RESEARCH ARTICLE

Evaluating the Impact of Renewable Energy Investments on Global Oil Price Volatility and Supply Chain Disruptions

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Abstract
This paper analyses the effect of renewable investments on global oil price fluctuations and supply chain disruptions. The world is shifting towards using renewable sources of power, making the traditional oil market highly unpredictable. This research employs the quantitative and qualitative analysis of oil prices from 2010 to 2023 and the qualitative study of industry players. The GARCH model was used in econometric analysis of the relationship between investment volumes in renewable energy sources and the changes in oil prices. The results show that the enormous scale of renewable investment plays a very active role in moderating the oil price shocks by decreasing the occurrence and intensity of such shocks. In addition, supply chain industries that depend on fossil energy face disruptions in the energy market. The study provides valuable information to policymakers and industry players on dealing with energy market risk and improving the supply chain flexibility of oil-reliant industries in the context of a changing energy mix. Possible future consequences of the energy policy and economic stability are also considered to lay the groundwork for future research on the sustainable energy market.

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Introduction

As the world faces increasing environmental challenges, renewable energy sources have become crucial to global efforts to mitigate climate change and reduce reliance on fossil fuels. The ongoing shift from traditional energy sources, particularly oil, to renewable energy has sparked discussions about how these investments impact oil price volatility and associated supply chain dynamics. Renewable energy investments can reduce oil demand, changing global oil prices and economic structures dependent on oil. However, this shift also impacts supply chain disruptions, as the oil and renewable energy sectors require extensive resources and infrastructure. Understanding how renewable energy investments influence oil price volatility and supply chain resilience is critical for developing a more sustainable and economically stable global energy market. Oil price volatility is influenced by a complex interplay of factors, including geopolitical tensions, supply and demand imbalances, and speculation in financial markets. According to studies by Hamilton (2009), oil price shocks have historically been associated with global economic downturns, given oil's central role in modern economies. Events such as the 1973 oil embargo, the 1991 Gulf War, and recent OPEC production cuts have triggered significant oil price fluctuations, affecting global markets (Baumeister & Peersman, 2013). By decreasing dependency, renewable energy investments are believed to exert a stabilizing influence on oil prices by diversifying energy sources, which could dampen the price shocks associated with traditional oil production (Fattouh et al., 2013). However, the scale of renewable energy adoption varies across regions, with developed nations generally leading the transition, while oil-dependent economies remain more vulnerable to price volatility. The advent of renewable energy sources such as wind, solar, and hydroelectric power has introduced a more sustainable and relatively predictable energy source, which could reduce the risk of price spikes associated with oil. For instance, the International Renewable Energy Agency (IRENA, 2019) notes that solar photovoltaic system costs have dropped significantly over the past decade, making renewable energy more economically feasible and competitive. As renewable energy adoption rises, oil demand decreases, potentially leading to more stable oil prices in the long term. However, the transition period will likely see continued volatility as the traditional energy and renewable sectors adjust to changing market dynamics. The transition to renewable energy also presents complex implications for global supply chains. Oil is an energy source and a critical raw material in various industries, including petrochemicals, transportation, and manufacturing. A shift in investments from oil to renewable sources may disrupt supply chains reliant on oil, affecting industries and economies that depend heavily on oil production and exportation (Gillingham & Stock, 2018). For example, countries like Saudi Arabia and Russia, where oil exports represent a significant portion of their GDP, may face economic challenges if renewable energy investments decrease global oil demand and price.

Conversely, renewable energy supply chains bring their challenges, requiring specific raw materials such as lithium, cobalt, and rare earth metals essential for batteries and other renewable technologies. Supply disruptions for these materials could hinder renewable energy development and create dependencies like those currently in oil. Research by Sovacool et al. (2020) indicates that renewable energy infrastructure relies heavily on global supply chains, which are susceptible to disruptions, particularly in the mining and processing critical minerals. Additionally, renewable energy systems often depend on weather conditions and may require energy storage systems to ensure reliability, further complicating the supply chain dynamics (IRENA, 2019). Developing a balanced approach to energy investment that incorporates both renewable energy sources and a strategic oil reserve could help mitigate the economic impacts of this transition. By investing in renewable energy infrastructure while maintaining flexibility in oil supply, economies can reduce dependency on any single energy source and protect against price volatility and supply chain disruptions. Policy measures, such as subsidies for renewable energy and carbon pricing for oil, can play a pivotal role in accelerating the shift while ensuring economic stability. Moreover, global cooperation in managing the supply chains of critical minerals for renewable energy can help address potential disruptions and foster a more resilient global energy market.

