

Topic & Formulas in Economics

1) Profit = Revenue - Cost

Business Profit / Accounting Economic Profit

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$\Rightarrow \text{Profit} = \text{Revenue} - \text{Explicit Cost}$ $\Rightarrow \text{Profit} = \text{Revenue} - \text{Implicit} - \text{Explicit Cost}$

2) Equilibrium $\Rightarrow Q_d = Q_s$

\uparrow supply
 \downarrow demand

3) Price ceiling \Rightarrow leads to shortage

Price floor \Rightarrow leads to surplus

& Price floor \geq Price ceiling

Tax (T)

4)

Imposed on
Seller

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Supply curve
shift upward
by T

Imposed on
buyer

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Demand curve
shift downward by T

To Solve Tax Question

Tax on seller : Write ' P ' in terms of Q_s

& add Tax on RH
i.e. $P = 1/n \cdot T$

& then find equilibrium
with demand equation

Tax on buyer

work P in terms of Q_d & subtract Tax 'T' on P.M

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

& 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) ~~y~~ ~~\rightarrow~~
 ~~P~~ $Q = B + a_p P$

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

Slope becomes Twice

9) $(TR) \Rightarrow \text{max}$ when



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

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

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

11)

Elastic Demand ($E_p < -1$)

$$P \uparrow Q \downarrow = TR \downarrow \quad P \downarrow Q \uparrow = TR \uparrow$$

Inelastic Demand ($E_p < 0$)

$$P \uparrow Q \downarrow = TR \uparrow \quad P \downarrow Q \uparrow = TR \downarrow$$

* Less elastic Demand

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When few substitutes, Requires small portion of total expenditure.

Less time available to adjust for price

* More elastic Demand

(b) Write opposite of above

12) Income elasticity

$$E_I = \frac{\Delta I}{I} \times \frac{1}{\Delta Y} \quad (\text{Point})$$

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

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 \rightarrow Change in quantity 'x' due to change in price of 'y'

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

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

$E_{xy} > 0 \Rightarrow$ Substitute

$E_{xy} < 0 \Rightarrow$ 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 other good.
- * Indifference curve move more towards right means more satisfaction
- * No interior of curve possible due to transitivity
- * Demand sloping: due to Non-satiation
- * Convex to origin

13) Marginal Rate of substitution:

$$\frac{-MU_x}{MU_y}$$

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

17) Budget Line

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

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

18) Utility Maximization

$$\frac{P_x}{P_y} = \frac{MU_x}{MU_y} \rightarrow \boxed{\frac{P_x}{P_y} = \frac{MU_x}{MU_y}}$$

Forecasting

Qualitative Method



Opinion of Expert

Quantitative Method



Rely on data & analytical technique

Time Series

Trend Projection

Exponential Smoothing

Moving Average

Associative

Linear Regressor

1a) Regression line

dependent $\rightarrow Y$ Independent
 $y = a + b(x)$

To find a & b

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

$$\sum xy_i = a \sum x_i + b \sum x_i^2$$

or
or

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

$$b = \frac{n \sum xy_i - (\sum x)(\sum y)}{n \sum x^2 - (\sum x)^2}$$

2a) Standard Error (S_e):

$$\sqrt{\frac{\sum (y_t - \hat{y})^2}{n - k - 1}}$$

Where $n = \text{No of observation}$ \rightarrow degree of freedom
 $k = \text{No of independent variable in equation}$

~~Shows S_e shows stronger relation~~

$S_e = \sqrt{t}$ is probable error in predicted values

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

Testing Regression Estimate

1) Coefficient of Determination (R^2)

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Test the overall equation

& show the strength of

the relation

between dependent & independent variable

The t-stat

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Test relationship between each independent variable & dependent variable individually

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

~~$$22) \sum(Y_e - \bar{Y})^2 = \sum(Y_t - \hat{Y}_e)^2$$~~

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

Total variation
Unexplained variation
Explained variation

\Rightarrow More value of R^2 . \Rightarrow More strong relationship

Implies independent variable explains R^2 percent of the dependent variable

$$24) \text{Coefficient of Correlation } (r) = \frac{\sqrt{R^2}}{1} = R$$

The t - Statistic

$$t = \frac{b}{s_b}$$

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

If calculated $>$ tabulated
Value

Strong Relation ship

25) Confidence Interval

$$b \pm t_{\alpha/2, n-k-1} s_b$$

Growth

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 term increase or decrease in data series
- * Cyclical: Change that occur over years
- * Seasonal \Rightarrow Regular occurring fluctuation
- * Irregular or Random
 - ↳ due to unique events
(like lost - a)

20) Trend projection

$$S_t = S_0 + bt$$

where S : Sales

t : time

21) Seasonal adjustment

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

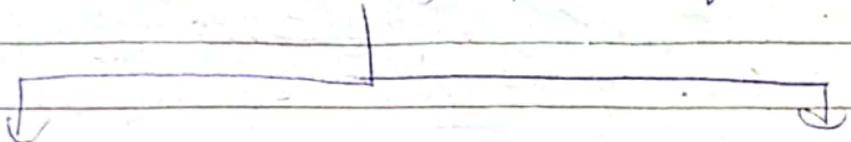
Seasonal adjustment: Average of Ratio for each seasonal period

28) Adjusted forecast = Trend forecast + Seasonal Adjustment

Limitations of Trend Analysis

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

Smoothing Techniques



Moving Average

Exponential Smooth

$$29) \text{ Rmse} = \sqrt{\frac{\sum (A_t - f_t)^2}{n}}$$

ProductionInputs

Land labor Capital Enterprise

$$Q = f(L, K)$$

Short Run

II

Only one variable factor
i.e. Labour

3)

$$\text{Total Product} = Q$$

$$\text{Average Product} = \frac{Q}{L}$$

$$\text{Marginal Product} = \frac{dQ}{dL}$$

$$= \frac{\Delta Q}{\Delta L}$$

here
L is
the
variable
factor
considered.

