t \rightarrow$ Prospective yield over the life of the project

$$t = 1, 2, \dots, n \text{ (years)}$$

$\Leftrightarrow e \rightarrow$ MEC or discount rate.

- e is the discount rate which will make the current prospective yield equal to the supply price.

$$C_0 = \sum \frac{R_t}{(1+e)^t}$$

$$C_0 = \frac{R_1}{(1+e)} + \frac{R_2}{(1+e)^2} + \dots + \frac{R_n}{(1+e)^n}$$

- If $e > r$, new investment is profitable.
- If $e < r$, new investment is not profitable.
- If $e = r$, investors are neutral.
- New investment is carried out until MFC becomes equal to the rate of interest.
- e is the annual rate of return over cost the company is expected to realise from the project over its life.
- r is the annual cost of raising the capital to undertake the project.
- $e - r$ is the margin of profit to the company if $e > r$.

- But a/c to classical economists, investment is only an inverse funcⁿ of interest rate.
- The ~~concrete~~ countries/places where MFC is higher attract more investment compared to the places where MFC is lower.
- Therefore, MFC is the major determining factor of investment, not only rate of ~~interest~~ interest. In order to increase investments, MFC should increase along with lowering the rate of interest.
- As the amount of investment will keeps on increasing, MFC from the successive projects will decrease. i.e. MFC on the additional amount of capital will decrease.
- ∵ The company should continue investment until MFC becomes equal to the rate of interest.

Demand Price v/s Supply price.

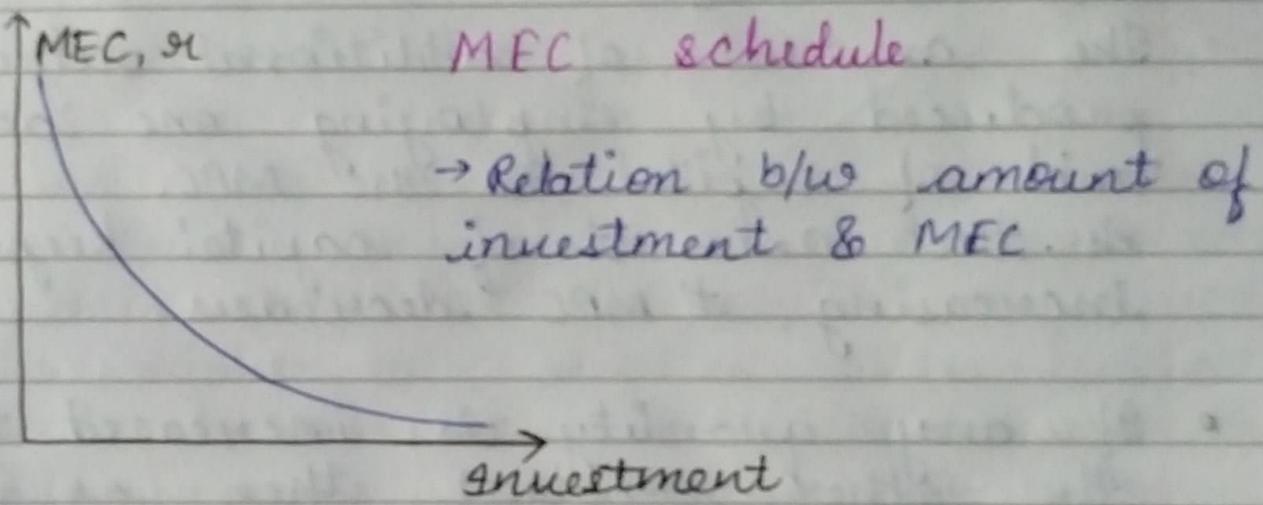
- Supply price: Sum of the prospective yields discounted at the MFC.
 - Prospective yields : R_1, R_2, \dots, R_n .
- Supply price = $\frac{R_1}{(1+e)} + \frac{R_2}{(1+e)^2} + \dots + \frac{R_n}{(1+e)^n}$

