

Analysis of Short-Term and Long-Term Linkage of S&P BSE Oil and Gas Index with Selected International Indices

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Abstract

Government of India revamped its policy framework in 1990 to circumscribe yoke international debts and reanimate the fatally poised economy. The economic makeover in terms of globalisation exposed all domestic sectors to international market and Indian Oil & Gas sector is no exception to this. Since India is one of the largest oil consumer of the world Indian producers are under direct heat of global turbulence. It is essential to investigate the global linkage of Indian Oil & Gas Sector so that during downturn Indian producers and investors may cushion themselves. In this context, the present paper attempts to examine the short term and long term linkage of S&P BSE Oil & Gas index with the oil and gas indices of three prominent oil producers of the world i.e. Russia, UK and US. Unit root exhibited that all series have unit root at level but are stationary at first difference. The co-integration analysis establishes that selected nations have long term relationship with each other. Granger Causality shows that Indian market has uni-directional causal relation flowing from US and UK.

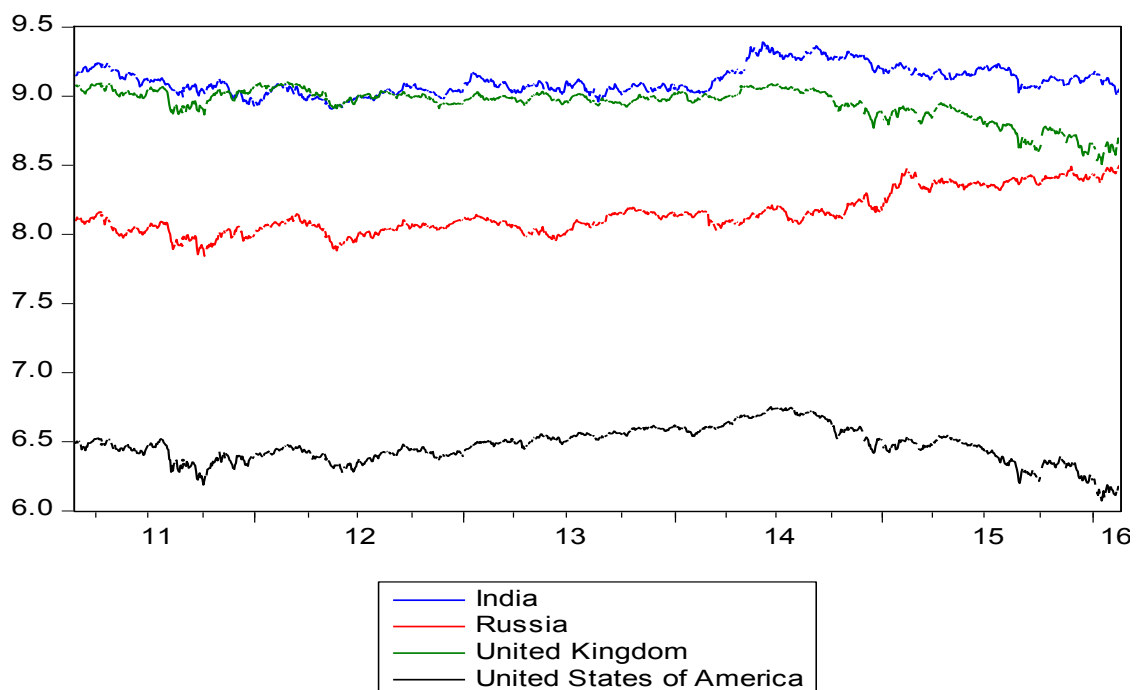
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INTRODUCTION

