Journal of Quantitative Economics, Vol. 8 No.1, January 2010

# STUDY OF INFLATION IN INDIA: A COINTEGRATED VECTOR AUTOREGRESSION APPROACH

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**Abstract**

*The spate of persistent inflationary pressure experienced in the post liberalisation era in India throws light on the fact that the causes of inflation in India have undergone tectonic changes. The present study therefore aims at empirically identifying the determinants of inflation in India. In a Cointigrated Vector Autoregression (VAR) framework, the empirical estimation is carried out. The Error Correction Mechanism (ECM) of the cointegrated variables is also carried out. The Impulse Response Function (IRF) of the cointegrated VAR system shows that there is a lag in the response of inflation to the changes in the other variables in the VAR system. The Fixed Error Variance Decomposition (FEVD) shows that, the inflation in India is a mix of demand and supply side factors. The stabilization policies should therefore focus on both demand control as well as supply management. Also considering the lag in the impact of the explanatory variables the stabilization policies should become more pro-active.*

**Keywords:** Inflation, Money Supply , Stabilasition Policy, Cointegrated Vector Autoregression, Error Correction Model

**JEL Classification:** E31, C32

## 1. Introduction

Inflation is a process of persistent rise in prices. The monetary authorities announce the monetary policy measures at regular intervals to achieve the objectives of price stability and full employment (RBI, RCF, 2004). The policy impulses reach the final target variables *ie* prices and employment through the various channels of monetary transmission mechanism. The recurrent spates of persistent inflationary pressure experienced in India, has been creating ripples not only within the academic circles but also among the policy makers. The Indian economy went through structural changes in the post 1990s, it is likely that the causes of domestic inflation too have undergone tectonic changes. Whether it is due to increased money supply, or increasing fuel prices, or increase in demand it is needless to emphasise, that the causes of today's inflation are complicated. The present paper therefore attempts to empirically study the causes of inflation in India in the post liberalisation era. The rest of the paper is designed as follows:- Section 2 Reviews the literature, Section 3 Covers the recent trends in inflation in India. In Section 4, the

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variable used and methodology are discussed. The empirical results are reported in Section 5 and Section 6 Concludes.

## 2. Review of Literature

A vast body of literature is available on inflation, and its estimation in India. Some models follow the structural approach to inflation while others follow the monetarist's approach. The present paper reviews a few prominent papers among them.

John (2003) used post liberalisation data to study the causality between monetary aggregates and exchange rates. The paper employed a Vector Autoregressive (VAR) framework to find out as to which monetary aggregate explains the inflation in a better way. Even though no clear evidence is found as to which of the monetary aggregates best explains inflation, from the VAR model there is sufficient reason to believe that the broad money measure (M3) is better. It has also been observed that the explanatory power of these variables in explaining inflation is not high any more.

Pandit, (1993), was of the view that the government was placing excessive emphasis on the demand pull factors and was over looking the cost push. The paper said that an across the board contractionary fiscal and monetary policy, even if effectively implemented, is not a good substitute for efficient resource utilisation. In fact it may hurt the economy and result in stagnation, at least in the short run.

In view of the fact that the Reserve Bank of India (RBI) has shifted from monetary targeting to a multiple indicator approach Callan and Chang, (1999), assess as to which indicators provide the most useful information about future inflationary trends. The authors use a VAR framework in the empirical analysis. The paper concludes that while the broad money target has been de-emphasized, developments in the monetary aggregates remain an important indicator of future inflation. The exchange rate and import prices are also relevant, particularly for inflation in the manufacturing sector.

Srinivasan, Mahambare and Ramachandran (2006), estimated an augmented Phillips curve to examine the effect of supply shocks on inflation in India. In an Ordinary Least Square framework it was found that supply shocks have only a transitory effect on both headline inflation and core inflation. The paper concludes that monetary policy in India is more focused towards the core inflation.

Bishnoi and Koirala (2006), studied the robustness and stability of inflation models in NepaL a test of cointegration between inflation and its explanatory variables was used to find the long- term relationship among them and the Error Correction Mechanism (ECM) was used to find the short term relationship. The results reveal that the ECM of inflation is stable and robust.

