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BSc 6<sup>th</sup> SEMESTER EXAMINATION

STATISTICS PROJECT



# STATISTICS PROJECT ON SCENARIO OF INFLATION IN INDIA

# Statistics Project on Scenario of Inflation in India

Inflation is like toothpaste, once it out,  
you can hardly get it back in again

– KARL OTTO POHL

## Introduction

The **CHAKRAVYUHA** legend from the **MAHABHARAT** describes the ability to enter but not exit, with seriously adverse consequences. It is a metaphor in the workings of the Indian Economy in the 21<sup>st</sup> century. '**INFLATION**' may be one of the most familiar words in economics. Inflation has plunged countries into long periods of stability. Central bankers often aspire to be known as '**INFLATION HAWKS**'. Politicians have won election with promises to combat inflation, only to lose power after failing to do so. Inflation was even declared '**PUBLIC ENEMY NO. 1**' by US president **GERALD FORD** in **1974**. But What is **Inflation**?

## Definition of 'Inflation'

The rate at which the general level of prices for goods and services keep on rising, and leads to subsequent fall in purchasing power of the currency, is often referred to as inflation. So, when inflation rises, every Rupee spent by us would buy a smaller Quantity of goods and/or services. Central banks i.e. Reserve Bank in case of India, therefore attempts to stop severity of inflation.

**In India the Inflation is measured as the percentage change in the value of the Wholesale Price Index (WPI) of a basket of goods and services on a year-on year basis.**

According to Economic Times, **Inflation is the percentage change in the value of the Wholesale Price Index (WPI) on a year-on year basis.** It reflects the change in the prices of a basket of goods and services in a year. In India, inflation is calculated by taking the WPI as base. But, to the contrary, in the majority of other countries, it is measured as retail or consumer price index.

**Formula for calculating Inflation in India is:**

$$\frac{(WPI \text{ in the period of current year}) - (WPI \text{ in same period of previous year})}{(WPI \text{ in same period of previous year})} \times 100$$

## **Implications of Inflation**

Inflation affects lives of the consumers or the public much adversely. High prices of day-to-day goods make it difficult for ordinary consumers to afford even the basic necessities of life. This leads to poor standard of living and compell them to ask for higher incomes. Inflation also makes, the exports noncompetitive. Therefore, in a state of price rise, the exports of the country decline. This creates deficit in the foreign trade, leading to current account deficit and decline in the value of the currency i.e. of Rupee in case of India. On a decline in the exchange rate of the currency, the imports become more costly and this leads to further price rise and so on. If it goes on continuously, the economy may face severe crisis. Hence, the government and the central bank i.e. RBI always tries to keep inflation under control. The central bank also does the same.

However a very moderate level of inflation may be called good for an economy, as it encourages people to invest more, facilitates rise in money supply, for investment and demand creation by enhancing income level. Therefore, some rise in money supply leading to enhanced demand, followed by increased demand and production to off-set the increase in money supply by the higher level or supply of goods and services leads to sustained economic growth.

## **Measurement of inflation, or Price Index in India**

Changes in the level of prices over a period of time are measured by means of **index numbers**. This index of prices includes a wide variety of goods and services which are essential for life. In India, till recently there had been five indices for measuring inflation or changes in the price level. Four of these are the Consumer Price Indices (CPIs), which are specific to a group, or class of consumers and the fifth one is the Wholesale Price Index (WPI), which has an economy wide coverage. These indices cover a vast variety of products and services, being consumed. Further, to overcome the weaknesses of these 5 indices, **three new indices have been launched since 2012**. Thus, in India we used five major national indices for measuring inflation or price levels in the economy till 2012. These were

(A) The Wholesale Price Index (base 1993-94), the official headline inflation indicator of India.

(B) **The four different consumer price indices**, used to assess the inflation for different sections of the labour force.

(C) The GDP deflator as an indicator of inflation for the economy as a whole and its different sectors, and available on a quarterly basis

The current series of WPI at a base of 2004-05 has 676 commodities. There are three consumer price indices (CPIs), officially released regularly at the national level to reflect the fluctuations in retail prices of goods and services pertaining to the specific segments of population in the country. These are:

- (i) Consumer Price Index for Industrial Workers (**CPI-IW**),
- (ii) CPI for Agricultural Labourers (CPI-AL) (iii)  
CPI for Rural labourers (CPI-RL).

The basket of **CPI for Industrial Workers (CPI-IW)** is based on 2001 as the base year and includes 120-360 items. The **CPI for Agriculture labourers (CPI-AL)** and **CPI for Rural Labourers (CPI-RL)** both have a base year of 1986-87 include 260 items. In addition, to this a new series of **CPI-(U+R)**, based on the year 2010 for both rural and urban areas combined has been introduced in the country **from January 2011** and includes 456 items.

### **Wholesale Price Index (WPI):**

India is among very few countries, which uses the Wholesale Price Index (WPI) to calculate or to decide the inflation rate in the economy. Most developed countries use the Consumer Price Index (CPI) to calculate inflation, also called as the Retail Price Index. The WPI is said to have been first published in 1902, and was one of the most referred economic indicator available to policy makers worldwide, until it was replaced in most developed countries by the Consumer Price Index in the 1970s. WPI is the index that is used to measure the change in the average price level of goods traded in wholesale market. In India, a total of 676 items', data on price level is tracked under the WPI which is an indicator of movement in prices of commodities in all trade transactions. **It is also the price index which is available on a weekly basis for reference at the shortest possible time lag i.e. only two weeks.** The Indian government uses WPI as an indicator of the rate of inflation in the economy.

In India WPI is extensively used for short term policy interventions because it is the only index that is available on a weekly basis with a two weeks' lag only. In principle, inflation requires to be managed with respect to changes in prices of final goods or consumer prices. So, now it is also under consideration to substitute WPI by CPI in India as well.

This index (WPI) is the most widely and officially used as the inflation indicator for most of the policy

decisions in India and is regularly published by the **Office of Economic Adviser, Ministry of Commerce and Industry**. All important monetary and fiscal policy decisions of the government are based on WPI movements. In India it is in use since 1939 and is being published since 1947. With the changing scenario and changes in consumption pattern, the composition and the base year of WPI has been revised several times. The current series of Wholesale Price Index has 2004-05 as the base year and 676 items for calculating index. Latest revision of WPI has been done by shifting base year from 2004-05 to 2011-12 on the recommendations of the Working Group of Members of Planning Commission as Chairman for revision of WPI series and has been launched on May, 2017 in the country. A brief on the historical development of this WPI is given in table 1.

**Table No. 1. Wholesale Price Index (WPI): Historical Evolution since 1939.**

Base Year for calculating index number	Year of Launching the Index	Number of Items Included in Index	No of Price Quotations used
Week ended on 19 August 1939	1942	23	23
End August 1939	1947	78	215
1952-53 (1948-49 as weight base)	1952	112	555
1961-62	4 July 1969	139	774
1970-71	January 1977	350	1295
1981-82	July 1989	447	2371
1993-94	April 2000	435	1918
2004-05	September 2010	676	5482
2011-12	May 2017	697	8331

According to the International Monetary Fund (IMF) statistics, only 24 Countries in the world use WPI as the official measure to track inflation, whereas 157 countries use CPI for the same purpose.

### **Consumer Price Index (CPI):**

As already aforesaid a number of consumer price indices like Consumer Price index for Industrial Workers (CPI-IW), for Agricultural Labourers (CPI-AL), and for Urban Non-Manual Employees (CPI-UNME) are being compiled only on a monthly basis. The Labour Bureau of Government of India compiles the CPI-IW. It compiles changes in the retail prices of fixed baskets of goods and services being consumed by the target group (namely the average working class family). Based on the Income and Expenditure survey being conducted by the National Sample Survey Organisation of the Central Govt. (NSSO) in 78 selected centers, this index is constructed on a monthly basis. It is constructed on the basis of average monthly family expenditures on items of consumption groups: food, Pan, Supari and Tobacco, fuel and light, housing, cloth, bedding and miscellaneous (including medical care, education, recreation, transport, communication etc.). This index is

used by the government for determining the dearness allowance to be paid to Central and State Government employees and to industrial workers besides fixation and revision of minimum wages.

Another more comprehensive measure for inflation is the implicit **price deflator of GDP**. This is an annual series, which is available with a lag of two years. More recently, the quarterly series of GDP is also available.

The CPI measures price changes of a basket of goods and services from the perspective of the retail buyers. So, It is the real index of prices for the common public. It reflects the actual inflation borne by the individuals. CPI is designed to measure changes over time in the level of retail prices of selected goods and services in the proportion, on which consumers of a defined group spend their incomes. Till January 2012, there were only following four CPIs compiled and released on national basis in India. In some countries like UK, Malaysia, Poland it is termed as Retail Price Index. The four CPIs used till 2011 are for the following 4 categories of workers.

