PERFORMANCE EVALUATION OF CRUDE OIL WITH REFERNCE TO MULTI-COMMODITY EXCHANGE OF INDIA LIMITED

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Abstract – This research study is undertaken to understand that how crude oil prices is volatile with reference to multi-commodity exchange of India. This study is contributed to research in Indian energy market and especially for commodity market (COMDEX). The span of this study includes data of crude oil spot prices for last 10 years (2011-2020) and MCXiCOMDEX closing prices for last 5 years (2016-2020) in a yearly format. With this data tools are applied for performance evaluation is trend analysis, descriptive statistics, correlation and regression. The findings of this study indicate that oil prices are fluctuated as compared to market returns also oil prices and markets indicating moderate to high positive correlation in the past data.

Keywords –

Crude oil, Derivatives, Trend Analysis, Regression

INTRODUCTION

Crude oil is most significant variable under the macro-economic part of the country and even world also. So, oil prices are highly affected and fluctuated at global level because of different supply and demand variables, demographic, geographic variables, political situations of various nations, etc. Thus, oil prices were also effect global countries exchange rates fluctuations and financial markets conditions. In all such cases US serves better than other countries to producing oil at largest bulk in the world.

Oil is a basic source of energy. The largest boost come into oil demand of 90% is from principal of energy source. So, major oil demand is further improving the developing countries and encouraged by the growth of particular petrochemical industry. Mostly effect of population which is growing on planet by hook or by crook i.e. by 2025 developing countries will contribute half of the global GDP growth.

82% is India imports for oil needs and it decreased by 2022 by 67% with this aim replacing it with renewable energy, local exploration and indigenous ethanol fuel. As on 31st March, 2018, India had estimated natural gas reserves of 1339.57 billion cubic meters and crude oil reserves of 594.49 million tones. In 2018, India was top 3rd importer of crude oil – 205.3 million tones.

In India, one of the major commodities trading in MCX is crude oil and also important factor of increasing inflation are crude oil prices which is evident from the numbers announced by exchanges like Multi Commodity Exchange (MCX) signaling growth in the volume of trade day by day. Investors need to understand the effect that crude oil inventories have on the prices of crude oil which in turn is likely to affect the commodity market as a whole.

LITRATURE REVIEW

Prof. Vishal Sood, Dr. Ira Bapna, Dr, N. K. Totala and Prof. H. S. Saluja (2014) conducted research on crude oil in Indian capital market and trading in equity derivative with reference to exchange preferred as – NSE, S&P CNX Nifty with carry analysis on hedging, investing, trading of securities on the exchange. According to data researchers have applied tests and tools like – unit root test, correlation, regression, GARCH (1, 1) model, Jarque Bera Statistics, ARCH Effect and Serial Correlation Test. In conclusion, they are defined that relationship with crude oil with reference to their chosen exchanges respectively.

Palash Bairagi and Virendra Pratap Rai (2016) analyzed that the relationship between crude oil prices and Indian stock market fluctuations on the basis of various tools like trend analysis, correlation and regression based modeling to gather past available data of crude oil. Crude oil prices were gathered from BSE past year data of 2003-12 in time series format. In this paper they were finding that there is a weak but significant relationship between crude oil prices of Indian economy and BSE.

Dr. P. Sri Ram (2017) conducted research on impact of crude oil price on Indian stock market, commodity market and some macro-economic variables like GDP, WPI and CPI. This study had taken data of the years 2007-2016 from NSE and MCX to measure tend to volatility, unit root test, granger causality test, GARCH (1, 1) model, correlation analysis and ordinary list square (OLS Model). Thus, he is studied on the impact of between Nifty 50 index and Commodity Exchange (COMDEX) with include parameters also GDP and WPI. Thus, researcher fined all variables relationships in between among.

Anand P., Parmar S. and Shrivatsava S. K. (2020) in this research they were analyzed that the impact on Indian stock market. Researchers were collected data from National Stock Exchange for period of August 2007 to December 2018 monthly closing prices of oil. They have use tools to measure impact of oil prices in Indian stock market like, Vector Auto Regression, Augmented Dickey-Fuller Test and Granger Causality Test. Thus, this paper concluded oil prices difference between Nifty 50 and other fluctuations.

Raghunand S R and Dr. Smita Kavatekar (2019) this research study is intention to study impact of oil prices with respect to Indian stock market. This study has applied various statistical tools like - ANOVA, Regression analysis. The span of 5 years i.e. 2013-17 data this study includes as per available past data on BSE and NSE. This study concluded that found volatility fluctuations between oil Brent prices and indices of stock market.

