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Measurement of Effect of Volatility in Crude Oil Prices on Share Prices of Major Petroleum Companies in the Indian Stock Market

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Abstract

Crude Oil is a common word that makes the headlines frequently. It is an essential natural resource for any country. Crude Oil price is one of the most crucial and essential macroeconomic variables which are volatile due to fluctuation in the crude oil prices. Investment in stock market involves future uncertainties and unexpected risks. Irregularity in stock market also called as volatility. It is associated with the changeability as well as future uncertainty of the prices of various financial instruments. Consequently the stock market comprises maximum volatility which leads to maximum risk in the stock market. Therefore, this study mainly related to measurement of effect of volatility in crude oil prices on share prices of major petroleum companies in the Indian stock market. The study considers the daily closing price of crude oil, Sensex and major petroleum companies in India to evaluate the daily returns. For analysing the objectives the data has been composed from secondary source for the duration of 10 years from October 1, 2011 to September 30, 2021. Different tools like mean, stand deviation, skewness, kurtosis, correlation, t test and regression are used to study the volatility pattern of petroleum companies in Indian stock market.

Keywords: Volatility, Crude Oil, Sensex, Petroleum Companies, Correlation, t test and Regression

I. Introduction

Crude Oil price is one of the most significant macroeconomic variables which affect the cost of production directly or indirectly, thus, affecting the future cash flows and profits of companies. Recent years especially after Gulf War (1990-91) and Iraq War (2003) had resulted sharp swings in oil prices, with oil price reaching as high as $148/bbl, followed by an equal dramatic fall in prices. Despite the fact that, based on previous research, oil price changes seem to affect equity prices in a negative manner, a deeper analysis should be done as regard the different impacts on oil exporting and on oil importing countries. In the OPEC countries and in other oil exporter countries the effect of increase in oil prices should be positive, whereas for the oil importing countries like India the impact should be negatively affect the petroleum products.

Stock market is one of the important parts in Indian financial system. Stock market is a place where investors can buy and sell their stocks. In India Bombay Stock Exchange (BSE) and National Stock Exchange (NSE) are two important stock exchanges where the liquidity is very high (Patjoshi, 2020). After post liberalization Indian Stock Market trading is increased highly. Security Exchange Board of India (SEBI) controlled the stock market and on line trading mechanism started. Market capitalization of Indian Stock Market is also increased hugely. When there is an upward or downward movement in the stock prices it also shows in the indices(Patjoshi, 2016)..

II. Review of Literature

Samanta (2003) analysed the volatility in Indian stock market for the period from 1993 to 2002. He found that past values of stocks were affecting the volatility in stock market. When volatility increased the return is also increased in the study period. Stock market volatility and return plays important role for future prediction in the Indian stock market. While Chang-Jin, James and Charles (2004) have done their research in stock market volatility. They have taken a study period from 1996 to 2000. They tried to find whether there is any positive relation between equity premium and volatility. They found a negative volatility response impact but a positive relation between equity premium and volatility. Similarly Patjoshi and Nandini (2020) analysed the day of the week effect in Indian stock market from the period 2000 to 2018 by taking the returns of Indices of BSE. They have used descriptive statistics and GARCH model for the study. They found a statistically significant return in the days of a week. From the above review of literature it has been observed inconsistence in the result especially in petroleum industry that allows us make further study in related field and industry to add more evidence to the past results. [19] Patjoshi (2020), examined the volatility pattern of the cement companies in Indian Stock Market,