- (1) Industrial Workers (IW) (base 2001),**
- (2) Agricultural Labourer (AL) (base 1986-87) and**
- (3) Rural Labourer (RL) (base 1986-87)**
- (4) Urban Non-Manual Employees (UNME) (base 1984-85),**

### **The New Series of CPI started Since 2012:**

The first three indices stated here above and compiled by the Labour Bureau in the Ministry of Labour and Employment, and the fourth one compiled by the Central Statistical Organisation (CSO) in the Ministry of Statistics and Programme Implementation reflect the effect of price fluctuations of various goods and services purchased and consumed by the specific segments of population in the country. These indices do not reflect the true picture of the price behaviour for the country as a whole.

Therefore, now **Central Statistics Office (CSO)** of the Ministry of Statistics and Programme Implementation has started compiling a new series of CPIs. These are

- (a) CPI for the entire urban population i.e. CPI (Urban);
- (b) CPI for the entire rural population i.e. CPI (Rural)
- (c) Consolidated CPI for Urban + Rural will also be compiled based on above two CPIs

These indices reflect the changes in the price levels of various goods and services consumed by the Urban and rural populations. The new series, having 2010 as the base year, also includes services, which are not there in the WPI series. However, this new series has become relevant only in 2013 when the data for 2012 are available for comparison.

**Producer Price Indexes (PPI) versus WPI:** Many countries use Producer Price Index instead of the WPI. The Producer Price Index (PPI) measures the average change over time in selling prices by producers of goods and services. Majority of the OECD countries measure inflation based on Producer Price Index (PPI) while some others OECD countries use WPI. The OECD Countries like Japan, Greece, Norway and Turkey use WPI. Broader coverage is provided by the PPI in terms of products and industries and the consistency of PPI with the national account. PPI may be considered to be more relevant and technically superior compared to one at wholesale level. But, in India we are still continuing with WPI.

### **Cost-of-living indices (COLI):**

This is different from CPI and better reflects of the incidence of prices. This index helps to measure the effects of price changes on the cost of achieving or maintaining a constant standard of living from the point of view of welfare of people as distinct from maintaining the purchasing power to buy a fixed consumption basket of good and services. Maintaining a constant standard of living does not imply continuing to consume the same fixed basket of goods and services. The COLI facilitates the households to maximize their welfare from a given expenditure by adjusting their expenditure patterns, to in response to changing relative prices by substituting relatively cheaper, for goods for those which have become relatively dearer. The use or preference for a particular goods may also change.

### **DEFLETION:**

Deflation is defined as a decrease in the general price level.

- It is a negative inflation rate.
- Deflation means the value of money will increase.
- Deflation is often associated with periods of negative or stagnant economic growth (Great Depression, Japanese economy in the 1990s, early 2000s). In fact, deflation is often used to express a declining economy.

Deflation is considered harmful to economy because

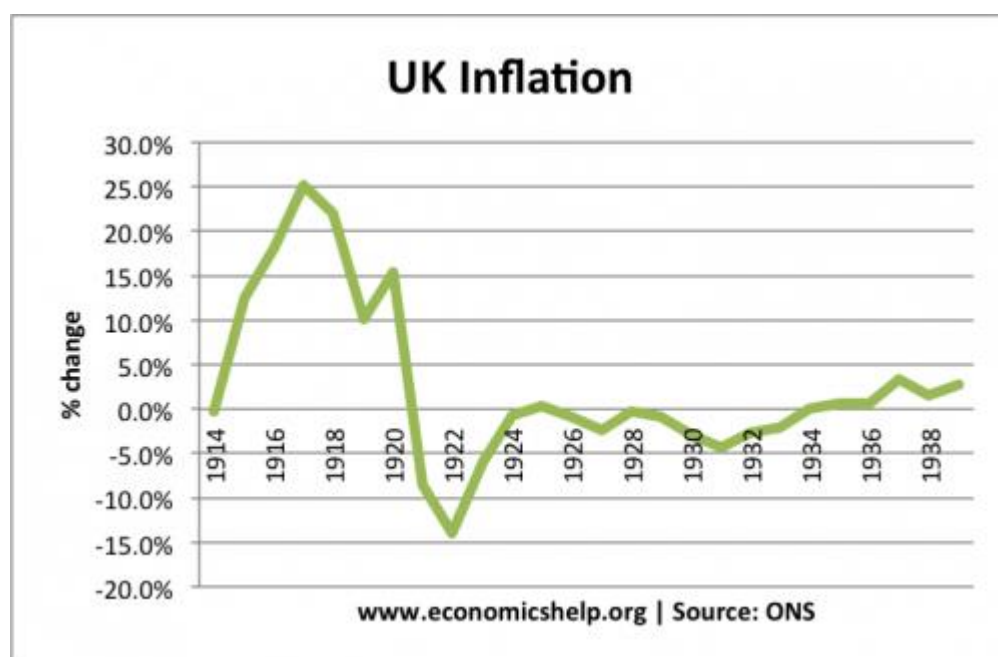
1. People delay spending; hoping prices will be lower next year; this causes further falls in aggregate demand and rate of economic growth.
2. Workers resist nominal wage cuts. Therefore, real wages rise causing real wage unemployment.
3. Real interest rates become too high. Even interest rates of 0% cannot induce people to spend creating a liquidity trap.
4. Deflation increases the burden of debt and reduces the disposable income of indebted people.
5. Deflation can become entrenched in the economy – causing sluggish rates of economic growth.

**However, if deflation is caused by rising productivity, improved technology and lower costs, the deflation may not be harmful but beneficial.**



## Examples of deflation

### UK 1920s/30s deflation



Between 1920 and 1936, the UK had a prolonged period of deflation, with the inflation rate rarely rising above zero.

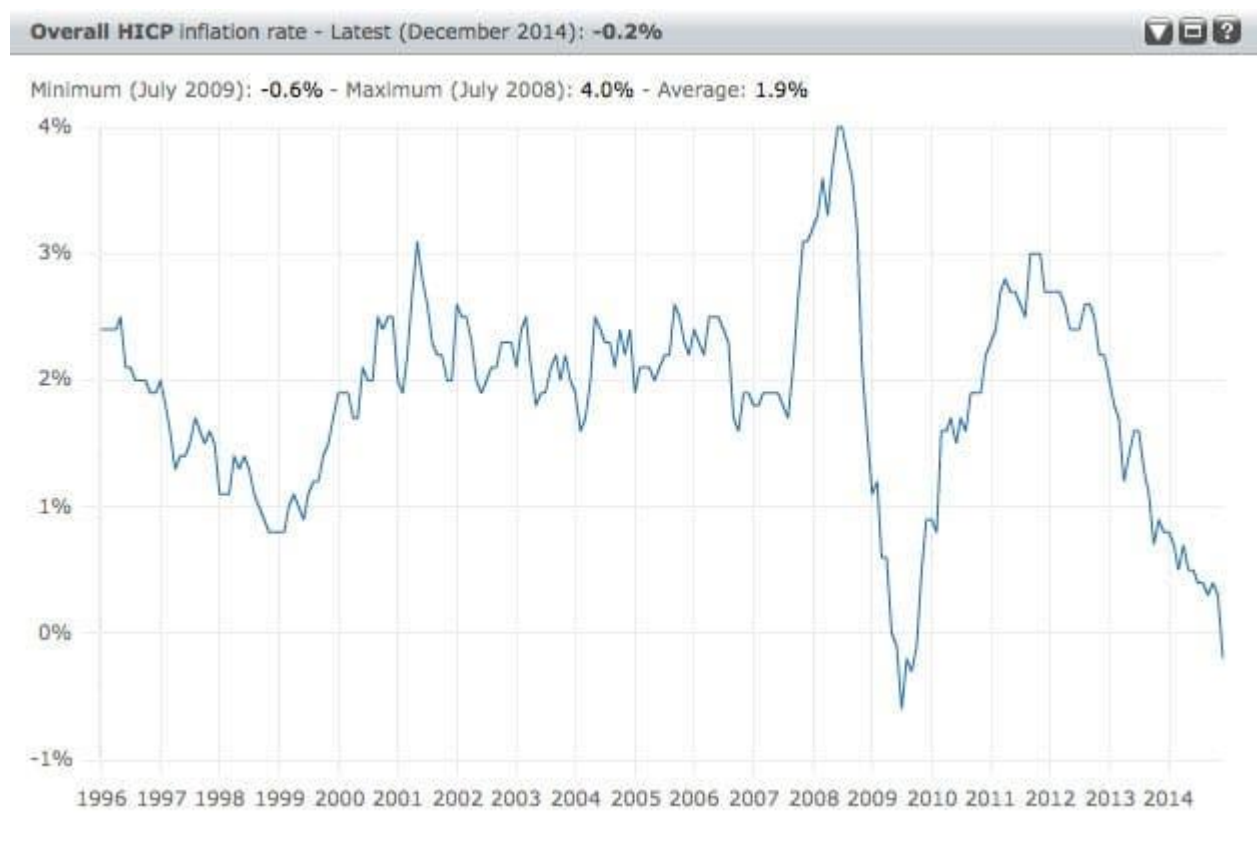
This deflation was caused by:

- High real interest rates depressing demand
- Overvalued exchange rate – In 1925 UK joined Gold Standard at pre-war level, but this caused deflationary pressures as UK exporters became uncompetitive

This caused problems of low growth high national debt to GDP and high unemployment.

