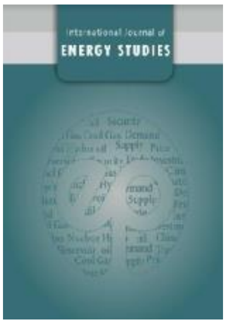
INTERNATIONAL JOURNAL OF ENERGY STUDIES

e-ISSN: 2717-7513 (ONLINE); homepage: https://dergipark.org.tr/tr/pub/ijes



Research Article

Int J Energy Studies, 2022; 7(1): 1-20

Received: 05 Jan 2022
Revised: 06 May 2022
Accepted: 22 May 2022

Investigating the effects of climate policy uncertainty on the US petroleum markets

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Highlights

- The Climate Policy Uncertainty Index has been taken to determine the climate uncertainty impacts on US petroleum markets
- Multiple tests were employed in the VAR model to determine the interactions between the two indices
- The results of the tests suggest that the CPU is not a good predictor for the US petroleum market and vice versa

You can cite this article as: Hamad Ameen, M.H, Afşar, A. "Investigating the effects of climate policy uncertainty on the us petroleum markets", International *Journal of Energy Studies* 2022; 7(1): 1-20.

ABSTRACT

The uncertainty of climate policy and its impact on the petroleum markets has attracted the attention of many researchers over the past two decades. Many research works have been conducted regarding the reactions of each variable to the other and the present study aims to investigate the effects of climate policy uncertainty on the US petroleum markets by taking the Climate Policy Uncertainty Index (CPU) and the Petroleum Markets EMV tracker data (PEMV) based on monthly data which starts from Jan 2000 to March 2021. We employ multiple tests by using the VAR model to analyze the collected data. First, the results of the Granger causality test show no causality cause between the CPU and PEMV indices. Second, the outcomes of the Impulse response test show only the reactions come to the variables themselves positively but provide no meaning to the shocks of each variable to the other one. Lastly, the results of the variance decomposition test imply that the variables highly lagged with their dynamics which is about 98 percentile for each variable.

Keywords: CPU index, PEMV index, VAR model

1. INTRODUCTION

Climate change is now widely acknowledged as posing severe challenges to financial stability, and as such, it is relevant to the mandates of central banks and financial supervisors. Therefore, central banks and supervisors are recognizing climate-related financial risks as important to their financial stability objectives. The current approach to climate risk is based on incorrect assumptions about financial market dynamics and the environmental difficulties we face. To solve this shortcoming, financial policymakers must have a better knowledge of climate policy uncertainty. Hence, the Bank of England is now paying more attention to climate risk as part of its responsibility to ensure financial stability. This includes 'physical risks', such as increased frequency of extreme weather events like droughts, flooding, and storms. Second, 'transition risks', such as significant shifts in asset values and business costs due to policy or technology changes associated with the low-carbon transition; and third 'liability risks', such as increased compensation claims that will almost certainly result from the other two types of risk. As a result, the Bank of England, as well as the Network for Greening the Financial System which includes 50 central banks and regulators from across the world, is putting a lot of effort into establishing tools to assess these risks. This is also the main goal of the Task Force on Climate-Related Disclosures, which expects that firms would embrace climate risk-measuring methodology for disclosure reasons in the future [1].

