DOI: 10.20472/EFC.2022.016.005

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COST-PUSH AND DEMAND-PULL INFLATION IN INDIA – A FREQUENCY DOMAIN ANALYSIS

Abstract:

The study checks for causal effects of supply-side and demand-side instruments on domestic inflation in the frequency domain for India. The representatives for the cost push and demand pull factors for the study are international energy prices and domestic food prices (cost push) and output gap (demand pull). Domestic food price is found not to cause core inflation in the bivariate spectral method however in a multivariate framework there is significant causal effect. International energy price is found to cause core inflation only in the long run but output gap causes core inflation in the short run mostly. This signifies the differences in the supply side and demand side transmission mechanisms for causing inflation. The policy implications of the results show that a rise in the cost push inflation should be targeted with a long run perspective in mind, while inflation caused through demand pull channel should receive more attention in the short run.

Keywords:

Inflation, Causality, Spectral analysis, Frequency-domain analysis, Policy-making, Long-run, Short-run

JEL Classification: C32, C49, E00

 ISBN 978-80-7668-007-4, IISES

I. Introduction:

Inflation has been one of the main points of interest to policy makers due to the fact that it eats away purchasing power, raises cost of living and lowers the real value of saving making it one of the most closely monitored macroeconomic indicators of any economy.

During 2000 to 2007, India has fared comparatively well with respect to its inflation figures vis-à-vis other countries. India's average inflation (WPI 5.2% and CPI-IW 4.6%) has been below the average of emerging and developing economies (6.7%). In 2008-09 inflation went up to 8.1% and had remained in double digits during 2010-11 and 2011-12 (Mohanty, 2013).

The indices that are most widely used in India to measure inflation are the Wholesale Price Index (WPI) and four measures of Consumer Price Index (CPI). As per the methodology adopted by the Office of Economic Adviser, Ministry of Commerce and Industry, Government of India to compute the two indices, the WPI and CPI vary widely with respect to their composition. However, the WPI has a more comprehensive and economy-wide coverage and the weights in the commodity basket are based on the value of quantities traded in the domestic market (Statistical Yearbook 2011, Ministry of Statistics and Programme Implementation (MOSPI)).The WPI has also proved to be a comparatively more real-time indicator of inflation than the CPI (CPI has been tagged as the 'lagging indicator' of inflation). The study hence uses WPI to represent inflation for the causality analysis.

A commonly used way to analyse inflation data is to use the 'core inflation' instead of the headline inflation. Within WPI, non-food manufactured inflation is considered as core inflation which is a measure of inflation excluding the volatile components of food and energy prices. Including food and energy prices may misguide the representations as it may seem that overall prices are increasing or decreasing more rapidly than they actually are. According to Motley (1997) "although these prices have substantial effects on the overall index, they often are quickly reversed and so do not require a monetary policy response". Hence the current study uses core inflation for the analysis.

According to the Statistical Yearbook 2011 of the Ministry of Statistics and Programme Implementation (MOSPI), the main reasons for the consistent rise in inflation are crude oil, global commodity price trends (due to increased deregulation and liberalization) and exchange rate changes. The demand for food products have been seen to increase even though the production has remained stagnant. With rise in per capita income, protein based food products have been gaining on its demand. Strong demand factors in periods of high inflation and low supply elasticities, have led to further rise in inflation. NSSO 68th Round survey shows per capita consumption expenditure has increased in both rural (average 1.4% during 2004-09 to 8.7% during 2009-12) and urban (2.4% to 6.7% for the same period) areas of the country. High food prices have been followed by subsequent rises in nominal wages which led to higher consumption demand. Moderation in the recent inflation is attributable to lowering inflation of non-food articles, non-administered petroleum products (leading to a moderation of inflation in fuel and power sectors) and manufactured products.

The study is divided into the following sections – Section II: Literature Review - discusses the existing literature on effects of energy prices, food prices and output gap on inflation; Section III: Data and Methodology – reports the sources of the data and computations along with the statistical tools used; Section IV: Results - reports the findings of the study; Section V: Conclusion - concludes by discussing the significance and policy implications of the results.

II. Literature Review

The mixed results depicted by existing studies for India and otherwise for causality of inflation through international energy prices, food prices and output gap, in particular, are discussed in this section.

Darbha and Patel (2012) in their paper titled "Dynamics of Inflation 'Herding': Decoding India's Inflationary Process", show the evolution of empirical properties of the Indian inflationary dynamics (time series and cross-sectional) with disaggregated sector prices. The study finds widespread diffusion of inflation across sectors. An analysis of the common and specific factors has revealed that the former has become more persistent. This study mainly triggers the motivation for the current study. The specific factors in the form of demand side pressures through output gap variable and supply side cost push through international energy prices and domestic food prices along with their effects on inflation are the concerns of the study.

Evidence for output gap and inflation relation:

Tiwari (2013) used wavelet transform methods to understand the relationship between output gap and inflation for France. The approach measured the co-movement of the two series in the context of both time and frequencies. The study finds that the output gap is able to predict the inflation dynamics in the short and medium runs and that "in a discrete wavelet framework, the short and medium term fluctuations of both variables are more closely correlated, whereas the continuous wavelet analysis states that the output gap leads inflation in short and medium runs".