See UK economy in the 1920s

## EU 2009/2015



Two periods of deflation in the EU – 2009 and 2015 – both caused by very weak demand.

**Table No. 2: Wholesale Price Index in India (Average).  
[2012-13 to 2018-19 (upto March 2019)]**

**(Per cent)**

Year	Quaters	Food Articles		Manufactured Product	
1	2	3		4	
(Base year: 2011-12=100)					
		Quarterly	Yearly	Quarterly	Yearly
2012-13	April - June	106.9	110.9	104.1	105.3
	July – Sep	110.9		105.4	
	Oct – Dec	110.5		105.6	
	Jan - Mar	111.8		105.8	
2013-14	April - June	115.7	124.5	106.6	108.5
	July – Sep	122.1		108.2	
	Oct – Dec	124.8		109.1	

	Jan - Mar	119.9		110.1	
2014-15	April - June	123.2	131.5	111.2	111.2
	July – Sep	129.8		112.1	
	Oct – Dec	126.6		111.3	
	Jan - Mar	123.5		110.2	
2015-16	April - June	124.9	134.9	110.3	109.2
	July – Sep	127.2		109.4	
	Oct – Dec	129.4		108.7	
	Jan - Mar	127.5		108.8	
2016-17	April - June	133.6	140.3	110.1	110.7
	July – Sep	136.3		110.5	
	Oct – Dec	135.5		111.2	
	Jan - Mar	133.5		112.2	
2017-18	April - June	134.3	143.2	112.6	113.8
	July – Sep	140.3		113.4	
	Oct – Dec	140.3		114.4	
	Jan - Mar	134.3		115.9	
2018-19	April - June	135.9	143.7	117.2	117.9
	July – Sep	138.9		118.4	
	Oct – Dec	139.1		118.4	
	Jan - Mar	138.4		118.2	
2019 - 20	April - June	142.7	147.5	118.3	118.3
	July – Sep	146.5		117.9	
	Oct – Dec	151.9		118.2	
	Jan - Mar	148.8		118.7	
Source: Office of Economic Advisor, Ministry of Commerce & Studies, Govt. of India					

## PURPOSE:

Our purpose is to estimate the WPI for future time pts.

## Forecasting

The main objective of time series analysis is to predict the behavior of the variable under study for some future point of time or at least to be able to see whether prediction within acceptable limits of error is possible.

In the Time Series we start with  $X_t = T_t + S_t + U_t$ , where

$T_t$  : Trend at the time point t

$S_t$  : Seasonal index at time point t

$U_t$  : Residual at time pt. t

We can get the estimate of the trend values for future time periods with some suitable trend equation & seasonal indices can also be obtained by employing some suitable methods & finally with the help of the correlogram we suggest some model for  $U_t$ . If the past behavior of the series is studied & from that we can assume that the generating system is more or less stable, an attempt may be made to project the series into the future series without a detailed study of the generating system. Thus given an autoregressive series (of order 2) & estimating the constants we may write

$$u_t = \hat{\alpha}_1 u_{t-1} + \hat{\alpha}_2 u_{t-2} + e_t$$

Estimating  $\alpha_1, \alpha_2$  we can estimate  $u_t$  by

- i) Substituting known  $U_{t-1}$  &  $U_{t-2}$  in the model &
- ii) By assuming that the best estimate we can make of the disturbance term e is to equate it to zero.
- iii) If we have from previous experience the estimate of the variance of error &  $\hat{\alpha}_1, \hat{\alpha}_2$  we may put confidence interval round the estimate of  $U_t$ .

Thus, empirical approach is based on the following assumptions:

- i) The system is such that an AR (Autoregressive) scheme (or some other chosen scheme) is a good approximation to the effect of the generating mechanism.
- ii) Such mechanism is not changing or at any stage, not changing rapidly enough to violate the supposition that we use in estimating the parameters.

## Inflation rise blamed on seasonal factors



May 20, 2014 3:46 pm by [Emily Cadman](#)

A rise in the UK's headline rate of inflation to 1.8 per cent – bucking the trend of the previous six months of consecutive falls - caused a brief rally in sterling on Tuesday as investors speculated it could bring forward the timetable for interest rate rises.

However, the currency quickly fell back as a more detailed examination of the figures suggested much of the increase was driven by seasonal factors.

Because Easter was in March last year and April this year, air fares were higher in the period covered by the most recent inflation data. In addition, petrol prices declined sharply in April last year, whereas this year saw virtually no change.

George Buckley, chief UK economist at Deutsche Bank, said the figures needed to be treated with caution, adding that he expected to see “some volatility” in the data over the coming months as the effects of the Easter distortion unwound.

But the rise in inflation from 1.6 per cent the previous month reinforced the impression that a substantial improvement in living standards was some way off. Last week's labour market data for March saw [average earnings edge ahead of inflation](#) for the first time since 2010 as unemployment dropped to a five-year low, but wage growth was slower than economists expected at 1.7 per cent.

If headline wage growth holds steady, “the squeeze in real wages will be back on”, said Martin Beck, senior economic adviser to the EY Item Club.

A bright spot in the data for consumers was falling food price inflation, aided by an [intensifying supermarket price war](#). Alan Clarke of Scotiabank said it was positive news inflation was down for essential goods like food and energy, but cautioned “household budgets continue to be squeezed”.

The Consumer Price Index measure does not attempt to capture the impact of rising house prices. CPIH, an new alternative measure which includes owner occupier's costs grew by 1.6 per cent up from 1.5 per cent.

Samuel Tombs, UK economist at Capital Economics, said the increase in inflation was likely to be a “blip” and should not be seen as a sign that the economic recovery was causing price pressures to build. Separate data from the Office for National Statistics showed the price of goods at the factory

gate remained essentially flat in April, reinforcing the perception that inflationary pressures were muted, Mr Tombs added.

But not everyone agreed. Michael Saunders at Citi said it was wrong to regard the pick-up as “just a quirk”. He argued that with rapid economic growth and companies using more capacity, core inflation was unlikely to slow in the coming months. “The recent downtrend in CPI inflation is now probably over,” he said.

Copied from The Financial Times Limited.

The same matter occur for INR in Indian Economy as well WPI. Here our data is in quarterly

terms start fiscal year in 1<sup>st</sup> April-31<sup>st</sup> March format.

**The forecasts generated by the method with the multiplicative seasonality display larger and increasing seasonal variation as the level of the forecasts increases compared to the forecasts generated by the method with additive seasonality. Thus here we use Holt-Winter’s Multiplicative model for better gain in forecasting.**

## WINTER’S MULTIPLICATIVE MODEL:

Sometimes in Time Series data Seasonal effect is multiplicative rather than additive.

Thus a suggested model is

$$X(N, h) = (\mu_N + \beta_N h) S_{N+h} + e_{N+h} \quad \text{where} \quad (\mu_N + \beta_N h) \quad \text{is trend component \& } S_{N+h}$$

is seasonal componenet.

This model is usually appropriate for the series where the amplitude of seasonal effect is proportional to the level of the series.

The variation due to seasonal activity is accounted for through seasonal factor such that

$$\text{i) } S_i = S_{i+s} = S_{i+2s} = \dots \quad \text{for all } i = 1(1)s \quad \text{and}$$

$$\text{ii) } \sum_{i=1}^s S_i = 0$$

$$\hat{X}(N, h) = (\hat{\mu}_N + \hat{\beta}_N h) \hat{S}_{N+h-s} \quad \text{for } h = 1(1)s$$

$$\hat{\mu}_N = \alpha_1 \left( \frac{X_N}{\hat{S}_{N-S}} \right) + (1 - \alpha_1)(\hat{\mu}_{N-1} + \hat{\beta}_{N-1})$$

With

$$\hat{\beta}_N = \alpha_2(\hat{\mu}_N - \hat{\mu}_{N-1}) + (1 - \alpha_2)\hat{\beta}_{N-1}$$

$$\hat{S}_N = \alpha_3 \left( \frac{X_N}{\hat{\mu}_N} \right) + (1 - \alpha_3)\hat{S}_{N-S}$$

$\alpha_1, \alpha_2, \alpha_3$  are so chosen that  $\alpha_i$  resides in the interval (0,1),  $i = 1(1)3$  and they are chosen so that to give more weights to recent observations and less weights to the observations in the distant past,  $\alpha_i$  's are called SMOOTHING CONSTANT & they are also chosen in away such that the sum of square of one step ahead forecast error is minimum. Generally the value of the smoothing constant is taken between 0.1 to 0.3.

