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# Imp point & Formulas in Economics

1) Profit = Revenue − Cost

Business profit / Accounting
⇓
$ = Revenue − Explicit Cost

Economic Profit
= Revenue − Implicit − Explicit

2) Equilibrium ⇒ $Q_d = Q_s$
$Q_d$ → demand
$Q_s$ → supply

3) Price cieling ⇒ leads to shortage
Price floor ⇒ leads to surplus
& Price floor > Price ceiling

4) Tax (T)

Imposed on Seller
⇓
Supply curve shift upward by 'T'

Imposed on buyer
⇓
Demand Curve shift downward by 'T'

## To Solve Tax Question

Tax on seller : write 'P' in term of $Q_s$
& add Tax on RHS
i.e. $P = f(Q_s) + T$
& then find equilibrium with demand equation

Tax on buyer

↓

Use P in terms of $Q_d$ & subtract Tax 'T' on RHS

$$P = f(Q_d) - T$$

& find equilibrium with supply equation

5) Elasticity:

$$E = \frac{\% \Delta A}{\% \Delta B}$$

Price Elasticity of demand

$$E_p = \frac{\Delta Q}{\Delta P} \times \frac{P}{Q} \quad \text{(Point Elasticity)}$$

$$E_p = \frac{Q_2 - Q_1}{P_2 - P_1} \times \frac{P_2 + P_1}{Q_2 + Q_1}$$

6) Inelastic Demand: $-1 < E_p < 0$

Unitary elastic demand: $E_p = -1$

Elastic demand: $E < -1$

7) $TR = P \times Q$

$MR = \frac{dTR}{dQ}$

8) If ~~$P =$~~ $Q = B + a_p P$

then $MR = B + (2) a_p P$

Slope becomes Twice

9) $(TR) \Rightarrow$ Max when

$MR = 0$ & $E_p = -1$

10) ~~$MR = P\left(1 + \frac{1}{|E_p|}\right)$~~ Put $E_p$ ~~+ve~~ -ve here

10) $MR = P\left(1 + \frac{1}{(E_p)}\right)$ → Put '$E_p$' -ve here

11) Elastic Demand ($E_p < -1$)

P↑ Q↓ = TR↓ P↓ Q↑ = TR↑

Inelastic Demand ($E_p < 0$)

P↑ Q↓ = TR↑ P↓ Q↑ = TR↓

* less elastic Demand
  ↓
  When few substitutes, Requires small portion of total expenditure, less time available to adjust for price

* More elastic Demand
  ↳ write opposite of above

12) Income elasticity

$$E_I = \frac{\Delta Q}{\Delta I} \times \frac{I}{Q} \quad \text{(Point)}$$

$$E_I = \frac{(Q_2 - Q_1) \times (I_2 + I_1)}{(I_2 - I_1)(Q_2 + Q_1)}$$

13) $E_I$ (Income elasticity) = +ve

↳ Normal goods

Necessities
$0 < E_I < 1$

Luxuries $\Rightarrow E_I > 1$

$E_I$ = -ve $\Rightarrow$ Inferior goods

14) Cross Price Elasticity → Change in quantity 'x' due to change in price of 'y'

$$E_{xy} = \frac{\Delta Q_x}{\Delta P_y} \times \frac{P_y}{Q_x}$$

$$E_{xy} = \frac{Q_{x_2} - Q_{x_1}}{P_{y_2} - P_{y_1}} \times \frac{P_{y_2} + P_{y_1}}{Q_{x_2} + Q_{x_1}}$$

$E_{xy} > 0 \Rightarrow$ Substitutes

$E_{xy} < 0 \Rightarrow$ Complement

# Consumer Choice

* Individuals can rank their preferences
* Non-satiation: People prefer more to less
* Transitivity: Ranking are consistent
* Give up smaller amount of one good in order to get additional units of that good.
* Indifference curve more towards right means more satisfaction
* No intersection of curve possible due to transitivity
* Downward sloping: due to Non-satiation
* Convex to origin