Evidence from India

Callen and Chang (1999) suggest that output gap does not explain inflation significantly in India. The study assesses the timely and reliable predictability of various potential indicators for future inflation through a model of inflation and by estimating a series of bivariate VARs. The results show that while developing an accurate model of inflation, extreme difficulties are posed by swings (or volatility) in the prices of primary products and by changes in administered prices. The study also shows that modeling inflation based on output gap does not predict inflation efficiently with Indian data.The study uses the manufacturing subcomponent of the WPI as a measure of core inflation. The authors suggest developing a measure of core inflation excluding the items that contribute to the volatility by the central bank as this entity is expected to provide better understanding of the underlying developments of inflation in the economy and would in turn help in conducting monetary policy more effectively. The results show important linkages that exist between developments in the primary sector and other areas of the economy, and emphasizes the fact that the RBI needs to take this into account while framing policies.

Virmani (2004) estimates output gap for the Indian economy with the help of quarterly data from 1983 to 2001 on output series. He regresses inflation on output gap and finds that inflation decreases with rise in output gap.

Manoj Kumar (2012) finds that the output gap ratio Granger causes inflation but inflation does not Granger cause output gap ratio in the Indian macro economy. Thus, there is only a unidirectional causation.

Evidence for food prices and inflation relation:

Blinder (1979) estimated the effect of food price on inflation for the period of 1973 to 1975. Blinder (1982) notes that it is safe to believe that rise in food price leads to higher wage which eventually result in a wage-price spiral which subsequently leads to a rise in overall prices.

An IMF report in 2007 claims that, in the emerging economies the higher growth in inflation is partly due to the larger share of food in the consumption basket for countries with lower per capita income.

Cecchetti and Moessner (2008) take a cue from the strong rises in commodity prices till mid 2008 that led to rising inflation across the world. The authors study the effect of food price and energy price on headline inflation with CPI inflation and its food and energy components for developed and emerging economies.

Evidence for energy and inflation relation:

The studies of Pierce and Enzler (1974), Rasche and Tatom (1977), Mork and Hall (1980), and Darby (1982) documented and explained the inverse relationship between oil price increases and aggregate economic activity. Studies such as Gisser and Goodwin (1986) and the Energy Modeling Forum-7 study documented in Hickman et al. (1987) confirmed the inverse relationship between oil prices and aggregate economic activity for the United States. Darby (1982), Burbidge and Harrison (1984), and Bruno and Sachs (1981, 1985) documented similar oil-price-economy relationships for countries other than the United States.

Hudson (1981) studied the phenomenon of energy price decontrol in the United States in terms of its energy and economic effects. According to the study, decontrol stimulates some increase in oil and gas supply together with a substantial reduction in demand. Decontrol affects real economic performance through several mechanisms - adjustments related to energy supply expansion and international trade tend to increase productivity while adjustments related to energy demand reduction lower productivity. Through a quantitative analysis of decontrol, Hudson was able to show that real economic growth is likely to be increased as a result of decontrol with the international trade effect being the dominant mechanism underlying these gains.

Rehman (1982) develops a model of interdependence between energy and the macro-economy and estimates the same for several South Asian economies. The generalization of the model ensures that it can be applied to a wide range of developing countries that are majorly dependent on oil. The econometric estimation of the model for the Indian economy reveals that primary energy demand is price responsive.

Hamilton (1983) extended the analysis to show that all but one of the post-World-War-II recessions were preceded by rising oil prices (lag of three-fourths of a year), and that other business cycle variables could not account for the recessions. This does not necessarily mean that oil shocks were the reason for these recessions. Hamilton presented evidence that even over the period 1948-72 this correlation is statistically significant and non-spurious, supporting the proposition that oil shocks were a contributing factor in at least some of the U.S. recessions prior to 1972. By extension, energy price rises may account for much of post-OPEC macroeconomic performance. The author goes on to note that there is little support for the proposition that over the period 1948-72 some third set of influences was responsible for both the oil price increases and the subsequent recessions. None of the six variables in Sims's (1980) macroeconomic system, singly or collectively, exhibited any unusual behavior in the year prior to the oil price increases that could have been used statistically to predict the oil price episodes, and only import prices, which one might have expected to be the series least indicative of endogenous business conditions, were statistically informative about future oil prices based on 8-quarter lags. He observed that (a) this latter correlation seems to be attributable precisely to that component of import price changes that would not have been predicted on the basis of' previous changes in U.S. output, prices, or money growth rates; (b) it is in fact those oil price changes that would not have been predicted on the basis of previous import price changes that are statistically informative about future output; and (c) import prices could not by themselves have been used to predict the subsequent economic downturns. Moreover, the conclusion that import prices over the period 1948-72 were statistically informative about future oil prices was not found to be robust with respect to an alternative specification that perhaps relies on more realistic distributional assumptions. If' some third macroeconomic variable was in fact responsible for both the oil price increases and the subsequent recessions, its effect is not apparent in this small version of the macro economy.

