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The Impact of Crude Oil Price Fluctuations on Indian Economy

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Abstract: ***The importance of Crude Oil has been on a rise in almost every single economy around the world. As economies grow, the requirement of this very vital resource is also fattening at a rapid pace. The Indian economy is rapidly expanding, as is its reliance on crude oil. For the period 2001-02 to 2020-21, the article investigates the reasons for changes in Crude Oil prices, as well as their implications for Indian Economic Development and GDP Growth. Because of the spike in crude prices, India's fuel and diesel prices have reached all-time highs. The current Indian economy is thriving despite rising trade disparities and persistent inflation. The goal of this study is to see how speculation and variations in crude oil prices affect Indian economic development, GDP growth, retail gasoline prices, financial markets (BSE), currency, and government finances. The study looked at how changes in oil prices affect Indian economic development via a variety of networks, including GDP, trade and investment characteristics, and other macroeconomic indicators.***

Keywords: Crude Oil Price, Indian Economic Growth, Gross Domestic Product, Inflation, Petrol Prices, Diesel Prices, Sensex, Bombay Stock Exchange, Import of Crude Oil, Fluctuations, Price, Wholesale Price Index, Index of Industrial Production (IIP), Shocks.

I. INTRODUCTION

A. Background

Energy is the primary driver of economic growth and is essential to the modern economy's survival. The long-term supply of energy from sources that are affordable, accessible, and ecologically benign is critical for future economic growth.

The country's objectives for strong economic growth in the coming decades necessitate rapid development of the energy market. The energy resources available locally are limited and may not be adequate to maintain economic development in the long run, resulting in growing reliance on imported energy. The country's energy supply system is based on finite resources like fossil fuels.

The energy sector is critical for any economy to prosper and grow. Crude oil, natural gas, hydroelectric power, coal, nuclear power, solar power, and wind power are just a few examples of energy sources. Crude oil is a common source of energy. India is one of the world's largest crude oil importers. More than 80% of India's crude requirements are met by imports. Any increase in global oil prices has a major influence on our import bill as well as the Indian rupee. India imports oil mostly from the Middle East. The price of petroleum is controlled by the Organization of Petroleum Exporting Nations (OPEC), a collection of Middle Eastern countries. (Verma, 2021).

India's economy is growing at a rapid rate. The country's reliance on crude oil imports is growing by the day. In July 2008, the international market saw a dramatic rise in crude oil prices, reaching as high as $148/bbl. Crude oil prices were as low as $84 per barrel in 2014. Import of crude oil with higher price is increasing the balance of trade deficit in India (Government Staff, n.d.).

Oil prices have a big influence on a country's economic development and GDP growth; India's present growth model is based on oil imports, with the country importing more than 70% of its crude oil. The impact of crude oil price on Indian macroeconomic variables has been investigated using GDP, Index of Industrial Production (IIP), and Wholesale Price Index (WPI) as the key variables in this research paper. (Modak, 2015)

India has undergone a paradigm shift as a result of its global competitiveness. The Indian economy is on a strong growth path, with a consistent annual growth rate, rising foreign exchange reserves, and thriving capital markets, to name a few features. India's economy is the world's seventh largest in terms of nominal GDP and the third largest in terms of Purchasing Power Parity (PPP). The country is a member of BRICS, a G-20 major economy, and a developing economy among the top 20 global traders. According to the Ministry of Finance of the Government of India, the Indian economy's annual growth rate is expected to increase to 7.4% in fiscal year 2014-15, up from 6.9% in fiscal year 2013-14. According to the IMF's annual report, India's economy will grow by 7.5 percent in the 2015-16 fiscal years, beginning on April 1, 2015, up from 7.2 percent in 2014–15. India was the world's 19th largest merchandise exporter and sixth largest services importer in 2013, importing $616.7 billion worth of goods and services.

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India is potentially sitting on significant hydrocarbon resources, but reduced exploration activities mean their size and scope has yet to be properly determined. This is compounded by a lack of encouragement at national level for a more proactive approach to exploration, which has undermined India's E&P sector.

India's proved balance of recoverable reserves were reported at 9.04 billion barrels of oil equivalent in 2011, putting the nation in 19th place globally. According to a 2012 report by India's Directorate General of Hydrocarbons – the regulatory body in charge of the promotion and management of the country's oil and gas resources – in the financial year 2010-2011, 12 percent of India's sedimentary basins were unexplored, with another 22 percent classified as "poorly explored." As these fields have yet to achieve their full potential, production from India's undeveloped onshore and offshore fields is projected to increase in the near future.

Imports of energy are also causing problems for the country's economy. The Indian government spends billions of dollars on non-targeted subsidies, which the International Energy Agency estimates the country can still afford. Oil imports accounted for 54 percent of India's trade imbalance in the fiscal year 2011-2012, which totalled US$189.9 billion. The rupee plummeted, inflation skyrocketed, and India's foreign exchange reserves were depleted by about US$13 billion as a result of the huge deficit. These incidents might have been averted, according to a PwC assessment, if India had generated an additional 17 million tonnes of oil domestically.

The existing scenario of oil consumption and production of world indicates that there is more demand for than supply of crude oil in general, except a few developed economies, for the developing country like India in particular reveals that the country is able to meet 24% of crude oil requirement and the rests 76% are to be meet through import. Therefore, there are sometimes demand driven price rise otherwise price rise due to supply disruption. Under such circumstances it is very much essential to study the impact of crude oil price on the inflation and economic growth of our country

The current Indian emerging market inquiry has made significant progress in understanding the advantages and disadvantages of oil price shocks. Endogenous shocks such as supply disruptions due to political clashes or synchronised supply constraints in producing countries, rather than exogenous shocks such as economic expansion, existing inflation, and currency changes in interest rates, are said to drive crude oil price fluctuations in the majority of studies. From the outset, the real rate of change in oil prices should be regarded endogenous to economic fundamentals study. Oil price volatility has a substantial impact on stock prices, profitability, and GDP growth in emerging nations.

Furthermore, if unanticipated oil price changes shock the nation's actual economic development and influence GDP growth owing to consumer and industrial behaviour, the findings of this study will have an impact on the Indian and global stock markets. Oil price fluctuations, in my opinion, should be carefully evaluated. The fact that disruptions in flow supply quantities have had only a limited impact on the actual oil price on the stock market does not minimise the relevance of domestic politics. On the one hand, such events have pushed up the actual oil price by causing forecasts of future oil supply limitations to shift in proportion to demand. These projections are reflected in our data research on defensive oil demand. (Punati, 2017).

B. Impact Of Russia And Ukraine War

Even though this research study does not cover time period after December 2020, it is important for the users of this Dissertation to know about how Russia and Ukraine war of March 2022 impacted the crude oil price.

Crude oil prices had been climbing even as Russia's President Vladimir Putin prepared to launch a special military campaign in Ukraine, a former Soviet republic backed by the US-dominated military alliance NATO (North Atlantic Treaty Organization).

The world feared that the war would lead to a ban on Russian oil in the West. Even before the United States and the United Kingdom imposed sanctions on Russian oil and gas supplies, some countries had ceased purchases, while others went into panic buying mode. On March 7, 2022, prices rose to a 14-year high of $140 per barrel. (Singh, 2022)

Russia is the world's third-largest oil production (behind the US and Saudi Arabia). It supplies 14 percent of global crude oil production, or 7-8 million barrels per day, to markets around the world. The US and UK embargoes, as well as some other pro-Ukraine countries' refusal to buy Russian petroleum, have exacerbated the crisis. The supplies were already tight.

India is the world's third-largest oil consumer, behind the United States and China, at 5.5 million barrels per day. Oil demand in the country is increasing at a rate of 4% per year. According to this estimate, India will consume approximately 7 million barrels of oil per day in the next ten years. India imports around 85% of its oil from about 40 countries, the majority of which come from the Middle East and the United States. India imports 2% of its supplies from Russia, including oil, which it refines and converts to petroleum products. So, rather than Russian oil, India is concerned about rising oil prices in general. Crude oil prices, on the other hand, would have ramifications that went beyond the current account balance. It is expected to have far-reaching consequences for the Indian economy.

The rise in crude oil prices is expected to exacerbate inflation and impede economic development. According to Credit Suisse, a Brent crude oil price of $120 per barrel would add $60 billion to India's import expenses. (Shgun, 2022)

Other items that have suffered price hikes as a result of the current Russia-Ukraine conflict include gas, edible oils, fertilisers, and coal. As a result, India's import expenses could soar by another $35 billion. Inflation is predicted to rise by at least 1% as a result of the high import spending for crude oil and other items.

C. Problem Statement

Brent crude oil has been steadily rising after hitting a low of $16 per barrel on April 22, 2020. It has grown roughly 58 percent since the beginning of 2021, from around $51.8 per barrel to around $81 at the end of October. Prices approached their intermediate peak level of $86 per barrel, according to analysts, at which some softening is likely, even though the larger trend remains upward. (BP Wealth Staff, 2021)

Crude prices have skyrocketed in 2021 as the global economy recovers from the pandemic, resulting in a boom in worldwide demand. The OPEC+ coalition's supply limits have also kept global oil prices high. So yet, these oil-producing economies have only witnessed minor increases in output, resulting in higher gas prices. The demand for oil for power generation has risen dramatically as a result of a gas scarcity in Europe and Asia. (Macro Trends Staff, 2022)

India's domestic fuel prices have reached all-time highs as a result of the rise in crude prices. A 15-day rolling average of international prices is used to ascertain the price of gasoline and diesel in India. The federal and state governments' hefty taxes have also contributed to considerably higher retail costs. (Kotak Securities Staff, n.d.) In this research, we study how the Crude Oil Fluctuations causes:

- Impact on Retail Fuel Prices
- Impact on the Rupee
- Impact on Current Account Deficit (CAD)
- Impact on Sensex
- Impact on Inflation
- Impact on Gross Domestic Product

Figure 1: Crude Oil Prices - 20 Year Historical Chart
Source: Macro Trends Staff, n.d.

D. Operational Definitions

1) *GDP:* The total market worth of all finished goods and/or services produced in a country's economy in a certain time period is known as GDP. It serves as a comprehensive scorecard of a country's economic health because it is a wide measure of entire domestic production.
2) *Inflation:* Inflation is the decline of a currency's buying power over time. Measuring the pace at which a basket of selected items and services in an economy's average price level rises over time can provide a quantitative approximation of the rate at which purchasing power declines. Inflation is also defined as a decrease in the purchasing power of money, which is the economy's internal means of exchange and unit of account. Because it measures the annualised percentage change in a wide price index over time, the inflation rate is a useful indicator of price inflation.

3) *Current Account Deficit (CAD):* The current account deficit is a measure of a country's trade in which imported goods and services outweigh exports. Net revenue, such as interest and dividends, as well as transfers, such as overseas aid, are included in the current account, although they only account for a small portion of the total current account.
4) *Fiscal Deficit:* A fiscal deficit occurs when a government's revenue falls short of its spending. A government with a budgetary deficit is spending more than it can afford.
5) *Macroeconomic Indicators:* An economic indicator is a piece of economic data that analysts use to analyse current and future investment potential, generally on a macroeconomic scale. These metrics may also be used to assess an economy's overall health. GDP, inflation, foreign reserves, and current account deficit are the macroeconomic metrics examined in this article (CAD).
6) *Shocks:* Economic shocks are defined as major changes in underlying macroeconomic variables or links that have a considerable influence on macroeconomic outcomes and performance measures such as unemployment, consumption, and inflation.
7) *Indian Basket Crude Oil:* Indian refineries process 75.50 percent sour grade crude oil (average for Oman and Dubai) and 24.50 percent sweeten grade crude oil (Brent) in the crude oil basket. Because the prices of petroleum products are linked to their own market, they are used in macroeconomic calculations.
8) *Foreign Exchange Rate:* The value of one country's currency in relation to the currency of another country or economic zone is known as an exchange rate.
9) *Index Of Industrial Production (IIP):* The Index of Industrial Production (IIP) is a graph that shows the growth rates of different industrial groups in the economy through time. The IIP index is calculated and published monthly by the Central Statistical Organisation (CSO).
10) *Wholesale Price Index (WPI):* A wholesale price index (WPI) is a measure and monitor of changes in the price of items before they reach the retail level. This is a term used to describe goods that are sold in large quantities and transferred between entities or businesses (instead of between consumers).

E. Research Questions

1) What causes the Global Crude Oil Prices to change?
2) How does change in Crude Prices impact Retail Selling Price of Petrol and Diesel?
3) How does change in Global Crude Oil Prices Impact Stocks and Indices in Bombay Stock Exchange (BSE)?
4) How does fluctuation in Crude Oil Prices impact The Indian National Rupee (INR)?
5) Does change in Oil Prices Globally impact the rate of Inflation in the Indian Economy?
6) How does change in Crude Oil Prices impact the Indian Current Account Balance?
7) How is India’s GDP impacted by the price speculation of Crude Oil?

F. Research Objectives

1) To understand the causes for the Global Crude Oil Prices to change.
2) To analyse the impact of change in Crude Oil Prices on the Indian Domestic Petrol Prices.
3) To find out the impact of change in Crude Oil Prices on the Indian Domestic Diesel Prices.
4) To understand how Dynamic Global Crude Oil Prices drives the BSE Sensex.
5) To find out the Impact of fluctuations in Indian Basket Crude Oil Prices on Indian Macroeconomic Indicators.

G. Purpose Of The Research

Because crude oil is an essential input for productivity, it is a vital indicator for the refining industry, which has an influence on the economy. In India, there is a huge disparity between crude oil demand and production. National oil corporations are capable of producing between 23 and 24 percent of India's total crude oil consumption. Due to the age and maturity of the fields, India's crude oil production from public sector firms has been declining.

Because India's crude oil output is insufficient, it is necessary and inevitable for the country to import crude oil to meet demand. Imports will become more expensive if global crude oil prices rise, as will the price of the Indian crude basket. As a result, the rise in global crude oil prices, as well as India's reliance on crude oil imports, are both major issues that might hurt the Indian economy. India's reliance on imported crude oil is expected to reach 94% by 2030, according to forecasts.

As a result, the most difficult difficulty in Indian crude oil demand and supply management is rising global crude oil prices, followed by the size of the increase in crude oil demand needed to achieve a probable higher GDP growth rate of 8% to 9%. By the conclusion of the twelfth plan, India's crude oil import dependency has climbed from 76 percent in 2011-12 to 80 percent (2012-17). It's critical to understand the economic repercussions of rising crude oil prices since they're increasing all around the world, making imports more expensive. As a result, it is critical to examine the big picture of whether changes in Indian crude basket prices have an impact on inflation and GDP growth, or whether there is a link between Indian crude oil basket price changes and inflation, or whether inflation is the cause of concern for GDP growth slowdown, and what should be our strategy to meet the rising demand for crude oil for economic growth. It is against this backdrop that we attempt, in this study, to critically analyse the impact of the change in crude oil prices on Indian economy. The goal of the research is to determine how increases in Indian crude basket prices as a result of rising international crude oil prices affect economic indicators such as inflation and GDP growth. The essence of the study is to garner the understanding of the causal relationship with the phenomenon of complexity of historic facts in crude oil prices and social reality of economic development and economic growth.

