



## ECONOMICS

Unit-7. "Putting All Markets  
Together: The  
AS-AD"7.1 Aggregate Supply: Effect of  $Y$  on  $P$ .

» Aggregate Supply Relation is derived from the behaviour of wages and prices.

For Wage Determination:  $W = P^e F(u, z)$  (1)

For Price Determination:  $P = (1+m)W$  (2)

→  $P^e$  (expected price level),  $P$  (Real price level),  
 $u$  (unemployment rate),  $W$  (~~Real~~ <sup>nominal</sup> Wage),  $z$  (other  
factors) and  $m$  (markup level).

» We then used these two relations to derive an assumption i.e.,  
 $P = P^e$

Under this assumption, we derived the natural rate of  
unemployment i.e.,  
natural rate of output.

HERE in this chapter, we will not impose this assumption.

» It will turn out that this assumption will be imposed in  
Medium run but not in Short run."

But without this assumption, we will derive a new eqn.:  
(with wage & price setting relation) i.e., :

[among  $P$ , output level,  $P^e$ ]





First : (Eliminating  $w$  from both the equations (1) & (2) :)

$$\Rightarrow " P = P^e (1+m) F(u, z) " \text{ --- (3)}$$

$\therefore$  Price level depends on the expected price level and on the unemployment rate as well as  $m$  &  $z$  but they both are constant here (assuming).

Second : (replacing  $u$  with its output's expression :)

$$u = \frac{U}{L}$$

$$(U = L - N) \text{ so, } u = \frac{L - N}{L}$$

$$\therefore \text{ Keeping } L \text{ constant :- } 1 - \frac{N}{L}$$

Now, with the derivation of production function, which says one unit of output = one worker  
 $\therefore \underline{Y = N}$  - Using this,

$$\text{we derive } \Rightarrow u = \underline{\underline{1 - \frac{Y}{L}}}$$

Final : Putting everything together for equation (3) :

$$" P = P^e (1+m) F\left(1 - \frac{Y}{L}, z\right) " \text{ (} m, L, z = \text{constant)}$$

This is the Aggregate Supply Relation.

"It should be called labor market relation BUT it is called AS Relation as it looks like a supply curve graphically."



Two important Properties: " $P = P^e (1+m) F(1-\frac{Y}{L}, z)$ "

- ⊙  $\uparrow Y = \uparrow P$  (increase in output = increase in price level)
- ⊙  $\uparrow P^e = \uparrow P$  (increase in expected price = increase in price level)

①  $\uparrow Y = \uparrow P$  [How / Because]:

- 1st Graph
- » An  $\uparrow$  in <sup>(Y)</sup> Output =  $\uparrow$  in <sup>(N)</sup> employment i.e.,  $\uparrow$  price levels.
  - »  $\uparrow$  in employment =  $\downarrow$  in unemployment i.e., equals to  $\downarrow$  in unemployment rate <sup>(u)</sup>
  - »  $\downarrow$  in unemployment rate <sup>(u)</sup> =  $\uparrow$  nominal wage <sup>(W)</sup>
  - »  $\uparrow$  in  $W = \uparrow$  prices set by firms =  $\uparrow$  price levels <sup>(P)</sup>

$$\therefore \underline{\underline{\uparrow Y = \uparrow P}}$$

$$\therefore \uparrow Y = \uparrow N = \downarrow U = \downarrow u = \uparrow W = \uparrow P$$

②  $\uparrow P^e = \uparrow P$  [How / Because]:

- » Wage setters (who sets real wage according to the inflation) expect an  $\uparrow$  in price level = they set  $\uparrow$  nominal wage.
- »  $\uparrow$  Nominal Wage =  $\uparrow$  Costs =  $\uparrow$  prices of firms =  $\uparrow P$ .

$$\therefore \underline{\underline{\uparrow P^e = \uparrow P}}$$

$$\therefore \uparrow P^e = \uparrow W = \uparrow \text{Costs} = \uparrow P$$

⇒ If  $\hat{Y}$  (the natural level of output)  $Y_n$ .

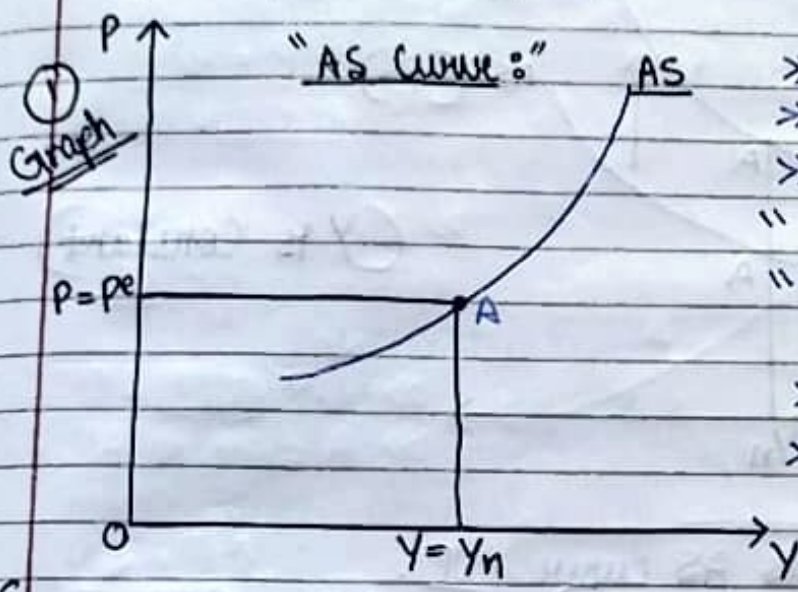
So,

$$\text{(Price level)} \underline{P} = \underline{P}^e \text{ (Expected price level)}$$





# This relation between Output ( $Y$ ), Price level ( $P$ ) and expected price level ( $P^e$ ) is shown in AS Curve.



"AS Curve:"

- >> is upward sloping.
- >>  $\uparrow Y = \uparrow P$
- >> equilibrium here is when " $Y = Y_n$ " is equals to " $P = P^e$ " i.e. A.
- >>  $\uparrow P^e =$  AS Curve goes up.
- >>  $\downarrow P^e =$  AS Curve goes down

③ • " $Y = Y_n$ " = " $P = P^e$ " [How/Because] :

2nd Graph

>>  $Y$  is above  $Y_n$  so,  $P$  is  $\uparrow$  than expected.