Nguyen, Cavoli and Wilson (2012) employ a simple macroeconomic model of inflation to empirically investigate the determinants of CPI inflation for Vietnam over the period 2001 to 2009. The study examined the role of supply side factors such as the prices of crude oil and rice on inflation, among other variables. Using a range of time series estimation techniques, they find that persistence in inflation and that the money supply, oil prices and rice prices had strongest effects on inflation.

Rehman (2014) notes that monetary policy tools such as money supply and interest rate have been the most popular instruments to control inflation around the world. A tight monetary policy would either result in reduction in money supply or an increase in interest rate, which will reduce inflation by reducing aggregate demand in an economy. The authors argue that monetary policy could be counterproductive if cost side effects of monetary tightening prevail. High energy prices may lead to an increase in the cost of production by reducing aggregate supply in the economy. If tight monetary policy is used to reduce this cost push inflation, the cost side effect of energy prices will add to cost side effects of monetary tightening and will become dominant. The monetary policy could then turn out to be futile. Furthermore, simultaneous reduction in aggregate supply and aggregate demand will bring twofold reduction in output. The findings for the chosen South Asian economies suggest that both monetary policy and oil prices have cost side effects on inflation and monetary tightening could be counterproductive if used to reduce energy pushed inflationary trend.

The International Monetary Fund (IMF) had cited demand side explanation for the growing inflationary pressure in Emerging Market Economies (EMEs) in 2011. On the other hand, they attributed global inflationary pressure to supply-side factors like rising input prices – mainly oil and metals. Higher commodity prices can cause both a reduction in real output and a cost push inflation. The oil price shocks in the 1970s were a major source of inflationary pressure in the global economy.

Evidence from India

Mallik (2009) studies the inter linkages between energy and growth for the Indian economy between 1970–71 and 2004–05. None of the components of energy is found to significantly influence the two components of economic growth viz. private consumption and investment. In contrast, the variance decomposition analysis of Vector Autoregression (VAR) depicts the possibility of a bidirectional influence between electricity consumption and economic growth. Therefore, the study yields mixed and contradictory result compared to the previous studies in the Indian context.

Hatekar, Sharma & Kulkarni (2011) find that the IMF's argument of overheating is relevant only in the short run in the Indian context. However, the RBI's concern about rising international commodity prices seems to be more relevant in driving domestic inflation over the business cycle in the long run.

These studies generate various competing hypotheses that have strong policy focus:

1. The relation between food prices, rural incomes, shifts in dietary patterns and supply chain infrastructure
2. The relation between aggregate demand and inflation
3. The relationship between international prices of energy and other inputs and their inflationary impact.

Hence, it is important to check for causal effects of supply side instruments and demand side instruments that may affect domestic inflation in the frequency domain rather than just the time domain. Though some of the studies have looked into the effects of the three said variables on inflation under various circumstances, none of them concentrate on the cyclical effects at all. The present study checks for evidence of causal effect of international energy prices and domestic food prices (representative for the cost push factor) and output gap (representative for the demand pull factor)on domestic core inflation in the frequency domain so that a better understanding can be provided about the business cycle nature of these two mechanisms. Though international energy prices alone would have served as a sufficient representative for the cost push factor in developed economies, India being an emerging economy, the pass through from international to domestic prices may not be swift and significant. Hence, the study takes into consideration domestic food prices along with international energy prices to represent the cost push aspect of inflation. The study may have been more insightful with the inclusion of inflation expectations but the same could not be incorporated as the availability of data for inflation expectations is only from 2010 and the current study checks causal relations from 2000.

III. Data and Methodology:

Data:

The data for the study is monthly WPI from January 2000 to April 2014 (172 months). The data was obtained from the Office of the Economic Adviser. Data till 2004 was reported with respect to 1993-94 as the base year and that from 2004-2014 is available with 2004-05 as the base year. These two series have been linked using the linking factor as obtained from the Office of Economic Adviser (WPI Compilation Manual, 2004). The food component was culled out to represent the domestic food price index. The core inflation was calculated from non-food and non-energy WPI. The weights of the two base years being different, average of the same was considered for computation of the core inflation as well as food inflation.

Data for monthly international energy prices for the same period was obtained from Federal Reserve Economic Data (FRED) with a base year of 2004-05.

The monthly IIP data was collected from Ministry of Statistics and Planning of India (MOSPI) and linked to the base year of 2004-05 for further calculations of the various output gaps. The variable output gap was calculated by applying the Hodrick-Prescott filter (Hodrick and Prescott 1997), Baxter King filter (Baxter and King 1999), Butterworth filter (Pollock 2000) and Christiano and Fitzgerald filter (Christiano and Fitzgerald 2003)using the actual output data (monthly index of industrial production IIP) to decompose the data into its trend and shock components. The difference between the actual output from the trend is then calculated, which serves as a measure of the output gap. The Hodrick-Prescott λ was set equal to 1,29,600 as per the suggestions of Ravn and Uhlig (2002) for monthly data.

Logarithmic transformations of the variables were used for the analysis other than output gap.

