

# Food Inflation in India

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**Abstract-** Food inflation in India has remained stubborn for years. There are several factors such as increasing demand due to the increase in the wages as a result of a rise in MSP ( minimum support price), upsurge in agriculture cost of production, changing consumption pattern with a shift towards protein-based dietary patterns and drought in certain years have led to the increase in food inflation over years. The paper examines the various demand and supply-side factors that contribute to the upswing in inflation. The paper takes into consideration the various government policy program like MNERGA that leads to an increase in real rural wages and turn the inflation. The study looks at the increase in wages and its effect on inflation by using the Johnson test for cointegration. The empirical evident indicate that MNERGA do have long term impact on food inflation.

**Key words:** Food inflation, MNERGA, rainfall, Johnson multivariate analysis, correlation matrix.

## 1.INTRODUCTION

Food inflation refers to the condition where there is an increase in the wholesale price index of essential food items included in the basket than the general or the consumer price index. Unlike in many advanced economies, food inflation has had a non-trivial impact on aggregate retail inflation in India (Anand and others, 2014; Walsh, 2011), reflecting various causes notably the higher household expenditure on the food items, and correspondingly high weights in CPI, inflation expectations of the household and change in the consumption pattern of economy.

Gokran was the first person to who gave a new dimension in the debate of food inflation during his speech on October 26, 2010, he stated that earlier food inflation in India was because of rising in the prices of wheat, rice and the other major crops but now the food inflation dynamics have changed, food inflation rises because of increase in the protein consumption by the household. Change in food habits, lifestyle has been attributed as one of the main reasons for the increase in food inflation over the years.

In the context of India food inflation has remained high than the overall WPI from the year 2014-19. The WPI for food increased by 4.26 % in 2016-17 from 2.41% in 2015-16 whereas the overall WPI in this period remained 1.03%.

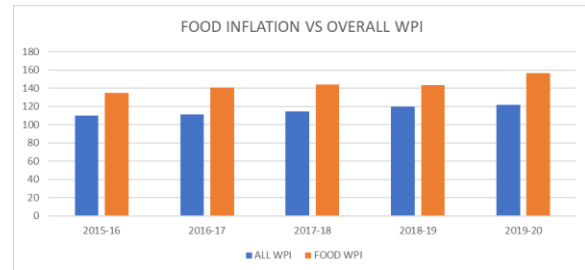


Chart 1. Food inflation vs overall WPI

Recent developments in rural wages, especially since 2007 has received much public attention. It has, by now been a well-established fact that in the recent years, wages in rural areas have increased at a rate higher than the inflation thereby contributing to increasing in real wages (RBI, 2012). Deficient rainfall, as a result of the weaker monsoon in 2009, affected the output of key agricultural crops and was an important factor behind elevated food inflation spilling into 2010 (RBI, 2014b). This leads us to the question that does the demand-supply gap play an important role in increasing food prices?

### 1.1 INDIA'S FOOD INFLATION: TIMELINE:

A chronological account of India's food inflation reveals some important events:

During 1980 and 1990s, a set of policy intervention known as the green revolution was introduced, with the help of better technology, high-quality seeds and fertilizer the food inflation during this period was short-lived and less intense. However, during the 1990s and 2000s. agriculture supply slowed down by the average of  $3^{1/2}$  % per annum, although the slowdown was tackled by reducing consumer demand and running buffer stock contained food inflation in the 2000s.

The Indian government response to surge in global food prices beginning in 2007-08 helped limit impact

on food prices (OECD,2009), however, buffer stock continued to fall, besides series of government measures such as increase in food and fertilizer and over 30% increase MSP for 2008/09 season led to the prolonged inflationary pressure even after global commodity price spike episode of 2007-08. Deficient rainfall in 2009 affected the production of various agricultural crops thus reducing supply and increasing prices. Food inflation exceeded non-food inflation by almost 7<sup>1/2</sup>% per year during this period

Even though in 2010, average rainfall was good, food inflation remained high. Inflation expectations played a major role in this year. As real personal consumption growth is expected to increase and supply to be relatively sluggish in coming years it seems that India's inflation dynamics will continue to be shaped by the trend in relative food prices (IMF,2016).

