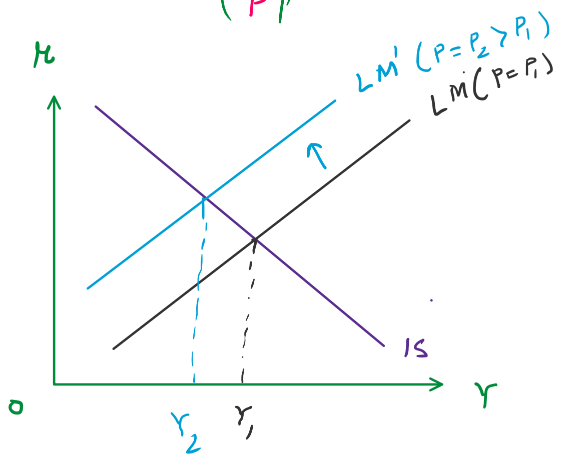
AD - AS Model

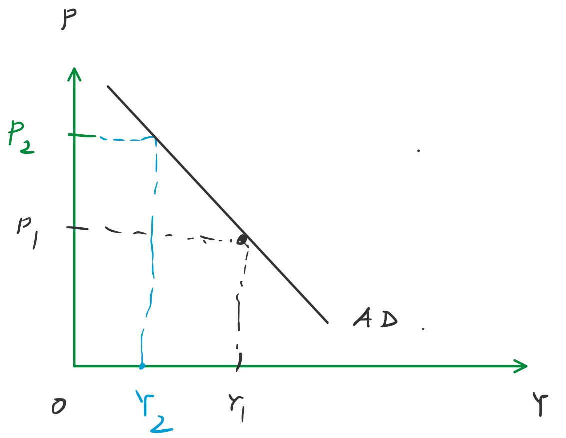
Recall: Keynesian Theory [SKM + ISLM].

$$IS: \quad Y = C(Y) + I(r) + G .$$

$$LM: \left(\frac{\bar{M}}{P\uparrow}\right) = L(Y, r)$$

} → construct the AD curve.





AS: Agg short run prodn fn: $Y = F(L, \bar{K})$

[Optimal output (at given price) → Optimal level of L]

Assuming a competitive setup, $Y = F(L, \bar{K})$, $F_L > 0$, $F_{LL} < 0$.

∴ Optimal choice of Labour [through π-max].

$$\pi = R - C = P.Y - wL - r\bar{K}.$$

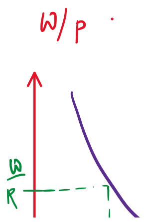
$$\pi = P.F(L, \bar{K}) - wL - r\bar{K}$$

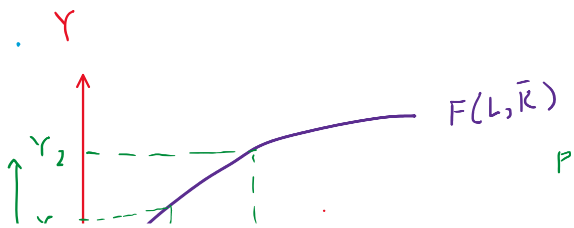
FOC: $\frac{\partial \pi}{\partial L} = 0 \Rightarrow P.\frac{\partial F}{\partial L} - w = 0 \Rightarrow P.F_L - w = 0.$

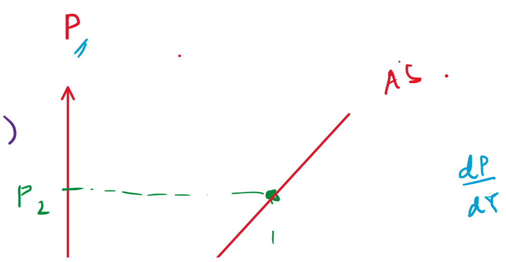
$$\Rightarrow \boxed{F_L = \frac{w}{P}}$$