On the other hand Balaban and Bayar (2005) investigated in the stock market of 14 different countries. They have taken stock market return and made the prediction of volatility from 1987 to 1997. They have used

different conditional heteroskedasticity model like ARCH, GARCH (1,1), GGARCH(1,1), EGARCH(1,1) for the study. They found some positive and some negative relation of volatility on stock indices. Predictable volatility has a negative impact on weekly as well as monthly stock return of different countries.
On the other hand Patjoshi and Nandini (2020) have done their research by taking the closing value of Sensex and different steel companies for the period from 2010 to 2019. They have used descriptive statistics, t test and correlation for the analysis. They found that Sensex average daily return is positive whereas all the sample companies return is negative. Also the volatility is more for the sample companies than Sensex. Similarly Sarkar and Banerjee (2006) examined the Indian stock market by taking the day wise stock prices in each five minutes break from National Stock exchange. They have taken a study period from 1st June 2000 to 30th January 2004. They used GARCH model for the analysis. They found that GARCH model shows a better market volatility than simple replicas of the volatility. Whereas Tripathy, Prakash and Arora (2009) analysed in the Indian Stock market by taking data of BSE Sensex for the period from January 2005 to June 2009. They have taken different factors such as leverage outcome, daily stock returns, volume and volatility for the analysis. They tried to find out the association between these factors by using ARCH model. They found persistence of volatility in the stock market and also the influence of old news and current news on the volatility for the study period. While Patjoshi (2016), scrutinized suitable day in a week for investment, in the BSE.

On the other hand Patjoshi (2011) analysed volatility in Indian stock market by taking various indices of BSE and NSE. However Nicholas and Nicholas (2011) studied in European stock market. They tried to find out the deviation of volatility in the crises period. They found that most of the stocks show negative and statistically insignificant leverage belongings. Patjoshi and Tanty (2016) analysed the stock market volatility in BSE and NSE of India While Gahan, Mantri, Parida and Sanyal (2012) analysed the volatility pattern in Indian stock market for both pre and post derivative period. They have taken daily closing return value of BSE Sensex and NSE Nifty for the period from 1992 to 2012 and 1995 to 2012. They have calculated volatility by taking the different structure of volatility such as perseverance, irregularity etc. for both pre and post derivative period. They found that the volatility of post derivative period is lesser than pre derivative period. They also found that the current news has more influence in the volatility in the post derivative period than the pre derivative period. Alternatively Patjoshi (2016) investigated the issue and challenges faced by the Indian Stock Market
Similarly Nandini, Patra, Mishra (2012) studied the volatility by finding month of the year effect and also day of the week effect. They have used statistical techniques and GARCH (1,1) model for the analysis. They found there is a significant difference in the return of the days of the week. Patjoshi (2016) has done the research in Indian stock market. He has taken Sensex and banking stocks indices to find the risk and return for the analysis. Similarly; Similarly Nandini (2013) analysed to find the volatility in the Indian stock market. She also found that there is a significance difference in the return of days of the week in different stock exchanges. Conversely, while Patjoshi and Tanty (2017) scrutinizes the volatility of 30 companies of BSE SENSEX. They have taken daily return into consideration to find the volatility. Therefore, this study has taken as initiative to focus on measuring the effect of volatility in crude oil prices on share prices of major petroleum companies in the Indian stock market.

III. OBJECTIVES OF THE STUDY

The study is based on the subsequent objectives.

a. To measure the volatility pattern of the selected petroleum companies in Indian stock market.
b. To analyse the effect of volatility pattern of selected petroleum companies on Indian stock market.
c. To measure the effect of volatility in crude oil prices on share prices of major petroleum companies in the Indian stock market.

IV. HYPOTHESIS OF THE STUDY

Keeping the objectives in view, the hypothesis framed for the study is
H_{01}: There is no significant difference between Sensex returns and petroleum stock returns.
H_{02}: There is no significant difference between crude oil price and petroleum stock price.

V. METHODOLOGY AND TESTS USED IN THE STUDY

The study considers the daily closing price of crude oil, Sensex and major petroleum companies in India to evaluate the daily returns. The study considers the daily closing price of crude oil, Sensex and major

petroleum companies in India to evaluate the daily returns. For analysing the objectives the data has been composed from secondary source for the duration of 10 years from October 1, 2011 to September 30, 2021. The data has been collected from BSE official website and investing.com. Different tools like mean, stand deviation, skewness, kurtosis correlation, t test and regression are used to study the volatility pattern of petroleum companies in Indian stock market.

