SCHOLEDGE INTERNATIONAL JOURNAL OF MANAGEMENT & DEVELOPMENT
Vol.2, Issue 8 ISSN 2394-3378 Archives available at http://thescholedge.org

DETERMINANTS OF INFLATION IN INDIA: AN ECONOMETRIC ANALYSIS

Dr. SWAMI P SAXENA[1]

Ms. ARCHANA SINGH[2]

[1]Professor, Department of Applied Business Economics, Dayalbagh Educational Institute (Deemed University) Agra, India

[2]Research Scholar, Department of Applied Business Economics, Dayalbagh Educational Institute (Deemed University) Agra, India

ABSTRACT

Inflation is a continual increase in general price level of goods and services in an economy over a period of time. It is caused by many factors, important among them are excess of demand of goods and services over supply, macroeconomic performance, money supply, economic policies implications, environmental factors etc. A number of researchers in the past made attempts to identify determinants of inflation and to investigate the impact of identified variables on inflation in European and also in some Asian economies. But, in context of India, not many studies can be traced in the literature. The purpose of this paper is to shed some light on the impact of selected variables on inflation in India. The paper considers CPI (Consumer Price Index) inflation as dependent variable and a set of independent macroeconomic variables, which includes Gross Domestic Product, Money Supply, Deposit Rate, Prime Lending Rate, Exchange Rate, Trade Volume (Value of Imports and Exports) and Crude Oil Prices. The empirical analysis covers the quarterly data series for ten financial years from 2002Q1 to 2012Q1. The collected data is analyzed using ADF Unit root test, Granger Causality test, and the Ordinary Least Square (OLS) technique.

KEYWORDS: Inflation, Economic Growth, Trade Volume, Investment, OLS

JEL Classification Codes: E31, E32, E51

INTRODUCTION

Inflation is one is of the most dreaded and misunderstood economic phenomena. It is a persistent increase in general price level of goods and services in an economy over a period of time, thus reflects a decrease in the purchasing power or a loss in real value per unit of money within an economy. The most well known measures of inflation are the CPI, which measures consumer prices; and the GDP deflator, which measures inflation in the whole domestic economy. Macroeconomists believes that high rates of inflation are caused by an excessive growth of money supply and the price rise. But, in this era of globalization, effects of economic inflation cross borders and percolate both developed and developing countries. Whether it is due to increased money supply, or increasing fuel prices, or increase in demand, it is needless to emphasize, that the causes of today's inflation are complicated.

The level of inflation is an aspect of major concerns to government, businesses, and especially to individual consumers. Inflation management is one of the most difficult jobs an economic policymaker has to carry out. The goal of each and every Government is to maintain relatively stable and low levels of inflation. In India, the average inflation rate from 1969 to 2013 is measured at 7.73 percent with historical high of 34.68 Percent (September 1974) and a record low of -11.31 Percent (May 1976). The inflation rate in India measured by the Ministry of Commerce and Industry in August 2013 was 6.10 percent.

REVIEW OF LITERATURE

Liu and Adedeji (2000) studied the determinants of inflation in the Islamic Republic of Iran for data covering the period from 1989 to 1999. By applying Johansen co-integration test and vector error correction model, they concluded that lag value of money supply, monetary growth, four years previous expected rate of inflation are positively contributed towards inflation while two years previous value of exchange premium is negatively correlated with inflation. Mallik and Chowdhury (2001) examined the short-run and long-run dynamics of the relationship between inflation and economic growth for four South Asian economies: Bangladesh, India, Pakistan, and Sri Lanka. By applying co-integration and error correction models to the annual data retrieved from IMF, they found two motivating results, viz., the relationship between inflation and economic growth is positive and statistically significant for all four countries, and the sensitivity of growth to changes in inflation rates is smaller than that of inflation to changes in growth rates.

Faria and Carneiro (2001) examined the relationship between inflation and economic growth in Brazil. Using bivariate time series model on annual data for the period 1980 – 1995, they observed a short-run negative association between inflation and economic growth, but no association in long run. Nachane and Lakshmi (2002) in their study employed P-Star model of dynamics of inflation in India. The authors found that velocity in India is trend stationary. Using cointegration techniques, the paper explored possibilities to develop a model to gauge inflationary pressures in the economy. The model developed by authors' significantly outperformed seasonal ARMA benchmark model. John (2003) used post liberalisation data to study the causality between monetary aggregates and exchange rates. The paper employed VAR framework to find out as to which monetary aggregate explains the inflation in a better way. The authors observed that the explanatory power of selected variables in explaining inflation is not significantly high.

