Unit IV (1)

Explain Index no (or) Discuss briefly about Index no

Index Nos

An Index no. is a measure that states relative comparison b/w groups of related items. An index no. is nothing but a % figure that expresses the r'ship b/w 2 nos. with one of the nos. used as the base.

Our aim is to study the change in prices of a no of commodities. In this case we want to combine the price relatives of many commodities in a single fig for each ys. For such a fig we use the term Index no.

Define Index no

Def:

Index nos are devices for measuring differences in the magnitude of a group of related Vbls (Variables)

- Croxton & Cowden

An Index no is a statistical measure designed to show changes in a vble or group of related vbls w.r to time, geographical location or other characteristics

- Spiegal.

Write down the uses of Index no (or) Importance of index no.

Uses

1. Widely used in connection with decision making & analysis in business

2. They are very useful in measuring relative changes

3. Index nos reduce the changes of price level into more useful & understandable form

4. Various Index no's computed for different purposes say employment, transport, industry etc

5. The stability of prices or their inflating or deflating conditions can be observed with the help of indices

6. In the field of economy, wage adjustments are done with the study of consumer's price Index no.

7. Cost of living index nos are used for fixing the dearness allowance to the employees to enable them to meet increased cost of living

What are the problems involved in the construction of Index nos. (or) Explain the Problems in the construction of Index nos.

Problems in the construction of Index nos

The foll are some of the " " "

1) Purpose of the Index No.

An Index no constituted for one purpose in general cannot be used for other purposes. For eg, for constructing

The whole Sale price Index no, the retail prices are not necessary. Hence the purpose of Index nos. to be constructed Should be well defined before the collection of data

2. Selection of Commodities

It is not possible to select all the Commodities in the construction of Index no. After selection of the commodity to be included in the construction of Index no. Sampling procedure can be adopted to determine which Specific prices will be included. For eg, if we study the change in production of Cloth then we may include 1. production of mill cloth, powerloom Cloth, handloom cloth etc.

3. Choice of the Base: the Base period of an indexno is very important, as it is used for the construction of indexno. Every Indexno must have a base when Selecting a base period, the year must be recent & normal. The normal yr is one if abnormal yrs are considered, then the indexnos. will be misleading one.

4. Determination of wts.

Usually the types of wts are used in attaching wts. They are 1) Qty wt 2) Value wt.

Qty wts for commodities are useful when importance is attached to the no of units of the commodities used.

5. Selection of Avg:

In practice the AM is used, b'cos it is easy for computation, GM & HM are very difficult to calculate But GM is preferred b'cos of foll charac:

1) GM is the best measure.
2) It gives less wt to bigger items & more wt/.. to smaller items.

the purpose and convention.

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7. The Formula. As seen in the following pages, many formulae are available. Each one has its own advantages. If for a certain situation only one formula is suitable, there is no difficulty in using the formula. For certain other situations more than one formula may be found suitable. In such cases the purpose and the opinion of the experts in the field are the guides in choosing a formula.

Proper decision under each of those headings is bound to lead to a good index number.

Period is referred to as year hereafter and the following notations are used.

p_0 - price of a commodity in the base year.
p_1 - price of a commodity in the current year.
q_0 - quantity of a commodity in the base year.
q_1 - quantity of a commodity in the current year.
p - price of a commodity.
q - quantity of a commodity.
V or W - weight of a commodity.

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I or P -price relative or price index number of a commodity.

Q -quantity relative or quantity index number of a commodity.

$$P = \frac{p_1}{p_0} \times 100 \qquad Q = \frac{q_1}{q_0} \times 100$$

P_{01} -price index number of the current year compared with the base year.

Q_{01} -quantity index number of the current year compared with the base year.

Formulae. All the formulae can be brought under four groups as follows. First, they are divided into two groups, viz., Unweighted Methods and Weighted Methods and then each group is subdivided into two as Aggregatives Methods and Average of Relatives Methods. Under each of the four subdivisions one or more formulae are available.

Methods

- Unweighted (Simple)
  - Simple Aggregatives Method
  - Simple Averages of Relatives Method
- Weighted
  - Weighted Aggregatives Method
  - Weighted Averages of Relatives Method

1. Simple or Unweighted Aggregatives Method. It is based on the aggregates or the totals as shown below.

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

It may be noted that the current year figure is in the numerator while the base year figure is in the denominater as in the other methods when the index number of the current year as compared to the base year is calculated.