Therefore, many climate experts appear to be concerned about the significant level of uncertainty in climate change science [2]. Numerous conferences, media debates, and scientific studies have been held on the subject [3, 4, 5, 6]. Climate change is a classic example of a 'wicked problem' in terms of public policy [7]. Despite the overwhelming scientific data presently accessible, climate change remains a contentious issue [8]. Fundamentally, uncertainties in the field of climate change stem from a lack of knowledge about the potential physical consequences of increased greenhouse gas concentrations in aerospace, as well as the cost of reducing greenhouse gas emissions to halt this accumulation. The two most uncertain properties that control the climate system's response to increases in greenhouse gas concentrations over several decades are climate sensitivity, or the increase in global mean temperature in response to a doubling of atmospheric concentrations, and the proportion of heat uptake by the deep ocean [9]. The climate sensitivity parameter is usually given as 1.5 - 4.5°C, which is the range given in the Third Assessment Report of the Intergovernmental Panel on Climate Change (IPCC). In addition to climate sensitivity and economic implications, the expense of technologies for lowering emissions is another significant source of uncertainty. This has an impact on policy decisions as well as the expenditures that businesses will incur in order to achieve mitigation obligations [10]. The global climate system is extremely intricate, and the causal chain extending from greenhouse gas emissions to rising atmospherical greenhouse gas attentiveness, rising universal average temperatures, alterations in territorial climate systems, and eventually, effects on socio-economic systems, results in an increasing propagation of irresolutions with each link in the sequence i.e. there is an abnormal change in the energy industry, in particular, fossil fuel and petroleum markets [11, 12]**.**

Energy executives in the United States, as well as the Wall Street bankers and investors who support them, are doing little to increase output to levels that would lower prices. Manufacturers are still chafing at recollections of the early-pandemic price fall. Even Wall Street is not overjoyed. Not only have banks and investors lost money in the sector's boom-bust cycles over the last ten years, but many also say they are willing to reduce their exposure to fossil fuels in order to achieve their climate change pledges. Nevertheless, in October 2021, the price of fossil fuels skyrocketed. After OPEC and its partners declined to considerably increase supply, the primary US oil price rose to around $80 a barrel, which is a seven-year high. Moreover, a gallon of gasoline costs a dollar which is more than it did a year ago in the United States. Natural gas costs have risen by more than 150% in the same time period, and this is threatening to drive up the cost of food, chemicals, and plastic items, as well as heating in winter. Oil, natural gas, and coal prices have risen substantially in recent months, putting the global energy system in jeopardy [13]**.** Fuel poverties and panic buying have resulted in outages and huge queues at gas stations in China and the United Kingdom [14]**.** Though country-specific variables may contribute to the high prices, there must be a more basic cause. Above all, mineral and agricultural commodity price indexes, like fuel prices, have returned from a six-year depression, resuming their 2014 levels. The long-standing link between the prices of many commodities reveals a shared macroeconomic rationale. The obvious cause for the rise in energy prices in 2021 is the world's strong economic expansion after the fall down in prices during the first stages of the epidemic [15]**.** Although the circumstances are not as bad in the United States as in the aforementioned countries, oil and gasoline prices are high enough causing President Joe Biden to call on international producers to increase supplies. Concurrently, he is pressuring Congress to address climate change by shifting the country away from fossil fuels and toward renewable energy and electric vehicles. However, the industry continues to fund climate science denial, create fresh destruction, and advocate for the existing quo to be maintained. Moreover, It has been emphasized by many researchers that the oil industry is misguided by the energy companies, and these firms manipulate and mislead the public claims [16, 17, 18]**.** The issue is more pressing now that officials from over 200 countries have met in Glasgow for the United Nations Climate Change Conference (COP26), where they are expected to declare their goal to attain net-zero carbon emissions by 2050 [19]**.** Therefore, we endeavor to determine how the petroleum markets reacted to the climate policy uncertainty in the last twenty years in the United States of America. This study provides a clear understanding of the current uncertainties in the petroleum markets and climate risks. Investors in the oil and gas industry can have a better prediction by reading this paper and also analyzing twenty years of interaction between the two variables can prove whether climate change affects the US petroleum markets or not. Thereby, the perspective of investors, especially those who predominantly use an environmental, social, and governance (ESG) perspective may change towards the oil and gas companies.