Development in rural wages, especially since 2007, has received very much public attention. Wages in rural areas have increased at a rate higher than the inflation rate. The rural wage employment programme in India like MNERGA established in 2006 provided a legal guarantee of at least 100 days of unskilled wage employment in a financial year to rural households. The main objective of the act is to enhance the livelihood security of the rural poor by generating employment opportunities and to increase productive employment. It has been argued that MNERGA has been one of the factors that have contributed an increase in wages and thus the inflation (CACP 2012). Although increase in wages is beneficial for the rural labourers from the social welfare point of view, sustained increase in the wages have number of macroeconomic implication (RBI 2012), first increase in wages does not necessarily mean that there will be increase in productivity too, this would lead to wage-price spiral, offsetting the initial increase in rural wages. increase of wages in one sector may lead to an increase in wages in another sector thus negatively impacting the competitiveness in the economy. The ability of public policy particularly monetary policy to keep inflation under limit will reduce due to wage spiral pressure. Increase in wages leads to increase in demand for highly nutritious food items that leads to increase in the prices of this food items and thus reducing the income of the labourers which in turn increases their bargaining power for a hike in wages. Below graph shows the increasing protein expenditure in the basket of food.

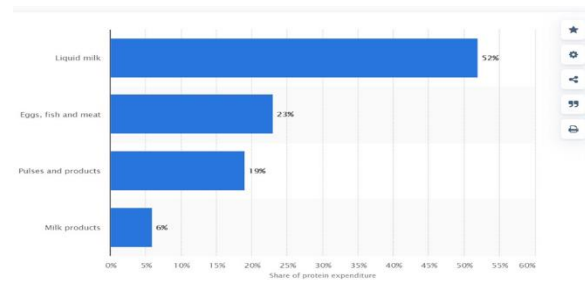


Chart 2 share of protein expenditure in the basket of consumption.

## 2 REVIEW OF LITERATURE

one of the traditional reasons given for the increase in food inflation is uneven rainfall, drought, and the changing weather conditions. Volume and spatial distribution of rainfall have over the years affected the production of food and thus lead to an increase in food inflation (Mohanty 2010). The supply-side shock has also led to an increase in food inflation in India (RBI 2011).

Apart from the short-term factors, the long term structural supply-side problem has also played a major role in driving food prices up Prices are lower in the harvest season and high in the lean season finally it depends upon the demand and supply and hence the price (Sarkar 1993). Deficient rainfall, as a result of the weaker monsoon in 2009, affected the output of key agricultural crops and was an important factor behind elevated food inflation spilling into 2010 (RBI, 2014b).

As far as the demand side is concerned about the rise in rural wages and the increase in consumption is one of the important factors in rising food prices up (chand,2010). Since the opening of the economy in 1991, also with the growth of India, there is a rising middle class which was cited as one of the main causes for the increase in food inflation (Mohanty 2010).

In the analysis of changing inflation dynamics, Mohanty (2011) states that the average annual monthly expenditure has been rising since the 2000s. Carrasco and Mukhopadhyay (2012) analysed that rising per capita income has led to an increase in food prices. Another source of demand-driven food inflation is a government policy program called Mahatma Gandhi national rural employment scheme (MNERGA), pay commission award and other welfare schemes.

These welfare program schemes have increased the flow of money supply, purchasing power in the economy, and in turn, the demand for food (Rakshit 2011, ministry of agriculture GOI). (Rajan 2014) noted that an increase in rural wages was after implementation of MNERGA.

The study on rural wages was started when various scholars try to analyse the effect of green revolution on the rural standard of living a pioneering study was undertaken by (Bardhan 1970). He found that rural wages in Punjab(including Haryana), Delhi and Uttar Pradesh did not show any significant response to increase in agriculture productivity while in Kerala the productivity increase more than proportionate to increase in wages the reason given by him was that there was peasant organization that played an important role in increasing the wages. He also concluded that the green revolution did not have much impact on improving the standard of living of people as it failed to increase the share of rural agriculture labourers.