When quantity index number is required, $Q_{01} = \frac{\Sigma q_1}{\Sigma q_0} \times 100$

The calculation is illustrated together with the simple averages of relatives method.

The drawbacks of this method are:

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(i) It does not satisfy even unit test which is explained later. The defect is due to the fact that the unit prices are added as such even though the units of measurements are different such as kg, metre, litre, etc.

(ii) It does not distinguish between the commodities with regard to their relative importance.

2. Simple or Unweighted Averages of Relatives Method. The price relatives, P, for price index number and the quantity relatives, Q, for quantity index number are calculated and their A.M. or G.M. is found.

Price Index (P_{01})

(i) Using A.M., $P_{01} = \frac{\Sigma P}{N}$

(ii) Using G.M., $P_{01} = \text{Antilog}\left(\frac{\Sigma \log P}{N}\right)$

Both these formulae can be found to satisfy unit test.

Example 1: From the following data construct an index for 1995 taking 1994 as base:

Commodities	A	B	C	D	E
Price in 1994 (Rs.)	50	40	80	110	20
Price in 1995 (Rs.)	70	60	90	120	20

Solution:

Commodities	Price 1994 (p_0)	Price 1995 (p_1)	$P=\frac{p_1}{p_0} \times 100$	log P
A	50	70	140.00	2.1461
B	40	60	150.00	2.1761
C	80	90	112.50	2.0512
D	110	120	109.09	2.0378
E	20	20	100.00	2.0000
Total	$\Sigma p_0=$ 300	$\Sigma p_1=$ 360	$\Sigma P=$ 611.59	$\Sigma \log P=$ 10.4112

By Aggregatives Method,

$$P_{01} = \frac{\Sigma p_1}{\Sigma p_0} \times 100 = \frac{360}{300} \times 100 = 120$$

Using A.M.,

$$P_{01} = \frac{\Sigma P}{N} = \frac{611.59}{5} = 122.32$$

Using G.M.,

$$P_{01} = \text{Antilog}\left(\frac{\Sigma \log P}{N}\right) = \text{Antilog}\left(\frac{10.4112}{5}\right) = 120.84$$

Note : Although any one of them is sufficient, all the three possible indices have been calculated for the sake of illustration.

When the index number is required by only one method as in this problem, the preferable method is simple A.M.and the answer is $P_{01} = 122.32$

$P_{01} = 122.32$ indicates that the prices, on the average, have increased 22.32% in the current year compared with the base year.

Whenever the price index number is less than 100, it indicates that the prices, on the average, have decreased in the current year compared with the base year.

3. Weighted Aggregatives Method.

Price Indices (P_{01})

(i) Laspeyre's formula: $P_{01}{}^{L} = \dfrac{\Sigma p_1 q_0}{\Sigma p_0 q_0} \times 100$

(ii) Paasche's formula: $P_{01}{}^{P} = \dfrac{\Sigma p_1 q_1}{\Sigma p_0 q_1} \times 100$

(iii) Fisher's formula: $P_{01}{}^{F} = \sqrt{\dfrac{\Sigma p_1 q_0}{\Sigma p_0 q_0} \times \dfrac{\Sigma p_1 q_1}{\Sigma p_0 q_1}} \times 100$

$$= \sqrt{P_{01}{}^{L} \cdot P_{01}{}^{P}}$$

(iv) Marshall - Edgeworth formula:

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

$$= \frac{\Sigma p_1 q_0 + \Sigma p_1 q_1}{\Sigma p_0 q_0 + \Sigma p_0 q_1} \times 100$$

(v) Bowley's formula: $P_{01}{}^{B} = \dfrac{1}{2}\left(\dfrac{\Sigma p_1 q_0 + \Sigma p_1 q_1}{\Sigma p_0 q_0 + \Sigma p_0 q_1}\right) \times 100$

$$= \frac{P_{01}{}^{L} + P_{01}{}^{P}}{2}$$

(vi) Kelly's formula: $P_{01}{}^{K} = \dfrac{\Sigma p_1 q}{\Sigma p_0 q} \times 100$

base indices also.

Example 2: Compute (i) Laspeyre's (ii) Paasche's and (iii) Fisher's index numbers.