This study involves four major petroleum companies apart from Sensex and Crude Oil. The four sample petroleum companies are Oil and Natural Gas Corporation Limited (ONGC), Indian Oil Corporation Limited (IOCL), Hindustan Petroleum Corporation Limited (HPCL) and Bharat Petroleum Corporation Limited (BPCL).

Sensex

A stock market analyst Mr Deepak Mohoni introduced the term Sensex. The term Sensex is a portmanteau of Sensitive and Index. The Sensex is an index that reflects the Bombay Stock Exchange (BSE). The Sensex Index comprises 30 stocks on BSE. These stocks are the largest and most actively traded stocks on the BSE. The criteria for selecting stocks are as follows:

Listed on BSE

It should be a large to mega-cap stock.

Relatively liquid stocks

Revenue generated from core activities

A diversified and balanced sector involvement in line with the Indian equity market

The Sensex reflects the movements in the Indian stock market. If the Sensex increases, it means the prices of the underlying 30 stocks have increased. If the Sensex has decreased, it means the prices of the underlying 30 stocks have decreased. The Sensex is the oldest index in India, and people consider it to be a reflection of the Indian economy. Market research analysts refer to the Sensex to understand the overall growth, development in industry, country's stock market trend.

Crude Oil

Crude oil is a naturally occurring petroleum product composed of hydrocarbon deposits and other organic materials. A type of fossil fuel, crude oil is refined to produce usable products including gasoline, diesel, and various other forms of petrochemicals. It is a nonrenewable resource, which means that it can't be replaced naturally at the rate we consume it and is, therefore, a limited resource. Crude oil is typically obtained through drilling, where it is usually found alongside other resources, such as natural gas (which is lighter and therefore sits above the crude oil) and saline water (which is denser and sinks below).

After its extraction, crude oil is refined and processed into a variety of forms, such as gasoline, kerosene, and asphalt, for sale to consumers

Profile of Oil and Natural Gas Corporation Limited (ONGC):

Oil and Natural Gas Corporation is an Indian multinational oil and gas company earlier headquartered in Dehradun, Uttarakhand, India. This largest natural gas company rank 11th among global energy majors (Platts). It is the only public sector Indian company to feature in Fortune's 'Most Admired Energy Companies' list. ONGC ranks 18th in 'Oil and Gas operations' and 220 overall in Forbes Global 2000. Acclaimed for its Corporate Governance practices, Transparency International has ranked ONGC 26th among the biggest publicly traded global giants. It is most valued and largest E&P Company in the world, and one of the highest profit-making and dividend-paying enterprise.

ONGC has a unique distinction of being a company with in-house service capabilities in all areas of Exploration and Production of oil & gas and related oil-field services. Winner of the Best Employer award, this public sector enterprise has a dedicated team of over 30,000 professionals who toil round the clock in challenging locations.

Profile of Indian Oil Corporation Limited (IOCL):

Indian Oil Corporation Limited (IOCL), commonly known as Indian Oil is an Indian state owned oil and Gas Company with registered office at Mumbai and primarily headquartered in New Delhi. It is the largest commercial oil company in the country, with a net profit of INR 19,106 crore (USD 2,848 million) for the financial year 2016–17. It is ranked 1st in Fortune India 500 list for year 2016 and 168th in Fortune's 'Global 500' list of world's largest companies in the year 2017.

Indian Oil's business interests overlap the entire hydrocarbon value-chain, including refining, pipeline transportation, marketing of petroleum products, exploration and production of crude oil, natural gas and petrochemicals. Indian Oil has ventured into alternative energy and globalization of downstream operations. It has subsidiaries in Sri Lanka (Lanka IOC), Mauritius (IndianOil (Mauritius) Ltd) and the Middle East (IOC Middle East FZE).

Profile of Hindustan Petroleum Corporation Limited (HPCL):

Hindustan Petroleum Corporation Limited is an Indian state-owned oil and natural gas company with its headquarters at Mumbai, Maharashtra. It has about 25% market-share in India among public-sector companies and a strong marketing infrastructure.

