Satisfying ...
food → Social gathering
— nutrition.

* HD — functioning and capabilities.
- only possession of goods will not produce same outcome
• commodities → desirable characteristics

$x_i$ : a vector of commodities owned by 'i'
$c(\,)$ : translates $x_i$ to characteristics (characteristic function)
$f_i(\cdot)$ : personal utilization function 'i' actually uses
$F_i(\cdot)$ : set of $f_i$; all possible personal utilization function of i
$v_i(\,)$ : valuation function of 'i'; given $x_i$ and $f_i$ the achievements can be valued/ranked.
$h_i(\,)$ : Happiness function

Achievements $= b_i = f_i(c(x_i))$

eg: $x_i = \{\text{Book}\}$
$c(x_i) = \{$ information (I), knowledge (K), reading pleasure (RP), listening pleasure (LP), Fuel $\}$
$F_i = \{$ Reading ability, Listening ability, Making a Fire $\}$
$f_i = \{RA\}$

$b_i = RA(K(\text{Book}))$ → Job (achievement).

$P(x_i) = \{ b_i \mid b_i = f_i(c(x_i)),\ f_i \in F \}$
for a given $x_i$, we can have alternating $b_i$ for alternating $f_i$(s) used

$P(\text{Book}) = \{$ ~~RP~~, Job, Warmth, LP $\}$

$X_i$ : all possible commodities individual can own.
→ Endowment set
Similarly to P, $Q(X_i) = \{ b_i \mid b_i = f_i(c(x_i))\ f_i \in F_i\ x_i \in X_i \}$
↳ all possible achievements i can achieve

* $Q(X_i)$ = choices

more human development

$Q(X_A) > Q(X_B)$ A has more choices than B

$Q(X_i) \rightarrow$ Capabilities $\rightarrow$ no. of choices available to an individual

$P(x_i) \rightarrow$ Functioning;

$Q(X_A) = \{$Job, LP, Warmth, Mobility$\}$

* achievements for A $= \{$Job, Mobility$\}$ (ranked). for Book & Bicycle.

$Q(X_B)$ $\not\subset$ LA $= \{$Job, W, M$\}$. interms of outcome — equal

" " choices — unequal

current status P $\rightarrow$ $\{J, M\}$.

* Commodities & Capabilities — Amartya Sen — Gp-2.

---

Poverty.

① Problem of identification — who is poor?

② " " aggregation — How to aggregate?

• Benchmarking income = Poverty line (Z).

* $Y_i \geq Z$ 'i' is non-poor else poor

* Basic need approach (to ascertain benchmarking income)

i) food $\rightarrow$ requirement $\rightarrow$ calorie intake

ICMR $\rightarrow$ indian council of medical research

Z: 1000 - rural, 1407 - urban

2400 kcal / per day / per person (rural).

2100 " " " (urban).

• consumer expenditure (NSSO) - survey.

| food items | Quantity 30 days | Prices | $G_i$ = per capita cal. availability for 30 days | ICMR - kcal of each food item |
|---|---|---|---|---|
| 365 days | $q_j$ | $P_j$ expenditure $[q_j \cdot P_j]$ | | |

- $C_i = \frac{1}{N_i} \sum_{j=1}^{k} q_{ij} R_j$

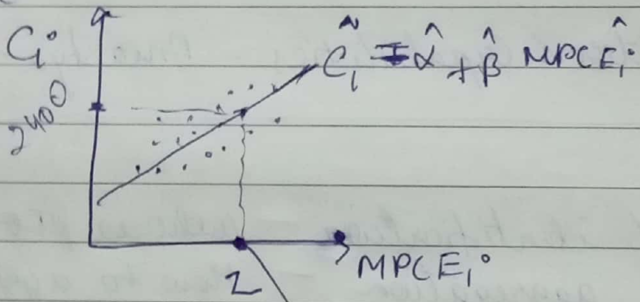
$N_i$ = household size of 'i'th household
$q_{ij}$ = Quantity of jth food item consumed by ith household
k no. of food items.
$R_j$ = per unit calorie value of jth food item

* Monthly per-capita consumption expenditure

$$MPCE_i = \frac{1}{N_i} \sum \left[ (p_j q_{ij})^f + \frac{1}{12}(p_j q_{ij})^{nf} \right]$$

? non-linear regression $C_i = \underbrace{\alpha + \beta}_{\text{parameters}} MPCE_i + e$ error term.

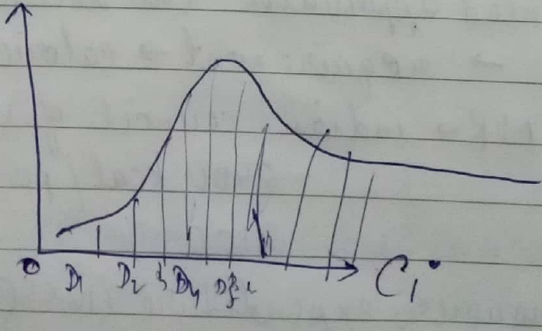
OLS. Min $\sum e^2$ → linear regression




* $C_i = 800 + 0.8\, MPCE_i$ 1000 — rural.
* assumption : $e \sim N(0, \sigma^2)$ normal distribution
mean

when e doesn't follow this, estimated $\alpha$ and $\beta$ are biased.

for each D, group (deci) → mean PCE for each group.




$T_{D1}$ = 1700 $T_{D2}$ = 1800 $T_{D3}$ = 2200
$\boxed{T_{D4} = 2400}$ $D_{P_0}$ = → MPCE

FGT - Foster, Geer - Thorbecke

(b) Square poverty gap ($P_2$)

$$P_2 = \frac{1}{N}\sum_{i=1}^{N}\left(\frac{Z-Y_i}{Z}\right)^2 I(Y_i<Z)$$

* $P_1, P_2 \rightarrow$ FGT family of poverty index

$$P_{FGT} = \frac{1}{N}\sum_{i=1}^{N}\left(\frac{Z-Y_i}{Z}\right)^{\alpha} I(Y_i<Z)$$

$\alpha \rightarrow$ penalty coefficient $\begin{pmatrix} \alpha=0, & P_{FGT}=P_0 \\ \alpha=1 & P_{FGT}=P_1 \\ \alpha=2 & " = P_2 \end{pmatrix}$

penalty is given if individual is far from Z (poverty line).