H. Chapterisation

1) CHAPTER 1: INTRODUCTION

This chapter presents the introductory statement to the issue of Impact of Crude Oil Price fluctuations on the Indian Economy. Covering the background of the problem, it presents the answers to why this study is conducted, what questions it poses to answer, and also explains its readers.

2) CHAPTER 2: LITERATURE REVIEW

This chapter intends to read through various articles on related topics by researchers across the globe to understand their methodology and ideology about how crude oil impacts various economies and governments across the globe.

3) CHAPTER 3: RESEARCH METHODOLOGY

This chapter explains the methodology this paper has adapted to gather information to fulfil the research hypothesis and reach a point of conclusion where the paper could commence with the Analysis and Interpretation stage. It speaks about how Data for the research was collected, sampled, and the variables it discusses.

4) CHAPTER 4: ANALYSIS AND INTERPRETATION

This chapter analyses and interprets the collected data using Data Analysis tools and charts. Explaining objective findings and discussing the data collected, this chapter analyses and provides the insights of each objective this paper poses to solve.

5) CHAPTER 5: DISCUSSION AND CONCLUSION

This chapter discusses and concludes the findings of the paper, compares it to previously written literature, specifies the scope of further data collection and limitations it had to oversee while working on this research.

I. Limitations

1) Due to time constraint, this paper did not mention other prominent Indian stock indices other than BSE Sensex.
2) To ensure uniformity of the data, this study is conducted for data from the past 20 years, that is, 01-2001 to 12-2020.
3) A shorter time frame was adapted for the purpose of the research since uniform data was unavailable for all Independent and Dependent Variables.
4) To provide the highest quality work, this study intends to understand the Impact of Crude Oil Price Fluctuations only on the Indian Economy. Such research could have been done on all other and further economies around the world.

II. REVIEW OF LITERATURE

A. Introduction

Because crude oil is a vital component of modern man's life, it is inelastic. As a result, variations in crude oil supply and price on the worldwide market have a considerable influence on the currency stability of many nations. Oil price fluctuations have a direct or indirect impact on the price of all other commodities, and hence play an essential role in global economic stability. India's crude oil import bill has climbed in lockstep with the country's population, which currently accounts for 17.2% of the world's total.

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To meet the needs of its enormous population, India must import 2.5 million barrels of crude oil. Because crude oil is such a valuable commodity, the country's import costs have been steadily increasing since 1997.

Due to the financial crisis that hit the Middle East countries in 2008-09, the import bill for crude remained constant. India's crude oil imports surged after 2008-09. Due to abundant supply and inadequate demand, the cost of oil imports has been declining since 2014. The decline in crude oil prices is advantageous to economic growth if the nations are oil importers; however, the drop in crude oil prices is negative to economic growth if the countries are oil exporters.

The factors that influence crude oil prices are subjective in nature and are a source of discussion. The factors that influence crude oil prices are viewed in a variety of ways. According to one interpretation, the behaviour of oil prices is attributable to market forces of demand and supply. Another viewpoint is that of OPEC, the Organization of Petroleum Exporting Countries. Another is as a result of the rise in oil derivatives trading over the last decade. There are arguments for and against each of the three ideas on both sides.

B. International Literature Review

Huynh (2016) using a two-country framework with different sectors and endogenous energy production with convex costs, researchers investigated the impact of a wide range of energy price shocks on external balances. He classified distinct energy market demand and supply shocks based on their influence on external balances. The work summarised a theoretical validation of Kilian et al. (2009) as well as a theoretical structure for the non-energy trade balance's determining role in the transmission of energy price shocks. The addition of durable goods highlighted the direct impact of energy costs on the non-energy trade balance.

In addition to Huynh (2016) findings, Bjørnland (2009) examined the impacts of oil price shocks on stock returns in Norway, an oil-exporting country, with a focus on the oil price transmission channels for macroeconomic behaviour. He used stock returns in a structural VAR model to represent the interaction between the different variables. Stock returns improve by 2.5 percent after a 10% spike in oil prices before the effect fades. The results were resistant to various (linear and non-linear) oil price modifications. The effects on the other factors were less pronounced. When oil prices rise, however, all evidence suggest that the Norwegian economy responds by increasing aggregate wealth and demand. According to the study, other shocks, such as monetary policy shocks, are important driving forces behind stock prices.

Bjørnland (2009) examined impact of oil price fluctuations on stocks in Norway, whereas Hamilton (2000) reported that Oil price hikes are far more important than oil price declines, according to claimed clear evidence of nonlinearity. An alternate interpretation was presented utilising exogenous disturbances in petroleum supplies as a tool to estimate a linear functional form. Oil shocks, according to his research, have a critical role in influencing macroeconomic behaviour because they disturb consumer and business expenditure. Hamilton expanded on his previous studies and offered empirical data that suggests oil price shocks are one of the key causes of US recessions.

Kilian (2004) contend that the influence of oil shocks is minor and that oil shocks alone are insufficient to explain the 1970s stagflation in the United States. Taking a more moderate stance, Bernanke et al. (1997) claimed that a major part of the impact of oil price shocks on the US economy is due to the tightening of monetary policy that arises as a result of the shift in oil prices.

Unlike others, Gali (2007) presented the evidence that the dynamic effect of oil shocks has declined significantly over time, owing to a combination of monetary policy reforms, more flexible labour markets, and a lower oil proportion in output. According to their calculations, a 10% increase in oil prices would have reduced US GDP by 0.7 percent in the two to three years leading up to 1984, but just 0.25 percent thereafter. Despite the substantial literature on the impact of oil prices on the US economy, there has been little study on the impact of oil prices on the US economy. Studies of the link between oil prices and the macro-economy outside of the United States have almost entirely focused on other OECD members, with findings showing that they are impacted in a comparable but less severe way than the US.

In addition to the study conducted by Gali (2007), Kayalara. Küçüközmen, and Kestel (2017) analysed that the changes in oil prices have a variety of effects on financial indicators in global markets and economies. Their goal was to look at the relationship between crude oil prices and stock market indices, as well as currency rates, across a variety of developing/emerging market and oil importer/exporter economies. In this study, copula models are used to examine dependency systems in detail. The extensive time frame enabled for an examination of the impact of the global financial crisis on the aforementioned dependency system. The inclusion of a 1-to-30-day analysis in this study was a unique characteristic that captures the variance in dependency as the length changes. A special emphasis was placed on the Turkish case to demonstrate the country's susceptibility to oil prices. Most oil exporter countries' exchange rates and stock indices exhibit a larger dependence on oil prices, whereas emerging oil importer markets are less subject to price changes. The worldwide crisis, as well as the recent dramatic drop in oil prices, had significant consequences.

In contrary to previous researches, Cashina, Mohaddes, Raissic, and Raissi (2014) analysed that to distinguish between supply-driven and demand-driven oil-price shocks, and to study the time profile of their macroeconomic effects across a wide range of countries and real/financial variables, a set of sign restrictions on the impulse responses of a Global VAR model, estimated for 38 countries/regions over the period 1979 Q2 – 2011 Q2, as well as bounds on impact price elasticities of oil supply and demand were developed. They demonstrated that the GVAR's cross-sectional dimension enhances the aforementioned identification strategy by providing a significant number of extra cross-country sign constraints, hence reducing the number of models that are acceptable. The findings reveal that the economic effects of a supply-driven oil price shock differ considerably from those of a demand-driven oil price shock caused by global economic activity, and that these effects differ for oil-importing and energy-exporting nations. While a supply-driven increase in oil prices often results in a long-term drop in economic activity for oil importers, it benefits energy-exporting countries with big proved oil/gas reserves. Almost all of the nations in their sample saw long-run inflationary pressure, an increase in real output, a rise in interest rates, and a drop in equity prices as a result of a disruption in oil consumption.

While Cashina (2014) studied Global Prices and exports, Sunac, Zhana, Penga, and Cai (2022) using the MS-VAR model, determined whether the relationships between China's exchange rate, domestic crude oil price, and international crude oil price have a switch in the period before and after the Shanghai International Energy Exchange (IEE) released China's crude oil futures. They observed that, while the worldwide crude oil market has a significant impact on China's oil price, it has a minor impact on the global crude oil price. The volatility in the US dollar against the RMB (USD/CNY) exchange rate has had a considerable positive impact on China's crude oil prices since the launch of INE crude oil futures in the new regime.

According to Rattia, and Vespignani (2013), in a past few years, there has been a significant increase in liquidity, and real oil prices have nearly returned to the high levels as seen prior to the global financial crisis. Unexpected rises in global fuel costs resulted in statistically significant increases in actual oil prices. During the oil price rebound from 2009 to 2011, the historical impact of global gasoline prices on the real price of crude oil was significant.

In addition to Sunac (2022) study of Crude Oil Price Impact on currency, Anh Le and Trang Do (2022) investigate that in the years 2008–2017, the impact of crude oil market structure on stock market volatility in Asian countries was studied. As a result of the interruption in oil consumption, almost all of the countries in their sample saw long-run inflationary pressure, an increase in real production, a rise in interest rates, and a reduction in equity prices.

Using a unique approach of Quantile Regression, Guoa, Chena, Lisa, Jinhong, and Jackson (2022) wrote that with the proposal of the new development pattern of "dual circulation", the connection between China and the international market was interpreted to be even closer. The thriving global market for crude oil draws millions of investors from all over the world since it is one of the most extensively financialized commodities. What effect will the worldwide price of crude oil have on the price of crude oil in China? Their article employed quantile regression to examine the influence of worldwide oil prices on the oil spot price in China using data from the Daqing and Shengli oil fields from January 2005 to March 2021. This study uses quantile regression to identify varying degrees of worldwide crude oil price effect on China's crude oil pricing.

Using different oil price indexes, Donga, Chun-Ping, Qiang, and YinChu (2019) looked at the dynamic relationship between global economic activity and crude oil prices in both time and frequency domains using the wavelet analysis method. Their findings reveal that at high frequencies throughout the sample period, there is a considerable association between crude oil prices and global economic activity; however, the correlation is less at low frequencies and only occurs for a portion of the time. They also discovered a positive association between global economic activity and oil prices, as well as dynamic lead-lag interactions that are time-dependent. Their findings held up when they included in additional complicating factors including geopolitical risk, military conflicts, economic policy uncertainty, and equity market volatility. Their study has significant consequences for oil market participants since it was based on knowledge about the global economic condition and its dynamic links with oil prices.

Additionally, to Donga (2019), Khan (2013) examined oil as a commodity with enormous strategic value for all governments on the planet. Crude oil prices peaked between 2002 and 2008, owing primarily to rising crude oil demand as a result of robust global economic development. During the pre-recession years, rapid manufacturing growth in China, India, and other Asian countries resulted in the biggest spike in oil prices ever seen. Crude oil prices fell following the economic slump, according to the Economist (2009), due to lower petroleum demand and other energy sources. Crude oil prices had risen dramatically since then, owing to the fact that oil remains the world's most essential energy source (IMF, 2011). In their research of factors influencing oil prices, the article discovered that crude oil prices had a significant impact on the global economy since their enormous fluctuations can cause economic shocks for countries, forcing them to adjust their policies.

Unlike others, Yanan, Wang, and Keung Lai (2010) empirically investigated cointegrating relationship between crude oil prices and global economic activity. As a measure of worldwide economic activity, the Kilian economic index is utilised. They discovered that

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real futures crude oil prices are co-integrated with the Kilian economic index and a trade weighted US dollar index, and that variations in the Kilian economic index have a significant impact on crude oil prices through both long-run equilibrium conditions and short-run impacts, using a supply–demand framework and cointegration theory. They also developed a single-equation error-correction model (ECM) that is experimentally stable, and data-coherent.

In addition to Yanan (2010) study on Crude Oil fluctuations on US Dollar Index, Brahmasrenea, Huang, and Sissoko (2014) examined the short-run and long-run dynamic link between imported crude oil prices and exchange rates in the United States Monthly data on US crude oil imports from five source nations was examined between January 1996 and December 2009. According to empirical research, exchange rates affect crude oil prices in the short run, while crude oil prices cause exchange rates in the long run. Furthermore, swings in exchange rates had only a little influence on oil prices. Oil price shocks, on the other hand, have a significant influence on medium and long-term exchange rate movements. Although the exchange rate variable's impulsive response to a crude oil price shock is statistically insignificant, exchange rate shocks have a major impact on crude oil prices.

In addition to others, Nadala, Szklo, and Lucena (2017) investigated the effects of demand and supply oil shocks on correlations between changes in crude oil prices and stock market returns. Demand shocks had a positive impact on the correlations between crude oil prices and stock market returns from late 2007 to mid-2008, when financial markets were most volatile; from early 2009 to mid-2013, when the global economy was recovering from the financial crisis; and after 2015, when concerns about Chinese growth and the US economy upturn arose. The dynamic conditional correlation had an average value of 0.13 when all economy sectors were studied, and it had an average value of 0.03 when the energy sector returns were removed from the stock index. According to these correlations, exogenous supply oil shocks have had a minor influence on US primarily business cash flows during the previous 10 years, which are still favourable on average. Huge and unanticipated shifts in the oil market occurred between 2006 and the financial crisis, as well as from 2014 to April 2016, altering the value of major US corporations.

In agreement to Donga (2019), Khan and et. al. (2019) using data from January 2000 to December 2018 found the asymmetric influence of oil prices on stock returns in Shanghai and investigated it using an asymmetric ARDL model. According to the results of the asymmetric autoregressive distributed lag model, there was cointegration between oil prices and stock returns. Increases in oil prices have a negative impact on stock returns on the Shanghai stock market in both the long and short term, according to the results of the asymmetric autoregressive distributed lag model, but drops have a positive impact. Oil prices, according to the conclusions of this study, dynamically contribute incompetence in stock values, hurting stock market earnings.

In consideration with Covid-19 Pandemic Alana and Monge (2020) used long memory techniques to evaluate the impact of the COVID-19 issue on crude oil prices. With an order of integration of 0.84, the oil price series is quite persistent and shows mean reversion. The first order integration hypothesis cannot be ruled out when data is analysed prior to the commencement of COVID-19. The findings backed with previous evidence of market efficiency, with the oil market becoming inefficient after the crisis data was included in. The fact that oil price data is mean reverting predicted that the shock would be brief, but with long-term implications.