Krishanji (1971) and Jose(1974) used agriculture wages in India to analyse the movement of the money wage and real wage across the states and over time. Another set of studies tried studying agriculture wage by demand-supply analyse. Using AWI data they found that in India supply curve of labour is perfectly elastic while the demand curve of labour is negatively sloped this leads us to the situation where an increase in labour supply increases the employment but not the wages.

There has been a sudden change in food inflation in the current financial year in urban and rural areas. The economic survey highlighted the rising inflation in urban years. Since June 2019, the urban area has registered much higher inflation. This increase in the urban area has registered much higher inflation. This increase in the urban area has been mainly due to cereals, eggs, fruits, vegetables. The rural food inflation decrease as there was a decrease in rural wages and thus the purchasing power. (economy survey of 2019-20).

The CPI rose to 7.35% in December hitting the highest since 2014 and crossing the limit set by RBI. Food price inflation increased to 14% led by vegetables

(60%), pulses (15%), meat and fish (9.6%) and eggs (8.8%). A similar emerged from WPI (live mint).

The uneven rain and drought in various places have led to crop loss and it contributed to the supply shocks. The price of cereals and pulses have been consistently increasing from the past 6 months. As of January, total stocks with food cooperation of India (FCI) stand at 75 million tonnes, 33 million tons of it wheat and rice. The buffer norms for FCI prescribe 21.4 million tonnes of stock at the start of each year. The artificial scarcity of wheat has not affected the price of the wheat but also the price of coarse grains and fodder (live mint) (FCI).

Gulati and Saini (2013) have shown that the pressure on price is more on the protein food Like pulses, milk, milk products, eggs, fish meat and vegetables. Adequate infrastructure and technology are very important to increase production and satisfy the hunger of the increasing population (nerlove,1958). Food inflation surged to 6,9 % in October pushed up a sharp increase in the price of vegetable due to heavy unseasonal rains, prices of onion in particular increased (economic times,2019).

The united nations food and agriculture organization (FAO, s)- food price index which is the measure of the change in the international price of a basket of major food commodities with reference to the base period (2002-04=100) touched 182.5 points in January 2020. According to the department of consumer affairs, retail prices of soybean oil in Delhi rose from Rs 79 to Rs 108 per kg. (economics times)

### 3 DATA USED

The objective of the paper is to study the effect of government policy programmes like MNERGA and a rising demand-supply gap that leads to food inflation. The variable used in the analysis is CPI(AL), WPI (FOOD), MNERGA ad RAINFALL(MM) from period 2014-19.

Monthly data of this variables are officially sourced from Reserve bank of India (RBI), a commission of agriculture and price (CACP), ministry of statistics (MOS), Indian metrological department (IMD). The summary statistics of the data is tabulated below:

Variables	WPI(FOOD)	CPI (AL)	MNERGA(W)	RAINFALL(MM)
Mean	4.924	6.748	5.082	3.879
Minimum	4,806	6.629	4.898	2.041

1 <sup>st</sup> quartile	4.896	6.701	5.043	2.96
Median	4.926	6.767	5.081	3.791
3 <sup>rd</sup> quartile	4.96	6.79	5.159	4.995
Maximum	5.081	6.819	5.226	5.734
Skewness	-0.53	-0.58	-0.42	0.093
kurtosis	-0/09	-0.77	-0.76	-1.26

Table 1- Representing summary statistics of all the 4 variables from the year 2014-19

There are numerous reasons for data scale transformation that is convenience, reducing skewness, equal spreads, linear relationship etc. As a converted scale may be as natural as the original scale and more convenient for a selected reason. A change may be used to lessen skewness distribution that is symmetric or nearly so is regularly less difficult to handle and interpret than a skewed distribution. When the data is left-skewed median is typically greater than mean, by

the skewed left, we mean that the left tail is longer relative to the right tail and the median is closer to the third quartile than the first quartile. Kurtosis is actually the measure of outliers present in the distribution. Here the kurtosis is less than 3 which means that data are light-tailed or lack of outliers. In this study, the logarithm is used to change the data scale. It is commonly used for reducing right skewness and is appropriate for measured variables.