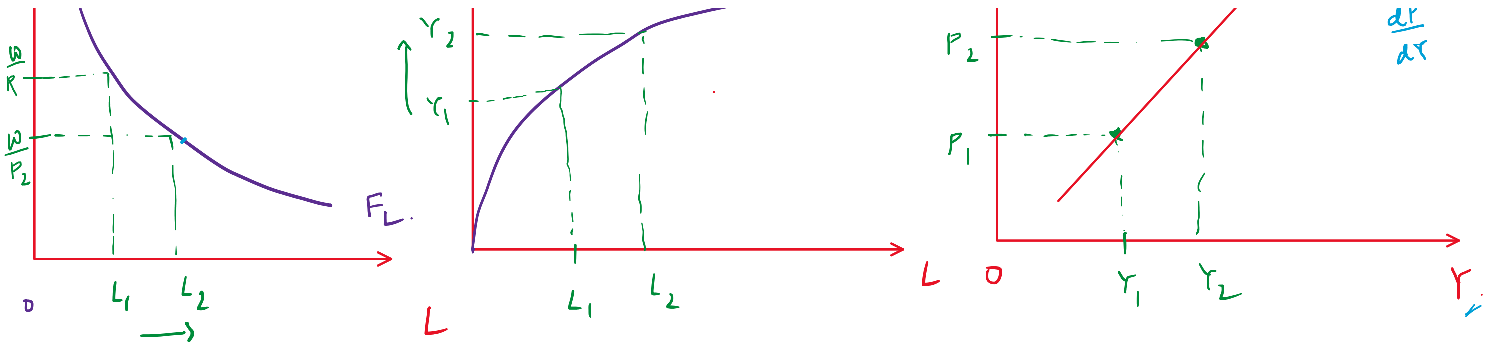
$$u = f(x, y) \qquad Y = F(L, \bar{K})$$

$$\frac{\partial u}{\partial x} = \phi(x, y) \qquad \frac{\partial Y}{\partial L} = \phi(L, \bar{K})$$









Prodn fn: $Y = F(L, \bar{K})$ ---- (i)

$\therefore$ Optimal labour employment: $F_L = \frac{W}{P}$ --- (ii) Find $\frac{dP}{dY}$.

Diff. (i): $dY = \left(\frac{\partial F}{\partial L}\right) . dL = F_L . dL$. $\Rightarrow \frac{dY}{F_L} = dL$

Diff (ii). $F_{LL} . dL = -\frac{W}{P^2} . dP$.

Replace: $F_{LL}\left(\frac{dY}{F_L}\right) = -\frac{W}{P^2} . dP$.

$$\therefore \left.\frac{dP}{dY}\right|_{AS} = \frac{\left(\overset{<0}{F_{LL}} / \overset{>0}{F_L}\right) < 0}{\underset{<0}{-W/P^2}} > 0 .$$

N = No. of Labour units.
L = No. of employed.
U = No. of unemployed.

$\Rightarrow$ Rate of unemployment $= \frac{U}{N} = u$.

$\Rightarrow$ Rate of employment $= \frac{L}{N} = e$

$\boxed{e + u = 1}$

Found the natural rate of unemployment (u_n)

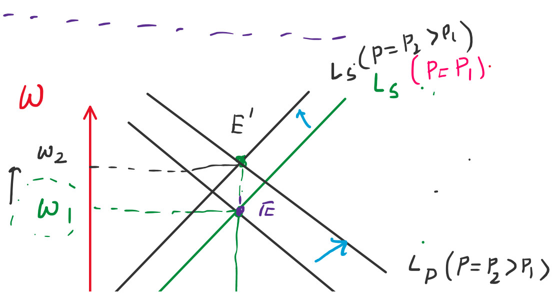
$\boxed{e_n = 1 - u_n}$

Classical Framework..

Production fn: $Y = F(L, \bar{K})$

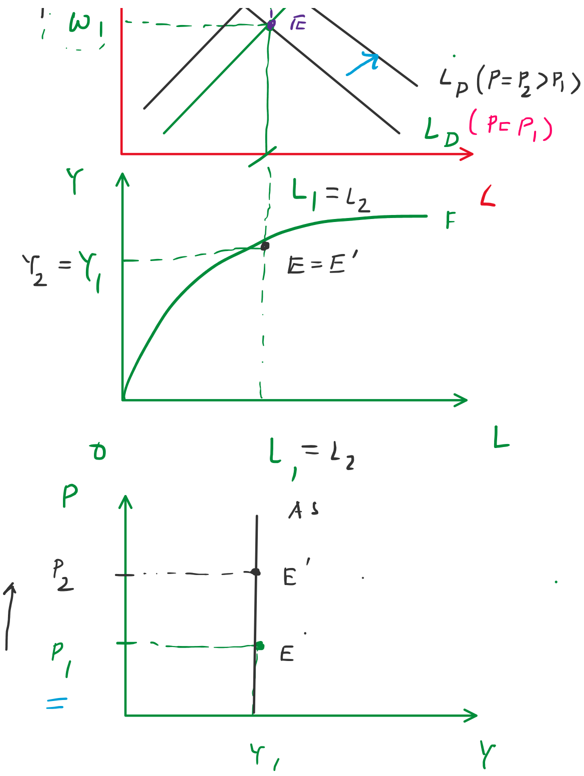
Labour dd fn: $\overset{\uparrow}{W} = \overset{\uparrow}{P} f(L)$, $f' < 0$.

