The Nexus Between Brent Crude Oil Volatility and Indian Stock Market Returns: An Environment Management Perspective

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Abstract
The main aim of the research paper is to study the impact of Brent crude oil price movements on the Indian stock market, with a focus on major Indian indices such as BSE SENSEX, NIFTY 50, NIFTY AUTO and key sector-specific indices such as Automobile, FMCG, Energy, and Aviation sectors and its implication on environment and importance of renewable energy. The data which is utilized for finding the effect of the Crude oil fluctuations on Indian Stock Market is secondary data which is obtained from NSE website. The time period taken for this analysis is 2016–2025 i.e. 10 years period. This secondary time-series data helps us in analysis part by applying various econometric techniques such as correlation analysis, regression modelling, unit root tests, Johansen cointegration, ARDL, VAR, Granger causality, and GARCH models to examine both short-run and long-run relationships.
On performing further analysis using Johansson Cointegration Tests, it shows no evidence of long run cointegration between Brent Crude Oil prices and Indian stock indices. The volatility model shows that Crude oil price fluctuations contribute moderate risk to Indian Stock Market. The Company-level analysis demonstrates that most firms exhibit insignificant sensitivity to oil price movements. Some cases like Automobile company named Ashok Leyland shows a significant negative relationship. Overall, the study concludes that Brent crude oil influences the Indian stock market primarily in the short run, with limited magnitude when compared to broader macroeconomic variables.

Keywords: Environment Management, Brent Oil Volatility, Crude Oil Price, Indian Stock Market, Environmental degradation, Sustainability Development Goals

Introduction

The Crude oil is an important resource which is derived from fossils buried deep inside the Earth about millions of years ago. This fossil fuel-based energy stored in crude oil is extracted from deep inside the earth. It is a non-renewable source of energy and it is present in limited reserve form across the globe. The major reserves of crude oil are found in Saudi Arabia, Venezuela, Russia, United States, Qatar etc. The acquisition of this fossil fuel-based energy resource at a discounted rate is one of the main determinants of growth of country.
The estimated total global crude oil consumption is 100–102 million barrels per day. These top five countries, US, China, India, Saudi Arabia, Russia collectively represent a significant share of global crude oil consumption. Consumption is widely distributed across developed and emerging economies, such as US and China. Crude oil prices are a critical determinant of global and domestic economic conditions, particularly for emerging economies that rely heavily on energy imports.
Brent crude oil serves as an international pricing benchmark and reflects global supply–demand imbalances, geopolitical developments, and macroeconomic uncertainty. For India, a predominantly oil-importing nation, movements in Brent crude prices have far-reaching consequences for inflation, trade balance, currency stability, and overall economic
From an Indian perspective, such volatility has critical economic implications. Since India imports a large portion of its crude oil requirements, rising oil prices lead to higher import bills, increased inflation, and pressure on the Indian rupee. This, in turn, affects corporate profitability and investor sentiment in the stock market. However, the impact is not uniform across sectors. Oil-sensitive industries such as aviation, automobile, and energy tend to be more affected, whereas sectors like FMCG may experience relatively indirect effects.
These macroeconomic effects are transmitted to the Indian equity market through multiple channels such as rising production costs, changes in consumer spending, and monetary policy responses. Broad market indices like BSE SENSEX, NIFTY 50, which represent the performance of large, diversified Indian corporations, often react to crude oil price volatility. However, the extent of impact varies significantly across sectors. Industries with high fuel dependence, such as aviation, are particularly vulnerable, while sectors like automobiles experience both direct and indirect effects depending on fuel prices, input costs, and shifts in consumer behaviour. Analysing these differentiated responses provides valuable insights into sector-specific risk exposure within the Indian stock market.
The main driver of crude oil price volatility is the geopolitical tension which arises due to conflicting interest in the regions particularly in the Middle East. The region of Middle East accounts for a substantial share of global oil production and supply chain routes to various parts of the world.
The findings of this study have important implications for **Sustainable Development Goal (SDG) 7: Affordable and Clean Energy** and **SDG 13: Climate Action** in the context of crude oil dependence. The limited and short-term impact of Brent crude oil prices on the Indian stock market suggests that the economy is gradually becoming **less sensitive to fossil fuel shocks**, which aligns with the transition toward cleaner and more sustainable energy

sources. Under **SDG 7**, the goal is to ensure access to reliable, sustainable, and affordable energy. The weak dependence of most companies on oil price fluctuations indicates increasing **diversification of energy sources**, including renewable energy such as solar and wind... The shift toward cleaner energy not only stabilizes economic performance but also promotes long-term sustainability.

