



Declining crude oil prices and its implications on the Indian economy

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ABSTRACT

The following research paper aims to study the implications of oil prices on the Indian economy especially the impact of declining prices. Oil prices are highly important for the economy especially a developing country like India. India is the 3rd largest energy and oil consumer in the world after China and the US. Oil is a factor that helps an economy to move forward and achieve high levels of growth. The research paper studies the oil production and the supply of oil. This paper has tried to estimate using various tools a correlation between oil prices and various economic and market factors. The paper studies the impact on various leading and lagging indicators in the economy that help give an idea about the implications of declining oil price on the economy. This research entails a study of economic factors like inflation, GDP, the impact on foreign reserves, etc. India depends highly on oil imports and thus an intensive study is required to understand the impact of the oil prices. Major imports for India come from Iraq and Saudi Arabia and the demand for oil in India is on the rise with every coming year. This Research has helped us conclude that Oil prices have an inverse relation with stock prices which means declining oil process have a positive impact on the stock prices and thus the economy. It is observed statistically that the role of inflation is significant in declining GDP growth of Indian economy. The two variables of oil prices and GDP of India are negatively correlated. This can explained by the fact that increase in oil prices lead to greater inflation, lower profits of firms, lower tax revenues for the government, higher current account deficit and dampened investor sentiment. All this factors restrict the economy from growing at its full potential.

Keywords— Crude oil prices, GDP, Impact on economy, Inflation, CAD

1. INTRODUCTION

Energy and oil are vital sources of economic growth and help in moving the economy further. Crude oil reserves are not distributed around the world uniformly. The global oil industry has a lot of characteristics starting from exploration and production, gathering, refining and manufacturing of intermediate products and converting into various products, refined product distribution, storage and other facilities like pipelines and various terminals, other marketing and retail operations, etc. There are countries around the world with huge reserves of oil like the United States, Canada, Russia, Venezuela, and all the Middle East countries like Iran, Iraq, Kuwait, Saudi Arabia, UAE, etc.

The world consumption for oil in 2018 alone was \$2.18 trillion tonnes. In gallons this is equivalent to 1.134 trillion which is equal to half the water in Lake Michigan. Total world production for oil is estimated to be 101.06 million barrels per day and total world consumption is assumed to 100.82 million barrels per day. According to EIA, the global liquid consumption of oil will increase by 0.9 million barrels per day which is down from the year over year growth of 1.3 million barrels per day. EIA estimates the demand to rise to 1.4 million barrels per day in 2020. Crude oil stood first as the world's number one export product in 2018, then came petroleum and the third was cars as the most valuable commodity.

Oil prices are difficult to determine due to several factors such as the high uncertainty relating to the development of the resource and investment required, the nature of the resource, the scarcity of the resource, high pressure by the resource producers and refineries due to their monopolies, the inelastic demand of oil as it is needed to fuel economic growth, etc. however there are three major factors determining oil prices i.e. the oil supply especially from OPEC and other alternative fuel supplies like Shale gas, etc., the access to future supply that is the reserves available in various exporting countries and the third factor is the demand from various countries.

The major oil exports came from Asia of 49.5%, Europe supplied overall 16.9%, smaller percentages came from Latin America, etc. The Middle Eastern countries (OPEC) account for the highest exports in the world 42.9% or \$486.1 billion of globally exported crude oil. Other major exporters are the US, Canada, Russia, etc. The major oil importing are China at 20.2%, United States at 13.8%, India at 9.7%, Japan at 6.8%, etc. other importers also include south Korea, Netherlands, United Kingdom, Germany, Spain, Italy, etc. Oil prices thus fluctuate highly throughout the period. Oil prices were decided by OPEC in the form of long term contracts. However, now with the growth of the spot market as well as the future commodity market these long term contracts have reduced and the price is influenced by global demand and supply. OPEC being a large producer still has an influence on this price. For

example, in 2012 the oil prices rose to an all-time high of \$108.54 when Iran threatened the straits of Hormuz. Also in 2016 the prices for oil fell sharply due to the excess supply from US in the form of SHALE gas and other alternative fuels. The oil prices were at a low of \$26.66/barrel. However to combat this problem the OPEC cut supply of oil and restored prices at normal levels \$47.50/ barrel in 2018. Shale Gas is a highly upcoming product from the US and is showing substantial growth in the market. Oil prices are not only dependent on the demand and supply but also the location of the production and refinery. Oil produced close to major markets has more demand as it requires less transportation and thus this oil will demand a premium. Other minor factors also include the type of oil and the type of content in the oil for example sulphur content, density and the gravity, etc. However, the three major factors the affect price are demand, supply and the reserves and any other global economic events.

India imports 70 to 80 % of its oil demand. It is predicted that the nation's oil needs will rise by 40% in 2020. Volatile oil prices are a threat to the economy as India consumes high amount of oil which is not produced domestically. Oil prices for India also depend on the exchange rate. Higher the exchange rate more is the pressure on the economy. Oil prices depend on the various regulations also that are present in India especially the various import duty applicable to various countries. Iraq and Saudi Arabia is India's largest supplier of oil. India has stopped importing oil from Iran post the US sanctions. Kuwait is also one of the major suppliers of oil to India.

Oil can be used to make several products like gasoline or motor spirit, distillate fuel oils like diesel and kerosene and heating oil, hydrocarbon gas fluids like propane, jet fuel which is a very important product used across the world and highly impacts the airline sector, lubricants, asphalt, petrochemical feedstock, coke, aviation gasoline, waxes, etc. Oil is used in various forms in India and for various purposes. Oil is used as motor spirit that is petroleum which is used as fuel for passenger cars, trucks, two and three wheelers, etc. Oil is also available in the form of ATF (automatic transmission fuel) which is used by airlines, oil is used as SKO (superior Kerosene oil) used for cooking and lighting, HSD (high speed diesel) fuel for transport sector (Railways/Road), agriculture (tractors pump sets, threshers, etc.) and captive power generation, LDO (Liquefied diesel oil) which is used in small pumps, agriculture, etc. Oil is used to make lubes, other minor products like coke, Paraffin Wax, etc.

