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An Analytical View of Crude Oil Prices and Its Impact on Indian Economy

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Abstract: *To tame inflation & to sustain rapid economic growth crude plays a vital role in VUCA market where in the world, India is positioned 4th largest consumer of crude oil by importing 100 million tons of crude oil every year which falls 37 percent of the total import. Crude is a price determinant among various other commodities since rise or fall in price will directly have an impact on price of various commodities and society as a whole. Even reduction of one-dollar in price of crude impacts three-fold effect in the economy ie., saves the country about 40 billion rupees. The downward range of fall in oil prices nearly 55 percent since June 2014 authenticates the reason of oversupply from OPEC & US and sluggish demand in usage across the globe. India has recently adopted a pricing mechanism for its petroleum products which reflects the global crude prices. India's reflection to the global trend on crude prices has an impact of 57 percent fall in price which India capitalized to fund its current account deficit which paved the way to stabilize the exchange rate. This paper addresses the impact of crude oil price on the Indian economy by considering the relevant inputs like Gross Domestic Product (GDP), Consumer Price Index (CPI)and Crude Oil Price for the period of 15 years (2001 – 2015). The proposed model to analyze the linkage among the key variables is done by using Regression model.*
Keywords: *Gross Domestic Product (GDP),) and), Consumer Price Index (CPI),*

I. Introduction

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. The common man does not know much about this strange mineral oil although in almost every country he bears the burden of the cost of exploration of oil or its import. Oil is a vital input for the production of a wide range of goods and services, because it is used for transportation in business of all types. 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 labor 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. The increased price of imported oil forces the businesses to devote more of their production to exports, as opposed to satisfying domestic demand for goods and services, therefore cause inflation, even if there is no change in the quantity of foreign oil consumed Oil or Petroleum is defined in a variety of ways by geologists, chemists, refiners, engineers and lawyers. There is, therefore, no uniformity or full agreement. Since, it is a natural product forming a part of rocks, geological definition finds more general acceptance. The word petroleum is derived from two Latin words petra means rock and oleum means oil. Petroleum is loosely called „rock oil‟ or „crude oil‟. It is a generic term covering a wide range of substances comprising hydrocarbons, which are naturally occurring molecules of carbon and hydrogen.

Global Primary Energy Consumption

The global primary energy consumption at the end of 2011 is equivalent to 12274.6 Million tonnes oil equivalent. The share of oil is the largest at 4059.1 Million tones oil equivalent; i.e. oil: 33.06%; followed by coal: 30.34 %, natural gas: 23.67%; hydroelectricity: 6.45%; nuclear energy: 4.88%; renewable: 1.59% respectively. The demand for natural gas in future will increase as industrialized countries take strong action to cut CO2 emissions. World primary energy consumption is projected to grow by 1.6% p.a. over the period 2010 to 2030, adding 39% to global consumption by 2030. The growth rate has declined from 2.5% p.a. over the past decade, to 2.0% p.a. over the next decade, and 1.3% p.a. from 2020 to 2030. Almost all (96%) of the growth is in non-OECD countries. By 2030 non-OECD energy consumption is 69% above the 2010 level, with growth averaging 2.7% p.a. (or 1.6% p.a. per capita), and it accounts for 65% of world consumption (compared to 54% in 2010). OECD energy consumption in 2030 is just 4% higher than in 2010, with growth averaging 0.2% p.a. to

2030. OECD energy consumption per capita is on a declining trend (-0.2% p.a. 2010-30). The International Energy Agency (IEA) defines energy security primarily in terms of stable supplies of oil and natural gas. A broader definition of energy resource portfolio and supply of energy services for the desired level of services that will sustain economic growth and poverty reduction. Energy security covers many concerns linking energy, economic growth, environment and geopolitics.

Effects of Falling oil prices in India

Oil is one of the most important commodities in recent times. Much of the economy depends on oil. This is why prices of oil matter to almost every economy. Global crude oil prices are down nearly 40% this year to $60 per barrel-levels from $110/barrel at the start of the year. This has caused a crisis in countries like Russia, which depends on oil exports.

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.

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%, according to a Moneycontrol report.

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. However, since diesel was recently deregulated, the fall in oil prices will likely have less effect on the government's fiscal deficit. Moreover, the government still has to pay for previous under-recoveries. Any benefit from the fall will be offset by payments for the past under-recoveries.