In relation to **SDG 13**, which focuses on urgent action to combat climate change, reduced reliance on crude oil is crucial. High oil consumption contributes significantly to greenhouse gas emissions. The observed moderate and indirect influence of oil prices on market performance highlights an opportunity for policymakers and industries to accelerate **decarbonization efforts**. By investing in green technologies and sustainable practices, India can mitigate climate risks while maintaining economic growth.

GREEN HOUSE GAS EMISSIONS

Globally, **energy-related CO_2 emissions reached about 37.8 gigatonnes (Gt CO_2) in 2024**, an all-time high. The IEA (Internation Energy Agency) says this includes CO_2 from **fuel combustion** plus some **industrial processes**; specifically, **CO_2 from fuel combustion alone rose by about 1% in 2024**.

Year	Total CO_2 Emissions (Gt)	Total CO_2 (Billion Tonnes)	Major Source	Contribution (% of Emsissions)
2020	33.3 Gt	33.3 billion tonnes	Fossil fuels	~73%
2021	36.3 Gt	36.3 billion tonnes	Fossil fuels	~74%
2022	36.8 Gt	36.8 billion tonnes	Fossil fuels	~75%
2023	37.4 Gt	37.4 billion tonnes	Fossil fuels	~75%
2024	37.8 Gt	37.8 billion tonnes	Fossil fuels	~75%

Table 1.2 CO_2 Emissions in the last five years

Sector	Share (%)	Description
Power & Heat	~40%	Electricity generation using coal, oil, gas
Transport	~25%	Petrol, diesel, aviation fuel
Industry	~20%	Manufacturing, cement, steel
Buildings	~10%	Heating, cooking
Others	~5%	Miscellaneous

Table 1.3 Sector wise Contribution to CO_2

Cleaner fuel (Solar Power) energy plays a critical role in addressing the rising levels of greenhouse gas emissions and aligns directly with **global sustainability priorities**. According to the International Energy Agency, the continued **increase in CO_2 emissions** highlights the urgent need to transition toward low-carbon and cleaner energy sources such as **natural gas, hydrogen**, biofuels, and renewable energy technologies like solar and wind power. These alternatives emit significantly lower greenhouse gases compared to traditional fossil fuels like coal and crude oil.

The shift to cleaner fuels is closely linked with United Nations Sustainable Development Goals, particularly SDG 7 (Affordable and Clean Energy) and SDG 13 (Climate Action). SDG 7 emphasizes ensuring universal access to reliable, sustainable, and modern energy, while promoting energy efficiency and increasing the share of renewables in the global energy mix. Cleaner fuels contribute to this by reducing dependency on carbon-intensive energy systems and improving energy security.

Simultaneously, SDG 13 focuses on taking urgent action to combat climate change and its impacts. Transitioning to cleaner fuels reduces carbon emissions, mitigates global warming, and supports countries in meeting their climate commitments under international agreements like the Paris Agreement. Moreover, cleaner energy adoption enhances environmental quality, reduces air pollution-related health risks, and promotes sustainable economic growth. Therefore, accelerating the adoption of cleaner fuel energy is not only essential for emission reduction but also for achieving long-term environmental sustainability and global climate goals.

Thus, the aim of the Sustainable Development Goal 7 is to make transition from fossil fuel-based energy to Renewable and cleaner form of energy which helps in preventing global warming and healthy for the Planet. The SDG 13 helps to mitigate climate change through reduced emissions for sustainable economic growth.

Literature Review

The authors compare NIFTY with crude oil, gold, and the USD/EUR rate to separate long-run equilibrium links (cointegration) from short-run movements (often using VECM/ECM after confirming integration order). The main point is to check whether NIFTY is connected to global commodity and currency factors in the long run, while short-run gaps can occur but tend to move back toward equilibrium. (Marisetty Nagendra, 32024)

Using ARDL bounds testing, the researchers estimate short-run effects and long-run elasticities of Indian stock market performance with respect to oil prices, exchange rates, and interest rates—useful when variables are a mix of I(0) and I(1). The ARDL framework also produces an error-correction term (ECT) that measures how quickly the system returns to long-run balance after shocks. The main strength is clarity: ARDL does not require all variables to be integrated at the same order and gives easy-to-read long-run multipliers along with short-run dynamics. (Rehmani & Ansari, 2019)

The authors look at time-changing spill overs and connectedness among Indian equities and key commodities/macros (gold, oil, FX, and natural gas). The common method in this area is VAR-based connectedness (Diebold–Yilmaz approach), sometimes improved using TVP-VAR or rolling-window estimation. (Agarwal et al., 2021)

The authors treat gold and oil as both sources of risk transfer and possible hedges or safe havens for Indian equities, stressing that these roles change across market regimes. The "evolving role" idea means hedging effectiveness is not fixed and can change strongly during crises and high-volatility periods. (Maharana, N et al., 2020)