Methodology:

Many economic variables display some kind of seasonality. Forecasts made by ignoring such patterns may lead to high variances. To test for the presence of seasonal unit roots, the study has applied the Hylleberg, Engle, Granger, and Yoo (henceforth, HEGY) test (1990).

The data is filtered through ARIMA models and the residuals from the models are used to estimate the spectra and the cross spectra for the frequency domain analysis.

With the residual data, spectra were calculated for the individual series followed by co-spectrum and quadrature. Cross-spectrum was calculated with the help of co-spectrum and quadrature. Finally the coherence was calculated for various cycles.

The bivariate Granger Causality (GC) test over the spectrum as proposed by Lemmens et al (2008) is followed here. Let X_t and Y_t be two stationary time series of length T. The goal is to test whether X_t Granger causes Y_t at a given frequency λ. Pierce's measure for GC (Pierce 1979) in the frequency- domain is performed on the univariate innovations series, u_t and v_t, derived from filtering the X_t and Y_t as univariate ARMA processes.

The idea of the spectral representation is that each time series may be decomposed into a sum of uncorrelated components, each related to a particular frequency λ. The spectrum can be interpreted as a decomposition of the series variance by frequency. The portion of variance of the series occurring between any two frequencies is given by area under the spectrum between those two frequencies. In other words, the area under $S_u(\lambda)$ and $S_v(\lambda)$ between any two frequencies λ and λ + d λ, gives the portion of variance of u_t and v_t respectively, due to cyclical components in the frequency band (λ, λ + d λ).

The cross spectrum represents the cross covariogram of two series in frequency-domain. It allows determining the relationship between two time series as a function of frequency.

The cospectrum and quadrature spectrum are respectively, the real and imaginary parts of the cross-spectrum. The cospectrumQ_{uv} (λ) between two series u_t and v_t at frequency λ can be interpreted as the covariance between two series u_t and v_t that is attributable to cycles with frequency λ. The quadrature spectrum looks for evidence of out-of-phase cycles (Hamilton 1994: 274). This cross-spectrum allows us to compute the coefficient of coherence h_{uv} (λ). Coherence can be interpreted as the absolute value of a frequency specific correlation coefficient. The squared coefficient of coherence has an interpretation similar to the R-square in a regression context. Coherence thus takes values between 0 and 1. Lemmens et al (2008) have shown that, under the null hypothesis that $h_{uv}(\lambda) = 0$, the estimated squared coefficient of coherence at frequency λ, with $0 < \lambda < \pi$ when appropriately rescaled, converges to a chi squared distribution with 2 degrees of freedom, denoted by χ^2_2. The coefficient of coherence gives a measure of the strength of the linear association between two time series, frequency by frequency, but does not provide any information on the direction of the relationship between two processes. Lemmens et al (2008) have decomposed the cross-spectrum into three parts: (i) the instantaneous relationship between u_t and v_t; (ii) the directional relationship between v_t and lagged values of u_t; and (iii) the directional relationship between u_t and lagged values of v_t. The goal is to test the predictive content of u_t relative to v_t.

The Granger coefficient of coherence is then computed and tested for statistical significance of causality.

For multivariate causality two tests are used in the study –an F-type Granger-causality test followed by a Wald-type (testing for nonzero correlation between the error processes of the cause and effect variables). For both tests the vector of endogenous variables Y_t is split into two sub-vectors Y_{1t} and Y_{2t} with dimensions $(K_1 \times 1)$ and $(K_2 \times 1)$ with $K = K_1 + K_2$. The null hypothesis being tested here is that the sub-vector Y_{1t} does not Granger-cause Y_{2t}. The test statistic is distributed as $F(pK_1K_2, KT - n^*)$, with n^* equal to the total number of parameters in the VAR(p). The null hypothesis for instantaneous causality is defined as $H_0 : C\sigma = 0$, where C is a $(N \times K(K + 1)/2)$ matrix of rank N selecting the relevant co-variances of u_{1t} and u_{2t}; $\sigma = vech(\Sigma_u)$.The Wald test statistic asymptotically follows $\chi^2(N)$ distribution.

IV. Results

The HEGY test for seasonal unit roots was conducted where the null is H_0: There exists unit root. The results (test statistic and corresponding p-values) have been reported in the table below. The results show that output gap computed through HP, BK and CF filters and food prices have seasonal unit roots at some or all the of various frequencies. The rest of the variables in the study are found not to suffer from seasonality (table 1).

Seasonal Unit Root Test								
Frequency→ Variable ↓		**0**	**p**	**p/2**	**2p/3**	**p/3**	**5p/6**	**p/6**
lnCoreInflation	**Statistic**	-2.44	-2.79	7.31	6.27	8.6	4.46	4.74
	p-value	0.1	0.01**	0.01**	0.01**	0.01**	0.0111**	0.01**
lnIntEnergyP	**Statistic**	-2.11	-3.88	15.55	25.79	17.04	10.16	4.79
	p-value	0.1	0.01**	0.01**	0.01**	0.01**	0.01**	0.01**
GapHP	**Statistic**	-2.68	-0.58	0.32	0.62	0.04	0.38	0.35
	p-value	0.1	0.1	0.1	0.1	0.1	0.1	0.1
GapBK	**Statistic**	-3.01	-0.29	2.46	0.005	0.63	0.58	16.33
	p-value	0.1	0.1	0.088*	0.1	0.1	0.1	0.01**
GapBW	**Statistic**	-3.89	-2.75	8.55	6.21	11.71	2.42	12.77
	p-value	0.01**	0.01**	0.01**	0.01**	0.01**	0.09*	0.01**
GapCF	**Statistic**	-13.34	-1.05	2.29	0.16	2.22	0.74	173.31
	p-value	0.01**	0.1	0.1	0.1	0.1	0.1	0.01**

