

Oil Prices Shock in Indian Stock and Oil Market

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Abstract:

India highly relies on the foreign crude oil supply, hence many listed firms in the National Stock Exchange trade accord the crude oil prices. In this study, we materialize Brent Oil prices impact on three important Sectoral Indices, stock prices of NIFTY along with NIFTY 500 Index. Each sector accommodates those stocks, which endure a close relationship with the crude oil prices. We followed the model developed by (Lutz Killian, Cheolbeom Park, 2009) for selecting the sectoral indices and variable in oil market components. VAR and FEVD model assist us in understanding what determines Indian Oil market prices and whether oil prices affect the NIFTY sectoral index stock prices. We construct growth model to assess study further and followed guideline and tests, which are essential for VAR analyses. It is observed that only energy sectoral index respond to oil shock and global oil production impact Indian oil demand and oil prices whereas domestically oil price are determine by oil reserves and oil supply in India. At last this study advocates for requirement of Indian oil reserves but does not provide any cost based analysis.¹

Key Words: Oil Demand, Oil Supply, Oil Reserves, Oil Prices, NIFTY Sectoral Index, Stock Prices

JEL Classification: C3

Introduction

The rising oil prices slow down economic activity for oil-dependent countries and affect industrial profit and stock prices (Yudong Wang, Chongfeng Wua, Li Yang b, 2012) this motivate us to conduct a study based on Indian aspect. In this study, we search whether crude oil prices influence Indian Stock Prices and what is the composition in the Oil market which determines the oil prices. We have employed two different data sets for this. Initially, data consists of oil markets like Global Crude oil production, Brent Oil Prices, Oil Supply, Oil Demand and Oil Reserves. The data is sourced from Centre for Monitoring Indian Economy database to capture what determines oil prices in India, and with the help of FEVD model internal potential of the variable to influence another variable by external shock is observed.

Secondly, I model whether oil prices impact the Indian stock prices. To do so NIFTY Sectoral Index data is sourced from the NSE database and I have followed (Lutz Killian, Cheolbeom Park, 2009) approach for selecting the Sectoral Index (Auto Index, Energy Index and Fast Moving Consumer Goods Index 'FMCG') along with Nifty 500 stocks closing prices from 2005-2017 monthly data is employed along with Brent crude oil prices "INR" the purpose is to see whether oil shocks impact the indice's shares prices, to capitulate that we employed Impulse response function, one stand deviation shock on the oil prices and observe responses on these indices' stock prices performance.

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Albeit (Lutz Killian, Cheolbeom Park , 2009) evaluated US stock market and oil market component with same observation data with three different shocks tools like supply, demand and oil specific demand (oil reserves), but due to lack of monthly observation of oil supply and demand data, this study is based on different time horizon but the purpose is same.

Rest of the study is as follow: section first comprises of Introduction and Literature review second deals with Data, Estimation strategies and third deals with results and discussions. The last section comprises of conclusion, references and appendix.

Literature Reviews

Change in precautionary oil demand causes long term impact on the oil exporting countries stocks prices as oil importing countries whereas change in oil prices does not cause change in stock returns to oil importing country (Yudong Wang, Chongfeng Wua, Li Yang b, 2012). The oil specific demand (precautionary demand) significantly affects stock prices of retail, auto and precious metal and oil prices affect cumulative stock returns in case of US stock market see (Lutz Killian, Cheolbeom Park , 2009) albeit (Killian, 2008) asserted that global oil supply affect US, CPI and GDP growth negatively due decline in oil supply (RON ALQUISTa AND LUTZ KILIANb,c*, 2010) asserted similar findings. (Neville Francis, Sergio Restrepo, 2018) studies oil price effect on the sectors like Industry, Agriculture and Mining (on different factor like Inflation, GDP and FDI) the unanticipated rise in oil prices response negatively to GDP in agriculture, positive in mining, FDI, whereas Industrial Inflation in case of Columbia rising of oil prices act as a catalyst for economic crisis see (Robert B. Barsky, Lutz Kilian , 2001).

The oil shock may affect single market but cannot be generalised in the international financial market until it is significantly big. (Dayong Zhang, 2016) studies in case of China to gauge the impact of change in stock returns by change in global demand, real activity and oil specific demand shocks (Chung Rou Fang, Shih Yi You, 2013) develop a study and reported no change in China stocks returns by these shocks except other shock whereas Russia along with India have significant impact on stock returns by real activity and Oil specified demand. (Hanan Naser, . Abdul Rashid, 2018) examine the oil price shock to stock prices among BRIC nations. India has responded positively to exchange rate and negative to interest rates, stock prices, industrial production with unanticipated positive shock to oil prices.