The research paper tests whether Indian stock market levels/returns move together with crude oil prices, usually using correlation and regression along with unit-root and cointegration tests, and sometimes Granger causality. The authors' main assumption is that since India imports oil, higher oil prices can hurt equities through higher inflation, weaker profit margins, and higher interest rates, though the impact can differ by sector (energy versus transport or industrials). The paper is useful as India-specific evidence to support a dissertation argument that oil acts as a priced macro risk for Indian markets. (Sharma, et al., 2018)

The authors study wavelet methods to examine how oil prices and the INR exchange rate interact across time scales. The researchers' logic is straightforward: higher oil prices can worsen India's trade balance and pressure the rupee, while exchange-rate changes can raise

The authors test how the oil price changes relate to Indian stock returns using time-series regression and testing the volatility models. The expected research contribution is straightforward as it provides India-specific evidence that oil shocks influence returns (and possibly volatility), supporting the view that oil is an important macro risk factor for an oil-importing economy like India. (Aggarwal, M. (2020).

The research paper models and forecasts oil with Stock Market linkages using VAR and variance decomposition with special attention to structural breaks and cycles. The result indicates a commodity cycle from 2008 to 2015. It also notes that the Indian stock market did not break a 5-year moving average downward even during crisis periods. The overall approach combines forecasting tools with longer time range trend indicators for interpreting market behaviour during oil cycles. (Saraswat, S et al. 2020)

Objective

Overall, the objectives are designed to provide a comprehensive understanding of oil price impact, which can support better investment decisions, risk management strategies, and policy formulation. Finally, the study supports the broader goal of sustainable development by emphasizing the need to reduce reliance on fossil fuels and transition toward cleaner energy sources. Thus, it provides both theoretical and practical contributions, making it highly relevant in today's economic environment.

The key objectives are:

1. To examine the relationship between Brent crude oil prices and the Indian stock market (BSE, NIFTY 50, Bank NIFTY)
2. To Analyze the short-run and long-run dynamics using econometric tools
3. To evaluate sector-wise sensitivity of stock indices to Brent movements
4. To explore the role of exchange rate INR/USD as a mediating factor which is under reform due to INR/RUB trade
5. To provide insights for investors, portfolio managers, and policymakers

Research Methodology

This research paper follows a quantitative, analytical, and descriptive research design, using secondary time-series data from reliable Government sources. The data are sourced from NSE, RBI, and international energy databases to ensure reliability and accuracy. This research paper utilises econometric techniques such as correlation analysis, regression, unit-root tests, cointegration, and Granger causality to examine both short-run and long-run relationships

Sampling: this research paper is based on non-probability sampling technique i.e. Judgemental Sampling where sample is selected based on prior knowledge and judgement. The sample selection relies on subjective judgement. It is based on secondary time-series data, and the sample data is chosen from the Stock Market Indices of BSE, NIFTY 50, NIFTY AUTO (sample includes the data of the sector industries such as Automobiles, FMCG, Energy and Aviation). The Sample Unit is Pan India.

All available daily observations of Brent crude oil prices and corresponding values of Indian stock indices (e.g., NIFTY 50 / sectoral indices) during the selected study period (2016-2025) are included. The time period and indices are chosen based on data availability (2016-2025) and relevance to the Indian stock market.

Data Sources: **Brent crude prices:** U.S. Energy Information Administration (EIA)

- BSE, NIFTY 50, NIFTY AUTO, FMCG, ENERGY: NSE India
- Sectoral Companies Stocks: Indigo, Ashok Leyland, GMR Airport, Jet Airways
- Time period: Last 10 years (2016-2025)

Variables: Independent Variable: Brent crude oil price (USD/bbl) (Price per barrel)
- **Dependent Variables:**
- BSE returns
- NIFTY 50 returns
- NIFTY AUTO returns
- Included Sector indices (Auto, FMCG, Energy, Aviation)
- **Control Variables:**
- INR/USD exchange rate
- INR/Rouble Trade at discount effect

Results And Analysis

The Impact of Brent Crude Oil price volatility on the Indian Stock Market is revealed through the results obtained as the output from R Studio. The analysis of the results helps in determining presence of short term as well as long term relationships between the dependent and independent variables.

Indian Stock Market Dependence On Brent Crude Oil

The Indian Stock Market's daily returns have dependency on Brent Crude Oil Price is examined using Stock Market closing price data which is available on BSE SENSEX and NSE website. The closing price data is used for analysis in R Studio and the output is obtained. The interpretation of the output helps us in finding the level of dependency. The analysis is made in two parts:

Results For Bse Sensex

The data collection is done for the period 2016 to 2025 to examine both short-term and long-term dependencies between the variables. The main objective of this report is to draw conclusion whether changes in global oil prices significantly impact BSE Stock Market returns along with sector-specific performance and individual company behavior. The analysis is completed and the statistical tools used are descriptive statistics, correlation, regression, stationarity tests, cointegration analysis, vector autoregression, and volatility modelling.

