

“A STUDY OF RELATIONSHIP BETWEEN STOCK INDEX AND CRUDE OIL PRICES”

Ms. Jyoti Verma* Research Scholar, Periyar Management and Computer College, New Delhi
Prof. Hardeepika Singh Ahluwalia** Assistant Professor, Periyar Management and Computer College, New Delhi

Abstract

VUCA an acronym for Volatility, Uncertainty, complexity and ambiguity forms the basis for the environment companies operate in current era. The relationship between macro-economic variables and stock returns had widely been researched upon. The present study depicts the relationship between crude oil prices and stock Indexes. Primarily Augmented Dickey fuller (ADF) test was used to check the stationary of variables under study namely Crude Oil prices, S&P BSE Sensex and NSE Nifty-50. The Direction of relationship between Crude oil prices and stock indexes was measured using Granger Causality Testing. The results depicted bi-directional relationship among variable for the period (2009-2020) undertaken for investigation.

KEYWORDS: Crude oil, Stock-Index, Granger-Causality

Macro-economic variables namely crude oil prices, Exchange rate, RBI policy rates , Inflation, GDP and Index of Industrial production plays a predominant role in influencing the stock returns. The present study focuses on responsiveness of stock returns to volatility in crude oil prices. Since, India is one of the largest importers of crude oil the study is primarily focusing on the two major Indian stock bourses namely BSE and NSE.

The paper is divided into following sections: Literature review, Research Methodology, Analysis and Conclusion.

LITERATURE REVIEW

Long run relationship between Crude oil prices and stock prices was investigated using Auto regressive Distributed lag (ARDL) model, the relationship depicted that volatility in stock prices in India had a significant impact on Crude oil prices while the contrary was not proved statistically (Chittedi, 2012). The inter-relationship between crude oil prices and stock returns was studied, the data was primarily tested for stationary using Augmented Dicky fuller test and

later linear regression was run. The results indicated that crude oil prices significantly impacted the Sensex and “had the competency to transmit shock to Sensex” (Sathyanarayana, Harish & Gargsha, 2018). The role of crude oil market in deriving the linkage between stock markets of oil-importing and exporting countries was studied using DCC-FIGARCH model for the period between 2008-2018 , the results depicted that stock market returns were more responsive in oil importing countries than oil exporting countries during periods of economic turmoil (Youssef & Mokni, 2019). Linear interdependence between international crude oil prices and stock indices from 2010-2017 was undertaken and cointegration test revealed absence of long run relationship, however negative relation was indicated between Nifty Index, BSE energy index and crude oil future prices (Sharma , Giri , Vardhan, Surange, Shetty & Setty, 2018). The interdependency between crude oil prices and sectoral equity was assessed and carbon sector was found to be most immune to oil price risk (Tiwari, Keshari, Mitra & Yoon, 2018).

OBJECTIVE OF STUDY

To study the relationship between stock index and crude oil prices.

RESEARCH METHODOLOGY

Causal research is undertaken in order to identify the extent of relationship between Stock index and crude oil prices . The sample size undertaken for the study includes 11 years data (2009-2020) pertaining to crude oil prices, NIFTY 50 and Sensex.

The study attempts to derive the causality between the Stock Index (Nifty 50 and S&P BSE Sensex) and Crude oil prices using Granger Causality Testing. But prior to study of such a causal relationship there is a need to understand whether the variables under study are stationary or not which was analyzed using Augmented Dickey Fuller test was.