>>  $\downarrow$  :  $Y$  is right to  $Y_n$  than  $P$  is  $\uparrow$  than  $P^e$ .

$Y_n \uparrow = Y$                        $P \uparrow = P^e$

>>  $Y_n$  is right to  $Y$  then  $P^e$  is  $\uparrow$  than  $P$ . (Vice-versa)

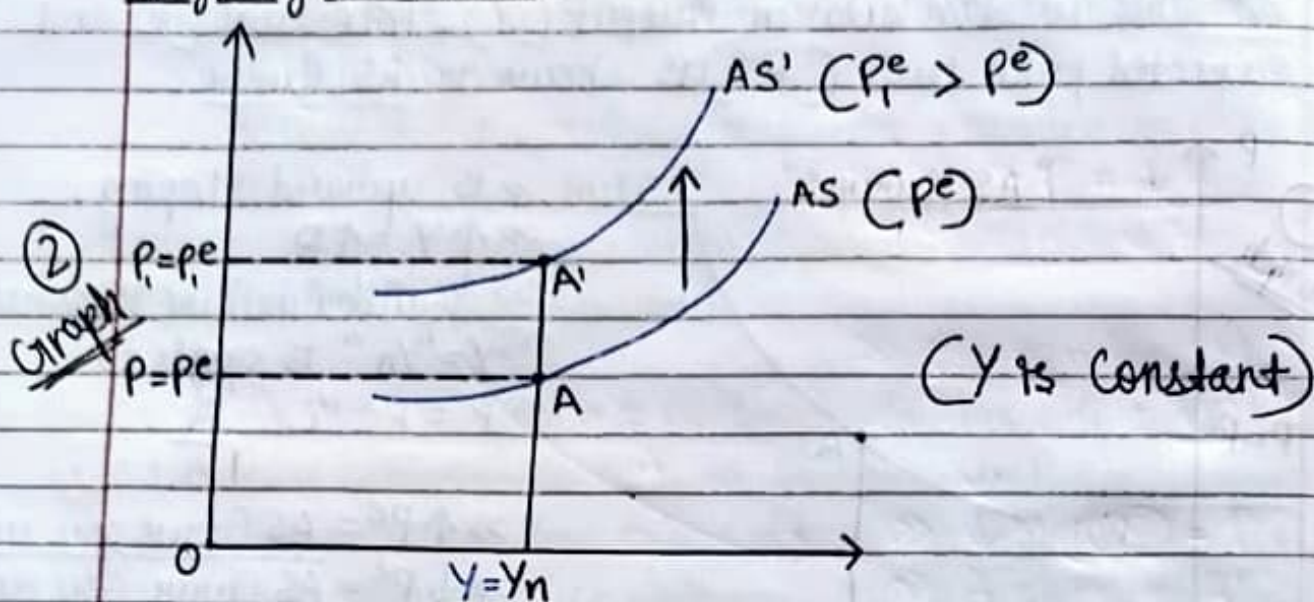
$Y \uparrow = Y_n$                        $P^e \uparrow = P$







## "Shifts of AS Curve:"



»  $\uparrow$  in  $P^e$  shifts AS curve UP.

» At a given level of  $(Y) = u = \uparrow P^e = \uparrow$  Wages  
 $\Rightarrow \uparrow P$

$\Rightarrow \uparrow Y = \uparrow P$

» At any level of  $Y = P$  is  $\uparrow$  (AS curve goes UP)

» New equilibrium point goes from A to A'.

»  $\uparrow P^e = P \Rightarrow$  Graph goes up.

»  $\downarrow P^e = P \Rightarrow$  Graph goes down.

## 7.2 Aggregate Demand: Effect of P on Y.

» Aggregate Demand is derived from the equilibrium conditions in goods and financial markets.

• Goods - Market Equilibrium -

$$Y = C(Y - \bar{T}) + I(Y, I) + G \quad \text{IS Relation}$$





→  $Y$  = Output,  $I$  = Investment Spending,  $C$  = Consumption,  $G$  = Govt. Spending,  $T$  = Transfer Payments / Tax.

• Financial Market Equilibrium -

$\frac{M}{P} = YL$  - "Demand for real balances / money"