Descriptive Statistics

Series	Mean	Std Dev	Skewness	Kurtosis	Interpretation
BSE SENSEX	0.0497	1.0430	-1.3772	25.75	Moderate volatility, negative shocks
Brent Crude	0.0217	3.2304	-1.6085	105.53	Very high volatility
Auto	0.0513	1.3937	-0.4939	13.27	Moderate volatility
FMCG	0.0420	1.0127	-0.3437	15.84	Low volatility
Energy	0.0590	1.3307	-0.9671	12.85	Moderate-high volatility

Table 6.1 Descriptive Statistics

The descriptive statistics given above shows that Brent crude oil returns are significantly more volatile than BSE SENSEX returns. The **higher standard deviation** indicates that cruse oil prices fluctuations happen more sharply compared to stock market returns. The report output suggests that oil markets are more **sensitive** to global shocks such as **geopolitical events**, **supply disruptions**, and demand fluctuations. On the other hand, the BSE SENSEX shows relatively stable behaviour although it still experiences volatility. The presence of Negative skewness across all series indicates that extreme negative returns occur more frequently than positive ones which reflects market crashes or sudden drops in expectations of stock returns.

Correlation Analysis:

Variables	Correlation	Interpretation
SENSEX–Brent	0.1254	Weak positive
SENSEX–Auto	0.7766	Strong
SENSEX–FMCG	0.6666	Moderate
SENSEX–Energy	0.7345	Strong

Table 6.2 Correlation Analysis between dependent and independent variables

The correlation output result shows that the relationship between BSE SENSEX and Brent crude oil returns is weak but remains positive. It means that both variables tend to move in the same direction occasionally but the strength of this relationship is limited as given in output. The presence of **strong correlations** existed between BSESENSEX and sector-specific indices are expected because these sectors form part of the broader Indian Stock

Market. The overall result indicates that oil prices alone cannot properly explain the movements in Indian stock market.

Regression Analysis

Variable	Coefficient	p-value	Interpretation
Intercept	0.0488	0.0205	Positive base return
Brent Return	0.0405	0.0000	Small positive impact

Table 6.3 Regression Analysis between dependent and independent variables

The regression analysis on the time series data indicates that Brent returns have a positive impact but relatively smaller impact in terms of magnitude on the BSE SENSEX returns. The output suggests that when oil prices rise then stock market returns may also increase slightly in the short run. However, it is noted that the magnitude of the effect remains small which means oil prices are not a major driver of stock market returns.

Stationarity Testing:

Series	Result
BSE SENSEX Level	Non-stationary
Brent Crude Level	Non-stationary
BSE SENSEX Return	Stationary
Brent Crude Return	Stationary

Table 6.4 Stationarity Test of the Dependent and Independent Variables

The output of stationarity test gives confirmation that price levels are non-stationary while returns are stationary. It is a common result in financial data where prices follow trends but returns fluctuate around a stable mean. It justifies the use of returns for short-run analysis and conducting cointegration tests for long-run relationships.

Long-run Cointegration Relationship

Test	Result
Johansen	No cointegration
ARDL	No long-run relation
ECM	Not significant