Hindustan Petroleum Corporation Limited (HPCL) is an Indian state-owned oil and natural gas company with its headquarters at Mumbai, Maharashtra. It has about 25% market-share in India among public-sector companies (PSUs) and a strong marketing infrastructure. Oil and Natural Gas Corporation owns 51.11% shares in HPCL and others are distributed amongst financial institutes, public and other investors. The company is ranked 367th on the Fortune Global 500 list of the world's biggest corporations as of 2016.

HPCL was incorporated in 1974 after the takeover and merger of erstwhile Esso Standard and Lube India Limited by the Esso (Acquisition of Undertakings in India) Act 1974. Caltex Oil Refining (India) Ltd. (CORIL) was taken over by the Government of India in 1976 and merged with HPCL in 1978 by the CORIL-HPCL Amalgamation Order, 1978. Kosan Gas Company was merged with HPCL in 1979 by the Kosangas Company Acquisition Act, 1979.

Profile of Bharat Petroleum Corporation Limited (BPCL):

Bharat Petroleum Corporation Limited is a Government of India controlled Maharatna oil and gas company headquartered in Mumbai, Maharashtra. The Corportion operates two large refineries of the country located in Mumbai and Kochi.

Around 1860's, the world witnessed vast industrial development that ultimately lead to an increase in petroleum refineries. This was also the time that there historical journey began as Burma Oil Company.

Although incorporated in Scotland in 1886, the Burma Oil Company became an important player in the South Asian market that grew out of an enterprise named Rangoon Oil Company (formed in 1871) to refine crude oil produced from primitive hand dug wells in Upper Burma independently.

Methods of Investigation

The main objective of the study is to comprehend the volatility accompanying with BSE and other sample petroleum stocks as well as to construct a linear regression model keeping BSE Sensex index as dependent variable and other petroleum stock indices as independent variable. In this analysis for testing the presence or absence of volatility in the Indian equity markets and for testing hypothesis, different methods like correlation, regression, descriptive statistics and t test have been adopted.

T test has been employed to measure the effect of volatility in crude oil prices on share prices of major petroleum companies in the Indian stock.

The Daily index returns of the stock markets have been computed using the following formula;

The return has been calculated on the basis of the model:

$$rt = \ln (It/It\text{-}1)$$

Where

rt = Return on stock price

ln = Natural logarithm

It = the closing index

I t –1 = the closing index

The standard deviation of all indices designed from the underneath mentioned formula to compute the risk associate with the return of indices.

$$\sigma = \sqrt{((x1-\mu)2+(x2-\mu)2+..+(xn-\mu)2)/n}$$

Where $\mu = (x1+x2+..+xn)/n$ (1)

Descriptive Statistics is an established of momentary descriptive coefficients that summaries an assumed set of data, that can also be a demo of the whole population. Descriptive statistics are being used to survey the central tendency (position) of data.

The linear relationship among two variables is measured by the correlation coefficient. In assumed set of explanations (x1, y1), (x2,y2),...(xn,yn), can be derived by computing the correlation coefficient(r)

$$r = \frac{1}{n-1} \Sigma \left(\frac{x - \bar{x}}{s_x}\right)\left(\frac{y - \bar{y}}{s_y}\right)$$

To predict the performance of BSE Sensex with the help of Petroleum stock data linear relationship was presumed keeping Sensex as dependent variable and return of other securities as independent variable. The formula used is given below

R=a+ Σ(i=1)n 〖bi Ri 〗

Where R = Return of Sensex Index

a = constant,

Ri = Return of petroleum stock indices

bi is the coefficient of particular petroleum stock index.

The paired t-test decides whether the difference between two sample is significant or not underneath the expectations that the paired differences are independent and identically normally distributed.

To put on the test, let

$$\hat{X}_i = \left(X_i - \bar{X}\right) \qquad (1)$$

$$\hat{Y}_i = \left(Y_i - \bar{Y}\right) \qquad (2)$$

Formerly demarcated by

$$. \; t = \left(\bar{X} - \bar{Y}\right) \sqrt{\frac{n(n-1)}{\Sigma_{i=1}^{n} \left(\hat{X}_i - \hat{Y}_i\right)^2}}$$

Here statistic has (n-1) degrees of freedom.