$\frac{M}{P}$  = Money } "Real Money equation"  
 $P$  = Price }

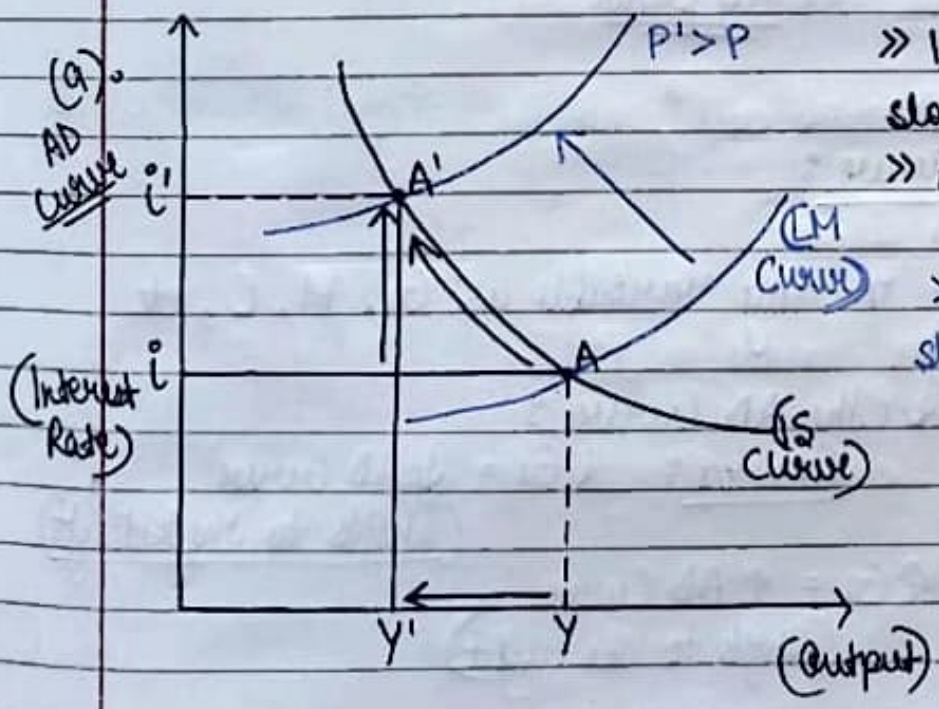
"LM Relation"

» Same effect on real money stock when:  $M \downarrow$  and  $P \uparrow$

(Same effect)

↓ "Real Money Stock"

» By using these IS & LM Relation derives the relation between price level and output level.



» IS Curve downward sloping:  $i \uparrow = \downarrow Y$ .

» A shifts to A'.

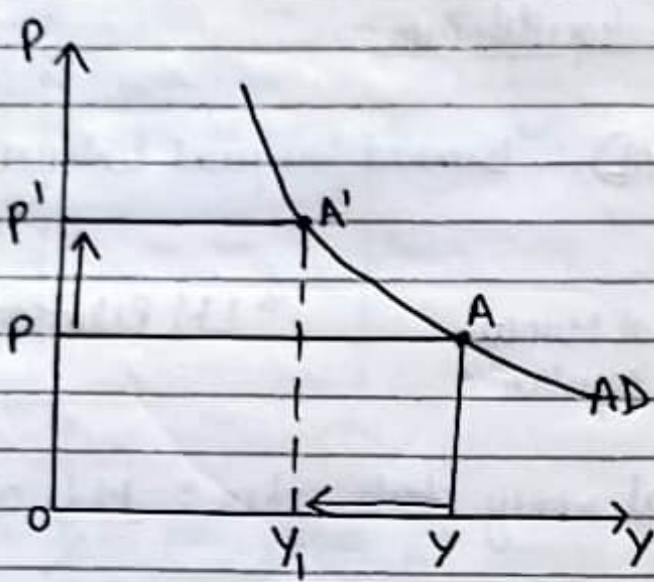
» LM Curve is upward sloping:  $\uparrow Y = \uparrow L$  (Demand)

$\uparrow Y = \uparrow i$

∴ A = equilibrium of IS and LM relation.



New (b). AD Curve :



»  $\uparrow P = \downarrow Y$   
 $\uparrow P = \downarrow M$  (M/P)

» This is why LM Curve shifts UP

»  $\downarrow M = \uparrow i$  (P)  
 » A shifts to A'

∴  $\uparrow P = \downarrow Y$

∴  $\uparrow i = \downarrow Y$

∴ This Negative relation between P & Y is drawn as "Downward Sloping."

∴ AD Curve

» Shifts of AD Curve :

"Any  $\uparrow$  or  $\downarrow$  in any variable as G, M, C, etc other than (P), also,  $\uparrow$  or  $\downarrow$  the AD Curve :

For ex:  $\downarrow G = \downarrow$  AD Curve  
 (Shifts to the left)

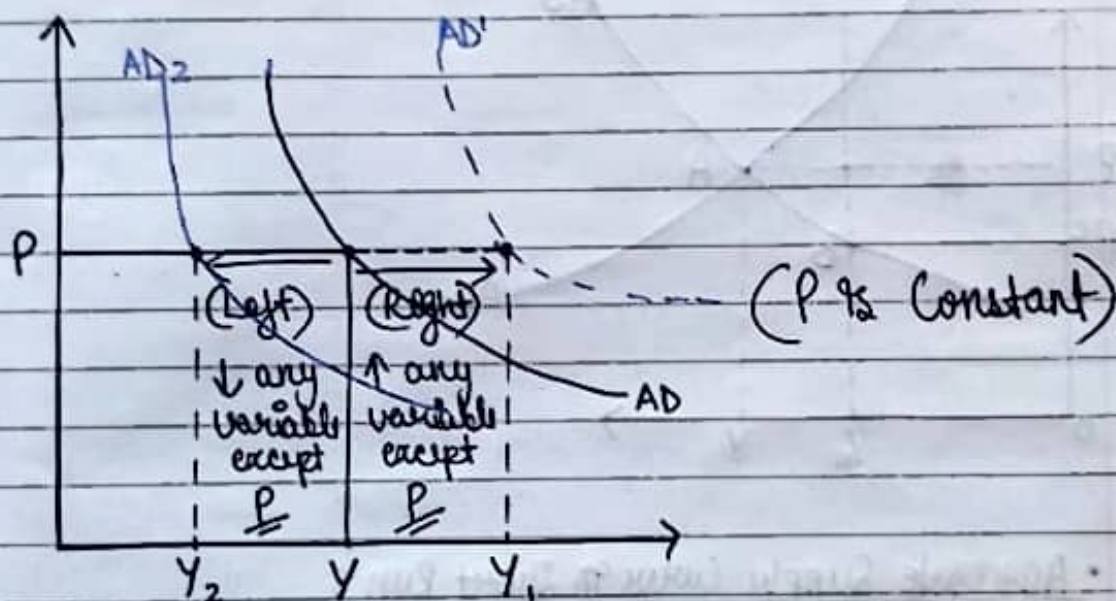
$\uparrow G = \uparrow$  AD Curve  
 (Shifts to the right)

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AD Relation:  $Y = Y \left[ \frac{M}{P}, G_1, T \right]$   
+ , + , -

∴ Output is an ↑ function of (Real Money)  $\frac{M}{P}$ , ↑ of  $G_1$  (Govt. Spending) and ↓ of  $T$  (Taxes).