Table 6.5 Long Term Cointegration Effect

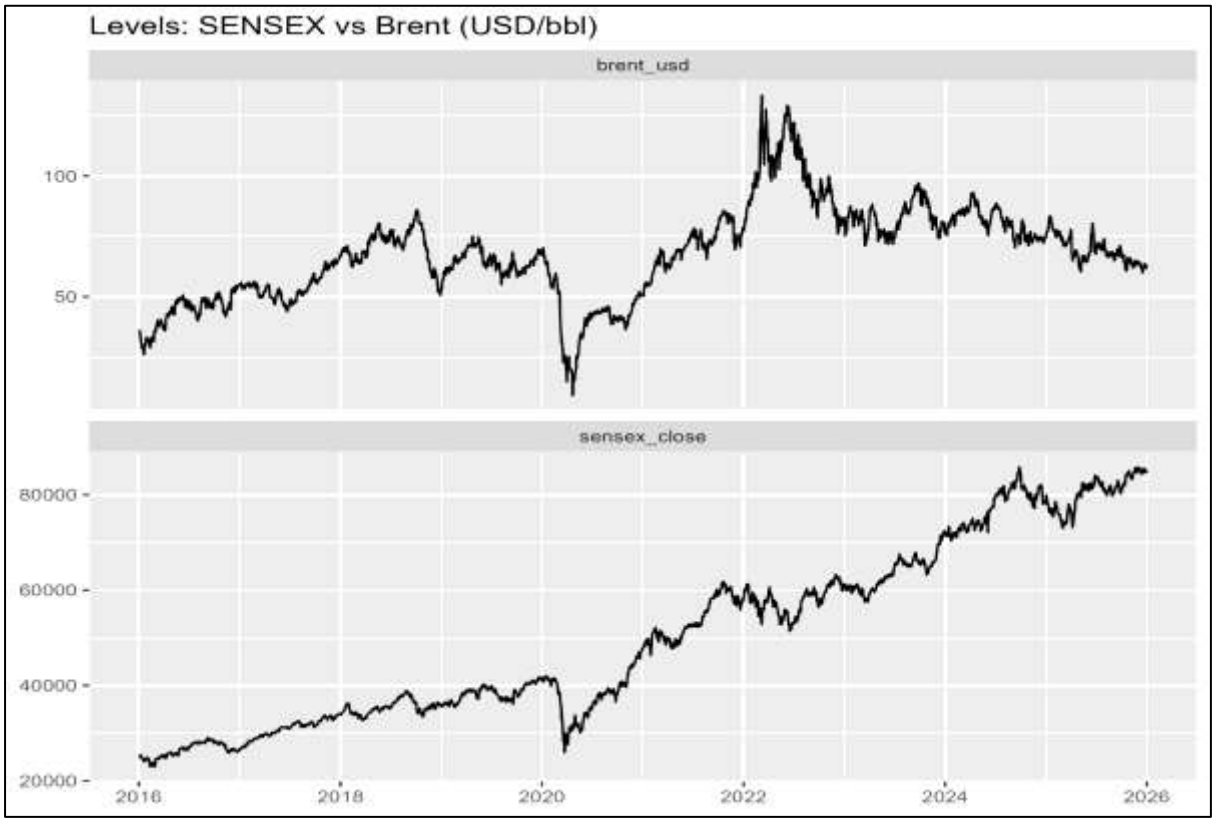
The result output shows no evidence of a long-run equilibrium relationship between Brent prices and the BSE SENSEX. It means that over time the two variables do not move together in a stable pattern whole short-term dependencies exist in this case.

Short Term Dependencies

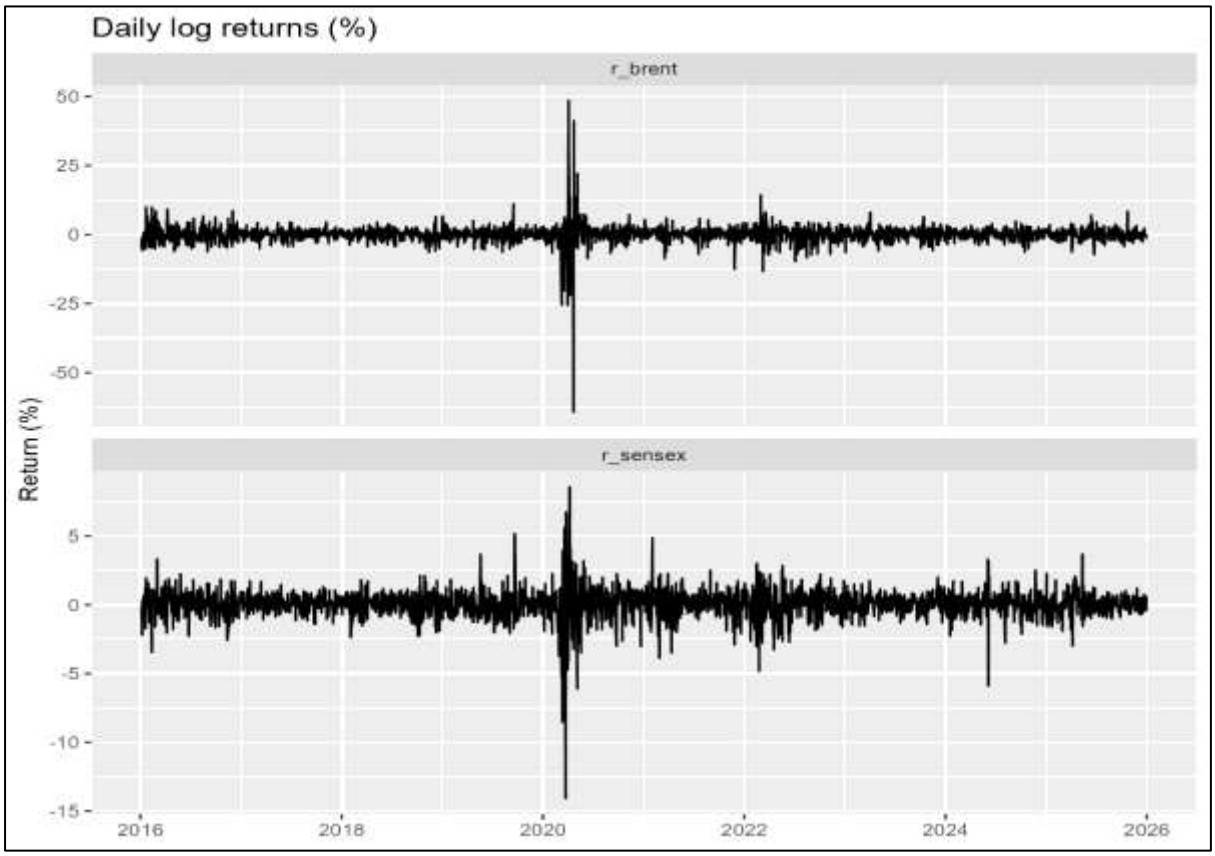
Direction	Result
Brent → BSE SENSEX	Significant
BSE SENSEX → Brent	Significant