On that account, we take the Climate Policy Uncertainty (CPU) Index which has recently constructed by Gavriilidis in June 2021 [20]**.** And the petroleum markets (EMV) tracker index inside the US Equity Market Volatility (EMV) Index gathered on the Economic Policy Uncertainty website [21]**.** Gvariilidis takes several articles in eight different major newspapers in the USA to construct the CPU index. He compares the number of relevant articles published each month to the overall number of articles published that month. And then, he standardizes eight series to a unit standard deviation and averages across the newspapers by the month. Eventually, over the period 2000:M1-2021:M3, the averaged series are normalized to a mean value of 100 [21]**.** Thereby, the present study aims to investigate the relationship between climate policy uncertainty and petroleum markets in the USA. For this purpose, we use Vector Autoregression (VAR) model to analyze the collected data as it starts from January 2000 to March 2021 based on monthly data. We first provide an introduction to the topic as the first step of our study. Then, we gather the previous studies related to the topic in the literature review. After that, the data and methodology are explained in the third part. The fourth and fifth parts contain the results and conclusion of the study respectively.

2. LITERATURE REVIEW

As climate change gets concerned worldwide, many other sectors are being affected by the plans, projects, and pledges in the international conferences regarding climate change and the new policies by the world leaders [22]**.** Governments all across the globe are working hard to reduce

CO2 emissions, and the latest United Nations Climate Change Conference (COP26) in Glasgow included a coal reduction strategy for the first time [23]**.** Meanwhile, the increase in global demand for oil sources is a border in front of the leaders to not come up with their pledges and they are powerless to apply the commitments they promise in the global meetings [24]**.** Therefore, the impact of climate change on the oil industry, and the petroleum market responses to the uncertainties and policies of climate change have left many researchers scratching their heads over the past decade. For instance, Levy et al, investigated the responses of multinational corporations in the oil industry to the prospect of international controls on greenhouse gases by taking four different oil companies in the US and Europe. According to the results, the oil companies see climate change as a big danger to their business operation and performance [25]**.** Rozenberg et al, examine the interactions between climate change policies and the uncertainty in the oil supply. They applied the global energy economy model to determine the linkage between the variables by evaluating the costs of climate initiatives and oil scarcity in a single framework that takes macroeconomic feedback into account. The study demonstrates that both costs are on the same scale. Furthermore, their findings show that climate policies minimize global susceptibility to peak oil in the context of a finite and unpredictable amount of eventually recoverable oil resources. Certainly, appropriate measures could help to mitigate this risk. However, if they switch to coal as a source of electricity, greenhouse gas emissions will skyrocket. Climate policy, on the other hand, can benefit both parties by averting hazardous climate change and hedging against oil supply unpredictability [26]**.**

In 2012, Maisonnave et al, examine the relationship between EU climate policy and its economic responses to the increases in oil prices. Using the GEM-E3 computable general equilibrium model to investigate the data and taking three hypotheses which include the rise of oil price and its impacts on the EU economy, the increase of climate policy, and the last scenario is the increase of oil price when the EU economic policy realized. The results show the effects of climate policy on the EU's economic policy and its value of GDP [27]**.** In 2013, Fertel et al, used SWOT analysis to investigate the relationship between Canadian energy and climate policies. Beyond the implementation of market principles, the results demonstrate a lack of consistency in Canadian energy and climate strategy. Further, in other areas, the Canadian method consists of a collection of provincial decisions made without consultation with the federal government or other provinces. And they imply that increasing collaboration between dissimilar jurisdictions by employing a wide range of policy tools and relying on existing intergovernmental organizations is one strategy to achieve policy coherence [28]**.** Liu et al, take OVX as a barometer of oil market turbulence to determine the long and short-term transmissions that come by EVZ, VIX, and GVZ indices. The results provide no relationship for long-term effects among the variables. Meanwhile, the oil market volatility index is affected by the other indices. This means that the uncertainty in other markets can influence the volatility in the oil market. Moreover, the results indicate that the shocks of OVX are positive and a substantial transmission over a short period of time has been confirmed between the oil market and the aforementioned variables [29]**.** A report by New Climate Economy also implies that the volatility in oil price hurt the economy in different ways and there is a price to pay for relying on fossil fuels. The economic harm can be avoided by taking steps to lessen this reliance. For instance, reducing the economy's energy intensity, increasing the share of non-fossil energy, and improving energy efficiency are all options to reduce the dependence [30]**.** Paterson et al, carried out a study that regarded climate change and its impacts on oil palm in Indonesia and Malaysia. The results of the study illustrate that climate change will have a significant impact on oil palm growth, with clear implications for the economies of Indonesia and Malaysia, as well as the oil palm industry, but with potential benefits in terms of climate change mitigation [31]**.**

