Ups And Downs In The Indian Economy: The Impact Of Crude Oil Prices

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Abstract: The economists have long been intrigued with the evidence of empirical data's macro-economic performance of the country are closely related with oil price shocks. India is one of the countries that is highly dependent on oil imports. The domestic consumption for oil products is rising year to year and since there is a decrease in oil prices over the years due to financial crises and oil shocks in the market. The nationals that are highly dependent on oil imports are hugely benefited as the economies of nations are growing at a faster phase. The study was undertaken in an Indian oil refinery, Mangalore Refinery Petrochemical Limited (MRPL). The paper considered crude oil prices as independent variable X and Stock market (BSE Sensex, Nifty 50), exchange Rate, inflation and GDP are taken as dependent variable. For this purpose, 10 years data is taken into consideration from January 2008 to January 2018. Hypothesis testing is done with the help of ANOVA using Regression, testing of hypotheses is done through F-test. The finding showed that crude oil prices has an impact on BSC Sensex Nifty 50 and inflation and no significant relationship with exchange rate and GDP of the country. The paper also suggest that India must move from using petroleum products to renewable resources as processing of crudes that has been imported has caused a lot of pollution worldwide. India and other countries must keep in mind that the resources of crude are depleting. Thus, these are fluctuations in crude oil prices are having an impact on Indian Economy.

Key Words: Crude Oil, MRPL, Inflation, GDP, Stock market, Exchange Rate, India

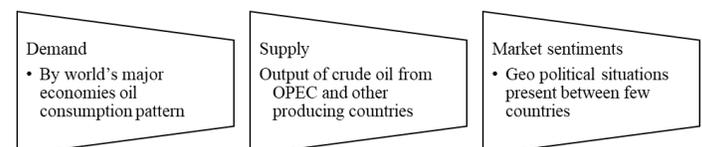————————————————◆————————————————

Introduction

Crude oil is the second major source of primary commercial energy in India after coal. As per the Niti Ayog (Policy think tank of Government of India), the share of gas in energy mix in India in 2018 was 6.5% whereas globally, the share was 24%. The natural gas demand in India is envisaged to lie between 191-267 Billion cubic meters (BCM) or 181-257 Billion cubic meters in 2040. However, as India is a price sensitive energy market, the demand for natural gas can significantly increase to 378 BCM and 418 BCM as envisaged in low gas price and long-term market driven scenario respectively. During 70's there were growing period of dependence on imported oil and unprecedented disruption in the global oil market. This development affected the macro economic performance of developed country like United states. The fluctuation towards high in oil prices have been one of the key responsible for recession, excessive inflation, poor productivity and lower economic growth (Barsky & Kilian, 2004). The international crude oil price sharply increased, and which resulted all the oil importing county including India faced specter of this oil shock. Although the burden of this price wasn't passed towards domestic consumers in India, the deficit expelled pressure on government financial process and affecting economy at the macro level. Over the past year the world economy has witnessed bouts of oil price shocks 1973 to 74, 1979 to 80, 1990's and 1999. The hike in oil price typically generate cost-push inflation that leads to decline in output and shift in terms of trade (Bhattacharya & Bhattacharyya, 2001). The various researchers opined that, there are general condenses regarding global inflationary and recessionary impact of crude oil prices (Darby, 1982), even though there has been considerable opinion regarding the extent of impact of crude oil price on macroeconomic. Further theoretical research states that shocks in oil price increases the wages and prices for consumable product and decrease in output (Bruno, 1982; Bruno & Sachs, 1982). There is a struggle for its exploration, to cut cost and export. Understanding this eccentric 'mineral oil' although in almost every country, bearing the burden of it is very difficult. Oil or Petroleum is defined in a mixture of ways. Therefore, there is no standardization or full agreement of the fact how crude oil was formed. The two words latintermspetra means rock and oleum means oil, which is petroleum, also called as 'rock oil' or 'crude oil'. It is a nonspecific term casing a wide range of substances. Naturally stirring molecules of carbon and hydrogen are comprised in hydrocarbons. India is dependent on oil producing countries; India exports refined products and not crude. India imports almost maximum million metric tons, of its crude oil and natural gas from Middle East and now also from USA. The total oil consumed after refining in India is from the imports of 80% of crude. When oil price rocketed past $100 per barrel, in 2007 the subsidies were frighteningly high. The public sector units are financed by the government by borrowing from via oil bonds. In the year 2012, $13billion government had taken as borrowings from via oil bonds. Due to these oil bonds most of the government projects could not be implemented and were stagnated, the reason being serving these debts staggered and drained the government recourses. This actually caused massive opportunity to India. Government bears completely the price risk involved, this is when government regulated the price risk. If pricing of all products is de-regulated, then it will be borne by the ultimate consumers.

Demand and Supply scenario of oil:
The supply and demand and market outlook are the factors that mainly affect the outlay fluctuations in the crude oil.

Demand	Supply	Market sentiments
• By world's major economies oil consumption pattern	Output of crude oil from OPEC and other producing countries	• Geo political situations present between few countries

The margin of the refinery is reliant between the crude oil prices and refined petroleum product prices for profitability, with oils tallness as a high-demanded global commodity comes the risk of major fluctuations in price, it can have a noteworthy monetarist impact. Globally since the no of producers have increased (before it was only the Middle Eastern countries .i.e. OPEC, the strategy of OPEC was to decrease the supply to increase the price of crude but it

started affecting some countries market share, those countries broke the contracted terms, this decreased the prices of oils, now there is a hell lot of competition between the producers of oil. Now even US are producing oil by fractioning method. Here there is increase in demand, importing prices decreases; this has been the captive market for oil firm's refineries.

Conceptual Framework

Impact of oil prices effect the health of the economy, despite its fall it continues to have a significant role in shaping economies globally. Crude oil is world economies main source of energy and is very important to economic growth. The prices of crude oil market are mainly due to the supply and demand from the countries that are not self-reliant to produce more and are dependent on other nation for more crude. In case the oil prices increase, there will be transfer of income from consumers to producers. When we talk about dependent countries importing and the other country exporting oil and that influences global income redistribution. When the crude oil prices rise, the cost of production also rises in the economy. The prices of oil also depend on the level of competition. In the developed economy might not have so much impact when compared to developing nation in terms of increase in the cost of production due to the increase in price of crude. There will be a demand side impact on the economy. Example in the automobile sector when oil prices rise the customers may delay in purchasing automobile. Therefore, there will be delayed sales which leads to increase in inventories and then industrial production declines. Indian crude oil market has been largely impacted by the global crude oil market, over the years the prices of crude oil has been declining.

> ➤ This has been happening because of two reasons (futures contract). Short term fluctuations expected by the potential investors in oils, when supply is more, and demand is less they will bid less and when supply is less they bid more.
> ➤ Another reason is the breakdown of the Cartel which was created by the OPEC to increase the prices of oils. Cartel helps in artificially reducing the supply, by agreement between the OPEC countries to have a certain fixed production which in turn increases the prices of oil.