The transmission channel flows through innovation in financial markets to the crude oil prices albeit stock market Granger causing oil prices not reported in case of Indian as to China, Brazil, US, UK as periodically (Jose Eduardo Gomez-Gonzalez, Jorge Hirs, 2017).

II

Data

We use monthly data of Brent oil prices from Index Mundi and NIFTY (sectoral index) closing prices from NSE database. The oil demand, oil supply, oil reserves data is source from CMEI database. Due to the limitation of monthly data of oil supply, demand, reserves two equation are constructed (1), (2) to analyse the impact of oil price on stock prices and oil market components. In the equation (1) yearly data from 1994-2017 analyses the impact of oil prices shocks on oil demand, supply and reserves whereas equation (2) analyse monthly data from 2005-2017 based on Brent oil prices impact on stock prices by Impulse response function, for that the variables are converted into a growth model.

The estimation of model given below represents the Vector Auto-Regressive model (VAR un-restricted). Before estimating the model we perform unit root test at the constant term “Dickey Fuller but not reported” on first difference log value after normality test for VAR model, auto and partial correlation test reports on the appendix. The lag selection accord to AIC and HIQA criteria as 2 months for equation (2), same for (1). Table 1 depicts the correlation values between these variables. The Figure 5 in Appendix depicts historical data of the entire variable by line chart.² We also check Granger causality among variable but not reported.

² Centre for Monitoring Indian Economy(CMEI),
National Stock Exchange (NSE)

III

Estimation Strategy

$$y_t = oil\ G, oil\ pr_{t-i}, oil\ sp_{t-i}, oil\ dm_{t-i}, oil\ rs_{t-i} + e_t \quad (1)$$

$$y_t = oil\ pr_{t-1}, oil\ Auto_{t-1}, oil\ FMCG_{t-1}, oil\ energy_{t-1} + e_t \quad (2)$$

$$\begin{pmatrix} oil\ pr^{brent} \\ oil\ Global \\ oil\ sp \\ oil\ dm \\ oil\ rs \\ Auto^{stock\ pr} \\ FMCG^{stock\ pr} \\ Energy^{stock\ pr} \end{pmatrix} = y_t$$

$$\begin{pmatrix} oil\ pr^{brent} \\ Auto^{stock\ pr} \\ Energy^{stock\ pr} \\ FMCG^{stock\ pr} \end{pmatrix} = (oil\ pr\ shock^{brent}) \begin{pmatrix} oil\ pr^{brent} \\ oil\ sp \\ oil\ dm \\ oil\ rs \end{pmatrix} = (Oil\ Global^{Production})$$

y_t denotes the vector of oil market consisting Global Crude oil Production ‘oil G’ rent oil prices ‘oil pr’, oil supply ‘oil sp’, oil demand ‘oil dm’, oil reserves ‘oil rs’ and auto stock prices ‘ $Auto^{stock\ pr}$ ’, FMCG stock prices ‘ $FMCG^{stock\ pr}$ ’, energy stock prices ‘ $Energy^{stock\ pr}$ ’³. Both the equations are analysed using same technique but the IRF is reported in stock prices variables by oil prices shock and to analysis oil market components Forecast Error Variance Decomposition (FEVD) model is employed to report how much variation in one variable can be explain by the exogenous shock in other variable is reported inn Table 2.

³ All the Units related to oil or prices of stock are mention in Appendix with diagram.

IV

Empirical Study

Table 2 below depicts the correlation between the variables in equations (1) and (2). The positive relation between oil prices and oil reserves suggests that for oil firms to maintain reserves is lucrative because it fulfils the rising demand and hence it may respond to the oil price shock. All the remaining variables are in line with the economic theory. The lower portion of Table.2 represents the correlation matrix of oil price to the stock market; results suggest that stock market may have positive relationship between oil prices and stock prices, which means rising of oil price will raise the stock prices of Auto, FMCG and Energy sector firms and vice-versa which in line with (Lutz Killian, Cheolbeom Park , 2009) findings. Albeit the raising oil price should have a negative relation with shock prices but constant rise in oil demand may neutralize the impact hence rising of oil price resulting more returns or their might no impact on the rising oil price in stock performance see (Yudong Wang, Chongfeng Wua, Li Yang b, 2012).