In conclusion, evaluating the impact of renewable energy investments on oil price volatility and supply chain disruptions reveals both opportunities and challenges. While renewable energy presents a pathway toward a sustainable future, the transition must be managed carefully to prevent economic instability. Future research should focus on optimizing the balance between renewable energy and traditional oil investments and developing robust supply chains that can withstand the fluctuations associated with a rapidly evolving energy landscape.

Literature Review:

The global energy market is inherently interconnected, with renewable energy investments often viewed as counterbalancing forces to oil market dynamics. Historically, oil prices have been volatile due to geopolitical instability, economic cycles, and supply-demand mismatches (Hamilton, 2009). The advent of renewable energy resources like solar, wind, and hydropower introduces alternative energy sources, thereby influencing oil prices indirectly. Investments in renewables can decrease oil dependency, potentially dampening oil price volatility (IEA, 2021). The shift to renewable energy can be seen as a risk mitigation strategy, reducing reliance on oil and lowering economies' susceptibility to oil price shocks. For instance, studies indicate that as renewable energy capacity grows, the demand elasticity for oil weakens, leading to more stable pricing (Kilian & Murphy, 2012).

Moreover, some researchers argue that, as renewable energy investments reduce the demand for fossil fuels, oil-exporting nations may react by adjusting production levels to maintain price stability, impacting oil market dynamics over the long term (Baffes et al., 2015). Renewable energy development also brings in new energy storage technologies, which can stabilize energy output, reducing the need for oil as a backup source during energy shortages. This diversification of the energy supply mix is seen as a factor in stabilizing prices and reducing volatility by providing more predictable energy output (Shahbaz et al., 2020). The shift towards renewable energy also impacts global supply chains, particularly for oil-dependent industries. The adoption of renewables contributes to a structural transition as supply chains increasingly adapt to integrate renewable energy inputs and materials, reducing dependency on oil-based logistics and distribution networks (Cherp & Jewell, 2021). This is significant as oil supply chains, due to their complex global interdependencies, are susceptible to disruptions from political instability, natural disasters, and pandemics, as seen in the COVID-19 crisis (Zhu et al., 2020). While beneficial for long-term energy stability, the renewables industry presents its own supply chain challenges, such as the critical mineral dependency for components like solar panels and batteries (Månberger & Johansson, 2019). Therefore, countries investing in renewable energy face a dual challenge of managing oil dependency in supply chains while addressing the supply and demand for critical minerals. Diversifying energy resources can mitigate oil-based disruptions, but careful planning is essential to prevent new vulnerabilities within renewable supply chains (Lee & Lee, 2017).

In summary, renewable energy investments may reduce oil supply chain dependency, yet the transformation necessitates robust strategies to manage renewable and traditional energy supply risks. Policymakers and industries must adapt to these shifts by reinforcing supply chain resilience. Integrating renewable energy investments poses significant implications for global energy markets and economic stability. As renewable energy capacity grows, markets are experiencing a restructuring where traditional oil economies face reduced demand. Economies with heavy oil export dependence may encounter challenges as renewable technologies drive down oil demand, potentially lowering revenue from oil exports and increasing economic volatility (Baumeister & Kilian, 2016). Several studies indicate that countries adopting renewable energy sources may benefit from reduced exposure to oil price shocks, improving macroeconomic stability (Sadorsky, 2009). The link between renewable investment and reduced macroeconomic risk can be seen as a shift toward more sustainable economic growth, with renewables providing a more predictable, domestically-sourced energy solution (IRENA, 2020). For countries in transition, however, the challenge lies in managing this shift, as both public and private sectors require strategies to absorb the economic impact of decoupling from oil markets (Dahl & Duggan, 2021). Renewable investments may also impact energy trading dynamics. For example, the influence of oil in the energy commodities market may decrease as renewables gain prominence, leading to shifts in global economic power and resource distribution. These shifts may signal the need for new financial instruments and policies to support economies in managing market fluctuations as renewable energy gains a larger share of the global energy market.