Supply price = C_0

Demand price

- Sum of the prospective yields discounted at the current market rate of interest.
- Demand price = $\frac{R_1}{(1+i)} + \frac{R_2}{(1+i)^2} + \dots + \frac{R_n}{(1+i)^n}$
- The demand price is greater, the lower the rate of interest i.e MEC will be greater than the rate of interest.
- Hence, & lower the rate of interest, the greater ~~the~~ is the number of projects over which the demand price exceeds supply price & greater the pace of new investment.
- This implies that ~~when~~ when MEC exceeds the rate of interest, the supply price is less than the ~~demand~~ demand price.
- MFC and Rate of interest must be determined before the investment is determined.
- Both MFC and ~~or~~ are determined independent of each other.

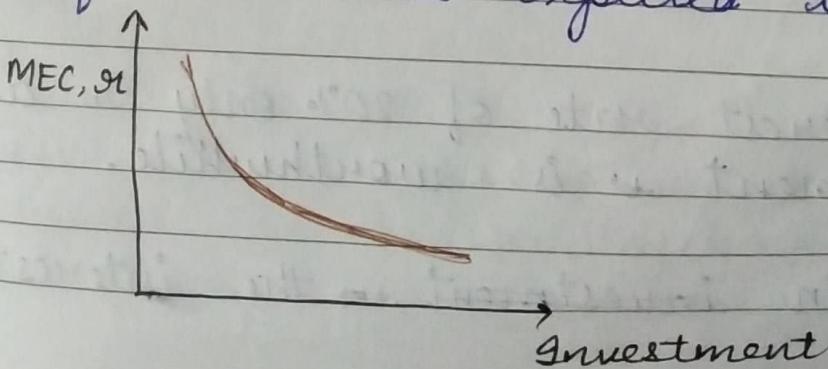
- Demand price > Supply price only when $MEC > r_i \Rightarrow c > r_i$
- However, as more and more capital is used in the production process, the MEC will fall due to diminishing marginal product of ~~savt~~ capital. As soon as MEC is equated to r_i , no new investment will be made in any income-earning asset.



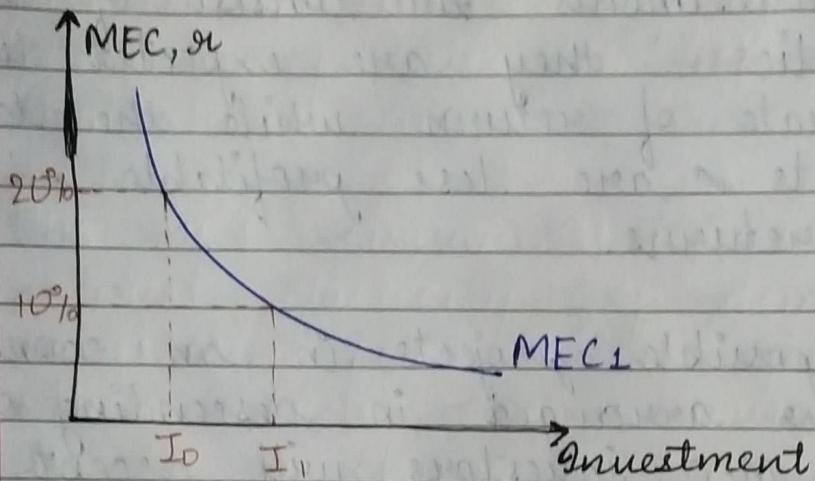
- As amount of investment increases, MEC decreases.
- As the amount of investment increases i.e. company keeps on taking more & more projects, MFC derived from the subsequent projects keep on decreasing.
- The company will keep on adding new projects until the MFC becomes ~~the rate~~ equal to the rate of interest.