Buer et al, applied the REMIND model to analyze the mitigation between international fossil energy markets and climate change and also the changes that come to the economy by the climate change policies. The study concludes that in the absence of climate policy, a considerable portion of fossil fuel stocks and resources will be consumed, resulting in atmospheric GHG concentrations well beyond 550 ppm CO2-eq. The means that the uncertainties in climate change affect the petroleum market volume and its volatility [32]**.** Another study in 2016 by Aloui et al, indicates the reaction of oil returns to the changes and/or uncertainties in economic policy and equity policy uncertainty. They utilized the data from January 2000 to May 2014 in the US market [33]**.** Fahen et al, consider the demand and supply sides of fossil fuels and how they would be affected by climate policies in Norway. They discover the most cost-effective mix of the two types of policy in the country. Given concern for global emissions and a desire for domestic action, their numerical estimates suggest that supply-side policies should account for roughly two-thirds of the emission reductions [34]**.**

Erickson et al, illustrate how the climate policy affects the usage of fossil fuel products by evidencing California state in the USA. They suggest that one way to decrease the CO2 emissions is by lowering the production, not only the consumption of the products. Thereby, the state can considerably reduce the global CO2 emissions and improve environmental justice in California [35]**.** In the same year, Jou investigates the relations between three important indices in the US economy which are the carbon emission, GDP, and oil prices between 1985-2013 time-series data. The results of the VECM model show that the fluctuations in oil price change the carbon emission usage for both the long and short term. Plus, it has a short-term impact on the GDP in the US [36]**.** Mercure et al, used the integrated global economy–environment simulation model to show the connection between the macroeconomic variables and the standard fossil fuel assets (SFFA). According to their study, a part of the SFFA would materialize as an outcome of an already existing technological trajectory, regardless of whether new climate policies are adopted or not. If new climate regulations are adopted to meet the Paris Agreement's 2°C objectives, and/or if low-cost producers (some OPEC nations for example) maintain their output levels despite diminishing demand, the loss will be magnified. The loss from SFFA could amount to a discounted global wealth loss of 1 to 4 trillion US dollars, and there are clear distributional impacts, with winners such as net importers like China or the EU and losers such as Russia, the US, or Canada, whose fossil fuel industries could be nearly shut down, though the two effects would largely offset each other at the global GDP level [37]**.**

Holden in a report addresses that the Oil firms in the United States are attempting to recast themselves as part of the answer to the climate catastrophe, beginning a campaign to countertop Democrats' proposals to drastically reduce emissions from power plants and automobiles that use the industry's petroleum and natural gas [38]**.** Moreover, oil executives would want to avoid coal's fate. Shell’s CEO Van Beurden assesses the challenges his company will face over the next ten years: deteriorating public reputation, changed customer behavior, the danger of being the next target of activist investors, and government leaders' bold promises to drastically reduce emissions. However, therefore, he adds that corporations like Shell must be prepared to adapt to the changes [39]**.** A study conducted by Abumunshar et al, demonstrated the bad effects of oil consumption and its impacts on the carbon emission in Turkey by using multiple models to examine the relationship between the oil price and other renewable and non-renewable energy sources, and the carbon emission between 1985-2015 time series data in the nation. They suggest that Turkey should decrease the non-renewable energy consumption instead invest in renewable energy sources [40]**.** Maghyereh et al, believe that the volatility in oil prices can impact the value firms in the US. According to their study, energy companies, in particular, have been affected by the fluctuations in oil prices during the 1984-2017 time period [41]**.** Meanwhile, another study showed that the global oil price does have a negative impact on stock market returns in Turkey [42]**.**