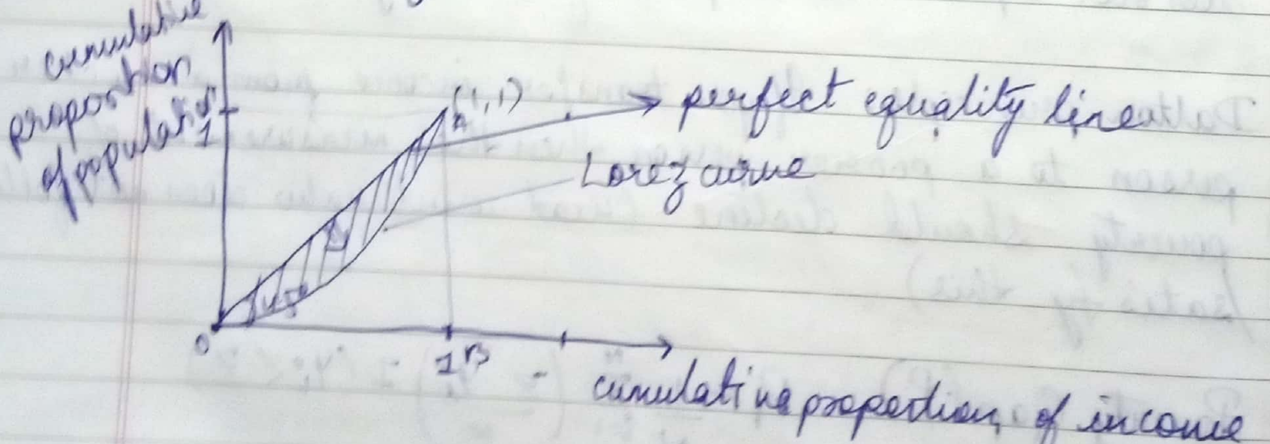
* when $\alpha \neq 0 \rightarrow$ captures depth of poverty & satisfies Dalton principle.

* Sen's poverty index ($P_S$) $\rightarrow$ captures inequality among the poor.

$$P_S = P_0\left[1-(1-G^P)\frac{\mu^P}{Z}\right]$$

$G^P$ = Gini coefficient for poor
$\mu^P$ = mean income of poor.

$G^P \rightarrow$ Lorez Ratio




as Lorez curve moves further from PEL $\rightarrow$ more inequality
$\downarrow$
OBA $\rightarrow$ perfect inequality

End sem → Lorez Curve

| Income | no. of persons | Cumulative income | Cum. prop. of I | Cum. pop. | Cum. prop. of P |
|---|---|---|---|---|---|
| $Y_1$ | 1 | $Y_1$ | $Y_1/Y$ | 1 | $1/q$ |
| $Y_2$ | 1 | $Y_1+Y_2$ | $(Y_1+Y_2)/Y$ | 2 | $2/q$ |
| $Y_3$ | 1 | $Y_1+Y_2+Y_3$ | ⋮ | 3 | $3/q$ |
| $Y_4$ | 1 | ⋮ | | 4 | ⋮ |
| $Y_5$ | 1 | ⋮ | ⋮ | 5 | ⋮ |
| $Y_6$ | 1 | ⋮ | | 6 | ⋮ |
| ⋮ | ⋮ | ⋮ | ⋮ | ⋮ | ⋮ |
| $Y_q$ | 1 | $Y_1+Y_2+\dots+Y_q = Y$ | $Y/Y = 1$ | $q$ | $q/q = 1$ |

plot.

Gini - coefficient = area between 45° PEL and Lorez Curve

area of $\Delta OAB = \frac{1}{2}\times 1 \times 1 = 0.5$

$$\text{Gini - coeff} = \frac{\text{shaded area}}{0.5}$$

---

* Modified Sen's Poverty Index (Sen, Sorb -, S -

$$P_{sss} = P_0 P_1^P (1 + \hat{G}^P)$$

$P_0$ = head count ratio

$P_1^P$ = P. gap for poor

$\hat{G}^P$ = Gini - coefficient for the population.

* $\ln(P_{sss}) = \ln P_0 + \ln P_1^P + \ln(1+\hat{G}^P)$

- $\Delta \ln(P_{sss}) = \underbrace{\Delta \ln P_0}_{\text{change in no. of poor}} + \underbrace{\Delta \ln P_1^P}_{\text{change in depth of poverty}} + \underbrace{\Delta \ln(1+\hat{G}^P)}_{\text{change in inequality}}$

Aug

all states

* After independence - 1962 → expert group

→ poverty line PMCE family size = 5 — permonth

all states rural R → 20/- per person/per 100 | satisfying basic needs

urban U → 25/ " / " 125 | " "

• did not use calorie norms

* 1979 — expert group. 1973-74 → Consumer exp. data - NSSO

(Task force) Y.K. Alag | Poverty line '79

Rural 2400 kcal | R = 49.06 (09 all states.

urban 2300 kcal | U = 56.64

reference period — URP → calorie to ₹

↳ uniform recall period (food items - 30 days; non-food items - 30 days)

when non-food items → 30 days → PL is underestimated

1 • Adjusted their PL for NAS consumption expenditure

national account services.

↳ $GDP = C + I + G + (X - M)$

$C^{NAS}$, $C^{NSSO}$

$\frac{C^{NAS}}{C^{NSSO}} = 1$ (ideally)

although $> 1$

adjusted by this ratio

* 1993-94, Exp. Group (Lakadawala)

- used the same methodology as 1979 task force
- didn't generate new PL
- upgraded the PL using

Consumption Price Index (CPI) PMCE

Rural → CPI - AL (agriculture labour) → 205.84/-

Urban → CPI - IW (industrial workers) → 281.35/-

• used URP

$P_0$ → 37.57% Rural

32.36% urban

$P_0$ - HC ratio - incidence of poverty.

→ generated state specific PL for ~~18~~ 17 major states and Delhi UT

→ didn't adjust for NAS consumption expenditure

* 2004-5, exp. group (Tendulkar) (if calculated by 93-94 → $P_0$ = 15%)

used till today (officially)

$\boxed{\alpha = C^{NAS} - C^{NSS}}$ - used same methodology (calorie bench marking)

• upgraded the PL using CPI

used MRP → mixed recall/reference period - food → 30 days, non-food - 365 days

using this x was smallest.