Srinivasan, Mahambare and Ramachandran (2006), estimated an augmented Phillips curve to examine the effect of supply shocks on inflation in India. In an OLS framework the authors found that supply shocks have only a transitory effect on both headline inflation and core inflation. Jan, Kalonji, and Miyajima (2008) used annual data to examine the determinants of inflation in Sierra Leone. They used a structural VAR approach to help forecast inflation for operational purposes. Andersson et al. (2009) analyzed the determinants of inflation differentials and price levels in the euro countries. Using dynamical panel analysis the researchers concluded that inflation differentials are primarily determined by cyclical positions and the inflation persistence. Kandil and Morsy (2009) also studied determinants of inflation with special reference to Gulf Cooperation Council (GCC) since 2003. Using an empirical model that included domestic and external factors, the authors found that inflation in major trading partners of GCC appears the most relevant to domestic inflation in GCC.

Kishor (2009) studied the role of real money gap and the deviation of real money balance from its long-run equilibrium level for predicting inflation in India. He found real money gap a significant predictor of inflation in India. Greenidge and DaCosta (2009) used unrestricted error-correction model and bounds test for co integrating analysis to capture new developments in the inflationary process in selected Caribbean economies (Jamaica, Guyana, Barbados and Trinidad and Tobago). The findings indicate that the determinants for inflation in the Caribbean are both cost-push and demand-pull. Dua and Gaur (2009) investigated determination of inflation in the framework of an open economy forward-looking as well as conventional backward-looking Phillips curve for eight Asian countries. Using quarterly data from 1990 to 2005 and applying the instrumental variables estimation technique, they found that the output gap, and at least one measure of international competitiveness to be significant in explaining the inflation rate in almost all the countries.

Xufang (2010) examined the association between China stock market and macroeconomic indicators like interest rate, GDP and inflation. They used (EGARCH) model for each variable, to estimate volatility, and then take second step to examine the causal relationship between the volatility of stock market returns and macroeconomic variables using LA-VAR model. Dlamini and Nxumalo (2011) used annual data from 1974 to 2000 and analyzed the determinants of inflation in Swaziland by employing the econometric technique of cointegration and error correction model (ECM). More recently, Francis and Godfried (2013) used annual data covering period from 1990 to 2009 to analyse determinants of inflation in Ghana by employing various diagnostic, evaluation tests. The findings show that real output and money supply were the strongest forces exerting pressure on the price level.

RESEARCH OBJECTIVES AND METHODOLOGY

This paper intends to develop an econometric model of the determinants of inflation in India. Accordingly, it focuses on (i) understanding of the dynamics of inflation, (ii) identification of major macroeconomic determinants of inflation, and (iii) econometric modelling of inflation in India. The paper is based on statistical database of selected variables for the period of ten years from 2002-Q1 to 2012-Q1.

The study considers Consumer Price Index as dependent variable, and the set of independent macroeconomic variables viz., Gross Domestic Product, Deposit Rate, Exchange Rate, Money Supply, Crude Oil Prices, Prime Lending Rate, and Trading Volume (Value of Imports and Exports). The brief description of selected variables with their source is given in table 1.

Table 1: List of Variables

Variables Name	Symbol	Data Source
Consumer Price Index	CPI	IMF-IFS Database, (except Deposit Rate which is collected from RBI's statistical database.
Deposit Rate	DR	
Exchange Rate	EXR	
Gross Domestic Product	GDP	
Imports CIF	IMPORT	
Exports FOB	EXPORT	
Money Supply	M2	
Average Crude Oil Price (WTI Dollars per Barrel)	OIL	
Prime Lending Rate	PLR	

The description of econometrics tools used for analysis is as follows.

The Stationarity Test (Unit Root Test): Before using the time series data for further investigation (testing Cointegration and implementing the Granger Causality Test) it must be tested for unit root and stationarity. If we do not test and regress a time series variable on another time series variables using OLS, estimation can obtain a very high r^2 (though meaningful relationship between the variables may not exist). This situation reflects the problem of spurious regression between totally unrelated variables generated by a non-stationary process. A variable is said to be integrated of order one, or I(1), if it is stationary after differencing once, or of order two, I(2) if differenced twice. If the variable is stationary without differencing, then it is integrated of order zero, I(0). Thus, a series is said to be stationary if the mean and variance are time invariant.