The P value (premeditated probability) is the projected probability of discarding the null hypothesis of a study at what time that hypothesis is correct. Null hypothesis is frequently a hypothesis of "no differences" besides practice to explain obviously beforehand the beginning of the study. When the P value is a smaller total than the selected significance level then it discard the null hypothesis i.e. agree to accept that sample gives sensible indication to provision the substitute hypothesis. On this point in this study the level of significant has been taken as 5% confidence level.

VI. DATA ANALYSIS AND INTERPRETATION

Comparative Analysis of Risks and Returns of Different Stock Returns

Table-1 summarizes the statistical results of daily stock market returns of different stock indices from 1st October 2011 to 30th September 2021 by the help of descriptive statistics.

Table-1

Descriptive Statistics of the Returns

Particulars	Sensex	ONGC	IOCL	HPCL	BPCL
Mean	0.0502	-0.0253	-0.0314	0.0026	-0.0142
Standard Deviation	1.0755	2.2433	2.8337	3.4311	3.1448
Kurtosis	19.5585	44.9917	314.6640	437.1363	226.1528
Skewness	-1.2257	-2.5098	-12.7000	-14.2230	-10.5155
Range	22.6965	56.2440	82.0366	123.7730	86.0607
Minimum	-14.1017	-39.2055	-72.0863	-110.0572	-72.0204
Maximum	8.5947	17.0385	9.9503	13.7159	14.0403

It has observed from above during the study period i.e. from 1st October 2011 to 30th September 2021, all indices showed negative average daily returns except HPCL. The average daily returns recorded highest of 0.0026 in case of HPCL, whereas it found lowest of -0.0314 in the case of IOCL. The average daily return of Sensex is found to be 0.0502, which is more as compare to ONGC, IOCL, HPCL and BPCL. Therefore from the

above clearly suggest that average daily return of Sensex is higher than that of all Petroleum stock returns over the study period. On the contrary, the standard deviation of Sensex is lowermost associate to all Petroleum stock returns. The standard deviation of HPCL stock return is uppermost for the mention period. Therefore it indicates that HPCL stock encompasses maximum risk than that of all other stock returns, while Sensex return comprises minimum risk. The daily returns distribution of all sample stock returns are found to be negatively skewed. All stock returns are observed to be leptokurtic (peaked) by nature i.e. it is lowest in case of Sensex and more peaked in case of HPCL.

Correlation between BSE Sensex and Petroleum Stock Returns

The Table-2 elaborates the correlation matrix for daily stock returns of Sensex and petroleum stock over a span of ten years from 1st October 2011 to 30th September 2021.

Table-2 Correlation of Daily Sensex and and Stock Market Returns

Particulars	Sensex	ONGC	IOCL	HPCL	BPCL
Sensex	1.0000				
ONGC	0.5021	1.0000			
IOCL	0.2998	0.3223	1.0000		
HPCL	0.3112	0.3016	0.3552	1.0000	
BPCL	0.3385	0.2907	0.3516	0.3897	1.0000

From the Table-2, we can observe that daily stock market returns of Sensex are positively correlated with that of all Petroleum stock returns. The Sensex return is highly correlated with that of ONGC and found lessor correlated with. IOCL

Correlation between Crude Oil Prices and Petroleum Stock Returns

The Table-3 elaborates the correlation matrix for daily crude oil prices and petroleum stock price over a span of ten years from 1st October 2011 to 30th September 2021.

Table-3 Correlation of Daily Crude Oil Prices and Stock Market Prices

Particulars	Crude Oil	ONGC	IOCL	HPCL	BPCL
Crude Oil	1.0000				
ONGC	-0.5589	1.0000			
IOCL	-0.6842	0.5749	1.0000		
HPCL	-0.4437	0.2990	0.7859	1.0000	
BPCL	-0.4746	0.3407	0.6940	0.8139	1.0000

From the Table-3, we can observe that crude oil prices are negatively correlated with that of all Petroleum stock. The Crude Oil return is highly negatively correlated with that of IOCL.