Amalendu Bhunia (2012) in this study to examine short and long-term relationships between BSE 500, BSE 200 and BSE 100 indexes of Sensex (BSE) with respect to crude prices by applying various tools. This study used data for 10 years period i.e. 2001-2011 from BSE 100,

BSE 200 and BSE 500 which is gathered database from Ministry of Finance, Government of India, BSE and Bloomberg. Researcher used analysis tools SPSS and Eviews. Crude Oil prices analyzed by Unit Root Test, Johansen Co-integration Test, Vector Error Correlation Model and Granger Causality Test. At the end find results that observed each stock index is co-integrate with crude price in long-term relationship. As see other results derived from this study that stock exchange returns in India are signaling change in crude oil prices.

Ankit Sharma, Harsh Vardhan, Sasmita Giri, Rohan Shetty, Sujeet Surange and Vishwaroop Shetty (2018) this paper examine the crude weekly prices from January 2010 to January 2017. Those data were collected from future prices Nifty index and BSE Sensex Energy index. Researchers applied tests like; Augmented Dickey-Fuller Test, Vector Auto Regression, Phillips-Perron unit root test which all are examines non- stationary time series at long-term relationships with its related variables. Researchers concluded that crude oil prices are relatively negative correlation when standard deviation shocks are given to stock indices.

Bidisha Sarkar and Jain Marthew (2018) this paper presenting an idea to the crude oil prices fluctuations has become an emerging topic for developing countries and all other oil exporting, importing countries. Overall, this study contributes to international crude oil prices with explore that causes and consequences of the changes in Indian crude oil price basket. Hence, to assess cause and effect relationship collects past available data of the financial year 2000-2001 to 2016-2017. Data were collected in monthly time series format for this research work. Researchers used tool for analyses data Granger Causality Test, Gross Domestic Production of crude oil, Co-integration Test, Augmented Dickey- Fuller Test of Unit Root Test.

Dr. M. Ganesh and Dr. K. Soundarapandiyan (2017) researchers analyses that the crude oil prices analytical view and its impact on our economy. This paper enlightens the research on impact of crude oil price on Indian economy by application of tools like Gross Domestic Production, Consumer Price Index and Regression Analysis. For this tools using data of 15 years time frame i.e. 2001-2015. Finding of this study is demand and supply prices fluctuations.

Dr. Kapil Jain (2013) this research analyze the impact of macro-economic variables on the performance of stock market. This performance is analyzed over the period 2008- 2013. Performance of stock market is measure with macro-economic variables like Interest Rate and Inflation Exchange Rate etc. this study carried out relationship between Sensex and Exchange Rate, Inflation and Foreign Institutional Investors in India. This study applied two tests – Multiple Linear Regression and Pearson Correlation.

Dr. P. Srithar, G. Mariselvam and N. Bairavi (2015) in this paper researchers aims to analyze crude oil price volatility with the selected economic variables of India. Such variables are likewise; GDP, inflation, CPI, employment, trade, industry and business affects in India. This study considered time span of year 2003-2013. According to researcher's data tools application

GDP, Inflation, CPI and National Stock Exchange prices are volatile. This study concluded that crude oil prices are significant positively relationship with inflation rates in India.

Firdous A Wani, Syed Mohsin Saif and Mudasir M Kirmani (2015) researchers analyze the impact of crude oil on Indian economy. They analyzed various sectors in India like Agriculture, Industry & Service, Banking & Finance, Global Trade Relations, and Foreign Direct Investments in India, Currency and Natural Resources. In this research, they did secondary data from websites and applications and on the other hand they were also did some type of information which has primarily collected. In this paper, researchers saw data like Indian Refinery Sector and Reserves, Indian Crude Oil Region Productions, Average change in Oil Prices, Imports of Crude Oil, and Import of Oil from Different Observationsries of the World, Production and Consumption of Petroleum Products (in MMT), Rate of Crude Oil in historical data and impact on GDP. Thus, crude oil prices affect all over globe directly or indirectly.

Geetanjali Narwal Nehra (2015) in this paper researcher carried out research on the impact of crude oil price in Indian economy with considering variables like Gross Domestic Production, Index of Industrial Production and Wholesale Price Index. Researcher also defines uses of crude oil. Research is carry on with secondary data which includes magazines, websites, newspapers, official reports, published brochures, periodicals, journals, books and the internet. She did research on various topics like Impact of crude oil prices on Indian economy, Factors and Effects of Rising Oil Prices, Factors that influence to raise Petrol Price, Reasons for Variation Crude Oil Prices maybe short-term or long-term.