It is important to note that a model without trend is easily found by setting  $\beta_N = 0$ .

## CALCULATION

### PROGRAMME FOR CALCULATION FOR HOLT-WINTER FITTING

```
RGui (64-bit) - [R Console]
File History Resize Windows

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Natural language support but running in an English locale

R is a collaborative project with many contributors.
Type 'contributors()' for more information and
'citation()' on how to cite R or R packages in publications.

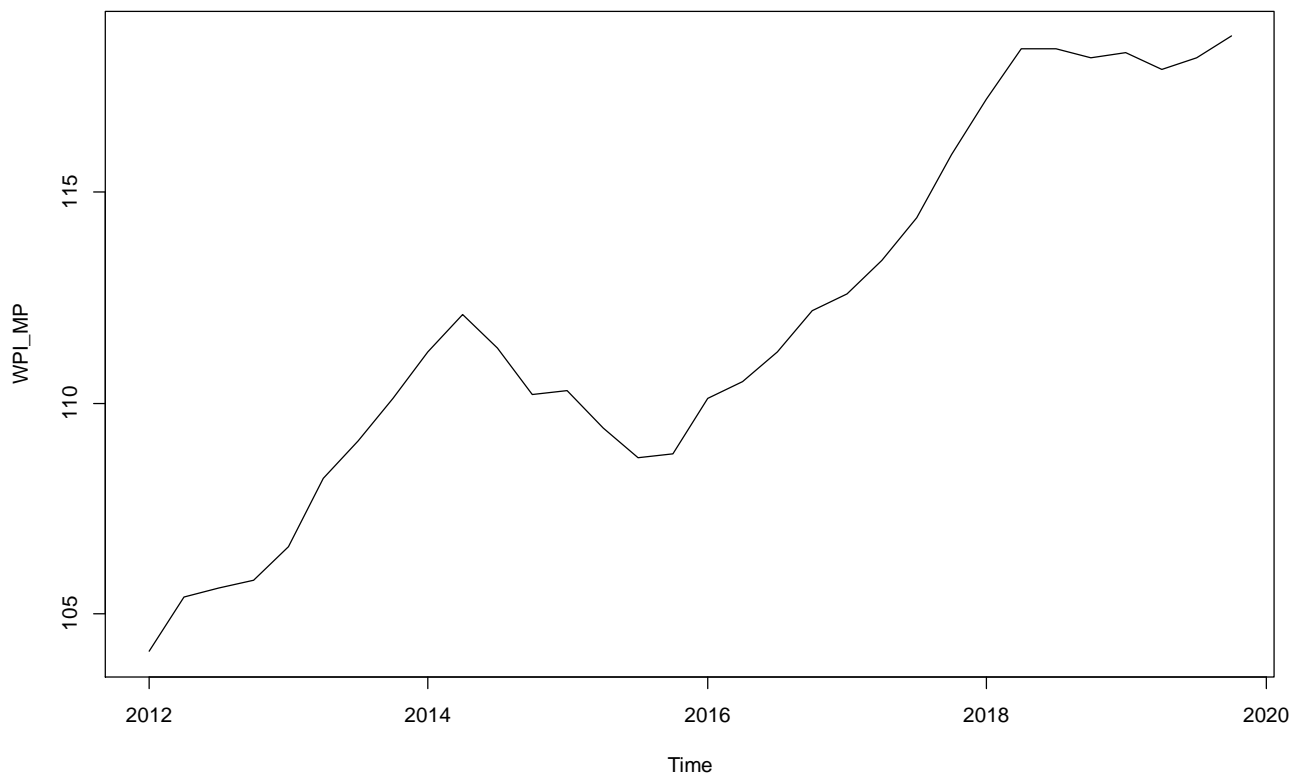
Type 'demo()' for some demos, 'help()' for on-line help, or
'help.start()' for an HTML browser interface to help.
Type 'q()' to quit R.

> setwd("c://ShiladityaBoseDoc")
> TS_data = read.table("manufactured_product_series.txt", header=F)
> TS_data = as.matrix(TS_data)
> TS_d = NULL
> for(i in 1:nrow(TS_data))
+ {
+ TS_d = c(TS_d,TS_data[i,])
+ }
> WPI_MP = ts(TS_d,frequency = 4,start = c(2012,1))
> WPI_MP

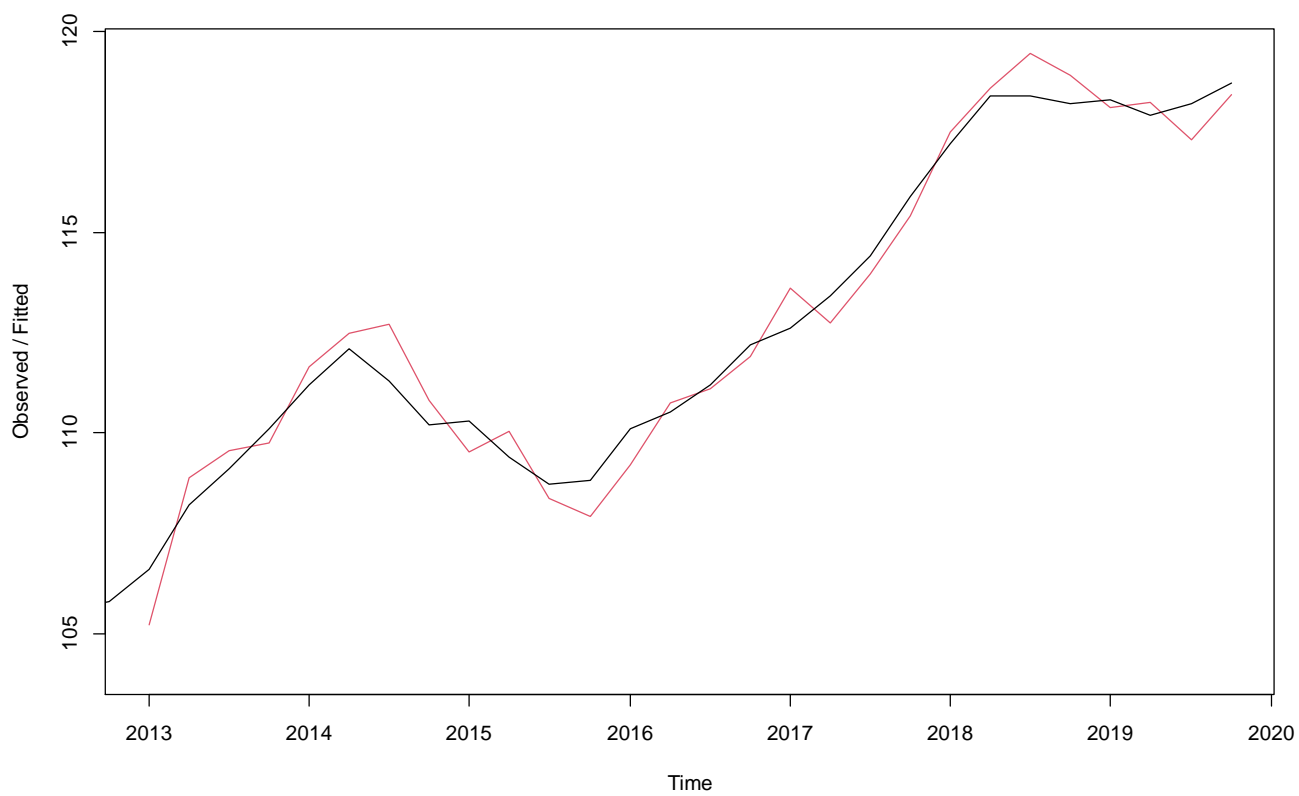
      Qtr1  Qtr2  Qtr3  Qtr4
2012 104.1 105.4 105.6 105.8
2013 106.6 108.2 109.1 110.1
2014 111.2 112.1 111.3 110.2
2015 110.3 109.4 108.7 108.8
2016 110.1 110.5 111.2 112.2
2017 112.6 113.4 114.4 115.9
2018 117.2 118.4 118.4 118.2
2019 118.3 117.9 118.2 118.7
> plot(WPI_MP)
> Fore = HoltWinters(WPI_MP,seasonal = "multiplicative")
> plot(Fore)
> pred = predict(Fore,16,prediction.interval = FALSE)
> pred

      Qtr1      Qtr2      Qtr3      Qtr4
2020 119.4233 119.9526 120.4642 120.9632
2021 121.6896 122.2183 122.7288 123.2266
2022 123.9560 124.4839 124.9934 125.4899
2023 126.2223 126.7495 127.2580 127.7533
> plot(Fore,pred)
> |
```