Nam examines the impact of uncertainty of climate change on the international commodity market. Thereby, he uses the time-varying factor augmented model and stochastic volatility mean model to analyze the data. According to the results, climate uncertainty puts upward pressure on agricultural food, non-energy, and energy commodities for the El Niño years. Second, particular commodities like maize and soybeans are more vulnerable to the effects of climate uncertainty than commodity indices as a whole. Third, climatic uncertainty causes individual agricultural commodities to experience a negative demand shock as a result of a negative supply shock and market uncertainty [43]**.** Fried et al, investigate the macroeconomic risks of climate policy uncertainty by concentrating on the economy's output side. They discover that the climate policy risk decreases carbon emissions by pushing the capital stock to diminish and become cleaner. However, the results show that a carbon price might accomplish the same decrease in emissions at a fraction of the cost [44]**.** Wi et al, use an EIO-LCA-based approach to calculate the carbon emissions of 1089 Chinese enterprises and examine the effects of global crude oil price variations and corporate development levels on individual company carbon emissions. They prove that the company's carbon emissions may be reduced if global crude oil price uncertainty rises. Plus, they discovered that there may be an inverted U-shaped environmental Kuznets curve (EKC) association between a company's level of development and its environmental performance. Nevertheless, certain deviations to corporate carbon performance may arise as a result of certain business features such as state-owned status and stock exchange listing [45]**.**

November 2021 was sensitive to the global oil market due to various reasons. First, is the COP26 summit [46]**.** Second, the white house’s and president Biden’s decisions regarding the oil price and the supply of oil and also their plan to meet the climate policy goals till 2050 [47]**.** Lastly, the new variant in South Africa is named Omicron by WHO [48]**.** These three factors, particularly the new variant, affected the oil prices by a 10% decrease and was the biggest one-day drop since April 2020 [49]**.** On the other hand, the borders that the American Petroleum Institute (API) and the large corporations such as Shell, Exxon, BP, etc.., create to manipulate the oil industry and climate policies make the climate plans much more sensible. Shell and other big oil companies are accused by critics of utilizing API as a cover for the industry. Moreover, Senator Sheldon Whitehouse, a Democrat from Rhode Island and a vocal critic of big oil's public relations tactics, accused API of "lying on a large industrial scale" about the climate crises in order to obstruct climate legislation and mentioned that the main oil companies and API are extremely closely linked [50]**.** Xu et al., examine the impacts of some macroeconomic variables on oil prices in China by using the FAVAR model. They reveal that the oil prices heavily respond to the shocks that come to the energy market uncertainty and other uncertainty shocks. Moreover, oil prices are affected by alternative energy sources [51]**.** Climate changes also cost a lot to energy companies. Doshi in an article shows that even while their lobbyists obstruct reform, energy companies are taking extreme efforts to safeguard their operations from the effects of climate change [52]**.** And also, Sommer believes that long-term investments in the petroleum market are not a wise decision particularly after the Covid-19 epidemic when the oil prices soared high due to the higher demand. However, he believes that the companies are required to respond to climate change therefore the long-term energy supply constraints [53]**.**

3. DATA AND METHODOLOGY

As we mentioned in the introduction section, we use the U.S. climate policy uncertainty index (CPU) [20] which is the data obtained on the EPU website [21]. On the other hand, the petroleum markets EMV tracker index (PEMV) and the data gathered in EPU website as well. The time-series data is monthly and starts from 01.01.2000 to 01.03.2021. We use the Vector-Autoregression (VAR) model constructed by (Stock & Watson, 2001) and employ it in the Eviews program [54] to analyze the data.