Nitin Kumar, Dr. Suchita Singh, Dr. Madhav Saraswat and Gopal Bihari Saraswat (2020) did research on modeling and forecasting linkages between stock market behaviors and crude oil. This research attempts to forecast crude oil price and Indian stock behavior on past global financial crisis had any significant shock in long-run and short-run to Indian financial structure. This study covers the data from January 1988 to March 2018 in a monthly closing prices of Brent crude oil price, Indian Exchange Rate (₹/$), Interest rates and Nifty 50 index. Researchers used micro-economic variables like Unemployment Rate, IIP and CPI. This research carried tests of Augmented Dickey- Fuller and Philip Peron Test, Vector Auto Regression Model and Jarque-Bera, Break Point Test, Forecast Evaluation, Econometric Model and Variance Decomposition.

Dr. Nidhi Sharma and Kirti Khanna (2012) this paper is research on crude oil price velocity and stock market ripple with the comparative study of BSE with NYSE and LSE. This paper is analyzed the performance/reaction of stock market towards the crude oil price change. Data collected from three stock markets – New York Stock Exchange, Bombay Stock Exchange, London Stock Exchange and Multi – Commodity Exchange. This study based on percentage of daily crude oil prices (spot) and market returns from 2008-09 to 2010-11. Data analyzed by tests Correlation and Regression with the SPSS, Minitab and IBM Amos Statistical Software.

Krishna Reddy Chittedi (2012) this paper investigates crude oil prices and stock prices between both have long-term relationships for India for year April 2000 – June 2011. This research study obtained results that volatility of stock price in India and it impact on volatility of oil prices. In this paper researcher used tests like Augmented Dickey-Fuller Test, Phillip-Perron Test, and KPSS Test, Co-integration, Correlations and Error Correlation. India has a significant impact on oil prices volatility.

Mr. Kali Charan Modak and Ms. Pallabi Mukherjee (2015) this paper object to study effect and impact of crude oil price fluctuations on the Indian economy from data available 2000-2014. Researchers defined the factors affecting crude oil prices at globally also. In this study applied tests are Multiple Linear Regression with variables like Inflation, Gross Domestic Production and Balance of Trade Deficit. Economic growth and oil price trends with respect to model of Trend Analysis, ANOVA. In analysis part, researchers defines relationship between economic growth and oil price trend, also defines relationship between inflation and oil prices as well as defines relationship between balance of trade deficit and oil prices.

Garima Jain and Mudit Garg (2019) research is study of crude oil and its effect on Indian market. As per researcher point of view, India imports about to 5 Million Brent per Day. So, this paper is discovered on the major factors for Oil Trading & it influence over the Indian economy including Instability and Sanctions on OPEC, Asian Premium and non-OPEC imports in India. Thus, India is stand as a leader in bargain buyer of Oil Trade of Asia. This research is also highlights on the part of Indian section unknown supplier section and risk that taken Indian economy while deciding its oil suppliers. However, India imports 80% of meet its crude oil requirements. Indian market is affect very immediately crude oil trading and pricing because of crude oil is an international level commodity.

Pankaj Bhattacharjee (2013) researcher objective is the impact of crude oil price in Indian economy. Extra variables are considered like Crude Oil Price, Inflation and GDP. Researcher said that oil price changes affect several domestic variables and 'economy- wide' effects. This research is a quantitative and analytical research by using various econometric and statistical parameters to find out the relationships between dependent and independent variables. Data were collected from 2000-2009 to analyze and relate with Basket Price, Inflation Rate, WPI and GDP growth. In this thesis, researcher applied statistical tools like; Karl Pearson's Correlation Coefficient, Goodness of Fit Test, Coefficient of Determination, Multiple Linear Regression and Ganger's Causality Test.

Narendra Punati and Raghuvender Raju G. (2017) this study is determinants of crude oil prices in India. This study enlighten today's at present condition of crude oil prices and imports of crude oil in India. Researchers collect the monthly data from April 1995 to December 2015. This study covered aspects of crude oil basics, crude oil recent developments in prices, imports of crude oil, demand and supply of oil, Organization of Petroleum Exporting Countries power. This research carries out ADF Test, Index of Industrial Production, Different Exchange Rate,

Inflation Rate and Past available on BSE Brent Crude oil Prices and Ordinary Least Square Method.