Major players in India in the oil sector are the ONGC, Indian Oil, GAIL, Great Eastern Energy Corporation limited, Essar oil, RIL, GSPCL, etc. Each player has a good amount of share in the market and caters to different needs of the market. These players are highly impacted due to declining or rising oil prices. India allows 100% FDI under the automatic route in exploration activities and 49% FDI in refining.

Thus oil has several end uses and thus has a major impact on the economy. A simple example could be a rise a price of oil would lead to higher inflation. This is because all goods are dependent on transport which is dependent on petroleum which originates from oil. Thus everything is interlinked and goes back to oil. The oil industry is a highly important industry as India is highly dependent on oil imports. There are estimates that oil demand has risen to 84% for India.

India is an emerging economy with a Gross Domestic Products (GDP) growth of 5-10% per annum. Moreover, the recent business reforms, initiated by Prime Minister Narendra Modi may bring in changes in the Indian Economy. Business reforms further indicate the possibility of energy consumption. Crude oil is the second highest source of India's energy consumption with 23% of the share after Coal. The recent scenario of Indian crude oil segment is not appreciable. On one hand where crude oil consumption is increasing, on the other hand, the production is declining. It results in more import expenses. In this context, the major difference with the developed countries is crude oil dependency. This is an alarming situation and India should start taking initiatives towards alternative energy sources. Sadorsky (1999) has disclosed the bidirectional connection between crude oil price and economy. He has found an asymmetric effect of crude oil volatility shocks on economic activities. According to the researcher, both the fluctuations in crude oil price and changes in economic activities have an impact on each other. Guo and Kliesen (2005) have found that crude oil price fluctuation influences aggregate economic events through relative dollar price changes of crude oil. Hence, it proves that there is a scope of understanding the connection between crude oil price and economic activities. In case of India the impact for high oil prices also affects the foreign reserves and widens the CAD and may also have other impacts on the economy. Thus the research will study the impact on declining oil prices.

2. SIGNIFICANCE OF STUDY

Oil is a magic word that always makes news. There is hardly a nation that does not seek this indispensable natural resource. A country that already possesses crude oil wants more. They struggle to explore it at almost any cost. Higher oil prices thus increase the cost of inputs; and final product price increases cause inflation, if the cost increases cannot be passed on to consumers, economic inputs such as labour and capital stock may be reallocated. Higher oil prices can cause worker layoffs and the idling of plants, reducing economic output in the short term. In a net importer of oil economy like India, higher oil prices shrink foreign reserves of the economy, affect the purchasing power of the economy in terms of International trade. India, which is the fourth largest consumer of oil, is a big beneficiary of falling oil prices. Reduction in prices will not only lower the import bill but also help save foreign exchange. As per rough estimates, a \$10 fall in crude could reduce the current account deficit by approximately 0.5% of GDP and the fiscal deficit by around 0.1% of GDP.

2.1 Current Account Balance

India is one of the largest importers of oil in the world. It imports nearly 80% of its total oil needs. This accounts for one third of its total imports. For this reason, the price of oil affects India a lot. A fall in price would drive down the value of its imports. This helps narrow India's current account deficit - the amount India owes to the world in foreign currency. A fall in oil prices by \$10 per barrel helps reduce the current account deficit by \$9.2 billion, according to a report by Livemint. This amounts to nearly 0.43% of the Gross Domestic Product - a measure of the size of the economy.

2.2 Inflation

Oil price affects the entire economy, especially because of its use in transportation of goods and services. A rise in oil price leads to an increase in prices of all goods and services. It also affects us all directly as petrol and diesel prices rise. As a result, inflation rises. A high inflation is bad for an economy. It also affects companies - directly because of a rise in input costs and indirectly through a fall in consumer demand. This is why the fall in global crude prices comes as a boon to India. Every \$10 per barrel fall in crude oil price helps reduce retail inflation by 0.2% and wholesale price inflation by 0.5%.

2.3 Oil subsidy and fiscal deficit

The government fixes the price of fuel at a subsidized rate. It then compensates companies for any loss from selling fuel products at lower rates. These losses are called under-recoveries. This adds to the government's total expenditure and leads to a rise in fiscal deficit - the amount it borrows from the markets. A fall in oil prices reduces companies' losses, oil subsidies and thus helps narrow fiscal deficit.

2.4 Rupee exchange rate

The value of a free currency like Rupee depends on its demand in the currency market. This is why it depends to a great extent on the current account deficit. A high deficit means the country has to sell rupees and buy dollars to pay its bills. This reduces the value of the rupee. A fall in oil prices is, thus, good for the rupee. However, the downside is that the dollar strengthens every time the value of oil falls. This negates any benefits from a fall in current account deficit.

2.5 Petroleum producers

The fall in global oil prices may be beneficial to India, but it also has its downsides. Directly, it affects the exporters of petroleum products in the country. India is among the largest exporters of petroleum products in the world. This helps it earn \$60 billion annually. Any fall in oil prices negatively impacts exports. At a time when India is running a trade deficit - high imports and low exports, any fall in exports is bad news. Moreover, a lot of India's trade partners and buyers of its exports are net oil exporters. A fall in oil price may impact their economy, and hamper demand for Indian products. This would indirectly affect India and its companies. Thus, due to the above stated implications that oil prices have on India's economy, it is necessary to further study the dynamics of oil prices and macroeconomic variables.

3. NEED FOR STUDY

Crude oil price is an important parameter for refining industries, which has a bearing on economy, because it is vital input for productivity. There is a vast gap in demand and production of crude oil in India. National oil companies are able to produce 23-24% of India's total requirements of crude oil. The production of crude oil from public sector enterprises in India has been decreasing due to old and the maturity of the fields. India is not self-reliant on crude oil production; therefore, it is necessary and inevitable to import the crude oil to bridge the gap between demand and supply. The increase in international crude oil prices will make import costly and raise the Indian crude basket price. Therefore, both international crude oil price rise and import dependency on crude oil are the problematic area that may damage the Indian economy. It is estimated that the import dependence of India associated with crude oil is expected to 94% by the end of 2030. Therefore, the trouble water in Indian crude oil demand and supply management is the rise in international crude oil prices followed with the extent of the increase in crude oil requirement with respect to feasible higher GDP growth 8% to 9%. The import dependence of India associated with crude oil is from 76% in 2011-12 to 80% by the end of twelfth plan (2012-17). As crude oil prices are rising globally and imports will be expensive, it is necessary to understand the consequences of crude oil price rise on the economy.