*, **, & *** show statistical significance at 10%, 5% & 1% level of significance

Source: Authors' Calculations

The variable exhibiting seasonality is seasonally differenced and the de-seasonalised data is used for further analysis.

The stationarised and deseasonalised data was filtered with ARIMA models and the residuals were collected for conducting the analysis for frequency wise causality.

The coherence for the two pairs of variables was calculated for all the frequencies/cycles. The smaller the frequencies, the larger the cycles; a smaller frequency value corresponds to a longer run or a business cycle while a larger value of the frequency corresponds to a shorter run. After all the adjustments there were 169 observations that were left with us. The results have been reported though the tables and the graphs. Band-pass filters, such as the Baxter-King (BK) and the Christiano–Fitzgerald (CF) filters, allow the components in the specified range of frequencies to pass through and they block all the other components. High-pass filters such as the Hodrick–Prescott (HP) and Butterworth filters, only allow the components of stochastic cycles at or above a specified frequency to pass through and they block the components corresponding to the lower-frequency stochastic cycles

i. IntEnergyP to Core

The causality running from international energy prices to domestic core inflation is statistically significant if the h-statistic is greater than the critical value at a particular frequency. The results show that core inflation is caused by international energy prices only in the long run and not in the short run (Fig. 1). Only for cycles of approximately 22 months and above does the causality turn out to be statistically significant. For any cycle lesser than that, international energy prices do not cause core inflation.

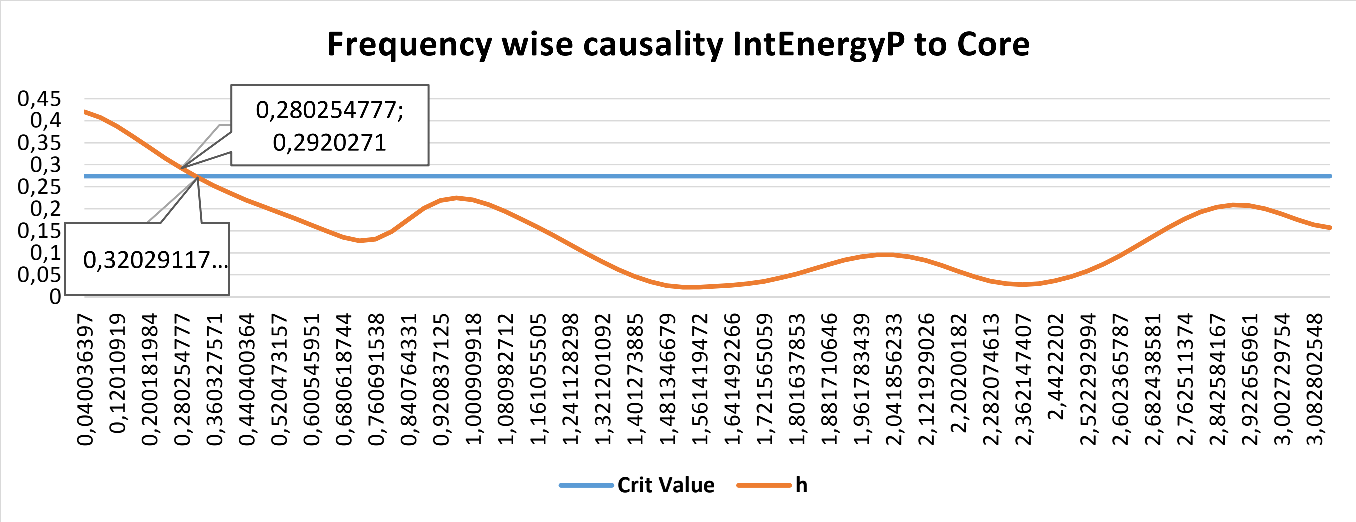

Fig. 1

Source: Authors' Calculations

ii. Food to Core

It is found that food prices do not cause core inflation at any frequency at all (Fig. 2). The h statistic is statistically insignificant for all the frequencies.