URP < MRP ↓ $P_0$ will be higher.

→ state specific R-U-PL - observed that calorie intake ~~where~~ was declining - (1) improvement in transportation & 2) mechanisation of agriculture) 3) (budget squeeze hypothesis - spending on health & education increased)

- need to recalculate calorie bench marking

* ~~200~~ 2011-12 (Rangarajan)

Calorie:-

Rural - 2155 kcal

Urban - 2090 kcal

used MMRP → modified mixed reference period - food - 7 days (highly perishable items), 30 days; non-food - 365 days

reduces x further

URP < MRP < MMRP.

Rangarajan

| | Tendulkar 2004-5 ($P_0$) | 2009.10 | Rangarajan 2011-12 | Rangarajan 2011-12 |
|---|---|---|---|---|
| R | 447 (41.8) | 673 (33.8) | 816 (25.7) | 972 (30.9) |
| U | 579 (25.7) | 860 (20.9) | 1000 (13.7) | 1407 (26.4) |
| ($P_0$) | (37.2%) | (29.8%) | (21.9%) | (29.5%) |

~~Rangar~~ Reports.

* Inflation

* increase in general/average price level

- $P_{2010}$ $P_{2019}$

Inflation $= \frac{P_{2019}}{P_{2010}} (\times 100\%) = 143\%$ → 43% increase

price index

inflation rate

| 2010 | quantity ($q_0$) |
|---|---|
| $P_1$ | 1000 |
| $P_2$ | 50 |
| $P_3$ | 700 |
| $P_4$ | 10 |

weights – importance given to commodities.

$w_i^0$ – for $i$th "

$\frac{1}{4}\Sigma$ → equal weights

→ weights → base year quantity

base yr 2010 → 0
current yr 2019 → 1

under estimates substitution effect ← $\boxed{\frac{\Sigma p_{i1} q_{i0}}{\Sigma p_{i0} q_{i0}}}$ → laspeyres price index (?).

* current year quantity $\frac{\Sigma p_{i1} q_{i1}}{\Sigma p_{i0} q_{i1}}$ - Paasche PI

↓

over estimates substitution effect

1 + 2 + 3 + 8

50 - marks

35 mark

Mostly numerical. full or zero.

GDP deflator = $\frac{\text{Nominal GDP}}{\text{Real GDP}} = \frac{\sum q_1 P_1}{\sum q_1 P_0}$ (PPI)

* Inflation = increase in aggregate price level
macro
average.

$$\boxed{\begin{array}{l} w_i > 0 \\ \sum w_i = 1 \end{array}}$$ weights.

$\cancel{\frac{1}{14} + \frac{2}{14} + \frac{3}{14} + \frac{8}{14}}$

$w_i$ = monetary value share in the base year

$$w_i = \frac{P_{i0} q_{i0}}{\sum_{i=1}^{n} P_{i0} q_{i0}}$$

→ $w_i$ should remain const. for both base & current year.

$$PI = \sum_{i=1}^{n} (w_i) \left[ \frac{P_{it}}{P_{ib}} \right]$$

b = 0
t = 1

$$\sum * \frac{P_{i0} q_{i0}}{\sum P_{i0} q_{i0}} \frac{P_{i1}}{P_{i0}} = \sum \frac{P_{i1} q_{i0}}{\sum P_{i0} q_{i0}}$$

doesn't account for substitution

$$LPI = \frac{\sum P_{it} q_{ib}}{\sum P_{ib} q_{ib}}$$ → Laspeyers PI

marcell.

$$\frac{q_{it} + q_{ib}}{2}$$

overestimates substitution effect.

$$PPI = \frac{\sum P_{it} q_{it}}{\sum P_{ib} q_{it}}$$ - paasche's PI

*change in taste & pref.
* income effect.

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(all index no.s should satisfy

* Time - Reversal Test

$PI_{bt} * PI_{tb} = 1$

$PI_{01} * PI_{10} = 1$

LPI and PPI does not satisfy
$\therefore$ not good indicators.

* Fisher's price index

$FPI = (LPI * PPI)^{1/2}$ — Geometric mean

· satisfies time reversal test.

* Circular test
- quantity index

$$P_{bt} \times Q_{bt} = \frac{\sum p_{it} q_{it}}{\sum p_{ib} q_{ib}}$$

$$\frac{p_{it} \cancel{q_{ib}}}{\cancel{p_{ib}} q_{ib}} \cdot \frac{q_{it} \cdot \cancel{p_{ib}}}{\cancel{q_{ib}} \cdot p_{ib}}$$

DA (allowances)

India

| Consumer PI (CPI) | Wholesale PI (WPI) |
|---|---|
| - p, q - info → consumer market (retail ") | - p, q - taken from wholesale market |
| 1) - welfare (effect on our ω) | - policy decision |
| 2) - only uses final goods & services | - both final & intermediate goods |
| 3) - does not include imported goods | - imported goods. |
| 4) - includes services | - doesn't include services |

GDP deflator ≡ PPI
only final goods ∴ GDP deflator ≡ CPI } more close to

* CPI
• Rural • Urban (Rent) • Combined (total) • Industrial workers (include agriculture product)
• Agriculture workers (better to include industrial prod)

* Different CPI because commodity basket consumed by different sectors is different.

CSO - central ~~stat~~ statistical org.
M.L.P.
Mat[illegible]er

time lag between I & Y → realistic

same as S = I   $S = -20 + \frac{1}{4}Y$
• PI = RI
eqlbm income   $Y = C + I$
$Y = 20 + \frac{3}{4}Y + 20$
$\frac{1}{4}Y = 50$
$\boxed{Y = 160}$
→ $C = 140$