In addition to research by others, Sek and et. al. (2015) conducted empirical investigations to investigate the effects of changes in oil prices on inflation in two sets of countries: those with a high vs low oil dependency. They looked at the impact of other shocks including the real exchange rate, domestic output, and exporters' production costs to see how oil prices vary. In an autoregressive distributed lag (ARDL) technique, they employed the pooled mean group methodology to estimate the pass-through equation. Changes in oil prices have a direct impact on domestic inflation in the low oil dependency group, but have an indirect impact in the high oil dependency group owing to changes in the exporter's production costs, according to their results. Real exchange rate and exporter's production cost (high oil reliance group) are the key factors of domestic inflation, as are domestic output and exporter's production cost (low oil dependency group). They recommended that policymakers use monetary policy to mitigate the effects of these shocks.

In a unique approach to research, Musa, Maijama, Shaibu, and Muhammad (2019) investigated using an autoregressive distributed lag model and looked at the impact of crude oil price and currency rate on Nigerian economic development from 1982 to 2018. In both the long and short term, the price of crude oil and the exchange rate had a considerable positive influence on economic development, according to the data. The study's findings showed that the price of crude oil and the exchange rate, which were the study's focus areas, might have a long and short-term influence on economic development. As a result, to reduce dependency on crude oil and income changes induced by price swings, the government should diversify its revenue streams by relying on agriculture, industry, and investment.

C. National Literature Review

Tuhran and et.al (2012) examined the dynamic relationship between oil prices and the exchange rate of selected developing nations. The researchers highlighted three points in their study: first, they looked at developing economies instead of investigating the link between oil prices and currency rates in industrialised countries. Oil is utilised as an alternate advantage class in monetary models to study exchange rate dynamics in emerging nations, and daily oil price data is used to study currency rate dynamics. The study compares the connection before and after the financial crisis to explain how it has altered.

Using further economical and statistical tools, Hidhayathulla and Rafee.B (2014) examined using time series data from 1972-73 to 2012-13 the influence of oil prices on the exchange rate of the Indian rupee against the US dollar. The data is analysed using several linear regression models. When the future price of crude oil rises, the model results implied that crude oil imports will continue to climb. As a result, oil imports became a significant source of dollar demand in India's foreign exchange market. This robust demand, among other things, lead to the strengthening of the dollar against the Indian rupee. This discovery will aid the Indian government in formulating policies to limit the price of gasoline in order to prevent the rupee from depreciating against the US currency.

Since Rafee.B (2014) understood the impact of Crude Oil Price fluctuations on Indian Foreign Exchange Market, Gurmeet, Manisha, and Pooja (2012) examined that India's oil imports were increasing. Our reliance on imports had reached 80% and was likely to continue to rise. At the same time, the price of oil on the global market skyrocketed in 2008. The price volatility of oil had also increased. Though it was difficult to predict future oil prices, they are most likely to grow. Since the beginning of the twenty-first century, oil prices have been steadily climbing. The impact of an oil price shock can theoretically be predicted. The immediate result of the oil price shock is a higher cost of manufacturing due to lower fuel costs. When the economy's overall inflation rate rises, the cost of construction rises as well, resulting in a drop in supply. Inflation, on the other hand, refers to a decrease in people's purchasing power. In short, oil price fluctuations have a negative impact on the economy.

Aparna (2012) in addition to Gurmeet (2012) highlighted that a rise in the crude oil price has an immediate negative impact on GDP and IIP, but has a favourable influence on the WPI. While GDP and IIP show signals of decline over time, the WPI returns to its prior level after a four-month period of positive growth. Despite the fact that WPI contains components other than gasoline, which account for 14.23% of its weight, and therefore indirectly affects other commodity baskets, a shock or impulse provided to WPI has the same effect on GDP. It also has a deleterious impact on the IIP, and the consequences linger for a long time, with symptoms of fluctuating degradation.

Studying further on Indian Macroeconomic Indicators, Soundarapandiyan and Ganesh (2017) analysed that to keep inflation under control and maintain strong economic development Crude oil plays an important part in the VUCA industry, as India is the world's fourth largest consumer of crude oil, importing 100 million tonnes per year, accounting for 37% of total imports. Crude oil is a price factor for many other commodities since its increase or fall has a direct influence on the pricing of other commodities as well as society as a whole. Even a one-dollar decline in crude oil prices has a three-fold economic impact, saving the government around 40 billion rupees. Oil prices have dropped by nearly 55% since June 2014, indicating OPEC and US oversupply, as well as poor global demand. India has developed a fuel pricing scheme that is based on global crude oil prices.

Adding to Aparna (2012), Bhattacharya and et al. (2005) analysed the influence of rising oil prices on inflation. They investigated the influence of growing gasoline prices in India on the pricing of other goods and output. It climbed from an all-time low of 11 dollars per barrel in February 1999 to a high of 35 dollars per barrel in September 2000. As a result, all oil-importing nations faced an oil scarcity, with India, as the world's largest oil importer, being particularly heavily impacted. According to history, there were four oil shocks in the previous thirty years. Despite this, industrialised nations have been supported in mitigating the dangers associated with oil shocks by low inflationary pressure. Developing countries, on the other hand, are disproportionately harmed due to a lack of advanced technologies for oil conservation. The majority of researchers agree that inflation has a recessionary effect on oil prices.

Speaking further on GDP and in addition to Aparna (2012), Sathyanarayana, Harish and Gargesha (2018) realized that the recent variations in crude oil prices have drawn the researcher's attention to the critical impact that crude oil prices play in every nation's economy. The price volatility of crude has influenced the country's economy's pricing expectation uncertainty. The majority of empirical studies show that crude oil price volatility has a considerable impact on the economy and stock returns of a country. As a result, from the perspective of a developing economy like India, comprehending the movement of stock returns is critical. Aside from that, their research suggests that crude prices play a substantial role in the Sensex's volatility and have the ability to transmit shocks to the index. As a result, when formulating policies that affect the economy in general and the stock market in particular, policymakers must consider the movement of oil prices.

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In agreement to Gurmeet (2012), Wani, Kirmani, and Saif (2015) with their research understood that India has become increasingly reliant on crude oil imports as demand for crude oil has increased at a rapid rate. Although crude oil's fundamental price is continually falling, import fees make it more expensive for the common individual. As a result, the cost of fuel and other associated items rises, putting more money in the hands of the common individual. Researchers also provide a summary of crude oil imports today, as well as an effort to explain why lowering crude oil imports is crucial for increasing the typical person's living standards.

In addition to Sathyanarayana (2018) understanding on impact on the stock market, Kumar (2017) examined the dynamic impact of crude oil price fluctuations in the international market on the erratic Indian stock market. The study examined at monthly crude oil prices expressed in USD per barrel, the BSE-listed index BSE Sensex, and the NSE-listed index CNX Nifty prices from January 2001 to December 2014. A GARCH (1,1) model with net crude oil price change as an exogenous variable is used to evaluate the influence of net oil price change in the international market on the conditional volatilities of both indices. Changes in net oil prices had a considerable effect on the conditional volatility of both indexes, according to the findings. These data revealed that investors restructure their portfolios in reaction to global crude oil price fluctuations. In forecasting models of stock returns and risk in the Indian stock market, they can include crude oil price as an essential exogenous variable.

In addition to Aparna (2012), Sarmah and Prasad (2021) attempted to examine the impact of crude oil price on the rate of inflation and economic growth in India using a structural vector autoregressive framework using monthly data from April 1997 to July 2016. While crude oil prices have a positive impact on inflation, they have the opposite effect on economic growth, according to the research. They employed a nonlinear and asymmetric autoregressive distribution lag framework to split the crude oil price into two parts, the positive and negative partial sums. The positive partial sum of crude oil prices on inflation and economic growth provides a similar conclusion, but the negative partial sum of crude oil prices on economic growth yields a large negative link. From a policy standpoint, they believed that policymakers should focus on reducing crude oil consumption and increasing the use of renewable energy to boost economic growth. This would help the government meet its long-term environmental aim of reducing crude oil use while also shielding the local economy from global oil price volatility and inflation.

In agreement to Mishra and Debasish (2020), Mehta and et al. (2021) studied the effects of oil prices on India's economy, particularly the impact of falling prices Oil prices is critical to the economy, particularly in developing countries like India. After China and the United States, India is the world's third largest energy and oil consumer. This paper attempted to evaluate a link between oil prices and key economic and market indicators using a variety of tools. The influence of lowering oil prices on numerous leading and trailing indicators in the economy is examined in this research, which helps to provide insight into the consequences of lower oil prices on the economy. This study examined economic aspects such as inflation, GDP, and the influence on foreign reserves, among others. India is heavily reliant on oil imports, necessitating a thorough investigation on the impact of rising oil prices. India's main imports are from Iraq and Saudi Arabia, and the country's demand for oil is increasing with each passing year. This research had led to the conclusion that oil prices have an inverse relationship with stock prices, implying that falling oil prices benefit stock prices and ultimately the economy. Inflation has a key part in the Indian economy's falling GDP growth, according to statistics. The two variables have a negative relationship. This can be explained by the fact that higher oil prices lead to higher inflation, lower corporate profits, lower government tax revenues, a higher current account deficit, and lowered investor confidence.

In addition to Sathyanarayana (2018) and Kumar (2017), Manish and et. al. (2020) investigated the impact of oil prices on the Indian stock market. The analysis relied on monthly records from the Bombay Stock Exchange (BSE) and the World Bank from January 2000 to November 2018. Oil price, exchange rate, inflation and real interest rate are all independent variables, whereas the BSE index is the dependent variable. Because most economic data is non-stationary, the augmented Dickey-Fuller unit root test is employed to ensure that variables are stationary. To test for long-run relationship among their time series dataset, they used the auto regressive distributed lag model and the bound testing test method to cointegration. Their findings report that changes in oil prices have a large and better impact on the return on the Indian stock market in both the long and short run. Inflation and real interest rates have a negative link with the Indian stock market, but this relationship is minor in the long run. Although the log of the exchange rate has a positive relationship with the Indian stock market, it is minor.

Carrying on to the research by Punati and Raju. G (2017), Tramboo and Rehman (2021) analysed that Oil is both a strategic energy source and a valuable fuel that ensures the growth of contemporary industry and the economy. Oil price fluctuations were frequently considered as a gauge of the global economy, with any transition causing widespread anxiety and debate in political and economic circles around the world. Crude oil is becoming increasingly significant in terms of national stabilisation as the global economy grows at an exponential rate. Oil prices, on the other hand, changed dramatically during an emergency. Oil's rising global worth and demand have resulted in a supply and price structure that is highly volatile. The purpose of their article was to provide an overview

of the crude oil market and the long and short-term evolution of the oil pricing mechanism. The systemic changes of international oil prices were investigated in this research. Crude oil prices, as a result, fluctuate over time and cannot be traced to a single market driver due to the emergence of a massively complex market structure based on a multitude of factors. The price volatility of crude oil had a direct impact on economic stability. The dynamic market environment is influenced by futures market contracts, commodities market speculators, refining capacity, the dollar's value, and the weather.

Unlike others, Fang and You (2014) examined that despite the fact that much empirical study has been done on the relationship between changes in oil prices and economic activity, there has been little research on the association between oil price shocks and the big Newly Industrialized Economies (NIEs). To fill this gap, their research improves Kilian and Park (2009)'s technique and explores how explicit structural shocks that reflect the endogenous nature of fluctuations in oil prices affect the stock-market returns of three big NIEs. In contrast to the impacts on stock markets in the United States and other developed countries, empirical evidence reveals that oil price shocks have a mixed influence on stock prices in these large NIEs. This finding is in line with previous empirical findings that the NIE stock markets are "somewhat related" to stock markets in other countries and to oil price shocks.

Using further statistical tools, Kumar (2005) assessed the link between oil prices and the macroeconomy using multivariate VAR with both linear and non-linear assumptions The study's scaled oil prices model outperforms the other models. They look at the impact of oil price shocks on India's industrial output development from 1975 Q1 to 2004 Q3. Oil prices Granger have been discovered to have an impact on macroeconomic activity. Oil price shocks are shown to have an inconsistent influence on industrial development. Oil price shocks had a considerable impact on industrial output growth, with a 100% increase in oil prices causing a 1% reduction in industrial output growth. Furthermore, the variance decomposition analysis demonstrates that, in addition to the variable itself, the most significant causes of variation in industrial production growth are oil price shocks connected with monetary shocks.

Panchakshari (2018) aimed to answer the question of why is everyone concerned about crude oil prices? He analysed that this is due to the fact that global crude oil prices have been continuously climbing in recent months. In May 2018, the worldwide benchmark for global oil prices reached the $80/barrel threshold for the first time since 2014. This unexpected price increase has a significant influence on numerous sectors of the Indian economy.

In addition to Panchakshari (2018), Sahu and et. al. (2021) remarked that as oil prices fall, crude oil may become a less expensive alternative to renewable energy (RE). As a result, this study evaluated the impact of oil price fluctuations on the usage of RE in the United States (US) from 1970 to 2018. To investigate the influence of positive and negative oil price shocks on RE adoption in the United States, they created two NARDL (nonlinear autoregressive distributed lag) models. The independent variables include GDP, Brent crude prices, population density, trade openness, and price index, whereas RE consumption is the dependent variable. In the short and medium term, growing crude oil prices, GDP, and population density, according to the study, will increase RE usage. According to the research, every drop in oil prices affects RE consumption in the near term, with the effect diminishing in the long run. On the policy front, it is advocated that the US strengthen its energy security by reducing its reliance on imported crude oil, increasing the role of renewable energy through oil taxes, and extending the production and consumption base through a number of approaches.

In agreement to other researchers, Mishra and Debasish (2020) noted the relationship between global crude oil price changes and equity market volatility in India and China's fast-growing economies. In this work, time series were decomposed into short, medium, and long-term frequencies using wavelet decomposition and the maximum overlap discrete wavelet transform (MODWT). The direction of causality between the variables was investigated using wavelet coherence analysis and wavelet-based Granger causality analysis, as well as continuous and cross wavelet transformations to assess variation among the variables. Over short, medium, and long time periods, continuous wavelet treatments demonstrated substantial fluctuation in WTIR (return series of West Texas Instrument crude oil price). At various time periods, the volatility in the CNX Nifty was noted in the short and medium run. SCIR, the Chinese stock index, had very minimal short-term volatility but high long- and medium-term volatility.