Oil prices are the key driver of all economic activities. The Oil and Gas sector has tremendous growth potential in India. It is among the six core industrial sector in Indian

market and has a major role in influencing decision making for all important sections of the society. S&P BSE Oil and Gas Index was launched on 23rd August 2004. Its base date is 1st February 1999 and is calculated on Free Float market capitalisation basis. During primitive times the sector has been the domain of Government of India and few selected government enterprises. But with the liberalization and privatization private firms entered into the market. Since, economic growth of the country is closely related to the performance of oil and gas sector it is imperative to note whether there are suitable conditions that make the sector conducive for investment or not. Government of India has already initiated few steps like permission of 100% foreign direct investment in many segments of the sector like Natural Gas, Petroleum Products, and Refineries. The welcoming gesture of Indian government resulted in to FDI inflow in the country. As per Department of Industrial Policy and Promotion, the petroleum and natural gas sector attracted FDI worth US\$ 6.8 billion between April 2000 and December 2016.

Oil and gas industry is experiencing a wide range of challenges as well as opportunities across all streams like independent exploration and production companies, oilfield services companies, independent refiners etc. During 2016 S&P Global Oil index (an index measuring the performance of 120 of the largest publicly traded companies in oil & gas exploration, extraction, and production from around the world) registered a heavy downfall after 2009 (Figure 1).



Source: Author's data

As every swing in oil and gas industry immediately bring capital reconstruction, many major capital products have been waned due to extended oil price downturn. According to John (2016) the downturn resulted into shifting of industry concentration to shorter life cycle projects. Further many projects have been deferred (or cancelled) due to this

change. This global oscillation has major impact over Indian economy also. The reason is that in spite of considerable domestic potential, India imports more than half the requirement of crude oil. For the year 2011-12, India was the fourth largest consumer of oil and consumed 4% of the total consumption in the world. Even the global slowdown has not impacted the oil consumption in India and in fact India's demand for O&NG continues to be highly fuelled by a rapidly growing automobile industry (Desai 2014). India is the fourth-largest Liquefied Natural Gas importer after Japan, South Korea and China. Therefore international turbulence has major impact over Indian economy. In this context the present study attempts to explore whether the Indian oil and gas industry has any long term relationship with international oil and gas industries or not.

LITERATURE REVIEW

Different researchers have undertaken different facets of Oil and Gas sector. Like Chima (2007) investigated the role of supply-chain management in the oil and gas industry. This paper also discussed the application of the Uniform Commercial Code (UCC) to supply-chain management issues. It also examined several strategies for improving supply-chains in the oil and gas industry. Some studies have analysed the causality between oil prices and stock prices. Papapetrou (2001) found a significant relationship between oil price changes and stock markets in Greece. Hammoudeh and Eleisa (2004) also observed that there is a bidirectional relationship between Saudi stock returns and oil price changes. El-Sharif *et al.* (2005) examined the linkage in the oil and gas sector of UK. The study reported the significant positive relationship between oil price changes and stock returns. The findings suggest that GCC stock markets are less affected by oil price fluctuations. Another study of GCC countries by Bashar (2006) reported the effect of oil price changes in Saudi and Omani markets through VAR analysis. Lescaroux and Mignon (2008) studied the large panel of developed and emerging countries to investigate the relationships between oil and stock prices. The results indicated positive causality from oil prices to stock prices. Aloui *et al.* (2008) analysed crude oil volatility shocks and stock market returns in six major industrial countries; France, Japan, U.S.A., Germany and Canada from 1989 -2007. The results of Unrestricted Vector Autoregressive model and Multivariate GARCH provide evidence that crude oil markets matter in forecasting major stock market behaviour. Most of the available literature is either based on internal processing of the sector or concerns to the analysis of possible relationship of Oil prices with stock prices. But the inter-linkage of domestic oil and gas sector with international market has not been explored. In this context, the present paper attempts to investigate the short term and long term relation of Indian Oil and Gas Sector with three other major indices of Russia, UK and USA.