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.

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 producers in the country. India is the sixth largest exporter of petroleum products in the world, according to media reports. 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. For example, the share prices of Bharti Airtel and Bajaj Auto fell because of the devaluation of the Nigerian currency - Naira. Both the companies have a significant presence in the African country.

II. Literature Review

Oil prices matter to the health of an economy, despite a consistent fall in global oil intensity; crude oil remains an important commodity and events in the oil market and continues to play a significant role in shaping

global economic and political development. Crude oil is the world economy's most important source of energy and is therefore, critical to economic growth. The price of crude in global market is essentially driven by supply and demand. The performance of world economy in general and the world's largest economies such as US, Japan and recently China have a significant impact on the demand for crude oil and vice versa. The various method developed by IMF, World Bank(WB) and OECD have estimated that 10 dollar increase in crude oil prices would lead to a decline of world production of goods and services by 0.5%. The world economic growth and world oil demand are moving in tandem and there is high correlation between world economic growth and demand for oil. It is essentially the supply that drives the prices of crude oil. Many researchers agree in opinion that no other economic event in post-World War II era generated as much attention as the series of oil price shocks, mainly produced by OPEC countries. No studies were necessary to see the clear relationship between oil prices and main economic indicators. Nevertheless, this issue was new and researchers posed such a question as the numerical impact of oil shocks and their correlation with the policy conducted by government in order to predict the best instrument to cope with the negative impacts caused by oil price increases. Since then a large number of studies have reported a correlation between increases in oil prices followed by economic downturns.

Later Hamilton (2000) reported clear evidence of nonlinearity-oil price increases is much more important than oil price decreases. An alternative interpretation was proposed based on the estimation of a linear functional form using exogenous disruptions in petroleum supplies as an instrument. His study shows that oil shocks play a crucial role in determining macroeconomic behavior because they disrupt spending by consumers and firms. Hamilton extended his research work (2003, 2005, and 2009) and has presented empirical evidence suggesting that oil price shocks have been one of the main causes of recessions in the United States. Others, including Barsky and Kilian (2004), argue that the effect is small and that oil shocks alone cannot explain the U.S. stagflation of the 1970s. Taking a more intermediate position, Bernanke et al. (1997) argue that an important part of the effect of oil price shocks on the U.S. economy results not from the change in oil prices per se, but from the resulting tightening of monetary policy. In the same line of research, Blanchard and Gali (2007) present evidence showing that the dynamic effect of oil shocks has decreased considerably over time, owing to a combination of improvements in monetary policy, more flexible labor markets, and a smaller share of oil in production. Their results indicate that a 10 percent increase in the price of oil would, prior to 1984, have reduced U.S. GDP by about 0.7 percent over a 2–3 year period, while after 1984 the loss would be only about 0.25 percent. In contrast to the extensive literature on the impact of oil prices on the U.S. economy, there has Outside the U.S., studies of the relationship between oil prices and the macro-economy have almost exclusively been confined to other OECD members, with results suggesting that they tend to be affected in broadly the same way as the U.S. but less strongly.

Kaushik Bhattacharya et al. (2005) analyzed the impact of increase in oil price on inflation. They studied the mechanism of increase in the prices of petroleum products on the prices of other commodities and the output in India. In February 1999, from an all time low of 11 U.S Dollars per barrel, it increased to a peak of 35 dollars in the first week of September 2000. Due to this, all oil importing countries faced the threat of oil shock; India, being a major oil importer, was particularly affected. Historically, there have been four oil shocks in the past thirty years. In spite of this, low inflationary pressure has been assisting the developed countries in mitigating the risk associated with oil shocks. Contrary to this, developing countries are affected more because of the absence of advanced technology to conserve oil. Literature reveals that most researchers agree with the fact that inflation has a recessionary effect on oil prices.

BAIC Economic Review Autumn 2006 (The business and industry advisory committee to the OECD), it has shown that the world economy slows down based on the BAIC Member Survey and at that time it was anticipated that the OECD –wide real GDP growth to drop from 3.1 % to 2.6% in 2007 and risk for growth was associated to oil price.