OPEC (Organization of the petroleum exporting countries) which also includes Saudi and Iran which are rival countries presently OPEC isn't able to set quotas because Saudi Arabia does not agree any decisions of OPEC that will favor Israel, therefore investors have been expecting a decline in prices of crude oil in market. Another reason is when US was banned from importing oil (embargo) because it supported Israel most of the US industries went on crises, US did not want to face such situation, being dependent on OPEC countries. Therefore, which used two strategies one was geo politics and innovative methods in finding oil. Result of this was less control of OPEC on oils. India was largely dependent on OPEC for its oil imports, which normally charged a surcharge from all Asian nations. Now because of the emerging non-OPEC countries, OPEC is losing its bargaining power. And India the 3rd largest importer in the world has planned to diversify its imports, India decided to buy crude oil from the US for the 1st time,

it received a shipment of 2 million barrel. With collaborative relationship with the US with Trump administration which demands to condense trade deficit of US with India i.e. India exports up to $72Billion while Imports is $30Billion, crude oil imports have the potential to boost the mutual trade by $2Billion.This is also beneficial to India because companies both public and private has made total investment of $5Billion in US Shale Gas Assets. OPEC charged $6 more compared to US and Europe, and US offered crude oil at$2 cheaper than OPEC. The cost of oil production in Russia is very high owing to their climatic conditions if production is stopped is going to cost the country a huge sum and time to restart the production. Another very important contract between India and UAE of giving oil storage facility in negotiation with UAE to give 2/3rd of its oil stored in India for free. This might have positive implications on the Indian crude oil market, as the imports are cheaper but the prices the oils are made available to the customers have had only slight variations.

Figure 1: India's crude oil production 2013-2018
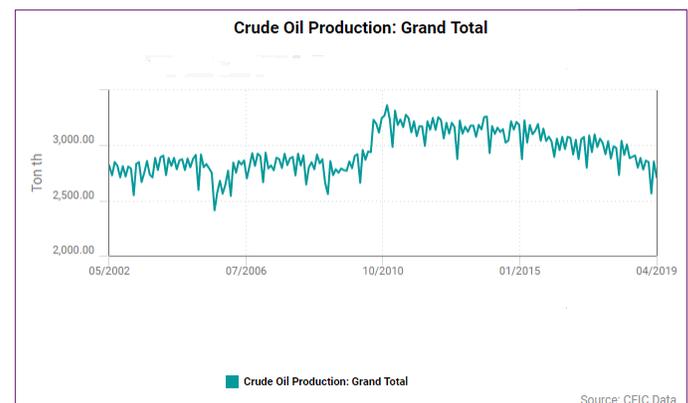
Source: CEIC Insights Report 2018

Figure 2: India's crude oil Import 2006-2018
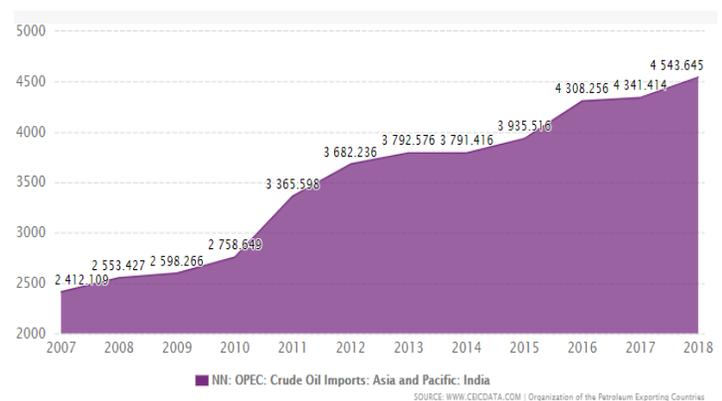
Source: CEIC Insights Report 2018

Literature review

The various commodities have an impact due to the fall in the prices of crude oil and it has an impact on the people. A reduction in 1$ of crude has a threefold effect on economy. The range of oil prices going down up to 55% has authenticated the here oversupply of oil by the OPEC and sluggish its demand across the globe. India adopts pricing mechanism to reflect global crude oil prices for its

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petroleum products. India has paved its way to stabilize its investments due to the 57% fall in prices of crude and has stabilized the exchange rate. Using Regression model, the parameters taken are GDP, CPI and crude oil price for 15 years (Soundarapandiyan, 2017). India's oil industry position and deterioration of crude prices. Then crude prices effect on India's inflation and importance of crude oil prices to Reserve Bank of India to manage the inflation and its impact on fiscal and trade deficit. By considering all these factors future hold for India is considered for crude prices. We also need decrease imports by making use of solar, nuclear, hydro and other alternative energy sources. India must carefully plane, those future petroleum requirements by usefully sustaining rapid future economic growth (Jain & Patil, 2015). Similarly, Increase in the imports as the crude future price of oil rise. This has contributed strong strengthening of the $ against Indian Rs, among the other factors (Touati, 2017). Another study opined that the data of daily crude oil price, $-Rs value and Nifty returns are taken into consideration from (April 2010 - March 2015) in a bi-variant correlation using Granger-causality approach, regression. The study concluded that there is correlation was negative between nifty and exchange rate and has substantial positive association between nifty returns and crude oil (Singh & Kapil, 2016). Another study reviewed the relevant variables considering Gross Domestic Product (GDP) and its impact on the Indian economy because of the crude oil price by Index of Industrial Production (IIP), WPI. When 70% of the crude was imported, no direct causal relationship could be recognized the objective had been analyzed by Vector Auto Regression (VAR) (Fang & You, 2014). The gold prices volatilability, global crude oil prices, and U.S. exchange rate will have uncertainty because of stimuli uncertainty in the stock market in the globalized business scenario. Developing nations like India, the degree of uncertainty is high in the stock market, the study of causal relationship between the 3 parameters is more appropriate (Zhu & Li, 2014; Büyüksalvarci & Abdioglu, 2010; Shiva & Sethi, 2015). The demand of oil and supply of crude oil trends can influence the future price of oil. The changes occurring in the crude oil market is highlighted here. The main issue on the supply side is when the oil production begins to decline. There is a prediction of the Global oil reserve data that there will be a skyward pressure on the oil prices as the capacity declines, and though the cost of production increases the quality decreases. There is a lot of risk to Soviet Union and OPEC this may happen between the years 2014-40. Though there is an increasing demand in the developing economy like China, will make the prices move upwards even if the crude oil deteriorates (Apergis & Miller, 2009; Kilian, 2009; Mitchell & Mitchell, 2014; Tokic, 2011; Crompton & Wu, 2005; Makridou et al. 2005). India is facing persistent inflation and issues of mounting trade imbalance. Oil imports have a wide impact on Indian economy as one third of the total imports of the country have been imported (Cerra & Saxena, 2002; Nayyar, 1993; Bibow, 2007). The macroeconomic volatility and pace of economic market slowing down. The shift of marginal preferences of small investors and their change in the risk perception, Investors avoid being traditional and hedge against inflation (Baur, D. G., & Lucey, 2010; Rahiman et al. 2014; Soytas & Sari, 2009). The correlations between

changes in prices of crude oil and stock markets return stand opined significant and unpredicted changes in oil market happened, Considering US companies due to the oil shocks (Sadorsky, 1999). As the country's income increases, hike in oil price is expected to witness a confident result in an oil-exporting nation and there are going to have a better economy due to the exports made (Yang et al.2002). The future prices of crude upsurges the import of crude oil remains to rise. therefor there exists a strong demand strengthening the $ against Indian Rs, among the other factors. This can help the government to avoid depreciating rupees and making policy better to control the petrol price (Zhang & Wang 2015; Andrews-Speed & Vinogradov 2000). The volatility in oil prices has increased and futures oil prices generally expected to rise. Theoretically, it is due to the impact of an oil price shock and to the increased cost of production which is caused by fuel cost increase, oil price instability has opposing effect on the budget (Basher & Sadorsky, 2006; Ewing & Malik, 2013).