RESEARCH METHODOLOGY

The present paper attempts to explore the short term and long term relationship of four Oil and Gas Sectoral Indices of India, Russia, UK and USA. Logarithm values of daily closing indices have been taken for the purpose of investigation from 2006 to 2016. At the outset the normality of data has been checked. As the data is suitable for further analysis only when it is stationary in nature therefore Augmented Dickey Fuller test has been conducted. The test checks the null hypothesis that the data series has unit root i.e. it is not stationary in nature. In case the same is rejected, we'll have to transform the data to bring the stationarity through taking first or more difference. Short term causality among the series will be examined through Granger Causality test and long term relationship will be checked through Johansen's unrestricted co-integration rank test.

FINDING AND ANALYSIS

The descriptive statistics is depicted through table 1. The table indicates that Russia has experienced highest variance in indices during the study period whereas India had least variance during the study period. The Jarque Berra statistics reject the null hypothesis of normality of distribution of the data.

Table 1: Descriptive statistics

	India	Russia	UK	US
Mean	9.111729	8.147703	8.946852	6.469646
Median	9.089736	8.107393	8.980499	6.472454
Maximum	9.391634	8.498927	9.101148	6.751943
Minimum	8.907776	7.840175	8.506146	6.072860
Std. Dev.	0.098154	0.148884	0.117905	0.127972
Skewness	0.571488	0.685636	-1.472686	-0.161957
Kurtosis	2.756735	2.439285	4.729498	3.085468
Jarque-Berra	64.40938	103.5208	550.2643	5.293308
Probability	0.000000	0.000000	0.000000	0.070888

Source: Author's calculation

However, normality of data is not usually observed in financial data therefore, we proceed to check whether the data is stationary in nature or not. The data is assumed to be stationary if it does not have unit root. To check the possibility of unit root Augmented Dickey Fuller (ADF) Unit Root test has been conducted (table 2). The test

presumes the null hypothesis of absence of any unit root in the data. Null hypothesis of ADF test can be accepted only when the statistics of test is less than the critical value at 5% level of significance i.e. the value of probability is more than 0.05.

Table 2: Results of ADF test

Particulars	At Level		At First Difference	
	Test Statistics	Probability	Test Statistics	Probability
India	-2.390564	0.1446	-32.32136	0.0000
Russia	-0.869099	0.7981	-33.42896	0.0000
UK	-1.327860	0.6184	-34.49985	0.0000
USA	-1.710487	0.4257	-30.80270	0.0000

Source: Author’s calculation

The comparison of ADF statistics with critical value for all four indices demonstrates that we cannot reject the null hypothesis and all the indices have unit root. Therefore, first differences have been taken for all indices and again the variables have been put under the diagnostic check of unit root. This time null hypothesis gets rejected and we may rule out the possibility of unit root among variables. In other words the studied data is stationary at first difference level. As stated earlier at the outset we will check the possibility of presence of any co-integrated equation (s). Table 3 represents the results of Johansen co-integration test.

Table 3: Results of Johansen co-integration test

Hypothesized Number of Co-integrated Equations	Eigenvalue	Trace Statistic	Critical Value	Probability
Trace test				
None *	0.028872	54.95697	47.85613	0.0093
At most 1	0.015011	21.93978	29.79707	0.3018
At most 2	0.004008	4.893623	15.49471	0.8200
At most 3	0.000326	0.367029	3.841466	0.5446
Maximum Eigen Value				
None *	0.028872	33.01719	27.58434	0.0090
At most 1	0.015011	17.04616	21.13162	0.1698
At most 2	0.004008	4.526594	14.26460	0.8000
At most 3	0.000326	0.367029	3.841466	0.5446

Source: Author’s calculation

Trace and Max-eigen value test rejects the possibility of none co-integrating equation among the indices. Therefore we may conclude that selected indices have long term relationship with each other. To explore the possibility of one way or two way directional short term relationships Granger causality test has been conducted. Table 4 exhibits the results of Granger causality test.