Correlation Result of Equation (1) and (2)

Table.2

	Supply	Demand	Reserves	Price
Supply	1.0000000	0.9710186	-0.2385516	0.8481076
Demand	0.9710186	1.0000000	-0.3540505	0.8013561
Reserves	-0.2385516	-0.3540505	1.0000000	0.1890926
Price	0.8481076	0.8013561	0.1890926	1.0000000

	Auto	FMCG	Energy	Price
Auto	1.0000000	0.9630983	0.6682455	0.1591556
FMCG	0.9630983	1.0000000	0.6795736	0.2844726
Energy	0.6682455	0.6795736	1.0000000	0.2405930
Price	0.1591556	0.2844726	0.2405930	1.0000000

Note: Author Computation

Table.3 represents Forecast Variance Error Decomposition results. We employ variance decomposition to identify how much one variable is contributing to explain the other variable due to positive shock, the oil prices significantly contributed to explaining highest variation in oil reserve (0.54%) and oil supply market (0.23%) whereas the oil supply explain the highest variation in the oil demand market (0.59%), the reserves explain the highest proportion in contribution to oil prices (0.22%) cumulative of ten year. This implies in India, Oil prices are determined by the oil reserve rather than oil supply or demand and have interdependence in domestic market.

<i>Basic FEVD</i>	<i>Price</i>	<i>Demand</i>	<i>Supply</i>	<i>Reserves</i>
Oil Prices (\$)				
1	1.00	0.00	0.00	0.00
5	0.8573	0.0035866	0.027825	0.11121
10	0.8572	0.0035868	0.027866	0.11126
Oil Demand(\$)				
1	0.03876	0.96123	0.00	0.00
5	0.09687	0.59537	0.18311	0.12454
10	0.09689	0.59528	0.18311	0.12470
Oil Supply(\$)				
1	0.058075	0.002367	0.939557	0.00
5	0.086242	0.006931	0.847349	0.059475
10	0.086270	0.006931	0.847308	0.059489
Oil Reserves(\$) ⁴				
1	0.131505	0.000606	0.040884	0.827003
5	0.205867	0.001148	0.150480	0.642502
10	0.205905	0.001148	0.150551	0.642394

Source: : Author Computation **Part 1**

FEVD part 2 assembles how global oil production impact the Indian oil market. It is observed that global oil production impact Indian oil Prices (0.026%) and demand(0.036%) the most which cascades future of oil prices. The Oil Price explain oil supply and demand, reserves explains prices and demand and demand explain reserve and prices most. This implies that global oil production impact Indian oil prices and demand severely hence reserves do not play price determining factor in international oil market for India.

⁴ Oil Reserves consist of Reserves and Life, Wells Developed, Metreage, Status of Wells from CMEI.

Part 2

<i>I</i>	<i>Global production</i>	<i>Supply</i>	<i>Demand</i>	<i>Reserves</i>	<i>Price</i>
1	1.00000000	0.00000000	0.00000000	0.00000000	0.00000000
5	0.9009699	0.01324927	0.05826418	0.008856914	0.01865976
10	0.9009292	0.01325156	0.05827756	0.008881669	0.01865997
<i>II</i>	<i>Global production</i>	<i>Supply</i>	<i>Demand</i>	<i>Reserves</i>	<i>Price</i>
1	0.1705738	0.8294262	0.00000000	0.00000000	0.00000000
5	0.1642441	0.6977219	0.02959204	0.002737745	0.1057042
10	0.1642364	0.6976659	0.02960399	0.002739080	0.1057546
<i>III</i>	<i>Global production</i>	<i>Supply</i>	<i>Demand</i>	<i>Reserves</i>	<i>Price</i>
1	0.1526301	0.007494076	0.8398759	0.00000000	0.00000000
5	0.1446453	0.038639763	0.7629830	0.001129594	0.05260236
10	0.1446447	0.038648816	0.7629550	0.001132603	0.05261893
<i>IV</i>	<i>Global production</i>	<i>Supply</i>	<i>Demand</i>	<i>Reserves</i>	<i>Price</i>
	0.1903419	0.1622427	0.02104379	0.6263716	0.00000000
	0.2522366	0.1132671	0.14152475	0.3751757	0.1177958
	0.2522153	0.1132648	0.14153178	0.3751532	0.1178348
<i>V</i>	<i>Global production</i>	<i>Supply</i>	<i>Demand</i>	<i>Reserves</i>	<i>Price</i>
1	0.1334101	0.04686478	0.01831087	0.02449456	0.7769197
5	0.1763341	0.08993969	0.13266595	0.02128294	0.5797773
10	0.1763475	0.08995875	0.13270979	0.02127990	0.5797041

Table: Showing (I) Global production, (II) Global price, (III) global supply, (IV) global and (V) global reserves.

VAR Model Results

Figure 4 represents the impulse response function of un-restricted VAR model. We constructed the model based on two months lag length suggest by AIC and HIQA. The advantage of using Impulse function is that it can report the unanticipated like y_{t+1} dynamic change in variables values. Therefore, we employed Brent oil prices as impulse variable and other as responsive variable, depicted below “positive one degree standard deviation shock to oil prices response reported’.

