CONTEMPORARY RESEARCH IN INDIA
ISSN 2231 - 2137

# SEASONAL AND CYCLICAL VARIATION IN PRICES OF SUGAR IN INDIA

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**Received: 25/08/2018** | **Edited: 03/09/2018** | **Accepted: 08/09/2018**

***Abstract:*** *Annual average price of sugar in India during the 25 year period from 1990-91 to 2015-16 was analyzed with the objectives of delineating the trend, identifying the different phases and direction of price movement and the contributing factors. Hence, the present study explores the seasonal and cyclical trend in domestic prices of sugar in India.The month wise seasonal index in domestic price of sugar was calculated by moving average method. It was lowest in the month of February and highest in the month of August in domestic market respectively. Thus, the farmer could notreceive the better price by postponing the sale of produce during the month of November to March to later month of the year.The analysis of cyclical indices in domestic price shows that there is an uneven cycle in domestic market of natural sugar.The sugar price in India did not show any significant pattern of consistent movement towards a particular direction in the long run.*

***Key words****: Sugar, Seasonal trend and cyclical trend.*

## Introduction

Sugar is derived mainly from sugarcane and sugar beet. Around 80 per cent of sugar is derived from sugarcane and largely grown in tropical countries. India is the second largest producer of sugar in the world having a share of over 16 per cent of world's sugar production after Brazil's 22 per cent. In India, two grades of sugar namely S-30 and M-30 are produced where grade S-30 is dominating the share in total production. Production of sugar, inter alia, depends on recovery rate of mills. Recovery rate of sugar mill mainly depends on sucrose content in the sugarcane, condition of plant and machinery, cane supply arrangement in the state and agro-climatic condition in the region. Indian sugar production is characterized by cyclic production pattern with typical sugar cycle lasting 2-3 years, as production adjusts to fall in price which in turn leads to lower supplies, prices increase and higher production. Hence, the present study explores the seasonal and cyclical trend in domestic prices of natural sugar in India (from 1990-91 to 2014-15).

## Objectives

1. To work out the seasonal and trend of domestic prices of sugar.
2. To work out the cyclical trend of domestic prices of sugar.

## Methodology

To study the seasonal and cyclical variation in price of sugar in India data pertaining to the period 1990-91 to 2014-15 were used. The data were collected from various secondary publications, official records and web sources such as Hand book of Statistics on the Indian Economy, indisat.com, Co-operative sugar.

## Estimation of Seasonal Indices of Monthly Data

Most widely used method of measuring seasonal fluctuations i.e. method of moving average was used to calculate seasonal indices. To measure the seasonal variations, prices were calculated employing twelve months ratio to moving average method. The seasonal indices were calculated by adopting the following steps:

1. Generate a series of 12 months moving totals.
2. Generate a series of 12 months moving averages: A series of 12 months moving averages is generated by dividing 12 months moving totals by 12.
3. Generate a series of centered 12 months moving averages. This step involves taking averages of

pairs of two subsequent 12 months moving averages and entering between each pair. There are no corresponding moving averages for the first six and last six months.

4. Express each original value as a percentage of corresponding centered moving average. The percentage of moving average represents indices of seasonal and irregular components combined.
5. The next step involves removing the irregular component.
6. Arrange the percentages of moving averages in the form of monthly arrays.
7. Next, the average index for each month is calculated.
8. These averages are to be adjusted in such a way that their sum becomes 1200. This can be done by working out of correction factor and multiplying the average for each month by this correction factor. The correction factor (K) is worked out as follows:

$$K = \frac{1200}{S}$$

Where, K is correction factor and S is sum of averages indices for 12 months, multiply K with the percentage of moving average for each month to obtain the seasonal indices.

**Estimation of Cyclical Indices**

The residual method of estimating cyclical movement in time series was used for estimating cyclical indices, after eliminating the seasonal variation and trend components. This is accomplished by dividing (Yt) by corresponding (S) for time 't' symbolically. These deseasonalized data contain cyclical and irregular components and are plotted against time for examining cyclical behavior. If there is any existence of cycle, periodicity of cycle is noted.