3.1 Gap Analysis

Crude oil prices substantially affect the economic growth of any economy. There is an increase in overall demand for crude oil due to increase in demand for the refined products that are made from crude. The changes in crude oil prices are passed on to the consumers through the prices of the final petroleum products. If the prices of petroleum products increase, consumers spend a larger amount of their income on those products. Their expenditure on other goods and services decreases. India imports a major portion of its crude oil requirement. Thus, the extra amount spent on crude oil basically goes to foreign oil producers. Higher oil prices also cause an increase in other energy prices. Depending on the ability to substitute other energy sources for crude the price increases can be large and can cause macroeconomic effects similar to the effects of oil price increases. Though energy is the prime mover in an economy, to bridge the gap between the demand and supply of crude oil, the country has to rely on imports. Therefore, crude oil becomes an important parameter to determine reserve position and trade balance and the Balance of Payment. Increase in Crude oil prices also affects inflation. With the increase in inflation, purchasing power is reduced, expenditure increases, savings decrease. All of this ultimately slows down the business and economic activities and thus slows down the GDP growth rate. Thus, this gives us the objective to study the impact of increase in crude oil prices on the Indian economy by studying various parameters which affect the economy directly.

4. RESEARCH OBJECTIVES

- To study the impact of Crude oil prices on Indian Economy
- To identify the linkage between change in crude oil prices and inflation, exchange rate, GDP and financial markets.

5. SCOPE OF OBJECTIVES

The effect of Crude oil on the economy have been studied in the Indian context only. The data for the parameters (Exchange rate, Imports of crude oil, Inflation rates, Stock markets data, GDP) of the analysis have been taken for a period of 10 years i.e. from 2007 to 2017. Correlation analysis has been performed between each of the factors and crude oil prices to identify the linkage between them. The results have been analysed to find if there is a direct or inverse relationship between these variables and the reasons for the same have been studied. Regression analysis and Hypothesis testing has also been used to study the impact of changes in crude oil prices on the economy where GDP is taken as the main indicator representing the economy.

5.1 Limitations of the Research

- The study has been conducted in the Indian context only
- The study does not consider the fact that the changes in the economy can be due to a combined effect of changes in crude oil prices and other factors such as tax rates, labour, government activity, laws and policies, recession, interest rates. At any point of time, Crude oil may not be the only factor which has had a positive or negative impact on the economy.
- The study does not analyse the impact of the changes in prices of crude oil on other metals like gold, silver, copper, platinum in commodity exchange markets.
- In hypothesis testing, GDP is taken as the only indicator as a representative of the changes in the economy.

6. REVIEW OF LITERATURE

The author (**Anmol Soni**) examines the trends and patterns in oil shocks and India's vulnerability to shocks in supply and prices at the national and international and national levels. First examining the definitions and international experiences of crude oil volatility, a qualitative approach is taken to examine the impact of volatility on major indicators. This paper takes a broad definition of volatility looking at demand, supply and speculation. In addition, a manifestation of the country's dependence on oil and its reflection through different economic and physical indicators such as share of oil in the energy basket, importance of crude oil and petroleum products in the trade balance and the patterns of trade in the recent years is also examined to understand the extent of vulnerability to shocks. It has been found that the vulnerability to these is expected to rise in the future as dependence on imported oil is projected to rise. Finally, based on international experience, measures to mitigate this vulnerability have been recommended.

Although there is some uncertainty about the prices at which trading takes place on the oil market, there is no doubt that the falls in oil prices since the early part of this year amount to one of the most significant economic events of the 1980s. If falls of such magnitude are maintained, investment plans in the oil sector, and depletion policy, could be affected. Furthermore, other supply-side changes may be set in train, due to the relative price (of oil to other fuels) change, and switches in profitability from the oil sector to other sectors of the economy. There are other, more immediate and quantifiable effects of oil price changes however: on demand, on the exchange rate and on prices. There have been several estimates of the macroeconomic effects of the change in oil prices. Many of these conclude that these effects are beneficial, giving a stimulus to output and lowering inflation. At the same time, it is also estimated that falling oil prices place an extra constraint on discretionary fiscal action. We will argue that much recent discussion of this subject has overstated the likely effect of declining oil prices on the PSBR and has done so because other macroeconomic effects of the change in oil prices have not been fully allowed for. Before providing estimates of the full macroeconomic effects, we note the direct, but partial effects of an oil price change. The subsequent section then extends this analysis to consider the full macroeconomic, direct and indirect, effects. (**Hall, Henry, and Herbert, 2019**)

(**Swadimath, Anilkumar, and Joshi, 2013**) attempt to study the causes for rising crude oil prices by understanding the working of cartels. It also studies the impacts of rising prices on the Indian economy. Crude oil being indispensable has a huge impact on the prices. A change in the price of crude oil can largely result in a change in the inflation rate in India. The research paper has studied the consumption, demand and supply of crude oil across the world and its impact on the prices. OPEC accounts for 60% of the world's proven oil reserves and it exports 55% of the oil traded internationally. The research paper thus studies price determination by OPEC and how much quantity does each player in the OPEC (Iran, Iraq, Kuwait, Qatar, Saudi Arabia, the United Arab Emirates, Libya, Algeria, Nigeria, Angola, Venezuela and Ecuador) supply. Thus it has aimed to study the market share of each player of the cartel and its impact on the price. The research paper also studies the extraction process and its impact on oil prices. The price is always influenced by OPEC internationally and it keeps changing according to their need. The impact of dollar appreciation and depreciation also has an impact on the prices for e.g. the prices of oil during 2008. The demand and supply also play a major role in price determination of oil. The research then finally studies the impact of all these price changes on the Indian economy and infers that the transportation sector, food, vegetables, rubber and plastics, textiles, etc. all face an impact due to changing oil prices.