- When the projects are arranged in increasing order of their investment, then the MEC derived comes out to be in the decreasing order.
- MPC \rightarrow Marginal productivity of capital
- Output is a func' of labour & capital, so if ~~to~~ capital is ~~increased~~ amount of capital is increased then the output will increase.
The amount of additional output produced by employing one additional unit of capital is the MPC.
As the amount of capital keeps on increasing, ~~&~~ MPC decreases.
- If any quantity is increased keeping the other constant, then as its quantity increases.
- dry factor whose quantity keeps increasing, given the quantity of other factor, then there will be diminishing return or diminishing productivity of that factor.
- In case of MPL or MPC, it is the immediate effect on the product on adding one additional unit of labour or Capital.

- while MEC is calculated for the long-run. In this, the terms are expressed in monetary terms while in case of production funcⁿ, factors are expressed in physical terms i.e. physical input or physical ~~on~~ output.
- Initial investments ~~are~~ consist of the best opportunities : they are expected to have higher rate of return while the later investments ~~are~~ are less profitable ~~and~~ lesser rate of returns.
- If all possible projects in an economy are ~~are~~ arranged in descending order of their MEC, investors will accept those with ~~higher~~ MEC higher than r_1 and reject those whose MEC is lower than r_1 .
- The MEC is not the same as the marginal product of capital which is concerned only with the immediate effect of additional capital on possible output and not with how long the resulting profits can be expected to persist.

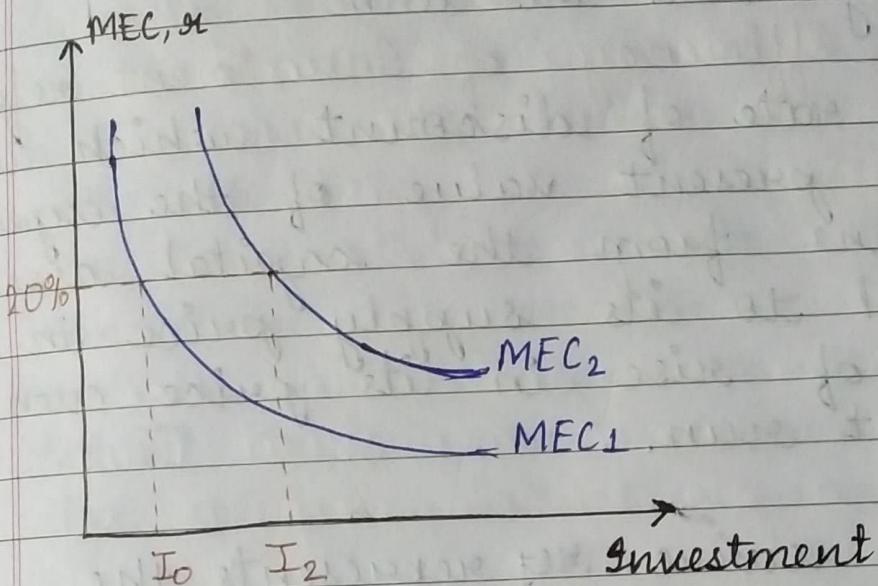


- MEC decreases as the amount of investment increases. This is because initial investments are concentrated on the 'best' opportunities and yield high rates of return; later investments are less productive and secure progressively lower returns.



- The amount of investment undertaken depends not only on expected returns but also on the cost of capital, i.e., the interest rate.
- Investment will be profitable up to the point where the marginal efficiency of capital is equal to the cost of capital.
- With interest rate of 20% only I₀ amount of investment is worthwhile.
- A fall in ~~investment~~ the interest rate

to 10% increases the amount of profitable investment I_1 .



- If expectations change and investors expect to receive better returns from each investment - because, for example, of technological progress - then at any given rate of interest such as 20% more investment will be undertaken than before; i.e., the marginal efficiency of capital schedule will shift to the right, investment will increase from I₀ to I₂.