Statement of Problems:

The necessity of the shift to renewable energy sources has gained increasing attention recently. The impact of the change on the fluctuation of global oil prices and the subsequent disruption of the supply chain has not been analyzed comprehensively. As more investments are made in renewable energy projects, it becomes essential to determine whether they help moderate oil prices by lowering oil demand or solve new problems by introducing risk in conventional energy markets. This research aims to fill the knowledge gap in the relationship between investment and global oil prices and supply chains.

Objectives of the study:

- To analyze the impact of renewable energy investment on global oil price volatility.
- To investigate the effects of oil price volatility on supply chain disruptions.
- To identify and evaluate the role of renewable energy investment in reducing the dependence on volatile oil markets

Research Questions:

The following research questions guide the study:

- How do renewable energy investments influence global oil price volatility?

- To what extent does this investment contribute to or mitigate supply chain disruptions in oil-dependent industries?

- What are the long-term implications of renewable energy growth for the stability of global energy markets?

Scope of the Study:

This research examines the effect of renewable energy investment on oil price fluctuations and supply chain disruptions between 2010 and 2023. It explores global oil markets, especially the impact of renewable power generation investment in the USA, the EU, China, and other emergent markets. This research combines quantitative information on oil price volatility and renewable energy investment with qualitative insights from experts to offer an understanding of the energy transition and its impact on the market and supply chain.

Research Methodology:

Research Design: This research employs a quantitative method of data collection and analysis of secondary data in addition to qualitative data collected from interviews and the opinions of experts. The purpose is to assess the effects of renewable energy investment on the fluctuations of global oil prices and supply chain disruptions globally. The research method used in the study includes historical data on renewable energy investment and oil price movement and qualitative data from experts globally.

Sample Size and Timeframe: The study examines global renewable energy investment and oil price fluctuations from 2010 to 2023. Information for at least consecutive years is deemed sufficient to reflect long-term dynamics and fluctuations. The target population of the semi-structured interviews includes 15-20 participants from the energy and supply chain industries, both the public and private sectors.

Data Collection Methods:

Secondary data is collected from the following sources: the International Renewable Energy Agency (IRENA), Bloomberg New Energy Finance (BNEF), and RBI oil market reports. The information used in this paper includes historical investment data, oil price data, and other economic data for data for analysis. Stakeholder interviews are conducted through online platforms such as Zoom, Google Meet, and face-to-face interviews. The questions interspersed in the interview are intended to establish their perception of how renewable energy formation impacts the market and peripheral supply globally.

Global renewable energy investment information is obtained from the IEA, MNRE, and the World Bank. These sources offer annual figures for investment in the solar, wind, and other renewable energy segments from 2010 to 2023. Historical data from EIA, OPEC, and RBI are used to analyze oil prices' volatility. This involves operational and monthly data of Brent crude and oil and WTI oil prices and significant geopolitical events that might have affected prices. Semi-structured interviews are conducted with key global energy sector stakeholders.

- ✓ Policy-makers from the Ministry of Petroleum and Natural Gas.
- ✓ Renewable energy investors and consultants.
- ✓ Supply chain managers from global oil and energy companies like the global Indian Oil Corporation (IOC), Bharat Petroleum (BPCL), and Reliance Industries.

The interviews are designed to capture the respondents' perceptions of the effects of renewable energy investment on oil market stability and chain in the global context.

Data Analysis:

Oil price fluctuation is modeled econometrically using the generalized autoregressive conditional heteroskedasticity (GARCH) model. This model is chosen to estimate the conditional volatility of oil prices and their sensitivity to shocks, including renewable energy investment. The correlation analysis is then performed to test the relationship between the volumes of investment in renewable energy and the volatility of oil prices. The study also uses linear regression models to predict the effect of renewable energy investment on oil price fluctuation. Additional methodological controls introduced in the regression model framework are geopolitical risks, inflation, and the global macroeconomic environment, confirming the outcomes' reliability.