* **Case 1: If ΔI is temporary / once-over type**

~~autonomous I = 20~~
~~Period C I ΔC ΔI Total spending ≷ Total output~~
$C = 20 + \frac{3}{4}Y$

| Period | C | I | ΔC | ΔI | Total Spending | ≷ | Total output | Y | ΔY | Planned I | | Realised |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 1 | 140 | 20 | – | – | 160 | = | 160 | 160 | – | 20 | = | 20 |
| 2 | 140 | 20 | – | 10 | 170 | > | 160 | 160 | – | 30 | > | 20 |
| 3 | 140 | 20 | 7.5 | – | 167.5 | < | 170 | 160 | 10 | 20 | < | 22.5 |
| 4 | 140 | 20 | 5.6 | – | 165.6 | < | 167.5 | 160 | 7.5 | 20 | < | 21.9 |
| 5 | 140 | 20 | 4.2 | – | 164.2 | < | 165.6 | 160 | 5.6 | 20 | < | 21.4 |
| ⋮ | ⋮ | ⋮ | ⋮ | ⋮ | ⋮ | | ⋮ | ⋮ | ⋮ | ⋮ | | ⋮ |
| t | 140 | 20 | ~0 | – | ~160 | = | ~160 | 160 | ~0 | 20 | = | 20 |

ΔY → decreasing at MPC rate.

supply   demand
$S_t = D_{t-1}$

* Case 2: ΔI is permanent/continuous.

| Period | C | I | ΔC | ΔI | T.S | ≷ | T.O. | Y | ΔY | PI | | RI |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 1 | 140 | 20 | – | – | 160 | = | 160 | 160 | – | 20 | = | 20 |
| 2 | 140 | 20 | – | 10 | 170 | > | 160 | 160 | – | 30 | > | 20 |
| 3 | 140 | 20 | 7.5 | 10 | 177.5 | > | 170 | 160 | 10 | 30 | > | 22.5 |
| 4 | 140 | 20 | 13.1 | 10 | 183.1 | > | 177.5 | 160 | 17.5 | 30 | > | 24.4 (30−7.5) (30−5.6) |
| ⋮ | ⋮ | ⋮ | ⋮ | ⋮ | ⋮ | | ⋮ | ⋮ | ⋮ | ⋮ | | ⋮ |
| t | 140 | 20 | 30 | 10 | 200 | = | 200 | 160 | 40 | 30 | = | 30 |

| ΔI – Temp | ΔI – permanent |
|---|---|
| $\Delta Y_1 = \Delta I$ | $\Delta Y_1 = \Delta I$ |
| $\Delta Y_2 = \Delta C_2 = b\Delta I$ | $\Delta Y_2 = \Delta I + b\Delta I$ |
| $\Delta Y_3 = \Delta C_3 = b^2\Delta I$ | $\Delta Y_3 = \Delta I + b\Delta I + b^2\Delta I$ |
| $\Delta Y_t = b^{t-1}\Delta I$ | $\Delta Y_t = \Delta I + b\Delta I + b^2\Delta I + \cdots + b^{t-1}\Delta I$ |

Planned I + unplanned I ⇒ 30 − 10
(actual I). taken from inventory.

20 + 2 = 5 all that isn't depended.

AI → autonomous investment is a powerful tool for the economy to realize its target.

---

Keynes — autonomous investment → Government

Micro?

* Investment Project Appraisal / Capital Building.

* New project: • feasibility
evaluation:

Tata Nano: failed after implementation
• Sahara housing project

Processes:

1. To estimate the initial amount of capital required & determine the sources of raising capital
2. To determine net cash flows with the life of the project
3. To apply suitable methods of evaluation

1. eg:- machinery - 580
reorganization - 200
land acquisation - 500.

sources of raising capital
internal — external.
① retained earnings. ② Bank ~~stock market~~ ③ share ④ Bond

Dividend :

ordinary share — voting right
preference share — " " - can convert shares from pref → ordinary.
↳ bought by big traders

bonds? → can be sold

1° market, 2° market IPO is issued,

value → present value

10,000

company — 10% rate of return annually

$$\frac{1000}{1+r} + \frac{1000}{(1+r)^2} + \frac{1000}{(1+r)^3} + \frac{1000}{(1+r)^4} + \frac{11000}{(1+r)^5}$$

discounted value of expected returns

current rate of interest

2) Derivation of net cash flows over the life of the project:

i) life

ii) 1. Gross sales revenues (annually)

P. Q (price per unit x quantity) increase annually by 10%

| $R_1$ | $R_2$ | $R_3$ |
|---|---|---|
| 1000 | 1100 | 1210 |

2. substract → • variable cost • fixed cost • depreciation

let say 20% eg:- rent i) flat depreciation

machine → 300

| | $R_1$ | $R_2$ | $R_3$ |
|---|---|---|---|
| G.S.R (10%) | 1000 | 1100 | 1210 |
| - var. cost (20%) | 200 | 220 | 242 |
| - fixed " | 100 | 100 | 100 |
| - depreciation | 100 | 100 | 100 |
| profit before tax | 600 | 680 | 768 |
| Tax 30% | 180 | 204 | 230.4 |
| Profit after tax. | 420 | 476 | 537.6 |
| + depreciation | 100 | 100 | 100 |
| | 520 | 576 | 637.6 |

subtracted

(dep - all its technical prop. & can't be used for current production

not to tax the amount of depreciation

↓ not actually a payment

// (+) salvage value — end value of machinery

last colum (+) recovery of working capital.

actual depn = cost - salvage value divided.

637.6+50+10

697.6//

Methods.

non-discounting — Pay back period (PBP)

discounting — net present value (NPV), internal rate of return (IRR), Capital rationing (CR)

- PBP - period of recovery - minimum possible time to recover capital invested.
  - when does it reach the break even point?

| | | $R_1$ | $R_2$ | $R_3$ | $R_4$ | $R_5$ | $R_6$ |
|---|---|---|---|---|---|---|---|
| C-1000 | A | 500 | 500 | 500 | 500 | | |
| | B | 300 | 500 | 800 | 1200 | 1800 | 2200 |

flaws → life of project, total return (ignored)
eg:- A ≡ IT, B ≡ manufacturing

money value changes over time
1. interest
2. inflation
3. risk

feedback loop: learn from past mistakes,

$FV_1 = PV + PV \cdot r$
$PV(1+r)$
$100(1+r)$ after a year.
$100(1+r)^t$
2. decides purchasing power of money.

$NPV = \sum \frac{R_t}{(1+r)^t} - \sum \frac{C_t}{(1+r)^t}$

>0 ✓ <0 ✗
=0 neutral

$r \equiv$ inflation adjusted interest rate (lowers)

net cash flow has already considered salaries to employ (which could count as dead weight loss if there's no project).