Item	Price		Quantity	
	Base year	Current year	Base year	Current year
A	6	10	50	50
B	2	2	100	120
C	4	6	60	60
D	10	12	30	25

Solution:

Item	Price		Quantity					
	Base year (p_0)	Current year (p_1)	Base year (q_0)	Current year (q_1)	p_0q_0	p_1q_0	p_0q_1	p_1q_1
A	6	10	50	50	300	500	300	500
B	2	2	100	120	200	200	240	240
C	4	6	60	60	240	360	240	360
D	10	12	30	25	300	360	250	300
Total	---	---	---	---	Σp_0q_0 =1040	Σp_1q_0 =1420	Σp_0q_1 =1030	Σp_1q_1 =1400

Laspeyre's I.N., $p_{01}{}^{L} = \dfrac{\Sigma p_1q_0}{\Sigma p_0q_0} \times 100$

$$= \frac{1420}{1040} \times 100$$

$$= 136.54$$

Paasche's I.N., $p_{01}{}^{P} = \dfrac{\Sigma p_1q_1}{\Sigma p_0q_1} \times 100$

$$= \frac{1400}{1030} \times 100$$

$$= 135.92$$

Fisher's I.N., $p_{01}{}^{F} = \sqrt{\text{Laspeyre's} \times \text{Paasche's}}$

$$= \sqrt{136.54 \times 135.92}$$

$$= 136.23$$

(or)

$$P_{01}^{F} = \sqrt{\frac{\Sigma p_1q_0}{\Sigma p_0q_0} \times \frac{\Sigma p_1q_1}{\Sigma p_0q_1}} \times 100$$

$$= \sqrt{\frac{1420}{1040} \times \frac{1400}{1030}} \times 100$$

$$= 136.23$$

Note: It may be noted that, unless mentioned otherwise, price index numbers are to be calculated.

When the formulae are required for quantity index number, p is replaced by q and q is replaced by p.

Example 3: It is stated that Marshall - Edgeworth index number is a good approximation to the ideal index number. Verify, using the following data:

	2000		2001	
Commodity	Price	Quantity	Price	Quantity
A	2	74	3	82
B	5	125	4	140
C	7	40	6	33

Solution: Nothing is indicated to decide which is base year and which is current year. In such cases the recent year is to be taken as the current year and the other one as the base year.

	2000		2001					
Comm-odity	Price p_0	Quantity q_0	Price p_1	Quantity q_1	p_0q_0	p_1q_0	p_0q_1	p_1q_1
A	2	74	3	82	148	222	164	246
B	5	125	4	140	625	500	700	560
C	7	40	6	33	280	240	231	198
Total	---	---	---		Σp_0q_0 =1053	Σp_1q_0 =962	Σp_0q_1 =1095	Σp_1q_1 =1004

Fisher's Ideal I.N., $P_{01}^{F} = \sqrt{\frac{\Sigma p_1q_0}{\Sigma p_0q_0} \times \frac{\Sigma p_1q_1}{\Sigma p_0q_1}} \times 100$

$$= \sqrt{\frac{962}{1053} \times \frac{1004}{1095}} \times 100$$

$$= 91.524$$

Marshall-Edgeworth I.N., $P_{01}^{ME} = \frac{\Sigma p_1q_0 + \Sigma p_1q_1}{\Sigma p_0q_0 + \Sigma p_0q_1} \times 100$

$$= \frac{962 + 1004}{1053 + 1095} \times 100$$

$$= 91.527$$

The results show that the Marshall- Edgeworth index number is a good approximation to Fisher's ideal index number.

Example 4: Using Fisher's Ideal Formula, compute price and quantity index number for 1999 with 1996 as base year, given the following:-

Year	Commodity A Price (Rs.)	Commodity A Quantity (Kg.)	Commodity B Price (Rs.)	Commodity B Quantity (kg.)	Commodity C Price (Rs.)	Commodity C Quantity (Kg.)
1996	5	10	8	6	6	3
1999	4	12	7	7	5	4

Solution: The prices and the quantities of the three commodities are taken one below the other before necessary products are found.

