

## Energy Sector Of NSE- A Study During The Lockdown Of Covid-19

### Bhargav Gautam Boruah

Research Scholar,  
Dibrugarh University,  
Assam, India

### Shiv Kumar Sharma

Assistant Professor,  
Don Bosco College Golaghat,  
Assam, India

### Abstract

India is one of the developing nations where most of oil and gas requirements are fulfilled by importing them. Price fluctuations in the global market creates a big impact on the economy. Lockdown called by the government of India cut the demand for fuel as there was no consumption of it as vehicular movement was stopped. Oil and gas sectoral indices along with all the companies enlisted in this index are studied. The study intends to find if there is any impact in the energy sector of the National Stock Exchange(NSE) of India along with finding if there are any abnormal returns. The period of study is from 30th May 2019 to 13th May 2020. The event study methodology is used for the study along with Kolmogorov-Smirnov, Shapiro-Wilk and Wilcoxon Signed Ranked Test. The study reveals that there is some abnormal return on a certain date. The market and return data are not normally distributed. The companies under study have a positive correlation which moves in unison with the sector index.

**Keywords-** Covid19, Energy, Event study. Oil & Gas, NSE, India,  
JEL: C12, C14, G01

### Introduction

The global COVID -19 pandemic has resulted in an unprecedented decline in investment, the global flow of capital has lowered the aggregate consumption and output in most of the nations. India was not far behind to feel the impact of contracting the global economy due to the pandemic on its overall growth which was showing some signs of recovery after bold fiscal/monetary measures. Early 2020 which saw an oil price war between Russia and Saudi Arabia, the pandemic has further worsened the situation through the reduction in the demand for oil, which is mainly because of the imposed travel restrictions and fall in oil price due to low demand. The Indian stock market is robust which reacts and responds quickly to the global economic effects. The pandemic has caused a greater impact on the real economic activity both at the micro and macro level, still, the actual impact is not yet properly estimated.

Market efficiency has been an important area of study for understanding the functioning of the market. (Shaik and Maheswaran, 2001) The capital market plays an important role in the allocation of economic resources in the productive activities of an economy. Capital market efficiency is determined by the information and its dissemination among the market players, i.e. it shows how correctly and quickly the prices of securities reflect information about the degree of efficiency in the capital market. (Sohail A. 2014)(Fama, 1970) reviewed the reassessment of efficient market hypothesis theory with an empirical base and distributed market efficiency based on weak, semi-strong, and strong levels of information. (Dickinson, J. P. et al.,1994), discussed that the level of efficiency in the market is nested. The strong form efficiency implies semi-strong form efficiency, and semi-strong efficiency in turn implies weak-form market efficiency. The role of the efficient stock market has been expounded by (Stiglitz,1981), where he points out that the when financial markets are very competitive and efficient, prices quickly reflect all the available information, along with the belief that competitive and efficient markets enable the efficient allocation of scarce capital among alternative investment opportunities. A weaker and economically more sensible version of the efficiency hypothesis says that prices reflect information to the point where the marginal benefits of acting on information (the profits to be made) do not exceed the marginal costs (Jensen,1978). The impact of the 1987 stock market crash was studied by (Taufiq Chaudhary 1996), where it was found that the existence of shocks to volatility was permanent before the crash of the market and temporary after the crash in the market of Mexico and Thailand. The study also failed to found any significant direct relationship between risk and return, which is emphasized by the theories of CAPM. (Fama,1970) suggested that if prices reflect all the available information(s), then the market can be defined as efficient.(Fama,1970) discussed the process of stock inefficient market at any point fully reflect the available information. The study discussed the categories of information where individual investor or groups have monopolistic access to any information in terms of price is considered as a strong form while in semi-strong form the