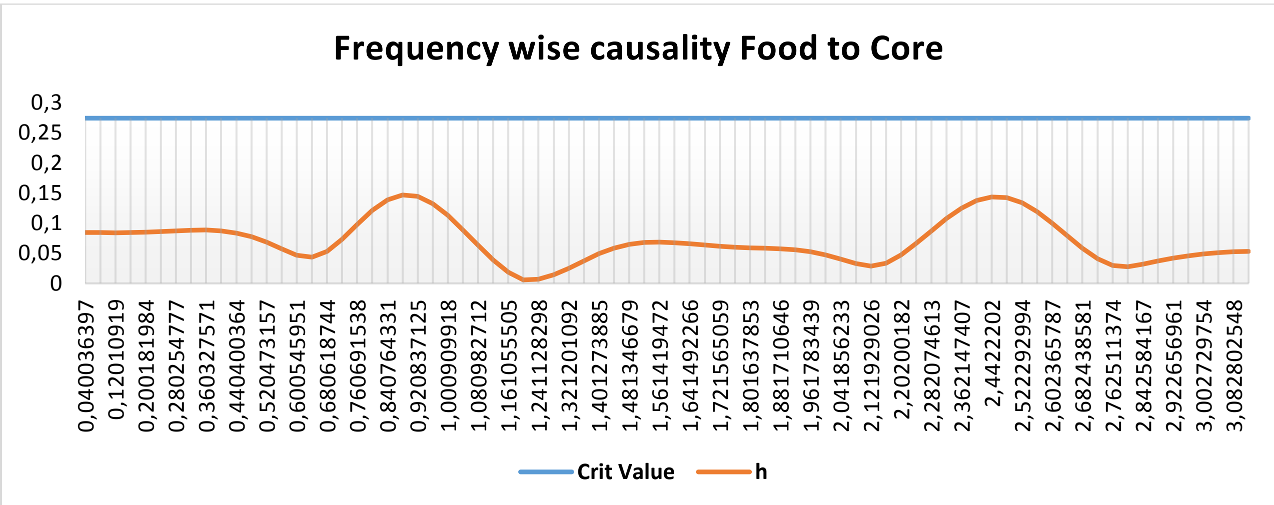

Fig. 2

Source: Authors' Calculations

iii. OutputGapHP to Core

Output gap from HP filter is seen to cause core inflation only in the short run and not in the long run (Fig. 3). Only for frequencies greater than 2.88 (which corresponds to 2 months' cycle) are the h-statistics greater than the critical value, i.e. the causality is statistically significant for cycles lesser than or equal to two months.

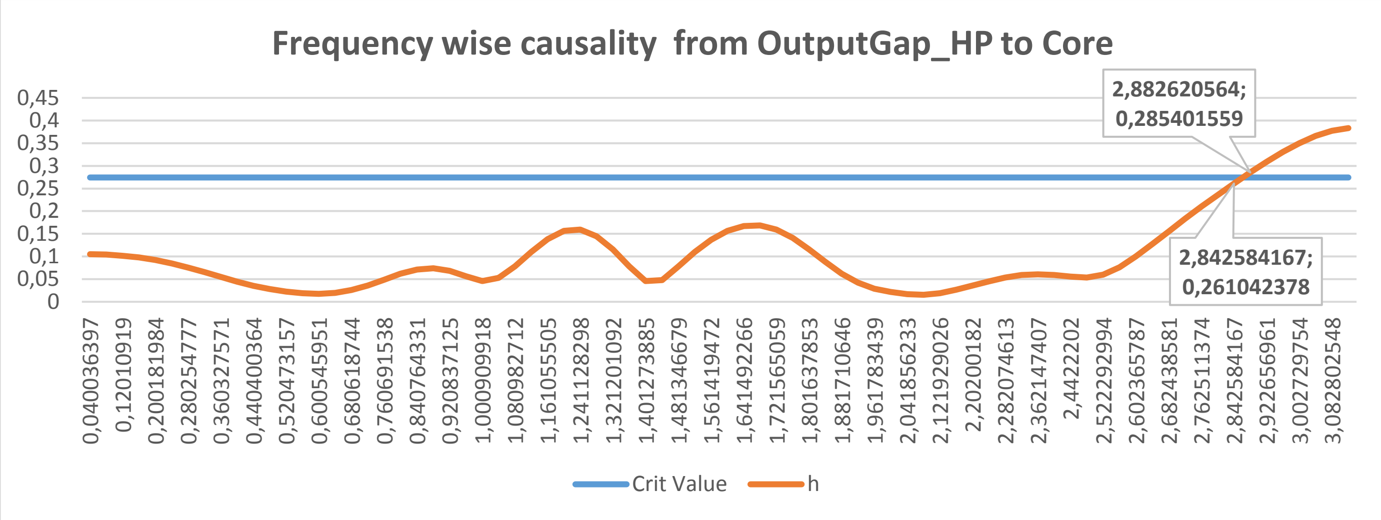

Fig. 3

Source: Authors' Calculations

iv. OutputGapBW to Core

Output gap received though BW filter is found to cause core inflation in the lower and medium frequencies (Fig. 4). Thus the causality effect is witnessed in the long run and in the medium run cycles. To be precise, significant causality is found to exist inthe following range of cycles – five to six months, seven and a half to nine and a half months and twenty-two to forty months.