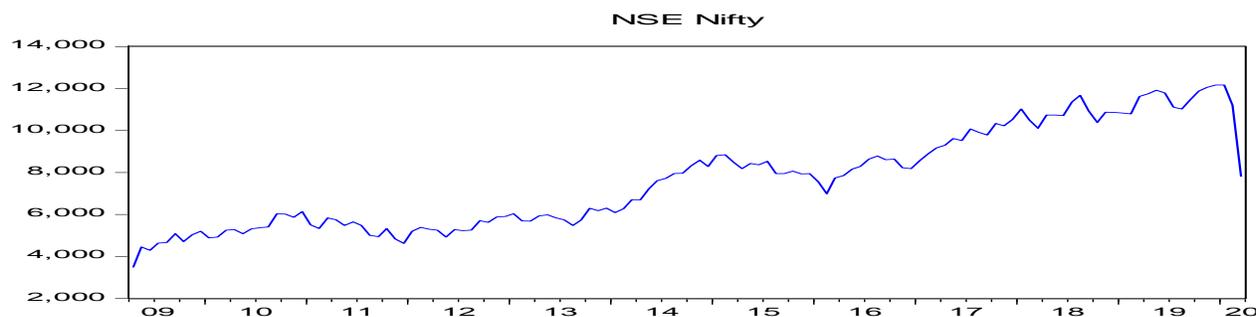


Fig1: NSE Nifty-50 Index Values

The above graph (Fig-1) examines the pattern important for assumption in Augmented Dickey Fuller (ADF) test. The X-axis shows number of observation which is 130 while the Y-axis represents the NIFTY-50 Index. The above figure shows an increasing trend in Nifty 50 i.e. over a period of 11 years the Nifty have been rising. If a trend line is drawn from point '0' it can be observed that the values evolve around the trend line hence it can be proved that as time passes the observations trend upward and hence shows a time trend. On the other hand if we take the sample mean of Nifty-50 index it come out to be 7641.923 . If we draw a horizontal line from here we see that observations evolve around the mean. Thus it can be concluded that the series evolve around a constant (Mean) and trend. Therefore, we need trend and a constant to check for stationary.

At first difference, it was observed that observed value of t-statistic is less than the critical values of t-statistic ($-7.21 < -4.030$). Hence, it can be concluded that Nifty-50 does not have a unit root i.e. the observations of NIFTY-50 are stationary. Hence, H_0 : NIFTY-50 has a unit root is rejected

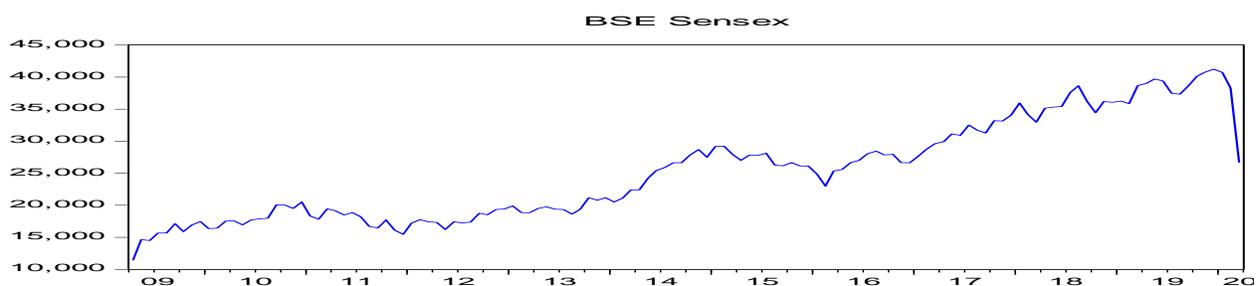


Fig 2: S&P BSE Sensex Index Values

At first difference, it was observed that observed value of t-statistic is less than the critical values of t-statistic ($-7.25 < -4.030$). Hence, it can be concluded that S&P BSE Sensex does not have a unit root i.e. the observations of Sensex are stationary.

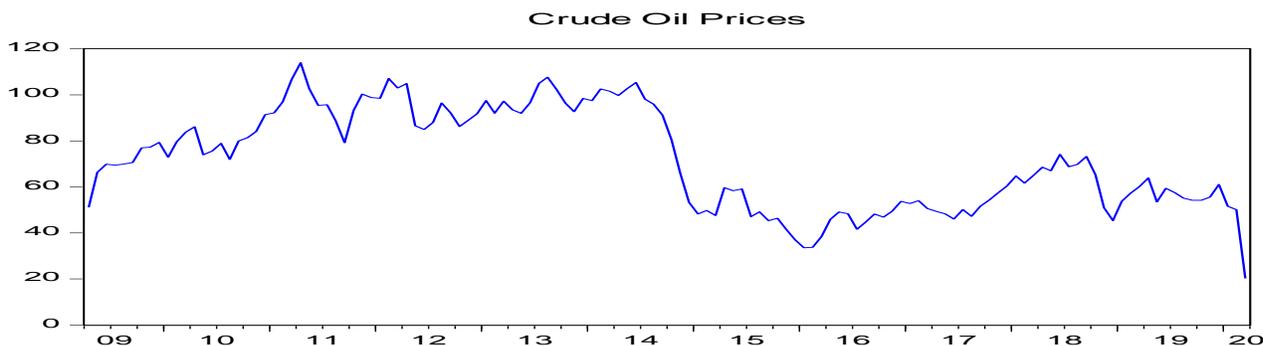


Fig 3: Crude oil Prices

At first difference, it was observed that observed value of t-statistic is less than the critical values of t-statistic ($-9.51 < -4.030$). Hence, it can be concluded that Crude oil prices do not have a unit root i.e. the observations of Crude oil prices are stationary.

Granger Causality test is a technique for determining whether one time series is significant in forecasting another. The standard Granger test seeks to determine whether past values of variable helps to predict changes in 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. The null hypothesis 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. Thus, 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.

Research Problem I: Whether crude oil prices granger causes S&P BSE Sensex or/and S&P BSE Sensex granger causes crude oil prices.