15) Marginal Rate of Substitution (MRS): $-\frac{MU_x}{MU_y}$

16) Total utility = $MU_1 + MU_2 + \dots$

17) Budget line

$$P_x \times Q_x + P_y Q_y = \text{Total Income}$$

$$\text{Slope} = -\frac{P_x}{P_y}$$

18) Utility Maximization

$$+\frac{P_x}{P_y} = +\frac{MU_x}{MU_y} \Rightarrow \frac{P_x}{P_y} = \frac{MU_x}{MU_y}$$

Forecasting

Qualitative Method
↓
Opinion of Expert

Quantitative Method
↓
Rely on data & analytical technique

↓
Time Series
↓
Trend Projection
Exponential Smoothing
Moving Average

Associative
↓
Linear Regression

19) Regression line

dependent → $Y = a + bX$ ← Independent

To find a & b

$$\Sigma y_i = na + b\Sigma x_i$$

$$\Sigma x_i y_i = a\Sigma x_i + b\Sigma x_i^2$$

Or

$$a = \frac{[\Sigma y_i \Sigma x_i^2 - \Sigma x_i \Sigma x_i y_i]}{n\Sigma x_i^2 - (\Sigma x)^2}$$

$$b = \frac{[n\Sigma x_i y_i - (\Sigma x_i)(\Sigma y_i)]}{n\Sigma x_i^2 - (\Sigma x)^2}$$

20) Standard Error ($S_e$):

$$\sqrt{\frac{\Sigma (Y_t - \bar{Y})^2 - \hat{b}\Sigma (x_t - \bar{x})(Y_t - \bar{Y})}{(n-k-1)}}$$

→ degree of freedom

Where n = No of observation

k = No of independent variable in equation

~~=> Here $S_e$ => How strange it seems~~

$S_e$ => It is probable error in predicted values

21) Range of $Y$ : $Y \pm t_{n-k-1} S_e$

## Testing Regression Estimates

1) Coefficient of Determination ($R^2$)
   ⇓
   Test the overall equation & show the strongness of the relation between dependent & independent variable

The t-stat
   ⇓
   Test relationship between each independent variable & dependent variable individually

22) $R^2 = \frac{\sum(\hat{Y}_t - \bar{Y})^2}{\sum(Y_t - \bar{Y})^2}$

~~23) $\sum(Y_t - \bar{Y})^2 = \sum(Y_t - \hat{Y}_t)^2$~~

23) $\sum(Y_t - \bar{Y})^2 = \sum(Y_t - \hat{Y}_t)^2 + \sum(\hat{Y}_t - \bar{Y})^2$

Total variation | Unexplained variation | Explained variation

⇒ More value of $R^2$ ⇒ More strong relationship

↓

Implies independent variable explains R percent of the dependent variable

24) Coefficient of Correlation ($\gamma$) = $\sqrt{R^2}$

= $R$

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# The t- Statistic

$$t = \frac{\hat{b}}{S_b}$$

$$S_b = \sqrt{\frac{\Sigma (Y_t - \hat{Y}_t)^2}{(n-k-1)(\Sigma (X_t - \bar{X})^2}}$$

If Calculated value > tabulated value

⇓

Strong Relationship

2) Confidence Interval

$$\hat{b} \pm \alpha t_{n-k-1} S_b$$

Goods

- Capital Goods ⇓ Required for production of other goods
- Durable Consumer goods ⇓ used Repeatedly
- Non-durable Consumer goods ⇓ used only once ⇓ like food

# Trend

* Secular Trend : long run increase or decrease in data series

* Cyclical : Changes that occur over year

* Seasonal => Regular recurring fluctuations

* Irregular or Random
  => due to unique events
  (like (ovid-19)