Nachane and Lakshmi (2002), employed a P-Star model in their study of dynamics of inflation in India. The paper, attempted the model for India using both annual and quarterly data for the period 1955-95. It is found that velocity in India is trend stationary. Using cointegration techniques, the paper shows that it is possible to develop a model to gauge inflationary pressures in the economy. The model is well calibrated to data, and in out-of-sample forecasts, it significantly outperforms a seasonal ARMA benchmark model. The velocity gap version of the model is particularly successful.

## 3. Trends of inflation in India

### Definitional aspects

Inflation can be headline inflation or core inflation. Headline inflation includes the entire set of commodities in the general price index. Core inflation does not take into consideration commodities that have volatile prices for eg. food and fuel (Batura, 2008). Inflation can be measured on a point to point basis i.e compare the most recent price index with the price index at another point of time usually a year ago. It can also be measured as an average rise in the prices over a period of time. Broadly, there are three measures of inflation in India

### The Wholesale Price Index (WPI),

WPI measures the change in average price of goods that are traded in the wholesale market. WPI was published for the first time in 1902, and was one of the major economic indicators available to policy makers. In India, price data for 435 commodities is tracked through WPI which is an indicator of movement in prices of commodities in all trades and transactions. The WPI series of commodities was revised for the last time in 1993-94, and has not been updated it till now. In India the WPI is compiled by the office of the economic advisor in the Ministry of Industry. The WPI is available on a weekly basis with the shortest possible time lag -- two weeks. Since the WPI is producer's price index it is argued by Economists that the WPI, has lost its relevance and cannot be the barometer to calculate inflation. As a result headline inflation is always tracked by the consumer price index.

### The Consumer Price Index (CPI)

CPI is a statistical time-series measure of a weighted average of prices of a specified set of goods and services purchased by consumers. It is a price index that tracks the prices of a specified basket of consumer goods and services, providing a measure of inflation. CPI is a fixed quantity price index and considered by some as a cost of living index. Under CPI, an index is scaled so that it is equal to 100 at a chosen point in time, so that all other values of the index are a percentage relative to this one. The CPI in India is constructed for four categories :- (a) CPI for Industrial workers, (CPI-IW), (b) The CPI for Agricultural Labourers, (CPI-AL) , (c) CPI for Rural Labourers (CPI-RL) and (d) CPI for urban non manual employees (CPI-UNME). The CPI-IW, CPI-AL and CPI-RL are released by the Labour Bureau and the CPI-UNME is released by the Central Statistical Organisation (Srinivasan, 2008).

### The implicit Gross Domestic Product (GDP).

This is another important measure of Inflation.

### Inflation Trend

The problem of inflation in India has been a perennial one. The WPI in India during the decade 1981-82 to 1991-92 rose by an annual average of 8.1%. In 1990-91, the WPI rose by 12.1% and got stuck up at double digits in the consecutive year. The anti- inflationary measures undertaken could provide only a temporary respite and again the prices started rising in the late 1993. Similar trends continued for some time until the inflation was brought down to 5% in 1995-

96. Again 1998-99 saw an escalation in the prices. In 2002 inflation on a point to point basis was as low as 1.6%. However, the upward trend resurfaced and again the mammoth called inflation became a cause for concern in the year 2004 when the point to point rise in inflation was 7.7%. Towards the end of the year 2006, the inflation was high, after which it fell steeply in the first quarter of the year 2007. It picked up for some time and then again declining towards the end of the year. The beginning of the year 2008 marked the re-entry of the era of rising prices which started falling towards the end of the year. However there was no major respite from the same in the months to come. This is clear from the table 1 given below.

**Table 1. Inflation Statistics of India based on CPI**

| *Year* | *Jan* | *Feb* | *Mar* | *Apr* | *May* | *Jun* | *Jul* | *Aug* | *Sep* | *Oct* | *Nov* | *Dec* |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 2007 | 8 | 9 | 8 | 8 | 8 | 7 | 8 | 9 | 8 | 7 | 7 | 7 |
| 2008 | 7 | 7 | 10 | 10 | 10 | 10 | 11 | 12 | 13 | 14 | 14 | 13 |
| 2009 | 14 | 13 | 11 | 12 | 12 | 13 | | | | | | |

Data Source: RBI Handbook of Statistics on the Indian Economy

The Table 1 above gives the point to point CPI in the last three years. It is clear that the CPI has been consistently rising since March 2008. The rise in the inflation in 2008 has been mainly due to a rise in fuel prices, and rise in prices of primary articles. Global food prices also registered a marked rise during this period. Needless to say, that India being a major importer of food items, the prices rose. Food grain prices continue to be the culprit behind the rising inflation even in the year 2009.