Regression Results for Returns on Sensex as Dependent Variable and Various Stock Returns as Predictors

Table 4

Regression Results for Sensex as Dependent Variable
and Various Factors as Predictors

a) Model Summary

Multiple R	R Square	Adjusted R Square	Standard Error
0.5560	0.3091	0.3080	0.8947

b) Goodness of Fit – ANOVA

Particulars	SS	MS	F	Significance F
Regression	884.9895	221.2474	276.3794	0.0000
Residual	1978.0866	0.8005		
Total	2863.0761			

c) Regression Coefficients

Particulars	Coefficients	Standard Error	t Stat	P-value
Constant	0.0566	0.0180	3.1496	0.0017

ONGC	0.1921	0.0088	21.9325	0.0000
IOCL	0.0305	0.0072	4.2617	0.0000
HPCL	0.0319	0.0060	5.3501	0.0000
BPCL	0.0527	0.0065	8.1371	0.0000

Dependent Variable: Sensex

The above table i.e., 4 (a), (b) and (c) derived the regression analysis between Sensex returns as dependent variable with the petroleum companies returns as independent variables. The goodness of fit consequences of standard linear multiple regressions through Sensex as the dependent variable and numerous determinants as forecasters are described in Table 4(a) and the model result has elaborated in Table 4 (b). The F-statistics value of 276.3794 ($P<0.05$) shows that the independent variables are jointly statistically significant at 5% level. This model discloses that there is a statistically significant association among Sensex and all petroleum stock returns ($P<0.05$). The regression result in table 4 (c) indicates that the coefficient for ONGC, IOCL, HPCL and BPCL are 0.1921, 0.0305, 0.0319 and 0.0527 respectively and is statistically significant at 1 per cent level, with p-value of 0.0000. This study indicates that there is a statistically significant association among Sensex returns and petroleum stock returns. Therefore our hypothesis (H_{01}: There is no significant difference between Sensex returns and petroleum stock returns) is accepted.

Analysist-Test: Paired of Crude Oil and ONGC Share Price

Table 5

t-Test: Paired Crude Oil Price and ONGC Share Price

Particulars	Crude Oil	ONGC
Mean	2829.4536	217.6822
Variance	12474055.1616	7825.6129
Pearson Correlation	-0.5589	
t Stat	36.8191	
P(T<=t) one-tail	0.0000	
t Critical one-tail	1.6455	
P(T<=t) two-tail	0.0000	
t Critical two-tail	1.9609	

Table 5 summarizes the results of paired crude oil price and ONGC share price from 1st October 2011 to 30th September 2021 with the help of t-test. Lower standard deviation for ONGC share price as compared to crude oil price clearly indicates that former is more consistent than the latter. Again, the correlation value is -0.5589 represents a negative correlation between both the indices. The p-value of 0.0000, which is less than 0.05, indicates that there is a significant difference in the daily prices between crude oil price and ONGC share price at 5 percent level of significance. Therefore the hypothesis (H02: There is a no significant difference between crude oil price and petroleum stock price) is rejected.

Analysist-Test: Paired of Crude Oiland IOCL Share Price

Table 6

t-Test: Paired Crude Oil Price and IOCL Share Price

Particulars	Crude Oil	IOCL
Mean	2829.4536	259.8188
Variance	12474055.1616	15441.4162
Pearson Correlation	-0.6842	
t Stat	35.8650	
P(T<=t) one-tail	0.0000	
t Critical one-tail	1.6455	
P(T<=t) two-tail	0.0000	
t Critical two-tail	1.9609	

Table 6 summarizes the results of paired crude oil price and IOCL share price from 1st October 2011 to 30th September 2021 with the help of t-test. Lower standard deviation for IOCL share price as compared to crude

oil price clearly indicates that former is more consistent than the latter. Again, the correlation value is -0.6842 represents a negative correlation between both the indices. The p-value of 0.0000, which is less than 0.05, indicates that there is a significant difference in the daily prices between crude oil price and IOCL share price at 5 percent level of significance. Therefore the hypothesis (H02: There is a no significant difference between crude oil price and petroleum stock price) is rejected.