Com-modity	1996 Price p_0	1996 Quantity q_0	1999 Price p_1	1999 Quantity q_1	p_0q_0	p_1q_0	p_0q_1	p_1q_1
A	5	10	4	12	50	40	60	48
B	8	6	7	7	48	42	56	49
C	6	3	5	4	18	15	24	20
Total	---	---	---	---	Σp_0q_0 =116	Σp_1q_0 =97	Σp_0q_1 =140	Σp_1q_1 =117

By Fisher's Ideal Formula,

$$P_{01}^{F} = \sqrt{\frac{\Sigma p_1q_0}{\Sigma p_0q_0} \times \frac{\Sigma p_1q_1}{\Sigma p_0q_1}} \times 100$$

$$= \sqrt{\frac{97}{116} \times \frac{117}{140}} \times 100$$

$$= 83.60$$

In a price index number formula, if p is replaced by q and q, if any, is replaced by p, the corresponding quantity index number formula is obtained.

$$Q_{01}^{F} = \sqrt{\frac{\Sigma p_0q_1}{\Sigma p_0q_0} \times \frac{\Sigma p_1q_1}{\Sigma p_1q_0}} \times 100$$

$$= \sqrt{\frac{140}{116} \times \frac{117}{97}} \times 100$$

$$= 120.65$$

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4. Weighted Averages of Relatives Method.

Price Indices $[P_{01}]$

(i) Using A.M., $P_{01} = \frac{\Sigma WP}{\Sigma W}$

(ii) Using G.M., $P_{01} = \text{Antilog}\left[\frac{\Sigma W \log P}{\Sigma W}\right]$

This method is better than the corresponding unweighted method in showing the relative change. From the data available under this method, index numbers by unweighted averages of relatives also could be calculated. This method provides scope for replacing one or more items at a later stage.

Example 5: Calculate the index number of prices for 1998 on the basis of 1995 from the data given below:

Commodity	Weights	Price (1995)	Price (1998)
A	40	16	20
B	25	40	60
C	5	2	3
D	20	5	7
E	10	2	4

Solution: Either G.M. or A.M. can be used.

Comm-odity	Weights W	Price 1995	Price 1998	$P=\frac{p_1}{p_0}\times 100$	WP	log P	Wlog P
A	40	16	20	125	5000	2.0969	83.8760
B	25	40	60	150	3750	2.1761	54.4025
C	5	2	3	150	750	2.1761	10.8805
D	20	5	7	140	2800	2.1461	42.9220
E	10	2	4	200	2000	2.3010	23.0100
Total	ΣW =100	---	---	---	ΣWP =14300	---	$\Sigma W \log P$ =215.0910

Using A.M., $P_{01} = \frac{\Sigma WP}{\Sigma W} = \frac{14300}{100} = 143$

Using G.M., P_{01}

$$= \text{Antilog}\left[\frac{\Sigma W \log P}{\Sigma W}\right]$$

$$= \text{Antilog}\left[\frac{215.0910}{100}\right]$$

$$= 141.55$$

Example 6: Show that Fisher's ideal index satisfies both time reversal and factor reversal tests, using the following data commonly.

Commodity	Price (1990)	Qty(1990)	Price(1992)	Qty (1992)
A	6	50	10	56
B	2	100	2	120
C	4	60	6	60
D	10	30	12	24
E	8	40	12	36

Solution:

Commodity	1990		1992					
	p_0	q_0	p_1	q_1	p_0q_0	p_1q_0	p_0q_1	p_1q_1
A	6	50	10	56	300	500	336	560
B	2	100	2	120	200	200	240	240
C	4	60	6	60	240	360	240	360
D	10	30	12	24	300	360	240	288
E	8	40	12	36	320	480	288	432
Total	---	---	---	---	Σp_0q_0 =1360	Σp_1q_0 =1900	Σp_0q_1 =1344	Σp_1q_1 =1880

By Fisher's formula, after ignoring the factor 100,

$$P_{01} = \sqrt{\frac{\Sigma p_1q_0}{\Sigma p_0q_0} \times \frac{\Sigma p_1q_1}{\Sigma p_0q_1}} = \sqrt{\frac{1900}{1360} \times \frac{1880}{1344}}$$

$$P_{10} = \sqrt{\frac{\Sigma p_0q_1}{\Sigma p_1q_1} \times \frac{\Sigma p_0q_0}{\Sigma p_1q_0}} = \sqrt{\frac{1344}{1880} \times \frac{1360}{1900}} \text{ and so}$$

$$P_{01} \times P_{10} = \sqrt{\frac{1900}{1360} \times \frac{1880}{1344}} \times \sqrt{\frac{1344}{1880} \times \frac{1360}{1900}}$$

$$= \sqrt{\frac{1900}{1360} \times \frac{1880}{1344} \times \frac{1344}{1880} \times \frac{1360}{1900}} = \sqrt{1} = 1$$