This study by (**Ghosh and Tomar, N.D.**) looks at the quantitative impact of crude price shock on India's three major macro-stability indicators: current account deficit (CAD), inflation and fiscal deficit. A high crude price results in high deficit and thus a CAD. This results in high CAD to GDP ratio. India's external sector remains highly vulnerable to global crude price movements and it will continue to remain so in the near future. The next impact the research paper suggests is on the inflation of the economy. The increase in prices results in high inflation in the economy. It also leads fiscal deficit depending on the scale of government intervention. Thus the research paper gives a comprehensive overview of the impact of oil prices on the external factors like CAD to GDP and the internal factors like inflation and fiscal deficit of the country.

In this paper, (**Aparna, 2014**) has made an attempt to study the impact of crude oil price on the Indian economy by considering Gross Domestic Product (GDP), Index of Industrial Production (IIP) and Wholesale Price Index (WPI) as the relevant variables. Vector Auto Regression (VAR) has been used to analyse the objective since a direct causal relationship could not be established. Crude oil prices play a very significant role on the economy of any country. India's growth story hovers around the import of oil as India imports 70% of its crude requirements. It can be seen that the analysis conforms with the discussion that the system does have a long term memory and has an effect for more than 10 quarters in case of GDP and IIP while for WPI, the system returns to its original value immediately as compared to others, thereby having a short term memory. Any sudden change in the price of oil has the ability to impact the industrial growth adversely. It also causes a very high spurt in the WPI. Altogether, change in oil price, WPI increase and declining IIP affect the economy negatively and even if the impulse or shock is short term, it has a long lasting impact on the economy.

(**Firdous A Wani, 2015**) gives an insight into the present state of crude oil imports and an attempt has been made to explain the importance of reducing the crude oil imports in order to improve the living standards of a common man. The research paper

concluded that the crude oil prices all across the globe have a significant impact on global economies directly or indirectly. However, the increase in the crude oil prices results in increase in almost all the consumable and non-consumable commodities. Any positive change in the crude oil price has negative impact on the increment in GDP of a country. The Indian economy is not an exception to the impact of change in crude oil prices. In India the demand for petroleum related products is increasing at a rapid pace which results in increase in crude oil imports. In case of any increase in crude oil prices a shock or impulse is visible which paves way for strengthening energy efficient mechanisms in order to reduce the dependency on petroleum products.

(Dr. K. Soundarapandiyam, Dr. M. Ganesh) brief the readers about the scarcity of petroleum and other types of oil and also goes on further explaining the impact of inflation on the oil prices, and how during inflation suppliers try to increase their exports. There are certain very enlightening topics that this paper touches upon, firstly, it explains how the Global Primary energy consumption is increasing as the consumption of natural gas is projected to increase at a growth rate of 1.6% p.a. from 2010 to 2030, and supports their projections with statistics. Secondly, it discusses about the effect of oil prices on India, how India is a very big importer of oil and about how India imports 80% of its Crude oil requirements. It further goes on discussing how the fall in the crude oil prices is a boon for the Indian economy and the country's current account deficit and how inflation has a very bad impact on the importing country's economy. It makes an attempt in explaining how an increase in the oil prices brings a fall in GDP and an increase in inflation, thus leading to a fall in demand in the importing countries and vice versa.

(Akansha Sanjay Jain¹, Nitish Sunil Patil²) discuss about the reasons for the fall in price, the oil imports and reserves of India (onshore and offshore reserves), the relationship between the production and consumption of oil in India and how the consumption has again started taking the growth trend. It also discusses the relationship between production and imports and states the reasons for the low production of domestic oil. It helps with knowing the impact of inflation on the crude oil prices and on the CPI and WPI, which in turn affects the GDP. It further goes on explaining how important crude oil prices are for RBI to determine their rates and amend their policies. The paper also discusses the impact of crude oil prices on the fiscal deficit and trade deficit due to increasing consumption rate. At the end, it suggests ways of improving to the imports and consumption of crude oil, such as market linked relative prices, minimizing subsidies and targeting them well and increased domestic exploration to improve on supplies.

(Bidisha Sarkar and Jain Mathew, 2018) aim to find out the factors influencing Indian basket crude oil price changes. Moreover, the paper attempts to investigate the impact of this price fluctuation on Indian economy. Overall, this study intends to explore the causes and consequences of international crude oil price changes of Indian basket. Assessing this cause and effect relationship requires a long-term historical data set. Hence, the timeframe of the research work has been considered from the financial year 2000-2001 to 2016-2017. Monthly data frequency has been employed for this research work. Oil Spreadsheet Model has been referred to understand the supply- demand mechanism which can be considered as the base for identifying the global factors, influencing Indian basket crude oil price changes. Econometric techniques (Granger Causality Test Model) have been adopted to understand the cause and effect relationship of this price fluctuation. It has been found that Organization of the Petroleum Exporting Countries (OPEC) and Brent crude oil prices have a bi-directional effect on an International crude oil price of Indian basket. On the other hand, the Indian basket crude oil price granger causes Gross Domestic Product (GDP). The study intends to provide a holistic picture of the given issue, crude oil price changes. Both the factors influencing crude oil prices and factors affected by crude oil prices have been taken into consideration. Several empirical pieces of evidence have been exhibited throughout the paper and based on that a conceptual model has also been developed. The outcome of the study and the conceptual model can be considered as a base for several other potential future studies.