Analysis of long-term movements (trend) for estimating the long run trend of domestic prices of sugar, the method of least squares estimate was employed. This method of ascertaining the trend in a series of annual prices involves estimating the co-efficient of intercept (a) and slope (b) in the linear functional form. The equation adopted for this purpose was specified as follows.

$$Yt = a + bX + e$$

Where,

Yt = Trend values at time tX = Period

a = intercept parameterb = slope parameter

e = Error

Annual trends of domestic for the markets were computed and compared. The goodness of fit of trend line to the data was tested by computing the coefficient of multiple determinations which is denoted by $R^2$.

**Results and discussion**

**Seasonal indices for domestic prices of sugar**

The pattern of variation in price within a year is revealed by seasonal indices, computed for each month from 1990-91 to 2015-16. In order to examine the extent of the seasonal variations in prices, the indices of seasonal variations for domestic prices were worked out. To identify the long run seasonal variations, time series data relating to monthly price of sugar were subjected to the percentage centered 12 months moving average method and it is presented in the Table 1.

**Table 1: Seasonal indices in natural sugar for domestic market prices (Rs / qt)**

| Months | Seasonal indices of Domestic price of sugar |
|---|---|
| January | 101.73 |
| February | 98.12 |
| March | 98.15 |
| April | 99.86 |
| May | 100.03 |
| June | 99.84 |
| July | 98.60 |
| August | 103.24 |

| | |
|---|---|
| September | 102.49 |
| October | 98.71 |
| November | 99.58 |
| December | 99.66 |

The Table 1 reveals that, the highest seasonal index was found in the month of August, followed by September as the seasonal indices stood at 103.24 and 102.49 respectively of every year in sugar due to the harvesting period of sugarcane in the month of December to March. The lowest seasonal index of domestic price of sugar was noticed in the month of February with 98.12 which is closely followed by March with 98.15. The seasonal domestic price indices were above hundred was May, August, September and January ranges from 100.03 to 103.24 while below hundred was found in the month of February, March, April, June, July, October, November and December ranges from 98.12 to 99.86 where the market arrivals are more in India.

**Cyclical trend in domestic prices of sugar**

The Table 2 reveals the cyclical trend in domestic prices of sugar.

**Table 2: Cyclical trend in domestic prices of sugar**

| Sr.No | Year | Cyclical indices of Domestic prices of sugar |
|---|---|---|
| 1 | 1990-1991 | 126.65 |
| 2 | 1991-1992 | 113.94 |
| 3 | 1992-1993 | 116.68 |
| 4 | 1993-1994 | 126.60 |
| 5 | 1994-1995 | 114.45 |
| 6 | 1995-1996 | 112.36 |
| 7 | 1996-1997 | 107.27 |
| 8 | 1997-1998 | 108.49 |
| 9 | 1998-1999 | 97.28 |
| 10 | 1999-2000 | 93.69 |
| 11 | 2000-2001 | 87.15 |
| 12 | 2001-2002 | 79.91 |
| 13 | 2002-2003 | 68.62 |
| 14 | 2003-2004 | 76.06 |
| 15 | 2004-2005 | 85.76 |
| 16 | 2005-2006 | 87.94 |
| 17 | 2006-2007 | 66.91 |
| 18 | 2007-2008 | 64.55 |
| 19 | 2008-2009 | 93.82 |
| 20 | 2009-2010 | 122.54 |
| 21 | 2010-2011 | 109.89 |
| 22 | 2011-2012 | 116.17 |
| 23 | 2012-2013 | 119.51 |
| 24 | 2013-2014 | 110.66 |
| 25 | 2014-2015 | 93.89 |

Cyclical trend in domestic prices were analyzed to know the variation in prices over the years. In case of domestic prices, it can be observed that there was an uneven 2 and 3 years of cycles, were observed. Large fluctuation in the price will be lead to switching over in area of cultivation from one crop to another commercial crop. It is suggested that perfect cycle with regards to variation in prices could be observed if the time series data is for larger period i.e. for period of 35 to 40 years. Non availability of data for such a long period has posed another

demerits in getting the proper cyclical pattern with respect to prices.

**Conclusion**

Seasonal pattern of sugar shows that price reach at lowest in the month of February. After that they rose continuously and reach at the peak in August in domestic market. While below hundred was found in the month of October, November, December, February and March where the market arrivals are more in India. The analysis of cyclical indices in domestic price shows that there is an uneven cycle in domestic market of sugar.

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