## 4. Variables Used and Methodology

### Variables & Model

The variables used in the study are Consumer Price Index (CPI), which is the measure of inflation, the Index of Industrial Production (IIP) (this represents the volume of demand in the economy), the Reserve Money (RM) which is a measure of money supply in the economy, and the Import Index (IMP), which will measure the external influences on the domestic prices. CPI has been used because the WPI includes only the wholesale prices, and it is in fact the producer's price index. The data on GDP are not available on a quarterly frequency, so IIP has been used as a proxy for GDP. Since there exists a direct and proportionate relationship between money supply and inflation (according to the Quantity Theory of Money) a measure of money supply was needed in the model. In a cointegrated frame work it is important that all the variables be integrated of the same order. Of the various measures of money, only the reserve money is I(1), so it has been used as a monetary measure. The import index was included in order to capture the external influences on the CPI. Also since a bulk of our food items are imported, the IMP will be able to reflect the impact of agriculture sector on CPI, which has otherwise not been included in the model.

The study aims at identifying empirically the determinants of inflation in India. It is hypothesised that post liberalisation the CPI is increasing prominently due to external factors.

Thus the model to be estimated is as follows:-

CPI = F ( IIP, IMP, RM)

Since the data is non- stationary a Cointegrated Vector Autoregression framework will be used for empirical estimation. Quarterly data on all the variables has been used for the period 1991 Q2 to 2008 Q2. All the data have been collected from the IFS statistics of the IMF.

## Methodology

As a first step in the analysis of time series data, the stationarity of the variables is tested. A time series is called as non-stationary if it's mean, variance and autocovariance (at various lags), keep changing with time.

## The Augmented Dickey-Fuller Test

Depending upon the nature of the time series it may be represented as in the equation (1) or equation (2) or equation (3).

$$\Delta Yt=\delta Y_{t-1}+ut \quad \ldots (1)$$

$$\Delta Yt=\beta_1+\delta Y_{t-1}+ut \quad \ldots (2)$$

$$\Delta Yt=\beta_1+\beta_2 t+\delta Y_{t-1}+u_t \quad \ldots (3)$$

The Augmented Dicky Fuller (ADF) test under the null of non stationarity can be conducted to test whether a given series is stationary or not. This test is conducted by augmenting either of the above three equations by adding the lagged value of the dependent variable ΔYt. Thus each of the above equation will be as follows:-

$$\Delta Yt=\delta Y_{t-1}+\alpha_i \sum_{i=1}^{m} \Delta Y_{t-i}+et \quad \ldots (4)$$

$$\Delta Yt=\beta_1+\delta Y_{t-1}+\alpha_i \sum_{i=1}^{m} \Delta Y_{t-i}+et \quad \ldots (5)$$

$$\Delta Yt=\beta_1+\beta_2 t+\delta Y_{t-1}+\alpha_i \sum_{i=1}^{m} \Delta Y_{t-i}+ et \quad \ldots (6)$$

Where $e_t$ is a pure white noise error, and the number of lagged difference term to include is determined empirically (Gujarati, 2005). In each of the above equations if δ=0 the series is non stationary. The Dicky Fuller tables can be used to test the significance of the hypothesis.

The Phillips-Perron Test (PP) uses non parametric statistical methods to take care of the serial correlation in the error terms instead of adding lagged difference terms.

Order of Integration

Having found unit roots, the order of integration becomes very significant. The order of integration of a time series implies, the number of times that the time- series has to be differenced to make it stationary.

## Cointegration

In case of non stationary data it is quite possible that there is a linear combination of integrated variables that is stationary; such variables are said to be cointegrated (Enders, 1995). It is important to note that the order of integration of all the variables in the cointegrated system has to be the same.