Several tests of non-stationarity called unit root tests have been developed in the time series econometrics literature, like Dickey-Fuller (DF), Augmented Dickey-Fuller (ADF) and Phillips and Perron (PP) tests, where in most of these tests the null hypothesis is that there is a unit root, and it is rejected only when there is strong evidence against it. So for the purpose of modelling we need to testify the time series non stationarity. Accordingly, the researchers established stationarity of data using the Augmented Dickey-Fuller (ADF) Unit Root Test.

Granger Causality Test: Causality is a kind of statistical feedback concept which is widely used in the building of forecasting models. Historically, Granger (1969) and Sim (1972) were the ones who formalized the application of causality in economics. Granger causality test is a technique for determining whether one time series is significant in forecasting another (Granger, 1969). The standard Granger causality test (Granger, 1988) seeks to determine whether past values of a variable helps to predict changes in another variable. The definition states that in the conditional distribution, lagged values of Y_t add no information to explanation of movements of X_t beyond that provided by lagged values of X_t itself (Green, 2003). We should take note of the fact that the Granger causality technique measures the information given by one variable in explaining the latest value of another variable. In addition, it also says that variable Y is Granger caused by variable X if variable X assists in predicting the value of variable Y. If this is the case, it means that the lagged values of variable X are statistically significant in explaining variable Y. The null hypothesis (H0) that we test in this case is that the X variable does not Granger cause variable Y, and variable Y does not Granger cause variable X. In nutshell, one variable (X_t) is said to granger cause another variable (Y_t) if the lagged values of X_t can predict Y_t and vice-versa. The spirit of Engle and Granger (1987) lies in the idea that if the two variables are integrated as order one, I(1), and both residuals are I(0), this indicates that the two variables are co integrated. The following model has been estimated in order to determine the direction of causality.

Let y and x be stationary time series. To test the null hypothesis that x does not Granger cause y, one first finds the proper lagged values of y to include in a univariate auto regression of y:

$$y_t = a_o + a_1 y_{t-1} + a_2 y_{t-2} + \cdots + a_m y_{t-m} + \text{residual}_t$$

Next, the auto regression is augmented by including lagged values of x:

$$y_t = a_o + a_1 y_{t-1} + a_2 y_{t-2} + \cdots + a_m y_{t-m} + b_1 x_{t-1} + \cdots + b_q x_{t-q} + \text{residual}_t$$

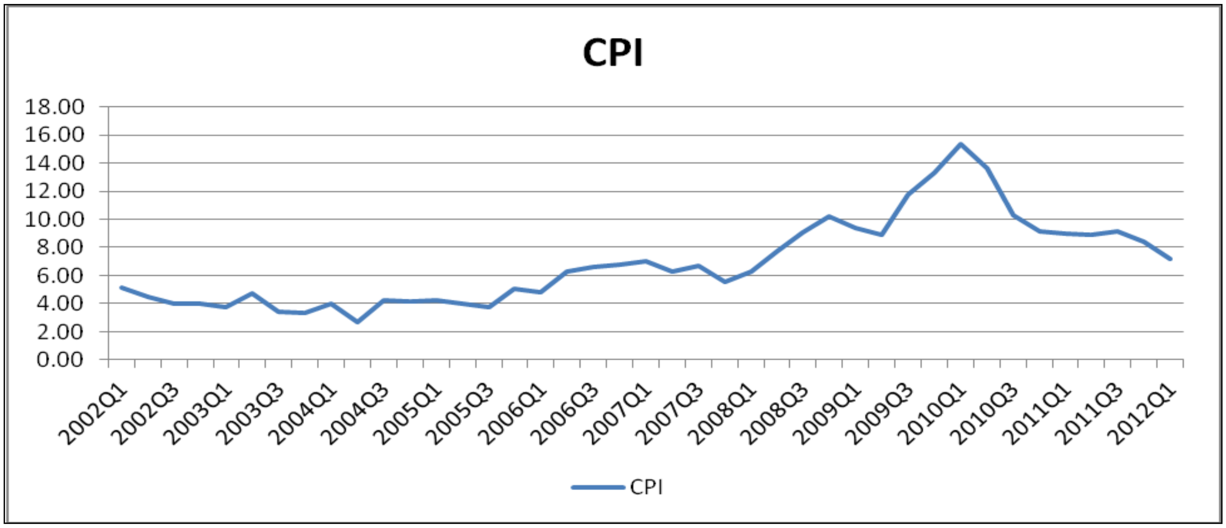
One retains in this regression all lagged values of x that are individually significant according to their t-statistics, provided that collectively they add explanatory power to the regression according to an F-test (whose null hypothesis is no explanatory power jointly added by the x's). In the notation of the above augmented regression, p is the shortest, and q is the longest lag length for which the lagged value of x is significant.