(S.Sathyarayanan, S. N. Harish and Sudhindra Gargasha, 2018) The recent fluctuations in the crudes prices have captured the researcher's attention towards the crucial role that crudes prices play on the economy of any nation. The volatility in crude price has influenced the uncertainty in the price expectation in the country's economy. As majority of the empirical studies support that the crude oil price volatility significantly influences the country's economy and also the stock returns. Therefore, understanding the movement of stock returns is an important issue from the perspective of a developing economy like India. Therefore, it is necessary to identify the variables that drives the stock prices are very important for the market participants and policy makers. The aim of this paper is to investigate the volatility of crude prices and its impact on Indian stock market. For the purpose of the study the data has been collected from Prowess data base for a period from 2006 to 2015. The collected data has been tested for stationarity by employing ADF test and the length intervals for each variable to run the AIC. Later a linear regression has been run. The volatility of the Sensex has been measured by applying GARCH (1, 1) model. The linear regression results show that changes in crudes prices have an impact on Sensex. Apart from that the study concludes that the Crude prices was significant in the volatility of the Sensex and have the competency to transmit shock on Sensex. Therefore, policy makers have to take the movement of the crudes prices while framing the policies that affect the economy at large and stock market in particular. Finally, these results have been compared to the available evidence

(Abhigyan) analyses four crucial aspects about the fall in oil prices. These are:

- Reasons behind the decline in prices of oil
- Global impact of the fall in oil prices
- Impact on the Indian economy due to the fall in oil prices
- How long will the oil prices continue to decline and how can India use this window of opportunity

This paper however does not explore other aspects such as reasons behind India's dependence on oil, alternative forms of energy that can be used. The author attributes the fall in oil prices to following factors. The first is the booming oil production by the United States. Innovative techniques such as Fracking and horizontal drilling have helped the US to significantly increase its production

which has led it to become one of the largest oil producing country in the world. This has, to some extent reduced the volatility that used to prevail in the oil market due to geopolitical tensions and instability in Middle East. Secondly, OPEC which is a consortium of petroleum exporting countries has not announced any cuts in oil supply thus maintaining a stable equilibrium between demand and supply. Oil exporting countries such as Iraq and Libya who have been severely affected by political instabilities have been able to provide stable output of oil production. Thirdly, the author opines that there has been a relative reduction in demand of oil due to decrease in consumption and economic slowdowns. India and China, one of the largest oil importers have also reduced their imports thus causing a reduction of overall demand in the oil market. Assessing the impact of reduced oil prices on India, the author states that it will have a positive effect and provide a big boost to the economy. India being among the largest importers of oil, even a fall of 1\$ reduces the import bill by almost 40 billion rupees. India should use this window of opportunity to decrease its Current Account Deficit (CAD) and create a favourable balance of payments. India should also increase its oil imports and start having strategic oil reserves that can be used during contingencies which may hamper our oil requirement in future.

(Pankaj Bhattacharjee) The main purpose of this paper was to analyse the impact of crude oil prices on India's macroeconomic variables such as GDP, Inflation, CPI and WPI among others. The study adds to the existing literature by bringing an awareness of the importance of crude oil prices on the Indian Economy. The study uses various statistical models such as Karl Pearson's coefficient correlation and Regression Analysis to test its hypothesis and arrive at conclusions. The paper states that the demand for crude oil will significantly rise by 2030 and this demand will not be satisfied by current levels of output and huge investments are needed in building oil facilities and the necessary infrastructure required to transport oil.

India imports most of its requirement and produces very low levels of crude oil domestically. This over dependence on imports especially from OPEC countries makes us vulnerable to several risks. The implications of dependence on OPEC is as follows:

- Oil is a global market, therefore, once non OPEC production peaks and demand continues to grow, there will be strong upward pressure on oil prices.
 - Despite the two price shocks in 1973-75 and 1979-1980, oil prices, after adjusting for inflation, have been essentially flat for the past 40 years with no clear trend. This is about to change. Over the next few decades, oil prices are expected to trend upwards and do so well above the inflation rate.
 - The world currently has little surplus oil capacity. Spare global capacity is at its lowest in 30 years. Tight capacity is likely to be an ongoing characteristic of the oil market in the future, given the expected slowing in non-OPEC production.
 - With little spare capacity, oil prices will be highly volatile and will respond quickly to any sudden change in demand or supply..
6. Much of OPEC's production is in countries with high geopolitical risk. With a growing reliance on OPEC oil, a speculative risk premium will be a permanent feature in the oil market.

7. RESEARCH METHODOLOGY

7.1 Research Problem

Analysing the impact of Declining oil prices and its implications on the Indian economy.

Crude oil is an important parameter for various refining as well as heavy industry inputs that have a large bearing on the economy, because they are a vital input for productivity in an economy. The current scenario is that there is a major gap in the demand and production of crude oil in India. The Demand exceeds the production as National oil companies are able to produce only about 25% of the total Crude oil demand generated in the economy. The players in the Crude oil industry consist of mainly the Govt. along with a few large players. The production of crude oil from public sector has been decreasing over time due to old and mature fields. India as a producer of crude oil is not self-reliant. Therefore, to bridge the gap between demand and supply it is essential to import crude oil. Hence, a change in the international crude oil prices is bound to impact the Indian import basket. An increase in the crude oil prices will make import costlier whereas a decrease will lead to reduction of price of the import basket.

7.2 Research Design

The type of research design used is Diagnostic research design. Here the research is done to find the root cause of the problem. The factors responsible for the problematic situation are described in detail. It is a problem research design that consists of mainly:

- a) Emergence of the problem
- b) Diagnosis of the problem
- c) Solution for the problem
- d) Suggestion for the problem solution

7.3 Source of data

The data has been obtained from secondary sources. Data has been sourced from online sources such as Articles, Official site of the Govt., Research papers in established journals etc. Research Instruments: The data analysed is between the years 2007 and 2017. Data points are annual, and the instruments used are correlation and regression analysis. Hypothesis testing (Two sampled T-test) has also been used. The factors that have been correlated to a decline in the Crude oil prices are:

- a) GDP
- b) Inflation
- c) Exchange Rates
- d) Financial Markets

7.4 Research Plan

The above mentioned techniques of analysis have been used due to the following reasons:

7.5 Correlation

Correlation is a statistical measure that indicates the extent to which two or more variables fluctuate together. A positive correlation indicates the extent to which those variables increase or decrease in parallel; an negative correlation indicates the extent to which one variable increases as the other decreases. To find the impact of change of crude oil prices on the respective factors, correlation has been used as:

- Most of the variables show some kind of relationship. For instance, there is relationship between price and GDP, Inflation and Exchange rates etc. With the help of correlation analysis, we can measure in one figure the degree of relationship.
- Correlation analysis contributes to the understanding of economic behaviour, aids in locating the critically important variables on which others depend.
- The effect of correlation is to reduce the range of uncertainty. The prediction based on correlation analysis is likely to be more variable and near to reality.