The data has to be filtered before analyzing by the VAR model. Thus, we describe the data and its stationary status by utilizing the ADF unit root test [55] to looking its statistics status and stationary status as can be seen in the first and second tables below. Then, we look at the probability of the data by applying the Heteroskidacity test and Autocorrelation LM test. and then we apply the AR graph unit root test. After that, we apply the Granger causality test [56] to determine the g-causes between the data. Further, the Impulse response test developed by [57] was applied to show how the climate uncertainty shocks affect US petroleum markets, and the Variance decomposition test was employed to show the interactions between the taken variables. This test determines how much information each variable adds to the other variables in the autorepression. It calculates how much of each variable's forecast error variance may be explained by external shocks to the other variables. The results are located in the tables below.

4. DATA ANALYSIS AND FINDINGS

The table below shows the nature of the data and a summary statistic that describes the characteristics of the collected data based on a common statistics table.

Table 1. Descriptive Statistics

	Mean	Std.Dev	Skewness	Kurtosis	Jarque_bera
DLCPU	0.007217	0.743132	0.210947	2.985543**	43.60743***
PEMV	4.776610	2.588103**	1.976135	1.976135**	562.4032***

*%1 **%5 ***%10

As can be seen above, the CPU index has an average value of mean with 0.007217, 0.743132 standard deviations, a normal skewness with 0.210947, and a high value of kurtosis. Plus, a normal constrained in jarque bera. Meanwhile, the PEMV index shows a 4.776610 mean, a 2.588103 standard deviation, a 1.976135 skewness, a high kurtosis, with a normally constrained jarque bera by 562.4032.

Table 2. ADF Unit Root Test

ADF UNIT ROOT TEST	Intercept	Trend& Intercept
DLCPU	<0.01	<0.01
PEMV	<0.01	<0.01

The stationary of the data is significant and Applying the ADF unit root test would be helpful to know the stationary status and run the VAR model healthy. As can be seen in the table above the data is stationary in both intercept and trend&intercept.

Table 3. Heteroskedasticity Test

Heteroskedasticity test result	
Prob.	0.8578

Employing the heteroskedasticity test is another important assumption in our model to know the existence of this feature in our data, and the results in table 3 show that heteroskedasticity exists in the applied model.

Table 4. Autocorrelation LM Test

Prob.
0.8723
0.9828
0.1130
0.4948
0.2781
0.4815
0.3766
0.8319
0.2482
0.6891

Correlating the data and the variables is necessary and applying the autocorrelation test can help us to know the linkage between the data. According to the outcomes of this test as shown in the table above, the correlation exists among all the data and they are greater than 10%. This tells us that the data is constrained.

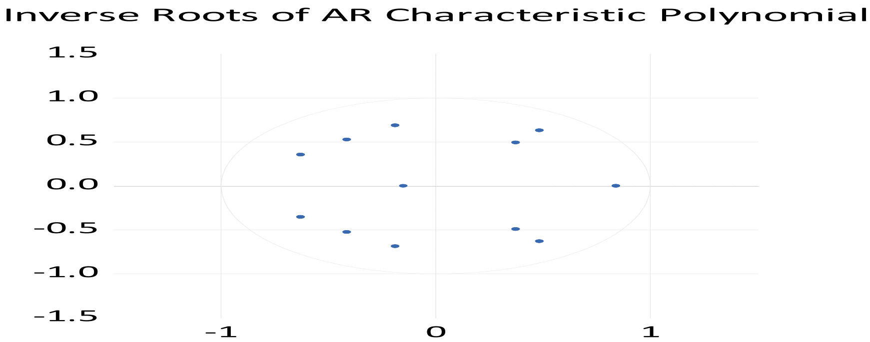

Figure 1. AR Roots Grap

According to the AR roots test, the VAR is stable due to all the roots are located inside the circle. Therefore, all the restrictions are met in the VAR model and it is constrained in the (6) model.