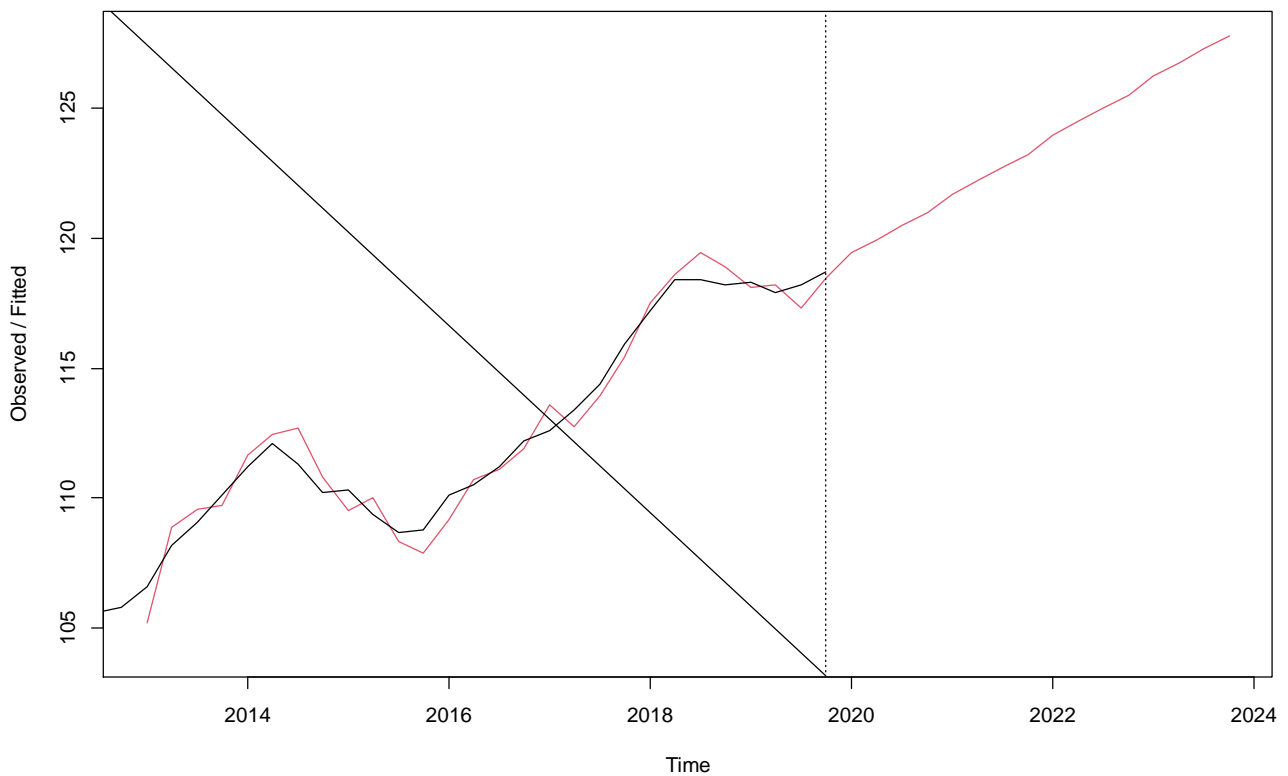




### Holt-Winters filtering

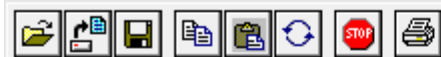


### Holt-Winters filtering



RGui (64-bit) - [R Console]