→  $\uparrow P = \downarrow \frac{M}{P} = \downarrow Y$



7.3 Equilibrium in the Short Run and in the Medium Run :

» AS Relation:  $P = P^e (1+m) F \left[ 1 - \frac{Y}{L}, z \right]$

» AD Relation:  $Y = Y \left[ \frac{M}{P}, G_1, T \right]$

» The value of  $P^e$  (Expected Price Level) of AS Relation. and the value of  $M, G_1, T$  (Monetary and Fiscal Policy variables) of AD Relation. "Depends on the Equilibrium of  $Y$  &  $P$ "



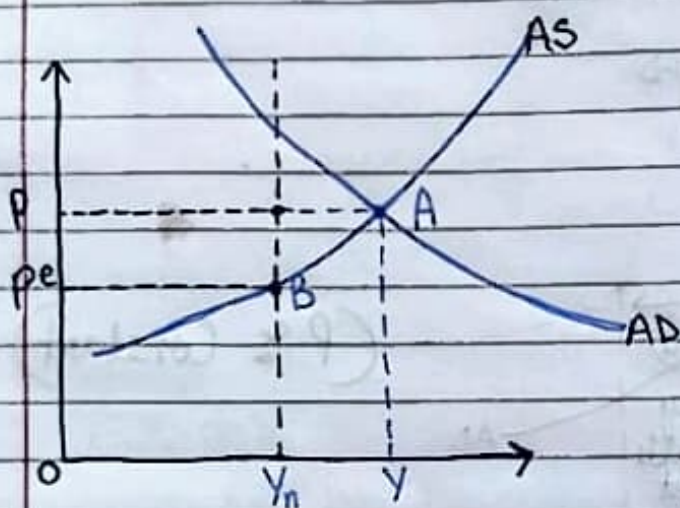


In Short Run Equilibrium, it is dependant on  $P^e$  (expected price level).

$P^e$  changes the AS Curve, when  $P^e$  increases / decreases, AS Curve shifts UP / DOWN.

» So, in short run,  $P^e$  changes and how it affects the equilibrium :-

→ Equilibrium in the Short Run :



• Aggregate Supply Curve in Short Run :

» AS Curve is determined by  $(P^e)$  and  $Y_n$  (majorly).

» It is upward sloping.

»  $\uparrow Y = \uparrow P$ .

» Position of Curve depends on  $P^e$ .

» If  $Y = Y_n$ ,  $P = P^e$

» Point of AS Curve goes through point (B).





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• Aggregate Demand Curve in Short Run :

» AD Curve is determined by  $M, G, T$  values.

» It is downward sloping.

»  $\uparrow P = \downarrow Y$ .

»»» Equilibrium point is A at the intersection of AS and AD.



▲ Point A : Financial Markets, Goods Markets, Labor Market are all in equilibrium.

∴ Financial and Goods Market are in equilibrium because it's on the AD Curve.

∴ Labor Market are in equilibrium because it's on the AS Curve.

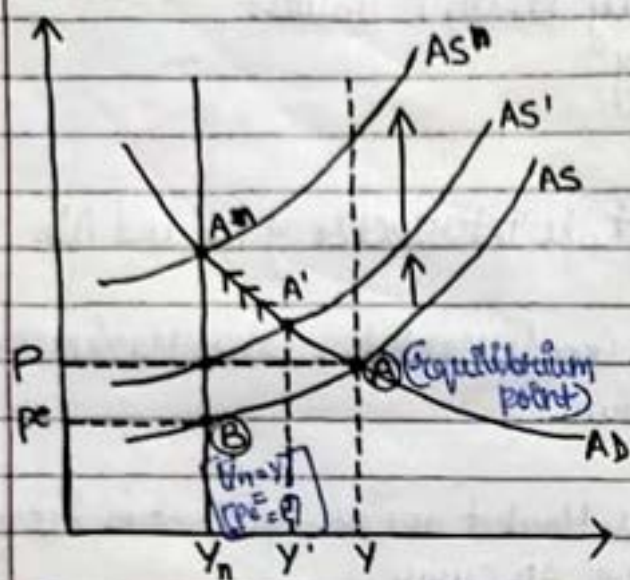
∴ In Short Run, there is no reason of output ( $Y$ ) being = to the Natural level of output ( $Y_n$ ),  $Y$  is  $\uparrow/\downarrow$  than  $Y_n$  here.

This depends on the value of AS Curve i.e. the expected price level ( $P^e$ ) and the value of AD Curve i.e. ( $M, G, T$ ).





## → From Short Run To Medium Run :



•  $Y = Y_1$  and  $Y_1$  is higher than  $\underline{Y}_n$ . ( $Y > \underline{Y}_n$ )

•  $Y$  exceeds  $\underline{Y}_n$  (at point A) =  $P$  exceeds  $\underline{P}^e$ .

• Which means the wage setters expectations had higher & increased.

• So, next time, wage setters will decide based on a Higher expected price level,  $P^e > P$ .  
(Future)

• AS shifts up to  $AS'$ , wage setters expect higher Price level.

• ↑ higher nominal wage = higher price.