7.6 Regression

Regression Analysis has been used to find out the amount and extent of the impact of changes in crude oil prices on the GDP.

7.7 Two sampled t-test

Hypothesis testing has been used to find out if the impact of changes in crude oil prices on GDP is significant or not.

7.8 Research Gap

Previous studies do not pay much attention to the holistic approach of input selection and the effect of crude oil price change on several economic variables. Furthermore, the previous researchers have either explored the factors influencing crude oil price changes or its consequences to a particular or set of economies. Few researchers have worked broadly on both the attributes. Hence, a holistic approach could not be captured from the previous work done in this field. Moreover, the majority of the research works are based on the international crude oil price benchmark, such as WTI and Brent. Thus, the Indian basket benchmark of Crude Oil Price Fluctuations and Its Impact on Indian Economy has been ignored. In this study, a broader perspective of global and Indian factors has presented. Unlike other studies, here, more attention is paid to the factor influencing international crude oil price of Indian basket and its effect on several Indian factors.

8. DATA ANALYSIS and FINDINGS

8.1 Exchange Rate and Crude Oil Prices

The two aspects of crude oil prices and exchange rate are shown. Since crude oil is one of the major components in India’s import basket any fluctuation in crude oil prices will affect the imports. Further, there is an inverse relationship between the crude oil price and exchange which is seen below.

8.1.1 Crude Oil Prices – Import

Year	Price (\$/Barrel)	Import (Barrels)	Import (\$)	Exchange Rate	Import (INR)
2008	\$ 91.48	2587700	\$ 236,722,796.00	₹ 43.78	₹ 10,363,724,008.88
2009	\$ 53.48	3216000	\$ 171,991,680.00	₹ 48.36	₹ 8,317,517,644.80
2010	\$ 71.21	2759000	\$ 196,468,390.00	₹ 45.65	₹ 8,968,782,003.50
2011	\$ 87.04	3365600	\$ 292,941,824.00	₹ 46.45	₹ 13,607,147,724.80
2012	\$ 86.46	3682200	\$ 318,363,012.00	₹ 53.42	₹ 17,006,952,101.04
2013	\$ 91.17	3792600	\$ 345,771,342.00	₹ 58.51	₹ 20,231,081,220.42
2014	\$ 85.60	2791400	\$ 238,943,840.00	₹ 61.01	₹ 14,577,963,678.40
2015	\$ 41.85	3935500	\$ 164,700,675.00	₹ 64.12	₹ 10,560,607,281.00
2016	\$ 36.34	4308300	\$ 156,563,622.00	₹ 67.17	₹ 10,516,378,489.74
2017	\$ 45.33	4341500	\$ 196,800,195.00	₹ 65.11	₹ 12,813,660,696.45

	Exchange Rate	Imports of Crude Oil
Exchange rate	1	
Imports of crude oil	0.451777399	1

Findings

We have taken Exchange Rates and Import of Crude Oil (in INR) from 2008 - 2017 as two variables of our study. To check the effect of exchange rate on the import of crude oil we conducted a correlation test which showed a positive correlation of **0.45** between the two. A correlation of 0.45 between the two shows us that the import quantity and exchange rates are **moderately linked** to one another, the study reveals that an increase in the oil price return leads to the depreciation of Indian currency vis-à-vis US dollar. The study also establishes that positive and negative oil price shocks have similar effects, in terms of magnitude, on exchange rate volatility and oil price shocks have permanent effect on exchange rate volatility. As oil prices are paid in dollars, a rise in oil prices increase the demand for dollars. This increases the value of dollar vis- a-vis Indian rupee that is, a rise in oil prices leads to depreciation of rupee.

8.2 Crude oil Prices and Exchange rate

Year	Price (\$/Barrel)	Exchange Rate
2017	50.84	67.79
2016	43.58	66.46
2015	48.72	62.97
2014	93.17	62.33
2013	97.98	56.57
2012	94.05	53.44
2011	94.88	46.67
2010	79.48	45.73
2009	61.95	48.41
2008	99.67	43.51
2007	72.34	41.35

	Exchange Rate	Crude Oil (\$/Barrel)
Exchange Rate	1	
Crude Oil (\$/Barrel)	-0.527538231	1

Findings

We have taken Exchange Rates and Crude Oil Prices (\$/Barrel) from 2007 - 2017 as two variables of our study. To check the effect of exchange rate on the prices of crude oil we conducted a correlation test which showed a negative correlation of **-0.53** between the two. The negative correlation depicts an inverse relation between the two variables. This is because currently India has a deficit balance and a high deficit is when the country has to buy dollars by selling its rupees which in turn reduces the value of INR. Therefore a fall in oil prices is good for the rupee.

8.3 Crude Oil Prices and Inflation

Year	Price (\$/Barrel)	Inflation (%)
2017	50.84	2.49
2016	43.58	4.97
2015	48.72	5.88
2014	93.17	6.37
2013	97.98	10.92
2012	94.05	9.30
2011	94.88	8.87
2010	79.48	12.11
2009	61.95	10.83
2008	99.67	8.32
2007	72.34	6.39

	Inflation	Crude Oil (\$/Barrel)
Inflation	1	
Crude Oil (\$/Barrel)	0.56938079	1

Findings

We have taken Inflation and Crude Oil Prices (\$/Barrel) from 2007 - 2017 as two variables of our study. To check the relation between inflation and prices of crude oil we conducted a correlation test which showed a positive correlation of **0.57** between the two. Oil is an extremely fundamental commodity with every day need for local just as industrial needs. Oil is a basic raw material for various fragments of the business. Along these lines any expansion in oil to fuel Inflation in all portions like expense of manufacturing to delivering products to moving it which would at long last be passed on to end clients in this manner making the goods exorbitant. Oil is an essential commodity mainly because of its use in transportation (of goods, services and people). A rise in oil price leads to an increase in prices of all goods and services. It also has an impact on the individual level directly as petrol and diesel prices rise. As a result, inflation rises. A high inflation is bad for an economy. This is why the fall in global crude prices comes as a boon to India. Every \$10 per barrel fall in crude oil price helps reduce retail inflation by 0.2% and wholesale price inflation by 0.5%, according to a Moneycontrol report.