After determining all the necessary steps to create the VAR model and the stationary status of the collected data. We can now use the Granger causality test to examine the causality relationships between the two variables.

Table 5. Granger Causality Test

	Granger Causality
DLCPU ≠ > PEMV	0.3882
PEMV ≠ > DLCPU	0.4335

The Granger causality tests suggested that US climate policy uncertainty is not a significant predictor of US petroleum markets and vice versa. In other words, there is no G-causality between the CPU and PEMV indices. The results above mean that climate policy uncertainty can not cause the US petroleum markets. As we mentioned above the CPU index has been constructed based on the articles and daily news in eight U.S. major newspapers regarding climate risks, greenhouse gases, carbon dioxide, environmental changes, renewable energy projects, White house legislations, laws, and global warming in the last twenty years. Although many studies indicate the negative impacts of energy firms on climate change but the companies in the sector misled the public and played with the facts. This may be the reason why the test provides such a result.

The next test here is the impulse response test which this uses to determine the reactions of the shocks that come from one variable to the other variable.

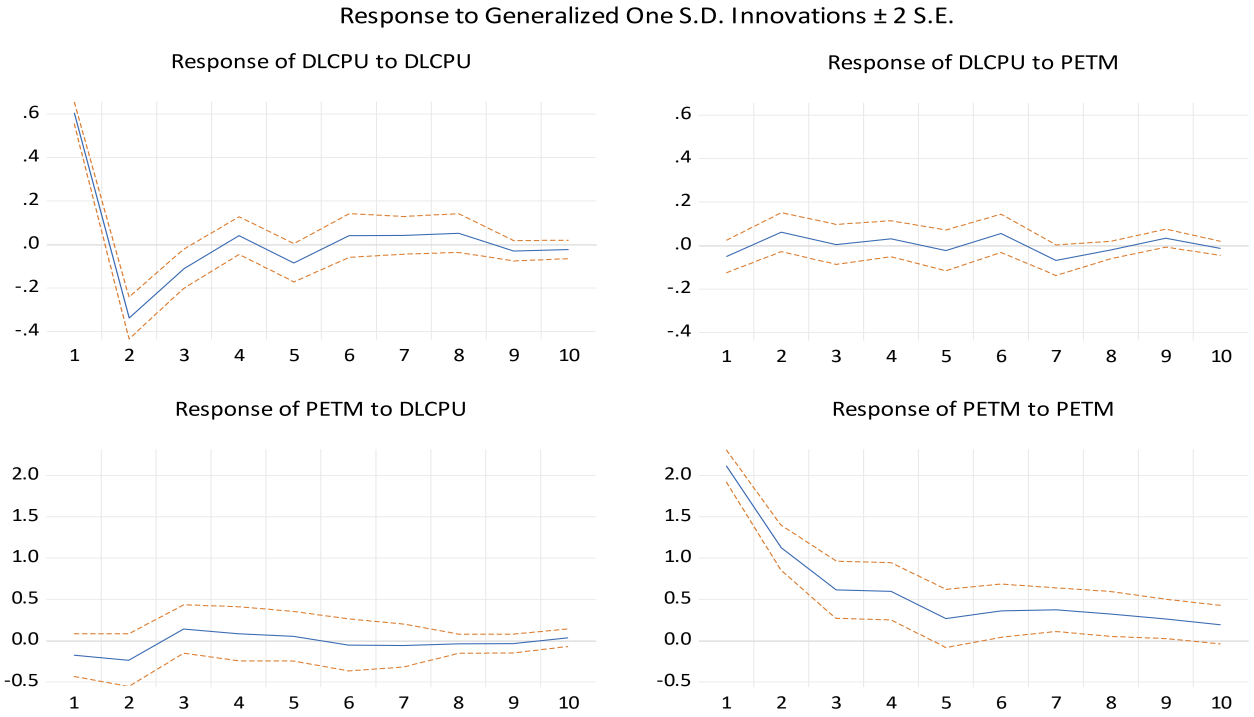

Figure 2. Impulse Response

The first figure on the left side shows the reactions of the CPU index to shocks that come to the same index. It shows a two-month positive reaction to each shock that comes to the CPU itself. The second and third figures are the most significant indicators in the test. However, they provide no meaning. The last figure shows the reaction of the shocks that come from the PEMV index to the index itself. Here, the reaction for each change comes to the CPU continuing for five months positively. Important to say that the results of this test support the results of the Granger causality test.

The final phase in the process is employing the variance decomposition test to know the variance of variables by determining how much they lagged by their dynamics and the other dynamics.

Table 6. Variance Decomposition

CPU	
CPU	**PEMV**
100.0000	0.000000
99.77570	0.224305
99.77681	0.223193
99.53777	0.462226
99.36749	0.632507
98.67978	1.320225
97.87613	2.123870
97.83610	2.163895
97.65730	2.342697
97.61396	2.386040

The table above shows the results of variance decomposition while the CPU is at the top of the table. The results tell us that the CPU index is highly lagged by the dynamics itself which is about 98% and lagged by approximately 2% of the dynamics of the PEMV index.

Table 7. Variance Decomposition

PEMV	
CPU	**PEMV**
0.699847	99.30015
1.537340	98.46266
1.745417	98.25488
1.746636	98.25336
1.765225	98.23477
1.774765	98.22523
1.794039	98.20596
1.790103	98.20919