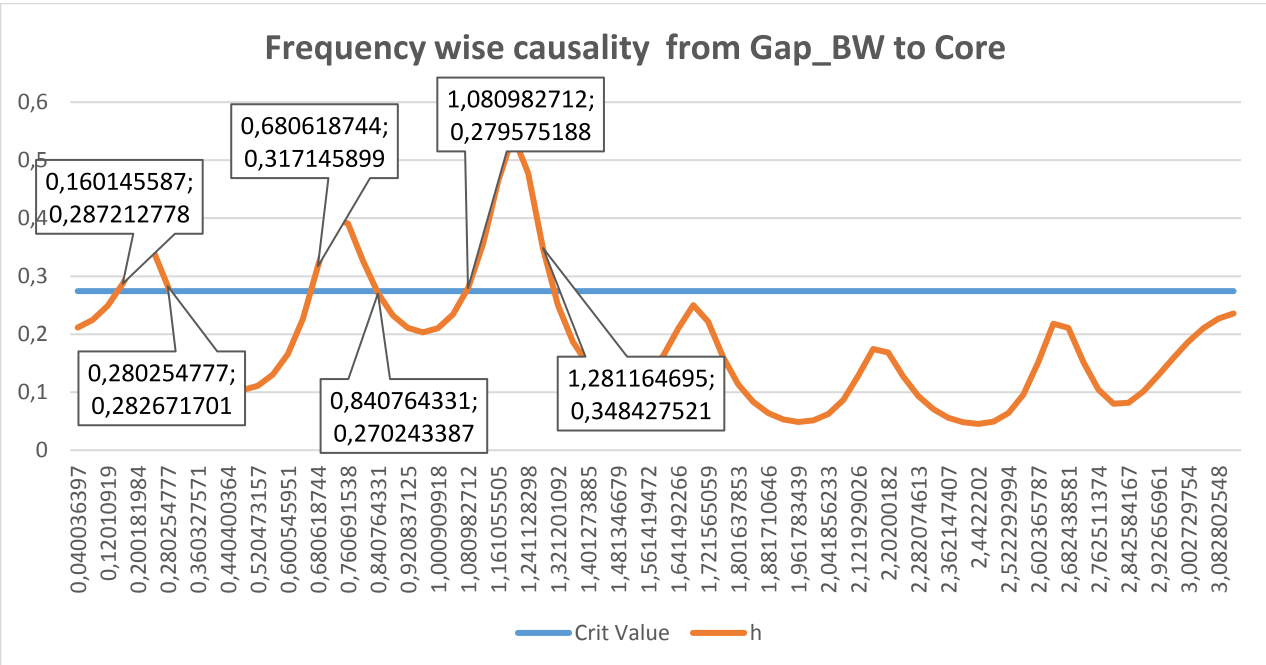

Fig. 4

Source: Authors' Calculations

v. OutputGapBK to Core

The output gap computed through the BK filter is found not to cause core inflation at any of the frequencies (Fig. 5).

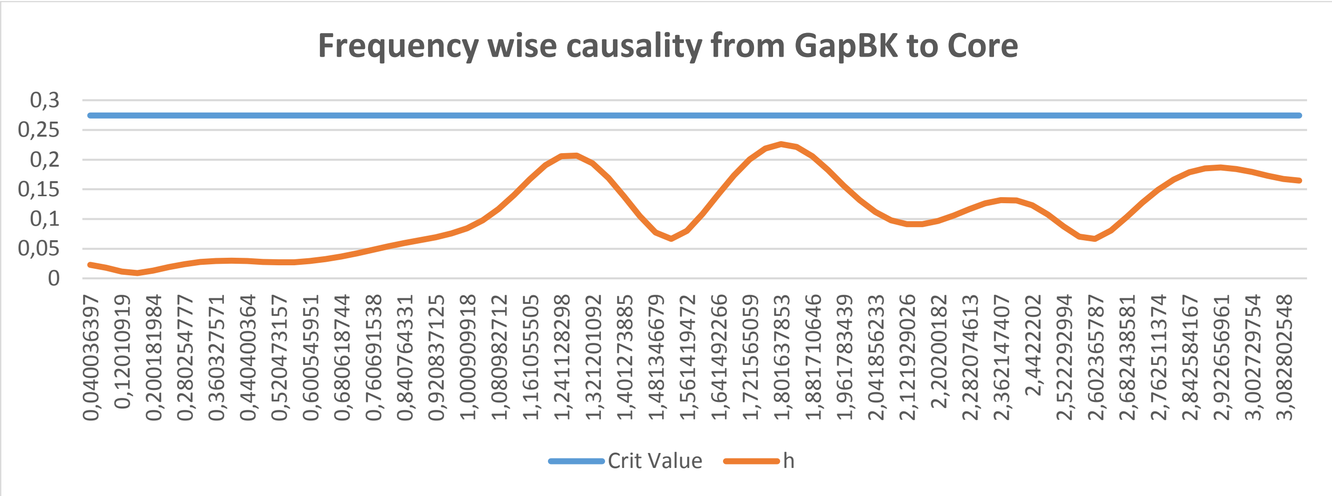

Fig. 5

Source: Authors' Calculations

vi. OutputGapCF to Core

Output gap computed through the CF filter is found to cause core inflation only for cycles of two months (Fig. 6). No medium or long run causality is displayed.