8.4 Crude Oil Prices and Stock Market

Year	Price (\$/Barrel)	SandP BSE Sensex
2017	50.84	34,056.83
2016	43.58	26,626.46
2015	48.72	26,117.54
2014	93.17	27,499.42

2013	97.98	21,170.68
2012	94.05	19,426.71
2011	94.88	15,454.92
2010	79.48	20,509.09
2009	61.95	17,464.81
2008	99.67	9,647.31
2007	72.34	20,286.99

	Sandp BSE Sensex	Crude Oil (\$/Barrel)
SandP BSE Sensex	1	
Crude Oil (\$/Barrel)	-0.61776038	1

Findings

To study the relation between Indian stock market and crude oil prices we have taken SandP BSE SENSEX and Crude Oil Prices (\$/Barrel) from 2007 - 2017 as two variables of our study. To check the relation between stock market and prices of crude oil we conducted a correlation test which showed a negative correlation of **-0.62** between the two. The main reason behind this is the fear of the investors that the profit margin of the companies will decrease because of the increase in the oil price. As an increase in the oil price directly increases the operational cost, fuel cost, transportation cost of the companies, it is quite natural that the profit margin of these companies will decrease. This is the reason that the buyers become susceptible about the future of the companies that are hugely dependent on oil. This uncertainty restricts the buyers to invest in these companies and as a result the price of the stocks falls that ultimately has a negative effect on the overall market scenario. Energy stocks have approximately 15.2% in the Sensex. Thus, the stock markets are sensitive to oil price movements. Higher crude prices adversely affect companies in the tyre manufacturers, footwear, lubricants, paints, and airline sector.

8.5 Crude Oil Prices and GDP

YEAR	PRICE (\$/Barrel)	GDP (%)
2017	50.84	7.168
2016	43.58	8.17
2015	48.72	7.996
2014	93.17	7.41
2013	97.98	6.386
2012	94.05	5.456
2011	94.88	5.241
2010	79.48	8.498
2009	61.95	7.862
2008	99.67	3.087
2007	72.34	7.661

	GDP (%)	Crude Oil (\$/Barrel)
GDP (%)	1	
Crude Oil (\$/Barrel)	-0.6750501	1

8.6 Correlation Analysis Findings

To study the relation between GDP (%) and crude oil prices we have taken GDP Rate (according to the World Bank) and Crude Oil Prices (\$/Barrel) from 2007 - 2017 as two variables of our study. To check the relation between GDP and prices of crude oil we conducted a correlation test which showed a negative correlation of **-0.68** between the two. High oil prices lead to inflation, a decrease in tax revenues, an increase in the budget deficit and an increase in interest rates. All these effects can lead to an increase in unemployment, at least in the short term. The increase in oil prices also violates the trade balance and the exchange rate. Monetary and fiscal policies that contain inflationary pressures can deepen the recession and the effect of unemployment. Expansionary monetary and fiscal policies, on the other hand, can simply delay the decline in national income and worsen the impact of oil prices in the long run. Thus, on the other hand decline in oil prices will lead to increase in GDP rate of the economy.

8.7 Regression Analysis

To study the amount and extent of impact of change in crude oil prices on GDP, we also conducted a regression analysis. The regression analysis output is as follows:

Regression Statistics	
Multiple R	0.67505
R Square	0.455693
Adjusted R Square	0.395214
Standard Error	1.27217
Observations	11

	Coefficients
Intercept	10.69828
PRICE (\$/Barrel)	-0.05109

Findings

The R-square value shows **45.5%** change in the dependent variable i.e. GDP is due to changes in oil prices.

For every 1 unit change in oil prices, the GDP fell by **0.05109**.

Change in GDP= -0.05109(Changes in oil prices) + 10.69828

9. HYPOTHESIS TESTING

Using the two- sampled T-test we have studied whether the changed in crude oil prices have a significant impact on the GDP (taken as an indicator of the changes in the economy due to changes in oil prices). The two variables have been studied for a time span of 10 years ranging from 2007 to 2017. The null and alternate hypotheses are as follows:

H₀: The changes in oil prices have no impact on GDP

H₁: The changes in oil prices have a significant impact on GDP

Year	Price (\$/Barrel)	GDP (%)
2017	50.84	7.168
2016	43.58	8.17
2015	48.72	7.996
2014	93.17	7.41
2013	97.98	6.386
2012	94.05	5.456
2011	94.88	5.241
2010	79.48	8.498
2009	61.95	7.862
2008	99.67	3.087
2007	72.34	7.661

To check if both the variables have equal or unequal variances we performed the F test for variances. Following are the results of the F-test. Since the P value is less than 0.05, the two variables have unequal variances.

F-Test Two-Sample for Variances		
	Price (\$/Barrel)	GDP (%)
Mean	76.06	6.812273
Variance	467.1604	2.676013
Observations	11	11
Df	10	10
F	174.5733	
P(F<=f) one-tail	7.41E-10	

Thus, we now perform the Two sampled T- test for Unequal variances.

The results of this test are as follows:

t-Test: Two-Sample Assuming Unequal Variances		
	Price (\$/Barrel)	GDP (%)
Mean	76.06	6.812273
Variance	467.1604	2.676013
Observations	11	11
Hypothesized Mean Difference	0	
Df	10	
t Stat	10.59567	
P(T<=t) one-tail	4.67E-07	
t Critical one-tail	1.812461	
P(T<=t) two-tail	9.33E-07	
t Critical two-tail	2.228139	

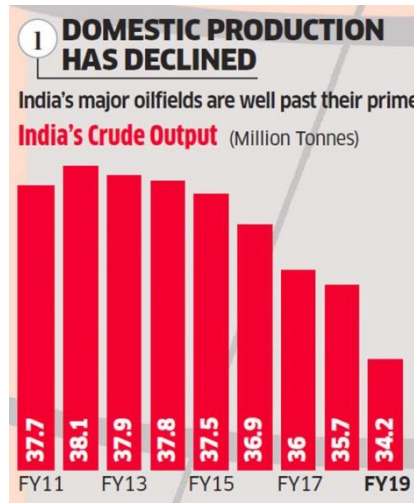
Since the P value is less than 0.05, we can reject null hypothesis and accept alternate hypothesis. Thus, Changes in oil prices have a significant impact on the GDP.