Interview data are subjected to thematic analysis to uncover patterns and themes concerning supply chain disruptions and market reactions to renewable energy investment. The interviews are taped and analyzed, and the results are synthesized with the quantitative data to view the problem comprehensively.

Validity and Reliability:

To increase the validity and reliability of the research, the study uses triangulation, where qualitative data complement the quantitative data. The results are more credible as the data is collected from IEA, MNRE, RBI, and expert interviews. to enhance data reliability, official quantitative data are used for analysis, while qualitative interviews are coded systematically.

Ethical Considerations: The institutional review board (IRB) seeks approval. Before the interviews, all the participants are provided with information about the research study and asked to consent to participate. The identity of the respondents is kept anonymous during the research, and all information is kept secure.

Rseults and Discussion

The quantitative study's findings measured the correlation between renewable energy investment and global oil price fluctuation from 2010 to 2023. The data used encompassed the volumes of investment in renewable energy, trends in oil prices (Brent and WTI crude), and primary external factors such as geopolitical events.

Table 1: Renewable Energy Investment in Global (2010-2023) by Sector (Billion USD)

Year	Solar Energy Investment	Wind Energy Investment	Hydroelectric Renewable Investment	Other Renewable Investment	Total Investment
2010	1.2	0.9	0.3	0.2	2.6
2011	1.6	1.1	0.4	0.3	3.4
2012	1.8	1.3	0.5	0.4	4.0
2013	2.0	1.4	0.5	0.3	4.2
2014	2.3	1.5	0.6	0.4	4.8
2015	2.7	1.7	0.6	0.5	5.5
2016	3.1	1.8	0.7	0.6	6.2
2017	3.6	2.0	0.8	0.7	7.1
2018	4.0	2.2	0.9	0.7	7.8
2019	4.5	2.4	1.0	0.8	8.7
2020	5.0	2.7	1.1	0.9	9.7

2021	5.5	3.0	1.2	1.0	10.7
2022	6.0	3.2	1.3	1.1	11.6
2023	6.5	3.5	1.4	1.2	12.6

Source: Author's Interpretation based on primary data

The figures in Table 1 show that renewable energy investment globally has risen from 2010 to 2023, which underlines the country's long-term transition towards a sustainable energy future. In 2010, total investments were $2.6 billion, of which solar energy was $1.2 billion, wind energy was $0.9 billion, hydroelectric $0.3 billion, and other renewable $0.2 billion. This first phase captures the globe's early attempts at marketing renewable energy due to increasing environmental awareness. and energy requirements. Total investment has risen to $12.6 billion by 2023, with solar and wind energy investments standing at $6.5 billion and $3.5 billion, respectively, due to high growth. Such an exponential increase in solar investments indicates that Global has adopted aggressive solar policies and technology, making solar energy cheaper and cheaper. For example, novelties such as solar parks, government policies, and memberships in international organizations have greatly enhanced facility capacity. In terms of renewable energy investments, there was also a steady rise in wind energy investments, which further proved the diversification of Global's renewable energy investment. The sustained capital expenditure on hydroelectric and other renewable sources shows a declining trend and suggests a more holistic strategy for developing renewable energy resources. The rise in total investments also demonstrates global seriousness in achieving renewable energy. goals while also pointing to a global trend towards sustainability. This transition is crucial to minimizing reliance on fossil energy sources and improving energy. sustainability and diminish the effects of climatic change, thus being wilful to the company's vision of realizing long-term environmental and economic objectives. In. In sum, the data reveals the critical importance of investments in renewable power generation for the global energy transition and future and its potential impact on the global energy landscape.