∴  $P = \uparrow$  (1st reason)

• This upward shift in AS moves up along AD Curve.

• A to A' (moves up) and  $Y = Y'$  (decrease)

• At A',  $Y'$  exceeds  $\underline{Y}_n$ , so  $P \uparrow$  than  $\underline{P}^e$ .

• So, (2nd reason) why,  $P \uparrow$  and wage setters keep their expectations of price level higher.





Summarizing:  $\odot$   $A'$  exceeds  $A$  on equilibrium, and  $Y$  decreases to  $Y'$ .

$\bullet$   $AS$  shifts up to  $AS'$ ,  $P$  exceeds the  $P^c$ .

$\odot$  So, wage setters will increase their expectations for price level from next time (future). If  $P^c > P$ ,  $AS$  curve will  $\uparrow$ .

$\rightarrow \uparrow P^c = \uparrow W = \uparrow P$ .

$\rightarrow$  This adjustment ends when  $Y = Y_n$  &  $P = P^c$  and wage setters does not change their expectation then.

$\therefore$  In Medium Run, this all changes returns the  $Y$  to  $Y_n$ .

$\rightarrow$  If  $Y$  exceeds  $Y_n$ ,  $AS$  curve shifts up, until

$\rightarrow Y$  returns to  $Y_n$ .

#### 7.4 The effects of a Monetary Expansion:

$\gg$  The Dynamics of Adjustment -

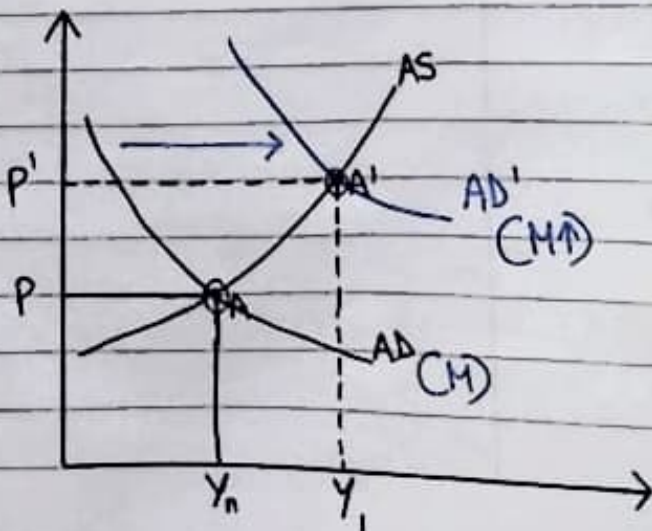
$$Y = Y \left[ \frac{M}{P}, G, T \right] \bullet \uparrow M = \uparrow \frac{M}{P} = \uparrow Y$$

$\bullet \uparrow \frac{M}{P} = AD$  curve Right. ( $\uparrow Y$ )

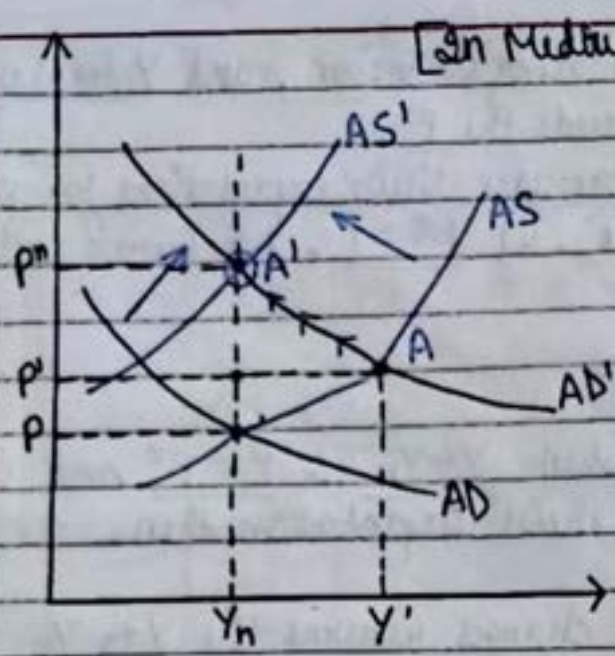
$\bullet$  In Short Run,  $Y$  and  $P \uparrow$ .

$AD = AD'$   
(shifts right)

[In Short Run]







[In Medium Run]

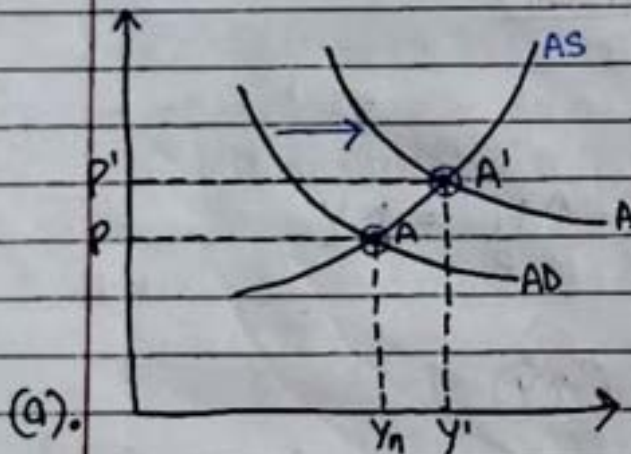
∴ In medium run, AS shifts to AS' and economy returns to equilibrium at  $Y_n$ .

$A' = (P'' = Y_n)$

• P increases & Y has no effect in medium run

by monetary expansion. → coz it goes back to its natural form.