information subset of interests includes all publicly available while in the weak form the information subset in just historical price or return sequences. (Fama,1991) indicates that average stock prices adjust quickly to information about investment decisions, dividend changes, changes in capital structure, and corporate control information, which further can be redefined as prices adjust efficiently to firm-specific information. (Fisher,1965) study lends considerable support to the conclusion that the stock market is efficient in the sense that stock prices adjust very rapidly to new information. The study suggests that stock split in the market reacts only to the dividend implication which can be clearly understood as the split cause price adjustments only to the extent that is associated with changes in the anticipated level of future dividends (Fisher,1969). (Khan et al.,2011) studied the weak Indian Capital Market based on the two indices BSE Sensex and NSE Nifty and concludes that the Indian stock market doesn't follow a normal distribution and the strong autocorrelation behavior of the variable leads to non-stationary. According to (Ellison and Mullin 2001), contemporary news can influence the movement of stocks in the short run, while stock return underperformance (Hwang,2013) due to negative events is greater in magnitude and exists there for a longer duration as compared to abnormal returns due to positive cases or events. Though previous literature discussed in vast about previous recessions(Stiglitz 2010)(Mian and Sufi,2010)(Bentolia,2018),but the cause 2020 global recession was novel in modern history. This is because the Asian debt crisis of 1997 was mainly due to the collapse of Thai baht in 1997, which cause a region-wise financial crisis and economic recession in Asia (Radlett and Sachs.1998) The 2008 global recession was due to loose monetary policy which created economic bubble supported by weak regulatory structures and high leverage in banking sector (Allen and Carletti,2010). (Rady,2010)discussed the structural weakness in the Greek economy in 2010 caused due to the effect of lack of monetary policy flexibility as a Euro member country and structural weakness in national economic policy. The 2016 recession in Nigeria was mainly due to a fall in crude oil prices, the balance of payment deficit, adoption of a fixed float exchange rate regime(Rady,2012).

## Review of Previous Studies

Le Roy(1989), illustrates that under the random walk model concept, the resources that are being used on analysis of securities are unproductive which further implies that the market pricing decisions doesn't get affected by the past price levels.

The random walk patterns, when was studied on Dow Jones Industrial Average by Robert(1959), it revealed that stock prices movements may be random in nature and at the same time price changes in shares are random, which barely has any predictive value.

Long(1978), studied the relative prices of stock where he found that the different classes of stocks are identical in their respective aspects, except the dividend payout aspect. As the particular company provides result where it can be observed that the effect of market prices on cash dividend policies. This provides strong evidences of irrelevant dividend concept of Modigliani and Miller(1961).

Jensen M(1969), used the CAPM Model for defining risk adjusted rate of return. He further concluded that the fund manager hardly have any financial information regarding the choices of investment to be made.

## Objectives of the study

- To study if there is any abnormal return arising out of the declaration of lockdown on the selected stock indices and companies of NSE.
- To analyze the impact on the share return during pre and post-event.
- To study the correlation of the selected companies and indices during the studied event window period.

## Hypothesis of the Study

- **H01:** There is no significant difference between in AAR during pre and post of lockdown.
- **H02:** there is no significance in the AR of the selected companies.
- **H03:** The market return and abnormal return are normally distributed.
- **H04:** There exists no significant correlation between companies.

## Materials and Methods

Nifty oil and gas sector index and the companies under the sector are studied. The companies are Adani Gas Ltd, Aegis Logistics Ltd, Bharat Petroleum Corporation Ltd, Castrol India Ltd, GAIL (India) Ltd, Gujarat Gas Ltd, Gujarat State Petronet Ltd, Hindustan Petroleum Corporation Ltd, Indian Oil Corporation Ltd, Indraprastha Gas Ltd, Mahanagar Gas Ltd, Oil & Natural Gas Corporation Ltd, Oil India Ltd, Petronet LNG Ltd, Reliance Industries Ltd. In India total Lockdown was implemented on 25th March 2020. So the event date is taken as 0, with 30 days pre-event and 30 days post-event, event window is 61 days, estimation period is 171 days, thus overall trading days were 231; starting from 30th May 2019 to 13 May 2020.