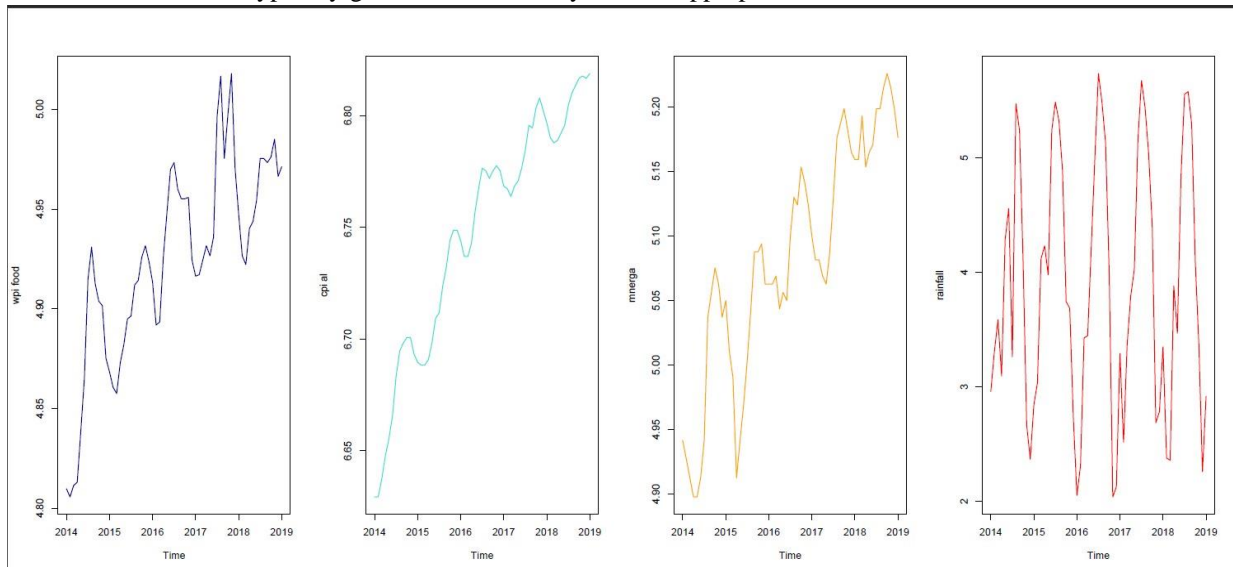


Chart 3 graphically representing summary statistics of the 4 variables

As we can see in the above figures that MNERGA wages are continuously rising from the year 2014-19, higher wages lead to increase in demand for the food creating pressure on the agricultural productivity and the food production. On another hand, rainfall statistics show that the average rainfall (MM) has been volatile during the years leading to constraint in production of the crops. The increasing WPI for food shows that there is a rising share of expenditure on food in relation to other items included in the basket Next, the correlation matrix is employed to determine that relationship exists between all the 4 variables employed in the analysis. The coefficient indicates both the strength of the relationship as well as the

direction (positive vs negative correlations). The range of values for the correlation coefficient is -1.0 to 1.0. If the correlation matrix is greater than 0, it indicates the positive relationship between the variables and vice versa. As we can see in the below chart that line 1.00 going from the top left to the bottom right is the main diagonal showing that each variable is perfectly correlated to itself. In our matrix, it is directly visible that most of the variable correlates with each other positively. In the below diagram log 1 to 4 signifies the 4 variable that is WPI for food, CPI for agricultural labourers, MNERGA wages and rainfall (MM) respectively.

The matrix shows a strong positive correlation between CPI(AL) and WPI(FOOD) with a correlation of 0.91 as both together help to monitor the situation of food price better. It also shows a highly positive relationship between CPI(AL) and MNERGA with the

correlation of 0.93 as MNERGA wages are derived based on the consumer price index of agriculture labourers. The matrix for rainfall with all the other variables shows a negative relationship as all the numbers are closed to -1