Table 6.6 Short Term Dependencies

The Granger causality test results indicate a two-way relationship between Brent and BSE SENSEX in the short run. It suggests that past values of one variable can help predict the other variable. However, it does not imply to true causation but rather information linkage between the variables.



Graph 6.1 Showing long run curve for Brent crude (above) and BSE SENSEX



Graph 6.2 Daily Log Returns for BSE SENSEX and Brent Crude

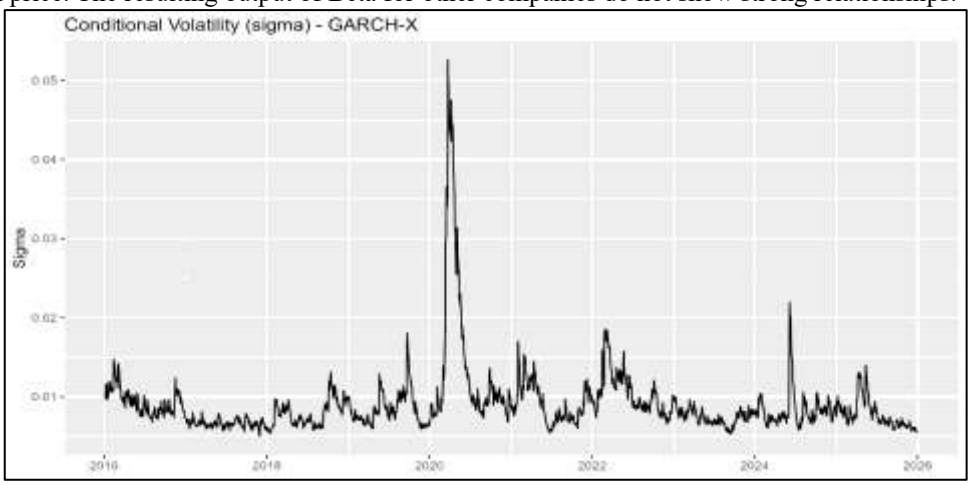
Volatility of the Sectoral Indices

Company	Beta	p-value	Interpretation
INDIGO	-0.0048	0.8269	No effect
JETAIRWAYS	0.0177	0.4440	No effect
MARUTI	-0.0144	0.4723	No effect
ASHOKLEY	-0.0513	0.0076	Significant negative

Table 6.7 Volatility of the sector-specific Indices measured by Beta

Among the list of companies studied in this report, only Ashok Leyland shows significant sensitivity to Brent oil prices. It is likely because of its dependence on fuel costs and transport demand. Ashok Leyland vehicles are

mainly linked with commercial transportation and logistics, therefore, increase in crude oil price negatively effects its stock price. The resulting output of Beta for other companies do not show strong relationships.



Graph 6.3 Conditional Volatility on GARCH Model during 2016-2025

The result of the analysis reveals that the Brent crude oil prices have shown a limited impact on the Indian stock market. The relationship between the variables is mainly **short-term** and weak in magnitude and there is **no strong long-term linkage** between oil prices and stock market performance.