The positive shock in oil price reduces the Energy “Sectoral Index” Stock prices ”Figure 4” by more than 0.01% value along with the significant band “red dotted line” the Auto “Sectoral Index” stock prices reduce after one month but cannot be counted as significant.

This implies that in NIFTY Energy sectoral index only respond to change in oil price shock and no change observed in Auto and FMCG sectoral index in the context of India Stock market⁵.therefore

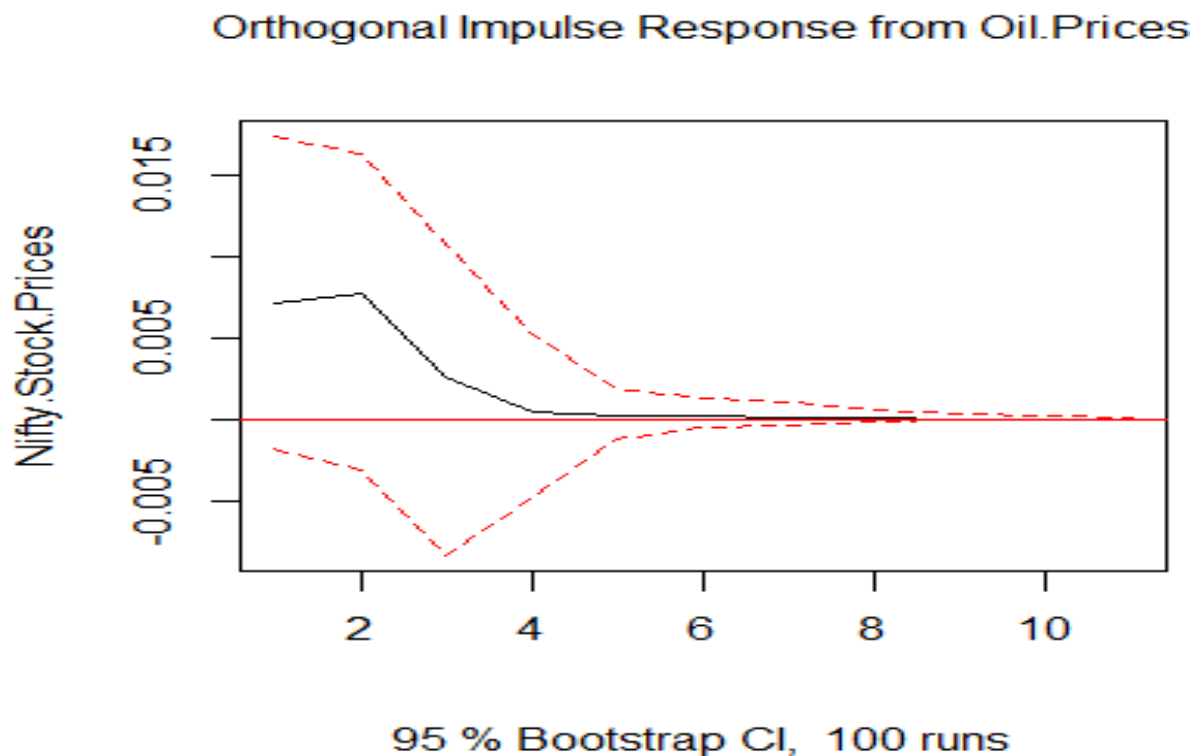
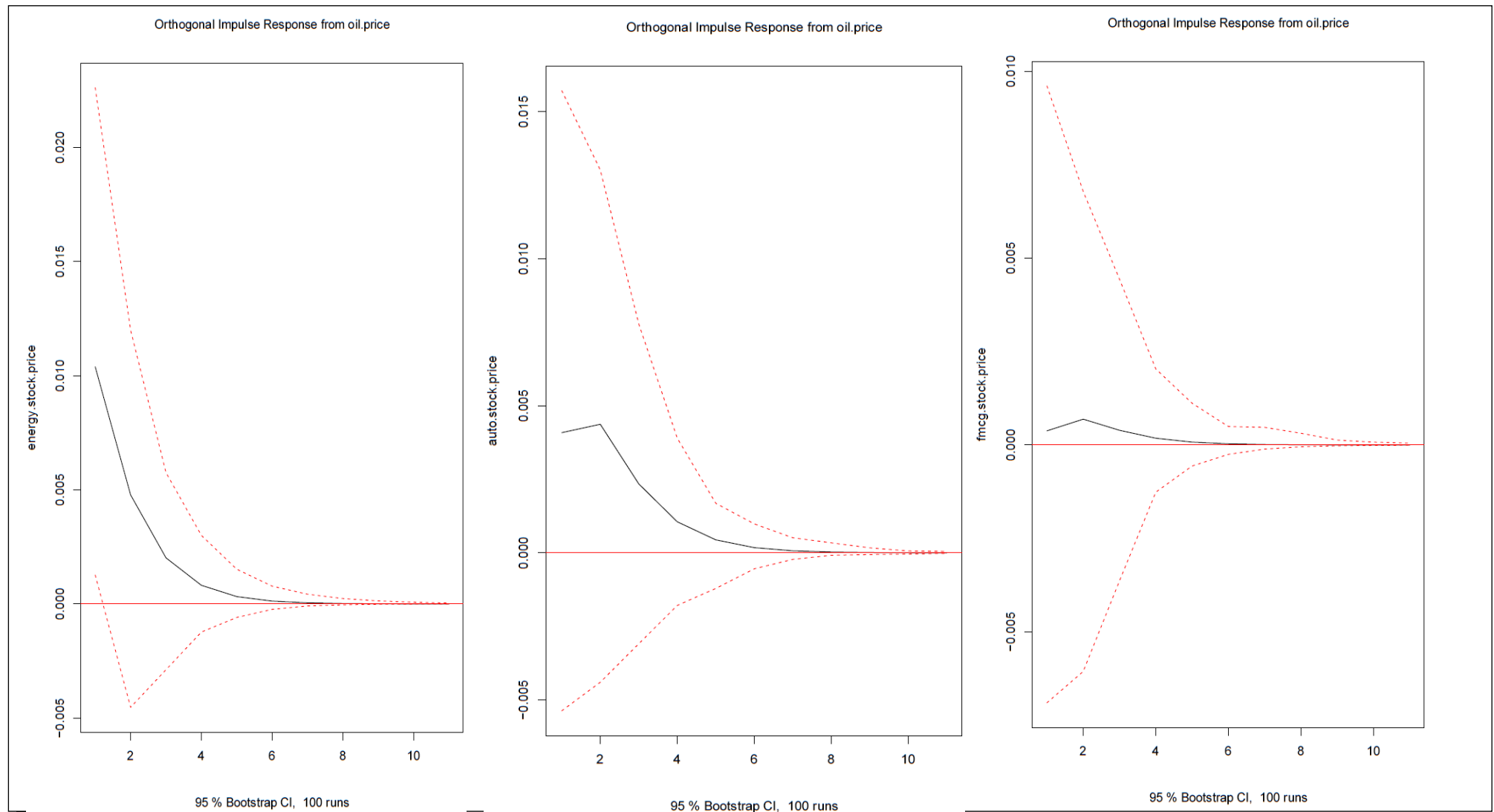