The null hypothesis that x does not Granger-cause y is not rejected if and only if no lagged values of x are retained in the regression. Granger causality is not necessarily true causality. If both X and Y is driven by a common third process with different lags, one might still accept the alternative hypothesis of Granger causality. Yet, manipulation of one of the variables would not change the other. Indeed, the Granger test is designed to handle pairs of variables, and may produce misleading results when the true relationship involves three or more variables. A similar test involving more variables can be applied with vector auto regression.

ANALYSIS AND EMPIRICAL RESULTS

TRENDS OF INFLATION: Following figure reflects the changes in inflation in India from the year 2002 Q1 to 2012 Q1.

Figure 1: Inflation in India: (Consumer Prices Index % Change)



The above graph indicates that the inflation rate in the first quarter of 2001 was 5.10% which decreased up to quarter two of 2004 (except in 2003 quarter two) and after that severe fluctuations have been seen up to quarter four of 2009. In 2010 quarter one, inflation rate was at its highest peak of 15.32% and then decreased continuously up to quarter one of 2012.

BASIC DESCRIPTIVES: Basic descriptives of selected dependent and independent variables presented in (table-2) indicates that out of all variables only PLR has negative growth rate during the period of study. The value of standard deviation is very high in case of M2 which indicates very high degree dispersion in data. When we see the values of skewness, the variables that have positively skewed distribution are DR, EXR and M2, while negatively skewed distribution is observed in case of remaining variables.

A peaked curve is called leptokurtic, if kurtosis value is greater than 3, Mesokurtic, if kurtosis value is equals to 3, and Platykurtic, if the value of kurtosis is lesser than 3. The values of kurtosis indicates that EXPORT is the only variable which is platykurtic, while the distribution of variables CPI, DR, EXR, GDP, IMPORT, M2, PLR and OIL is leptokurtic.

Jarque Bera (JB) test for normality states that the distribution is normal if JB probability is more than 0.05, otherwise the distribution is considered non-normal. Among the variables under consideration DR, IMPORT, M2, PLR, and OIL have the non-normal distribution, while CPI, EXR, GDP and EXPORT are normally distributed.

CORRELATIONS: The correlation matrix of selected variables in (table-3) indicates that CPI has negative low degree correlation with M2, OIL and DR while with other variables has low degree positive correlation and only PLR is the variable with which it has moderate degree positive correlation.

RESULTS OF UNIT ROOT TEST**:** Before applying causality analysis on the selected variables, it is must to apply a formal test to confirm whether time series is stationary or not. For this purpose researchers applied Augmented Dickey Fuller (ADF) test of unit root. The lag length based on the Akaike Information Criterion (AIC) selected is four. In ADF test, the null hypothesis is that a variable contains a unit root/ are generated by a non-stationary process, and alternative hypothesis is that the variables are generated by a stationary process/ does not contains unit root. The results of ADF test contained in table 4 show that 't' value of all the variables is less than critical value. It rejects the null hypotheses at 1 percent level of significance. Hence, it can be said that all the variables are stationary at level except, CPI which has been made stationary after differencing once. Thus, researchers made all variables stationary after taking first differences with lag order four (selected on basis of Akaike Information Criteria).

RESULTS OF GRANGER CAUSALITY TEST: The results of causality analysis reported in table 5 (see appendix) indicate that there exists bidirectional causality between EXPORT and EXR, unidirectional causality between CPI and IMPORT, CPI and PLR, M2 and DR, IMPORT and EXR, OIL and EXR, M2 and IMPORT, OIL and IMPORT, EXPORT and IMPORT, OIL and M2, and EXPORT and OIL at 5 percent level of significance. There exists no causality among remaining variables.