Dr. K. H. Anilkumar, Prasanna B. Joshi and Uma C. Swadimath (2013) this study covered aspects that causes of raises crude oil prices and its factors to influence it. According to belief of these researchers crude oil is most essential commodity and most traded in the world which influences any economy of the world. An extract of crude oil / petroleum is known as "liquid gold". So, crude oil is compared to gold because of it has same economic value as gold as well as oil. This study considered variables like; Cartels and Joint Profit Maximization, Cartels & Market Sharing, Extract of Petroleum & Crude Oil Components, Determinant of Oil Prices, Reasons in Oil Prices, Rise & Fall in Oil Prices and at last, and Impact of Oil Prices on Indian Economy.

Dr. Saif Siddiqui and Dr. Neha Seth (2015) this paper discover the idea on global oil price changes affect Indian stock market returns, this analysis based on historical data that researchers identify for research study. Data were collected from CNX Nifty, National Stock Exchange and Daily Closing Oil Prices from January 2010 to December 2014. Data also gathered from moneycontrol.com. Researchers are applied statistical tools like; Pearson Correlation Test, Unit Root Tests – Augmented Dickey-Fuller and Phillip-Perron Test, Johansen Co-integration Test, Granger Causality Test, Jarque-Bera and Pair Wise Granger Causality Test.

Swati Sharma (2017) this study enlighten to research on how high frequency data can be turned into strategies of trading by exploring the information cycle direction between Indian and US market of Crude Oil Futures. This study carried data NYMEX and MCX; 2013-15 for closing prices at each five minute frequency of futures contract of crude oil traded on those exchanges. Researchers also collect the data of average daily trading volume and open interest of crude oil futures contract. Researchers applied statistical tests; Augmented Dickey-Fuller Test, Phillip-Perron Test, Co-integration Test, Vector Error Correlation Mechanism, Wald Test, Market Efficiency and Trading Simulations, Trading Trigger - short and long positions and results.

Sahaj Wadhwa and Vishesha Khemka (2015) this paper is purpose of study of relationship between spot and futures prices of crude oil from 1st January, 2011 to 31st December, 2013 on past data available at NCDEX. For this research here applied statistical tools are; Descriptive Statistics - Mean - Median, Standard Deviation, Kurtosis, Skewness and Jarque-Bera. Other methods are Unit Root Test under which Augmented Dickey-Fuller Test and Granger Causality Test have analyzed for crude oil futures and spot prices for a period of time.

OBJECTIVES OF THE STUDY

- To discover the fluctuations of crude oil prices in last ten years. (2011-2020).
- To evaluate the significance volatility and impact of Crude Oil Prices on the Indian Commodity Market.
- To understand the impact of Crude Oil Price and Indian Commodity Market.
- To analyze the correlation between Crude Oil spot Price and Indian Commodity Market (MCXiCOMDEX).

RESEARCH METHODOLOGY

The study is descriptive in nature and collects secondary data of crude oil and commodity market from Multi-Commodity Exchange India (www.mcxindia.com). The time frame of the study was 10 years, beginning from 2011 till end of 2020. The sampling elements for the study were oil spot price and MCX crude oil closing price.

TOOLS FOR DATA ANALYSIS

1. Trend Analysis
2. Descriptive Statistics
3. Correlation
4. Regression Analysis

DATA ANALYSIS & INTERPRETATION

1. Trend Analysis

Trend analysis is conducted on the data of last 10 years oil spot prices collected from MCX i.e. 2011-2020.

Years	Oil Spot Prices (Per Year in Rs.)
2011	4432.7
2012	5019.07
2013	5739.05
2014	5663.21
2015	3125.48
2016	2919.82
2017	3314.58
2018	4441.3
2019	4007.2
2020	2945.14