Figure 5

The Figure 5 above represent the impulse response of oil prices on Nifty **500** stock prices, it is observed that one degree positive shock on oil prices will decline the Nifty 500 stock prices more than 5% but the impact is not statistically significant. This implies that Nifty 500 stocks do not respond oil shock significantly unless and until it is big shock as suggest by (Dayong Zhang, 2016).

⁵ The Indian Stock returns may influence by oil specific demand and real economic activity shock as studied by (Chung Rou Fang, Shih Yi You, 2013), (Yudong Wang, Chongfeng Wua, Li Yang b, 2012) in context of Brics Nations.

Figure-4



Chung Rou Fang, Shih Yi You, 2013 studied BRIC nation performances they assert that real economic activity and oil specific demand significantly affect the Indian and Russian Stock market.

VI

Conclusion:

This study evaluates Indian Stock market performance with respect to oil price movements. We asserted that oil prices impact the energy sectoral index which comprises those firms which entirely depend on oil extraction, oil supply or acquire oil equipment's for production hence no impact is observed in Nifty Auto and Nifty FMCG Index which are the secondary product of oil. This study also reveals what determine oil prices, it is observed that global oil production affect oil prices and oil demand in Indian oil market, the oil reserve and oil supply impact domestic oil prices 'India', therefore, we have not found any evidence of oil supply factors determining the price. This might be due to constant real economic growth without any surprise shock as suggested by the Chung Rou Fang, Shih Yi You, 2013.

The study has policy implication for those stock investors who regularly trade in energy sectoral index and in FMCG, Auto sectoral index because it gauge the amount of responsive of each sectoral index when oil prices sinusoids in international market. It strongly suggests India Oil reserve requirement for the prices stabilization (rising oil specific demand will cause the oil prices surge, this can be avoided for some duration by releasing the excess oil reserves into oil market which will stabilize oil prices and curb the impact of oil specific demand).