## Tools of Analysis

### A. Event Study Methodology

There are many ways to study the impact of the event in the financial market, event study is one of them. In this study event study market model is used.

Daily Return is calculated using logarithm method

$$R_t = \log \frac{P_t}{P_{t-1}} \quad (1)$$

Where,

$R_t$  = Market return of the period  $t$

$P_t$  = Closing price of Index at day  $t$

$P_{t-1}$  = Closing price of index at day  $t-1$

Log = Natural Log

Daily expected return is estimated using Market Model for each index as follows

$$E(R_{it}) = \alpha + \beta (r_m) \quad (2)$$

Where,

$E(R_{it})$  = Expected return on index  $i$  on day  $t$

$\alpha$  = Alpha Value

$\beta$  = Beta Value

$r_m$  = return on the market on day  $t$

To study the market reaction to the event of abnormal return it is calculated on the day of the event.

$$AR_{it} = R_{it} - E(R_{it}) \quad (3)$$

Where,

$AR_{it}$  = abnormal rate on index  $i$  on day  $t$

$R_{it}$  = return on share  $i$  on day  $t$

The abnormal rate is the percentage change in index value above and below what would normally expect to happen. To make the study more informative, the average abnormal return has been taken for all the observations.

$$AAR_t = \frac{1}{N} = \sum_{i=1}^N AR_{it} \quad (4)$$

Where,

$AAR_t$  = Average Abnormal Return at day  $t$

$AT_t$  = Abnormal return for index  $i$  at day  $t$

$N$  = Number of events in the sample

### B. Normality test

(Kolmogorov as cited in Stephens 1992). The test statistic is given by:

$$D = \sup_x |F_0(x) - F_{data}(x)|$$

Where (for a two-tailed test):

- $F_0(x)$  = the cdf of the hypothesized distribution,
- $F_{data}(x)$  = the empirical distribution function of your observed data.

### C. Wilcoxon Signed Ranked Test

If the data set is not normally distributed then for a single sample or paired sample of the independent variable, the Wilcoxon Signed Ranked Test is used for testing the hypothesis.

## Result and Discussion

**Table -I: Average Abnormal Return and t-statistics during pre and post Lockdown period**

| Days | AAR      | t-statistics | Days | AAR      | t-statistics |
|------|----------|--------------|------|----------|--------------|
| -30  | -0.01156 | -1.09904     | 1    | 0.04118  | 3.91395**    |
| -29  | -0.00057 | -0.0538      | 2    | -0.01302 | -1.23732     |
| -28  | 0.00755  | 0.71726      | 3    | -0.01575 | -1.49698     |
| -27  | -0.00493 | -0.46854     | 4    | 0.06245  | 5.93609**    |
| -26  | -0.00473 | -0.4498      | 5    | -0.01123 | -1.06719     |
| -25  | -0.01616 | -1.53644     | 6    | 0.01267  | 1.20454      |
| -24  | 0.00121  | 0.11504      | 7    | 0.05483  | 5.21183**    |
| -23  | 0.01178  | 1.11971      | 8    | 0.01377  | 1.30879      |

$$ET = \frac{W - n(n+1)/4}{\sqrt{n(n+1)(2n+1)/24}} \quad (8)$$

Where,

$n$  = number of observation

$w = \min(W^-, W^+)$

### D. Correlation of Coefficient

For calculating the correlation in this study, Pearson's Correlation is used which is also known as Pearson's R. It is most commonly used in linear regression. To study the correlation of various indices the equation given below is used.

$$r = \frac{N \sum XY - (\sum X)(\sum Y)}{\sqrt{[N \sum X^2 - (\sum X)^2][N \sum Y^2 - (\sum Y)^2]}} \quad (7)$$