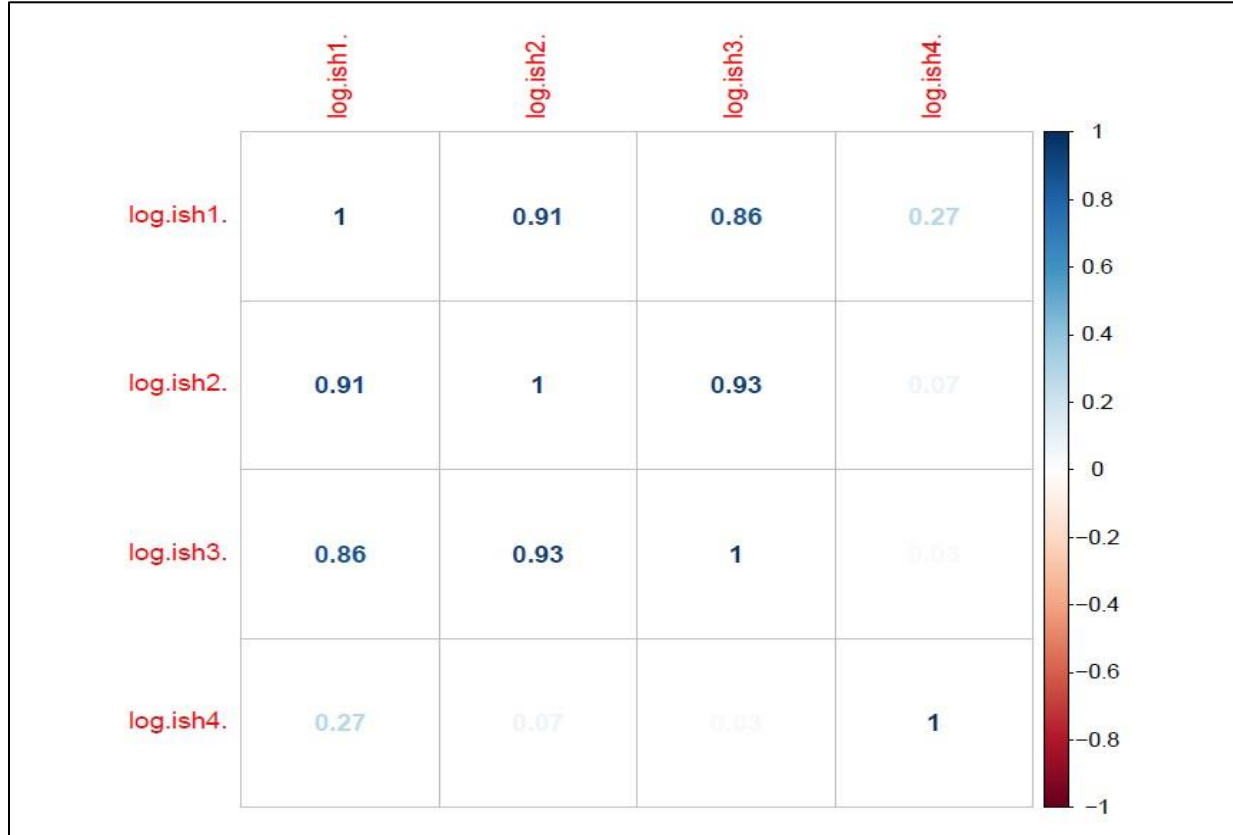


Chart 4 CORRELATION MATRIX.

### 3.1 Methodology and results

The methodology used in the paper is the Johnson multivariate co-integration method. ADF test is used to make data stationery and our null hypotheses is the series as a unit root or a stationarity. But the results show p value for CPI(AL) is greater than level of significance that is 0.05 (0.1281>0.05). therefore, null hypothesis is retained which implies data is not stationary.

	WPI (F)	CPI (AL)	MNREGA	RAINFALL
ADF	-5.6571	-3.1046 (p-0.1281)	-5.288	-6.6699
ADF 3 <sup>rd</sup> Diff	-4.2316	-4.4818	-4.7377	-4.5691

Table: 2 ADF Tests Results

The general vector regressive model is similar to AR(P) expect that each quantity is vector-valued and matrices are used as coefficients.

The general form of VAR(p) without drift is given by  $X_t = U + A_1 X_{t-1} + \dots + A_p X_{t-p} + w_t$

Where U is the vector-valued mean of the series.  $A_i$  is the coefficient matrix for each lag and  $W_t$  is multivariate Gaussian noise term with mean 0. The test check for when the matrix  $A=0$  The Johansen test is more flexible and check for multiple linear combinations of time series for forming stationary portfolios.