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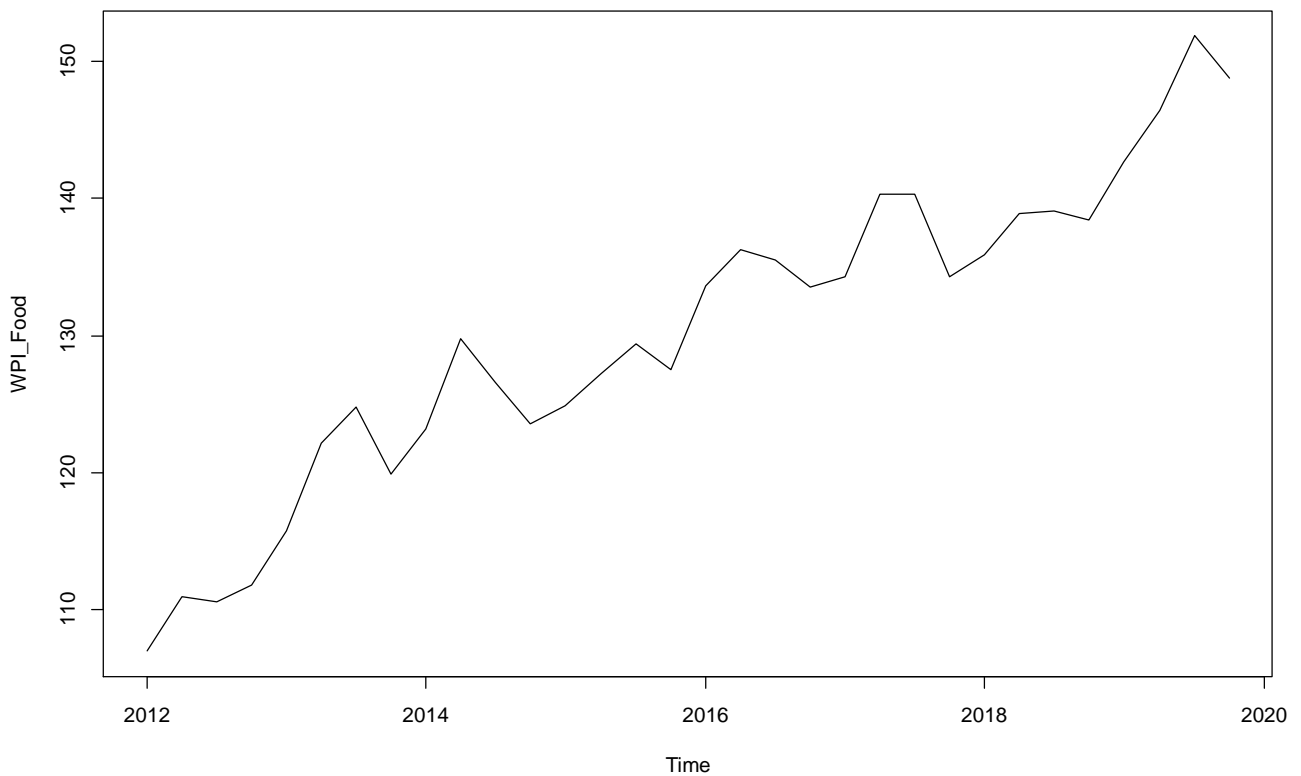
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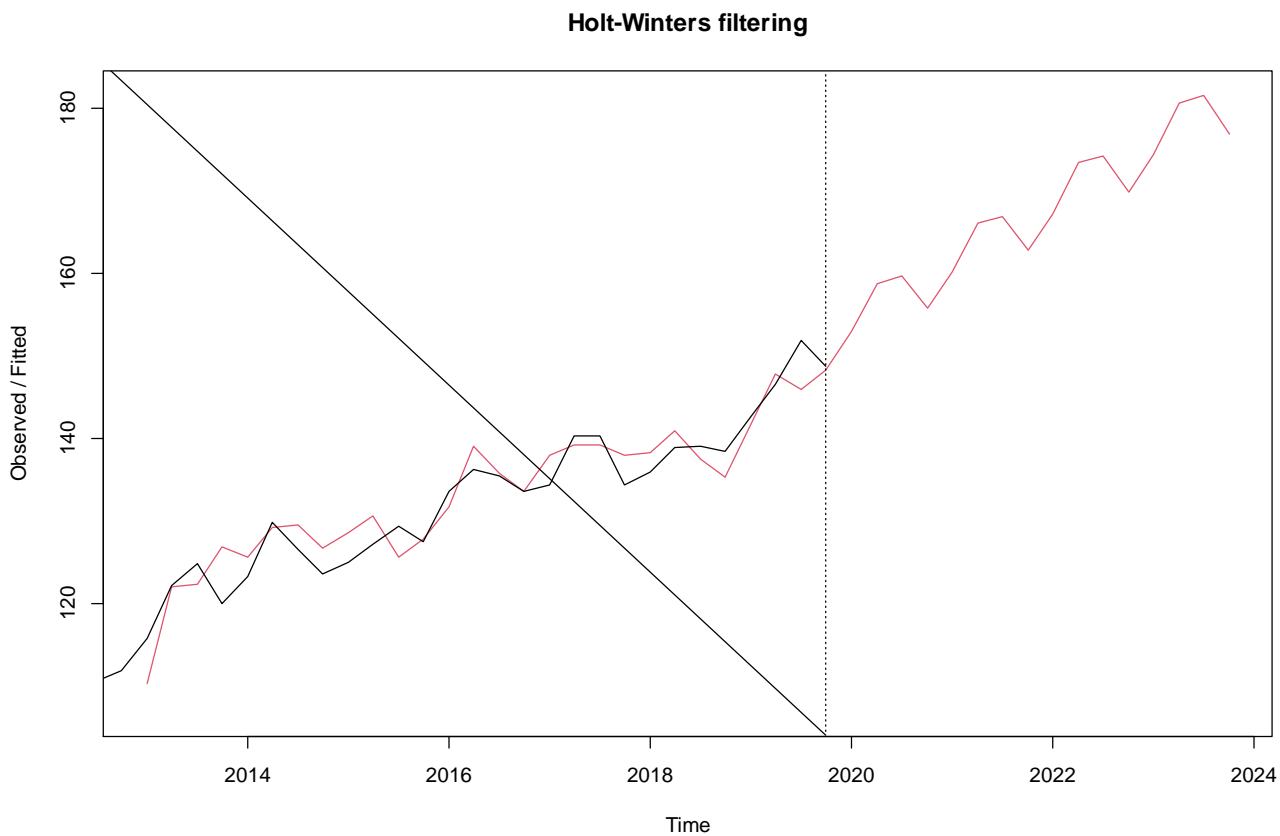
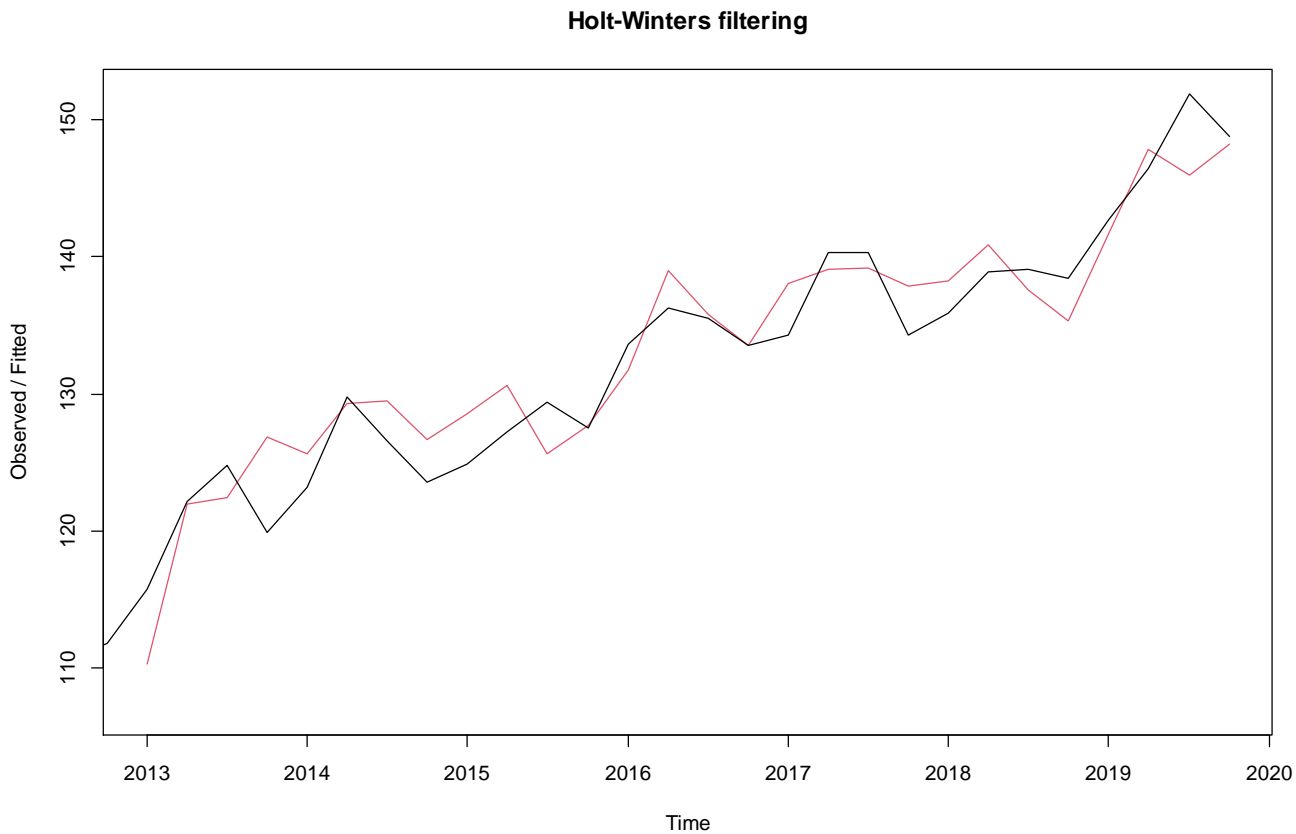
```
> setwd("c://ShiladityaBoseDoc")
> TS_data = read.table("food_series.txt", header=F)
> TS_data = as.matrix(TS_data)
> TS_d = NULL
> for(i in 1:nrow(TS_data))
+ {
+   TS_d = c(TS_d, TS_data[i,])
+ }
> WPI_Food = ts(TS_d, frequency = 4, start = c(2012, 1))
> WPI_Food
```

```

      Qtr1  Qtr2  Qtr3  Qtr4
2012 106.9 110.9 110.5 111.8
2013 115.7 122.1 124.8 119.9
2014 123.2 129.8 126.6 123.5
2015 124.9 127.2 129.4 127.5
2016 133.6 136.3 135.5 133.5
2017 134.3 140.3 140.3 134.3
2018 135.9 138.9 139.1 138.4
2019 142.7 146.5 151.9 148.8
> plot(WPI_Food)
> Fore = HoltWinters(WPI_Food,seasonal = "multiplicative")
> plot(Fore)
> pred = predict(Fore,16,prediction.interval = FALSE)
> pred
      Qtr1      Qtr2      Qtr3      Qtr4
2020 152.9477 158.7150 159.6530 155.8484
2021 160.1077 166.0591 166.9560 162.8967
2022 167.2678 173.4032 174.2590 169.9451
2023 174.4278 180.7473 181.5620 176.9935
> plot(Fore,pred)
> |

```





**Using R programming for calculation of Holt-Winter fitting we get the following estimated prediction of WPI**

**for the Manufactured product & Food Article for next 4 fiscal years as follows:**

**TABLE No. 3**

Year	Quaters	Food Articles		Manufactured Product	
1	2	3		4	
		Quarterly	Yearly	Quarterly	Yearly
2020 - 21	<b>April - June</b>	152.9	156.8	119.4	120.2
	<b>July – Sep</b>	158.7		119.9	
	<b>Oct – Dec</b>	159.7		120.5	
	<b>Jan - Mar</b>	155.8		120.9	
2021-22	<b>April - June</b>	160.1	164.1	121.7	122.5
	<b>July – Sep</b>	166.1		122.2	
	<b>Oct – Dec</b>	166.9		122.7	
	<b>Jan - Mar</b>	162.9		123.2	
2022-23	<b>April - June</b>	167.3	171.2	123.9	124.7
	<b>July – Sep</b>	173.4		124.5	
	<b>Oct – Dec</b>	174.3		124.9	
	<b>Jan - Mar</b>	169.9		125.5	
2023-24	<b>April - June</b>	174.4	178.4	126.2	127.1
	<b>July – Sep</b>	180.7		126.8	
	<b>Oct – Dec</b>	181.6		127.3	
	<b>Jan - Mar</b>	176.9		127.8	

By Calculating Inflation through calculator by the following formula,

$$\frac{(WPI \text{ in the period of current year}) - (WPI \text{ in same period of previous year})}{(WPI \text{ in same period of previous year})} \times 100$$