Where,

$N$  = number of paired score

$\sum XY$  = Number of product paired score

$\sum X$  = Sum of X score

$\sum Y$  = Sum of Y score

$\sum X^2$  = Sum of Squared X score

$\sum Y^2$  = Sum of Squared Y score

| Days                        | AAR            | t-statistics     | Days | AAR      | t-statistics |
|-----------------------------|----------------|------------------|------|----------|--------------|
| -22                         | -0.005         | -0.47495         | 9    | 0.02277  | 2.16439**    |
| -21                         | -0.02597       | -2.46844**       | 10   | -0.01015 | -0.96439     |
| -20                         | -0.01098       | -1.04396         | 11   | 0.01055  | 1.00286      |
| -19                         | -0.01541       | -1.46501         | 12   | 0.01864  | 1.77139      |
| -18                         | -0.01191       | -1.13172         | 13   | 0.01025  | 0.97453      |
| -17                         | -0.03481       | -3.30843**       | 14   | 0.0092   | 0.87474      |
| -16                         | -0.01566       | -1.48808         | 15   | -0.03405 | -3.23657**   |
| -15                         | 0.02595        | 2.46635**        | 16   | 0.00494  | 0.46918      |
| -14                         | -0.01012       | -0.96147         | 17   | 0.0046   | 0.43711      |
| -13                         | -0.00368       | -0.34938         | 18   | -0.00847 | -0.80524     |
| -12                         | -0.0197        | -1.87253         | 19   | 0.00877  | 0.83389      |
| -11                         | -0.04326       | -4.11229**       | 20   | 0.01317  | 1.2518       |
| -10                         | -0.01784       | -1.69525         | 21   | 0.0154   | 1.4634       |
| -9                          | -0.09202       | -8.74642**       | 22   | 0.03448  | 3.27700**    |
| -8                          | 0.03831        | 3.64091**        | 23   | -0.0378  | -3.59268**   |
| -7                          | -0.0527        | -5.00873**       | 24   | -0.00912 | -0.8665      |
| -6                          | -0.01022       | -0.97098         | 25   | -0.00109 | -0.10339     |
| -5                          | -0.0392        | -3.72630**       | 26   | -0.0054  | -0.51351     |
| -4                          | -0.02874       | -2.73151**       | 27   | 0.00272  | 0.25863      |
| -3                          | 0.06054        | 5.75387**        | 28   | 0.00694  | 0.65953      |
| -2                          | -0.11797       | -11.21301**      | 29   | -0.01758 | -1.67109     |
| -1                          | -0.014         | -1.33115         | 30   | 0.00605  | 0.57503      |
| <b>0</b>                    | <b>0.02744</b> | <b>2.60829**</b> |      |          |              |
| ** Significant at 5% level. |                |                  |      |          |              |

Source: Author Calculation

Table – I, shows the Average Abnormal return of the selected companies returns along with the t-statistics of the pre and post 30 trading days of the national stock exchange. The table shows the significance level at 5 percent. On the event date t-statistics shows that there is a significant impact in the AAR with a t-value of 2.60829. On -21, -17, -15, -11, -9, -7, -5, -4, -3, -2, there is a significant impact on the pre-event days. In post-event days on 1, 4, 7, 9, 15, 22, 23 days there is an impact in AAR of the selected

companies. We can see that in pre-event on 10 occasions there is impact and in post-event, there is an impact on 7 occasions. There is positive significance on the -15th and -3rd day with 0.02595 and 0.06054 AAR. It shows that in those days' investors earn some abnormal returns. While on post 1st, 4th, 7th, 9th, 22nd days there 0.04118, 0.06245, 0.05483, 0.02277, 0.03448 are having positive AAR, thus implying some abnormal gain for investors.