Stock Indices	N	Brent_beta	Se	T-statistic	P value	Correlation
INDIGO	2,432	-0.0048	0.0221	-0.2187	0.8269	-0.0038
JETAIRWAYS	2,140	0.0177	0.0232	0.7657	0.4440	0.0153
MARUTI	2,420	-0.0144	0.0200	-0.7189	0.4723	-0.0209
ASHOKLEY	2,429	-0.0513	0.0192	-2.6733	0.0076	-0.0288
HEROMOTOCO	2,187	0.0220	0.0191	1.1546	0.2484	0.0286
GMRAIRPORT	2,426	-0.0004	0.0159	-0.0243	0.9806	-0.0003

Table 6.8 Company-level Sensitivity and correlation

The regression results examine the sensitivity of selected companies' stock returns to changes in Brent crude oil prices. Overall, the result findings indicate that most companies exhibit weak or statistically insignificant relationships with oil price movements. In case of INDIGO and GMRAIRPORT, the beta coefficients are extremely close to zero with very high p-values (0.8269 and 0.9806 respectively), indicating no meaningful impact of oil price changes on their stock returns. Similarly, JETAIRWAYS and HEROMOTOCO show weak positive relationships, but their p-values are well above the 5% significance level which suggest that these effects are not statistically reliable. MARUTI displays a weak negative relationship which implies that rising oil prices may slightly reduce stock returns due to increased fuel costs. However, the relationship is statistically insignificant indicating limited practical relevance in Stock market.

In contrast of the above companies, ASHOK LEYLAND stands out as the only company with a statistically significant negative beta (-0.0513, p = 0.0076). It signifies that increases in oil prices have a significant adverse effect on its stock performance. This can be attributed to its strong dependence on fuel costs and the commercial vehicle segment where demand is sensitive to diesel price fluctuations. Also, its exports might get severely affected due to rise in international Brent Crude prices thus reflecting negative beta value.

The correlation between the variables remains very low for across all companies studied in the report which reinforces the conclusion that Brent oil price movements explain only a small portion of stock return variability.

The overall analysis of result indicates that company-level sensitivity to Brent oil prices is generally weak with only specific firms shows the exposure effect directly.

Descriptive Statistics

Series	Mean (%)	Std. Dev.	Skewness	Kurtosis
r_nifty50	0.0500	1.0362	-1.4004	24.9703
r_brent	0.0217	3.2304	-1.6095	105.7534
r_nifty_auto	0.0513	1.3937	-0.4942	13.3007
r_nifty_fmcg	0.0420	1.0127	-0.3440	15.8774
r_nifty_energy	0.0590	1.3307	-0.9677	12.8818

Table 6.9 Descriptive Statistics

The result of the output indicates that Brent crude oil exhibits significantly higher volatility when compared to the NIFTY 50 index. The standard deviation of the Brent returns (3.23) is more than three times that of the NIFTY 50 (1.03) which highlights the unstable nature of oil prices. All return series exhibit negative skewness which indicates that a higher probability of extreme negative shocks can occur. The result is consistent with financial market behaviour during crises or sudden downturns according to the prevalent Business Environment.

The kurtosis values are substantially higher than 3 which confirms that the distributions are leptokurtic (fat-tailed). The Brent crude oil shows extremely high kurtosis (105.75) which suggest frequent extreme events such as oil price crashes or spikes. The result confirms that financial time series are non-normal, justifying the use of advanced econometric models.

Correlation Analysis:

	r_nifty50	r_brent	r_auto	r_fmcg	r_energy
r_nifty50	1.000	0.1256	0.7963	0.6720	0.7580
r_brent	0.1256	1.000	0.0843	0.0684	0.1145
r_auto	0.7963	0.0843	1.000	0.5479	0.6212
r_fmcg	0.6720	0.0684	0.5479	1.000	0.4598
r_energy	0.7580	0.1145	0.6212	0.4598	1.000

Table 6.10 Correlation Analysis

Correlation Test output result given above states that:

- Correlation (NIFTY vs Brent) = **0.1256**
- p-value = **< 0.001**

The correlation between NIFTY 50 and Brent returns is **positive but weak (0.1256)**. Thus, it indicates that both variables tend to move in the same direction but the relationship is not strong as evident from output.
The result is statistically significant which implies that Brent oil prices do have some kind of influence on stock market returns. However, the low magnitude of correlation suggests that **oil is not the dominant driver** of stock market movements.
The Sector-specific study reveals that the energy sector shows relatively higher sensitivity to oil prices which aligns with the high oil demands of the sector.

Regression Analysis

Variable	Coefficient	Std. Error	t-value	p-value
Constant	0.0491	0.0211	2.33	0.0197
r_brent	0.0403	0.0232	1.73	0.0830

Table 6.11 Regression Analysis

The regression coefficient indicates that a **1% increase** in **Brent returns** leads to a **0.04% increase** in **NIFTY returns**. However, the p-value (0.083) shows that the relationship is **not significant at 5% level**, but marginally significant at 10%.
This suggests that:

- The Brent oil has **limited direct short-term impact** on the Indian Stock Market
- The relationship between the variables is **weak and conditional**

The positive sign may reflect global growth conditions rather than a direct oil-price effect.