Trend Analysis (2011-2020)
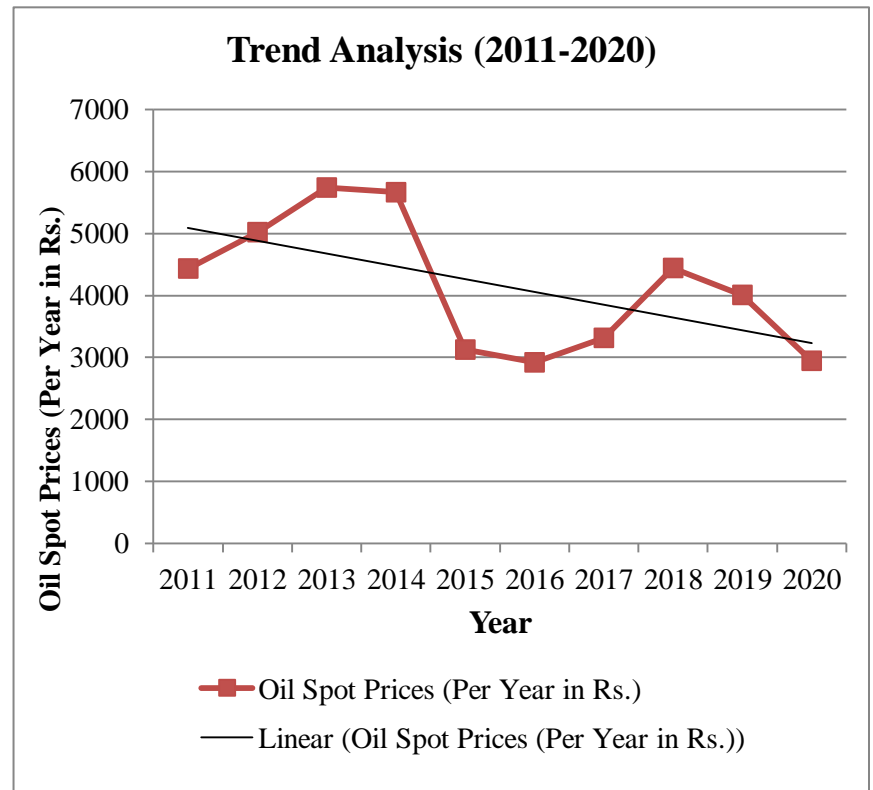
Source: This table is created by researcher.

Crude oil is a global macro-economic variant, so that for the span of year after 2011 oil prices are goes very high till 2014 because of in 2011, crude oil Brent average over $100 per barrel. Due to Arab spring and civil war market coped with the loss of 1.5 million barrels per day. Also, affect the European debt crisis loomed large over the global economy and expectation for economic growth and supply grains increases during half of the year. In 2012, some changes in economy growth expectations, oil supply and production disruptions in Sudan, Yemen and Syria. Other factors like - Iran sanctions nuclear program, rising oil production. In 2014, price decline is the major factor affecting to the oil supply and production at globally. In 2015-16, rapid expansion of unconventional supply, shift in OPEC policy after a period of high prices, market sentiments and rising demand in Asia-pacific, china's economy changes. After 2016, there was a created jump in oil market production and supply till 2017 and 2018. At last the major bearish trend in a market came once again due to world pandemic of novel corona virus and effect in import-export of whole world countries.

2. Descriptive Statistics

- **O – Crude Oil Price**

- **C – MCXiCOMDEX Closing Price**

	N	Range	Minimum	Maximum	Mean	Std. Deviation	Variance	Skewness	Kurtosis
	Statistic	Statistic	Statistic	Statistic	Statistic	Statistic	Statistic	Statistic	Statistic
O2016	12	1444.160	2091.430	3535.590	2910.609	452.147	204437.352	-.761	-.241
O2017	12	795.150	2919.950	3715.100	3319.872	268.355	72014.468	.134	-1.296
O2018	12	1728.990	3488.240	5217.230	4429.045	508.508	258580.471	-.161	-.613
O2019	12	812.190	3608.260	4420.450	4011.077	225.922	51040.850	.147	-.075
O2020	12	2672.190	1449.670	4121.860	2926.758	707.266	500225.810	-.533	.820

	N	Range	Minimum	Maximum	Mean	Std. Deviation	Variance	Skewness	Kurtosis
	Statistic	Statistic	Statistic	Statistic	Statistic	Statistic	Statistic	Statistic	Statistic
C2016	12	2534.600	7967.580	10502.180	9372.371	735.191	540505.553	-.168	-.245
C2017	12	2439.270	7668.860	10108.130	8738.481	791.526	626513.617	.390	-.850
C2018	12	4329.970	8604.130	12934.100	10972.206	1258.519	1583870.839	-.158	-.433
C2019	12	1695.810	8815.300	10511.110	9383.699	509.583	259674.440	.950	.712
C2020	12	6561.130	2766.010	9327.140	4479.0117	2106.211	4436123.761	1.783	2.113

Source: This table is created by researcher.