In a unique variable research approach, Kanungo and Dang (2021) studied the association between the price of gold, the price of crude oil, the Indian exchange rate, and the stock market in India was discovered. The study looked at pre-COVID periods to determine if there was a relationship between pre-global financial crisis, crisis, and post-crisis circumstances. The authors use the Granger causality test, Johansen’s Cointegration, and Vector Autoregression to analyse the connection between variables from pre-crisis to post-crisis eras. Regression was utilised to investigate the impact on India's stock market. The empirical findings show that gold causes USDINR during the Pre-Crisis and Post-Crisis eras, Crude oil causes Gold during all three periods, and gold causes Crude oil during the Crisis and Post-Crisis periods.

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Similar to other researches, Punati and Raju. G (2017) noted that crude oil is a crucial commodity for any economy, and as economies expand, so does the need for crude oil, causing India to become increasingly reliant on crude oil imports. Crude oil is nearly always cheaper than import charges; import duties are what make it more expensive for the common person. The present situation of crude oil prices in India, as well as crude oil imports, were investigated in this study. Monthly time series data from April 1994 to December 2015 is used in this study. The goal of this study was to find the major drivers of crude oil prices using an econometric methodology known as the ordinary least squares' method. Finally, crude oil price determinants (Brent crude oil prices, industrial output index, exchange rate, and inflation) were determined to be significant.

D. Research Gap

Indian Basket Crude Oil, comprised 75.5% of Dubai Oman Average, and 24.5% Brent Sweet Grade is one variable not explored by many researchers. One could find a vast array of articles over the internet, across journals speaking of Brent, US, and Dubai Average variable prices, while research over Indian Prices stay limited.

This research aims to provide much deeper insight to the impact on Indian Economy and study the changes in the variable of Crude Prices of Indian Basket.

E. Conclusion

Upon reviewing all the above research articles written by esteemed and knowledgeable researchers, it is very evident that Oil Price Fluctuations do play a huge role in deciding upon the Global and National Economy charts, Inflation and GDP Growth Rates, Exports and Import Values across nations, Current Account Balances, and various other macro or microeconomic indicators. It is essential that we understand the value of Crude Oil and how surge in its prices could mark an enormous impact on retail prices and local lives across nations.

Using all provided literature, we understand the impact constantly and uniformly affects all countries and their economies across the planet. We also understood the importance of various tools and variables to be kept in consideration while conducting our research and running tests. There exists a great void on research understanding of the Impact of Crude Oil Price fluctuations on Indian Economic Indicators. Therefore, with knowledge gained from all above mentioned 40 literatures, this paper intends to offer the best possible answer to questions posed on Indian Economy and how it is affected with fluctuations in Crude Oil Prices.

III. RESEARCH METHODOLOGY

A. Introduction

Crude oil is the most basic component of primary energy, and its value as a basic input for economic growth determines the whole energy mix. Oil is often thought of first fall back energy resource. Its price is the basic unit for all economic activities like agriculture, manufacturing, project evaluation directly or indirectly, for calculating price of manufacturing articles, product prices, transportation cost, service industry etc., even in pricing other forms of energy. Therefore, crude oil price increase is viewed throughout the world as it has a bearing on all the prices of final goods and services of the economic activities of the world. There are no economies in the world that are immune to the impact of rising crude oil prices, whether they are exporters or importers. Crude oil price increase can be treated as the source affecting the economy, it may be treated as the epicentre of earthquake in an economy, which has the potential to cause catastrophe to any economy and can damage the business activities, in worst condition, it can bring down to business and economic recession. This is a quantitative and analytical research project. Data analysis is primarily done using statistical and econometrics methodologies to find connections between the dependent and independent variables, as well as empirical correlations of the variables depending on the goal and assumptions.

B. Research Design

Research design is a blue print of the study conducted, which includes steps of data collection, sample selection, process of data and finally interpretation of the data.

C. Research Software - EViews

EViews is a Windows-based statistical tool that is mostly used for time-series focused econometric analysis. EViews may be used to analyse cross-section and panel data, as well as time series estimates and forecasting, and statistical and economic studies.

EViews is a Windows-based statistical software that blends spreadsheet and relational database technologies with classic statistical activities. This is combined with a programming language that only shows object orientation to a limited extent.

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D. Data Processes At Eviews

1) Augmented Dicky Fuller Unit Root Testing: In statistics, a unit root test tests whether a time series variable is non-stationary and possesses a unit root. The null hypothesis is generally defined as the presence of a unit root and the alternative hypothesis is either stationarity, trend stationarity or explosive root depending on the test used.
2) Johansen Cointegration Test: The Johansen test determines if three or more time series are cointegrated. It uses a maximum likelihood estimates (MLE) approach to evaluate the validity of a cointegrating connection. It's also used to figure out how many relationships there are and to estimate how many there are. If the test on the given Variables turns out to be Cointegrated, we conduct a VEC – Vector Error Correction Estimates test further; however, if the resultants are not cointegrated, we would conduct a VAR – Vector Autoregression test.
3) VAR – Vector Autoregression: The statistical model Vector Autoregression (VAR) is used to capture the relationship between several quantities as they change over time. A stochastic process model, or VAR, is a form of stochastic process model. By allowing for multivariate time series, VAR models extend the single-variable (univariate) autoregressive model.
4) VEC – Vector Error Correction Estimates: A Vector Error Correction (VEC) model is a constrained VAR developed for use with cointegrated nonstationary series. We use an estimated VAR object, an Equation object estimated using nonstationary regression methods, or a Group object to test for cointegration.
   ECTt-1 = [Yt-1 – njXt-1 – EmRt-1
5) Impulse Response Analysis: In econometric analyses that use vector autoregressive models, impulse response analysis is a crucial step. Their major aim is to describe how a model's variables evolve in response to a change in one or more variables.

E. Sampling

Data collected for the purpose of this research is entirely Quantitative, and thus, is used entirely for the purpose of Analysis and Interpretation. Of all the data collected, no sampling was done, and therefore there is no Sampling Technique adopted and no Sample Size exists. However, of all variables used, data is converted to Monthly Values for analysis and the research uses values of variables for 20 years from 01-2001 to 12-2020.

F. Sources Of Data

Secondary data sources have been used to collect information about the Indian Crude Basket Prices, Wholesale Price Index, Inflation Rate, GDP Growth, Retail Fuel Prices, Sensex, CAD, INR Value, and Forex Reserves. Information collected from Secondary data sources include:

1) RBI: Inflation Rates
2) OPEC: GDP Growth Data
3) RBI and OPEC: Current Account Balance
4) Indian Economic Survey Reports
5) Petroleum Planning and Analysis Cell (PPAC): Crude Oil FOB Indian Basket and Retail Selling Prices of Petrol and Diesel.
6) BSE: Historical Indices
7) OPEC- Statistical Database

G. Variables

This research study focuses on various Variables, including Indian Macroeconomic Indicators to ascertain the impact on Indian Economy caused due to Global Crude Oil Price Fluctuations. All such variables listed are:

1) Crude Oil FOB Price – Indian Basket
2) United States Dollar (USD) and Indian National Rupee (INR) Values
3) Bombay Stock Exchange (BSE) Sensex
4) India GDP Growth Rate
5) India Inflation Rate
6) India Current Account Balance / Deficit (CAD)
7) Retail Selling Price of Petrol
8) Retail Selling Price of Diesel

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IV. ANALYSIS AND INTERPRETATION

A. Introduction

The recent surge in crude oil prices has brought to everyone's notice the importance of oil in every country's economy. India imports almost 100 million tonnes of crude oil and other petroleum products each year, making it one of the most sought-after commodities on the planet. As a result, a large amount of foreign exchange is spent. The rising volume of petroleum imports has a substantial impact on the Indian economy. Especially now that crude oil prices are skyrocketing over the world.

Crude oil is used as a source of energy as well as a major raw material in a variety of industries. It is commonly observed that the pricing structure in India is designed in such a way that it provides a method for containing skyrocketing overseas costs and hence has a direct impact on growth inflation. (Wani, 2015)

B. Crude OIL

Crude oil is a complex combination of several organic molecules that differ in look and content from one oil field to the next. Crude oil is characterised as paraffinic, naphthenic, aromatic, or asphaltic depending on the amount of hydrocarbon series molecules present, which determines its physical and chemical qualities. Although there are a variety of theories about the origins of crude oil, the general opinion is that most of the deposits are the consequence of the burial and alteration of biomass during geological time spans of around 200 million years.

In terms of quantities, therefore, the total amount of oil and gas residing in the earth’s subsurface is certainly finite. While it is recognized that some of these resources have yet to be found, there is considerable uncertainty about the magnitude of the “undiscovered resources”.

There is no universally agreed definition of what is meant by conventional oil or gas, as opposed to nonconventional. Roughly speaking, any source of hydrocarbons that requires production technologies significantly different from mainstream in currently exploited reservoirs is described as non-conventional. (Punati N. , 2017)

Since hitting a low of $16 per barrel on April 22, 2020, Brent crude oil has steadily increased. It has climbed by over 58 percent from the beginning of 2020, from approximately $51.8 per barrel to around $81 at the time of closing. The ascent has been rapid in recent weeks, with the price of a barrel beginning at $65 on August 20, 2021. Despite the fact that the overall trend continues to grow, analysts believe prices are reaching their intermediate high level of $86 per barrel, around which some cooling is expected. (Sreenu, 2019)

As the world economy recovers from the epidemic, crude prices have increased significantly in 2021, resulting in a comeback in global demand. The OPEC+ alliance's supply limits have kept global oil prices high as well. So yet, these oil-producing economies have only shown moderate increases in output, resulting in a rise in gas prices. As a result of a gas scarcity in Europe and Asia, demand for oil for power production has increased dramatically.

India's petrol and diesel prices have reached all-time highs as a result of the rise in crude prices. The price of gasoline and diesel in India is calculated using a 15-day rolling average of international prices. The federal and state governments' hefty taxes have also contributed to considerably higher retail costs.

C. Reasons For Crude Oil Price Fluctuations

1) OPEC Influences Prices

Oil price fluctuations are primarily influenced by the Organization of Petroleum Exporting Countries, or OPEC. As of 2021, OPEC is constituted of 13 countries: Algeria, Congo, Angola, Equatorial Guinea, Gabon, Iran, Iraq, Kuwait, Libya, Nigeria, Saudi Arabia, the United Arab Emirates, and Venezuela.

Over 80% of the world's oil reserves are controlled by OPEC. The consortium determines production levels to meet global demand and has the ability to affect oil and gas prices by increasing or decreasing output.

Prior to 2014, OPEC pledged to keep oil prices over $100 per barrel for the foreseeable future, but by the middle of the year, the price of oil had started to fall. It fell from a peak of more than $100 per barrel to a low of under $50. OPEC was the main cause of low oil prices in that scenario since it refused to curb supply, forcing prices to collapse.

2) Supply And Demand Impact

Oil prices fluctuate according to supply and demand, just like any other commodity, stock, or bond. Prices fall when supply exceeds demand, and vice versa when demand exceeds supply.

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3) Natural Disasters

Another factor that can cause oil prices to fluctuate is natural disasters. For example, after Hurricane Katrina hit the southern United States in 2005, disrupting over 20% of the country's oil supply, the price of a barrel of oil increased by $13.56.

4) Political Instability

Global oil prices fluctuate due to political instability in the Middle East, which supplies the majority of the world's oil. For example, in July 2008, the price of a barrel of oil topped $128 due to market turbulence and consumer concern over the battles in Afghanistan and Iraq. On March 7, 2022, prices reached a 14-year high of $140 per barrel.

5) Production Costs And Storage

Oil prices can grow or fall according to production costs. While oil production in the Middle East is relatively inexpensive, Alberta's oil sands are more expensive. 10 If the tar sands are the only cheap oil source, the price may grow until the supply runs out.

The price of oil is also directly affected by US output. Due to the industry's overabundance, a reduction in output reduces overall supply and raises prices.

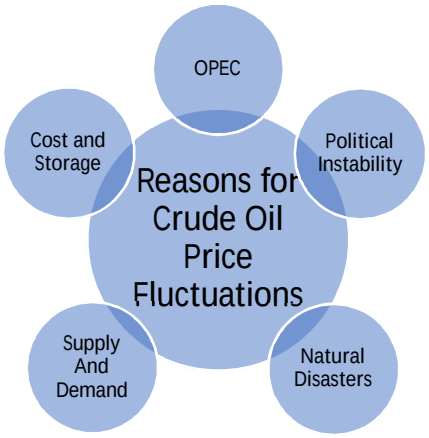

Figure 2: Reasons for Crude Oil Price Fluctuations
Source: Self-Generated Word Figure

D. Factors Affecting Crude Oil Prices

1) *Production:* When the worldwide supply or production of crude oil increases, the price tends to decline. Despite rising demand, the price of petroleum has dropped due to increased crude oil output in the United States in 2014. The price of crude oil peaked at 83 dollars per barrel in October 2014.
2) *International Issues:* International issues for example Russia Ukraine war affect the price of crude oil in the international market.
3) *Cartel of OPEC Member:* Cartel of OPEC members also affect the prices of crude oil in the international market.
4) *Inventory:* Because crude oil inventory costs are so high, any country can only import a certain amount. As a result, the cost of crude oil inventories has an impact on the price of crude oil.
5) *Demand:* According to law of demand if the demand of crude oil increases so the price also increases in global market. (Modak K. C., 2015)

E. Causes Of Rising Fuel Prices In India

Fuel production has decreased on the international market, and oil-rich countries are looking for bigger earnings. As a result, consumers in consumer countries face higher fuel prices. Nearly 80% of India's crude oil needs are met by imports. As a result, the country bears the brunt of rising fuel prices. Furthermore, the increasing rate of global industrialisation has resulted in an increase in fuel demand and consumption.

Aside from the cost of refining, fuel sales are subject to federal and state taxes. Fuel taxes are the largest contributor to state coffers. Fuel sales are also expected to make a substantial contribution to the central government's annual budgets.

As a result, despite numerous pledges, neither the state nor the federal governments want to lower their revenues. When freight charges and dealer commission are included in, the total cost of fuel exceeds the base price.

Crude oil demand has been steadily increasing over the world. Because of technological developments, energy consumption has increased. People all across the world are becoming more reliant on gadgets and other technological devices in their daily lives. Mobile phones, for example, were formerly considered a luxury item available mainly to the rich. Today, mobile phone penetration is so high that 5.22 billion people throughout the world charge their phones every day. Geopolitical tensions are exacerbating the surge in global oil prices. Prices may rise as a result of increased demand for gasoline in a war-like scenario. Oil prices have lately risen because to tensions between the United States and Iran, the world's second-largest oil producer after Saudi Arabia. Civil wars in oil-producing countries across the Middle East and Africa have also lowered output. In recent years, India's gasoline consumption has also increased. Indians are spending more on vehicles and electronics as their population grows younger and their per capita income rises. As a result of the increased consumer demand, fuel costs have skyrocketed.