Two methods for testing for cointegration are popular in economic literature, they are:-

1. Engle Granger (1987) Method
2. Johansen and Juselius (1990) Method

The present study uses the Johanson's Methodology which is a maximum likelihood method for estimating cointegrating relation in multivariate systems. Thus, if the vector $y_t$ has n time series, each of which is I(1) and if the vector can be expressed as

$$y_t=\pi_1 y_{t-1}+\ldots.\pi_k y_{t-k}+\varepsilon_t \quad \ldots (7)$$

where, $\pi_1$ are NxN matrices of unknown constants and the error term $\varepsilon_t$ has the multivariate normal distribution N(0, Σ). The equation (7) can be converted into the following equation:-

$$\Delta y_t= \Gamma_1 \Delta y_{t-1}+\ldots.+ \Gamma_{k-1} \Delta y_{t-k+1}+\pi \Delta y_{t-k}+\varepsilon_t \quad \ldots (8)$$

The Johansen (1988) and Johansen and Juselius (1990), show that the rank r of π in the equation (8) is equal to the number of cointegrating vectors in the system (Nachane, 2006). Further, the π may be factorised as $\pi = \alpha\beta'$. Under the null hypothesis of no cointegration the hypothesis testing of the number of cointegrating vectors 'r' is done using two test statistics $\lambda_{max}$ and $\lambda_{trace}$ derived from β. Johansen and Juselius (1990), have provided the critical values of $\lambda_{max}$ and $\lambda_{trace}$ statistics. If the Test statistics is greater than the critical value at a significance level then the null hypothesis of r cointegrating vectors is rejected for the alternative hypothesis (Panda, 2008).

## Error Correction Model

Existence of a cointegrating vector among variables establishes a long run relationship among them. Engle and Granger (1987), showed that an equilibrium specification is missing when these cointegrated variables are represented in a Vector Autoregression specification, but when lagged disequilibrium terms are included as explanatory variables the model becomes well specified. The model is called an error correction model because it has a self-regulating mechanism whereby deviation from the long-term equilibrium is automatically corrected (Shivam & Jayadev, 2004).

## Vector Autoregression

VAR is useful in forecasting systems of interrelated time series and for analysing the dynamic impact of random disturbances on the system of variables. The VAR approach models every endogenous variable as a function of lagged values of all the endogenous variables in the system.

Impulse Response Functions (IRF) and Forecast Error Variance Decomposition (FEVD), are then estimated from the VAR system. The IRF trace the impact of one standard error change in the exogernous variable on the endogenous variable. The FEVD decomposes variations in an endogenous variable into component shocks giving information about the relative importance of each random shock to the variable. The FEVD tells us the proportion of movement in a sequence due to its "own" shocks versus the shocks due to other variables (Enders, 1995).

## 5. Results of Empirical Estimation

**Steps of Analysis:** The various steps of the present empirical analysis are as follows:-

i. Stationarity test of the variables using ADF test and PP test.

ii. Lag order selection of the cointegrated VAR system, using the AIC and SBC criteria.

iii. Testing for cointegration among the I(1) variables using the Johanson methodology.

iv. Estimating the ECM equation for CPI and the IRF and FEVD of the CPI.

**Step I**

From the table 2 below it is clear that all the variables under study are non stationary in level and stationary in first difference, i.e, their order of integration is 1.

**Table 2. Stationary Test Results**

| *VARIABLES* | *ADF (in level)* | *ADF (first difference)* | *PP Test* |
|---|---|---|---|
| Import Index (IMP) | -1.6608 | -6.736** | -1.830 |
| Reserve Money (RM) | -1.355 | -7.6751** | -2.320 |
| Consumer Price Index (CPI) | -0.7662 | -7.818** | -1.941 |
| Index of Industrial Production (IIP) | 0.05269 | -9.3131** | -0.0360 |

*Significant at 5% level and ** Significant at 1% level.

Since all the variables are found to be non-stationary in level using both the ADF test and the PP test, and are stationary in first difference, cointegrating relation can exist between the variables. Hence cointegration test has to be conducted on the data. However, before the test for cointegration, it is necessary to test for the lag order using the AIC and SBC criteria.

**Step II**

The lag order using the AIC and SBC criteria was found to be 3 (results not reported here).

**Step III**

Cointegration test using Johanson & Jesilus (1990) Method:-

From the table 3 it can be seen that a cointegrating relation does exist between the variables under study. The max and the trace statistics rejects the null of no cointegration at 95% significance level. Even the SBC is minimum at r = 1. Thus, the number of cointegrating vectors r = 1. This establishes a long run relationship between the variables under study.

**Step IV**

The cointegrated variables have an ECM according to the Granger representation theorem. The ECM results are reported in Table 4 .