Table 2: Descriptive Statistics No. of Observations: 41									
	CPI	DR	EXR	GDP	IMPORT	M2	OIL	PLR	EXPORT
Mean	0.050419	1.993894	0.220222	7.704634	6.434824	5.107312	4.891005	-0.028780	5.582195
Median	-0.027850	0.000000	-0.357063	7.770000	4.779797	4.493310	7.915228	0.000000	7.300000
Maximum	2.880400	73.07692	9.403623	10.66000	37.94399	82.16756	38.51173	9.320000	24.65000
Minimum	-3.354000	-29.24528	-6.514509	2.310000	-26.02865	-45.97093	-50.57462	-33.33000	-17.96000
Std. Dev.	1.148350	15.64637	3.928849	1.855790	11.00897	16.87482	14.99225	6.423656	9.709562
Skewness	-0.146100	2.207755	0.720696	-0.443936	-0.260997	1.727259	-1.197214	-3.263028	-0.336989
Kurtosis	3.868410	11.73688	3.256961	3.143136	5.063734	13.45983	6.426419	18.97672	2.666061
Jarque-Bera	1.434176	163.7093	3.662054	1.381707	7.741271	207.2920	29.85079	508.8185	0.966510
Probability	0.488172	0.000000	0.160249	0.501148	0.020845	0.000000	0.000000	0.000000	0.616772

Table 3: Correlations No. of Observations: 41									
	CPI	DR	EXR	GDP	IMPORT	M2	OIL	PLR	EXPORT
CPI	1.000000	-0.078949	0.123434	0.165080	0.125257	-0.151435	-0.221118	0.364416	0.122834
DR	-0.078949	1.000000	0.006381	0.179771	0.046373	0.073219	-0.029340	0.108390	0.155385
EXR	0.123434	0.006381	1.000000	-0.337535	-0.153273	-0.053175	-0.234526	0.190861	0.005732
GDP	0.165080	0.179771	-0.337535	1.000000	0.057451	-0.063941	0.110770	-0.018520	-0.022236
IMPORT	0.125257	0.046373	-0.153273	0.057451	1.000000	-0.026827	-0.206503	0.190160	0.332053
M2	-0.151435	0.073219	-0.053175	-0.063941	-0.026827	1.000000	0.002629	-0.022135	0.233241
OIL	-0.221118	-0.029340	-0.234526	0.110770	-0.206503	0.002629	1.000000	-0.238348	0.123434
PLR	0.364416	0.108390	0.190861	-0.018520	0.190160	-0.022135	-0.238348	1.000000	0.112143
EXPORT	0.122834	0.155385	0.005732	-0.022236	0.332053	0.233241	0.123434	0.112143	1.000000
5% Critical value (two-tailed) = 0.3120 VH = Very High (r ≥ 0.75); H = High (0.75 > R ≥ 0.50); M = Moderate (0.50 > R ≥ 0.25); L = Low (r < 0.25); 0 = No Correlation (r = 0)									

RESULTS OF OLS (ORDINARY LEAST SQUARE): The results of OLS applied on selected variables (table 6) show Durbin Watson statistics (DW) between 1.5 and 2.5, which indicates that there is no autocorrelation in the series. The DW statistics close to 2 indicates that the model is better fit. The lesser AIC value (3.22) also indicates that the lag length selected for analysis purpose is also correct. There exist opposite relationship between Durbin Watson (DW) statistic and Akaike Information Criteria (AIC). High difference between r^2 and adjusted r^2 indicates that there are some other significant variables which may influence the variations in dependent variable. The P value of F statistics is more than 0.05, which proves that independent variables have significant impact on the identified dependent variable.

The fundamental multiple OLS equation for selected variables can be written as:

$CPI_t = \beta_o + \beta_1 DR_t + \beta_2 EXR_t + \beta_3 GDP_t + \beta_4 IMPORT_t + \beta_5 M2_t + \beta_6 OIL_t + \beta_7 PLR_t + \beta_8 EXPORT_t + \varepsilon_t$

Where: $\beta_{o,}$ $\beta_{1,}$ $\beta_{2,}$ $\beta_{3,}$ $\beta_{4,}$ $\beta_{5,}$ $\beta_{6,}$ $\beta_{7,}$ and $\beta_8 \neq 0$

Based on results of OLS analysis (table 6), the equation for examining combined effect of selected variables on CPI is as follows.

$CPI_t = -1.106 - 0.013\, DR_t + 0.026\, EXR_t + 0.155\, GDP_t - 0.003\, IMPORT_t - 0.010\, M2_t - 0.014\, OIL_t + 0.054\, PLR_t + 0.022\, EXPORT_t + \varepsilon_t$

The above equation of selected independent variables (DR, EXR, GDP, IMPORT, M2, OIL, PLR, and EXPORT) on dependent variable (CPI) indicates that the DR, IMPORT, M2 and OIL have the negative impact on CPI while other variables have the positive impact on CPI.