Analysist-Test: Paired of Crude Oil and HPCL Share Price

Table 7 t-Test: Paired Crude Oil Price and HPCLShare Price

Particulars	Crude Oil	HPCL
Mean	2829.4536	396.4293
Variance	12474055.1616	46055.5042
Pearson Correlation	-0.4437	
t Stat	33.8258	
P(T<=t) one-tail	0.0000	
t Critical one-tail	1.6455	
P(T<=t) two-tail	0.0000	
t Critical two-tail	1.9609	

Table 7 summarizes the results of paired crude oil price and HPCL share price from 1st October 2011 to 30th September 2021 with the help of t-test. Lower standard deviation for HPCL share price as compared to crude oil price clearly indicates that former is more consistent than the latter. Again, the correlation value is -0.4437 represents a negative correlation between both the indices. The p-value of 0.0000, which is less than 0.05, indicates that there is a significant difference in the daily prices between crude oil price and HPCL share price at 5 percent level of significance. Therefore the hypothesis (H02: There is a no significant difference between crude oil price and petroleum stock price) is rejected.

Analysist-Test: Paired of Crude Oil and BPCL Share Price

Table 8

t-Test: Paired Crude Oil Price and BPCL Share Price

Particulars	Crude Oil	BPCL
Mean	2829.4536	527.7657
Variance	12474055.1616	33978.1204
Pearson Correlation	-0.4746	
t Stat	32.0812	
P(T<=t) one-tail	0.0000	
t Critical one-tail	1.6455	
P(T<=t) two-tail	0.0000	
t Critical two-tail	1.9609	

Table 8 summarizes the results of paired crude oil price and BPCL share price from 1st October 2011 to 30th September 2021 with the help of t-test. Lower standard deviation for BPCL share price as compared to crude oil price clearly indicates that former is more consistent than the latter. Again, the correlation value is -0.4746 represents a negative correlation between both the indices. The p-value of 0.0000, which is less than 0.05, indicates that there is a significant difference in the daily prices between crude oil price and BPCL share price at 5 percent level of significance. Therefore the hypothesis (H02: There is a no significant difference between crude oil price and petroleum stock price) is rejected.

VII. Conclusion

This research mainly related to measure the volatility pattern of the selected petroleum companies in Indian stock market, to analyse the effect of volatility pattern of selected petroleum companies on Indian stock market and to measure the effect of volatility in crude oil prices on share prices of major petroleum companies in the Indian stock market. The study considers the daily closing price of crude oil, Sensex and major petroleum companies (ONGC, IOCL, HPCL & BPCL) in India to evaluate the daily returns. For analysing

the objectives the data has been composed from secondary source for the duration of 10 years from October 1, 2011 to September 30, 2021. Different tools like mean, stand deviation, skewness, kurtosis, correlation, t test and regression are used to study the volatility pattern of petroleum companies in Indian stock market. It has found from descriptive statistics that all indices showed negative average daily returns except HPCL. The average daily returns recorded highest in case of HPCL, whereas it found lowest of in the case of IOCL. The average daily return of Sensex is higher than that of all Petroleum stock returns over the study period. The standard deviation of HPCL stock return is uppermost and encompasses maximum risk than that of all other stock returns, while Sensex return comprises minimum risk. It found that daily stock market returns of Sensex are positively correlated with that of all Petroleum stock returns whereas the daily Crude Oil Prices are negatively correlated with that of all Petroleum stock prices. Regression analysis specifies that there is a statistically significant association among Sensex returns and petroleum stock returns. Therefore our hypothesis (H01: There is no significant difference between Sensex returns and petroleum stock returns) is accepted. The t test summarizes the results of paired Crude Oil and petroleum companies indicates that there is a significant difference in the daily prices between Crude Oil and petroleum companies share price at 5 percent level of significance. Therefore the hypothesis (H02: There is a no significant difference between crude oil price and petroleum stock price) is rejected.

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