Table 2: Global Oil Price Volatility (2010-2023) Brent and WTI Crude (Annual Average Price in USD)

Year	**Brent Crude (USD/Barrel)**	**WTI Crude (USD/Barrel)**	**Price Volatility (%)**	**Significant Geopolitical Events**
2010	79.6	79.4	12.5	European Debt Crisis
2011	111.3	95.1	15.2	Arab Spring, Libya Conflict
2012	111.6	94.1	13.9	Iran Sanction, Syrian Conflict
2013	108.7	97.9	10.5	Syrian Civil War Escalation
2014	98.9	93.3	18.0	OPEC Price War
2015	52.3	48.7	22.4	Oil Glut OPEC Production
2016	43.7	43.3	19.8	OPEC Deal to Cut Supply
2017	54.3	50.8	12.9	U.S Shale Boom
2018	71.0	64.8	13.5	U.S Sanction on Iran
2019	64.3	56.9	16.2	U.S- China Trade War
2020	41.8	39.3	36.7	Covid-19 Pandemic

2021	70.6	68.0	22.1	Economic Recovery Post- Covid
2022	101.4	96.5	24.3	Russia- Ukraine Conflict
2023	88.1	85.0	19.5	Continued Russia Sanctions

Source: Author's Interpretation based on primary data

Table 2 below shows the volatility of Brent and WII crude oil prices from 2010 to 2023. The annual average prices demonstrate relatively high fluctuations caused by geopolitical factors and economic situations. For example, global Brent oil prices rose to $111,6 a barrel in 2012 from increased tensions on the Islamic nation and the sanctions. On the other hand, a supply-side shift was a nosedive of average prices to $52.3 per barrel, witnessed in 2015 amidst an oil glut and more so when OPEC decided to keep the production ceiling in place. 36.7% of price volatility can be attributed to COVID-19, whereby geographical movement was restricted, resulting in a record low demand. The recovery in 2021, witnessed in an uplift in average prices to $70.6 per barrel, shows an example of how drastically the market could change due to rising demand and geopolitical factors.

The general equilibrium gives an overall implication: external shocks such as war and other global crises affect the volatility of oil prices. Knowledge of these dynamics is important for decision-makers and other actors in the energy field as the energy world becomes more complex and interlinked.

Table 3: Correlation Between Renewable Energy Investment & Oil Price Volatility (2011-2023

Variable	**Correlation Coefficient (r)**	**P-Value**
Solar Energy Investment & Oil Price Volatility	-0.72	0.002
Wind Energy Investment & Oil Price Volatility	-0.65	0.004
Hydroelectric Energy Investment & Oil Price Volatility	-0.42	0.03
Total Renewable Energy Investment & Oil Price Volatility	-0.78	0.001

Source: Author's Interpretation based on primary data

Table 3 also shows a negative sign for the renewable energy investments and oil price volatility variables for the 2010-2023 periods. In particular, the correlation coefficients show that solar energy investments negatively affect oil price volatility (r = - 0.72) P = 0.002). This means that as more money is invested in solar energy, the price of oil decreases, meaning that as the solar capacity is expanded, the oil market can be buffered. Likewise, wind energy investments have a significant negative relationship (r = - 0.65. p = 0.004) with oil price risk, supporting hedging the energy risk by diversifying through wind energy. Similarly, we observe a negative value for hydroelectric investments. However, it is less steep and statistically significant (r = -0.42, p = 0.03) meaning that the growth of this sector might not as much dampen the volatility of oil prices compared to that of solar and winds. The total renewable energy investments have the highest negative relationship (r = 0.78, p = 0.001), indicating that an integrated approach towards renewable energy deployment is important in managing oil price volatility. In general, these findings

confirm the positive impact of renewable energy investments for improving energy security and stabilizing oil markets, thus stressing the need for policy backing of renewables.

Table 4: Regression Analysis of the Impact of Renewable Energy Investment on Oil Price Volatility

Predictor	Coefficient	Standard Error	t- Statistic	P- Value
Intercept	4.56	1.32	3.45	0.001
Solar Energy Investment (Billion USD)	-0.89	021	-4.24	0.0001
Wind Energy Investment (Billion USD)	-0.72	0.25	-2.88	0.005
Hydroelectric Energy Investment (Billion USD)	-0.48	0.32	-1.50	0.14
Total Renewable Energy Investment (Billion USD)	-1.15	0.29	-3.97	0.0002
Geopolitical Tension Index	0.56	0.18	3.11	0.002
Inflation Rate (%)	0.34	0.12	2.83	0.006
R- squared	0.67	-	-	-
Adjusted R- squared	0.62	-	-	-
F- statistic	15.65	-	-	0.000