Labour ss fn: $\overset{\uparrow}{W} = \overset{\uparrow}{P} g(L)$ ...



$P f(L), \; f'<0$

Labour ss fn: $w = P \, g(L), \; g'>0$.



As prices and wages are fully flexible $dM = dw = dP$

Production fn: $Y = F(L, \bar{K})$ --- (i)

Labour dd curve: $w = P f(L)$ --- (ii)

Variables: Y, L, w, P.

Parameter: K.

$\therefore$ (ii): Diff: $dw = dP f(L) + P \cdot f'(L) \cdot dL$, $f'>0$,

$$\left. \frac{dP}{dY} \right|_{AS}.$$

$dw = dP \Rightarrow dP = dP f(L) + P \cdot f'(L) \cdot dL$.

$\Rightarrow \boxed{dP [1 - f(L)] = P \cdot f'(L) \cdot dL} \Rightarrow dL = \text{------}$

(i): $Y = F(L, \bar{K})$.

$dY = \left(\frac{\partial F}{\partial L} \right) dL$.

AD - AS Model under Keynesian setup

AD: → IS: Good's Mkt Equi: $Y = C(Y) + I(r) + G$, $C'>0$, $I'<0$.

→ LM: Money Mkt Equi: $\frac{M}{P} = L(Y, r)$, $L_Y = \frac{\partial L}{\partial Y} > 0$, $L_r = \frac{\partial L}{\partial r} < 0$.

TDM SDM.

Method I: Take functional forms the IS, LM & solve for AD.

Method II: use eqns directly to find slope of AD: $\left. \frac{dP}{dY} \right|_{AD}$.

Variables: Y, r, P.

IS : $Y = C(Y) + I(r) + G$

Diff: $dY = C' \cdot dY + I' \cdot dr$.

$$(1-c') \cdot dY = I' \cdot dr \quad \text{---- (i)}$$

LM : $\frac{M}{P} = L(Y, r)$

Diff: $-\frac{M}{P^2} \cdot dP = L_Y \cdot dY + L_r \cdot dr \quad \text{---- (ii)}$

(ii) : $-\frac{M}{P^2} \cdot dP - L_Y \cdot dY = L_r \cdot dr$.

$$dr = -\frac{1}{L_r} \underbrace{\left[\frac{M}{P^2} \cdot dP + L_Y \cdot dY \right]}\quad \text{--- (ii a)}$$

Put (ii)(a) in (i): $(1-c') \cdot dY = -\frac{I'}{L_r} \left[\frac{M}{P^2} \cdot dP + L_Y \cdot dY \right]$.

$$\left[(1-c') + \frac{I'}{L_r} \cdot L_Y \right] \cdot dY = -\frac{I'}{L_r} \cdot \frac{M}{P^2} \cdot dP.$$

$$\frac{dP}{dY} = \frac{-\overset{<0}{\left(\frac{I'}{L_{r\,<0}} \cdot \frac{M}{P^2} \right)} > 0}{\left[\underbrace{(1-c')}_{>0} + \underbrace{\overset{<0}{\frac{I'}{L_r}} \cdot L_{Y\,>0}}_{\overset{<0}{>0}} \right]} < 0 \quad \text{Slope of AD.}$$

(Short Run)

As: Short Run production fn: $Y = F(L, \bar{K})$, $\underbrace{F_L > 0}$, $\underbrace{F_{LL} < 0}$.

Assume: Nominal wages (w) are rigid in the short run $(w = \bar{w})$.

Firm in labour mkt wants to choose Labour s.t its π is max.

$$\pi = R - C = P \cdot Y - wL - r\bar{K} = P \cdot F(L, \bar{K}) - wL - r\bar{K}.$$

$$\frac{\partial \pi}{\partial L} = 0 \Rightarrow P \left(\frac{\partial F}{\partial L} \right) - w = 0 \Rightarrow \boxed{F_L = \frac{w}{P}} \rightarrow F_L = F_L(L, \bar{K})$$

$\therefore$ Prodn fn: $Y = F(L, \bar{K})$

Labour dd fn: $F_L = \frac{w}{P}$

$\rightarrow$ Variables: Y, L, P.

Find: $\frac{dP}{dY}$.