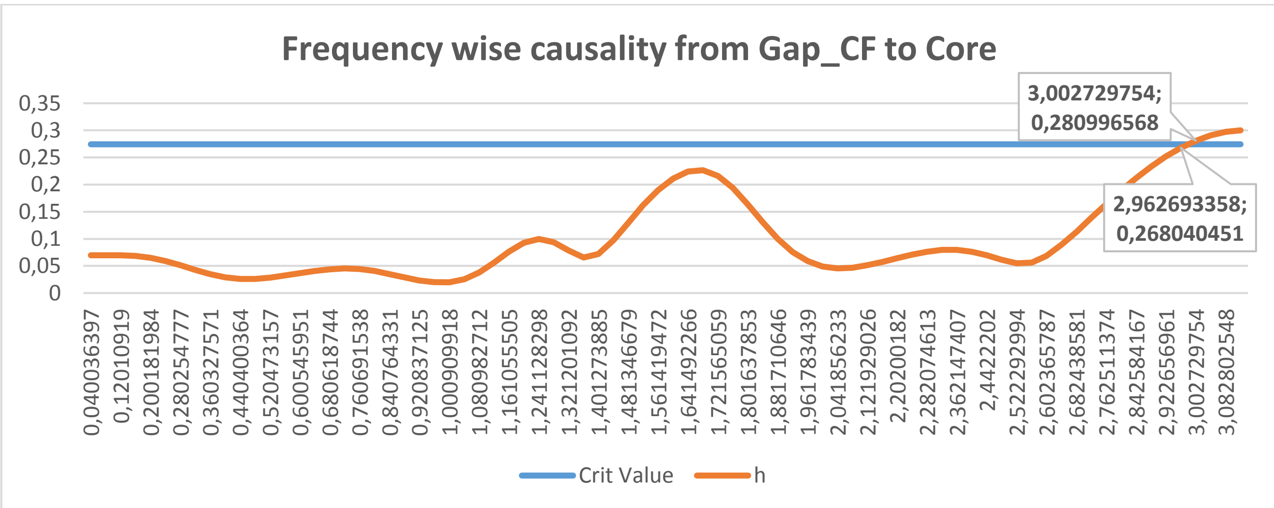

Fig. 6

Source: Authors' Calculations

 ISBN 978-80-7668-007-4, IISES

vii. Multivariate causality from food inflation

The table below shows the results for multivariate causality test for checking whether domestic food prices cause core inflation, international energy prices and output gap (since the bivariate results showed no evidence of causality). The results show that food prices cause core inflation, international energy prices and output gap in a multivariate framework (Table 2).

Table 2: Multivariate Causality(H_0: Food price doesn't cause the effect variables)

Causal Variable →	**Domestic Food Prices**	
Effect variables ↓	**Granger Causality**	**Instantaneous Causality**
	F - statistic	χ^2
Core Inflation, International Energy Prices, Output Gap HP	6.3527***	12.8497***
Core Inflation, International Energy Prices, Output Gap BK	6.2175***	0.6447
Core Inflation, International Energy Prices, Output Gap CF	5.0105***	0.7628

*, **, & *** show statistical significance at 10%, 5% & 1% level of significance

Source: Authors' Calculations

V. Conclusion:

The spectral or frequency domain analysis of causality for international energy prices, food prices and various measures of output gap towards core inflation help us detect causality (or non-causality) at various frequencies or cycles for the time frame considered for the study. The frequency domain representation provides further crucial insights into the causality relationships by breaking down the time domain representation into frequencies that enables us to identify the existing cyclical relationship, if any.

The results reveal that international energy prices cause core inflation only in the long run but two of the output gaps cause core inflation only in the short run, one of the measures of output gap does not cause core inflation at any frequency and one measure causes core inflation in two and seven month cycles, showing by and large, the short run nature of causality from output gap to inflation. Even though domestic food price is found not to cause core inflation at any frequency, the multivariate causality analysis shows that there is statistically significant causality running from food prices to core inflation, international energy prices and output gap measures. This signifies the differences in the supply side and demand side transmission mechanisms for causing inflation. International energy prices raise domestic cost of production which in turn may reduce incentives for producers to produce as much as they have been producing earlier. This leads to a fall in the supply of the economy as a whole, vis-à-vis the existing demand in the market. Rise in domestic food prices, in turn, leads to a rise in cost of consumption. As a result, prices go up. On the other hand, output gap, which is the difference of the actual production from the potential production level, is essentially an instrument to determine the extent of excess demand in the market. This excess demand forces market prices to rise, leading to inflation. Given this, it can be argued that international energy price and domestic food price are supply side variables and output gap is a demand side variable, while analysing their relationships with inflation. The above results allow us to argue that the supply side mechanism for causing inflation has significant effect only in the long run and not in the short run and the demand side mechanism works mostly in the short run. These insights may be able to assist policy-makers in designing more effective policies while trying to combat inflation both in long run and short run. With the knowledge of short run and long run effects of the demand and supply side forces on inflation, both the central bank as well as the Centre should be in a better position to frame more effective policies to curtail inflation as and when the necessity arises. A rise in the cost push inflation (through international energy prices and/or domestic food prices) should be targeted with a long run perspective in mind, while inflation caused through output gap channel (demand pull) should receive more attention in the short run.

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