**Table 3. Cointegration with no intercepts or trends in the VAR**

| **Cointegration LR Test Based on Maximal Eigenvalue of the Stochastic Matrix** | | | | |
|---|---|---|---|---|
| 65 observations from 1992Q2 to 2008Q2. Order of VAR = 3. | | | | |
| List of variables included in the cointegrating vector: RM IMP CPI IIP | | | | |
| List of eigenvalues in descending order: .56079 .15324 .059925 .0066324 | | | | |
| Null | Alternative | Statistic | 95% Critical Value | 90% Critical Value |
| r = 0 | r = 1 | 53.4799 | 23.9200 | 21.5800 |
| r<= 1 | r = 2 | 10.8122 | 17.6800 | 15.5700 |
| r<= 2 | r = 3 | 4.0167 | 11.0300 | 9.2800 |
| r<= 3 | r = 4 | .43254 | 4.1600 | 3.0400 |
| **Cointegration with no intercepts or trends in the VAR**<br>**Cointegration LR Test Based on Trace of the Stochastic Matrix** | | | | |
| Null | Alternative | Statistic | 95% Critical Value | 90% Critical Value |
| r = 0 | r>= 1 | 68.7414 | 39.8100 | 36.6900 |
| r<= 1 | r>= 2 | 15.2615 | 24.0500 | 21.4600 |
| r<= 2 | r>= 3 | 4.4493 | 12.3600 | 10.2500 |
| r<= 3 | r = 4 | .43254 | 4.1600 | 3.0400 |
| **Cointegration with no intercepts or trends in the VAR**<br>**Choice of the Number of Cointegrating Relations Using Model Selection Criteria** | | | | |
| Rank | Maximized LL | AIC | SBC | HQC |
| r = 0 | -1219.3 | -1251.3 | -1286.1 | -1265.0 |
| r = 1 | -1192.6 | -1231.6 | -1274.0 | -1248.3 |
| r = 2 | -1187.2 | -1231.2 | -1279.0 | -1250.0 |
| r = 3 | -1185.1 | -1232.1 | -1283.2 | -1252.3 |
| r = 4 | -1184.9 | -1232.9 | -1285.1 | -1253.5 |

AIC = Akaike Information Criterion SBC = Schwarz Bayesian Criterion HQC = Hannan-Quinn Criterion

**Table 4. ECM for variable CPI estimated by OLS based on cointegrating VAR(3)**

| Dependent variable is dCPI<br>65 observations used for estimation from 1992Q2 to 2008Q2 | | | |
|---|---|---|---|
| Regressor | Coefficient | Standard Error | T-Ratio[Prob] |
| dX11 | -.011651 | .0066036 | -1.7643[.083] |
| dX21 | .0012339 | .0045583 | .27068[.788] |
| dX31 | .093355 | .12609 | .74040[.462] |
| dX41 | -.19212 | .13248 | -1.4502[.153] |
| dX12 | -.0045410 | .0083651 | -.54285[.589] |
| dX22 | .0066397 | .0051293 | 1.2945[.201] |
| dX32 | -.14726 | .11323 | -1.3005[.199] |
| dX42 | .065569 | .13648 | .48043[.633] |
| ecm1(-1) | -.0058455 | .0013413 | -4.3582[.000] |
| List of additional temporary variables created:<br>dX3 = X3-X3(-1)<br>dX11 = X1(-1)-X1(-2)<br>dX21 = X2(-1)-X2(-2)<br>dX31 = X3(-1)-X3(-2)<br>dX41 = X4(-1)-X4(-2)<br>dX12 = X1(-2)-X1(-3)<br>dX22 = X2(-2)-X2(-3)<br>dX32 = X3(-2)-X3(-3)<br>dX42 = X4(-2)-X4(-3)<br>ecm1 = 1.0000*X1 + .65447*X2 + 15.1033*X3 -64.9285*X4 | | | |
| F-stat. F( 8, 56) 4.3632[.000] | | DW-statistic 1.9676 | |

(X1 = RM, X2 = IMP, X3 = CPI and X4 = IIP above)

The ECM equation of CPI is as follows:-

$$\Delta\mathrm{CPI}_t = -0.0058455\,\mathrm{Z}_{t-1} - 0.011651\Delta RM_{(t-1)} + 0.0012339\Delta IMP_{(t-1)} + 0.093355\Delta CPI_{(t-1)} - 0.19212\Delta\mathrm{IIP}_{(t-1)} - 0.0045410\Delta\mathrm{RM}_{(t-2)} + 0.0066397\Delta\mathrm{IMP}_{(t-2)} - 0.14726\Delta\mathrm{CPI}_{(t-2)} + 0.065569\Delta IIP_{(t-2)} + \mathrm{u}_t \quad \ldots (9)$$

The equation number (9) represents the ECM equation of CPI. The F test shows that the equation is highly significant. Since the DW statistics is 1.9676 there is no problem of serial correlation among the disturbance terms. The disturbance terms are normally distributed. This is clear from the plot of the residuals below.