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* IRR (internal rate of return)

$i = MEC$

$$\sum \frac{R_t}{(1+i)^t} - \sum \frac{C_t}{(1+i)^t} = 0$$

$i > r$ accept $i = r$ neutral
$i < r$ reject

$i > r$ , NPV > 0
$i < r$ NPV < 0

| | NPV | IRR |
|---|---|---|
| A | 100 | 12% ✓ |
| B | 150 ✓ | 10% |

* Two projects.
• mutually exclusive A or B

→ why? — size of project is not talked about!
1) — could be because $C_{tB} > C_{tA}$
2)

* The return from the reinvestable amount is same as the return from investible amount.
$C_0$

return of 1st year. used again

NPV → return from reinvestible amt. → r (bank interest rate)

IRR > NPV
NPV > IRR

* IRR isn't suitable when project life is long & fluctuation in estimation of net cash flows — -ve value, +ve, 2 IRR.

* Same problem → growth rate (income) - annual
↳ long run avg. growth rate (linear)
→ trend breaks. ; each trend separately

~~capital is limitted~~

*

finally NPV // as long as capital is unlimitted.

* Capital rationing / profitability index ratio.

- capital is limited
- rate of profit = profit per unit capital

• benefit cost ratio (bcr)

gross bcr ≡ bcr (gross).

net: bcr ≡ nbcr

$>1$, $<1$, $=1$ — $BCR = \frac{PV}{C_0}$ if $BCR > 1$, $<1$, $=1$ | $NBCR > 0$, $<0$, $=0$

$>0$, $<0$, $=0$ — $NBCR = \frac{NPV}{C_0} = \frac{PV - C_0}{C_0}$

* limitted capital & no. of proposals. $C \leq 100$

| | $C_0$ | PIR |
|---|---|---|
| A | 50 | 1.2 |
| B | 70 | 1.4 |
| C | 80 | 1.5 |
| D | 20 | 1.3 |
| E | 30 | 1.6 |
| F | 90 | 1.6 — highest (doesn't utilize entire capital though) |

Combination: CD, BE, ADE — (weight) avg. PIR — highest PIR.

* Market (fault? firm?) entity, invisible institution.
two imp. instruments to work with — demand & supply.

- bilateral monopoly

Market forms.

(Product market ✓)

perfect competition — imperfect competition

large no.

Perfect competition:
knowledge desemination
perfect substitutes

Imperfect competition: monopoly, oligapoly, monopolistic

oligapoly:
collusive (?) or non-collusive
cooperative (Cartel)
tacit, or open/agreement
(advertisement is important)

monopolistic:
product differentiated products
close substitutes
• delivery services make a difference (malls, online window shopping)
not just shipping
– presentation, attraction

brand ambassador

steeper — horizontal — less flatter — flatter

---

* Perfect competition:

characteristic – 1. large no. of buyers & sellers
2. product homogeneity (identical)

not in SR – 3. free entry and exit (happens in long run)

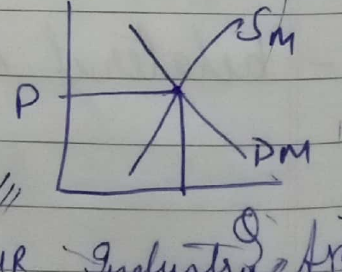
information is shared (no patent) – 4. perfect knowledge about the market

knowledge of production — 5. perfect mobility of the factors & products. → opposite of monopoly "immobility"

• complete absence of rivalry. (each individual player is insignificant in terms of total supply)

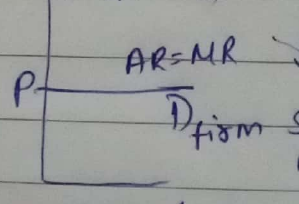
• due to 1 & 2, each individual can't decide the price.

• price is decided by the demand & supply curve




firm → price taker & output adjuster

D curve ≡ Avg. Revenue curve $= \frac{TR}{Q} = \frac{PQ}{Q} = P$
≡ MR




Industry fixes the price
↓
sum total of firms.

slope of TR w.r.t. Q → Marginal revenue
→ AR fixed ⇒ MR fixed

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price : labour mobility (no surplus or scarcity)
: product "

* Monopoly characteristics : 1. single seller - one producer
2. no close substitutes
3. barrier to entry

comes into existence
* strategic ownership over the raw materials (eg :- AlcoA)
* patent right
• natural monopoly : (economies of scale) (license)
→ may expect them to charge a lower price than a oligopoly market
* government monopoly : eg :- Railway
(private - chances of increasing prices)

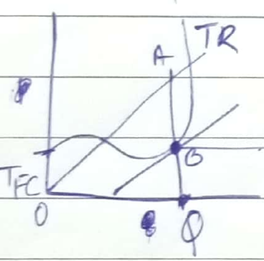
* limit pricing policy : deliberate attempt to create an entry barrier. (reduces the price to discourage newer players).

---

* Equilibrium (maximization of profit

pure monopoly

$\pi = TR - TC = R - C$




slope of TC = slope of TR
max. diff

$\frac{d\pi}{dQ} = 0$

MC = MR.

$\frac{dR}{dQ} - \frac{dC}{dQ} = 0$
marginal revenue, marginal cost.

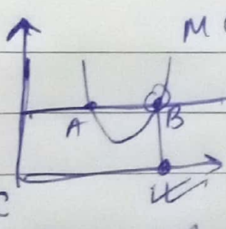
MR = MC //

AC < AR (super-normal profit)
AC = AR (normal profit)
AC > AR (normal profit)

only one eqlbm.

$\frac{d^2\pi}{dQ^2} < 0$

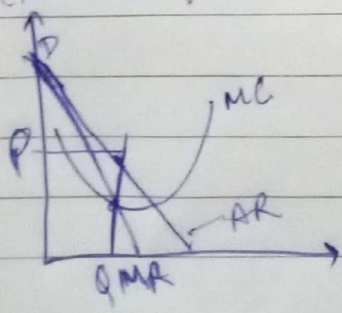
slope of MC > slope of MR



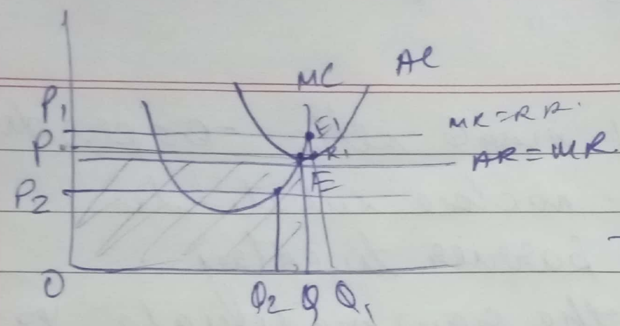

perfect comp. ←
P = MC
∵ beyond A, additional revenue is greater than additional cost.

monopoly (firm itself is industry)

can't fix both P & Q




Q chosen
P > MC
(exploits the consumers).