Objectives

i. To analyze the relationship between stock market and in the crude oil prices.
ii. To formulate and study the change in crude oil prices with the growing inflation
iii. To study impact of declining crude oil prices on exchange rate.
iv. To study how change in crude oil is impacting the GDP growth rate

Research Methodology

Secondary research is a research which is already been compiled, gathered, organized and published by others. Such data can be obtained faster and are more affordable. Secondary data is available by webs, reading articles, magazines, trade journals etc. The fundamental purpose of study is to check the extent of impact on Indian economy with respect to the parameters in the study. Data collected from 2008 to 2018, for the first 4 hypotheses is on monthly basis and for the 5th hypotheses it's on quarterly bases and even the January and February months of 2018 are included in the financial year in this study with the sample size 122 is the sample size. This period is important because in 2008 crude inventory drawn took place against the backdrop of global financial crises that was by great recession, in November 2014 the oil started falling even more, OPEC countries started fighting for market share and the prices further decreased and from 2015 the futures market availability of transport, Currency rates and the cost of extracting equipment's and labor can increased with affected the prices of the crude to drop. 2016 it has been due to the market shocks which prevailed earlier, even the political war between the countries effects the fluctuation in crude oil prices.

The study explained data analysis step by step using statistical methods followed by interpretation.

I.   Karl Pearson's Correlation coefficient (r):

This is a statistical technique used for used to determine the relationship between the variables and the strength between the variables. It ranges from -1 to +1.

- If r is close to 0 → no relationship between the variables
- If r is positive >1 → as X variable increases Y variable increase and as X variable decreases Y also decreases **(X↑Y↑ and as X↓Y↓)**
- If r is negative <1 → as X variable increases Y variable decreases and as X variable decreases Y variable increases **(X↑Y↓ and X↓Y↑)**

Square of the coefficient or r^2 is the percentage of the variation in one variable related to the other variable (it's multiplied by100 and ignore the decimal points)

Formula to calculate Correlation Coefficient

$$r = \frac{n(\sum xy) - (\sum x)(\sum y)}{\sqrt{n\sum x2 - (\sum x)2][n\sum y2 - (\sum y)2}}$$

II.   Regression Analysis

Regression is used for prediction of dependent variable based on the independent variable and helps to forecast it. It's a statistical process for estimating the relationship among the variables. It's used to find trends of the calculated data. The Standard Errors of the regression coefficients can be used for hypothesis testing and constructing confidence intervals. Under this study 95% confidence interval is considered for the construction of the regression line. Since the scattered plot does not indicate the increasing and decreasing trend, regression line is used to determine this.

Y=a+bX

Where Y is a dependent variable, X is an explanatory variable, a is the constant and b denotes the co-efficient of X

Formula to calculate regression

$$B = \frac{\sum(Xi - X)(Yi - Y)}{\sum(Xi - \overline{X})}$$

III.   ANOVA (Analysis of variance) using Regression

ANOVA tells how the regression equation accounts for the variability of variables

Source	Sum of squares	Df	Mean Square	F
Regression	*1 SSReg	k-1	MSReg=SSReg/k-1	MSReg/MSRes
Residual	*3SSRes	N-k	MSRes=SSRes/N-k	
Total	*2	N-1		

*1: Sum of squares is $SSReg = \sum n_j(\overline{x}j - \overline{x})^2$
*2: $SST = \sum\sum(X - \overline{X})^2$
*3: $SSRes = \sum\sum(X - \overline{X}_j)^2$

IV.   Hypotheses is tested

If Calculated F> F tabled value (95% confidence and 5% is the significance level)
Reject H0. i.e. null hypotheses and accept H1. i.e. alternative hypotheses
And if calculated F< F tabled value

Accept H0 and reject H1.
The regression outputs of all the parameters on crude oil price is calculated using excel software, it has 3 components
  a) Table of Regression statistics
  b) Table of ANOVA
  c) Table of Regression coefficients

Hypotheses
Independent Variable: crude oil
Dependent Variable: BSC Sensex, Nifty 50, Exchange rate (Rs to $), Inflation and GDP

Hypotheses 1:
- H_0: Crude oil price fluctuation do not have an impact on BSC Sensex index
  H_1: Crude oil price has an impact on BSC Sensex index

Hypotheses 2:
- H_0: Crude oil price fluctuation do not have an impact on Nifty 50
  H_1: Crude oil price fluctuation has an impact on Nifty 50.

Hypotheses 3:
- H_0: Decreasing value of (Rs to $) exchange rate is not due to the decreasing oil prices
  H_1: Decreasing value of Rupee exchange rate is due to the decreasing oil prices

Hypotheses 4:
- H_0: Crude oil does not play a significant role in rising inflation (CPI).
  H_1: Crude oil plays a significant role in rising inflation (CPI)

Hypotheses 5:
- H_0: Crude oil price change does not have a significant effect on nominal GDP
  H_1: Crude oil price change has a significant effect on nominal GDP

Fluctuations in crude oil from January 2008 to February 2018:
The study is on the "impact of crude oil fluctuations on Indian economy", knowing the reasons for these fluctuations is very much important. There two benchmarks viz. Brent crude and West Texas for global oil. Therefore, introduction to this crude oil fluctuation is explained in brief below. Crude inventory was trading at $159.27 in June 2008, but when the economies where facing "Great Recession" in the year 2008 there were a backdrop to $52.81 in the same year in December.

Great Recession: This happened when Alan Greenspan, the chairman of the federal reserve in the year. He decided to make the interest rate to 1% in the year 2003 from the existing rate of 6.5% in the year 2000. He had taken this decision to make the economy stable. Earlier the investors hugely invested on the treasury bills as it was the safest among all the securities, but the central bank declared interest of 1%, the investors were not satisfied. However

commercial banks could borrow at cheaper rates and could lend to people (prime family) with a security their mortgaged property. These commercial banks transferred their risk to investment banks, and these investment banks converted these mortgaged securities to CDO's (collateralized debt obligations) to HNI's of different country, because of the returns expected out of it. The HNI's wanted more CDO's for this purpose the commercial banks started giving loans to non-prime family's, when such borrowers started defaulting their property would to undertaken for sale. Soon the number of defaulters increased because of which the houses for sale increased, the prices of house property declined. As a result, the (Lehman Brothers) investment bank could not repay the HNI's who had brought CDO's and the people who wanted money to start their own business, banks denied loans for them. Most of the companies went bankrupt there was no liquidity in the US economy and the global economy went into recession. Economies came to halt, the demand oil dropped drastically. OPEC tried to correct this declining global crude oil prices by cost cutting technique in production by 16% to bring back global stability. Here the consumption dropped by 1.5% which in turn was the reason for the drop-in production. It took two years for OPEC to correct the parity situation till 2010. Till August 2014 the crude oil prices reminded stable from 2011 but when Iran and Russia continued to pump more crude thinking about its market share going against the OPEC contract to gain large market share. Saudi Arabia started losing its market and started going against this and decided to concentrate on market share rather than cash flows, because of this there was an imbalance there was a down word shift in the crude oil prices. OPEC increased its production up to 14% from November 2013 to June 2016 which largely came from Iran, Iraq and Saudi.