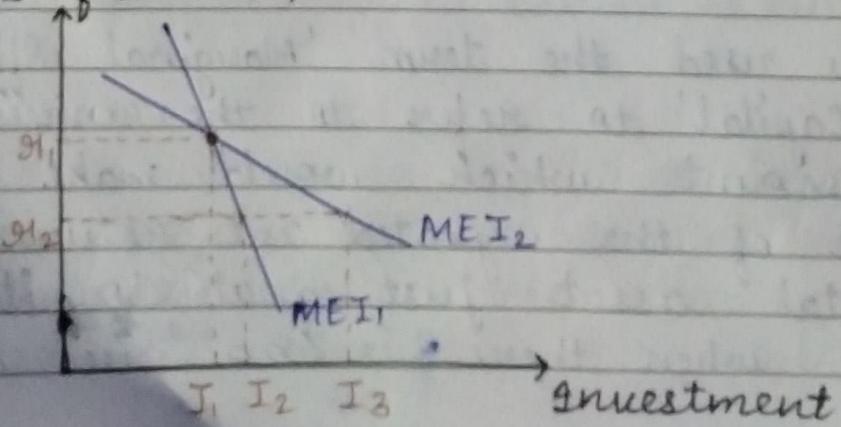
* MEC vs MEI

- Keynes used the term 'Marginal efficiency of capital' to refer to the unique rate of discount which would make the present value of the expected net returns from a capital asset just equal to its supply price when there is no rise in the

supply price of the asset.

- K. Boulding used the term Marginal Efficiency of Investment refer to that rate of discount which would make the present value of the expected net returns from the capital asset just equal to its supply price in the presence of rise in its price even in the short run.
- The MEI curve represents the interest elasticity of demand for investment (or capital goods), or in other words, how responsive investment is to a change in interest rates. Interest rates represent the cost of borrowing. Theoretically, the lower the rate of interest, the cheaper it is for firms to finance investment, and the more profitable the investment will be. Hence, the level of investment will rise.

Rate of interest, r



- A/c to Keynes, the M.E I curve is steep, i.e. the rate of interest has little effect in changing the investment.
- Only when rate of interest is changed very sign significantly, then the investment might change by a considerable amount.
- And it is also not desirable to decrease the rate of interest very much.
- Even if ~~the~~ rate of interest becomes a factor to determine investment demand, it is not a very significant factor. Higher MEC must be ensured in order to attract more investment.

* factors influencing MEC.

- MEC is the expected rate of return, :- it is based on the expectations of the investors.
- If there are +ve expectations, then the investors will invest & if there are -ve expectations for rate of return then the investors may not be willing to invest.

(i) Expectations may be of 2 types :

(i) Short-term

(ii) Long-term

- It is easier to predict short-term expectations. It may be based on past experience. ~~about~~ about the economy of the country in the past, the different policies of the govt, etc.
- But long-term expectations also ~~ex~~ matter as much as short-term because a plant/company is set up for the long run.

Short-term and long-term expectations are based on the following factors:

1. Infrastructure

Better infrastructure ensures higher MEC. Infrastructure is socio-economic overhead capital, all the public-utilities come under this. These are the basic pre-requisites for MEC to be high. ~~so~~ Road systems are needed ~~to~~ for better transportation, ~~the~~ electricity is needed for energy-intensive plants, etc.

2. Governance.

~~If~~ Good governance is needed to quick licensing, ~~a~~ ~~no~~ actions against violation of law and order, etc.

3. Capital equipment Supply

Capital refers to the assets in the company. In India, most of the capital assets are imported. Supply price will depend on the ~~source~~ source from where capital stock is coming i.e. from import or domestic supply.

4. Skilled Man-power

most of the skilled man-power of India goes abroad.

5. Change in Income

If the economy is in recession, then the MEC will be lower and if the economy is in prosperity, then the MEC is expected to be higher.

6. Production methods:

(i) Labour intensive

(ii) Capital intensive

Unless labour skill set has some necessary pre-requisites, then the MEC cannot be high in case of labour intensive. The capital should complement the labour force in order to get the higher MEC.