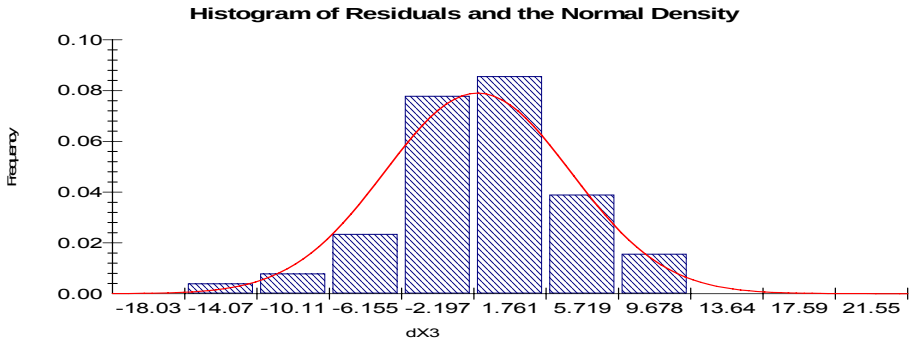


**Figure 1**

From the Figure 1 above it is clear that the plot of residuals has a normal distribution. The structural stability of the model can be studied by estimating the CUSUM (Cumulative Sum of Squares) recursive residual test of the variables. The Figure 2 below plots the CUSUM recursive residuals of the equation. If the residuals deviate within 5% critical region the equation is said to be structurally stable. In the Figure 2 the structural stability of the present equation is evident. The residuals lie within the 5% critical region, indicated by the critical bounds.

The ECM equation shows the short term and long term relationship among the variables (Bishnoi and Koirala, 2004). The Table 4 exhibits the temporal causality between the CPI and the past trend in other variables in the system. The coefficient of ECM reflects the self correcting dynamic mechanism. The sign of ECM is negative and the speed of adjustment or the coefficient of ECM is highly significant with a p-value of 0.000. Which implies that the current changes in CPI adjusts to past trends and policy fundamentals. The value of ECM gives the extent of correction in the next time period. It is important to note that the cointegrating vectors were normalised by assuming A1 = one, where A1 is the cointegrating vector of the variable RM. The coefficient of ECM is less than 1; this imparts stability into the system.

It is thus clear from the cointegration results that a long term relationship exists between the CPI and the other three variables. The ECM covers for the short run dynamics between the variables. As a result, these variables can be analysed in a Cointegrated Vector Autoregression (CVAR) frame work. The Impulse Response Functions (IRF) from the CVAR can trace out impact of one standard error change on the other variables in the CVAR system on the CPI. The

IRF in figure 3 shows that the peak of the impact of a shock to the CPI is felt after three time horizons i.e after 12 months. After this, the impact gradually wanes away.