Since 2014, the Indian government has deregulated fuel pricing. Under the new deregulated technique, fuel prices are now directly linked to the worldwide price of crude oil. Consumers should have been relieved, as worldwide crude costs had dropped dramatically in India last year. Despite the substantial drop in pricing, the selling price of gasoline has remained same. This was largely due to the government's decision to raise both federal and state taxes. The government's decision negated the benefit of lower crude prices for end consumers. In the end, consumers had to suffer the brunt of the higher taxes, and despite a drop in worldwide oil prices, they had to pay higher costs for gasoline and diesel. (Staff, 2021)

1) Retail Selling Price - Petrol

a) Augmented Dicky Fuller Unit Root Test

Table 1 Unit Root Test RSP Petrol

Null Hypothesis: D(RSP_PETROL) has a unit root
Exogenous: Constant
Lag Length: 0 (Automatic - based on SIC, maxlag=14)

		t-Statistic	Prob.*
Augmented Dickey-Fuller test statistic		-13.31052	0.0000
Test critical values:	1% level	-3.457747	
	5% level	-2.873492	
	10% level	-2.573215	

*MacKinnon (1996) one-sided p-values.

Source: Self Constructed (EViews generated outcome)

Upon conducting the Augmented Dicky Fuller Unit Root Test, the RSP of Petrol as a variable demonstrated a Probability of 0.0000 on Stationary Level I(1). Since this probability level is less than 0.05, we could move further to conduct the Johansen Cointegration Test.

b) Johansen Cointegration Test

Table 2 Cointegration Test RSP Petrol

Date: 04/18/22 Time: 15:59
Sample (adjusted): 2001M06 2020M12
Included observations: 235 after adjustments
Trend assumption: Linear deterministic trend
Series: CRUDE_OIL RSP_PETROL
Lags interval (in first differences): 1 to 4

Unrestricted Cointegration Rank Test (Trace)

Hypothesized No. of CE(s)	Eigenvalue	Trace Statistic	0.05 Critical Value	Prob.**
None	0.020198	4.977654	15.49471	0.8112
At most 1	0.000777	0.182626	3.841465	0.6691

Trace test indicates no cointegration at the 0.05 level
* denotes rejection of the hypothesis at the 0.05 level
**MacKinnon-Haug-Michelis (1999) p-values

Source: Self Constructed (EViews generated outcome)

On conducting the Johansen Cointegration Test, it is clear that the Independent Variable – Crude Oil Price has no long-term relationship with the Dependent Variable – RSP Petrol. The test finds no traces of cointegration at the 0.05 level. Therefore, Vector Autoregression (VAR**)** test was conducted to capture the relationship between both the variables as they change over time.

c) VAR – Vector Auto Regression

Table 3 VAR RSP Petrol

Vector Autoregression Estimates
Date: 04/18/22 Time: 16:01
Sample (adjusted): 2001M03 2020M12
Included observations: 238 after adjustments
Standard errors in ( ) & t-statistics in [ ]

	CRUDE_OIL	RSP_PETROL
CRUDE_OIL(-1)	1.386555	0.125542
	(0.06192)	(0.02008)
	[22.3914]	[6.25270]
CRUDE_OIL(-2)	-0.417280	-0.125594
	(0.06239)	(0.02023)
	[-6.68788]	[-6.20819]
RSP_PETROL(-1)	-0.030765	1.044282
	(0.19153)	(0.06210)
	[-0.16062]	[16.8155]
RSP_PETROL(-2)	0.033729	-0.045952
	(0.19154)	(0.06211)
	[0.17609]	[-0.73991]
C	1.883432	0.310827
	(1.20975)	(0.39225)
	[1.55688]	[0.79242]
R-squared	0.967310	0.989135
Adj. R-squared	0.966749	0.988948
Sum sq. resids	6443.165	677.3775
S.E. equation	5.258619	1.705051
F-statistic	1723.639	5302.950
Log likelihood	-730.2294	-462.1764
Akaike AIC	6.178398	3.925852
Schwarz SC	6.251345	3.998799
Mean dependent	64.20508	54.30504
S.D. dependent	28.83818	16.21901

Source: Self Constructed (EViews generated outcome)

d) CHOLESKY ONE S.D. (d.f. adjusted) Innovations
± 2 MONTE CARLO S.E.s

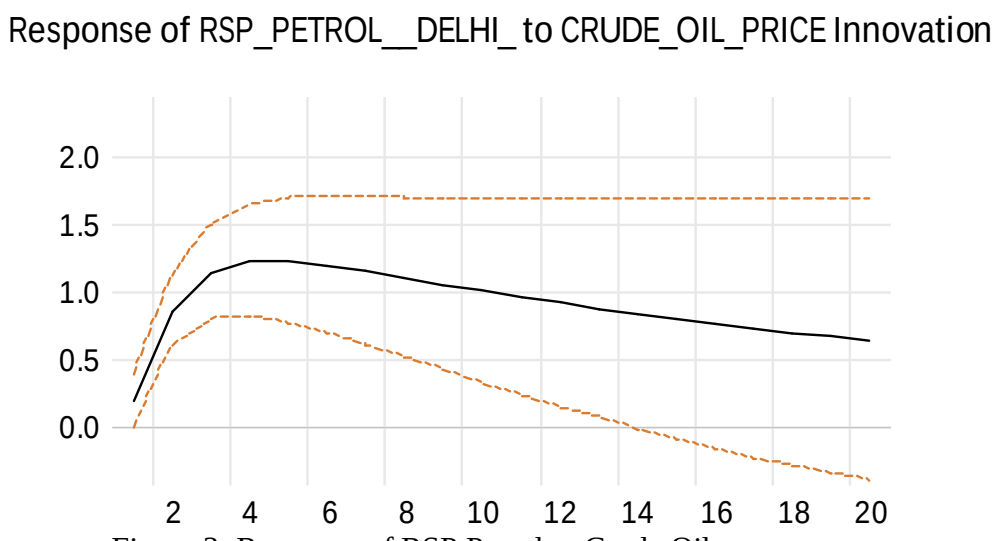

Figure 3: Response of RSP Petrol to Crude Oil

Source: Self Constructed (EViews generated outcome)

- Magnitude Of the Shock: One Standard Deviation
- Red Dots are the Standard Error Confidence Bands. the confidence intervals are computed as ± 2 se confidence bands.
- X-Axis Represents the Periods (Months)
- Y-Axis shows the percentage variation
- The Cholesky One S.D. (d.f. adjusted) Innovations graph for Response of RSP Petrol to Crude Oil Price shows an initial positive response for the first 4 periods (months), followed by a gradual decline with a negative trend.

Interpreting the Figure 3, it is seen that the there exists a rapid positive increment followed by a gradual decline. It infers that one standard deviation shock on the Crude Oil prices will have rapid positive effect initially, however, in the long run, it will have a slightly negative impact.

It is therefore understood that as Crude Prices rise, the RSP of Petrol rises too initially. However, in the long run it is clear that rising crude prices do not impact the retail prices too much, since RSP is seen to be falling even when crude becomes increasingly expensive. It is due to the taxes and cesses levied that RSP too kept getting higher with time.

2) Retail Selling Price – DIESEL

a) Augmented Dicky Fuller Unit Root Test

Table 4 Unit Root Test RSP Diesel

Null Hypothesis: D(RSP_DIESEL) has a unit root
Exogenous: Constant
Lag Length: 2 (Automatic - based on SIC, maxlag=14)

		t-Statistic	Prob.*
Augmented Dickey-Fuller test statistic		-11.50147	0.0000
Test critical values:	1% level	-3.457984	
	5% level	-2.873596	
	10% level	-2.573270	

*MacKinnon (1996) one-sided p-values.

Source: Self Constructed (EViews Generated)

On conducting the Augmented Dicky Fuller Unit Root Test, the RSP of Diesel as a variable demonstrated a Probability of 0.0000 on Stationary Level I(1). Since this probability level is less than 0.05, we could move further to conduct the Johansen Cointegration Test.

b) Johansen Cointegration Test

Table 5 Cointegration Test RSP Diesel

Date: 04/18/22 Time: 15:39
Sample (adjusted): 2001M06 2020M12
Included observations: 235 after adjustments
Trend assumption: Linear deterministic trend
Series: CRUDE_OIL RSP_DIESEL
Lags interval (in first differences): 1 to 4

Unrestricted Cointegration Rank Test (Trace)

Hypothesized No. of CE(s)	Eigenvalue	Trace Statistic	0.05 Critical Value	Prob.**
None	0.020984	5.201469	15.49471	0.7871
At most 1	0.000926	0.217691	3.841465	0.6408

Trace test indicates no cointegration at the 0.05 level
* denotes rejection of the hypothesis at the 0.05 level
**MacKinnon-Haug-Michelis (1999) p-values

Source: Self Constructed (EViews generated outcome)

On conducting the Johansen Cointegration Test, it is clear that the Independent Variable – Crude Oil Price has no long-term relationship with the Dependent Variable – RSP Diesel. The test finds no traces of cointegration at the 0.05 level. Therefore, Vector Autoregression (VAR) test was conducted to capture the relationship between both the variables as they change over time.

c) VAR – Vector Auto Regression

Table 6 VAR RSP Diesel

Vector Autoregression Estimates
Date: 04/18/22 Time: 15:44
Sample (adjusted): 2001M03 2020M12
Included observations: 238 after adjustments
Standard errors in ( ) & t-statistics in [ ]

	CRUDE_OIL	RSP_DIESEL
CRUDE_OIL(-1)	1.386168	0.087675
	(0.06309)	(0.01832)
	[21.9704]	[4.78618]
CRUDE_OIL(-2)	-0.414787	-0.089262
	(0.06316)	(0.01834)
	[-6.56703]	[-4.86742]
RSP_DIESEL(-1)	-0.045540	1.107466
	(0.22262)	(0.06464)
	[-0.20456]	[17.1336]
RSP_DIESEL(-2)	0.038963	-0.106059
	(0.22359)	(0.06492)
	[0.17426]	[-1.63373]
C	2.179552	0.252467
	(1.05035)	(0.30496)
	[2.07508]	[0.82787]
R-squared	0.967322	0.991514
Adj. R-squared	0.966761	0.991368
Sum sq. resids	6440.804	542.9473
S.E. equation	5.257655	1.526514
F-statistic	1724.292	6805.991
Log likelihood	-730.1858	-435.8516
Akaike AIC	6.178032	3.704635
Schwarz SC	6.250979	3.777582
Mean dependent	64.20508	41.16227
S.D. dependent	28.83818	16.43058

Source: Self Constructed (EViews generated outcome)

d) CHOLESKY ONE S.D. (d.f. adjusted) Innovations
± 2 MONTE CARLO S.E.s

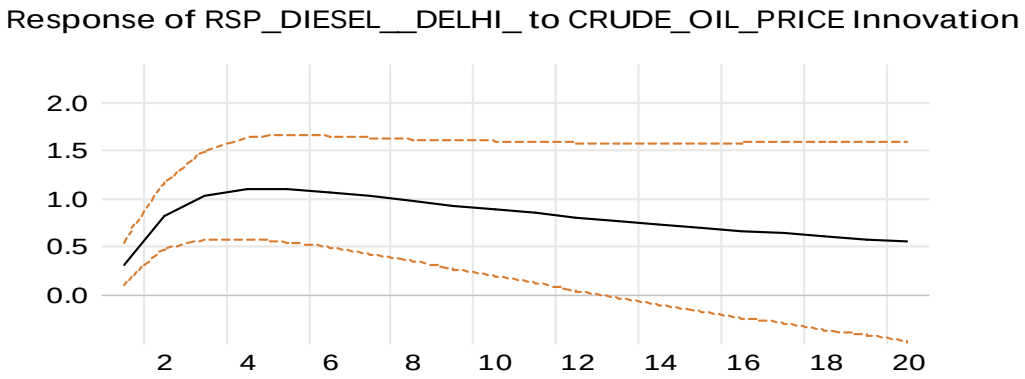

Figure 4: Response of RSP Diesel to Crude Oil
Source: Self Constructed (EViews generated outcome)

- MAGNITUDE OF THE SHOCK: One Standard Deviation
- RED DOTS are the standard error confidence bands. The confidence intervals are computed as ± 2 SE Confidence Bands.
- X-AXIS represents the periods (Months)
- Y-AXIS shows the percentage variation

The Cholesky One S.D. (d.f. adjusted) Innovations graph for Response of RSP Diesel to Crude Oil Price shows an initial positive response for the first 4 periods (months), followed by a gradual decline with a negative trend.

Interpreting the Figure 4, it is seen that the there exists a rapid positive increment followed by a gradual decline. It infers that one standard deviation shock on the Crude Oil prices will have rapid positive effect initially, however, in the long run, it will have a slightly negative impact. It is therefore understood that as Crude Prices rise, the RSP of Diesel rises too initially. However, in the long run it is clear that rising crude prices do not impact the retail prices too much, since RSP is seen to be falling even when crude becomes increasingly expensive. It is due to the taxes and cesses levied that RSP too kept getting higher with time.

In 2013, petrol break-up in Delhi was:

- Crude Oil Cost : Petrol
  Raw Crude Oil Price in INR: Rs. 37.5
- Calculating Cost of Processing
  Crude Oil Processing in Refineries – Approximate Cost: 10 – 12% of Crude Oil Cost: Rs. 4
  + Transportation, Freight, Packing: Rs. 3
  Gross Cost After Refining Crude Oil: 44.5
- Calculating Final Price of Fuel
  Commission to Petrol Pump Owner: Rs. 1.5 to Rs. 2
  Excise Duty: Rs. 9.5 – Rs. 10
  VAT on Gross Price Including Excise * (@ 20%) – Rs. 11.2
  Final Price of Fuel- **67.2**

Carrying forward from previous analysis, it is therefore clear that Crude Oil Prices in the long run do not play a very substantial role in driving the RSP of Petrol and Diesel, but the taxes and cesses implied on thy fuel play a larger role.

F. Impact On Stocks | BSE Sensex

Many Indian businesses rely on stable crude oil prices. This comprises tyre, lubricant, and footwear manufacturers, as well as refineries and aviation firms. Higher input costs have a negative impact on the profitability of these businesses. In the short run, this could have a negative influence on stock values. On the other side, a spike in oil prices could benefit the country's oil exploration businesses. While a substantial increase in oil prices may cause a momentary panic in the equity markets, history shows that equity markets often bottom out at the same time as oil prices. Stock markets bottomed out when oil futures were negative at the height of the outbreak last year, but they have subsequently recovered in tandem with rising oil prices. Higher oil prices, according to analysts, signify increasing economic demand, and stocks frequently yield more than the predicted inflation that a rise in oil prices may bring. Other commodities, such as coal, have been growing in lockstep with the price of oil. (Verma S. , 2021)

The surge in crude oil prices has put a lot of pressure on the Indian stock markets. The Sensex declined by 2.3 percent from May 1 and May 24, 2018. The BSE small and mid-cap indices, on the other hand, have had lost approximately 8% of their value. Small and mid-cap equities have been selling off as crude oil prices have risen above $80 per barrel. Analysts warn that if the price of crude oil continues to rise, this might continue.