Above results revealed conclusions are as follows –

In 2016 oil and market comparisons are - Average returns of crude oil are grater and crude oil is highly volatile then MCXiCOMDEX. The variance of Crude Oil Spot price is smaller than MCXiCOMDEX which shows the longer distance of the accumulated data from the mean point. The values of skewness are indicating that Crude oil and COMDEX both are negatively skewed and therefore the series is asymmetric. The kurtosis figures depict that both Crude oil and COMDEX have a flatter peak and follow a Platykurtic distribution as both their values are less than 3.

In 2017 oil and market comparisons are - Average returns of market is grater and market is highly volatile then crude oil. The variance of Crude Oil Spot price is smaller than market which shows the longer distance of the accumulated data from the mean point. The values of skewness are indicating that Crude oil and COMDEX both are positively skewed and therefore the series is asymmetric. The kurtosis figures depict that both Crude oil and COMDEX have a flatter peak and follow a Platykurtic distribution as both their values are less than 3.

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In 2020 oil and market comparisons are - Average returns of market is grater and market is highly volatile then crude oil. The variance of Crude Oil Spot price is smaller than MCXiCOMDEX which shows the longer distance of the accumulated data from the mean point. The values of skewness are indicating that Crude oil is negatively skewed and market is positively skewed and therefore the series is asymmetric. The kurtosis figures depict that both Crude oil and COMDEX have a flatter peak and follow a Platykurtic distribution as both their values are less than 3.

3. Correlation

The hypothesis testing for correlation between variables is as follows: -

- H0: There is No correlation between Crude Oil Spot prices and MCXiCOMDEX index.
- H1: There is Positive correlation between Crude Oil Spot prices and MCXiCOMDEX index.

		C2016	C2017	C2018	C2019	C2020
O2016	Pearson Correlation	.882				
	Sig.(2-tailed)	.000				
	N	12				
O2017	Pearson Correlation		.896			
	Sig. (2-tailed)		.000			
	N		12			
O2018	Pearson Correlation			.999		
	Sig. (2-tailed)			.000		
	N			12		
O2019	Pearson Correlation				.909	
	Sig. (2-tailed)				.000	
	N				12	
O2020	Pearson Correlation					.679
	Sig. (2-tailed)					0.015
	N					12

Source: This table is created by researcher.

There exists a relationship of variable is indicating moderate - high positive correlation between Oil Spot prices and market (index) significant correlation (n=12, p<0.05). This indicates movement in Indian stock market is explained by changes in oil prices by a very significant extent as a positive correlation between the two.

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4. Regression Analysis

Model Summary

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate	Change Statistics				
					R Square Change	F Change	df1	df2	Sig. F Change
1	.983	.966	.938	524.936683	.966	34.217	5	6	.000

a. Predictors: (Constant), O2020, O2016, O2018, O2017, O2019

ANOVA

Model		Sum of Squares	df	Mean Square	F	Sig.
	Regression	47144010.247	5	9428802.049	34.217	.000[b]
	Residual	1653351.129	6	275558.522		
1	Total	48797361.376	11			

a. Dependent Variable: C2020

b. Predictors: (Constant), O2020, O2016, O2018, O2017, O2019

Source: This table is created by researcher.

The result of regression analysis suggests that changes in the independent variable (oil price) influences the dependent variable (MCXiCOMDEX), only up to a small yet significant extent. Thus, only a small extent of changes in dependent variable was explained by changes in independent variable. The total variance explained by the model as a whole was 96.6%, $F(6) = 34.217$, $p < 0.05$. Thus it was depicted that there was significant impact of oil prices on MCXiCOMDEX.

CONCLUSION

This study revealed that influence of the price movements on the commodity stock market of India and global markets and also to evaluate causes behind oil price fluctuations over a period. Past studies into the topic have found significant relationship between oil prices and stock market returns; however, the degree of such relationship varies from market to markets and different time periods. It is generally observed that rising oil prices tends to result in diminishing returns from the stock market and vice versa. The results of the study showed that there is significant although weak relationship between oil prices and Indian stock market returns. The correlation of crude oil and market closing price are moderately – very high correlated among five years. However, crude oil is energy source of India that imports till from other countries. From last ten years commodity market index is highly volatile than the crude oil spot market

Therefore, scope of further study is still left in analyzing and the impact of individual as well as collective impact of other macro-economic factors like GDP is affecting the value of stocks in Indian as well as global stock markets.

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