20) Trend projection

$$S_t = S_0 + bt$$

where S : Sales
t : time

21) Seasonal adjustment

Ratio = $\frac{\text{Actual}}{\text{Trend forecast}}$

Seasonal adjustment : Average of Ratio for each seasonal factor

28) Adjusted forecast = Trend forecast * Seasonal Adjustment

Limitation of Trend Analysis

⇒ Limited to short to term
⇒ Assume historical relationship will not change
⇒ Fluctuations in economic growth

Smoothing Technique

Moving Average

Exponential Smoot

29) $RMSE = \sqrt{\frac{\Sigma (A_t - f_t)^2}{n}}$

# Production

Inputs

- Land
- labor
- Capital
- Enterprise

$Q = f(L, K)$

## Short Run

Only one variable factor i.e L or K

30) Total Product = Q

Average Product ($AP_L$) = $\frac{Q}{L}$

Marginal Product ($MP_L$) = $\frac{dQ}{dL}$ = $\frac{\Delta Q}{\Delta L}$

here L is the variable factor considered

31) Elasticity = $\frac{\Delta Q}{\Delta L} \times \frac{L}{Q} = \frac{MP_L}{AP_L}$

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## * Law of Diminishing Marginal Returns

It says that as additional units of an input is used in production process while all other input are constant, then it result increment in output till some point, After that more addition leads to decline in marginal product of that variable.

## 32) Stages of production

| Stage 1: | Stage 2: | Stage: 3 |
|---|---|---|
| ⇒ Marginal product reaches max & start declining | Marginal Product intersect Average Product after which average product starts to decline continously | Marginal product become Negative |
| ⇒ Total Average product increases but slower than Marginal product | | & Average product also continues decline but is positive |
| $MP_L$ = +ve<br>$MP_K$ = -ve | $MP_L$ & $MP_K$ = +ve | $MP_L$ = -ve<br>$MP_K$ = +ve |

33) $MRP_L = MFC_L$

Inverse

$MRP_L = (MP_L) \times MR$

$MRP_L = \frac{\Delta TC}{\Delta L}$

34) In case of labour

$MRP_L = w$ (wage of labour)

So, $MRP_L = MFC_L = w$

## Long run

35) Firms will only use combination in isoquants where they are negatively sloped.

6) MRTS (Marginal Rate of Technical Substitution) $= \frac{-MP_L}{MP_C}$

37) Isocost lines

Total Cost = $wL + rK$

where $w$ ⇒ wages
$r$ ⇒ Cost of Capital

Slope = $-\frac{w}{r}$

Optimal Input Combination

$MRTS = \frac{MP_L}{MP_K} = \frac{w}{r}$

38) Return to Scale

- Increasing
- Decreasing
- Constant

for given equal
put $K$ & $L$ '2' times
if the answer is 2 times the previous ⇒ then Constant
if $> 2$ ⇒ Increasing
⇒ Decreasing

3.1) Cobb-Douglas Production Function

$$Q = AK^a L^b$$

To check Return to scale

Replace $K = zK$

& Replace $L = zL$

we get

$$Q' = z^{a+b} Q$$

If $a+b=1$ ⇒ Constant Return to scale

$a+b > 1$ ⇒ Increasing

$a+b < 1$ ⇒ Decreasing

4.5)

Average Cost = $\frac{\text{Total Cost}}{Q}$

Marginal Cost = $\frac{\Delta TC}{\Delta Q} = \frac{w}{\frac{\Delta Q}{\Delta L}} = \frac{w}{MP_L}$

41) Average Variable Cost: $\frac{TVC}{Q} = \frac{WL}{Q} = \frac{W}{AP_L}$

Average fixed Cost = $\frac{TFC}{Q}$

42) Break Even Analysis.

↳ Point where Total Cost = Total Revenue

Also known as Cost Volume Profit Analysis

Quantity at Break Even point $Q' = \frac{TFC}{P - AVC}$