Table 1: Variations in the crude oil prices ($ per barrel)

Years	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018
Jan	108.17	49.2	83.7	102.91	108.11	105.56	103.79	56.9	29.92	54.13	65.14
Feb	112.63	51.79	91.6	109.24	117.15	98.66	109.16	52.88	33.2	55.2	61.43
Mar	118.4	58.13	95.47	118.3	111.75	104.05	107.05	50.34	38.36	51.66	61.4
Apr	131.78	58.81	98.29	125.52	113.49	99.84	105.09	62.72	42.56	50.22	64.3
May	146.33	77.18	84.43	113.18	93.7	98.27	108.26	63.08	50.87	49.14	69.6
Jun	159.27	80.57	86.32	105.12	92.27	102.72	110.84	62.04	49.92	46.78	70.31
Jul	140.56	80.06	90.05	105.44	95.74	112.04	102.65	49.14	43.06	51.02	70.82
Aug	131.26	80.75	82.07	97.6	104.28	115	102.46	51.41	46.22	47.89	69.54
Sep	114.6	81.24	91.14	86.59	99.19	108.81	95.36	47.13	49.74	52.14	71.11
Oct	78.32	88.77	92.69	102.51	92.78	102.65	84.48	48.79	48.27	54.87	73.72
Nov	64.71	88.85	95.73	110.5	95.8	98.84	69.5	42.41	51.02	57.92	63.33
Dec	52.81	91.54	103.81	109.1	99.54	104.85	56.66	39.1	55.39	61.06	53

Presently there is global growth in all economies. One of the functions of economic growth is the oil demand. When increase in economic growth there will be increase in income and because of this there will be increase in the demand for cars (now there is over supply of oils and demand has failed to keep pace with the weak economic growth). More fuel-efficient cars and electric cars like Tesla is the threat to the oil exporting countries. Decline in the consumption pattern, shift towards environmentally friendly resources of energy. Environmental pollution is largely caused by fossil fuels biggest reason for the decline in oil prices. As the oil has limited shelf life OPEC is forced to

supply oil at lower prices.US is doing well because the cost incurred by it is comparatively lesser compared to OPEC. After the great recession US switched from conventional drilling to horizontal drilling after 2008. Now imports oil to India at cheaper than other OPEC countries this happened in 2017. Trump wants to reduce the trade deficit between India and US. Now US are becoming a threat to other oil exporting countries.

Graph 1: Crude oil Price fluctuations
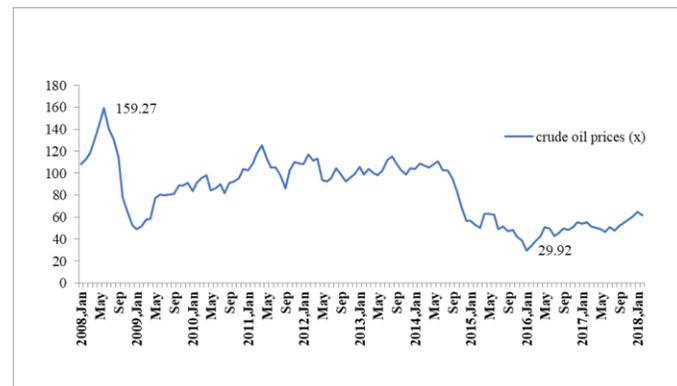
For the calculations of hypotheses 1, 2 and 3 Crude oil prices are taken as percentage of change in the previous year

Hypotheses 1:
- H_0: Crude oil price fluctuation do not have an impact on BSC Sensex index
  H_1: Crude oil price has an impact on BSC Sensex index

Table 2: Fluctuation trends of oil price

Years	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018
Jan	4.31	-7.34	-0.87	-0.92	5.70	-1.02	-1.02	0.42	-30.68	-2.33	6.26
Feb	3.96	5.00	5.79	7.72	-6.99	4.92	4.92	-7.60	9.88	1.94	-6.04
Mar	4.87	10.91	7.66	-4.83	5.18	-1.97	-1.97	-5.05	13.45	-6.85	-0.03
Apr	10.15	1.16	5.75	1.53	-4.22	-1.87	-1.87	19.74	9.87	-2.87	2.9
May	9.94	23.80	-10.90	-21.12	-1.60	2.93	2.93	0.57	16.34	-2.20	5.3
Jun	8.12	4.21	-7.67	-1.55	4.33	2.33	2.33	-1.68	-1.90	-5.04	0.71
Jul	-13.31	-0.64	0.30	3.62	8.32	-7.98	-7.98	-26.25	-15.93	8.31	0.51
Aug	-7.09	0.85	-8.03	8.19	2.57	-0.19	-0.19	4.42	6.84	-6.54	-1.28
Sep	-14.54	0.60	-12.72	-5.13	-5.69	-7.45	-7.45	-9.08	7.08	8.15	1.57
Oct	-46.32	8.48	15.53	-6.91	-6.00	-12.88	-12.88	3.40	-3.05	4.98	2.61
Nov	-21.03	0.09	7.23	3.15	-3.85	-21.55	-21.55	-15.04	5.39	5.27	-10.39
Dec	-22.53	2.94	-1.28	3.76	5.73	-22.66	-22.66	-8.47	7.89	5.14	-10.33

Source: https://oilprice.com

Stock Exchange in India

Stock exchange is the place where for a determined price buying and selling of securities is done through supply-demand mechanism. There is continuous trading as a result the securities fluctuate. Short- and long-term fluctuations indicate variation in economic variables. Stock market index is measuring a section of the stock market; to measure the performance of portfolios benchmarks are used. The index will be weighted to reflect the market capitalization. Bombay stock exchange (BSE) Sensex is the index of 30 well

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established companies which are listed in the Bombay Stock Exchange and which are actively traded. it involves various sectors. BSC 30 is the pulse of domestic stock market. Here the base year taken is 1st April 1979. NIFTY 50 indexes are for India's Equity market, which is based on the stock market index of NSE (national stock exchange) is the bench mark board. Nifty 50 is the weighted average of 50 Indian company stocks in 12 sectors. This index is free float market capitalization weighted index. The base period taken for Nifty is November 3, 1995.

Table 3: BSE Sensex performance over the years

| Years	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018
Jan	17648.71	9424.24	16358	18327.8	17193.6	19895	20513.9	29183	24870.7	27656	35965
Feb	17578.72	8891.61	16429.6	17823.4	17752.7	18861.5	21120.1	29361.5	23002	28743.3	34184
Mar	15644.44	9708.5	17527.8	19445.2	17404.2	18835.8	22386.3	27957.5	25341.9	29620.5	34,278.63
Apr	17287.31	11403.3	17558.7	19136	17318.6	19504.2	22417.8	27011.3	25606.6	29918.4	35,213.30
May	16415.57	14625.3	16944.6	18503.3	16218.5	19760.3	24217.3	27828.4	26668	31145.8	35,993.53
Jun	13461.6	14493.8	17700.9	18845.9	15430	19395.8	25413.8	27780.8	26999.7	30921.6	35,877.41
Jul	14355.75	15670.3	17868.3	18197.2	17236.2	19345.7	25895	28114.6	28051.9	32514.9	37,644.59
Aug	14564.53	15666.6	17971.1	16676.8	17429.6	18619.7	26638.1	26283.1	28452.2	31730.5	38,989.65
Sep	12860.43	17126.8	20069.1	16453.8	18762.7	19379.8	26630.5	26154.8	27866	31283.7	37,644.59
Oct	9788.06	15896.3	20032.2	17705	18505.4	21164.5	27865.8	26656.8	27930.2	33213.1	35,877.41
Nov	9092.72	16926.2	19521.3	16123.5	19426.7	20791.9	28694	26145.7	26652.8	33149.4	35,993.53
Dec	9647.31	17464.8	20509.1	15454.9	19500.7	21170.7	27499.4	26117.5	26626.5	34056.8	35,213.30

Graph 2: Performance of BSE Sensex Index

Table 4: Percentage change in the BSC Sensex points taking previous year as base

Years	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018
Jan	0.080	-2.37	-6.77	-11.90	10.11	1.98	-3.20	5.77	-5.01	3.72	4.7
Feb	-0.40	-5.99	0.44	-2.83	3.15	-5.48	2.87	0.61	-8.12	3.78	-4.9
Mar	-12.36	8.41	6.27	8.34	-2.00	-0.14	5.66	-5.02	9.23	2.96	-3.6
Apr	9.50	14.86	0.18	-1.62	-0.49	3.43	0.14	-3.50	1.03	1.00	6.2
May	-5.31	22.03	-3.62	-3.42	-6.78	1.30	7.43	2.94	3.98	3.94	0.0
Jun	-21.94	-0.91	4.27	1.82	-5.11	-1.88	4.71	-0.17	1.23	-0.73	-0.2
Jul	6.23	7.51	0.94	-3.56	10.48	-0.26	1.86	1.19	3.75	4.90	6.0
Aug	1.43	-0.02	0.57	-9.12	1.11	-3.90	2.79	-6.97	1.41	-2.47	2.9
Sep	-13.25	8.53	10.45	-1.36	7.11	3.92	-0.03	-0.49	-2.10	-1.43	-6.4
Oct	-31.39	-7.74	-0.18	7.07	-1.39	8.43	4.43	1.88	0.23	5.81	-5.0
Nov	-7.65	6.08	-2.62	-9.81	4.74	-1.79	2.89	-1.96	-4.79	-0.19	4.7
Dec	5.75	3.08	4.82	-4.33	0.38	1.79	-4.34	-0.11	-0.10	2.66	-1.1