**Fig. - 1: Showing the AAR of Pandemic Declaration**

Source: Author Calculation

Chart No-1 In the chart the line represents the average abnormal return of the event window. The AAR lies between -0.11797 and 0.06245

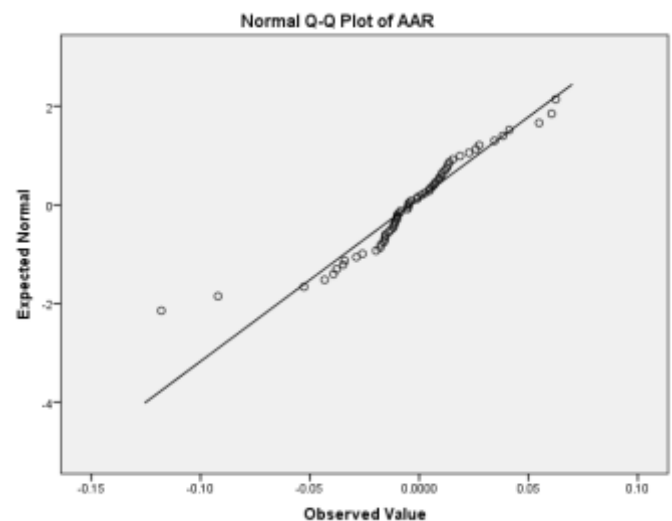
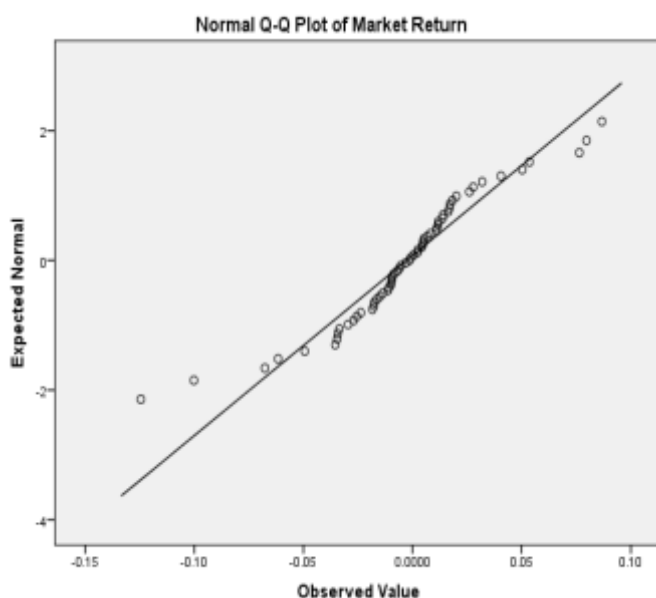
#### Normality test

H0 – The data is normally distributed

**Table no-II: Tests of Normality**

|                                       | Kolmogorov-Smirnov <sup>a</sup> |    |      | Shapiro-Wilk |    |      |
|---------------------------------------|---------------------------------|----|------|--------------|----|------|
|                                       | Statistic                       | df | Sig. | Statistic    | df | Sig. |
| Market Return                         | .118                            | 61 | .033 | .937         | 61 | .003 |
| AAR                                   | .144                            | 61 | .003 | .924         | 61 | .001 |
| a. Lilliefors Significance Correction |                                 |    |      |              |    |      |

The null hypothesis is rejected. The data are not normally distributed.

**Fig. - 2 Showing plot for market return and AAR**

It is used to check whether the data is normally distributed or not; which will eventually lead to deciding whether a parametric test or non-parametric test to be used for the

hypothesis. This test was run in spss statistical package. In table no-II, Kolmogorov-Smirnov and Shapiro-Wilk test is shown. The significance value of both average abnormal return and the market return is below 0.05, eventually null

hypothesis is rejected which says the data is normally distributed. An alternative hypothesis is accepted which says data is not normally distributed. In graph no-2, it can be observed that the bubbles are not on the diagonal lines which imply data are not normally distributed.

