UNIT 2 (Applied Statistics)

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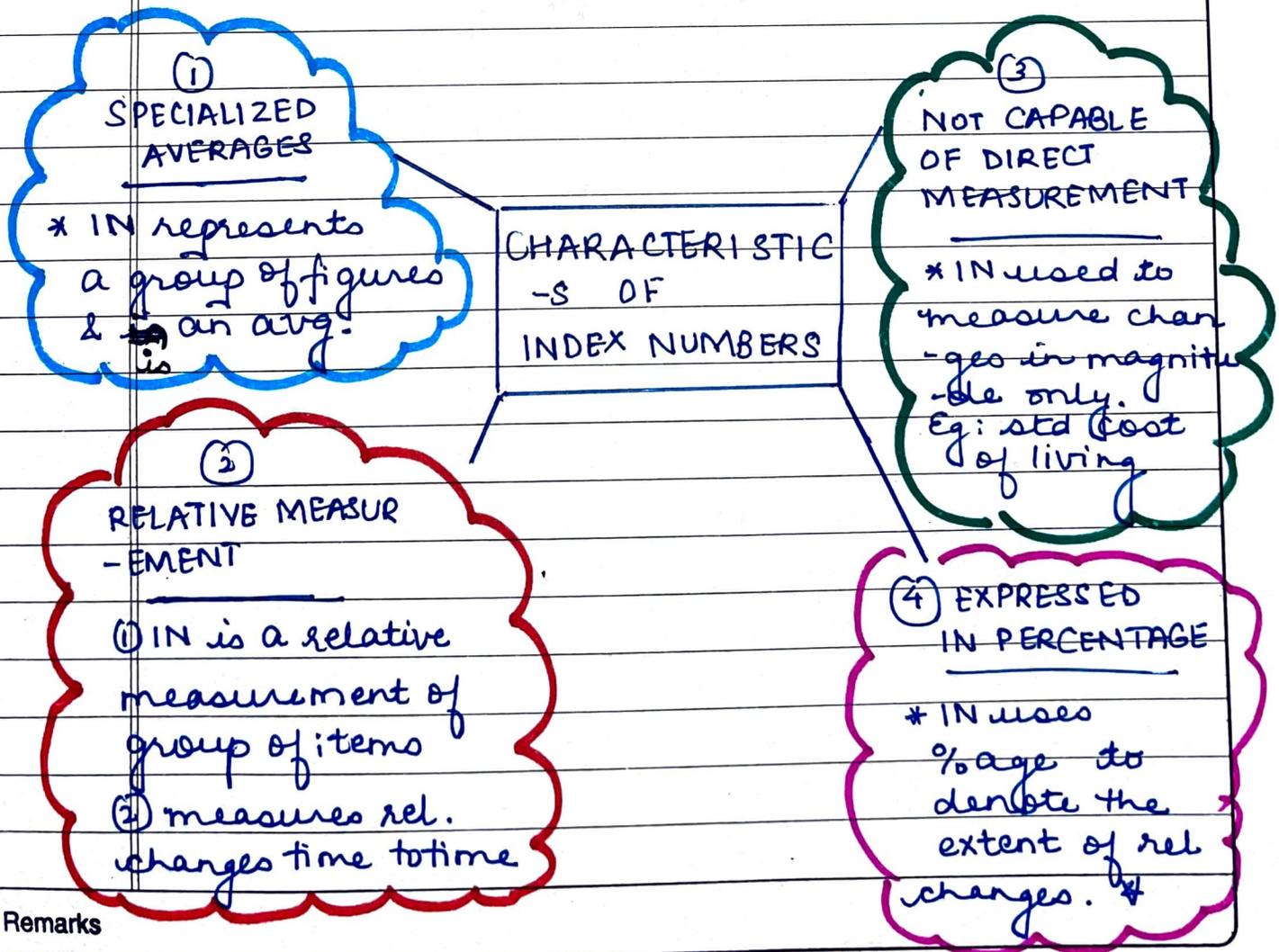
(Q1) What are 'Index Numbers' ?

→ It is a statistical device used to measure the relative change in the level of a phenom-enon with respect to (wrt) time, geographic-al location, or characteristics such as income, profession etc.

→ It uses : (1) variable arranged in time series
(2) base year
(3) given year

(Q2) Characteristics of Index numbers (IN)



Remarks

* IN doesn't use % symbol

Teacher's Sign.