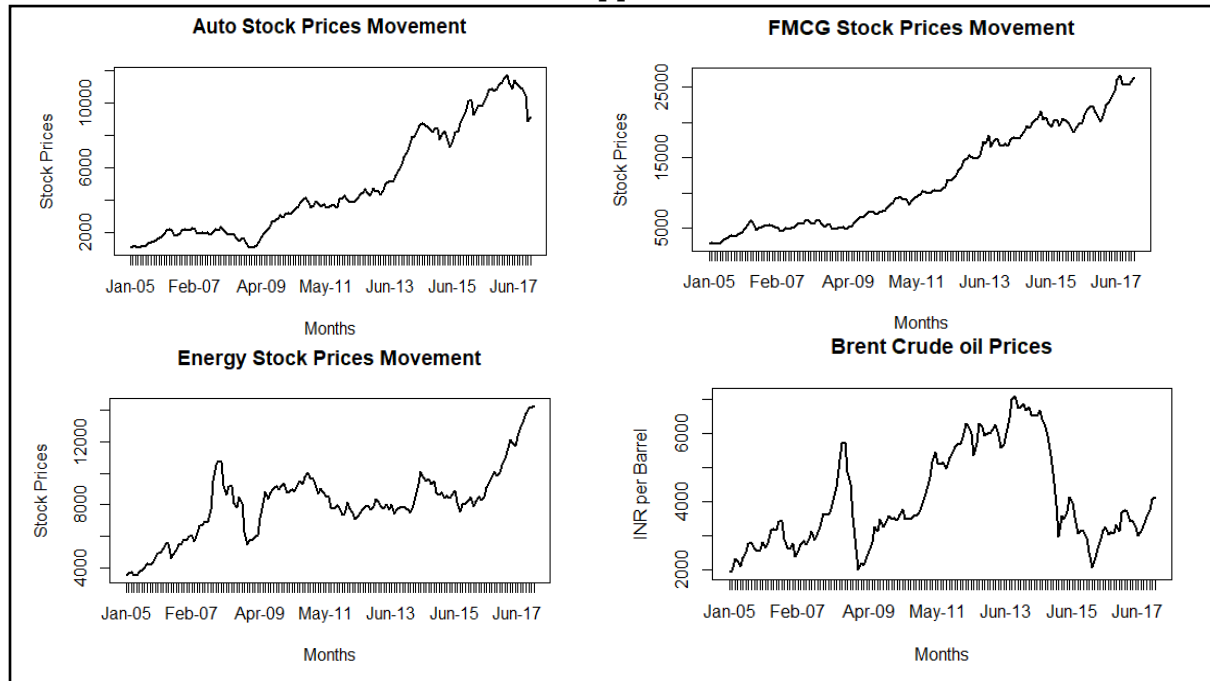
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Nifty Sectoral' s

Nifty Auto	Nifty FMCG	Nifty Energy
Amara Raja Batteries Ltd.	Britannia Industries Ltd.	
Apollo Tyres Ltd.	Colgate Palmolive (India) Ltd.	
Ashok Leyland Ltd.	Dabur India Ltd.	
Bajaj Auto Ltd.	Emami Ltd.	
Bharat Forge Ltd.	GlaxoSmithKline Consumer	
Bosch Ltd.	Healthcare Ltd.	
Eicher Motors Ltd.	Godrej Consumer Products Ltd.	
Exide Industries Ltd.	Godrej Industries Ltd.	
Hero MotoCorp Ltd.	Hindustan Unilever Ltd.	
MRF Ltd.	ITC Ltd.	
Mahindra & Mahindra Ltd.	Jubilant Foodworks Ltd.	
Maruti Suzuki India Ltd.	Marico Ltd.	
Motherson Sumi Systems Ltd.	Procter & Gamble Hygiene &	
TVS Motor Company Ltd.	Health Care Ltd.	
Tata Motors Ltd.	Tata Global Beverages Ltd.	
	United Breweries Ltd.	
	United Spirits Ltd.	