1) Augmented Dicky Fuller Unit Root Test

Table 7 Unit Root Test Sensex

Null Hypothesis: D(SENSEX) has a unit root
Exogenous: Constant
Lag Length: 0 (Automatic - based on SIC, maxlag=14)

		t-Statistic	Prob.*
Augmented Dickey-Fuller test statistic		-14.83812	0.0000
Test critical values:	1% level	-3.457747	
	5% level	-2.873492	
	10% level	-2.573215	

*MacKinnon (1996) one-sided p-values.

Source: Self Constructed (EViews generated outcome)

Upon conducting the Augmented Dicky Fuller Unit Root Test, the Sensex as a variable demonstrated a Probability of 0.0000 on Stationary Level I(1). Since this probability level is less than 0.05, we could move further to conduct the Johansen Cointegration Test.

2) Johansen Cointegration Test

Table 8 Cointegration Test Sensex

Date: 04/18/22 Time: 16:10
Sample (adjusted): 2001M06 2020M12
Included observations: 235 after adjustments
Trend assumption: Linear deterministic trend
Series: CRUDE OIL SENSEX
Lags interval (in first differences): 1 to 4

Unrestricted Cointegration Rank Test (Trace)

Hypothesized No. of CE(s)	Eigenvalue	Trace Statistic	0.05 Critical Value	Prob.**
None	0.020302	5.843900	15.49471	0.7139
At most 1	0.004347	1.023761	3.841465	0.3116

Trace test indicates no cointegration at the 0.05 level
* denotes rejection of the hypothesis at the 0.05 level
**MacKinnon-Haug-Michelis (1999) p-values

Source: Self Constructed (EViews generated outcome)

On conducting the Johansen Cointegration Test, it is clear that the Independent Variable – Crude Oil Price has no long-term relationship with the Dependent Variable – Sensex. The test finds no traces of cointegration at the 0.05 level. Therefore, Vector Autoregression (VAR**)** test will be conducted to capture the relationship between both the variables as they change over time.

3) VAR – VECTOR AUTOREGRESSION

Table 9 VAR Sensex

Vector Autoregression Estimates
Date: 04/18/22 Time: 16:11
Sample (adjusted): 2001M03 2020M12
Included observations: 238 after adjustments
Standard errors in ( ) & t-statistics in [ ]

	CRUDE_OIL	SENSEX
CRUDE_OIL(-1)	1.338586 (0.05888) [22.7337]	24.97434 (14.4290) [1.73085]
CRUDE_OIL(-2)	-0.365384 (0.05901) [-6.19182]	-29.12977 (14.4607) [-2.01441]
SENSEX(-1)	0.001096 (0.00027) [4.00615]	0.989817 (0.06707) [14.7577]
SENSEX(-2)	-0.001111 (0.00028) [-4.01676]	0.018211 (0.06778) [0.26866]
C	1.875551 (0.88568) [2.11764]	299.7715 (217.038) [1.38120]
R-squared	0.969424	0.988039
Adj. R-squared	0.968899	0.987834
Sum sq. resids	6026.575	3.62E+08
S.E. equation	5.085777	1246.282
F-statistic	1846.813	4811.798
Log likelihood	-722.2753	-2031.626
Akaike AIC	6.111557	17.11450
Schwarz SC	6.184504	17.18745
Mean dependent	64.20508	18876.23
S.D. dependent	28.83818	11298.96

Source: Self Constructed (EViews generated outcome)

4) CHOLESKY ONE S.D. (d.f. adjusted) Innovations
± 2 MONTE CARLO S.E.s

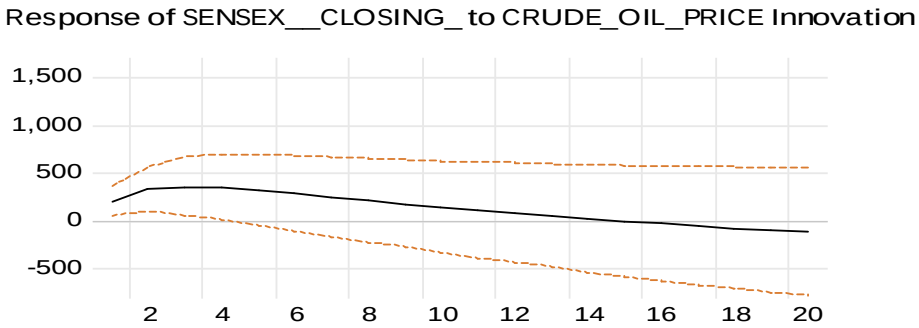

Figure 5: Response of Sensex Closing to Crude Oil
Source: Self Constructed (EViews generated outcome)

- MAGNITUDE OF THE SHOCK: One Standard Deviation
- RED DOTS are the standard error confidence bands. The confidence intervals are computed as ± 2 SE Confidence Bands.
- X-AXIS represents the periods (Months)
- Y-AXIS shows the percentage variation
- The Cholesky One S.D. (d.f. adjusted) Innovations graph for Response of Sensex to Crude Oil Price shows an initial positive response for the first 2 periods (months), followed by a very gradual decline with a negative trend.

Interpreting the Figure 5, it is seen that the there exists a very negligible positive increment followed by a very gradual decline. It infers that one standard deviation shock on the Crude Oil prices will have gradual negative effect, however, in the long run, the negative effect is negligible. It is therefore understood that with rise in Crude Oil Prices, the BSE Sensex rises gradually in initial periods, however in the long run, the rise in Crude Prices has resulted for the market to become weaker and Sensex to fall.

G. Impact On The Rupee

The Indian rupee has been affected by the rise in crude oil prices. The rupee was trading at 68.34 versus the dollar on May 24, 2018. The rupee was hitting an 18-month low at the time, according to a Livemint story, and was only 0.6 percent off its all-time low of 68.825 at the time. Furthermore, the rupee was anticipated to decline further by the end of the 2018 if crude oil prices continue high. The Indian economy and the stock market are affected by the rupee's depreciation.

Rising crude prices cause the rupee to weaken because India, as a major oil importer, need more dollars to purchase the same amount of oil. Even in non-winter months, winter tends to put downward pressure on prices. Coal supply chain difficulties have created recent power shortages in various locations, particularly China. As a result, oil demand has skyrocketed, worsening the issue.

1) Augmented DICKY Fuller Unit Root Test

Table 10 Unit Root Test INR USD Value

Null |
Exogenous: Constant
Lag Length: 0 (Automatic - based on SIC, maxlag=14)

		t-Statistic	Prob.*
Augmented Dickey-Fuller test statistic		-14.38533	0.0000
Test critical values:	1% level	-3.457747	
	5% level	-2.873492	
	10% level	-2.573215	

*MacKinnon (1996) one-sided p-values.

Source: Self Constructed (EViews generated outcome)

Upon conducting the Augmented Dicky Fuller Unit Root Test, the Sensex as a variable demonstrated a Probability of 0.0000 on Stationary Level I(1). Since this probability level is less than 0.05, we could move further to conduct the Johansen Cointegration Test.

2) Johansen Cointegration Test

Table 11 Cointegration Test USD INR Value

Date: [illegible]
Sample (adjusted): 2001M06 2020M12
Included observations: 235 after adjustments
Trend assumption: Linear deterministic trend
Series: CRUDE_OIL USD_INR
Lags interval (in first differences): 1 to 4

Unrestricted Cointegration Rank Test (Trace)

Hypothesized No. of CE(s)	Eigenvalue	Trace Statistic	0.05 Critical Value	Prob.**
None	0.046840	12.09424	15.49471	0.1525
At most 1	0.003486	0.820647	3.841465	0.3650

Trace test indicates no cointegration at the 0.05 level
* denotes rejection of the hypothesis at the 0.05 level
**MacKinnon-Haug-Michelis (1999) p-values

Source: Self Constructed (EViews generated outcome)

On conducting the Johansen Cointegration Test, it is clear that the Independent Variable – Crude Oil Price has no long-term relationship with the Dependent Variable – USD INR Values. The test finds no traces of cointegration at the 0.05 level. Therefore, Vector Autoregression (VAR**)** test will be conducted to capture the relationship between both the variables as they change over time.

3) VAR – VECTOR AUTOREGRESSION

Table 12 VAR USD INR Value

Vector Autoregression Estimates
Date: 04/18/22 Time: 16:13
Sample (adjusted): 2001M03 2020M12
Included observations: 238 after adjustments
Standard errors in ( ) & t-statistics in [ ]

	CRUDE_OIL	USD_INR
CRUDE_OIL(-1)	1.355430	-0.008485
	(0.06029)	(0.01317)
	[22.4836]	[-0.64416]
CRUDE_OIL(-2)	-0.381877	0.015285
	(0.06035)	(0.01319)
	[-6.32802]	[1.15916]
USD_INR(-1)	-0.692442	1.027744
	(0.30292)	(0.06619)
	[-2.28590]	[15.5272]
USD_INR(-2)	0.665333	-0.028719
	(0.30433)	(0.06650)
	[2.18623]	[-0.43188]
C	3.311349	-0.273731
	(1.97388)	(0.43131)
	[1.67758]	[-0.63466]
R-squared	0.968110	0.988777
Adj. R-squared	0.967562	0.988585
Sum sq. resids	6285.537	300.1044
S.E. equation	5.193896	1.134902
F-statistic	1768.325	5132.186
Log likelihood	-727.2819	-365.2987
Akaike AIC	6.153630	3.111753
Schwarz SC	6.226577	3.184700
Mean dependent	64.20508	54.31102
S.D. dependent	28.83818	10.62224

Source: Self Constructed (EViews generated outcome)

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4) CHOLESKY ONE S.D. (d.f. adjusted) Innovations
± 2 MONTE CARLO S.E.s

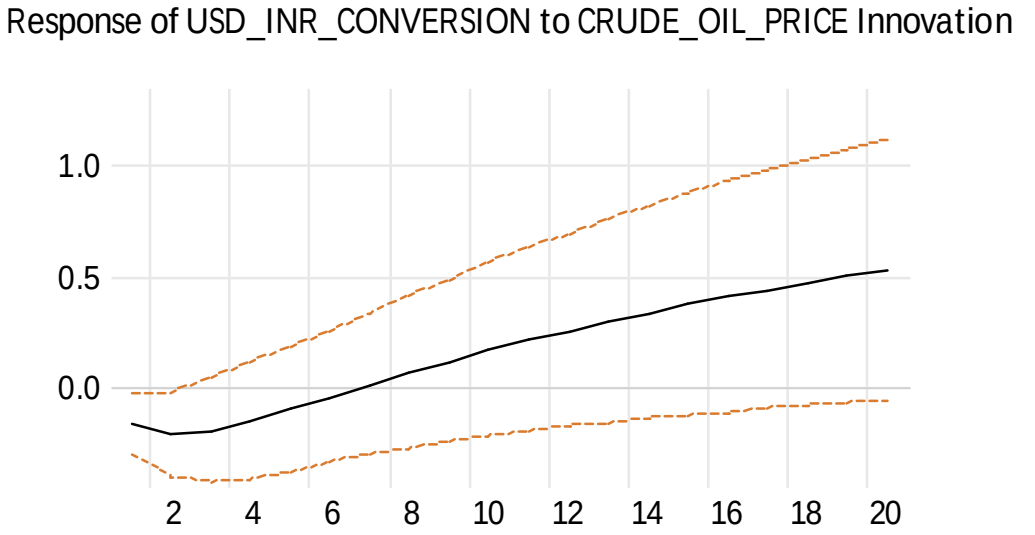

Figure 6: Response of USD INR Conversion to Crude Oil
Source: Self Constructed (EViews generated outcome)

- MAGNITUDE OF THE SHOCK: One Standard Deviation
- RED DOTS are the standard error confidence bands. The confidence intervals are computed as ± 2 SE Confidence Bands.
- X-AXIS represents the periods (Months)
- Y-AXIS shows the percentage variation
- The Cholesky One S.D. (d.f. adjusted) Innovations graph for Response of USD INR Conversion to Crude Oil Price shows an initial gradual negative response for the first 1 period (months), followed by a rapid positive trend.

Interpreting the Figure 6, it is seen that the there exists a very negligible negative decrement followed by a very rapid incline. It infers that one standard deviation shock on the Crude Oil prices will have rapid positive effect in the long run.
It is therefore understood that as Crude Oil Prices rise, the US Dollar becomes much higher and stronger in relation to the INR. This is provided with the fact that India Imports majority of its Crude Oil requirement, and for the purpose of such trade, the demand for the USD rises higher and higher, implying rise in exchange rates and expansion in US Dollar conversion rate.

H. Impact On Inflation And Government Finances

Oil is a vital commodity that is needed to meet domestic fuel demands. It is also a critical fundamental component used in a range of industries. The cost of making products rises when the price of crude oil rises. Consumers would ultimately face the brunt of the price hike, resulting in inflation. Experts estimate that a $10 rise in crude oil prices would raise inflation by ten basis points (0.1 percent).
Crude imports account for around 20% of India's total import expenditure. Petroleum import costs increased from $8.5 billion in the second quarter of 2020 to $24.7 billion in the second quarter of 2021. Inflation may grow as a result of higher prices, pushing the RBI to adopt liquidity-tightening measures followed by rate rises. Oil is a significant raw resource for a multitude of businesses in addition to its usage as a fuel and a critical commodity in the transportation industry. As the price of oil rises, so do the expenses of manufacturing and delivering things.
Inflation rises as a result; experts estimate that a $10 increase in crude oil prices will raise inflation by ten basis points. Increased gasoline costs cause India's expenditure to rise, increasing the country's budget deficit. India's current account deficit, which is the difference between the value of imported and exported goods and services and reflects how much foreign cash India owes, is influenced by growth.

1) Augmented Dicky Fuller Unit Root Test

Table 13 Unit Root Test Inflation Rate

Null Hypothesis: D(INFLATION RATE) has a unit root
Exogenous: Constant
Lag Length: 0 (Automatic - based on SIC, maxlag=14)

		t-Statistic	Prob.*
Augmented Dickey-Fuller test statistic		-13.24290	0.0000
Test critical values:	1% level	-3.457747	
	5% level	-2.873492	
	10% level	-2.573215	

*MacKinnon (1996) one-sided p-values.