⟨Q3⟩ Uses Of Index Number

① IN → Known as "Economic Barometer"
→ v. imp tool to measure changes in economic & business activity

② USES OF IN

⟨1⟩ Studying Trends
* useful for future forecasting
* eg: trends in: i) industrial product^{n} ii) national income

⟨2⟩ Policy Format^{n}
* used by govt. or businesses for planning & decisions
* eg: diving index for allowance of workers

⟨3⟩ Deflating values
* process of adjusting a series of income according to current price changes to find out any change in real income of people.

<Q4> Points to be considered in construction of Index numbers

POINTS TO CONSIDER DURING CONSTRUCTⁿ OF IN

<1> Purpose of IN

1. object of IN must be clear
2. no single IN can be used for all cases

   Eg: General vs Retail price IN

<2> Selection of Base Year

1. base period (bp) shouldn't be distant & should be normal
2. bp selected by - chain & fixed bm*

<3> Selectⁿ of repre-esentative Items

1. only the items that serve a purpose + are relevant selected
2. fairly large no of items must be taken

<4> Selectⁿ of repres-entative prices

1. select a well known trading place

   ↓

   reliable person/agency collects price quotatⁿs

   ↓

   divide the data in 2 parts - wholesale & retail prices

<5> Selectⁿ of Suitable Avg

1. A.M → affected by extremes
2. Median → ignores extremes & doesn't measure relative changes
3. G.M → most suitable avg (opposite of median)

<6> Selectⁿ of Proper Weights

1. makes index no truly representative of popⁿ under study
2. weights assigned for varying importance
3. weights should vary period to period

<7> Suitable Formula

1. depends on -
   - * available info
   - * purpose of constructing IN

* fixed base period method

chain base period method

A.M → arithmetic mean

G.M → geometric mean

(Q5) Types Of Index Number

(1) PRICE IN

(1) relative change in price

(2) WHOLESALE IN / RETAIL / COST OF LIVING IN

(3) $\frac{p_1}{p_0} \times 100$

(2) QTY IN

(1) relative change in qty

(2) Eg: qty of product^n, consumption

(3) $\frac{q_1}{q_0} \times 100$

(3) Value IN

(1) value = price x qty

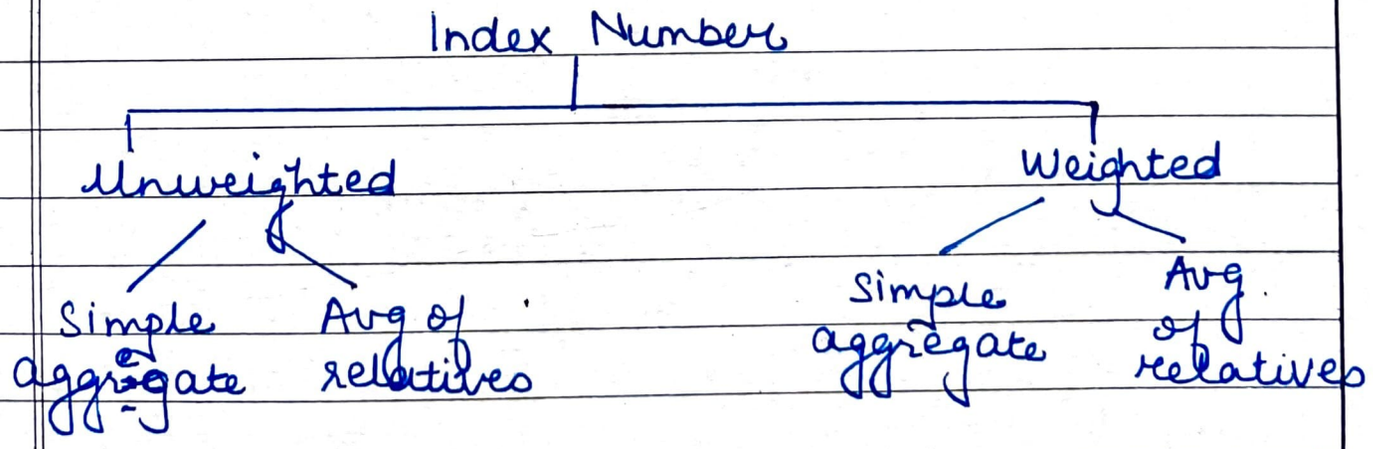
(2) $\frac{p_1 q_1}{p_0 q_0} \times 100$

(3) Special Purpose IN

(1) IN prepared for some specific purpose

Eg: nat^{n}al income, growth, productivity etc

(Q6) Methods Of Constructing IN



(1) UNWEIGHTED SIMPLE AGGREGATE METHOD

$$P_{01} = \frac{\Sigma p_1}{\Sigma p_0} \times 100$$

(2) UNWEIGHTED AVG OF PRICE RELATIVE METHOD

(1) $$P_{01} = \frac{\left(\Sigma\left(\left(\frac{p_1}{p_0}\right)\right) \times 100\right)}{N}$$ (using arithmetic mean)