$$Q_{01} = \sqrt{\frac{\Sigma p_0q_1}{\Sigma p_0q_0} \times \frac{\Sigma p_1q_1}{\Sigma p_1q_0}} = \sqrt{\frac{1344}{1360} \times \frac{1880}{1900}}.$$

$$P_{01} \times Q_{01} = \sqrt{\frac{1900}{1360} \times \frac{1880}{1344}} \times \sqrt{\frac{1344}{1360} \times \frac{1880}{1900}}$$

$$= \sqrt{\frac{1900}{1360} \times \frac{1880}{1344} \times \frac{1344}{1360} \times \frac{1880}{1900}}$$

$$= \frac{1880}{1360} = \frac{\Sigma p_1 q_1}{\Sigma p_0 q_0}$$

Using the given data, Fisher's index in found to satisfy both time reversal and factor reversal tests.

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9 Explain the Tests for Indexnos (or) write briefly about TRT & FRT.

Test for Indexnos

1) Time Reversal Test (TRT)

According to Fisher an Indexno should maintain the consistency by working both forward & backward w.r to time. This is called Time reversal test. The formula for calculating an index no/. Should be ∋ it will give the ratio b/w one pt of comparison & the other no matter which of 2 is taken as the base, or putting in another way, the index no reckoned forward should be reciprocal of that reckoned backward.

It can be expressed in the form as

$P_{01} \times P_{10} = 1$ (omitting the factor 100 from each index no)

$$P_{01} \times P_{10} = \sqrt{\frac{\Sigma p_1 q_0}{\Sigma p_0 q_0} \times \frac{\Sigma p_1 q_1}{\Sigma p_0 q_1} \times \frac{\Sigma p_0 q_1}{\Sigma p_1 q_1} \times \frac{\Sigma p_0 q_0}{\Sigma p_1 q_0}}$$

$$= \sqrt{1} = 1.$$

It shows that the reversal test is satisfied.

Factor Reversal Test (FRT)

The test is that the formula for index no ought to permit interchanging the prices & qts without giving inconsistent results (ie) the 2 results multiplied together should give the true value ratio. It is expressed in the formula

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

Explain Cost of Living IN (or) Consumer Price IN.

Cost of Living Index nos (Consumer Price Index)

Cost of Living Index no also known as Consumer Price Index no measures the effect

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of changes in prices of consumer goods during any yr w.r to some fixed yr
Generally, the list of goods consumed varies for different classes of people at the same place. Also people of the same class have diff habits at diff regions. Hence the cost of living Index no (relates to a specified class of people in a specified region)

How CLI nos can be constructed? Explain the method of constructing CLI

The CLI nos are constructed by the fig 2

Methods

1) Agg Expenditure method (or) Agg method
2) Family Budget Method (or) wtd Relatives

1) Consumer price Index no (agg method) $= \frac{\Sigma p_1 q_0}{\Sigma p_0 q_0} \times 100.$

$= \frac{\text{Total expenditure in Current yr}}{\text{Total expenditure in last yr}} \times 100$

2) Family Budget Method.

$$CLI\ No = \Sigma\left(\frac{p_1}{p_0} \times 100\right) \times V$$

$$= \frac{\Sigma PV}{\Sigma V}.$$

CLI by AM

$$P_{01} = \frac{\Sigma IV}{\Sigma V}$$

GM

$$P_{01} = AL\left[\frac{\Sigma \log IV}{\Sigma V}\right]$$

Test for Index No: Prove that (16)

7. 2- prove that Fisher's Ideal Index no satisfies both time reversal & factor reversal test

9/04

Com	2001 Price p_0	Value q_0	2002 P (p_1)	Val (q_1)
A	15	60	16	82
B	16	75	20	90
C	23	80	24	98
D	9	40	12	50
E	14	58	18	74.