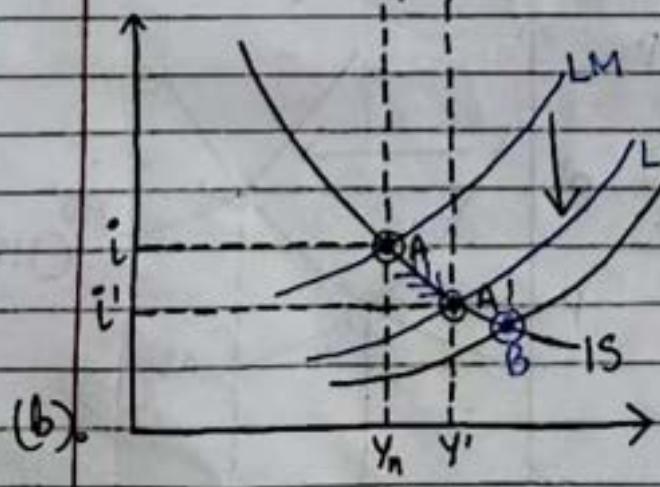
>> Getting Behind the Scenes:



>> The impact of this monetary expansion on interest rate is shown by IS-LM Curve.

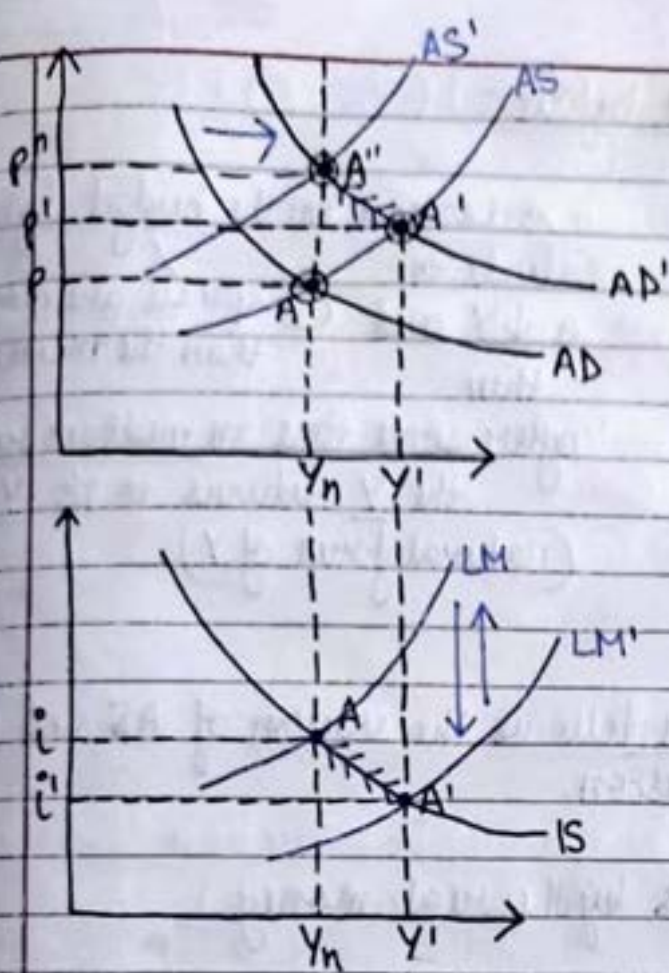
>> In short run, LM curve goes down:  $i \downarrow$  and  $Y \uparrow$ .

>> B point is when P did not increase, LM will get larger to LM''.



[In Short Run, for  $i$ ]  
[In IS-LM Curve]





- Price increases and AS curve shifts to AS', returning the LM curve to its natural form. ( $Y'$  to  $Y_n$ )
- In medium run, LM curve goes up / returns to its natural output form, where  $i$  remains unchanged.

Medium  
 [ In ~~Short~~ Run,  $i$  ]  
 [ In IS-LM curve ]

>> The Neutrality of Money:

- In the Short-Run, Monetary expansion increase the output, decrease the interest rate & increase the Price.

$\therefore \uparrow Y, \downarrow i \text{ \& \ } \uparrow P$

- In the Medium Run, Monetary expansion increase the nominal money & increase the Price.

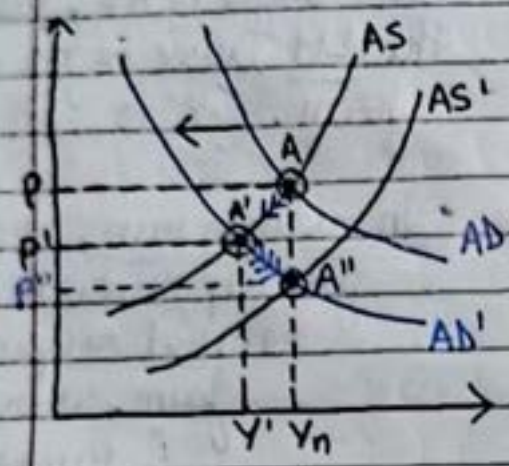
$\therefore \uparrow M = \uparrow P$

→ The Neutrality of Money refers to NO EFFECT on  $Y$  or on  $i$  in medium run, but on  $P$ .