Source: https://www.nseindia.com/

Graph 3: *Regression Analysis Graph taking crude oil as Independent variable and BSE Sensex as dependent variable*
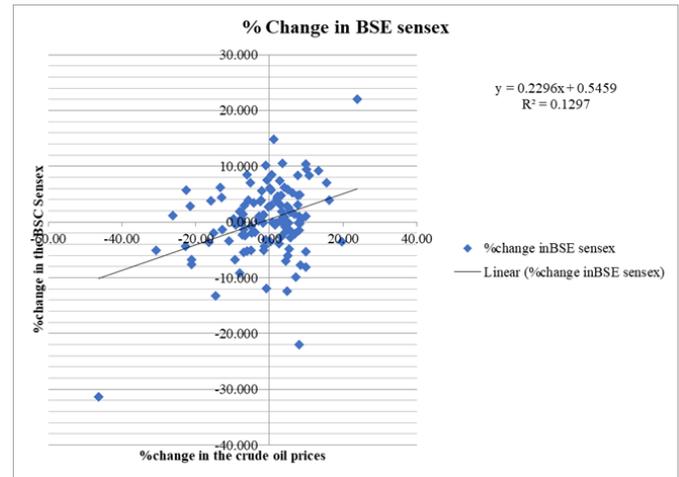
Here y is the %change in the BSC Sensex Index and x is the %change in the crude oil price, the BSC Sensex is dependent on the crude oil prices. Here it means a positive decrease in the price per barrel of crude oil has resulted in the increase in the performance of BSC Sensex. The relative variation between the two variables is 36%.

Regression Statistics.	
Multiple R	0.360076046
R Square	0.129654759
Adjusted R Square	0.122401882
Standard Error	6.094822805
Observations	122

ANOVA					
	df	SS	MS	F	Significance F
Regression	1	664.0492912	664.0492912	17.8763	4.62642E-05
Residual	120	4457.623803	37.14686502		
Total	121	5121.673094			

	Coefficients	Standard Error	t Stat	P-value
Intercept	0.545871784	0.55401807	0.985295992	0.32646
% Change in the crude oil	0.229568762	0.054296735	4.228039879	4.6E-05

Based on the Karl Pearson's correlation co-efficient and the regression analysis it is evident that there is a positive correlation between percentage change in crude oil price and percentage change in the BSC Sensex index. There is 36% of variance on BSE Sensex is explained by crude oil price. The slope coefficient has of t-statistic of 0.98; the slope coefficient has p-value of 0.32 and slope coefficient has estimated standard error of 0.55. Here F-table value (95%confidence) critical value of F at (1, 120) = 3.99.i.e. tabled F value 5%significance level. Calculated F value =17.88 F Calculated > F there H_0 is rejected and H_1 is accepted Thus, crude oil price has an impact on BSC Sensex index. i.e. Alternative hypotheses are accepted.

Hypotheses 2:
- H_0: Crude oil price fluctuation do not have an impact on Nifty 50
  H_1: Crude oil price fluctuation has an impact on Nifty 50.

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Table 5: *Performance of Nifty*

Years	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018
Jan	5137.45	2874.8	4882.05	5505.9	5199.25	6034.75	6089.5	8808.9	7563.55	8561.3	10778.4
Feb	5223.5	2763.65	4922.3	5333.25	5385.2	5693.05	6276.95	8901.85	6987.05	8879.6	10621.7
Mar	4734.5	3020.95	5249.1	5833.75	5295.55	5682.55	6704.2	8491	7738.4	9173.75	10383.8
Apr	5165.9	3473.95	5278	5749.5	5248.15	5930.2	6696.4	8181.5	7849.8	9304.05	11297.0
May	4870.1	4448.95	5086.3	5560.15	4924.25	5985.95	7229.95	8433.65	8160.1	9621.25	11498.4
Jun	4040.55	4291.1	5312.5	5647.4	5278.9	5842.2	7611.35	8368.5	8287.75	9520.9	10991.1
Jul	4332.95	4636.45	5367.6	5482	5229	5742	7721.3	8532.85	8638.5	10077.1	10742.9
Aug	4360	4662.1	5402.4	5001	5258.5	5471.8	7954.35	7971.3	8786.2	9917.9	10664.4
Sep	3921.2	5083.95	6029.95	4943.25	5703.3	5735.3	7964.8	7948.9	8611.15	9788.6	10472.9
Oct	2885.6	4711.7	6017.7	5326.6	5619.7	6299.15	8322.2	8065.8	8625.7	10335.3	10232.6
Nov	2755.1	5032.7	5862.7	4832.05	5879.85	6176.1	8588.25	7935.25	8224.5	10226.6	10533.1
Dec	2959.15	5201.01	6134.5	4624.3	5905.1	6304	8282.7	7946.35	8185.8	10530.7	10771.1

Source: *https://www.nseindia.com/*
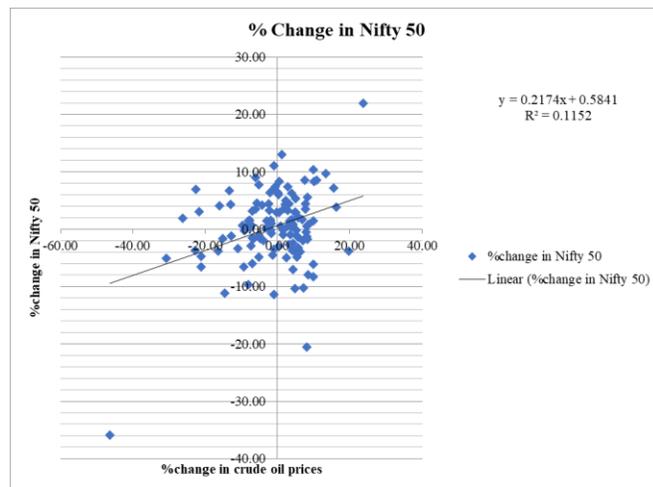
Graph 4: *Performance of Nifty 50 Index*
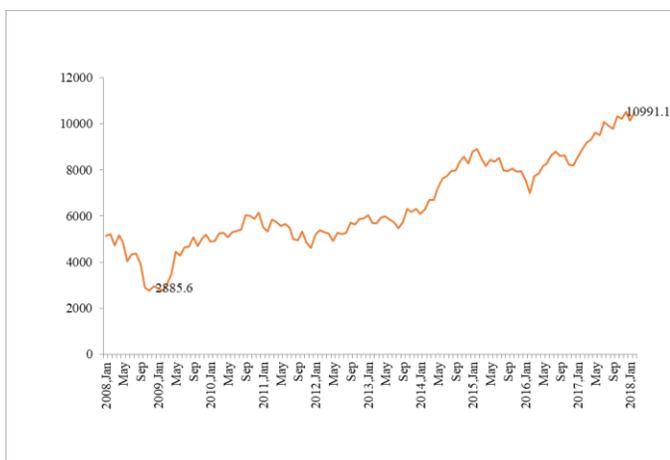
Table 6: *Percentage change in the Nifty 50 points taking previous year as base*