N → no of commodities

(2) $$P_{01} = \text{Antilog}\left[\frac{\Sigma\left(\log\left(\frac{p_1}{p_0} \times 100\right)\right)}{N}\right]$$

(3) WEIGHTED AGGREGATE INDEX NO

(1) Laspeyre's

$$P_{01} = \frac{\Sigma p_1 q_0}{\Sigma p_0 q_0} \times 100$$

(2) Paasche's

$$P_{01} = \frac{\Sigma p_1 q_1}{\Sigma p_0 q_1} \times 100$$

(3) Marshall

$$P_{01} = \frac{\Sigma p_1 (q_1 + q_0)}{\Sigma p_0 (q_1 + q_0)} \times 100$$

(4) Fischer

$$P_{01} = \left(\frac{\Sigma p_1 q_0}{\Sigma p_0 q_0} \times \frac{\Sigma p_1 q_1}{\Sigma p_0 q_1}\right)^{1/2} \times 100$$

(5) Dorbish - Bowley

$$P_{01} = \frac{1}{2}\left(\frac{\Sigma p_1 q_0}{\Sigma p_0 q_0} + \frac{\Sigma p_1 q_1}{\Sigma p_0 q_1}\right) \times 100$$

(6) Walsh

$$P_{01} = \frac{\Sigma p_1 \sqrt{q_1 q_0}}{\Sigma p_0 \sqrt{q_1 q_0}} \times 100$$

(4) WEIGHTED AVG OF RELATIVE METHOD

(1) using A.M

$$P_{01} = \frac{\Sigma \left(\frac{p_1}{p_0} \times 100\right) W}{\Sigma W}$$

(2) using GM

$$P_{01} = \text{Antilog}\left[\frac{\Sigma W (\log P)}{\Sigma W}\right] \qquad \left(P = \frac{p_1}{p_0} \times 100\right)$$

⟨Q 7⟩ Test For Index Number

⟨1⟩ A good formula should satisfy the following tests –

* time reversal
* factor reversal
* circular

⟨2⟩ TIME REVERSAL

* " The formula for calculating IN should be such that it gives the same ratio as b/w one point of comparison & the other, no matter which one is taken as base year. "

* [SIMPLE: if the base & current periods are interchanged, the product should be unity.]
[$P_{01} \times P_{10} = 1$]

* Satisfied by — Fischer, Marshall Edgeworth, Walsh

(for Fischer)

$$P_{01} = \left(\frac{\Sigma p_1 q_0}{\Sigma p_0 q_0} \times \frac{\Sigma p_1 q_1}{\Sigma p_0 q_1} \right)^{1/2} \times 100$$

$$P_{10} = \left(\frac{\Sigma p_0 q_1}{\Sigma p_1 q_1} \times \frac{\Sigma p_0 q_0}{\Sigma p_1 q_0} \right)^{1/2} \times 100$$

$$(P_{01} \times P_{10} = 0)$$

Remarks

(3) FACTOR REVERSAL

* "A good formula should permit interchanging of prices w/ quantities w/out giving inconsistent results."
* It shouldn't cause change in ~~ratio of~~ true value ratio.
* Test satisfied if —

$$P_{01} \times Q_{01} = \frac{\Sigma p_1 q_1}{\Sigma p_0 q_0} = \frac{\text{Value in year (1)}}{\text{Value in year (0)}}$$

* Satisfied by FISCHER (known as fischer's Ideal ~~formula~~ IN)

$$P_{01} = \left(\frac{\Sigma p_1 q_0}{\Sigma p_0 q_0} \times \frac{\Sigma p_1 q_1}{\Sigma p_0 q_1}\right)^{1/2} \times 100$$

$$Q_{01} = \left(\frac{\Sigma q_1 p_0}{\Sigma q_0 p_0} \times \frac{\Sigma q_1 p_1}{\Sigma q_1 p_0}\right)^{1/2}$$

$$P_{01} \times Q_{01} = \frac{\Sigma p_1 q_1}{\Sigma p_0 q_0}$$

(4) CIRCULAR TEST

* It's desired to shift the base
* A good IN should ensure that new IN obtained by shifting process should be equal to original IN.

$$P_{01} \times P_{02} \times P_{12} = 1$$

Remarks * NOT SATISFIED BY FISCHER

Neelgagan

Teacher's Sign.