Source: Self Constructed (EViews generated outcome)

Upon conducting the Augmented Dicky Fuller Unit Root Test, the Inflation Rate as a variable demonstrated a Probability of 0.0000 on Stationary Level I(1). Since this probability level is less than 0.05, we could move further to conduct the Johansen Cointegration Test.

2) Johansen Cointegration Test

Table 14 Cointegration Inflation Rate

Date: 04/18/22 Time: 16:09
Sample (adjusted): 2001M06 2020M12
Included observations: 235 after adjustments
Trend assumption: Linear deterministic trend
Series: CRUDE OIL INFLATION RATE
Lags interval (in first differences): 1 to 4

Unrestricted Cointegration Rank Test (Trace)

Hypothesized No. of CE(s)	Eigenvalue	Trace Statistic	0.05 Critical Value	Prob.**
None	0.041077	13.34164	15.49471	0.1029
At most 1	0.014719	3.484777	3.841465	0.0619

Trace test indicates no cointegration at the 0.05 level
* denotes rejection of the hypothesis at the 0.05 level
**MacKinnon-Haug-Michelis (1999) p-values

Source: Self Constructed (EViews generated outcome)

On conducting the Johansen Cointegration Test, it is clear that the Independent Variable – Crude Oil Price has no long-term relationship with the Dependent Variable – Inflation Rate Values. The test finds no traces of cointegration at the 0.05 level. Therefore, Vector Autoregression (VAR) test will be conducted to capture the relationship between both the variables as they change over time.

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3) VAR – VECTOR AUTOREGRESSION

Table 15 VAR Inflation Rate

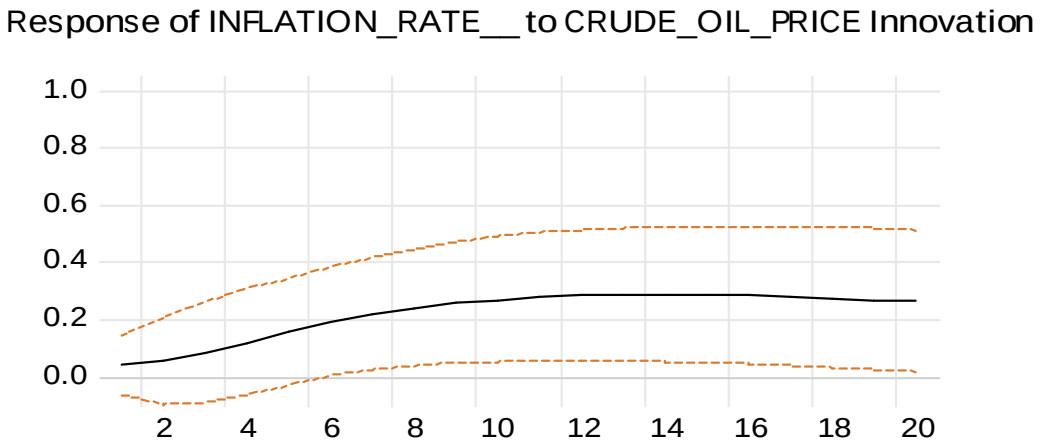
Vector Autoregression Estimates
Date: 04/18/22 Time: 16:10
Sample (adjusted): 2001M03 2020M12
Included observations: 238 after adjustments
Standard errors in ( ) & t-statistics in [ ]

	CRUDE_OIL	INFLATION_RATE
CRUDE_OIL(-1)	1.381457	0.001892
	(0.05964)	(0.00937)
	[23.1630]	[0.20194]
CRUDE_OIL(-2)	-0.422585	0.003263
	(0.05994)	(0.00942)
	[-7.05039]	[0.34648]
INFLATION_RATE(-1)	0.141533	1.102108
	(0.40980)	(0.06439)
	[0.34537]	[17.1154]
INFLATION_RATE(-2)	0.039719	-0.185575
	(0.40762)	(0.06405)
	[0.09744]	[-2.89729]
C	1.512047	0.233697
	(0.91780)	(0.14422)
	[1.64747]	[1.62045]
R-squared	0.967512	0.921319
Adj. R-squared	0.966954	0.919968
Sum sq. resids	6403.423	158.1081
S.E. equation	5.242376	0.823757
F-statistic	1734.698	682.0769
Log likelihood	-729.4931	-289.0374
Akaike AIC	6.172211	2.470902
Schwarz SC	6.245158	2.543849
Mean dependent	64.20508	6.591596
S.D. dependent	28.83818	2.911835

Source: Self Constructed (EViews generated outcome)

4) CHOLESKY ONE S.D. (d.f. adjusted) Innovations

± 2 MONTE CARLO S.E.s



Source: Self Constructed (EViews generated outcome)

Figure 7: Response of Inflation Rate to Crude Oil Price Innovation

- MAGNITUDE OF THE SHOCK: One Standard Deviation
- RED DOTS are the standard error confidence bands. The confidence intervals are computed as ± 2 SE Confidence Bands.
- X-AXIS represents the periods (Months)
- Y-AXIS shows the percentage variation

Interpreting the Figure 7, it is seen that the there exists a very rapid incline in initial 12 Periods (Months), after which the response curve flattens. It infers that one standard deviation shock on the Crude Oil prices will have rapid positive effect initially, and then pose a constant response. It is therefore understood that as Crude Oil Prices rise, the Inflation Rate rises rapidly initially, however it becomes constant after that and beyond that, the response to crude oil price fluctuation is negligible.

I. Impact On Current Account Deficit (CAD)

Over the last few years, India's reliance on crude oil imports has only grown. The percentage of people who are dependent has increased from 77.3 percent in FY2014 to 83.7 percent in FY2018. The increase in the crude oil price has a significant influence on India's current account deficit (CAD). The value of imported products and services surpasses the value of exported goods and services, as measured by the CAD. The amount of foreign currency that India owes the rest of the world is denoted by the symbol CAD. According to SBI study, assuming oil prices maintain at $80 per barrel, India's CAD might reach 2.5 percent of GDP in FY2019. CAD was forecasted to be 1.9 percent in 2017-18. As the CAD deepens, the rupee's value, as well as the rest of the economy, is under pressure.

1) Augmented Dicky Fuller Unit Root Test

Table 16 Unit Root Test CAD

Null Hypothesis: D(CAD_GROWTH) has a unit root
Exogenous: Constant
Lag Length: 5 (Automatic - based on SIC, maxlag=14)

		t-Statistic	Prob.*
Augmented Dickey-Fuller test statistic		-14.08704	0.0000
Test critical values:	1% level	-3.458347	
	5% level	-2.873755	
	10% level	-2.573355	

*MacKinnon (1996) one-sided p-values.

Source: Self Constructed (EViews generated outcome)

Upon conducting the Augmented Dicky Fuller Unit Root Test, the CAD Growth as a variable demonstrated a Probability of 0.0000 on Stationary Level I(1). Since this probability level is less than 0.05, we could move further to conduct the Johansen Cointegration Test.

2) Johansen Cointegration Test

Table 17 Cointegration Test CAD

Date: 04/18/22 Time: 16:04
Sample (adjusted): 2001M06 2020M12
Included observations: 235 after adjustments
Trend assumption: Linear deterministic trend
Series: CRUDE_OIL CAD_GROWTH
Lags interval (in first differences): 1 to 4

Unrestricted Cointegration Rank Test (Trace)

Hypothesized No. of CE(s)	Eigenvalue	Trace Statistic	0.05 Critical Value	Prob.**
None *	0.097019	28.25327	15.49471	0.0004
At most 1 *	0.018009	4.270696	3.841465	0.0388

Trace test indicates 2 cointegrating eqn(s) at the 0.05 level
* denotes rejection of the hypothesis at the 0.05 level
**MacKinnon-Haug-Michelis (1999) p-values

Source: Self Constructed (EViews generated outcome)

On conducting the Johansen Cointegration Test, it is clear that the Independent Variable – Crude Oil Price has a long-term relationship with the Dependent Variable – CAD Growth Values. The test indicates traces of cointegration at the 0.05 level. Therefore, Vector Error Correction Estimates (VEC**)** test will be conducted to capture the relationship between both the variables as they change over time.

3) VEC – Vector Error Correction Estimates

Table 18 VEC CAD

Sample (adjusted): 2001M04 2020M12
Included observations: 237 after adjustments
Standard errors in ( ) & t-statistics in [ ]

Cointegrating Eq:	CointEq1	
CRUDE_OIL(-1)	1.000000	
CAD_GROWTH(-1)	13.01016 (1.10209) [11.8050]	
C	-36.51763	
Error Correction:	**D(CRUDE...**	**D(CAD_GROWTH)**
CointEq1	-0.010498 (0.00631) [-1.66453]	-0.049592 (0.00474) [-10.4706]
D(CRUDE_OIL(-1))	0.395332 (0.06538) [6.04665]	0.094167 (0.04910) [1.91781]
D(CRUDE_OIL(-2))	-0.003332 (0.06638) [-0.05020]	0.104719 (0.04986) [2.10046]
D(CAD_GROWTH(-1))	-0.055800 (0.08346) [-0.66855]	0.304339 (0.06268) [4.85522]
D(CAD_GROWTH(-2))	-0.049496 (0.08230) [-0.60140]	0.332381 (0.06181) [5.37749]
C	0.084228 (0.34103) [0.24698]	-0.003017 (0.25612) [-0.01178]
R-squared	0.191850	0.352693
Adj. R-squared	0.174358	0.338682
Sum sq. resids	6364.963	3589.970
S.E. equation	5.249186	3.942207
F-statistic	10.96762	25.17259
Log likelihood	-726.2131	-658.3524
Akaike AIC	6.179014	5.606349
Schwarz SC	6.266813	5.694148
Mean dependent	0.109789	0.030987
S.D. dependent	5.776916	4.847682

Source: Self Constructed (EViews generated outcome)

From the above VEC Table, it is noted that CAD Growth is in Positive nature of the value 13.0101, whereas the correction value is noted to be -31.5176.

Based on output generated through VEC Model, the following equation can be developed:

ECTt-1 = [Yt-1 – njXt-1 – EmRt-1

Based on the variable adapted for the study – Crude Oil and CAD Growth, the following equation can be formed:

ECTt-1 = [1.0000 crude_oil (-1) – 13.0101 cad_growth (-1) – 36.5176

J. Impact On Indian Gross Domestic Product (GDP)

India imports 1.5 billion barrels of crude oil per year. This amounts to over 86 percent of the country's annual crude oil needs. As a result, rising crude oil prices may increase India's spending, reducing the country's fiscal deficit (the difference between total revenue and total spending). The fiscal deficit is the amount of money borrowed by the government to cover its expenses. An increase in the fiscal deficit could have a detrimental impact on the economy and markets. Between 2014 and 2016, the fall in crude oil prices was a crucial element in India's fiscal deficit being reduced. (Kotak Securities Staff, n.d.)

1) Augmented DICKY Fuller Unit Root Test

Table 19 Unit Root Test GDP

Null Hypothesis: D(GDP_GROWTH) has a unit root
Exogenous: Constant
Lag Length: 8 (Automatic - based on SIC, maxlag=14)

		t-Statistic	Prob.*
Augmented Dickey-Fuller test statistic		-9.262975	0.0000
Test critical values:	1% level	-3.458719	
	5% level	-2.873918	
	10% level	-2.573443	

*MacKinnon (1996) one-sided p-values.

Source: Self Constructed (EViews generated outcome)

Upon conducting the Augmented Dicky Fuller Unit Root Test, the CAD Growth as a variable demonstrated a Probability of 0.0000 on Stationary Level I(1). Since this probability level is less than 0.05, we could move further to conduct the Johansen Cointegration Test.

2) Johansen Cointegration Test

Table 20 Cointegration GDP

Date: 04/18/22 Time: 16:07
Sample (adjusted): 2001M06 2020M12
Included observations: 235 after adjustments
Trend assumption: Linear deterministic trend
Series: CRUDE OIL GDP GROWTH
Lags interval (in first differences): 1 to 4

Unrestricted Cointegration Rank Test (Trace)

Hypothesized No. of CE(s)	Eigenvalue	Trace Statistic	0.05 Critical Value	Prob.**
None *	0.141723	41.14936	15.49471	0.0000
At most 1 *	0.022029	5.234669	3.841465	0.0221

Trace test indicates 2 cointegrating eqn(s) at the 0.05 level
* denotes rejection of the hypothesis at the 0.05 level
**MacKinnon-Haug-Michelis (1999) p-values

Source: Self Constructed (EViews generated outcome)

On conducting the Johansen Cointegration Test, it is clear that the Independent Variable – Crude Oil Price has a long-term relationship with the Dependent Variable – CAD Growth Values. The test indicates traces of cointegration at the 0.05 level. Therefore, Vector Error Correction Estimates (VEC) test will be conducted to capture the relationship between both the variables as they change over time.