Years	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018
Jan	0.73	-2.93	-6.53	-11.42	11.06	2.15	-3.52	5.97	-5.06	4.39	-3.97
Feb	1.65	-4.02	0.82	-3.24	3.45	-6.00	2.99	1.04	-8.25	3.58	3.47
Mar	-10.33	8.52	6.23	8.58	-1.69	-0.18	6.37	-4.84	9.71	3.21	-1.58
Apr	8.35	13.04	0.55	-1.47	-0.90	4.18	-0.12	-3.78	1.42	1.40	-3.01
May	-6.07	21.92	-3.77	-3.41	-6.58	0.93	7.38	2.99	3.80	3.30	7.52
Jun	-20.53	-3.68	4.26	1.54	6.72	-2.46	5.01	-0.78	1.54	-1.05	2.01
Jul	6.75	7.45	1.03	-3.02	-0.95	-1.75	1.42	1.93	4.06	5.52	-5.14
Aug	0.62	0.55	0.64	-9.62	0.56	-4.94	2.93	-7.04	1.68	-1.61	-3.11
Sep	-11.19	8.30	10.41	-1.17	7.80	4.59	0.13	-0.28	-2.03	-1.32	-0.86
Oct	-35.89	-7.90	-0.20	7.20	-1.49	8.95	4.29	1.45	0.17	5.29	-1.98
Nov	-4.74	6.38	-2.64	-10.23	4.42	-1.99	3.10	-1.65	-4.88	-1.06	-3.09
Dec	6.90	3.24	4.43	-4.49	0.43	2.03	-3.69	0.14	-0.47	2.89	2.85

Source: *https://www.nseindia.com/*

Graph 5: *Regression Analysis Chart taking crude oil as Independent variable and Nifty 50 as dependent variable*

Here y is the %change in the Nifty 50 Index and x is the %change in the crude oil price, the Nifty 50 index is dependent on the crude oil prices. Here it means a decrease in the price per barrel of crude oil has resulted in the increase in the performance of Nifty 50. The relative variation between the two variables is 33%.

Regression Statistics.	
Multiple R.	0.3394104
R Square.	0.1151994
Adjusted R Square.	0.1078261
Standard Error.	6.1733994
Observations.	122

ANOVA

	df	SS	MS	F	Significance F
Regression.	1	595.4355677	595.436	15.623777	0.000131044
Residual.	120	4573.30325	38.1109		
Total.	121	5168.738818			

	Coefficients	Standard Error	t Stat	P-value
Intercept.	0.5840543	0.561160667	1.0408	0.3000623
%change in the crude oil prices.	0.2173852	0.054996748	3.95269	0.000131

Based on the Karl Pearson's correlation co-efficient and the regression analysis it is evident that there is a positive correlation between percentage change in crude oil price and percentage change in the Nifty 50 index. There is 33% of variance on Nifty 50 is explained by crude oil price. The slope coefficient has of t-statistic of 1.04; the slope coefficient has p-value of 0.30 and slope coefficient has estimated standard error of 0.56 Here F-table value (95%confidence) critical value of F at (1, 120) = 3.99. i.e. tabled F value 5%significance level

Calculated F value =15.62

F Calculated > F there H_0 is rejected and H_1 is accepted

Thus, crude oil price has an impact on Nifty 50 index. i.e. alternative hypotheses is accepted.

Hypotheses 3:

- H_0: Decreasing value of (Rs to $) exchange rate is not due to the decreasing oil prices
  H_1: Decreasing value of Rupee exchange rate is due to the decreasing oil prices

Table 7: Exchange rates from 2008 to 2018

Years	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018
Jan	39.3	48.26	46.245	44.7125	52.86	54.955	62.165	63.035	66.1653	67.94	63.465
Feb	39.13	48.715	46.185	45.645	49.12	53.17	62.685	61.6668	67.8755	67.21	64.275
Mar	39.92	51.54	45.935	44.985	49.205	54.905	61.755	61.8675	66.9557	66.795	65.13
Apr	39.95	50.49	44.805	44.485	50.8	54.875	59.905	62.1342	66.354	64.965	66.51
May	40.465	49.665	44.225	44.48	53.425	53.855	60.165	63.64	66.4993	64.3	67.41
Jun	42.395	47.085	46.56	44.82	55.45	57.065	59.1575	63.9882	67.4782	64.42	68.51
Jul	43.24	47.815	46.615	44.5825	54.485	59.497	59.725	63.3667	67.2483	64.63	68.53
Aug	42.31	47.47	46.095	44.56	55.475	61.105	61.22	63.9597	66.8138	63.66	71.00
Sep	43.96	48.955	46.555	45.67	55.525	67.07	60.685	66.6488	66.91	64.025	72.5
Oct	46.48	47.635	44.41	49.35	52.405	61.74	61.685	65.3626	66.4859	65.31	73.93
Nov	48.46	46.925	44.405	49.265	53.815	61.75	61.445	65.4463	66.7076	64.57	69.22
Dec	49.985	46.025	44.9275	51.11	54.68	61.44	61.81	66.5612	68.05	64.49	69.77

Source: https://data.gov.in/keywords/exchange-rate

Graph 6: Fluctuations in the exchange rate from Jan 2008 to Feb 2018


Appreciation in Rupee makes imports cheaper and exports expensive. Sectors like petroleum products have to import RM up to 77%, such sectors will gain if rupee appreciates. It means companies will have to pay less to import raw materials which in turn increase their profit margin. It's a significant tool to examine industries which are closely related to importing raw materials. Depreciation in rupees is welcome news for industries which are exporting majority of their products.

Table 8: Percentage change in the exchange rate taking previous year as base

Years	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018
Jan	2.80	-3.57	0.48	-0.48	3.31	0.50	1.17	1.94	-0.60	-0.15	-1.62
Feb	-0.43	0.93	-0.13	2.04	-7.61	-3.36	0.83	-2.22	2.52	-1.10	1.26
Mar	1.98	5.48	-0.54	-1.47	0.17	3.16	-1.51	0.32	-1.37	-0.62	0.98
Apr	0.08	-2.08	-2.52	-1.12	3.14	-0.05	-3.09	0.43	-0.91	-2.82	2.36
May	1.27	-1.66	-1.31	-0.01	4.91	-1.89	0.43	2.37	0.22	-1.03	1.52
Jun	4.55	-5.48	5.02	0.76	3.65	5.63	-1.70	0.54	1.45	0.19	1.55
Jul	1.95	1.53	0.12	-0.53	-1.77	4.09	0.95	-0.98	-0.34	0.32	0.09
Aug	-2.20	-0.73	-1.13	-0.05	1.78	2.63	2.44	0.93	-0.65	-1.52	3.2
Sep	3.75	3.03	0.99	2.43	0.09	8.89	-0.88	4.03	0.14	0.57	2.45
Oct	5.42	-2.77	-4.83	7.46	-5.95	-8.63	1.62	-1.97	-0.64	1.97	2.44
Nov	4.09	-1.51	-0.01	-0.17	2.62	0.02	-0.39	0.13	0.33	-1.15	-4.88
Dec	3.05	-1.96	1.16	3.61	1.58	-0.50	0.59	1.67	1.97	-0.12	0.95