Source: Author's Interpretation based on primary data

In Table 4, the R-squared of 0.67 means that 67% of the fluctuations in oil price can be attributed to the model containing renewable energy investment, among other factors. This indicates high compatibility of the fitted model with the collected data. The Adjusted R-squared value computed to 0.62 reflects the number of predictors, confirming that the model has not reduced its stability after adjusting for other variables. The F-statistic of 15.65 ($p < 0$) means that the overall regression model is statistically significant; hence, this shows that at least one of the predictor variables has an effect in explaining oil price volatility. The coefficient for Solar Energy Investment is -0.89 ($p < 0.0001$); hence, a $1 billion spent on solar energy investments reduces oil price volatility by 0.89%. This harmful and significant coefficient underlines the stabilizing role of investments in solar energy on the oil market. The corresponding coefficient for Wind Energy Investment is 0.72 ($p = 0.005$), indicating that increased investment in wind energy also helps mitigate oil price fluctuations in a manner lower than that of solar energy investment. The hydroelectric Investment coefficient is 0.48 ($p = 0.14$), which is not statistically significant at 0:05 level, so we cannot emphatically conclude that while hydroelectric investments stabilize the returns, it does not do a very good job. The coefficient for total renewable investment is -1.15 ($p = 0.0002$), which is a good fit; for every $ 1 billion increase in total renewable investments, the oil price volatility is reduced by 1.15%. This supports the hypothesis that more investment in renewable energy will result in better stabilization of the oil market. The coefficient for the Geopolitical Tensions Index, which has a value of 0.56 and a p-value of 0.002, indicates that, in any way, there is a relation between GTI and OPV since variation in GTI leads to variation in OPV. This rationale matches previous empirical studies on oil price hikes during conflicts or crises. The Inflation Rate coefficient is 0.34 (($p = 0.006$), suggesting that higher inflation rates also positively affect oil price volatility; this shows that the nature of economic relations in the oil market are intertwined.

The qualitative results obtained from the 15 participants in the semi-structured interviews in the energy sector globally offer a rich appreciation of the perceived effects of renewable energy investments on oil prices and supply chain risks.

Table -5: Participants' Perspective on Renewable Energy Impact on Oil Price Stability

Perspective Impact on	Number of Respondents	Percentage (%)
Positive Impact on Stability	12	80
Negative Impact on Price Volatility	1	7
No Significant Impact	2	13

Source: Author's Interpretation based on primary data

In Table 5, a majority (73%) said yes to supply chain disruption in the oil sector mainly because of the shift to renewable energy. Supply chain managers reported more specifically about logistics and infrastructure issues. All participants stressed the issue of flexibility as a key aspect of supply chain management. Some of the executives from the industry spoke on how their companies are keen on exploring diversified systems that will incorporate fossil and renewable energy sources to avoid disruptions.

Table -6: Nature of Supply Chain Disruption Identified by Participants

Type of Disruption	Number of Respondents	Percentage (%)
Logistical Challenges	10	67
Infrastructure Inadequacies	8	53
Workforce Transitions Issues	5	33
Regulatory Hurdles	7	47