Hyun Joon Chang of Korea Energy Economics Institute in his paper "The Impact of Oil Price Increase on the Global Economy" discussed the impact of an oil price increase of $5 per bbl on global economy (IMF - 2000).

Analysis of the impact of high oil prices on the global economy" by Economic Analysis Division, International Energy Agency reports in "Energy Prices and Taxes", 2nd Quarter 2004, wherein it has shown that the vulnerability of oil importing countries to higher oil prices varies markedly depending on the degree to which they are net importers and oil intensity of their economies. According to the results of a quantitative exercise carried out by the IEA in collaboration with the OECD Economics Department and with the assistance of the International Monetary Fund Research Department, a sustained for10 per barrel increase in oil price from $25 to $35 would result in the OECD as a whole losing 0.4% of GDP in the first and second years of higher prices. Inflation would rise by half a percentage point and unemployment would also increase. The OECD imported more than half its oil needs in 2003 a cost of over $260 billion-20% more than 2001. Euro-zone countries, which are highly dependent on oil imports, would suffer most in short term, their GDP dropping by

0.5% and inflation rising by0.5% in 2004. The U.S would suffer the least, with GDP would fall 0.4%, with its relatively low oil intensity compensating to some extent for its almost total dependence on imported oil. In all OECD regions, these losses start to diminish in following three years as global trade in non-oil goods and services recovers. This analysis assumes constant exchange rates. The adverse economic impact of higher oil prices on oil-importing developing countries is generally even more severe than for OECD countries. This is because their economies are more dependent on imported oil and more energy intensive, and because energy is used less efficiently. On average, oil-importing developing countries use more than twice as much oil to produce a unit of economic output as do OECD countries. Developing countries are also less able to weather the financial turmoil wrought by higher oil import costs. India spent $15billion, equivalent to 3% of its GDP, on oil import in 2003. This is 16% higher than its 2001 oil import bill. It is estimated that the loss of GDP average 0.8% in Asia and 1.6% in very poor highly indebted countries in the year following a $10 oil-price increase. The loss of GDP in Sub-Saharan African countries would be more than 3%. World GDP would be at least half of one percent lower – equivalent to $255 billion- in the year following a $10 oil price increase. This is because the economic stimulus provided by higher oil –export earnings in OPEC and other exporting countries would be more than outweighed by depressive effect of higher prices on economic activity in the importing countries. The transfer of income from oil importer to oil exporter in the year following the price increase would alone amount to roughly $150billion. A loss of business and consumer confidence, inappropriate policy responses and higher gas prices would amplify this economic effect. For as long as oil prices remain high and unstable, the economic prosperity of oil-importing countries-especially the poorest developing countries-will remain at risk.

In fiscal 2010, the India's import bill for crude oil was $100.08billion, which of 7.12% higher in volume than fiscal 2009, crude oil import bill increased to around $ 20.527billion. That means there was a jump of 25.8% in crude oil import bill for fiscal 2010 from previous fiscal 2009 i.e. $79.553billion.

Gap Analysis

Crude oil prices played a critical role in substantially reducing economic growth in any economy whether it is developed or developing economy. Worldwide demand for crude oil arises from demand for the refined products that are made from crude; and changes in crude oil prices are passed on to consumers in the prices of the final petroleum products. When the prices of petroleum products increase, consumers use more of their income to pay for oil-derived products, and their spending on other goods and services declines. The extra amount spent on those products is basically go to foreign oil producers as India is net importer of oil. Higher oil prices cause, to varying degrees, increases 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. Thus, though energy is the prime mover in an economy, the demand and supply gap of crude oil must be bridged through import to meet the country's requirement, hence, crude oil price is an important parameter in determining reserve position and trade balance and finally balance of payment. Inflation is also an important area arising with the increase of crude oil prices, with the increase of inflation, capacity to purchase is reduced and expenditure increases, saving decreases, ultimately slows down the business and economic activities thus slows down GDP growth.

Research Problem

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-reliance 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. Therefore, there is a need to look at crude oil prices have an implication on consumer price Index(CPI) and GDP.

Objectives of the study

- To find out if the crude oil price have an impact on CPI and GDP
- To Identify the linkage between differential change rate of crude oil prices and Inflation , also between inflation vis-à-vis GDP growth of Indian economy
- To understand the impact of Crude Oil Prices an Indian Economy.
- To find out if there is intercorrelation between CPI and Crude Oil price.