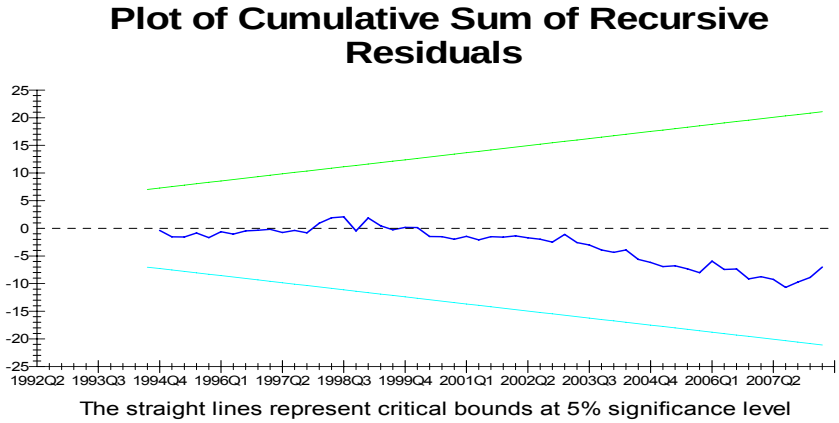


**Figure 2**

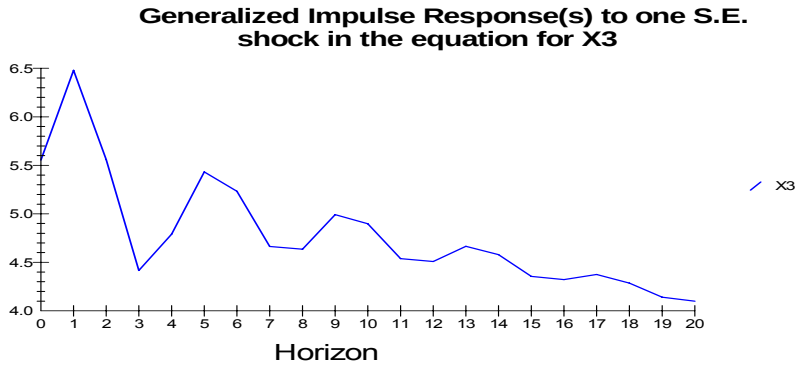


**Figure 3**

The FEVD, can also be calculated for the CVAR system. The table 5 gives the FEVD of the CPI. It can be seen that the most prominent impact on the CPI comes from the IIP. The impact of the IIP is long lasting and it is clear that after around 10 time horizons 50% of the impact comes from the IIP. The RM also influences the CPI but to a very small extent. Roughly around 3-4% variation in the CPI is felt due to the RM for about 2-3 time horizons, though the percentage variation due to RM is very small the impact last for around a year. The variation in the CPI due to imports is very small. But the impact of changes in imports is felt immediately. But after three time horizons its impact starts fading away.

**Table 5. Generalized Forecast Error Variance Decomposition for variable X3. Cointegration with no intercepts or trends in the VAR**

| 65 observations from 1992Q2 to 2008Q2. Order of VAR = 3, chosen r =1. | | | | |
|---|---|---|---|---|
| List of variables included in the cointegrating vector: RM IMP CPI IIP<br>List of imposed restrictions:<br>A1 = 1 | | | | |
| Horizon | RM | IMP | CPI | IIP |
| 0 | .16260 | .0092349 | 1.00000 | .2556E-3 |
| 1 | .28755 | .030529 | .95061 | .1490E-3 |
| 2 | .23684 | .030183 | .88859 | .056152 |
| 3 | .18449 | .023335 | .81475 | .13840 |
| 4 | .15219 | .021101 | .77165 | .18178 |
| 5 | .12995 | .017201 | .72647 | .22531 |
| 6 | .10478 | .014750 | .65962 | .29238 |
| 7 | .085125 | .012602 | .59027 | .36700 |
| 8 | .070541 | .012109 | .53302 | .42674 |
| 9 | .058119 | .010098 | .48333 | .47765 |
| 10 | .048755 | .0083783 | .43286 | .53061 |

## 6. Conclusion

Based on the results given above it can be concluded that:

a. The existence of cointegrating relationship between the variables reveals a long run relation between them. This clearly implies that the CPI is influenced by the IIP, RM and IMP.

b. The ECM equation is highly significant. This implies that the CPI adjusts to past period trend and lags in other variables. So also it responds to past policy fundamentals.

c. The IRF shows that the response to shock by the CPI equation is felt after around 12 months. This implies that the CPI responds to shocks after a lag.

d. The FEVD of CPI throws very crucial light on the determinants of inflation in India. Money supply does influence the inflation, but the impact is short lived. The impact on inflation due to the external sector is also very immediate but short lived. The most significant impact on inflation comes via the IIP.

From the above analysis, it can be concluded that the Indian inflation is majorly a demand pull inflation. This is because both the money supply and the IIP represent the existing demand in the economy. However, the supply side factors which come via the imports also influence the inflation in the short run. Moreover, the short duration impact of the Imports shows that the external factors are not the major factors influencing the inflation. This implies that our hypothesis, that inflation in India in the post liberalisation era is due to external factors is incomplete. As a result the stabilisation policies should be proactive by focusing on the demand management policies on a long term basis, and supply management policies keeping in mind their short term impact on inflation. Considering the lag in the impact of IIP, such stabilisation policies will be perfect.

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