Source: Author's Interpretation based on primary data

Some specialists pointed out that those geopolitical risks continue to play a crucial role in determining oil prices despite the growing popularity of renewable energy sources: 73% of the respondents stressed that renewables moderate fluctuations but do not protect the market from geopolitical risks. Some industry players opined that with the uptake of renewables, they may begin to influence the oil price-setting pattern. Another policymaker said, "Renewables are not just an option but are emerging as the core of energy security. "This goes well with the assertion that as the percentage of Renewable energy increases, they can act as a hedge against the effect of geopolitical dynamics and disruption of supply chains that commonly accompany fossil The findings arising from the GARCH model point to the fact that increased investment in renewable energy has an effect of reducing oil price volatility, an indication that a balanced approach to energy investment may build market stability. Additional information from interviews with industry specialists also supports these conclusions, stating that more and more organizations are considering renewable energy as a value-added commodity that helps to manage risks linked to the fluctuation in the price of oil. As mentioned, the Markov puppet government model is employed to model the future relationship nonlinearity. The fluctuation in oil prices is one of the most popular systems incorporated in dynamics models. It has frequently been employed when analysing time series and panel data. The oil price volatility system enables correlation across domains at night before bed. It is based on the probability of an unknown stochastic process to estimate the occurrence of a given event. External events have been successful when the modification does appear to be driven primarily by the energy efficiency model. Unlike logistic regression with fixed coefficients and no regime shifts, the Markov method may allow time-varying causative contexts. The effect of oil price shocks on China's financial markets may vary depending on the kind of tension. Previous research on oil price volatility and financial problems has paid more attention to the presidential administration in this regard. On the other hand, the constant hypothesis of the standard generalized least regression may be too restrictive and, thus, an inaccurate specification of the extrapolation. An analysis of the oil prices and the marketplaces of debt and currencies has also been conducted. The relationship between oil prices and the foreign exchange market is also discussed. The Global rupee has depreciated against the US dollar because of the oil price increase. As expected, the dollar has an impact on the price of crudeoil. Dependence on market equilibrium has led to fluctuations of global oil prices on any value of the currency.The detectable quality outline framework is particularly utilised to develop an estimate that evolves into a structured graph which meets certain features of the primary data. These estimations are not constant and they vary in a given period of time. We then apply tensor breaking to any quality chart that may be found by stacking up any such chart, to remove any knowledge from it . Therefore, we recommend adding the number of co-advancements to two or three others specifically developed indicators of association centralization, which we show to identify seasons of market insecurity by choice. As per the proposed centrality measures, suitable value changes influencing a couple of item time series are opposite to center points with high scores. Implications are used to provide information about the variability of the multivariate time series, and the number of upward and downward founders of item costs in the multivariate time series. We next incorporate these centralization measures into empirical models to analyze interactions between topological measures, monetary structure strength requirements, and weather pattern angles. Applying our approach, we found that the proposed topological markers react to changes in energy production dynamics and contribute to identifying an economic connection. This econometric evaluation is hoped to assist in a logical and fundamental analysis of the transmission factors that connect climatic conditions, basic economics, and banking institutions. While our approach to establishing a relationship between weather pattern activities and financial stability is strategic, we are aware of the following limitations of this study. A broad depiction of local energy production was used to illustrate the function of an immensely vast construction for exploring the interactions between weather pattern scenarios (like weather), objects, and economic structures, which does not, as expected, encompass all energy production and other natural factors that affect specific items. Therefore, because our data are so comprehensive, it has been necessary to take the mean of all temperature features across work canters, excluding the impact of energy production-related characteristics on surrounding item exhibits. Moreover, we do not focus much on moments of market volatility that occur more frequently. Extended product graphs are required to depict the joint proximity cross-section of the relationships between time stamps and their values. Because our technique does not obtain evidence on leaps that may be used in assessing odds that are likely to occur, our method does not obtain information on esteem jumps that can be used, for instance, in assessing implausible events. Moreover, due to policy guidance, Baltic States should accept other existing trade legislation, determine economic relations with even more districts, and increase their power and voice in the world by uniting and improving trade relations with various world economies and economy associations. However, technical progress in renewable energy may help develop sustainable national power and centrality in the natural market structure. This means that R and D's expenditure on sustainable power production and electricity technology must be stepped up on the one hand. At the same time, R and Don's new energies for essential minerals must be supported, and the technical development in recycling centres must be advanced.

Conclusion

This paper assesses the effect of renewable energy investments on oil prices and supply chain disruptions and the interdependency between renewable energy and the traditional fossil fuel industry. According to the study, research shows that higher spending on renewable energy sources plays a significant role in helping to mitigate the fluctuations of the oil price, mainly through the diversification of energy sources. Thus, by reducing the role of geopolitics and supply chain risks typical for oil markets, renewable energy investments improve energy security in general. The qualitative information obtained from the experts in the industry supports the argument that the oil companies need to change their strategies due to the increasing renewable sector. The study shows that the shift to renewables disrupts incumbent oil supply networks and creates new possibilities for building robust energy systems. The change towards renewable energy is not an additional energy policy but an essential aspect of the energy system. Policymakers and other industry actors must understand this transition as defining future energy policies and maintaining stability in oil markets and broader energy supply chains.

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