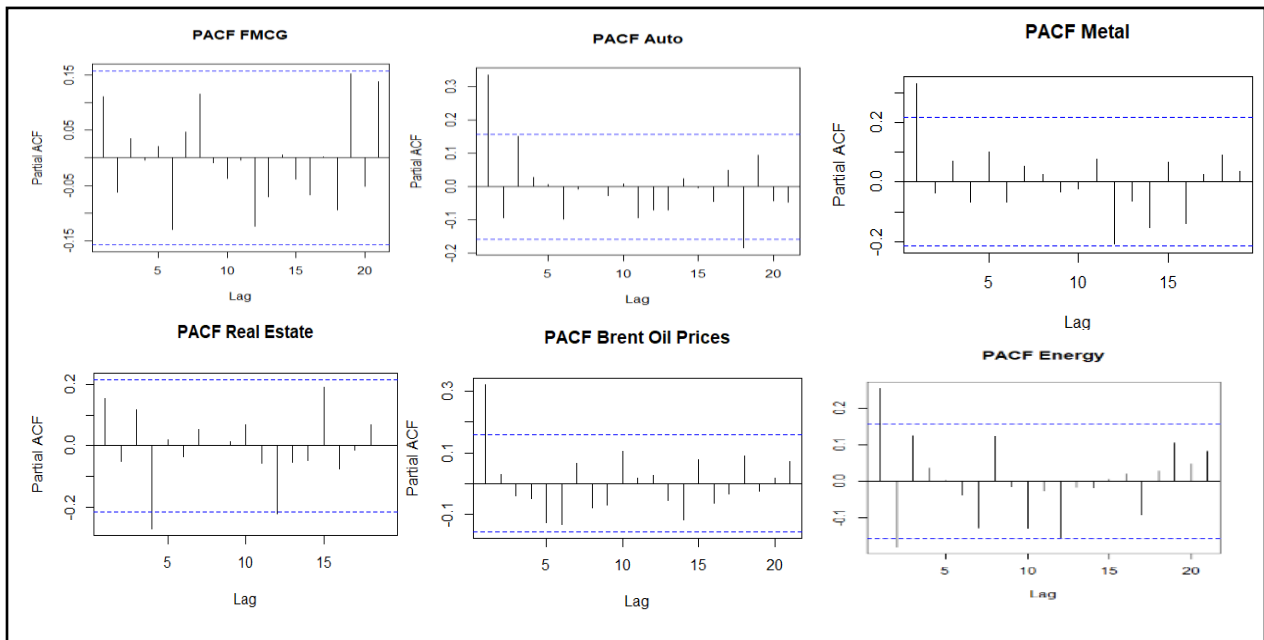
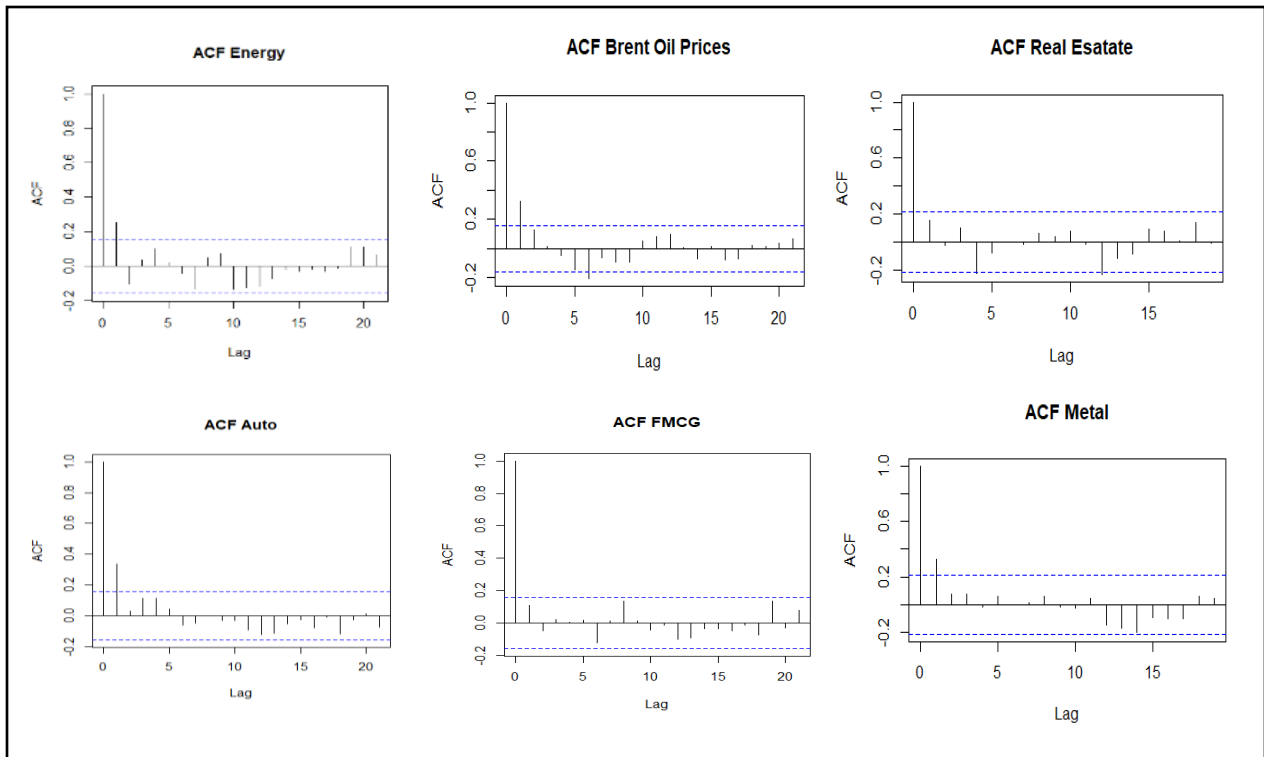
Appendix



