Base shifting, Splicing, Deflating on Index Number

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Abstract: In this paper we are learn with some definitions base shifting index numbers and we are proving some related index problems .

Keywords: Index base number , average number, Clothing prices

Introduction:

An index number is a statistical value that measures the change in a variable with respect to time. Index numbers are meant to study changes in the effects of factors which cannot be measured directly .Two variables that are often considered in this analysis are price and quantity. With the aid of index numbers, the average price of several articles in one year may be compound with the average price of the same quantity of the same articles in a number of different years. These are several sources of 'official' statistics that contain index numbers for quantities such as food prices. Clothing prices housing, wages and so on

BASIC DEFINITIONS:

Definition: 1.1

Factor Reversal test is a which holds that the product of price index and the Quantity index should be equal to the corresponding value index.

Symbolically if P_{01} is the price index of the current year and Q_a is the Quantity index of the current year.

$$P01\ Q01 = \frac{\sum P_1 q_1}{\sum p0q0}$$

Definition : 1.2

Circular test is just an extension of the time reversal test. According of this test the index should work in a circular fashion. Another index number is computed for 2 on the base period and soon. The three products should be equal to 1. Symbolically if there are indices P_{01}, P_{12}. P_{23} the circular test will be satisfied if

P01 x P12 x P23 = 1

Definition : 1.3

It is a good for onto evaluate its validity and constancy in the long run. All weighted indices are subject to test and evaluation the following tests are generally initiated by people to know the validity of indicies.

Definition : 1.4

A weighted index is an index where weighted are assigned to the various items constituting the index.

Definition : 1.5

An unweighted index is an index where equal weights are implicitly assigned.

Definition : 1.6

Simple aggregative method is expressing aggresate of price in any year as a percentage of their aggregate in the base year.

Symbolically

$$P_{01} = \frac{\sum P_0}{\sum P_1} x\ 100$$

Where

$\sum P_1 =$ Total of current year prices for various commodities.

$\sum P_0 =$ Total of base year prices for various commodities.

Definition : 1.7

For each commodity or item the price relative $^{P1}/_{P0}$ is found and the average of these relations is obtained using any one of the average. These prices indicies based on arithmetic mean (AM) and Geometric mean (GM) are given by

$$P_1(A.M) = \frac{\sum \left(\frac{P_1}{P_0} x100\right)}{n}$$

$$P_0(G.M) = antilog\left[\frac{\sum log\left(\frac{P_1}{P_0} x100\right)}{n}\right]$$

Definition : 1.8

Index number (based on new base year) = $\frac{Current\ year's\ old\ index\ number}{New\ base\ year' sold\ index\ number}\ x\ 100$

Definition : 1.9

Index No. of Current year x old index No. of Spliced

Index No $= \frac{New\ base\ Year}{100}$

Definition : 1.10

Real wage = $\frac{Money\ wage}{Price\ index}$ x 100

Problem : 2.1

Reconstruct the following index number numbers by shifting base to (i) 2000 and (ii) 2002.

Solution :

Year	Index Numbers	2000	2002
1995	120		
1996	150	$\frac{120}{200} x\ 100 = 60$	$\frac{120}{240} x\ 100 = 50$
1997	160	$\frac{150}{200} x\ 100 = 75$	$\frac{150}{240} x\ 100 = 62.5$
1998	180	$\frac{160}{200} x\ 100 = 80$	$\frac{160}{240} x\ 100 = 66.66$
1999	200	$\frac{180}{200} x\ 100 = 90$	$\frac{180}{240} x\ 100 = 75$
2000	200	$\frac{200}{200} x\ 100 = 100$	$\frac{200}{240} x\ 100 = 83.33$
2001	210	$\frac{200}{200} x\ 100 = 100$	$\frac{200}{240} x\ 100 = 83.33$
2002	240	$\frac{210}{200} x\ 100 = 105$	$\frac{210}{240} x\ 100 = 87.5$
		$\frac{240}{200} x\ 100 = 120$	$\frac{240}{240} x\ 100 = 100$

Problem : 2.2

Taking 1997 base the index numbers of wholesale prices of a commodity are given below.

Year 1997 1998 1999 2000 2001 2002 2003

Index nos 100 120 190 200 206 230 300

Construct a new series taking 2000 as base.

Solution :

Construction of index number by base shifting

Year	**Index Number Base (1997 = 100)**	**Index Number Base (2000 = 200)**
1997	100	$\frac{100}{200} x\ 100 = 50$
1998	120	$\frac{120}{200} x\ 100 = 60$
1999	190	$\frac{190}{200} x\ 100 = 95$
2000	200	$\frac{200}{200} x\ 100 = 100$
2001	206	$\frac{206}{200} x\ 100 = 103$
2002	230	$\frac{230}{200} x\ 100 = 110$
2002	300	$\frac{300}{200} x\ 100 = 150$

Problem : 2.3

Two sets of indices one with 1986 as base and the other with 1994 as base are given below.

a)Year	**Index Numbers**	**b)Year**	**Index Numbers**

1986	100		
1987	110		
1988	120	1994	100
1989	190	1995	105
1990	300	1996	90
1991	330	1997	95
1992	360	1998	102
1993	390	1999	110
1994	400	2000	96

The index a) with 1986 base was discontinued in 1994 you are required to splice the second index number.

b)With 1994 base to the first index number.