TR = AR · Q (=TR)

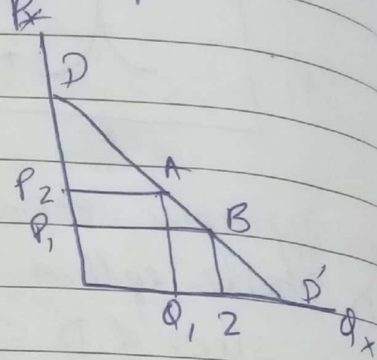
$Q_1$: AR > AC (supernormal profit)
TR = $OP_1E_1Q_1$
AC =

$P_2$ $Q_2$: AC > AR (remain in operation till P > AVC
if P < AVC – leave
close down: P = AVC

monopolist can continue to earn supernormal profit in the long run.

* Price elasticity of demand: how sensisity $Q_x$ for X is w.r.t change in $P_x$ for X

$$e_p = \frac{\text{\% change in Q demanded}}{\text{\% change in P of the same commodity}}$$




$$= \frac{\Delta Q/Q}{\Delta P/P} = \frac{\Delta Q}{\Delta P} \cdot \frac{P}{Q}$$

- Arc elasticity $\Delta P, \Delta Q \rightarrow$ considerable.
- Point elasticity (measuring close to a point)

$$e_p = \frac{dQ}{dP} \frac{P}{Q}$$ • A

↳ tangent at the point

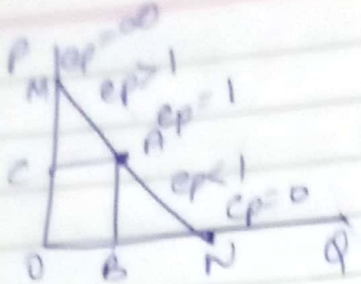
* relation is -ve.

∴ final value = -ve ∴ $e_p = -\frac{dQ}{dP}\frac{P}{Q}$ (So, final value = +ve

* factors affecting $e_p$: 1) nature of the commodity
luxury - highly elastic
essential - inelastic.
2) proportion of income spent on a commodity.
↓ high - ~~inelastic~~ elastic
low - ~~~~ inelastic
3) time required to adjust with new price.
4) availability of substitutes.
closer the substitutes - higher elasticity

5/3/19 ?

11/3/19




$$e_p = \frac{dQ}{dP} \cdot \frac{P}{Q}$$

$$= \frac{BN}{AB} \cdot \frac{AB}{OB}$$

$$= \frac{BN}{OB} = \frac{BN}{CA}$$

$$= \frac{AN}{AM} = \frac{\text{lower segment}}{\text{upper segment}}$$

best way. $\boxed{e_p = -\frac{dQ}{dP} \cdot \frac{P}{Q}}$

$$Q = a - bP$$

$$\frac{dQ}{dP} = -b \quad e_p = \frac{bP}{Q}$$

$$Q = aP^{-b}$$

$$e_p = +\frac{ab\,P^{-b}}{Q} = b.$$

Total revenue $= P \cdot Q$ (production)

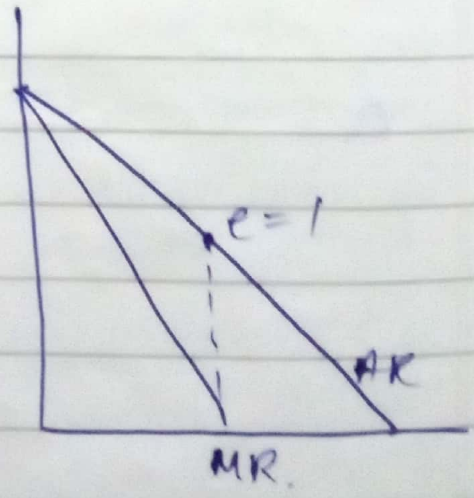
Average " $= \frac{TR}{Q} = \frac{P \cdot Q}{Q} = P$

$$MR = \frac{dTR}{dQ} = \frac{d(PQ)}{dQ}$$

$$= P + Q\frac{dP}{dQ}$$

$$MR = P\left(1 + \frac{Q}{P}\frac{dP}{dQ}\right)$$

marginal revenue $MR = AR\left(1 - \frac{1}{e}\right)$



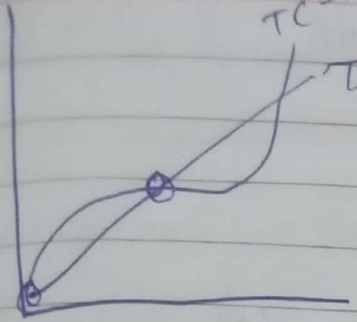

$e=1,\ MR=0$

$e>1 \quad MR>0$

$e<1 \rightarrow MR<0$ MR curve slope always twice?

Scanned by CamScanner

to maximize $\pi$




$\pi = TR - TC$ (profit function)

initially, cost > return
point =
beyond <

· Govt. targetting relative less elastic commodities to maximize revenue. increase in P demand doesn't change as much.