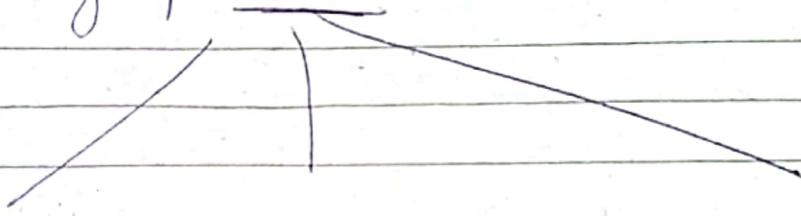
3i)

$$\text{Elasticity} = \left[\frac{\Delta Q}{\Delta L} \times \frac{L}{Q} = \frac{MP_L}{AP_L} \right]$$

* Law of Diminishing Marginal Returns:

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

32) Stages of production



Stage 1:

- ⇒ Marginal product reaches max & start declining

- ⇒ Total Average product increases but slower than Marginal product

$$MP_L = +ve \\ MP_K = -ve$$

Stage 2:

- Marginal Product starts intersecting Average Product after which Average Product starts to decline

- Average Product continuously declines

$$MP_L \& MP_K = +ve$$

Stage 3:

- Marginal product becomes negative

- & Average product also continues declining but is ~~as~~ positive

$$MP_L = -ve \\ MP_K = +ve$$

33) $MRP_L = MRP_C$

Wenche

$$MRP_L = (MPL) \times \underline{MR}$$

$$MRP_L = \frac{DTC}{DL}$$

34) In case of labour

$$MRP_L = w \text{ (wage of labour)}$$

$$\therefore MRP_L = MPL = w$$

Long Run

35) Firms will only use Combinations in Isoquants where they are negatively sloped.

3) MRTS

$$\text{Marginal Rate of Technical Substitution} = \frac{-MPL}{MPIC}$$

Marginal Rate of Technical Substitution

37) IsoCost Lines

$$\text{Total Cost} = wL + rK$$

where $w \Rightarrow \text{Wages}$

$r \Rightarrow \text{Cost of Capital}$

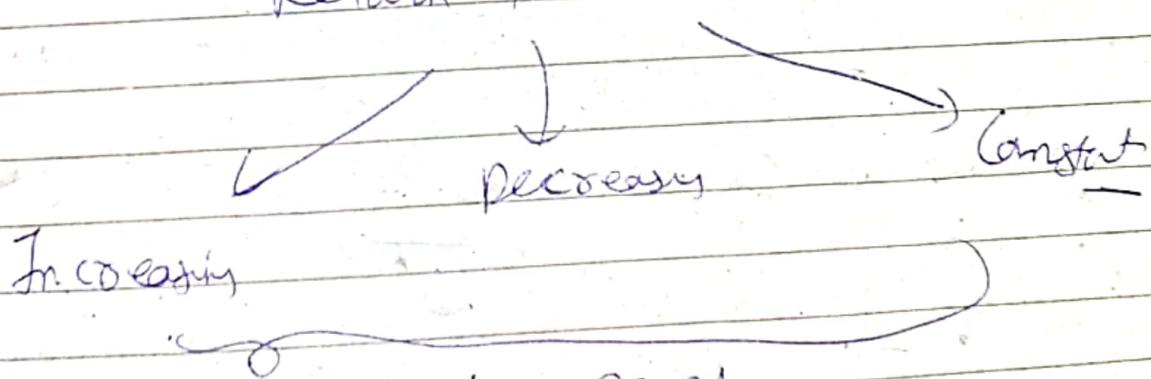
$$\text{Slope} = -\frac{w}{r}$$

Optimal Input Combination

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

38)

Return to Scale



for given input

put $K & L$ 1/2 times

if the answer is 2 times the previous \Rightarrow then Constant

$g_1 > 2 \Rightarrow$ Increasing
 \Rightarrow Decreasing

3.) Cobb-Douglas Production Function

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

To check Return to Scale

Let ~~R~~ Replaces $K = 2K$

L Replaces $L = 2L$

We get

$$Q' = 2^{a+b} Q$$

If $a+b=1 \Rightarrow$ Constant Return to Scale

$a+b > 1 \Rightarrow$ Increasing

$a+b < 1 \Rightarrow$ Decreasing

4.)

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

$$\text{Marginal Cost} = \frac{\partial \text{TC}}{\partial Q} = \frac{w}{\frac{\partial Q}{\partial L}} = \frac{w}{m_L}$$

41) Average ~~fixed~~^{variable} Cost: $\frac{TVC}{Q} = \frac{WL}{Q} = \frac{w}{AP}$

Average fixed cost: $\frac{TFC}{Q}$

42) Break Even Analysis.

(i) Point where Total Cost = Total Revenue

Also known as Cost Volume Profit Analysis

Quantity Q' at Break even point

$$= \frac{TFC}{P - AVE}$$