Source: https://data.gov.in/keywords/exchange-rate

Graph 7: Regression Analysis Chart taking crude oil as Independent variable and Exchange Rate as dependent variable
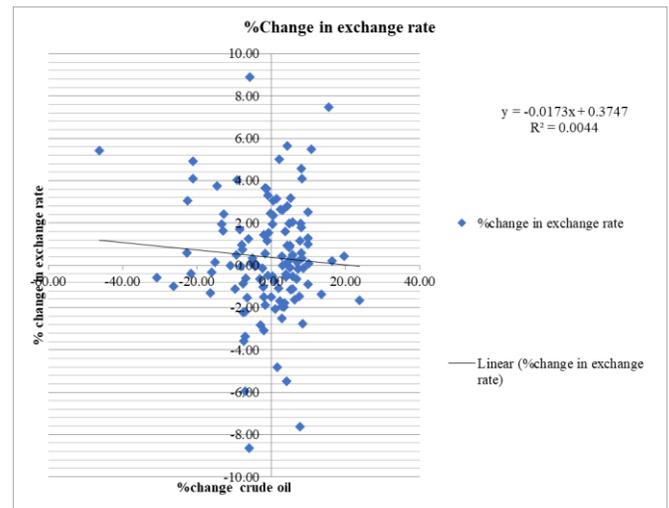
Therefore, though the prices of crude oil are decreasing and it's a positive sign for India. The rupee value is depreciating that means India has to pay more to import one barrel of crude. Example: as on 2008 India had to pay 108.17$ per barrel of crude oil in exchange of 39.3 Rs for 1 $. Now in the year 2016 India has to pay 61.43$ per barrel of crude oil in exchange of 64.75$ for 1$

The regression model is y= -0.0.17x+0.374
The correlation between dependent variable y exchange rate and independent variable x crude oil is r=0.071

Regression Statistics.	
Multiple R.	0.06647601
R Square.	0.00441906
Adjusted R Square.	- 0.003877448
Standard Error.	2.660052296
Observations.	122

ANOVA					
	df	SS	MS	F	Significance F
Regression.	1	3.768902612	3.768902612	0.53264	0.466920929
Residual.	120	849.1053858	7.075878215		
Total.	121	852.8742884			

	Coefficients	Standard Error	t Stat	P-value
Intercept.	0.374727923	0.241798176	1.549754958	0.12383
%change in the crude oil prices.	- 0.017294981	0.023697515	- 0.729822558	0.46692

Based on the Karl Pearson's correlation co-efficient and the regression analysis it is evident that there is a negative correlation between percentage change in crude oil price and percentage change in the exchange rate. There is 6% of variance on Exchange rate is explained by crude oil price. The slope coefficient has of t-statistic of 1.549; the slope coefficient has p-value of 0.124 and slope coefficient has estimated standard error of 0.24 Here F-table value (95%confidence) critical value of F at (1, 120) = 3.99. i.e. tabled F value 5%significance level
Calculated F value =0.532
F Calculated < F there H_0 is accepted and H_1 is rejected

Thus, decreasing value of (Rs to $) exchange rate is not due to the decreasing oil prices. i.e. null hypotheses is accepted.

Hypothesis 4

H_0: Crude oil does not play a significant role in rising inflation (CPI).

H_1: Crude oil plays a significant role in rising inflation (CPI)

Table 9: *Monthly Inflation rates from Jan 2008 to Feb 2018*

| Years	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018
Jan	5.5	10.5	16.1	9.3	5.3	11.6	7.2	7.1	5.9	1.9	5.11
Feb	5.4	9.9	14.9	8.8	7.5	12.1	6.8	6.3	5.5	2.6	4.74
Mar	7.9	8	14.9	8.8	8.6	11.5	6.7	6.2	5.5	2.6	4.36
Apr	7.8	8.7	13.2	9.9	10.1	10.5	7	5.7	5.9	2.2	3.97
May	7.7	8.6	13.9	8.7	10.01	10.6	7	5.6	6.5	1.1	3.96
Jun	7.6	9.1	13.8	8.6	10	11.1	6.5	6.1	6.1	1.1	3.93
Jul	8.2	11.9	11.2	8.4	9.9	10.9	7.2	4.4	6.5	1.8	5.61
Aug	9.1	11.8	9.9	9	10.1	10.8	6.7	4.3	5.4	2.5	5.61
Sep	9.9	11.7	9.9	10	9	10.7	6.3	5.1	4.2	2.9	5.61
Oct	10.2	11.6	9.8	9.4	9.3	11	5	6.4	3.3	3.3	5.23
Nov	10.2	13.2	8.6	9.3	9.4	11.5	4.2	6.7	2.6	4	4.86
Dec	9.7	15	9.2	6.5	11.1	9.3	5.3	6.3	2.4	4.1	5.24

Source: *https://data.gov.in/keywords/inflation*

Graph 8: *Inflation rates fluctuation monthly from Jan 2008 to Feb 2018*
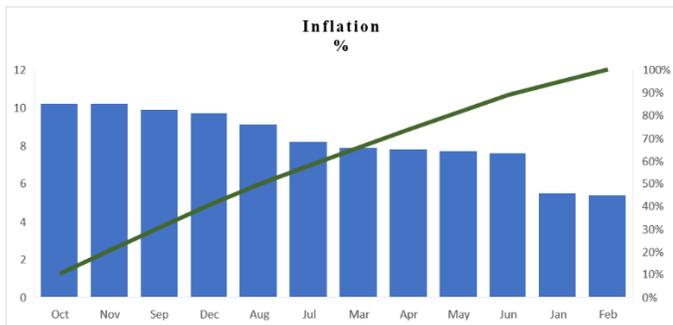
CPI is measured change in the prices of a basket of goods and services that are typically purchase by specific groups of households. There are many factors influencing the impact of inflation in the country. Demand factor occurs when demand in the economy exceeds the aggregate supply. Supply factor is with respect to the cost involved. Domestic factor, Country like India has weak bonding between interest rate and the aggregate demand.

Graph 9: *Regression Analysis Chart taking crude oil as Independent variable and Exchange Rate as dependent variable*
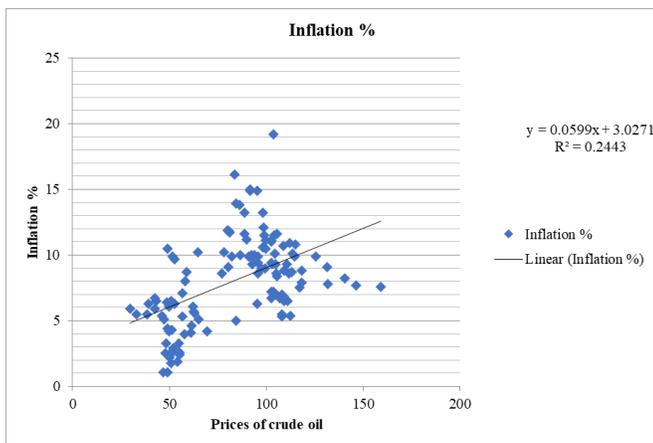
Inflation rates normally move with the same direction crude oil prices move. Past studies also tell us that crude oil and inflation has strong correlation between them. Example when the oil prices rises the industries dealing with oil will increase the prices due to which the end users are affected. Therefore, the falling prices of crude. i.e. the declining crude oil prices have a positive impact on the inflation rate.

The regression model is y= 0.058x+3.027

The correlation between dependent variable y inflation rate and independent variable x crude oil is r=0.49

H_0: Crude oil does not play a significant role in rising inflation (CPI).