Table 4: Results of Granger casualty test

Null Hypothesis	F-Statistic	Prob.	Result
Russia does not Granger Cause India	1.81963	0.1062	Accepted
India does not Granger Cause Russia	0.48491	0.7877	Accepted
UK does not Granger Cause India	6.05433	2.00E-05	Rejected
India does not Granger Cause UK	0.80211	0.5482	Accepted
US does not Granger Cause India	11.9008	3.00E-11	Rejected
India does not Granger Cause US	0.65964	0.6542	Accepted
UK does not Granger Cause Russia	3.80853	0.002	Rejected
Russia does not Granger Cause UK	4.14352	0.001	Rejected
US does not Granger Cause Russia	4.13286	0.001	Rejected
Russia does not Granger Cause US	1.68088	0.1363	Accepted
US does not Granger Cause UK	15.9052	4.00E-15	Rejected
UK does not Granger Cause US	1.45618	0.2015	Accepted

Source: Author's calculation

The results of Granger casualty test exhibits bidirectional relationship between oil and gas index of Russia and India and absence of any Granger relationship between Russia and US. UK and US Granger cause Indian Oil and Gas Sector but the reverse is not true. Uni-directional causality has been noticed for USA and UK indices also.

CONCLUSION

The present paper investigates the short term and long term relationship among four oil and gas sector based indices of India, Russia, UK and USA. The study covers a span of 10 years from 2006-16. All indices have been tested for stationarity of the series and the same has been found at first difference level. This indicates the possibility of at least one co-integration equation among the indices. Johansson Co-integration test has been conducted to examine long-term relationship among the selected indices. The results evidence the presence of long term relationship among the selected indices. The short-term causality has been explored through Granger Causality test. The results found

bidirectional causality between the indices of Russia and India, uni-directional causality between USA & UK. US found to affect the Russian and Indian market but no such causal relation was observed at the flip side. The results indicate that in case of global downturn in US or UK market Indian oil and Gas producing firms should become cautious as there is a causal effect of the former. However, any oscillation in the domestic sector has not been found to affect the other countries. US market has not been witnessed to get any causal relationship flowing from Russia or UK. So in case of downturn in Russia and UK, Indian investors may explore the possibility of US market. The results are expected to be useful for Oil and Gas producers, investors and market regulators for drafting policies concerning Oil and Gas sector in India.

REFERENCES

- [1] Aloui C., Ranya J, Dhakhlaoui. I. 2008. Crude oil volatility shocks and stock market returns, *Journal of Energy Markets*, Volume 1(3). Pp. 69– 96
- [2] Basher, S. A., Sadorsky, P., 2006. Oil Price Risk and Emerging Stock Markets”, *Global Finance Journal*, 17, 224-251.
- [3] Chima C. M. 2007. Supply-Chain Management Issues in the Oil And Gas Industry, *Journal of Business & Economics Research*, 5 (6): 27-36.
- [4] Desai N. 2014. Oil and Gas Industry in India retrieved from http://www.nishithdesai.com/fileadmin/user_upload/pdfs/Research%20Papers/Oil_and_Gas_Industry_in_India.pdf
- [5] El-Sharif, I., Brown, D., Burton, B., Nixon, B., Russell, A., 2005. Evidence on the nature and extent of the relationship between oil prices and equity values in the UK, *Energy Economics*, 27, 819-830.
- [6] Hammoudeh, S., Aleisa, E., 2004. Dynamic relationship among GCC stock markets and NYMEX oil futures’, *Contemporary Economic Policy*, 22, 250-269.
- [7] John. 2016. 2017 outlook on oil and gas, Deloitte Center for Energy Solutions retrieved from <https://www2.deloitte.com/content/dam/Deloitte/us/Documents/energy-resources/us-er-2017-oil-and-gas-industry-outlook.pdf>
- [8] Lescaroux, F., Mignon, V., 2008. On the influence of oil prices on economic activity and other macroeconomic and financial variables, *OPEC Energy Review*, 32(4), 343-380.
- [9] Papapetrou, E., 2001. Oil Price Shocks, Stock Market, Economic Activity and Employment in Greece, *Energy Economics*, 23, 511-32.