7. Government policy

Policies affecting the business world are quite important.

8. Nature of Demand.

MEC will largely depend upon the demand of that particular good or service. Huge demand can ensure higher MEC as demand creates scope for production.

- Government sometimes takes measures to increase the demand for goods and services especially non-essential or luxury good.

9. Business cycle.

* Determination of Equilibrium Income

- $GDP(Y) = \text{Consumption}(C) + \text{Investment}(I) + \text{Government Expenditure}(G) + \text{Net Export} + \text{Net Import}(X-M)$.
- $Y(\text{Income}) = C + S + T + (X-M)$.
- $Y(\text{Income}) = C + I + G + (X-M)$.
- Assuming a closed economy, identify for Investment & saving.

$$C + I + G = GDP = Y = C + S + T.$$

- So, the National Income

$$C + I + G = Y = C + S + T.$$

- The above eqⁿ is in Nominal terms.
We convert it into real terms (divided by price level).
 - Real terms are independent of price levels.
- * Saving-Investment Balance.
- Real Output Identity

$$c + i + g = y = c + s + t. \quad \text{Basic NI identity}$$

- This is an identity, not necessarily equilibrium.
- If we look separately to this identity, we get,

$$c + i + g = y.$$

$$y - c = i + g$$

$$y = c + s + t$$

$$y - c = s + t.$$

If we equate both, then

$$i + g = s + t$$

$$i = s + (t - g)$$

$s \rightarrow$ Real Private savings by the households.

$t - g \rightarrow$ Government savings or surplus.

t is the earning of government by the

taxes paid by the public & g is govt expenditure.

$\therefore t-g$ is govt. surplus or saving remaining with the govt. after expenditure.

- If $t-g > 0$, then it is govt. surplus.
- If $t < g$, then it is govt. deficit
- If $t = g$, then there is balanced budget
Govt. earning = Govt. expenditure.
- Planned & realized investment

$$i = \bar{I} + [\Delta \text{inv.}] \rightarrow (\text{lit})$$

↑ ↙ Unplanned investment
 Planned investment

Δinv → Unforeseen changes in inventory.

- i is the realized investment which is the sum of planned and unplanned investment.
- Unplanned investment is the unplanned change in inventories, or unforeseen change in inventories. Thus the producers don't plan or desire to do this but they have to do it.
- Inventory investment can be planned or unplanned. Δinv is the unplanned component.

- Unplanned inventory come into existence when the company is not able to sell the amount of output it planned to sell. The amount which remains unsold goes to the unplanned inventory.
- The unplanned inventory becomes a part of the national income as the and it also becomes a part of the company's investment.
- Even if the company is not able to sell that amount of output, it was produced in that particular period, ∵ it comes under the national income & the company's investment demand.

$$\bar{I} + \Delta \text{inv} + g = s + t$$

- National income consists of is the realized income & it consists of both planned and unplanned inventory component.

$$C + \bar{I} + \Delta \text{inv} + g = C + S + T$$

* Tax, Consumption and Saving Functions

- Tax revenue is a function of income y .

$$T = t(y) : t' > 0$$

- If t_0 is the tax which is independent of income, it is the compulsory tax for every household.
- $\therefore Y-t_0$ is the personal disposable income.
- Then consumption becomes a func" of $y-t_0$.
- If the amount of tax payed by everybody is equal ~~then it is called~~ i.e. the amount of tax remains the same regardless of income. then it is called lumpsome tax or constant tax system.
- It is similar to autonomous consumption it is autonomous tax (independent of income).
- If tax is proportional to income, then it is proportional tax structure and then tax revenue becomes a function of income.

$$t = t(y), t' > 0.$$

- $t' = \frac{dt}{dy}$, change in tax with the change in income is positive.
- t' is the tax rate i.e. proportion of

income that is becoming.

Disposable personal income = $y - t(y)$.