Stationarity (ADF Test)

Series	ADF Statistic	p-value	Conclusion
NIFTY Level	-2.22	0.4789	Non-stationary
Brent Level	-2.39	0.3832	Non-stationary
NIFTY Return	-14.65	0.000	Stationary
Brent Return	-13.41	0.000	Stationary

Table 6.12 Stationarity Test

The level series of NIFTY 50 and Brent are non-stationary which indicates the presence of trends across the series. However, the returns are stationary which make them suitable for regression and VAR modelling.
It confirms that:

- Long-run analysis → Levels
- Short-run analysis → Returns

The **Augmented Dickey-Fuller (ADF)** test results show that both NIFTY index levels and Brent crude oil prices are non-stationary at levels as the p-values in the above table 6.12 exceeds the 5% significance level. It indicates the presence of a unit root and underlying trend in the market data. However, when **first differencing** (returns) is done then both the series become stationary with **highly significant test statistics** and p-values of 0.000. The result confirms that although the price series exhibit long-term trends yet their **returns are stable** and have **mean-reverting** tendency. Therefore, the **level data** is appropriate for **long-run equilibrium analysis** such as cointegration whereas **return data** is suitable for **short-run econometric modelling** such as regression and VAR analysis.

Volatility Analysis (GARCH Model)

The GARCH-X model captures the dynamic behaviour of volatility in financial time series data. The results indicate the presence of **strong volatility clustering**, meaning periods of high volatility are followed by high volatility, and low volatility periods persist over time.

The model also shows that Brent oil price volatility has a moderate impact on the volatility of NIFTY 50. Thus, the result confirms that fluctuations in oil prices contribute to stock market risk particularly in sectors sensitive to energy costs. However, the influence is not dominant which indicates that other macroeconomic and financial factors also play a significant role in determining the market volatility.
The overall result of the findings imply that oil price uncertainty is an important but not exclusive driver of market risk, and investors should consider multiple sources of volatility when making investment decisions in the Indian Stock Market.

Company-Level Analysis:
The regression results confirms that most companies exhibit weak or statistically insignificant sensitivity to Brent oil price movements. For instance, **INDIGO** and **GMRAIRPORT** show very low beta values with high p-values which suggest that oil price fluctuations do not significantly influence their stock returns. Similarly, **JETAIRWAYS** and **HEROMOTOCO** display weak positive relationships but these are not statistically significant. **MARUTI** shows a weak negative relationship which indicates a slight adverse impact of rising oil prices although the effect remains insignificant.
In contrast of above companies, **ASHOK LEYLAND demonstrates moderate negative sensitivity** with a beta close to statistical significance ($p \approx 0.06$). It reflects the company's higher exposure to fuel costs as it operates in the commercial vehicle segment where diesel prices directly affect operating expenses and demand.
The result of the findings indicates that while oil prices influence certain sectors yet **most companies are either insulated or influenced by broader macroeconomic factors rather than oil price movements alone**.

Company	Beta	p-value	Interpretation
INDIGO	-0.004	0.86	No impact
JETAIRWAYS	0.015	0.44	Weak
MARUTI	-0.021	0.47	Weak negative
ASHOKLEY	-0.023	0.06	Moderate
HEROMOTOCO	0.029	0.25	Weak
GMRAIRPORT	0.003	0.82	No impact

Table 6.16 Company-Level Analysis of Volatility measured by Beta

The empirical analysis provides comprehensive insights into the relationship between Brent crude oil prices and the Indian stock market. First, the Brent oil prices are found to be highly volatile and non-normally distributed which reflects the influence of global geopolitical and economic uncertainties. Second, the correlation analysis indicates a weak positive relationship between oil prices and stock market returns which suggest limited co-movement.
Further, regression results reveal that the direct impact of oil price changes on stock returns is minimal which indicates that oil is not a primary driver of market performance. The absence of a strong long-run relationship as evidenced by cointegration tests also implies that stock prices and oil prices do not move together in equilibrium over time. However, short-run models such as VAR and Granger causality highlight the presence of term.
As per findings Brent crude oil acts as an important but not dominant factor influencing the Indian stock market. Its effects are largely short-term, indirect, and limited in magnitude while broader macroeconomic conditions, policy factors, and investor sentiment play a more important and substantial role in determining market performance.
The Hypothesis which is verified from above results is **H1** which states that:
H_1: Brent crude oil prices affect the performance of sectors such as Automobile, FMCG, and Aviation in Indian Stock Market.
Thus, it can be observed from the Result output data that Brent Crude oil Prices affect the performance of Indian Stock Market i.e. BSE SENSEX and NIFTY 50, along with an impact on sectoral indices like Automobile and FMCG under normal conditions when short term period is considered. We also found that NIFTY sectoral indices are also correlated like NIFTY Auto showing correlation with NIFTY Energy with 62% correlation.

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