Sol:

p_1q_0	p_0q_0	p_1q_1	p_0q_1
960	900	1312	1230
1500	1200	1800	1440
1920	1840	2352	2254
480	360	600	450
1044	812	1332	1036
5904	5112	7396	6410

TRT is satisfied when $P_{01} \times P_{10} = 1$.

$$P_{01} \times P_{10} = \sqrt{\frac{\Sigma p_1q_0}{\Sigma p_0q_0} \times \frac{\Sigma p_1q_1}{\Sigma p_0q_1}} \sqrt{\frac{\Sigma p_0q_1}{\Sigma p_1q_1} \times \frac{\Sigma p_0q_0}{\Sigma p_1q_0}}$$

$$= \sqrt{\frac{5904 \times 7396 \times 6410 \times 5112}{5112 \times 6410 \times 7396 \times 5904}}$$

$$= \sqrt{1} = 1.$$

FRT is satisfied when $P_{01} \times Q_{01} = \frac{\Sigma p_1q_1}{\Sigma p_0q_0}$

$$P_{01} \times Q_{01} = \sqrt{\frac{\Sigma p_1q_0}{\Sigma p_0q_0} \times \frac{\Sigma p_1q_1}{\Sigma p_0q_1}} \sqrt{\frac{\Sigma p_0q_1}{\Sigma q_0p_0} \times \frac{\Sigma q_1p_1}{\Sigma q_0p_1}}$$

hence I data satisfies both TRT & FRT.

$$= \sqrt{\frac{5904}{5112} \times \frac{7396}{6410} \times \frac{6410}{5112} \times \frac{7396}{5904}} = \sqrt{\frac{7396 \times 7396}{5112 \times 5112}}$$

Cost of living Index no. 17

Calculate Index no. using both Agg Expenditure method & family Budget method for year 2004 with 2001 as base yr from the following data.

Com	Qty in units 2001	Price per Unit 2001 (Rs)	Price Per Unit 2004 (Rs)
A	100	8	12
B	25	6	7.50
C	10	5	5.25
D	20	48	52
E	25	15	16.50
F	30	9	27

Sol

Agg Exp

q_0	p_0	p_1	p_0q_0	p_1q_0
100	8	12	800	1200
25	6	7.50	150	187.50
			50	52.50
			960	1040
			375	412.50
			270	810
			2605	3702.50

$$\text{Cost of LIN} : \frac{\sum p_1q_0}{\sum p_0q_0} \times 100$$

$$= \frac{3702.5}{2605} \times 100 = 142.13$$

b)

q_0	2001 p_0	2004 p_1	$P = \frac{p_1}{p_0} \times 100$	$V = p_0q_0$	PV
	8	12	150	800	120000
	6	7.50	125	150	18750
	5	5.25	105	50	5250
	48	52	108.33	960	103996.80
	15	16.50	110	375	41250
	9	27.00	300	270	81000
				$\sum V = 2605$	3,70,246.8

Family Budget

$$CLI = \frac{\sum PV}{\sum V} = \frac{3,70,246.8}{2605}$$

$$= 142.13$$

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2. In the construction of a certain CLI the foll group indexnos were found. cal the cost of LIN using i) weighted AM ii) wtd GM

Group	Indexno	No
Food	352	48
Fuel & lighting	200	10
		8
clothing	230	12
House Rent	160	15
Miscellaneous	190	

sol:

I	W	IW	$\log I$	$W\log I$
352	48	16,896	2.5465	122.232
200	10	2000	2.3010	23.010
230	8	1840	2.3617	18.894
160	12	1920	2.2041	26.499
190	15	2850	2.2788	34.182
	93	25,506		224.77

i) $CLI\ (\text{using wtd AM}) = \frac{\Sigma IW}{\Sigma W} = \frac{25506}{93}$

$= 274.26$

ii) $CLI\ (GM) = AL\left(\frac{\Sigma W\log I}{\Sigma W}\right)$

$= AL\left(\frac{224.77}{93}\right) = AL(2.419) = 261.1.$

Test for Indexno.

1 table shows 1 prices of baseyr & currentyr of 3 commodities with their qts. Verify whether Fisher's ideal Index satisfies 1 time reversal test & factor reversal test

Com	Baseyr Price	Baseyr Qty	Currentyr	
A	6	50	10	60
B	2	100	2	120
C	4	50	6	60

Fisher's Ideal

$P_{01} = \sqrt{\frac{1000}{700} \times \frac{1200}{840}}$

$= 142.86$

sol:

p_0q_0 300 200 200 = 700

p_0q_1 360 240 240 = 840

p_1q_0 500 200 300 = 1000

p_1q_1 600 240 360 = 1200

TRT

$P_{01} \times P_{10}$

$= 1$

FRT:

$= \sqrt{\left(\frac{1200}{700}\right)^2}$

$= \frac{1200}{700} = \frac{\Sigma p_1q_1}{\Sigma p_0q_0}$

Thus fisher's index satisfies TRT & FRT.