Disposable income (DI) = $y - t(y)$.

$$C = c(y - t(y)) \quad \text{Consumption function}$$

$s' > 0$, this is also known as MPC.

$$S = s(y - t(y))$$

$s' > 0$, this is also known as MPS.

$$MPC + MPS = 1$$

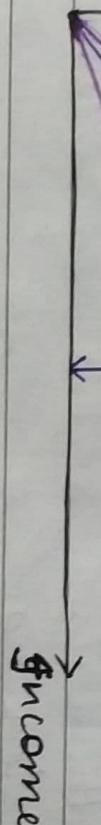
use of income

This is a 45° line

$$s(y_0 - t(y_0))$$

$$c(y_0 - t(y_0))$$

$$t(y_0)$$



One part of income goes in tax, another part goes in consumption and the remaining part goes in saving.

The 45° line is the total income.

- Area below the 45° line line is total income.
- Below tax line we pay tax. Rest is DI.
- Area which shows $c(y - t(y))$ is consumption. Rest is saved.

* Determination of equilibrium Income.

- Equilibrium income is achieved when Δinv becomes 0.
- i.e. Demand becomes equal supply in the plant/firm sense.

$$\bar{I} + \Delta \text{inv} + g = s + t$$

\Downarrow

0 for equilibrium
This is the inventory or unexpected part.

$$\bar{I} + \Delta \text{inv} + g = s(y - t(y)) + t(y)$$

\Downarrow

0 for eq.

- When there is no unplanned i i.e. planned i becomes equal to realized i then eq. income is achieved.

$$\text{Realized } i = \text{Planned } i + \text{Unplanned } i$$

At eq. income, Income becomes equal to planned expenditure.

$$\boxed{i + g} = \boxed{s(y - t(y)) + t(y)} \quad \begin{matrix} \text{Equilibrium} \\ \text{condition} \end{matrix}$$

Planned investment plus government expenditure

Savings plus tax revenue.

If income increases then,

$$(s+t) > (i+g)$$

Savings > Investment

i.e. $y > c + i + g \Rightarrow s + t > i + g$
 \Rightarrow Income > Expenditure.

$$(s+t) - (i+g) = \Delta \text{inv} > 0.$$

Eq. $y = c + i + g$ in ~~plant sense~~. planned sense not realized sense.

$\Delta \text{inv} > 0$, means there will be extra inventory. So producers will call back the orders until $\Delta \text{inv} = 0$.

When the demand rises, then the firm will expand supply until $\Delta \text{inv} = 0$. i.e. if $\Delta \text{inv} < 0$ then there will be unexpected demand & to meet that, producers will expand and then $\Delta \text{inv} = 0$. eq. reached.

Stability of the eq. income.

We consider that both $s+t$ & $i+g$ are autonomous functions i.e. independent of income.

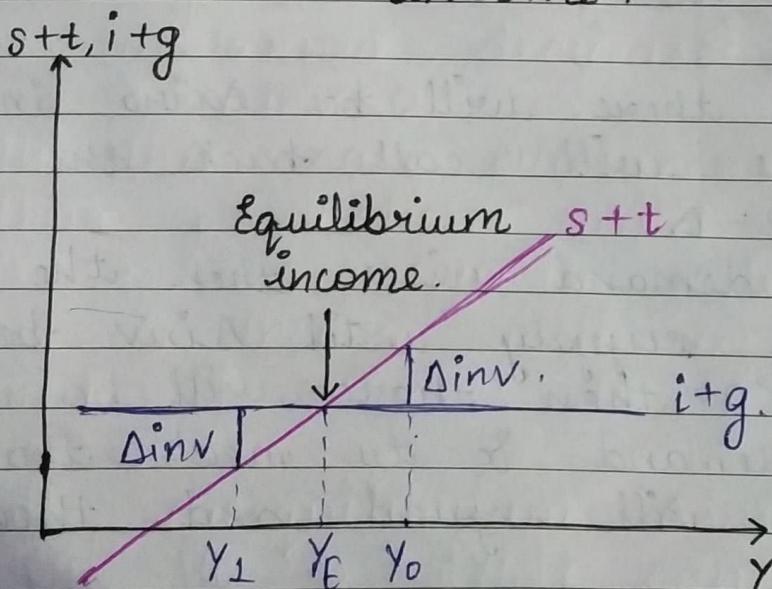
Leakage funcⁿ: $s+t$

Injection funcⁿ: $i+g$

$(s+t)$ is +vely sloped, because both are func's of y . Now i & g both are independent of income, they are autonomous. It is a horizontal line.