**Table – III: Wilcoxon Signed Ranks Test for pre and post-event of AAR**

| Ranks                                                       |                |                 |           |              |
|-------------------------------------------------------------|----------------|-----------------|-----------|--------------|
|                                                             |                | N               | Mean Rank | Sum of Ranks |
| PostAAR - PreAAR                                            | Negative Ranks | 8 <sup>a</sup>  | 11.63     | 93.00        |
|                                                             | Positive Ranks | 22 <sup>b</sup> | 16.91     | 372.00       |
|                                                             | Ties           | 0 <sup>c</sup>  |           |              |
|                                                             | Total          | 30              |           |              |
| a. PostAAR < PreAAR b. PostAAR > PreAAR c. PostAAR = PreAAR |                |                 |           |              |

**Table -IV: Test Statistics**

|                                                           | PostAAR - PreAAR    |
|-----------------------------------------------------------|---------------------|
| Z                                                         | -2.869 <sup>b</sup> |
| Asymp. Sig. (2-tailed)                                    | .004                |
| a. Wilcoxon Signed Ranks Test b. Based on negative ranks. |                     |

The Table No. III & IV shows the Wilcoxon signed ranks and test statistics of the Wilcoxon signed-rank test. The negative mean rank is 11.63 while the positive mean rank is 16.91. The significance value is .004 and Z value is -2.869, as it is below 0.05 thus rejecting the null hypothesis which

says there is no significant difference between AAR of pre and post-event period. The alternative hypothesis is accepted which says there is a significance difference in pre and post data of AAR.

**Table- V: Wilcoxon Signed Ranks Test for pre and post-event of AAR of the companies**

| Test Statistics                                                                       |                     |                      |                                   |                     |                     |                     |                             |                                      |                             |                       |                     |                              |                     |                     |                          |
|---------------------------------------------------------------------------------------|---------------------|----------------------|-----------------------------------|---------------------|---------------------|---------------------|-----------------------------|--------------------------------------|-----------------------------|-----------------------|---------------------|------------------------------|---------------------|---------------------|--------------------------|
|                                                                                       | Adani Gas Ltd.      | Aegis Logistics Ltd. | Bharat Petroleum Corporation Ltd. | Castrol India Ltd.  | GAIL (India) Ltd.   | Gujarat Gas Ltd.    | Gujarat State Petronet Ltd. | Hindustan Petroleum Corporation Ltd. | Indian Oil Corporation Ltd. | Indraprastha Gas Ltd. | Mahanagar Gas Ltd.  | Oil & Natural Gas Corp. Ltd. | Oil India Ltd.      | Petronet LNG Ltd.   | Reliance Industries Ltd. |
| Z                                                                                     | -4.021 <sup>b</sup> | -3.548 <sup>b</sup>  | -4.165 <sup>b</sup>               | -3.569 <sup>b</sup> | -3.281 <sup>b</sup> | -3.795 <sup>b</sup> | -3.671 <sup>b</sup>         | -1.244 <sup>b</sup>                  | -4.782 <sup>b</sup>         | -1.183 <sup>c</sup>   | -2.746 <sup>b</sup> | -3.404 <sup>b</sup>          | -3.075 <sup>b</sup> | -2.499 <sup>b</sup> | -.730 <sup>c</sup>       |
| Asymp. Sig. (2-tailed)                                                                | .000                | .000                 | .000                              | .000                | .001                | .000                | .000                        | .213                                 | .000                        | .237                  | .006                | .001                         | .002                | .012                | .465                     |
| a. Wilcoxon Signed Ranks Test b. Based on positive ranks. c. Based on negative ranks. |                     |                      |                                   |                     |                     |                     |                             |                                      |                             |                       |                     |                              |                     |                     |                          |

Table No V reflects the test statistics for all the studied companies. The significance value is greater than 0.05 in Hindustan Petroleum Corporation Ltd, Indraprastha Gas Ltd, Reliance Industries Ltd, with .213, .237, and .465 thus

implying that there is a significant difference between AR of the pre and post-event. For the rest of the studied companies, it doesn't have any significant difference in abnormal returns.