Solution :

Splicing of Index Numbers

Year	**Index Numbers (a) With 1986 as base**	**Index Numbers (b) With 1986 as base**	**Index Numbers b) Spliced to a) with 1986 as base**
1986	100		

1987	110		
1988	120		
1989	190		
1990	300		
1991	330		
1992	360		$100 \times \frac{400}{100}$
1993	390		$105 \times \frac{400}{100}$
1994	400	100	$90 \times \frac{400}{100}$
1995		105	$95 \times \frac{400}{100}$
1996		90	$102 \times \frac{400}{100}$
1997		95	$110 \times \frac{400}{100}$
1998		102	$96 \times \frac{400}{100}$
1999		110	$= 400$
2000		96	$= 420$
			$= 360$
			$= 380$
			$= 408$
			$= 440$
			$= 384$

Problem : 2.4

Given the following data :

year	Weekly take – home pay (wages)	Consumer Price Index
1997	109.5	112.8
1998	112.2	118.2
1999	116.4	127.4
2000	125.08	138.2
2001	135.4	143.5
2002	138.1	149.3

1) What was the real average weekly wage for each year.
2) In which year did the employee have the greatest buying power?
3) What percentage increase in the weekly wages for the year 2002 is required if any to provide the same buying power that the employees enjoyed in the year in which they had the highest real wages?

Solution :

Calculation of Real wages

Year	Weekly take home pay (Rs)	Consumer Price Index	Real wages
1997	109.5	112.8	$\frac{109.5}{112.8} x\ 100 = 97.07$
1998	112.2	118.2	

1999	116.4	127.4	$\frac{112.2}{118.2} x\ 100 = 92.92$
2000	125.08	138.2	$\frac{116.4}{127.4} x\ 100 = 91.37$
2001	135.4	143.5	$\frac{125.08}{138.2} x\ 100 = 90.51$
2002	138.1	149.8	$\frac{135.4}{143.5} x\ 100 = 94.36$
			$\frac{138.1}{149.8} x\ 100 = 92.19$

1) Real average weekly wage can be obtained by the formula

Real wage = $\frac{Money\ wage}{Price\ index}$ x 100

2) The employee had the greatest buying power in 1997 as the real wage was maximum in 1997.
3) Absolute difference = 97.07 – 92.19 = + 4.88.

Problem : 2.5

The following data relate to the income of the people and the General index number of prices of a certain region.

Calculate : 1) Real income and

2) Index numbers of real income with 1996.

Year	**Income (Rs)**	**General Price Index Nos.**

1996 1997 1998	800 819 825	100 105 110
1999 2000 2001 2002	876 920 938 924	120 125 140 140

Solution :

Computation of real income index numbers.

Year	**Income (Rs)**	**Price Index Number**	**Real Income**	**Real Income Index Number**
1996	800	100		100
1997	819	105	$\frac{800}{100} x\ 100 = 800$	$\frac{780}{800} x\ 100 = 97.5$
1998	825	110	$\frac{819}{105} x\ 100 = 780$	$\frac{750}{800} x\ 100 = 93.75$
1999	876	120	$\frac{825}{110} x\ 100 = 750$	$\frac{730}{800} x\ 100 = 91.25$
2000	920	125	$\frac{876}{120} x\ 100 = 730$	$\frac{736}{800} x\ 100 = 92$
2001	938	140	$\frac{920}{120} x\ 100 = 736$	$\frac{670}{800} x\ 100 = 83.75$
2002	924	140	$\frac{938}{120} x\ 100 = 670$	$\frac{660}{800} x\ 100 = 82.5$
			$\frac{924}{120} x\ 100 = 660$	

Problem : 2.6

Given below are two sets of indicies, one with 1970 as base and the other with 1973 as base.

Year	1970	1971	1972	1973	1974	1975	1976
Index (old)	100	130	170	200	-	-	-
Index (new)	-	-	-	-	100	120	115	125

Splice the new series (1973 as bases to old series (1970 base) so as to have a continuous series from 1970 upto data. You are also to prepare a combined series with 1973 as base.

Solution :

New series spliced into old series

Year	**Series old Index No**	**Series B Now Index No.**	**Spliced Index No. New spliced to old**	**Combined series with 1970 as base**

1970	100			100
1971	130			130
1972	170			170
1973	200	100	$\frac{100\ x\ 200}{100} = 200$	200
1974	-	120	$\frac{120\ x\ 200}{100} = 240$	240
1975	-	115	$\frac{115\ x\ 200}{100} = 230$	230
1976	-	125	$\frac{125\ x\ 200}{100} = 250$	250

Old series spliced into New Series.

Year	**Series old Index No**	**Series B Now Index No.**	**Spliced Index No. New spliced to old**	**Combined series with 1970 as base**

1970	100		$\frac{100\ x\ 100}{200} = 50$	50
1971	130		$\frac{130\ x\ 100}{200} = 65$	65
1972	170		$\frac{170\ x\ 100}{200} = 85$	85
1973	200	100	$\frac{200\ x\ 100}{200} = 100$	100
1974	-	120		120
1975	-	115		115
1976	-	125		125

Applications

The main uses of index numbers are given below,

(i) Index numbers are used in the fields of commerce, metrology, labour industry etc.

(ii) Index numbers measure fluctuation during intervals of time, group differences of geographical position of degree etc.

(iii) They are used to compare to total variations in the prices of different commodities in which the unit of measurements differs with time and price.

(iv) They measure the purchasing power of money.

(v) They are helpful in fore casting future economic trends.

(vi) They are used in studying the difference between the comparable catagories of animals, people or items.

(vii) Index numbers of industrial production are used to measure the change in the level of industrial production in the country.

(viii) Index numbers of import prices and export prices are used to measure the changes in the trade of a country.

Conclusion:

Throughout this paper conclude that some basis definitions, tests of adequacy were discussed and also sum, base shifting splicing, deflating on index numbers are explained.

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