The null hypothesis  $r=0$  means that there is no cointegration at all. A rank  $r > 0$  implies a cointegrating relationship between two or possibly more time series.

Johnson procedure:

Test type: trace statistic with linear trend

Eigen values (lambda):

Lags-3

(1) 0.67046505	0.4968687	0.3447089	0.2716440
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Table 2 Value of test statistic and critical values:

Hypotheses	Test	10pct	5pct	1pct	Prob
$r \leq 3$	18.38	6.50	8.18	11.65	0.01
$r \leq 2$	42.90	15.66	17.95	23.52	0.1281
$r \leq 1$	82.74	28.7	31.52	37.22	0.01
$r \leq 0$	147.12	45.23	48.28	55.43	0.01

Table 3 – the value of test statistic and critical value

Eigenvalues normalised to the first column

(This are the cointegrating relationship)

	d1. I2	d2. I2	d3. I3	d4. I2
d1. I2	1.000000000	1.000000000	1.000000000	1.000000000
d2. I2	-1.769269002	-1.88342730	-5.346761037	-9.409343385
d3. I2	-0.040746449	-0.19380569	3.081179166	0.561872920
d4. I2	-0.007160593	0.04291085	-0.033884074	0.003276511

Table 4- co-integrating relationship

Weights (This is a loading a matrix)

Loading is calculated by multiplying Eigenvectors by the square root of Eigenvectors.

	d1. I2	d2. I2	d3. I3	d4. I2
d1. I2	-1.53363123	-0.003317977	-0.09608537	0.17632574
d2. I2	-0.0813806	0.0543971262	-0.01778088	0.064302299
d3. I2	0.48684552	0.287059879	-0.224103120	-0.11337554
d4. I2	42.76189425	-16431948331	-5.74329173	2.33211608

Table 5- loading matrix

The first section (table 1) shows the eigenvalue generated from the test. In our analysis, we have 4 eigenvalues, the highest being approximately equal to (0.67046505). The next table (table 2) shows the trace test statistic for 4 hypotheses of  $r=0$ ,  $r \leq 1$ ,  $r \leq 2$ ,  $r \leq 3$ . For each trace statistic the critical values at a certain level of confidence: 10%,5%,1% respectively. The first hypothesis  $r = 0$  test for the presence of cointegration. It is clear that since the test statistic exceeds the 1% level of significance (147.12 > 55.43) we have strong evidence of rejecting null hypotheses of no cointegration. The second test  $r \leq 1$  against the alternative hypothesis  $r > 1$  also provide clear evidence to reject the null hypothesis as

test statistic exceeds the 1 % level of significance (82.74 >37.22). The third and the fourth test  $r \leq 2$ ,  $r \leq 3$ ,  $r \leq 4$  against the alternative hypothesis  $r > 2$ ,  $r > 3$ ,  $r > 4$  respectively provides the clear evidence to reject the null hypothesis as it exceeds 1% level of significance. Thus, the best estimate of the rank of the matrix is  $r=4$  which tells us that we need a linear combination of three-time series to form a stationary series. To form a linear combination, we use eigenvectors components of the eigenvector associated with the largest value that is approximately (0.67046505). It corresponds to the value given under the column d1.I2 (1.000000000, -1.769269002, -0.040746449, -0.007160593). by using this we can form a stationary series