* Income elasticity

$$e_i = \frac{\text{\% change in Q demanded}}{\text{\% change in income of the consumer.}}$$

$$e_i = \frac{dQ}{dM} \cdot \frac{M}{Q} \qquad e_i < 0 \text{ (inferior good)}$$

· cross elasticity of demand:

$$e_c = \frac{\text{\% change in Q demanded of X}}{\text{\% change in P of Y}}$$

$$e_{t,c} = \frac{dQ_t}{dP_c} \cdot \frac{P_c}{Q_t}$$

t – tea
c – coffee

* substitute → +ve. ; complementary → –ve ($P_Y \uparrow Q_Y \downarrow Q_X \downarrow$

$P_Y \uparrow Q_Y \downarrow Q_X \uparrow$

elasticity → not only using it for these comparisons

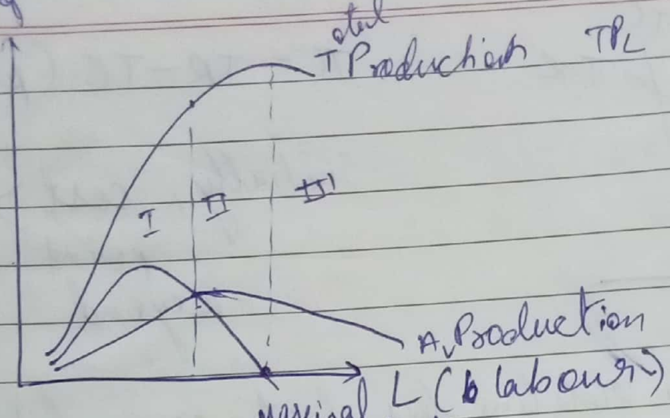
· elasticity of future price expectation

*· Elasticity of Supply (price elastic of supply) *· Production → Diff. assumption in production

$$e_s = \frac{\text{\% change of Q supplied}}{\text{\% change of Price of commodity}} = \frac{dQ_s}{dP} \cdot \frac{P}{Q_s}$$

? $Q = P$ ? $AP$ : $-L^3 + 15L^2 + 10L$ LoDMU.

SR?




S.R $MP_L = \frac{dTP_L}{dL}$

S.L

| $L$ | $TP_L = Q$ | $AP_L = \frac{TP_L}{L}$ | $MP_L = \frac{dQ}{dL}$ |
|---|---|---|---|
| 1 | 24 | 24 | |
| 2 | 72 | 36 | |
| 3 | | | |

Stage III ✗ S
Stage I ideally S I → end $AP_L$ (max).
reality → enters into S – II → analyse.

* production decision – Stage II

$AP_L = -L^2 + 15L + 10$ $\quad -2L + 15 = 0$

$L = 7.5$

short run $Q = f(L, \bar{x})$ fixed Capital

long run $Q = f(L, x)$ variable

Assumptions of Production analysis:
1) ? small input → small output
2) Labour & capital are homogenous.
3) Long run – both are elastic in nature
S.R → one is inelastic
4) Technology is fixed at a certain level
5) input prices are not varying / they're at a certain level

• Long run → varying capital.

* 100% increase in input
• output – more than 100% → more labour – more specific attention to machine – skill will go up (Division of labour – efficiency will go up)

· output – less than 100% → fishing → crossing regenerating capacity of fish.
mining.

Laws of returns to scale.

US manufacturing industries

Cobb-Douglas, $Q = AK^{\alpha}L^{\beta}$ $\quad \alpha+\beta = 1$

$hQ = A(kK)^{\alpha}(kL)^{\beta}$

$hQ = k^{\alpha+\beta}\underline{AK^{\alpha}L^{\beta}}$

law of

* (homogenous – degree of homogeneity depends on $\alpha+\beta$)

$\alpha+\beta > 1$, $h > k$ ∴ increasing returns to scale
$\alpha+\beta = 1$ $\quad h = k$ " const. " " "
$\alpha+\beta < 1$, $h < k$ " decreasing " " "

C-D → $MP_L$ & $AP_L$ depend on both L and K

$MP_K = \frac{dQ}{dK} = \alpha AK^{\alpha-1}L^{\beta} = \alpha AK^{-\beta}L^{\beta}$

$MP_K = \alpha A\left(\frac{K}{L}\right)^{\alpha-1}$

$MP_L = \beta A\left(\frac{K}{L}\right)^{1-\beta}$

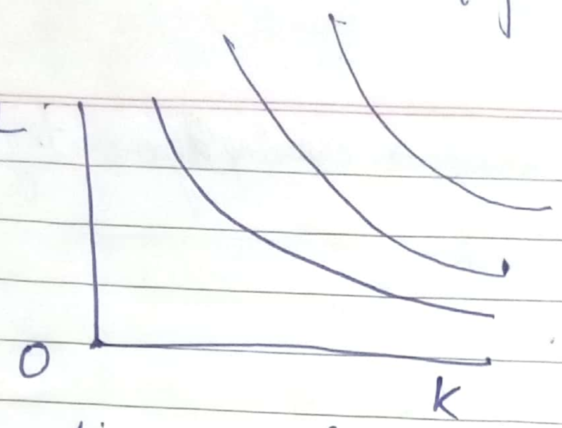
$\alpha$ =
· elasticity of output w.r.t capital.
* $\alpha = \frac{dQ}{dK}\frac{K}{Q}$
· $\beta$ = e w.r.t labour.

$\eta$ → smoothening factor.
· $\ln Q = \ln A + \alpha \ln K + \beta \ln L$

$\alpha$ & $\beta$ → dis. share of labour on output
distributive share of capital on output

higher – T output level,

isoquant curve →




locus of points ~~of~~ of ~~two~~ different combination of input (L & K) generating same amount (level) of output.

Properties: * (might be +vely sloped).

Cost of production, scale of average.

next class eg:– L, K, iso.

- none of the inputs are freely available.

* Cost (Short R, L R)
  L all variable except technology

$TC = TFC + TVC$ total fixed cost + total var. cost.

$AC = AFC + AVC$

- Marginal cost
- Actual cost.
- Opportunity cost (*) (return from next best alternative you are sacrificing)

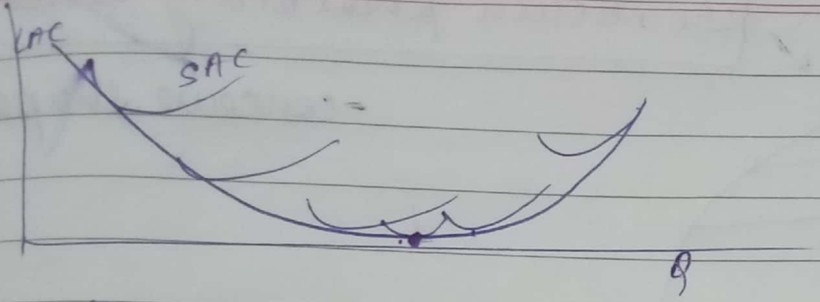
$AC = \frac{TC}{Q}$ $AFC = \frac{TFC}{Q}$

$AVC = \frac{TVC}{Q}$

* risk bearing capacity?