$Y = F(L, \bar{K})$

$$Y = F(L, \bar{K})$$

$$F_L = \frac{W}{P}$$

Diff: $dY = F_L \cdot dL$ ---- (i)

Diff: $F_{LL} \cdot dL = -\frac{W}{P^2} \cdot dP$ ---- (ii)

$$dL = -\frac{1}{F_{LL}} \cdot \frac{W}{P^2} \cdot dP \quad \text{---- (iia)}$$

Put (iia) in (i):-

$$dY = -\frac{F_L}{F_{LL}} \cdot \frac{W}{P^2} \cdot dP \implies \frac{dP}{dY} = \frac{-\left(F_{LL}^{<0} / F_L^{>0}\right)}{\left(W/P^2\right)} > 0 .$$

Counter-Recessionary Macroeconomic policies:

Demand side:

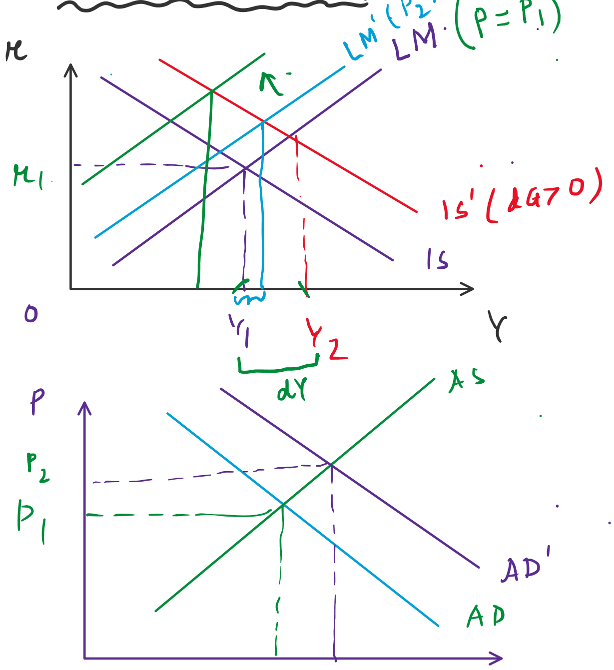
Fiscal policy :→ $dG > 0$. [$\frac{dY}{dG}$ = Govt exp multiplier] .

↳ $dT < 0$. [$\frac{dY}{dT}$ = Tax cut multiplier] .

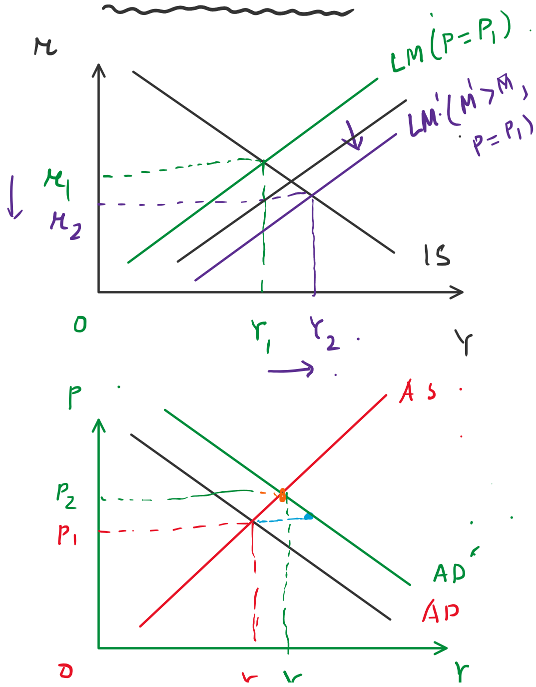
↳ $dG = dT$. [$\frac{dY}{dG}$ = Balanced budget Fiscal policy]

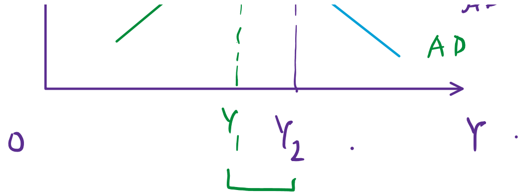
Monetary policy : $dM > 0$ [$\frac{dY}{dM}$ = Money supply multiplier] .

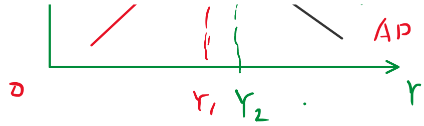
Increase in G



Increase in M.







Compare $\frac{dY}{dG}$ & $\frac{dY}{dM}$ in AD-AS.

$$\left.\frac{dY}{dG}\right|_{AD-AS} < \left.\frac{dY}{dG}\right|_{IS-LM}.$$