**Table – VI: Correlation Analysis**

|                        | Nifty Oil and Gas | Adani Gas Ltd. | Aegis Logistics Ltd. | Bharat Petroleum | Castrol India | GAIL | Gujarat Gas | Gujarat State Petronas | Hindustan Petroleum | Indian Oil | Indraprastha Gas | Mahanagar Gas | Oil & Natural Gas Corp | Oil India | Petronet LNG | Reliance Industries |
|------------------------|-------------------|----------------|----------------------|------------------|---------------|------|-------------|------------------------|---------------------|------------|------------------|---------------|------------------------|-----------|--------------|---------------------|
| Nifty Oil and Gas      | 1                 |                |                      |                  |               |      |             |                        |                     |            |                  |               |                        |           |              |                     |
| Adani Gas Ltd.         | .878              | 1              |                      |                  |               |      |             |                        |                     |            |                  |               |                        |           |              |                     |
| Aegis Logistics Ltd.   | .916              | .938           | 1                    |                  |               |      |             |                        |                     |            |                  |               |                        |           |              |                     |
| Bharat Petroleum       | .887              | .937           | .946                 | 1                |               |      |             |                        |                     |            |                  |               |                        |           |              |                     |
| Castrol India          | .911              | .926           | .969                 | .937             | 1             |      |             |                        |                     |            |                  |               |                        |           |              |                     |
| GAIL                   | .940              | .938           | .918                 | .918             | .901          | 1    |             |                        |                     |            |                  |               |                        |           |              |                     |
| Gujarat Gas            | .857              | .877           | .920                 | .940             | .926          | .855 | 1           |                        |                     |            |                  |               |                        |           |              |                     |
| Gujarat State Petronas | .899              | .913           | .947                 | .968             | .952          | .913 | .952        | 1                      |                     |            |                  |               |                        |           |              |                     |
| Hindustan Petroleum    | .746              | .698           | .658                 | .792             | .676          | .731 | .723        | .746                   | 1                   |            |                  |               |                        |           |              |                     |
| Indian Oil             | .740              | .934           | .879                 | .931             | .873          | .862 | .875        | .891                   | .652                | 1          |                  |               |                        |           |              |                     |
| Indraprastha Gas       | .848              | .547           | .639                 | .634             | .628          | .703 | .631        | .671                   | .679                | .361       | 1                |               |                        |           |              |                     |
| Mahanagar Gas          | .937              | .908           | .921                 | .948             | .907          | .934 | .923        | .939                   | .783                | .841       | .774             | 1             |                        |           |              |                     |
| Oil & Natural Gas Corp | .926              | .927           | .896                 | .890             | .881          | .972 | .822        | .893                   | .671                | .858       | .675             | .907          | 1                      |           |              |                     |
| Oil India              | .920              | .936           | .887                 | .905             | .874          | .966 | .816        | .873                   | .731                | .866       | .666             | .921          | .973                   | 1         |              |                     |
| Petronet LNG           | .969              | .887           | .936                 | .901             | .935          | .922 | .879        | .924                   | .705                | .779       | .786             | .930          | .911                   | .893      | 1            |                     |
| Reliance Industries    | .866              | .566           | .660                 | .559             | .664          | .683 | .575        | .601                   | .530                | .322       | .883             | .686          | .669                   | .658      | .795         | 1                   |

Source: Authors Calculation

Table No VI reflects the correlation of all the companies with the selected sectoral index. All the companies are positively correlated. This means that all the companies move with the market in unison. Nifty oil and Gas are highly correlated with Petronet LNG .969 while among the companies the lowest correlation value is of Indian oil with .740. the other companies in the sector lie between .740 and .969.

## Conclusion

The findings show that the lockdown has a significant impact on the Average Abnormal Return of the oil and gas companies. From the company's point of view, three companies out of fifteen have a significant impact on return.

The investor has earned abnormal returns from the oil and gas indices. From the companies, Hindustan Petroleum Corporation Ltd, Indraprastha Gas Ltd, Reliance Industries Ltd. investors have an abnormal return. The Market return and abnormal return is not normally distributed. Overall in pre-date, ten occasions are significant while in post-date significance reduces to seven occasions. The overall market is not completely efficient during the period because there is an abnormal return for the investors. All the companies positively correlated with the index. Further study will be required to check the impact on a short, medium, and a longer period..

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