Hypotheses

- There is no significant difference between Crude Oil price and GDP,
- There is no significant difference between CPI and GDP,

Research Methodology

The paper is analytical in nature. The data for the study between 2001 and 2015 was retrieved from reliable secondary sources. The statistical tools such as Regression, Co linearity and intercorrelation were used to infer the data.

III. Results and Discussions

Table No. 1 Regression Analysis

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate	Change Statistics				
					R Square Change	F Change	df1	df2	Sig. F Change
1	.934(a)	.873	.852	.16105	.873	41.180	2	12	.000

Since R value .934 indicates, the model is the best model to predict the movements between GDP and CPI and Crude. The adjusted R square value for this model is 0.852. It shows that the two independent variables (Crude oil and CPI) account for a 85.2% variance in the dependent variable (GDP).

Table No. 2 Regression with collinearity Statistics

Model		Unstandardized Coefficients		Standardized Coefficients	t	Sig.	Collinearity Statistics	
		B	Std. Error	Beta			Tolerance	VIF
1	(Constant)	4.758	1.049		4.536	.001		
	CRUDE	.823	.148	1.014	5.574	.000	.320	3.124
	CPI	-.099	.181	-.099	-.544	.596	.320	3.124

Ordinary Least Square Equation Model is GDP = 4.758+.823(Crude oil)-.099(CPI)

If all independent variables are converted into Z scores, then the standardized OLS equation will be Z(GDP)= 1.014(CRUDE OIL)-0.099(CPI). As the tolerance value is greater than 0.2 for the both Crude and CPI , we conclude that there exists multicollinearity between Crude and CPI.

Table No. 3 Inter Correlation Matrix between CPI and CRUDE Oil Price

Model			CPI	CRUDE
1	Correlations	CPI	1.000	-.825
		CRUDE	-.825	1.000

We infer from the above table that there is an inter correlation between CPI and Crude oil price as CPI increases Crude oil price decreases and vice versa

Findings Related to Hypothesis

Since the Crude Oil price is less than 0.05 , We reject the null hypothesis at 5% level of significance, we conclude that there is significant difference between Crude Oil price and GDP.

Since the Crude Oil price is greater than 0.05, We accept the null hypothesis at 5% level of significance, we conclude that there is no significant difference between CPI and GDP.

IV. Conclusion

India‘s imports of oil are increasing. Our dependence has reached 80% and is likely to keep growing. At the same time 2008 saw an unprecedented rise in oil price on the world market. Oil price volatility has also increased. Through future oil prices are difficult to predict, they are generally expected to rise. India's import dependence on oil rose to 81% in 2015-16 from 78.5% in the previous year. Just last year, Prime Minister

Narendra Modi had set a target of bringing this down to 67% by 2022. The government has unveiled new exploration policies for its oil and gas blocks lately, aiming to plug loopholes in its previous policies that encouraged only limited participation of resource-rich foreign oil companies and couldn't dramatically boost the domestic output. Given our increasing dependence on imports effects to the Indian economy, by the increase in the price of crude oil the inflation increases, government have to spend too much on subsidy, our exports become weaker, investment decreases and GDP is also affected. Thus, to meet the growing demand for crude oil, diesel and petrol etc. in the long run, India should take various measures for efficiency improvement in energy use such as market linked relative prices, minimizing subsidies, and targeting them well. It also needs to enhance petroleum supplies through increased domestic explorations as well as other measures, such as participation in exploration and production in foreign oil fields by Indian oil companies (which the Chinese are using extensively) to avoid excessive dependence on imported crude oil. India also needs to more vigorously pursue the use of renewable energy sources like hydro, wind, solar, bio-fuels, nuclear, etc., as the Western European countries have done. India should take measures to increase exports to be able to meet its growing future oil import requirements. Careful planning to ensure that future petroleum requirements can be met will be crucial in sustaining rapid economic growth in the future.

The Outcome of the paper indicate that there is an inter correlation between CPI and crude oil price and vice versa. There is a clear indication that whenever the CPI increases there is decrease in crude oil price and vice versa. It was also found that there was significant difference between crude oil price and GDP and no significant difference between CPI and GDP.

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