CONCLUSION

This paper is a modest effort for identifying major macroeconomic determinants of inflation and examining the trend and pattern of inflation in India. The results of analysis show F-value more than 0.05 indicating that selected independent variables have significant impact on CPI. However, the high difference between r^2 and adjusted r^2 indicates that there are some other significant variables which may influence the variations in dependent variables. To conclude, we can say that though identified independent variables have significant impact on the inflation, there are some other variables which may have impact on inflation.

Table 4: Results of Unit Root Test

No. of Observations 41

S. No.	Variables	ADF t-Value (Level)	Prob. Value	Order of Integration	Remark
1	DCPI*	-4.873001	0.0003	I(1)	Stationary
2	DR	-7.222632	0.0000	I(0)	Stationary
3	EXR	-4.847617	0.0003	I(0)	Stationary
4	GDP	-3.051838	0.0386	I(0)	Stationary
5	IMPORT	-6.268033	0.0000	I(0)	Stationary
6	M2	-9.522015	0.0000	I(0)	Stationary
7	OIL	-5.707853	0.0000	I(0)	Stationary
8	PLR	-6.334555	0.0000	I(0)	Stationary
9	EXPORT	-7.475092	0.0000	I(0)	Stationary

Note: 1%, 5 % and 10% critical values are -3.505, -2.889 and -2.579 respectively. * D denotes differencing of variable.

Table 6: Results of OLS

Dependent Variable: CPI Number of observations: 41

Variables	Coefficient	Std. Error	t-Stat. (P-Value)	F-Ratio (P-Value)	SE Est.	R^2& Adj. R^2	AIC	SWC	DW
C	-1.107	0.826	-1.340 (0.190)	1.435 (0.22)	1.101	0.264 0.080	3.222	3.598	1.659
DR	-0.013	0.0116	-1.145 (0.261)						
EXR	0.027	0.051	0.532 (0.598)						
GDP	0.156	0.1021	1.519 (0.139)						
IMPORT	-0.003	0.0181	-0.183 (0.856)						
M2	-0.011	0.011	-0.979 (0.335)						
OIL	-0.015	0.013	-1.118 (0.272)						
PLR	0.055	0.029	1.897 (0.067)						
EXPORT	0.023	0.021	1.098 (0.280)						

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Table 5: Pair-wise Granger Causality Tests

No. of observations: 37

Null Hypothesis:	F-Statistic	Prob.	Ho Rejected/ Failed to Reject
DR does not Granger Cause CPI	0.64162	0.6373	Failed To Reject
CPI does not Granger Cause DR	0.43749	0.7804	Failed To Reject
EXR does not Granger Cause CPI	0.86998	0.4942	Failed To Reject
CPI does not Granger Cause EXR	1.32041	0.2867	Failed To Reject
GDP does not Granger Cause CPI	0.36245	0.8332	Failed To Reject
CPI does not Granger Cause GDP	0.54223	0.7060	Failed To Reject
IMPORT does not Granger Cause CPI	3.04825	0.0333	HO Rejected
CPI does not Granger Cause IMPORT	0.86461	0.4973	Failed To Reject
M2 does not Granger Cause CPI	1.11567	0.3689	Failed To Reject
CPI does not Granger Cause M2	0.11823	0.9749	Failed To Reject
OIL does not Granger Cause CPI	2.66620	0.0530	Failed To Reject
CPI does not Granger Cause OIL	0.81121	0.5287	Failed To Reject
PLR does not Granger Cause CPI	1.60821	0.1999	Failed To Reject
CPI does not Granger Cause PLR	4.19793	0.0087	Ho Rejected
EXPORT does not Granger Cause CPI	1.13682	0.3595	Failed To Reject
CPI does not Granger Cause EXPORT	1.16147	0.3488	Failed To Reject
EXR does not Granger Cause DR	1.51072	0.2260	Failed To Reject
DR does not Granger Cause EXR	0.31165	0.8677	Failed To Reject
GDP does not Granger Cause DR	0.55276	0.6986	Failed To Reject
DR does not Granger Cause GDP	1.57815	0.2076	Failed To Reject
IMPORT does not Granger Cause DR	0.33670	0.8509	Failed To Reject
DR does not Granger Cause IMPORT	1.16867	0.3458	Failed To Reject
M2 does not Granger Cause DR	0.17280	0.9505	Failed To Reject
DR does not Granger Cause M2	6.16097	0.0011	Ho Rejected
OIL does not Granger Cause DR	0.14301	0.9646	Failed To Reject
DR does not Granger Cause OIL	1.02830	0.4100	Failed To Reject
PLR does not Granger Cause DR	0.27526	0.8915	Failed To Reject
DR does not Granger Cause PLR	1.31305	0.2893	Failed To Reject
EXPORT does not Granger Cause DR	0.38434	0.8179	Failed To Reject
DR does not Granger Cause EXPORT	0.47116	0.7564	Failed To Reject