### 7.5 A Decrease in the Budget Deficit :

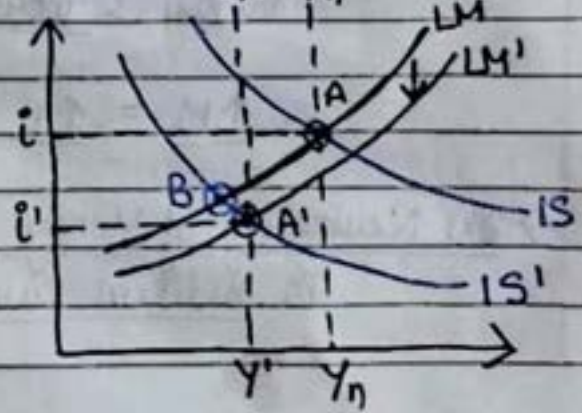
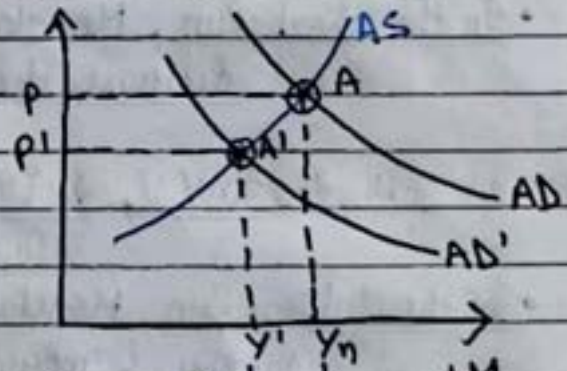
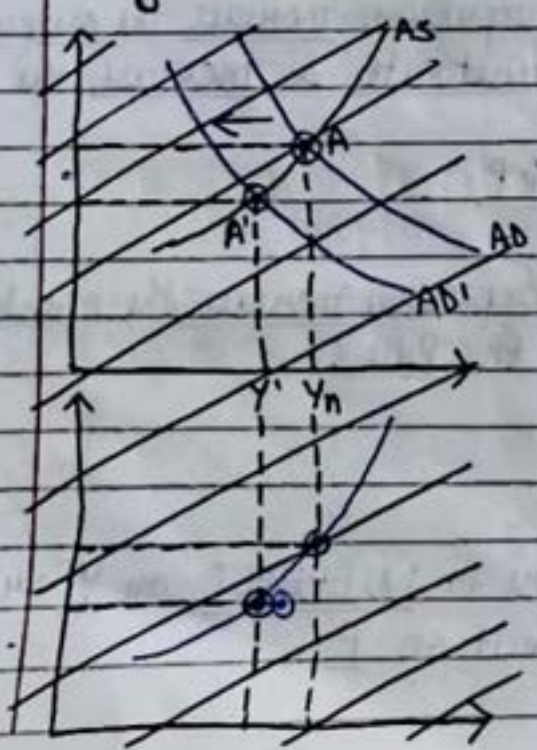


» Decrease in the budget deficit leads to a  $\downarrow Y$  and  $\left( \begin{array}{l} \text{Expenses are more} \\ \text{than the incomes} \end{array} \right)$  then after some time in medium run the  $Y$  returns to its  $Y_n$  (natural form of  $Y$ ).

\* Macroeconomics models tells us the version of AS and AD curve in a larger version.

It tells us how it effects by the real money.

### » Deficit Reduction, Output and the Interest rates :

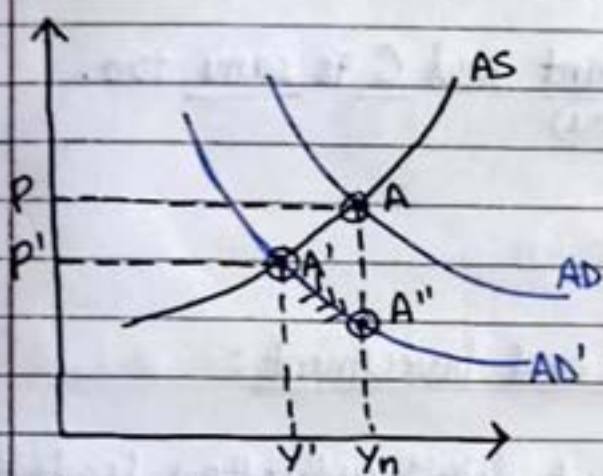




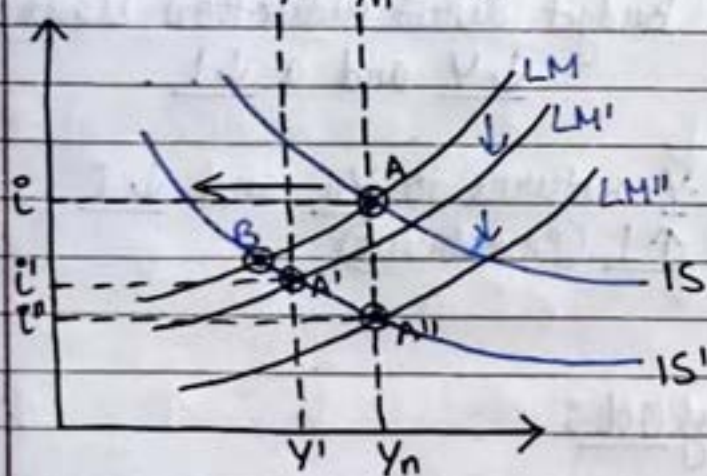


→ Price level ↓ because of ↓ Y, ↑ Money Stock.  
• This cause LM shift to LM', curve shifts down.

→ Y and i are lower.



» LM curve continues to shift down until Y goes back to its natural form i.e. Yn.



» Interest Rate is lower than before deficit reduction.

∴ In short run: ↓ Y and ↓ i.

∴ In medium run: Y returns to Yn and i ↓ more.

∴ Remember the IS Relation:

$$Y = C(Y, T) + I(Y, i) + G.$$

So, after deficit reduction:



$$\Rightarrow Y_n = C(Y_n - T) + I(Y_n, i) + G$$

: Income & Taxes remain unchanged, so C is same.  
~~(T)~~

: G is  $\downarrow$  than before, ~~and~~ I  $\uparrow$  than before.

$\therefore$  T is constant and C is same too.  
 (same)

$\rightarrow$  G  $\downarrow$ .

$\rightarrow$  I  $\uparrow$ .