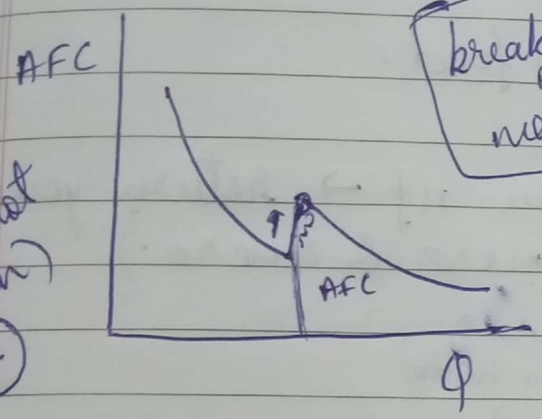
1/4/19 ?

managerial diseconomies.



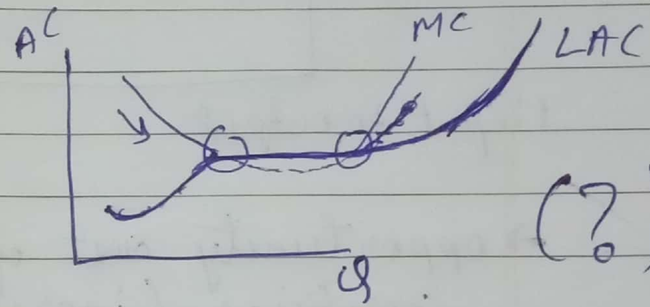

* there is always a scope to reduce Avg. cost.

* Modern(?) cost concept




breakdown of machine?

* (I did not listen)

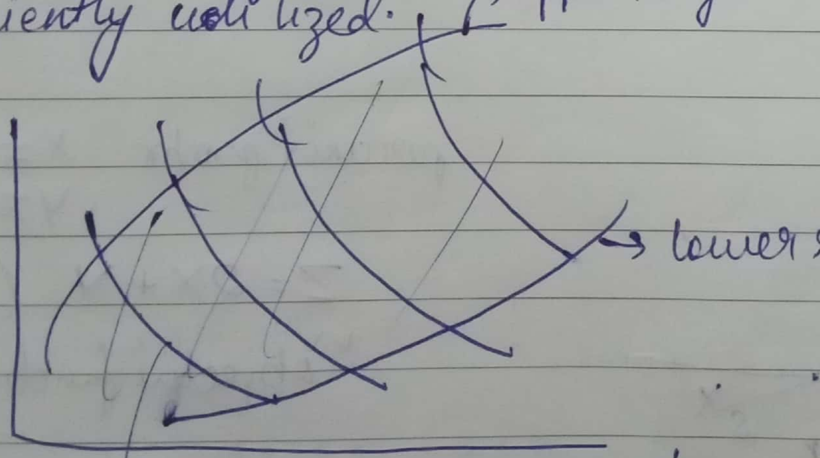



(?)

- buying - selling
-

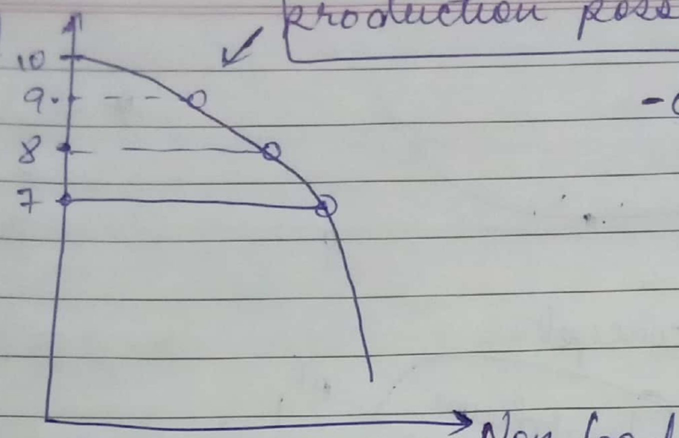
isoquants: maybe +vely sloped. (not considering this part).
efficiency ×
underutilised L or K.
under utilisation of resources

-vely sloped → inputs are efficiently utilized.




economic region of production. (technically efficient).

* Food




production possibility locus

- concave shape

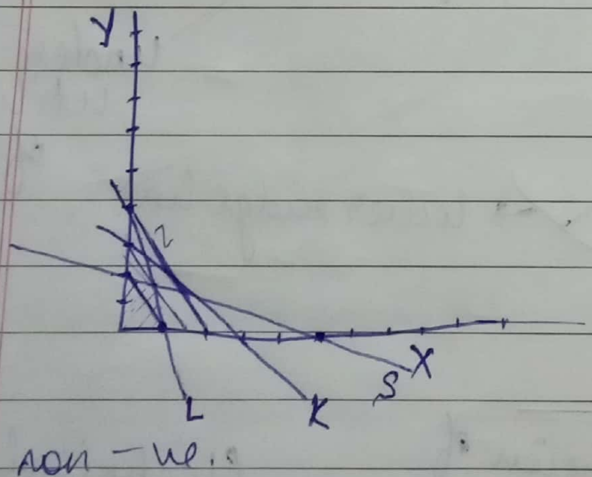
1 input to output.

→ opportunity cost of producin nf → return you are sacrificing (increasing, more & more.)

$L = 400$ (hours) $\quad K = 300$ (m. hour)

$S = 1000$ (land) (sq. feet).

| A | B | |
|---|---|---|
| $L_x = 4$ | $L_y = 1$ | $4x + Y \leq 400$ |
| $K_x = 1$ | $K_y = 1$ | $X + Y \leq 300$ |
| $S_x = 2$ | $S_y = 5$ | $2X + 5Y \leq 1000$ |




non - ve.

per unit profit $X \equiv 2$, $Y \equiv 1$

$Z = 2X + Y$ (profit function).

objective function

$X \geq 0 \quad Y \geq 0$

$4X + Y = 400$

$2X + 5Y = 1000$

$2X + 5Y - 20X - 5Y = 1000 - 2000$

$-18X = -1000$

$Y = 400 - \frac{4 \times 500}{9} = \frac{1600}{9}$ 177.777 178 $\quad X = \frac{1000}{18} = \frac{500}{9} = 55.55$ $= 56$