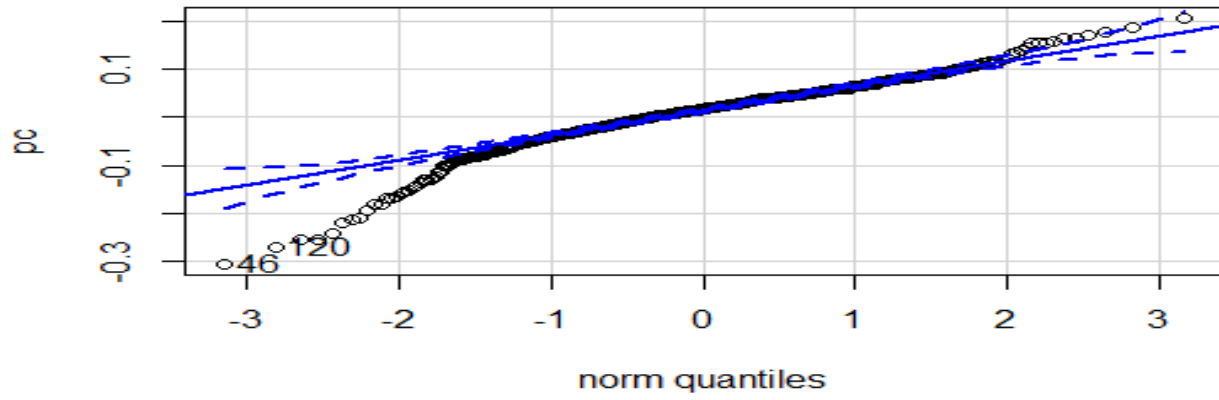
Brent crude oil historical prices



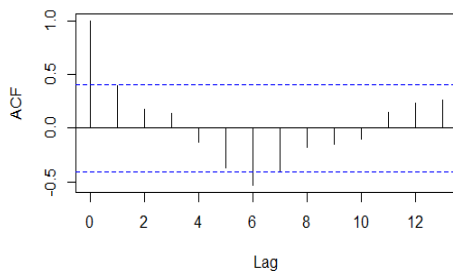
Test Auto Correlation and Normality



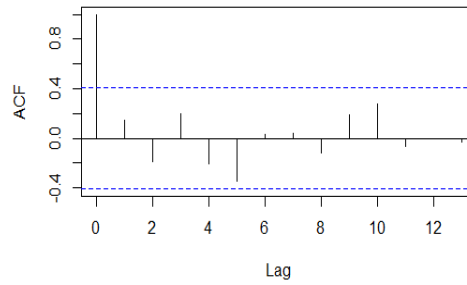
Normality check



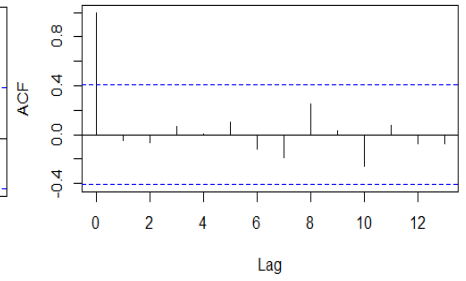
ACF oil Demand



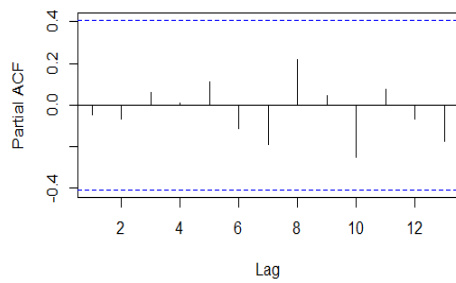
ACF oil Supply



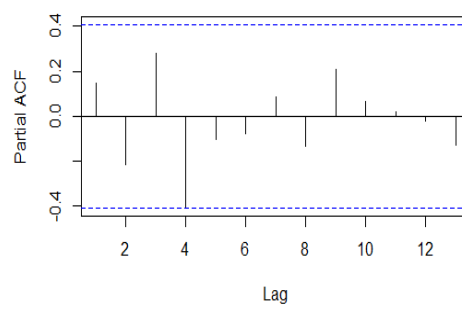
ACF oil Reserve



PACF oil Reserve



PACF oil Supply



PACF oil Demand