$\gg$  Budgets Deficits, Output and Investment:

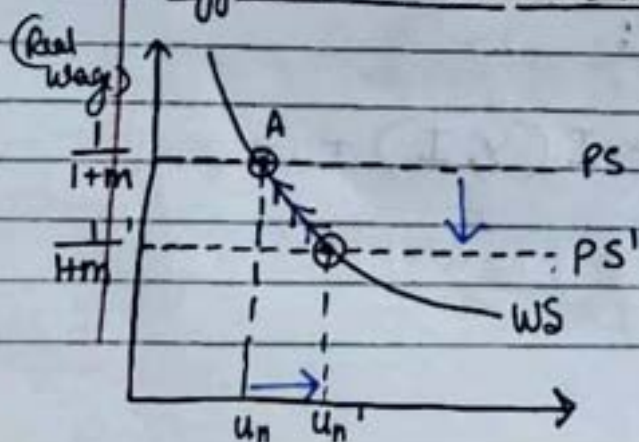
• In Short Run, Budget deficit reduction leads to  $\downarrow Y$  and a  $\downarrow I$ .

• In Medium Run, Y returns to  $Y_n$  and  $\downarrow i$  and  $\uparrow I$  (Investment)

## 7.6 Changes in the Price of Oil:

• Price of the crude petroleum oil increased 1970s and decreased in 1980s and 1990s.

$\gg$  Effects on the Natural Rate of Unemployment:



$\gg$  Increase of the prices of oil,  
 $\uparrow$  the markup,  $\uparrow$  the natural  
level of employment  
 and PS goes downward.



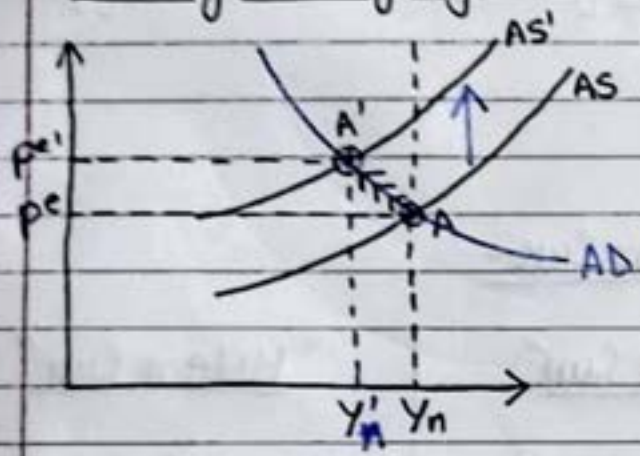


• ↑ m markup : ↑ P at any level of Y.

∴ AS Curve shifts up.

» The Dynamics of Adjustment:

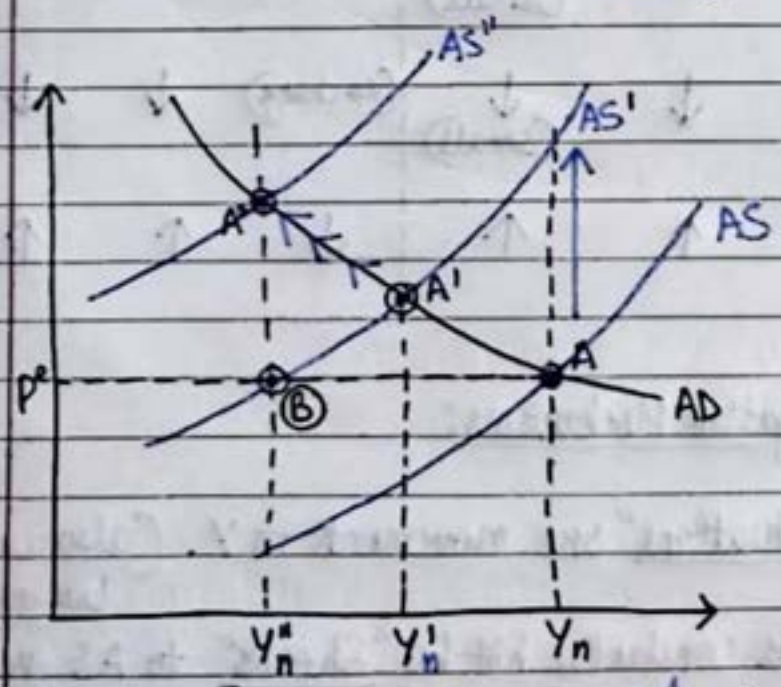
$$[P = P^e(1+m)F\left[1 - \frac{Y}{L}, z\right]]$$



» ↑ Price of oil = AS curve shifts up to AS' and A points to A'.  
equals to a lower level of natural form.

» AD curve → from A to A'

» Y ↓ → from Y<sub>n</sub> to Y<sub>n</sub>'.



» Over time AD curve move from A' to A''.

» At point A'', Y goes from Y<sub>n</sub>' to Y<sub>n</sub>''.

and the price level increase:

∴ In short run, ↑ P of oil ⇒ ↓ Y and ↑ P.

∴ In medium run, Y decrease further and P increase further.





- Stagflation: Slow growth, high unemployment and (Stagnation) rising prices, when occurs together is Stagflation. (inflation)

### 7.7 Conclusion:

#### » Short Run Vs Medium Run -

	<u>"Short Run"</u>			<u>"Medium Run"</u>		
	<u>Y</u>	<u>i</u>	<u>P</u>	<u>Y</u>	<u>i</u>	<u>P</u>
(Monetary Expansion)	↑	↓	↑ (small)	(no change)	(no change)	↑
(Fiscal Reduction)	↓	↓	↓ (small)	(no change)	↓	↓
(Increase in oil price)	↓	↑	↑	↓	↑	↑

#### » Shocks and Propagation Mechanisms:

- "Output Fluctuations" are movements in  $Y$ . (also called business cycle)
- The economy is constantly hit by "Shocks" to AS or AD or both.
- These "shocks" has dynamic effects on  $Y$  and this is called "Propagation Mechanism".