Regression Model for checking Granger causality between two variables is as follow:

- Regression model for crude oil prices causes S&P BSE Sensex
$$\text{BSE Sensex}_t = A_{11} \text{CRUDEOIL}_{(t-j)} + A_{12} \text{BSE}_{(t-j)} + E(t)$$

- Regression model for S&P BSE granger causes crude oil prices

$$\text{CRUDE OIL}_t = A_{21} \text{CRUDE OIL}_{(t-j)} + A_{22} \text{BSE}_{(t-j)} + E(t)$$

Where, t-j is lagged values or the lag period

E (t): Residual value or the error term

A₁₁, A₁₂, A₂₁, A₂₂ are the coefficients

Granger Causality Testing between S&P BSE Sensex and Crude Oil Prices

Null Hypothesis:	Obs	F-Statistic	Prob.
CRUDE_OIL_PRICES does not Granger Cause BSE_SENSEX	130	0.23484	0.7910
BSE_SENSEX does not Granger Cause CRUDE_OIL_PRICES		4.99431	0.0082

Table 1: Granger Causality Values computed using E-views

The basis for acceptance or rejection of null hypothesis is comparing the p values with 5% level of significance. p-value of crude-oil does not granger cause BSE Sensex is greater than 0.05, therefore null hypothesis is not rejected and hence Crude Oil prices doesn't help in predicting S&P BSE Sensex, on the contrary BSE Sensex granger cause Crude oil prices since its value is less than 0.05.

Research Problem II: Whether crude oil prices granger causes NSE Nifty-50 or/and NSE Nifty-50 granger causes crude oil prices.

Regression Model for checking Granger causality between two variables is as follow:

- Regression model for crude oil prices causes NSE Nifty-50

$$\text{NSE Nifty-50}_t = A_{11} \text{CRUDEOIL}_{(t-j)} + A_{12} \text{NSE Nifty-50}_{(t-j)} + E(t)$$

- Regression model for NSE Nifty-50 granger causes crude oil prices

$$\text{CRUDE OIL}_t = A_{21} \text{CRUDE OIL}_{(t-j)} + A_{22} \text{NSE Nifty-50}_{(t-j)} + E(t)$$

Where, t-j is lagged values or the lag period

E (t): Residual value or the error term

A_{11} , A_{12} , A_{21} , A_{22} are the coefficients

Granger Causality Testing between NSE Nifty-50 and Crude Oil Prices

Null Hypothesis:	Obs	F-Statistic	Prob.
NSE_NIFTY does not Granger Cause CRUDE_OIL_PRICES	130	5.21917	0.0067
CRUDE_OIL_PRICES does not Granger Cause NSE_NIFTY		0.26322	0.7690

Table 2: Granger Causality Test Values computed using E-views

Similarly, NSE Nifty-50 granger causes Crude oil prices while the opposite doesn't hold true statistically as depicted in table 2.

CONCLUSION

The primary motive of the present study was to analyze whether there exist granger causality between Crude oil prices and Stock Index. However, before undertaking this analysis it was essential to check whether the variables under study are stationary i.e. whether their mean and variance are invariant with time or show a specific trend. The analysis for checking stationary or existence of unit root was done using Augmented Dickey Fuller test and the results depicted stationary of variables under study. Further to this, granger causality testing was undertaken to unravel the nature of causal relationship (unidirectional or bidirectional causality) that exists between the Variables. The results depicted uni-directional relationship among S&P BSE Sensex and Crude oil Prices and NSE Nifty-50 and Crude oil prices.

REFERENCES

[1] Chittedi, R.K. (2012). Do Oil Prices Matters for Indian Stock Markets? An Empirical Analysis. Journal of Applied Economics and Business Research. retrieved from

<https://www.researchgate.net/publication/230793496> Do Oil Prices Matters for Indian Stock Markets An Empirical Analysis

- [2] Sathyanarayana, S., Harish, N., S., and Gargesha, S. (2018). Volatility in Crude Oil Prices and its Impact on Indian Stock Market Evidence from BSE Sensex. *SDMIMD Journal of Management*, 9(1). doi: <https://doi.org/10.18311/sdmimd/2018/19997>
- [3] Sharma, A., Giri, S., Vardhan, H., Surange, S., Shetty, R., & Shetty, V. (2018). Relationship between Crude Oil Prices and Stock Market: Evidence from India. *International Journal of Energy Economics and Policy*, 8(4), 331-337.
- [4] Tiwari, K., A., Keshari, S., Mitra, A., & Yoon, M. S. (2018). Impact of oil price risk on sectoral equity markets: Implications on portfolio management. *Energy Economics*, 70. Doi: <https://doi.org/10.1016/j.eneco.2018.03.031>
- [5] Youssef, M., & Mokni, K. (2019). Do Crude Oil Prices Drive the Relationship between Stock Markets of Oil-Importing and Oil-Exporting Countries?. *Economies*, 7(70). doi:10.3390/economies7030070.