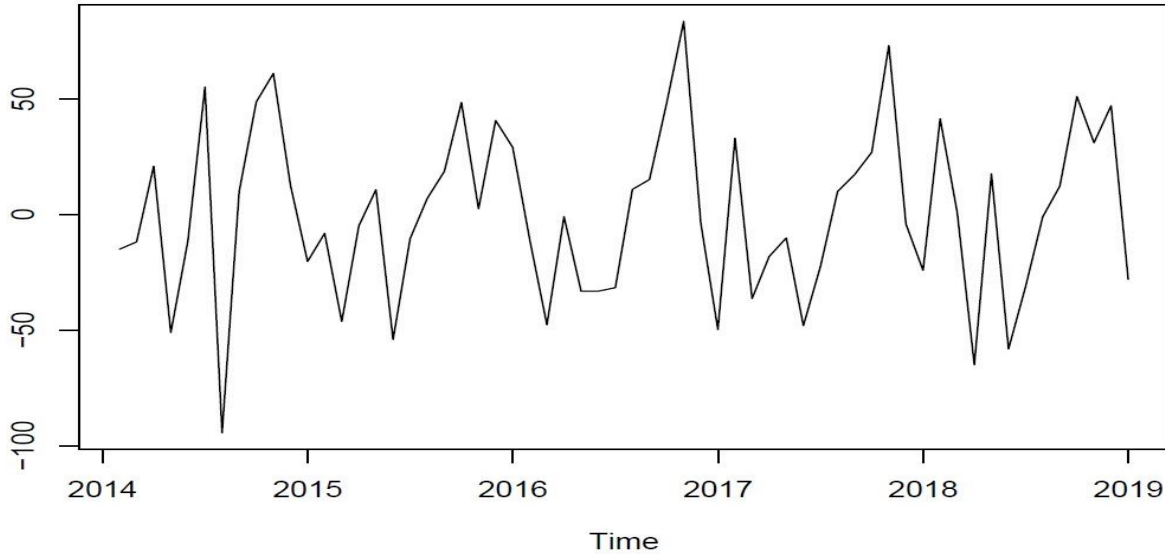


Chart 5- the plot of a stationary series formed via a linear combination  $d1. I_2, d2. I_2, d3. I_3$  and  $d4. I_2$ .

Both trace and max eigen values test indicates the presence of co-integrating vector the estimated coefficients of the long run co-integrating vector relationship suggest that real rural wages have the largest impact on food inflation. The dominant influence of real rural wages in determining long-run inflation is high because of the increase in the MNERGA wages from 2014-19. On the supply side, rainfall plays an important role in driving food prices and widening demand-supply gap.

#### 4 CONCLUSIONS

The study shows that the persistence of food inflation is largely ascribed to an increase in rural wages and uneven rainfall. Empirical results indicate that introduction of MNERGA has significantly Contributed to the food inflation in India in the long term. Uneven rainfall in the country has led to a decrease in the supply of various crops.

As there is an increase in population there will be a rising demand for the food grains and food items. Insufficiency on supply-side to cater to the needs of the increasing population and the rising demand-supply gap has led to an increase in food inflation over the years. The only solution to solve the problem of food inflation is increasing the supply by using various technology, hybrid seeds, better infrastructure, innovative techniques to grow essential crops and cater to the needs of the people. The policy option to

reduce food inflation are divided in to short and long run some of them are:

As a short-term measure, the short-term food scarcity can be overcome by removing the buffer stock available with the government or allowing imports by lowering the duties. However, the decision regarding export and import should be taken after appropriate planning based on commercial intelligence in supply and demand.

Inability to pre-access the market condition due to lack of information and time dissemination leads to inflationary pressure. Therefore, the government can appoint a committee or can start an agency of commercial intelligence that can study the market by collecting the data from diversified sources. There is a need for greater cooperation within various departments that collects data on prices, food stocks. Etc

One of the short-term solutions is reforming the mandi market as there is a great difference in the wholesale price and retail price especially for vegetables due to the presence of commission agent. The state should incentivize direct marketing between farmer and buyer without paying commission and mandi fee to the agents. This can be linked with the various programme as an incentive. Another solution that can be farm to farm linkage is the alternative to the mandi system and there is a success story related to it that is safal mother dairy, MAHA grapes, etc. such models can be developed and can be further experimented. Various corporations can be developed where farmers are

linked to private and public enterprises and businesses are developed where they earn and participate together.

The government can also invest in a backward linkage that is providing technology, infrastructure to store food grains, warehouses with better facilities as discussed above. The long term solution to the problem of food inflation is the investment of government into agriculture, although the investment has increased to 20% of the GDP it has not been translated in increasing agricultural stocks it is necessary to focus on nature of investment and account for the period of gestation lag in order to access growth. Agriculture reform should not be confined to the farms and farmers alone but also to the marketing, processing system as well. As rightly said by Raghuram Rajan in his speech “FIGHTING INFLATION” “people believe that if the government is serious about inflation their expectations about inflation also come down. The greater public faith that inflation will be low will add stability to the currency.

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