3) VEC – Vector Error Correction Estimates

Table 21 VEC GDP

Vector Error Correction Estimates
Date: 04/18/22 Time: 16:08
Sample (adjusted): 2001M04 2020M12
Included observations: 237 after adjustments
Standard errors in ( ) & t-statistics in [ ]

Cointegrating Eq:	CointEq1
CRUDE_OIL(-1)	1.000000
GDP_GROWTH(-1)	177.1124 (13.3319) [13.2849]
C	-369.0625

Error Correction:	D(CRUDE...	D(GDP_GROWTH)
CointEq1	-0.000121 (0.00065) [-0.18553]	-0.004664 (0.00035) [-13.3059]
D(CRUDE_OIL(-1))	0.413142 (0.06575) [6.28314]	0.094567 (0.03528) [2.68070]
D(CRUDE_OIL(-2))	-0.020321 (0.06752) [-0.30095]	0.099060 (0.03623) [2.73452]
D(GDP_GROWTH(-1))	-0.088234 (0.10797) [-0.81722]	0.371740 (0.05792) [6.41769]
D(GDP_GROWTH(-2))	-0.101220 (0.10716) [-0.94461]	0.405910 (0.05749) [7.06071]
C	0.085290 (0.34529) [0.24701]	-0.008693 (0.18525) [-0.04693]
R-squared	0.171526	0.459873
Adj. R-squared	0.153593	0.448182
Sum sq. resids	6525.039	1878.094
S.E. equation	5.314783	2.851364
F-statistic	9.565157	39.33541
Log likelihood	-729.1565	-581.5778
Akaike AIC	6.203852	4.958462
Schwarz SC	6.291651	5.046261
Mean dependent	0.109789	0.023443
S.D. dependent	5.776916	3.838439

Source: Self Constructed (EViews generated outcome)

From the above VEC Table, it is noted that CAD Growth is in Positive nature of the value 177.1124, whereas the correction value is noted to be -369.0625

Based on output generated through VEC Model, the following equation can be developed:

ECTt-1 = [Yt-1 – njXt-1 – EmRt-1

Based on the variable adapted for the study – Crude Oil and CAD Growth, the following equation can be formed:

ECTt-1 = [1.0000 crude_oil (-1) – 177.1124 cad_growth (-1) – 369.0625

V. DISCUSSION AND CONCLUSION

Table 22 Objective-wise Interpretation

OBJECTIVES	LITERATURE EVIDENCES	RESEARCH FINDINGS	OVERALL REMARKS
Causes for the Global Crude Oil Prices to change.	• Research evidence provided by Donga, Chun-Ping, Qiang, and YinChu (2019) • Khan (2013) wrote to explain causes of change in Crude Oil Prices.	• OPEC • Supply & Demand • Natural Disasters • Instability • Costs	The Reviewed Literature from esteemed and learned researchers and this research both provide a similar and in-agreement findings to answer the question of what causes the crude oil prices to change.
Impact of change in Crude Prices on Indian Domestic Petrol and Diesel Rates	• Study provided by Bhattacharya (2015) provided empirical evidence that rising Crude Prices resulted in higher Gasoline Rates • Saif (2015) understood that even though Crude prices remain statically down, it is the taxes that make retail fuel expensive.	• The research concluded based on cointegration that Crude Oil Prices have no long-term relation with RSP's.	The Reviewed literature provided contrasting resultants with oneself and the research findings of this paper. It is in conclusion that Crude Prices do impact RSP of fuel in present value but pose no long-term impact on the retail fuel prices of the country.
Dynamic Crude Prices driving BSE Sensex	• Kumar (2017) with his research provided that Net oil Price change have an impact on conditional volatility of BSE Sensex, but the relationship is minor in long run. • Gargesha (2018) provided evidence that crude prices play substantial volatility to Sensex and can transmit shocks to the index.	• The research concluded based on cointegration that Crude Prices have no long-term relation with Sensex.	Even though it is known that investors around the world invest and de-invest keeping in mind as Crude as an exogenous variable, this research provides a contrast to what other literary evidences suggest.
Impact of Fluctuations in Indian Basket Crude Oil Prices on Indian GDP	• Gurmeet (2012) highlighted that a rise in the crude price has an immediate negative impact on GDP.	• The research concluded based on cointegration that Crude Prices have a long-term relation with Current Account Balance Values.	The reviewed literature and this research's findings propose a similar finding, stating that there exists an immediate impact on GDP given rising crude prices, and that there exists a long-term relationship between the two variables.

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Impact of Fluctuations in Indian Basket Crude Oil Prices on Indian Inflation Rate	• Bhattacharya (2005) provided agreement to the fact that inflation has a recessionary effect on oil prices. • Rehman (2021) research resulted to a conclusion that volatility of crude has direct impact on inflation	• The research concluded based on cointegration that Crude Prices have no long-term relation with Inflation rate.	Based on reviewed literature and findings from this research, it is evident that there exist contradictory findings on the basis of relationship between Crude Oil and Inflation Rates of India.
Impact of Fluctuations in Indian Basket Crude Oil Prices on Indian CAD	• Ganesh (2017) found out that crude comprises of 37% if Indian overall imports. It therefore impacts the Current Account Balance of the country to a huge extent.	• The research concluded based on cointegration that Crude Prices have a long-term relation with Current Account Balance Values.	It is therefore in concluded that Crude Prices and Import of Crude has a substantial impact on Current Account Balances of the country. It also poses a long-term relationship between the crude prices and CAD Growth percentage.
Impact of Fluctuations in Indian Basket Crude Oil Prices on Indian Rupee and US Dollar Exchange Rates	• Rafee.B (2014) concluded that oil imports become a significant source of dollar demand, strengthening of Dollar against the Rupee. • Rehman (2021) posed in his results that dynamic crude prices drive dollar's value and economy.	• The research concluded based on cointegration that Crude Prices have no long-term relation with USD – INR Values.	It is known that India Imports nearly 85% of its crude needs. This poses a huge demand for currency for trade of such oil. Since demand for dollar stays high, the INR keeps weakening against it. However, this research found contradictory results to the reviewed literature and concluded based on analysed data that there exists no long-term relationship between the two variables.

A. Scope Of Further Study

This research focused and concentrated on majorly 7 variables namely – RSP Petrol, RSP Diesel, Sensex, Inflation Rate, GDP Growth Rate, CAD Growth, and GDP Growth. Crude Oil Prices and its Impact on Economy being a never-ending topic of research, many more Economic and Capital Market Indicators could have been taken for the purpose of further study.

This study also focuses on studying the Impact on the base on Indian Basket Crude Oil Prices. There exists a scope of study where several other benchmarks of Crude Oil Price Calculations, such as WTI, Brent, could be used to understand the impact on economy.

The paper solely analyses and interprets the value of impact on Indian Economy due to changes in Crude Prices. The study could potentially also be done on several other economies around the world, or also on the Global Economy as a whole.

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B. Suggestions And Recommendations

1) One Tax – GST levied on Petrol and Diesel

Petroleum is one of the only sectors in the Indian Economy that has still not adapted to the GST Regime of Taxation. Assuming petrol price in Delhi on 01st March 2022 was ₹91.17, the central government earned an excise duty of ₹32.90 per litre of petrol sold and ₹31.80 per litre of diesel sold. Every litre of gasoline and diesel sold is also subject to a value-added tax or a sales tax imposed by state governments. As of March 1, oil marketing firms were charging dealers ₹33.54 a litre. In addition, there was a ₹32.90 per litre excise fee and a ₹3.69 per litre dealer commission. This came to a total of ₹70.13 per litre. The state government imposed a 30 percent value-added tax on this, resulting in a price of ₹21.04 per litre. As a result, in Delhi, the retail price of gasoline was ₹91.17 per litre (70.13 + 21.04). The figures used in the computation above may differ per state, but the rationale remains the same. In Delhi, the total tax on gasoline is ₹53.94 per litre (₹32.90 excise duty + ₹21.04 value-added tax). As a result, the total tax on gasoline is around 161 percent of the amount invoiced to dealers. It also comes out to be roughly 145 percent of the amount charged to dealers plus their fee. If we make the same calculation for fuel, the total taxes levied by the state and the federal government equal 124 percent of the dealer price in Delhi. When it comes to GST, the most commonly utilised rates are 12%, 18%, and 28%, respectively. Given total calculation, if we were to assume highest GST Rate levied on any product in India, that is, 28%, the total RSP of Petrol would fall down to mere ₹47.65/litre.

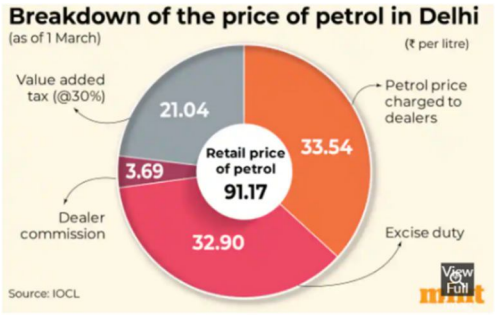

Figure 8: Breakdown of the price of petrol in Delhi
(Indian Oil Corporation Ltd., n.d.)

2) Central and State combine and levy one set of taxes

Currently, retail fuel sold from Petrol Bunks in Indian Cities, Towns and Villages are priced after including separate taxes from the Central Government and the State Government. Petrol and Diesel prices comprise of a good percentage of spendings from and Indian Citizen's pockets, and changes in their prices could impact an Indian Consumer's spendings to a good extent. If the Central Government and State Government, rather than levying separate taxes on fuel sold under their jurisdiction levied combined taxes, the overall price of sold fuel could go down to a good extent.

C. Findings And Conclusion

This research concluded with its intention to connect and establish a connection between Crude Oil Prices and the impact if its fluctuations on Retail Selling Price of Petrol and Diesel, and other Indian Macroeconomic Indicators. The Research successfully conducted various tests, namely Unit Root Test, Cointegration, VAR/VEC, and also conducted Impulse Response Analysis to understand the impact of the Independent Variable – Crude Oil Price over all Dependent Variables. The following findings could be reported post research:

1) *Impact of Crude Oil on RSP Petrol and Diesel:* The Crude Oil price fluctuation does impact the Retail Selling Price of Domestic Fuels of the country to some extent. However, the overall impact in the long run is not very substantial, and it was seen using Cointegration that such fluctuations in the independent variable would not impact the dependent variable in the long run. Impulse Response Analysis also reported that Crude Oil Price change definitely changes the RSP of Petrol and Diesel initially, however in the long run, the impact is negligible.
2) *Impact of Crude Oil on Sensex:* The Crude Oil price fluctuation does drive the BSE Sensex to negligible extent. The overall impact in the long run is not very substantial, and it was seen using Cointegration that such fluctuations in the independent variable would not impact the dependent variable in the long run. Impulse Response Analysis also reported that Crude Oil Price change changes the Sensex initially, however in the long run, the impact is insignificant.

3) *Impact of Crude Oil on USD INR Conversion Rate:* The Crude Oil price fluctuation does impact the USD INR Conversion rate to a good extent. The overall impact in the long run is substantial, given that India Imports majority of its crude oil requirement, and deals using USD to procure oil, justifying a constant and huge demand for it. It was seen using Cointegration that such fluctuations in the independent variable would not impact the dependent variable in the long run. However, Impulse Response Analysis reported that Crude Oil Price change drives changes the USD INR Conversion rate initially positively and USD becomes stronger with rise in Crude Prices
4) *Impact of Crude Oil on Inflation Rate:* The Crude Oil price fluctuation does impact the Inflation Rate of the country. The overall impact in the long run is not very substantial, and it was seen using Cointegration that such fluctuations in the independent variable would not impact the dependent variable in the long run. However, Impulse Response Analysis reported that Crude Oil Price change definitely changes the Inflation Rate Positively initially, however in the long run, the impact is constant and negligible.
5) *Impact of Crude Oil on Current Account Deficit:* The Crude Oil price fluctuation does impact the Current Account Deficit of the country. The overall impact in the long run is very substantial, and it was seen using Cointegration that such fluctuations in the independent variable would largely impact the dependent variable in the long run. Vector Error Correction Model too described that the CAD Growth was positive with a moderate figure with respect to Crude Oil Prices, therefore justifying a positive relationship between the Crude Oil price and CAD.
6) *Impact of Crude Oil on GDP Growth:* The Crude Oil price fluctuation does impact the GDP Growth of the country. The overall impact in the long run is very substantial, and it was seen using Cointegration that such fluctuations in the independent variable would largely impact the dependent variable in the long run. Vector Error Correction Model too described that the CAD Growth was positive with a large figure with respect to Crude Oil Prices, therefore justifying a positive relationship between the Crude Oil price and CAD.

The report therefore, considering all knowledge gained in this research, reports that the Fluctuations in Crude Oil Prices does impact the Indian Economy at places and its various macroeconomic variables. It directly has an impact on domestic prices of commodities and products in the Indian Market, as well as has a direct impact on Indian Consumers' Pockets and Earnings.

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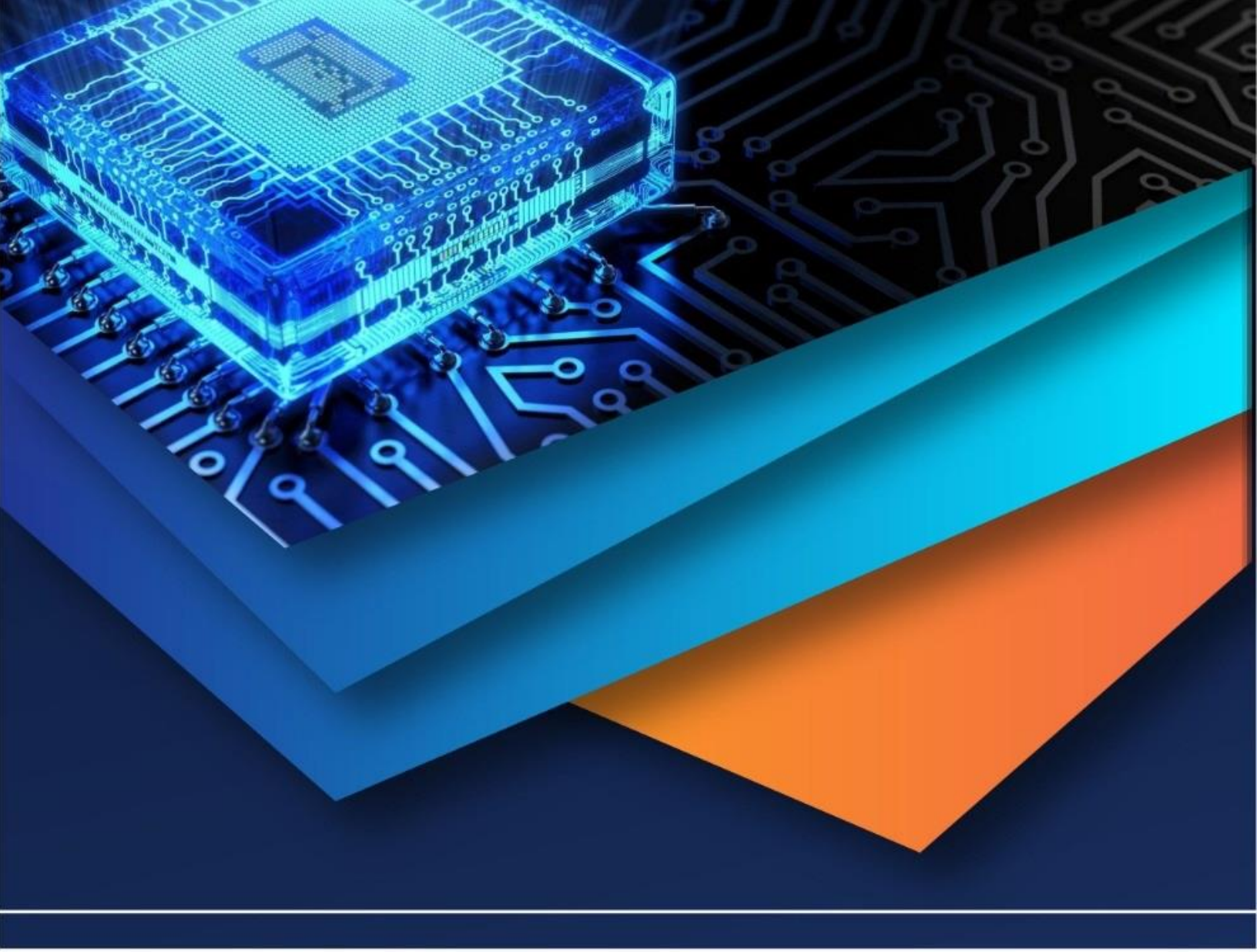

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