GDP does not Granger Cause EXR	0.40364	0.8044	Failed To Reject
EXR does not Granger Cause GDP	0.37721	0.8229	Failed To Reject
IMPORT does not Granger Cause EXR	1.24900	0.3132	Failed To Reject
EXR does not Granger Cause IMPORT	3.00471	0.0351	HO Rejected
M2 does not Granger Cause EXR	1.02970	0.4093	Failed To Reject
EXR does not Granger Cause M2	0.82428	0.5208	Failed To Reject
OIL does not Granger Cause EXR	0.64521	0.6349	Failed To Reject
EXR does not Granger Cause OIL	2.88304	0.0407	HO Rejected
PLR does not Granger Cause EXR	0.34404	0.8459	Failed To Reject
EXR does not Granger Cause PLR	0.35436	0.8388	Failed To Reject
EXPORT does not Granger Cause EXR	2.95941	0.0370	HO Rejected
EXR does not Granger Cause EXPORT	4.59309	0.0056	HO Rejected
IMPORT does not Granger Cause GDP	0.82077	0.5229	Failed To Reject
GDP does not Granger Cause IMPORT	1.36593	0.2709	Failed To Reject
M2 does not Granger Cause GDP	0.91030	0.4715	Failed To Reject
GDP does not Granger Cause M2	0.30640	0.8712	Failed To Reject
OIL does not Granger Cause GDP	0.37156	0.8269	Failed To Reject
GDP does not Granger Cause OIL	0.45802	0.7658	Failed To Reject
PLR does not Granger Cause GDP	0.16543	0.9541	Failed To Reject
GDP does not Granger Cause PLR	0.94106	0.4548	Failed To Reject
EXPORT does not Granger Cause GDP	0.78496	0.5446	Failed To Reject
GDP does not Granger Cause EXPORT	0.31321	0.8667	Failed To Reject
M2 does not Granger Cause IMPORT	2.99049	0.0357	HO Rejected
IMPORT does not Granger Cause M2	0.40110	0.8062	Failed To Reject
OIL does not Granger Cause IMPORT	5.55288	0.0020	Ho Rejected
IMPORT does not Granger Cause OIL	2.04360	0.1154	Failed To Reject
PLR does not Granger Cause IMPORT	0.17404	0.9499	Failed To Reject
IMPORT does not Granger Cause PLR	0.38982	0.8141	Failed To Reject
EXPORT does not Granger Cause IMPORT	4.39980	0.0069	Ho Rejected
IMPORT does not Granger Cause EXPORT	0.30950	0.8692	Failed To Reject
OIL does not Granger Cause M2	1.52050	0.2232	Failed To Reject
M2 does not Granger Cause OIL	6.32416	0.0009	Ho Rejected
PLR does not Granger Cause M2	0.65737	0.6267	Failed To Reject
M2 does not Granger Cause PLR	0.47279	0.7553	Failed To Reject
EXPORT does not Granger Cause M2	0.27419	0.8921	Failed To Reject

M2 does not Granger Cause EXPORT	1.45312	0.2429	Failed To Reject
PLR does not Granger Cause OIL	0.32410	0.8594	Failed To Reject
OIL does not Granger Cause PLR	0.22597	0.9216	Failed To Reject
EXPORT does not Granger Cause OIL	1.75826	0.1654	Failed To Reject
OIL does not Granger Cause EXPORT	3.87619	0.0125	HO Rejected
EXPORT does not Granger Cause PLR	0.10946	0.9782	Failed To Reject
PLR does not Granger Cause EXPORT	0.82587	0.5199	Failed To Reject
Note: (i) Significant at 5% confidence level. (ii) AIC is used to determine appropriate lag lengths.			