we get,

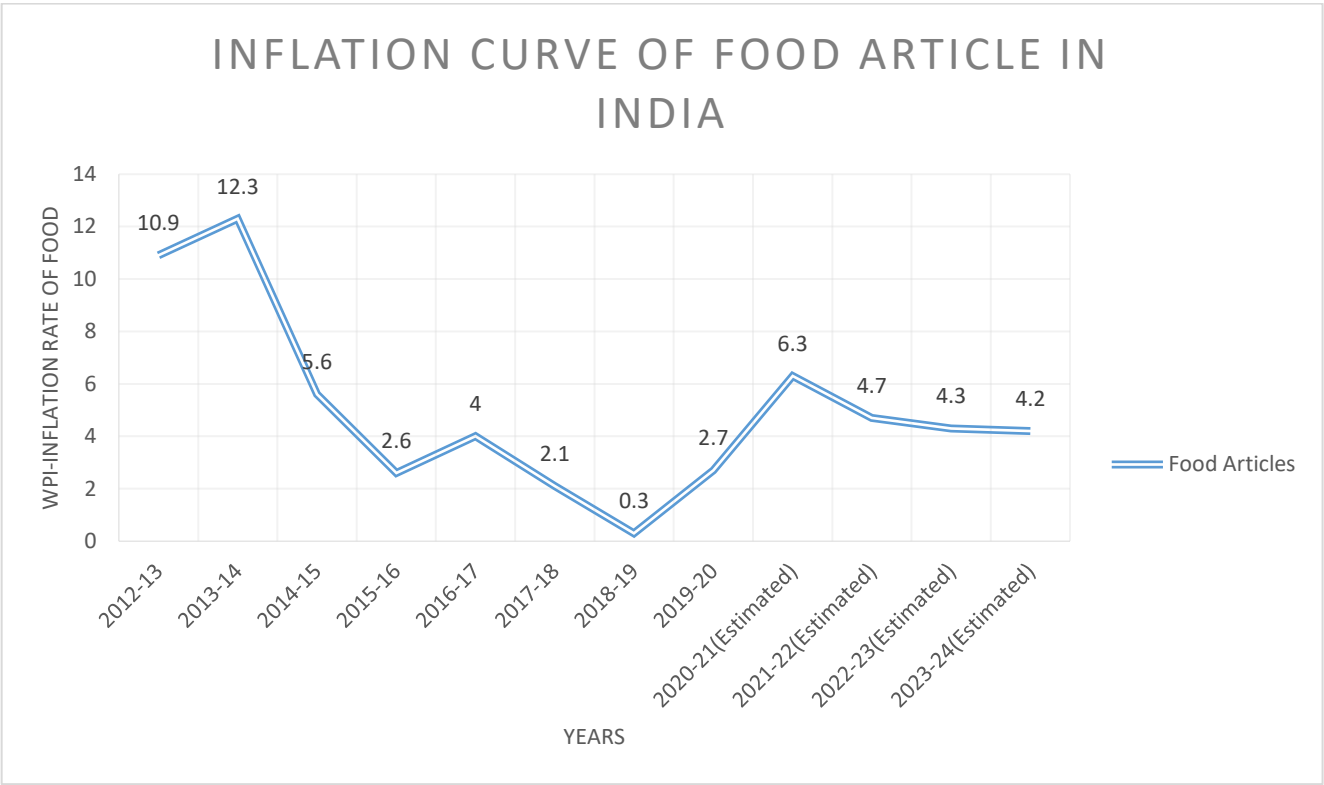
**Table No. 4: Wholesale Price Inflation in India (Average).**  
**[From 2012-13 to 2023-24 (upto March 2024)(Estimated)]**

**(Per cent)**

Year	Food Articles	Manufactured Product
<b>(Base year: 2011-12=100)</b>		
<b>2012-13</b>	10.9	5.31
<b>2013-14</b>	12.3	3.12
<b>2014-15</b>	5.6	2.53
<b>2015-16</b>	2.6	-1.82
<b>2016-17</b>	4.0	1.41
<b>2017-18</b>	2.1	2.83
<b>2018-19</b>	0.3	3.62
<b>2019-20</b>	2.7	0.01
<b>2020-21(Estimated)</b>	6.3	1.61
<b>2021-22(Estimated)</b>	4.7	1.91
<b>2022-23(Estimated)</b>	4.3	1.83
<b>2023-24(Estimated)</b>	4.2	1.92

(Despite of the effect of the COVID-19 pandemic)

Graphically it seems like below



## **Inflation in Post Independence Period in India**

Inflation has been moderate to high in the post independence period. A yearly statement of inflation rates based on WPI is given in table number 3. The yearly rates of inflation, based on CPI since 1970s is also given in table number 4.

**Inflation in the Pre-Reforms Period (1951-52 to 1991-92):** In the initial years after Independence inflation was moderate. The inflation began to rise rapidly only during the 1960s due to the two wars fought with China in 1962 and with Pakistan in 1965 and also due to crop failure of 1965-66, when agricultural output fell by more than 16 percent. It crossed 20 percent level in the early 1970s due to twin reasons of setback in agricultural production and an unprecedented hike in international oil prices. Prior to that, immediately after independence in the 1950s average inflation was less than 2 percent, but with vast yearly inflation in the rates of inflation. The percentage change in prices varied from a negative (-) of 12.8 percent in 1952-53 to the highest rate of inflation at 13.8 percent in 1956-57. The deflation of 1952-53 was due to the higher agricultural production in that year. During the 1950s, two more year viz, 1954-55 (-6.71 percent) and 1955-56 (-5.23 percent) also witnessed negative price Movement. However, inflation was in the range of 3 to 7 percent during the last four years of this decade (1957-58 to 1960-61).

In 1960s, average inflation increased to 6.2 percent. Price changes were the lowest at a negative of 0.91 percent in 1968-69 as a result of bumper agricultural harvest in the previous year. It was highest at 13.95 percent in 1966-67, followed by inflation of 11.56 percent in the following year.

The decade of the 1970s was the most turbulent period for India in terms of inflationary pressure emanating from agricultural and oil prices. Highest inflation has occurred in September 1974 when it reached 33.3%. Country's worst inflationary episode was from November 1973 to December 1974 when inflation never receded below 20% and was above 30% for four consecutive months starting June 1974. A hike in oil prices and poor agricultural production led to reappearance of high inflation in 1979-80 (17.1 percent) and 1980-81 (18.2 percent)

Inflation averaged 7.2 percent per annum during the 1980s with a noteworthy reduction in inflation variability. Inflation varied between 4.4 percent in 1985-86 and 10.1 percent in 1990-91.

**Inflation in the Post-reforms Period From 1991-92 to 2000-01: Since 1992-93:** Between end March 1991 and end-March 1992, the Indian rupee was devalued by nearly 37 percent with respect to the US dollar, under pressure from the IMF and world Bank for the purpose of seeking a \$7.2 billion loan from IMF. It was done by the then Finance Minister Dr. Manmohan Singh. A sharp increase in inflation was therefore witnessed during the Four out of the first five years of the 1990s which registered a double digit inflation due to reforms



launched under Washington consensus by the Narsimha Rao Government. From 1995-96 onwards, there had been a continuous deceleration and the average inflation for the period 1996-97 to 2000-01.

**Average trend in inflation from 2000-01 :** The range of inflation was wide and fluctuating varied sharply in the beginning of new millennium, from a low of 3.3 percent in 1999-2000 to a high of 7.2 percent in 2000-01. In 2002-03 inflation moderated at 3.4 percent. In 2005-06, WPI inflation eased to 4.3 percent as compared to 6.5 per cent a year earlier. The ten-year average of headline WPI inflation in the first decade of new millennium was around 5.4 percent between 2000-01 to 2009-10. In this decade 2000-01, 2003-04, 2004-05, 2006-07 and 2008-09 had higher inflation relative to the decadal average. The years 2003-04, 2004-05, 2006-07 and 2008-09 also witnessed high inflation in manufactured products mainly on account of high prices of raw materials such as basic metal alloys and metal products, nonmetallic mineral products, and machinery and machine tools.

#### **Trend since 2010-11 & 2011-12**

The year 2010-11 of the second decade of new millennium was marked by strong inflation due to hike in vegetable prices with unseasonal rains post-monsoon and rising global commodity prices that resulted in significant cost-push and demand-pull pressures since December 2010. Food products were the main drivers of price rise during April-July 2010, accounting for about two-fifths of increase in WPI. These price pressures spilled over to manufactured non-food products during December 2010-March 2011. The year 2010-11 was marked by inflation persisting with headline inflation averaging 9.6 percent.

During 2011-12, the WPI continuously increased and slowed down only during the latter half of the year. The financial year started with a headline inflation of 9.7 per cent which even touched double digit in September 2011 before coming down to 6.6 per cent in January 2012. In spite of decline in growth during 2011-12. Inflation persisted due to rupee depreciation and high global commodity prices. In the mid-year analysis in 2012-13, inflation (WPI) was reported to have averaged 8.9 percent for 2011-12.

**Inflation in 2012-13 and 2013-14:** The inflation decelerated to 7.7 per cent in first half of (April-September) of 2012-13. WPI inflation was 8.07 per cent in September 2012, which was 8.01 per cent in August 2012. It has fallen to 7.32 per cent in October 2012, 7.24 per cent in November, 7.18 per cent December 2012 and stood at 6.62 (provisional) for the month of January 2013.

**Highest rate of inflation in Asia in end 2013 : As per the Times of India Dec. 13, 2013** The Indian economy, Asia's third-largest one, had a difficult situation where the economic growth slowed to a decade low and price pressures have shown an upswing. It had one of the highest inflation rate in the world, and the highest in Asia. Weak growth and high inflation also complicated the policy choice for the central bank. According to the Central Statistics Office, industrial output had slumped 1.8% in October compared with an

annual growth of 8.4% in the same month last year. It was also lower than the 2% expansion in output reported for September 2013.

In rural areas retail inflation was at 11.7%, while in urban areas it stood at 10.5%, highlighting the extent of pain for households, especially those with low incomes. The increase in retail inflation also affected the ruling Congress party, in state elections. Rising prices, particularly of food, was identified as one of the factors, which had angered voters in elections. High inflation has been affecting manufacturing sector and overall growth in the economy as well. Since the RBI has raised the interest rates 14 times, since March 2010, to control inflation. So, the economic growth is severely affected.