Injection funcⁿ is a horizontal straight line. So leakage funcⁿ consists of 2 increasing func's of income. \therefore it is a +vely sloped straight line.

$s+t = i+g$ there is equilibrium income.



The incomes other than eq. income are called dis-equilibrium income.
i.e. Y_0 or Y_1 is dis-equilibrium income.

Y_E = equilibrium income

Y_0 = New Income if $(s+t) > (i+g)$.

Y_1 = $(s+t) < (i+g)$.

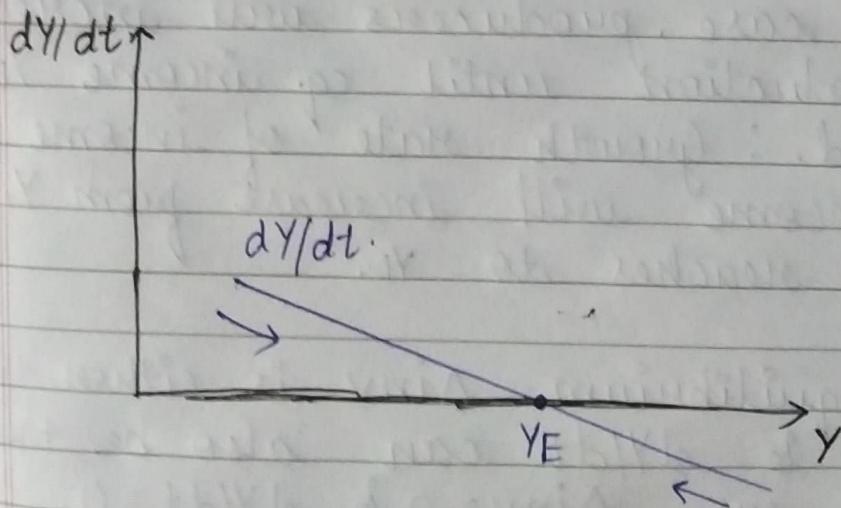
If $(s+t) > (i+g) \Rightarrow$ Savings & Tax > investment & govt. purchase.
 $y > c + \bar{I} + g$.

\rightarrow Total income > Total expenditure.

If Income > eq. income, there is over production in the economy

Total Supply > Total demand for output.
There will be unplanned increase in inventory.

at Y_0 , $(s+t) > (i+g)$,
producers will cut back production i.e.
production/output will be reduced &
correspondingly income will reduce from
 Y_0 to Y_E .



dY/dt is the rate of change in income with time.

dY/dt is positive. so income Y will be rising to point YE .

Similarly dY/dt is -ve, it will go back to YE .

When the production is cut down, then there is fall in income then there is -ve growth rate of income i.e. dY/dt is -ve. until YE is reached.

At Y_1 , $(s+t) < (i+g)$. Demand is high, producers start producing more.
 $y < c + i + g$.

Total demand $>$ Total supply.
 The current demand will be met by clearing the inventory i.e. there will be unplanned decrease in inventory.
 $\Rightarrow \Delta inv < 0$.

In this case, producers will increase their production until eq. income YE is reached. \because Growth rate of income is +ve & income will increase from Y_1 until it reaches to YE .

At disequilibrium Δinv is either +ve or -ve & dY/dt can also be +ve or -ve. At eq., $\Delta inv = 0$ & $dY/dt = 0$.