H_1: Crude oil plays a significant role in rising inflation (CPI)

Regression Statistics.	
Multiple R.	0.49422782
R Square.	0.244261138
Adjusted R Square.	0.237963315
Standard Error.	2.951637162
Observations.	122

ANOVA

	df	SS	MS	F	Significance F
Regression.	1	337.9012568	337.9012568	38.78500643	7.23474E-09
Residual.	120	1045.459433	8.712161938		
Total.	121	1383.360689			

	Coefficients	Standard Error	t Stat	P-value
Intercept.	3.02713405	0.845662064	3.579602515	0.000497676
crude oil prices.	0.059879146	0.009614875	6.227760949	7.23474E-09

Based on the Karl Pearson's correlation co-efficient and the regression analysis it is evident that there is a positive correlation between crude oil price and inflation rate. There is 49% of variance on inflation is explained by crude oil price. The slope coefficient has of t-statistic of 3.58; the slope coefficient has p-value of 0.00049 and slope coefficient has estimated standard error of 0.84 Here F-table value (95%confidence) critical value of F at (1, 120) = 3.99.i.e. tabled F value 5%significance level

Calculated F value =38.78

F Calculated > F there H_0 is rejected and H_1 is accepted

Thus, crude oil plays a significant role in rising inflation (CPI). i.e. alternative hypotheses is accepted.

Gross domestic product growth rate over the years

Table 10: *Quarterly GDP growths from 2008-09 to Q3 2017-18*

| Years	Q1	Q2	Q3	Q4
2008-09	8.04	7.81	5.59	5.76
2009-10	6.32	8.64	7.33	8.57
2010-11	8.8	8.9	8.2	7.8
2011-12	7.7	6.9	6.1	5.3
2012-13	5.5	5.3	4.5	4.8
2013-14	4.4	4.8	4.7	4.6
2014-15	5.7	5.3	7.5	7.5
2015-16	7	7.4	7.3	7.9
2016-17	7.1	7.3	7	6.1
2017-18	5.7	6.3	7.2	7.7

Source: *https://data.gov.in/keywords/gdp*

Graph 10: Quarterly GDP growths from 2008-09 to Q3 2017-18
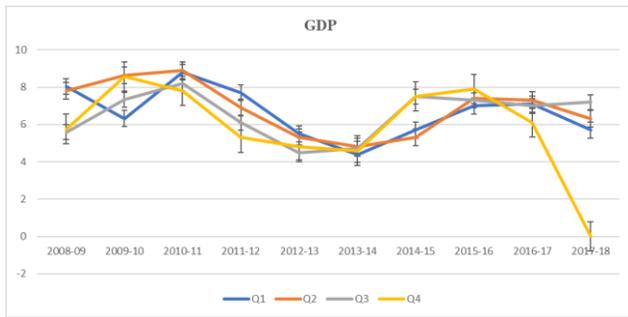
GDP indicates the growth of the country. Normally it's calculated taking previous year as base year. The GDP taken here is without the adjustment of inflation. i.e. nominal GDP. GDP of India was growing at a slow rate in 2010. In the Q3 Feb. 2018 it has picked up speed, may be due to the policies made by the government and the industries are growing rapidly might be due to the decrease in the oil prices which is the major row materials for most of the industries in India

Graph 11: Regression Analysis Chart taking crude oil as Independent variable and GDP Rate as dependent variable
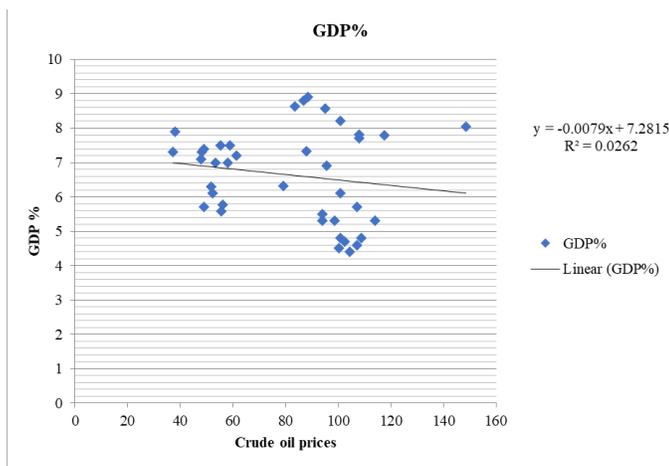
Therefore, there is negative correlation between the variable this may be because of considering nominal GDP without considering inflation. The slight decline in the GDP may be due to many factors. Only 26% of the real GDP is got from the manufacturing sector where crude oil products are involved

The regression model is y= -0.007x+7.281
The correlation between dependent variable y inflation rate and independent variable x crude oil is r=0.16.
Thus, crude oil price change does not have a significant effect on nominal GDP i.e. null hypotheses is accepted.
H_0: Crude oil price change does not have a significant effect on nominal GDP
H_1: Crude oil price change has a significant effect on nominal GDP

Regression Statistics.				
Multiple R.	0.16172816			
R Square.	0.026156			
Adjusted R Square.	-0.0001641			
Standard Error.	1.32791375			
Observations.	39			

ANOVA					
	Df	SS	MS	F	Significance F
Regression.	1	1.752360179	1.75236018	0.9937649	0.325299086
Residual.	37	65.24413213	1.76335492		
Total.	38	66.99649231			

	Coefficients	Standard Error	t Stat	P-value
Intercept.	7.28149569	0.685057319	10.6290313	8.475E-13
crude oil.	-0.0078982	0.00792292	-0.9968776	0.3252991

Based on the Karl Pearson's correlation co-efficient and the regression analysis it is evident that there is a negative correlation and the correlation between crude oil price and inflation rate are very week. There is 16% of variance on GDP is explained by crude oil price. The slope coefficient has of t-statistic of 10.6; the slope coefficient has p-value of 8.475E-13 and slope coefficient has estimated standard error of 0.6850
Here F-table value (95%confidence) critical value of F at (1, 37) = 4.11.i.e. tabled F value 5%significance level
Calculated F value =0.99
F Calculated < F there H_0 is accepted and H_1 is rejected.

Figure 3: Impact of Crude oil on Economy
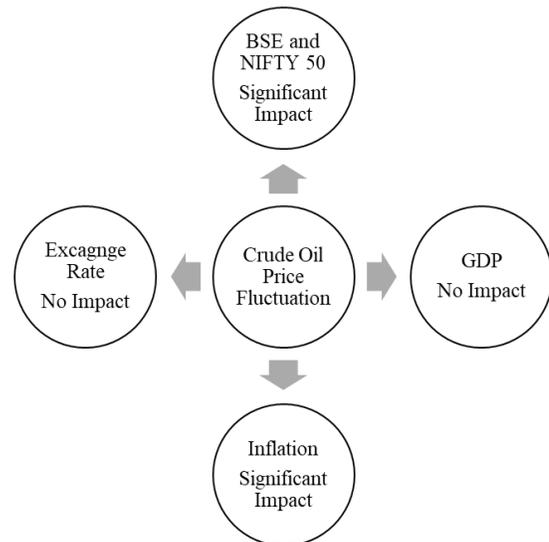
Source: *Date Analysis*

Conclusion

There always remains uncertainty of the changes in the prices of crude oil, it is known that it is highly dependent on demand and supply and it will never be at a stable price. Oil prices controls prices of other fuels.it is an important variable which controls inflation and cause substantial growth in any economy most prominently developing economy. Crude oil is taken as independent variable and the parameters under study are stocks (BSC Sensex, Nifty 50), exchange rate, inflation and GDP are dependent variable where exchange rate and GDP is negatively correlated, and the rest are positively correlated. Crude oil effects India in many ways, reduction in the oil prices has caused crises in oil exporting countries.1st it affects the current account balances, fall in crude prices narrows the

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per barrel prices and reduces the current account deposits. Secondly inflation rates, if inflation rates are high it's bad for the society, affecting companies directly because of the cost involved in purchase of raw materials. The government fixes the prices at subsidized rates and then pays the companies for any losses from selling fuel products for lower rates. Under Rs exchange rates rupee value depends on the current account deficit. If its high, it means country needs to sell Rs and buy $. This study is to bring awareness of the importance of crude oil in Indian economy, from the study its known that there is positive impact on stock market, inflation and negative impact on exchange rate and GDP.

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