Press Information Bureau Government of India Ministry of India 31-January-2020 13:17  
IST Inflation Witnessing Moderation Since 2014; Volatility of Prices for Most Essential Food Commodities Down in 2014-19. Measures to Safeguard Farmers should be Made More Effective.

Inflation has been witnessing moderation since 2014 in India. The Economic Survey 2019-20 presented in Parliament today by the Union Minister for Finance and Corporate Affairs Smt Nirmala Sitharaman states that recently inflation has however shown an uptick. Headline Consumer Price Index (CPI) inflation has increased from 3.7 per cent in 2018-19 (April to December 2018) to 4.1 per cent in 2019-20 for the corresponding period. Wholesale Price Index (WPI) inflation has seen an increase between 2015-16 and 2018-19. It however fell from 4.7 per cent in 2018-19 (April to December 2018) to 1.5 per cent during 2019-20 in the same period.

The Survey notes that during 2018-19, the major driver of CPI-Combined inflation was the miscellaneous group. However, during 2019-20 (April –December), food and beverages emerged as the main contributor to CPI-C inflation. Among food and beverages, inflation in vegetables and pulses was particularly very high, mainly driven by low base effect and production side disruptions due to untimely rain. The Survey recommends that measures to safeguard farmers like procurement under Price, Stabilization, Fund, Minimum Support Price (MSP) needs to be made more effective.

The Survey notes a divergence between the retail and wholesale price of various essential agricultural commodities in the four metropolitan cities of the country over the period 2014 to 2019. The divergence was particularly high for vegetables like onion and tomato. This could be due to the presence of intermediaries and high transaction costs.

The Economic Survey says that over time, there has been shift in volatility of prices of essential commodities. Volatility of prices for most of the essential food commodities with the exception of some of the pulses has actually come down in the period 2014-19 as compared to the period 2009-14. This

might indicate towards the presence of better marketing channels, storage facilities and effective MSP system for most of the essential agri commodities.

According to the Survey, CPI-C inflation has continued to be highly variable across States. Inflation ranged between (-) 0.04 per cent to 8.1 per cent across States/UTs in Financial year (FY) 2019-20 (April-December). Inflation in fifteen States/Union Territories (UTs) was below 4 per cent in FY 2019-20 (April-December). In all States, there was a divergence between rural and urban inflation. In most of the States the CPI-C inflation in rural areas is lower than the CPI-C inflation in urban areas and this divergence in rural urban inflation was observed across all components food and beverages, clothing and footwear, miscellaneous etc.

Analysing the variability of inflation in rural and urban areas, the Economic Survey observes that rural inflation has been more variable across States than urban inflation. It also states that there has been a change in the inflation dynamics, as there is convergence of headline inflation towards core inflation. The Survey suggests that this may have implications for the response of monetary policy to food and fuel price shocks: monetary policy need not become tighter in face of short-term, transitory price shocks in non-core components. However, owing to the large weightage of food and fuel in the consumption basket of consumers in India and the fact that demand-side pressures (and not just supply side factors) are important for food and fuel inflation focus on headline inflation for monetary policy decisions may be warranted.

The Economic Survey states that the Government takes various measures from time to time to stabilize prices of essential food items which include utilizing trade and fiscal policy instruments, minimum export price, export restrictions, imposition of stock limits. On the issue of onion prices it says that this went up during 2019-20 starting from August, 2019 and various measures were taken by the Government to ease the situation.

## **MEASURES ADOPTED TO CONTAIN INFLATION IN INDIA**

Inflation has been a major cause of concern for both the Government and Reserve Bank of India who are taking a number of measures to curb price rise. They are as under:

**Fiscal & Administrative measures :** The Central government has taken following steps to curb inflation

- Govt. has Reduced import duties to zero on food items like wheat, onion, pulses, crude palmolein and to 7.5 per cent for refined & hydrogenated oils & vegetable oils. In this connection duty-free import of white and raw sugar was also extended up to 30.6.2012; however, import duty of 10 per cent was instituted in June 2012.
- Govt. also banned export of edible oils (except coconut oil and forest based oil) and edible oils in blended consumer packs upto 5 kg with a capacity of 20,000 tons per annum and pulses (except Kabuli chana and organic pulses and lentils up to a maximum of 10000 tonnes per annum).

- Stock limits have been imposed to stop hoarding from time to time in the case of select essential commodities viz. pulses, edible oil, and edible oilseeds and in the case of paddy and rice for specific seven states upto 30.11.2019.
- Ban on export of onions was imposed for short periods, whenever the onion prices rose. Exports of Onion were property calibrated through the mechanism of Minimum Export Prices (MEP).
- Central Issue Price (CIP) for rice (at Rs 5.65 per kg for BPL and Rs 3 per kg for AAY) and wheat (at Rs 4.15 per kg for BPL and Rs 2 per kg for AAY) have been maintained since 2002.
- Futures trading in rice, urad, tur, guar gum and guar seed, has been suspended to check speculation.
- Adequate availability of sugar for the households covered under Targetted Public Distribution System (TPDS), has been ensured by the levy obligation on sugar factories was restored to 10 per cent for sugar season 2011-12.
- Government allocated rice and wheat under Open Market Sales Scheme.
- Scheme is resumed for subsidized imported pulses through PDS in a varied form with the nomenclature "Scheme for Supply of Imported Pulses at Subsidized rates to States/UTs for Distribution under PDS to BPL card holders" with a subsidy element of Rs.20/- per kg to be paid to the designated importing agencies upto a maximum number of BPL card holders for the residual part of the current year and extended the scheme for subsidized imported edible oils w.e.f. 1.10.2018 to 30.9.2019 with subsidy of Rs.15/- per kg for import of upto 10 Lakh tonnes of edible oils for this period.

**Monetary measures by RBI:** The Reserve Bank of India (RBI) had announced several consecutive increases in interest rates from March 2012 till March 2019.

## CONCLUSION ABOUT INFLATION:

Inflation has emerged as a major policy headache for the govt. as well as the RBI, as has the manufacturing sector is on rapid decline and unabated price rise has inflated public anger against the govt. Industrial output data show that the manufacturing sector contracted 2% in October, compared with a 9.9% growth in October 2012, while mining fell 3.5% compared with a decline of 0.2% in the year-ago period. Electricity was the only sector which notched up growth, rising 1.3% in October compared with an expansion of 5.5% in the year-earlier period. The consumer goods sector fell 5.1% compared to a growth of 13.8%, underscoring the fragile consumer sentiments. Consumer durables registered a bigger decline, contracting 12% in October compared with a 16.7% expansion in October 2012. Rising inflation was the most recent ticklish political issue that hit the UPA government as well.

Even in March, 2014 the Rising food prices drove up inflation in India up more than expected in leaving the RBI with less room to support the economy amid fresh signs of slowing growth. The rise in inflation in 2013-14, coupled with a slump in industrial output and merchandise exports and the risk of less than-normal monsoon rains this summer, indicates that the worst is not over. Higher prices for fruit, vegetables and milk have pushed the annual retail inflation rate up to 8.31 percent in (March 2014), from a 25-month low of 8.03 percent in February This is what the data from the ministry of statistics, revealed on Tuesday, the April 15, 2014. Annual wholesale price inflation, has also hit a three-month high of 5.70 percent in March, 2014 on higher food and fuel prices. Therefore, the RBI still considers price stability a necessary condition for economic revival and aims to bring down retail inflation to 6 percent by January 2016 & we see a mild deflation in the fiscal year 2015-16. Though Govt. of India introduce several Economic Policies such as [Demonitization](#) in year 2016, introduce [GST](#) IN 2017 but we can see inflation rate of India which is moderately behaved, but it has also several drawbacks. These are if the demand rate in the market is not remarkably changed and also inflation rate is not changed then unemployment rate increases, which is a massive blow to the prosperity of a nation. **But concern in our topics, and by estimating inflation for the future time points, inflation in India moderately in controlled state.(Despite of the effect of the [COVID-19 pandemic](#), due to Covid pandemic, countrywide lockdown has stopped the wheel of Economy. So as a result, a severe inflation would be occurred.)**

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# CERTIFICATE

It is to certify that the content of this project entitled, "**Statistics Project on Scenario of Inflation in India**" by Shiladitya Bose (Registration no. : A03-1112-0204-17 & College Roll No. : STUG/204/17) is bona fide work of him submitted to Department of Statistics, Ramakrishna Mission Residential College (Autonomous), Narendrapur for consideration in partial fulfillment of the requirement of Calcutta University for completion of Honours in Statistics in Semester VI of UG 3<sup>rd</sup> year.

The original project work was carried out by him under my supervision in the academic year 2019-20. On the basis of declaration made by him I recommend this project for evaluation.



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