10. SUGGESTIONS

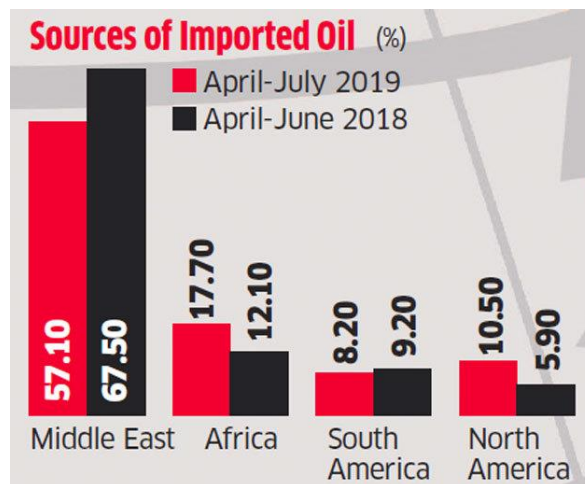
There is always an uncertainty in sourcing crude oil at optimum price for importing country like India. Oil prices have a significant impact on a country’s macroeconomic variable such as inflation, Current Account Deficit and GDP among others. Thus it is

important to have right strategies in place in order to insulate India's economy from price and output fluctuations. Some suggestions that should be considered are as follows:

- Need for oil companies to source the raw material through long term contracts and at the same time to sourcing the crude oil through acquisition of oil block in foreign countries
- Expansion of refining capacities and creation of refining hub in India in the Asia Pacific Region. It is the most important area of management for exporting petroleum products and earning foreign exchange to protect the foreign reserves and also to offset high crude oil prices.



- India should build and maintain strategic crude oil reserves which ensure necessary supply of oil to the country during contingencies and prevent any sudden disruptions in oil supply. India has already started working in this aspect and has signed MoU's with West Asian countries in this regard.
- Energy conservation is another area to be strengthened; energy conservation refers to efforts made to reduce energy consumption. Energy conservation can be achieved through increased efficient energy use in conjunction with decreased energy consumption and/or reduced consumption from conventional energy sources.
- Subdued growth of the Chinese economy and slowing global demand has significantly reduced oil prices. China is the second largest importer of crude oil in the world. India should exploit this window of opportunity and shore up its oil reserves before prices start rising again.
- India must diversify its sources of oil imports due to volatility in oil output in West Asia owing to prevailing geopolitical tensions there. India has already moved in this regard and has increased its imports from the United States.



11. CONCLUSION

There always remains uncertainty for the availability of crude oil at stable prices. Crude oil is the most important ingredient which controls the prices of other fuels in the energy mix. Crude oil prices remain an important economic variable inflicting inflation and cause substantial damage to GDP growth of the economy of oil importing country like India. This study adds to the existing literature by bringing an awareness of the importance of the impact of crude oil prices on Indian economy. The objectives and the hypotheses of the study have brought about certain conclusions with respect to the study. The study confirms that crude oil prices have an inverse relationship with the exchange rate. Data of 10 years was taken into consideration and a correlation test as performed. The correlation test proved that the quantum of oil imports and exchange rates are moderately linked to one another. It further demonstrates that an increase in oil price leads to weakening of Indian Rupee vis-à-vis the US dollar. This weakening of Indian Rupee vis-à-vis the US dollar is due to the fact that payments for all oil imports have to be made in dollars. Thus increase in oil prices lead to an increase in demand for dollars which in turn leads to the depreciation of rupee.

Oil prices and inflation are also positively correlated. A correlation test on 10 years' data proved the existence of a positive correlation between the two variables. This is due to significant usage of oil in almost all the major industries in an economy. An increase in oil prices substantially increases the manufacturing and logistics cost for companies. The burden of this increased cost is passed on the consumers which ultimately lead to a price rise of all goods. The study also analyses the correlation between oil prices and total market capitalization of benchmark indices like Sensex and Nifty. There exists a negative correlation between the two stated variables. This is because a rise in oil prices increases costs for the companies which in turn reduces their profits. This reduction in companies' profits dampens investors' sentiment and thus investors are more likely to turn bearish during such moments. Companies in the energy sector are most adversely affected by this and their stock prices see a huge downfall. Energy companies comprise of almost 15% at Sensex which explains a negative correlation between oil prices and market indices. It is observed statistically that the role of inflation is significant in declining GDP growth of Indian economy. The two variables of oil prices and GDP of India are negatively correlated. This can be explained by the fact that increase in oil prices lead to greater inflation, lower profits of firms, lower tax revenues for the government, higher current account deficit and dampened investor sentiment. All these factors restrict the economy from growing at its full potential.

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APPENDIX

Table no.	Table name	Page no.
1.1	Exchange Rates and Imports Data	14
1.2	Correlation between Exchange Rate and Imports	14
1.3	Crude oil Prices and Exchange Rate Data	15
1.4	Correlation between Crude Oil Prices and Exchange rate	15
1.5	Crude oil Prices and Inflation Rate Data	15
1.6	Correlation between Crude Oil Prices and Inflation rate	16
1.7	Crude oil Prices and SandP BSE Sensex Data	16
1.8	Correlation between Crude oil Prices and SandP BSE Sensex Data	17
1.9	Crude oil Prices and GDP	17
1.10	Correlation between Crude oil Prices and GDP	18
1.11	Regression Statistics	18
1.12	Regression Intercepts and Coefficients	19
1.13	Crude oil Prices and GDP	19
1.14	F- test for Crude oil Prices and GDP	20
1.15	T- Test for Crude oil Prices and GDP	20