1.791825	98.20818
1.796856	98.20314

The last table shows the percentile of PEMV which is lagged by 98% of the dynamics itself and lagged by 2% of the dynamics of CPU.

As we look at the resultss of the test above, we can understand that the data of each variable is independent of the other one. This test declares that the changes in each variable can not impact the other variable. Moreover, the changes in each variable are because of the shocks that come to the same variable itself, not the other one. As a consequence, the results of all the tests we employed are supporting each other. All the outcomes imply that the PEMV index is independent of the CPU index and non of the variables can affect the other one. There are various reasons for such a reason. First, the data we used are the data related to the last twenty years as an index constructed by (Gavriilidis, 2021) based on the articles regarding climate change. Second, although the critics claim that the energy firms and petroleum industry damage the climate but the firms are hiding the facts and reject such an impact. This may be another cause why the study provides such a result.

5. CONCLUSION AND RECOMMENDATIONS

It has been emphasized by many researchers that the oil industry is misguided by the energy companies, and these firms manipulate and mislead the public claims in the US. Therefore, we endeavor to determine how the petroleum markets reacted to the climate policy uncertainty in the last twenty years in the United States of America. Specifically, the study aims to determine the impacts of CPU on the PEMV in the U.S.A. between 2000:M1-2021:M3 by using the VAR model and employing multiply tests to analyze the data.

The results of the Granger causality test show that there is no G-causality cause between the CPU Index and the PEMV index in the United States of America. In other words, the CPU is not a significant predictor of the volatility of PEMV, and also the PEMV can not be used to forecast the future changes of the CPU. The results of the Impulse response test, on the other side, show an incomprehensible result for the relationship between the indices. Meanwhile, the CPU index positively reacts to the shocks that come to the index itself for two months, and the PEMV index has a five-month positive impact on the shocks that come to the index itself. Lastly, the Variance decomposition test indicates that the variables depend on their dynamics more than the dynamics of the other variable. The proportion of the dynamics for each variable is 98% lagged by their dynamics and each variable lagged by 2% of the other variable’s dynamics.

What differentiates this study from the literature is that the study focuses on a new climate uncertainty index, which particularly includes the US climate policy data. Second, the time series data that shows twenty years of petroleum market volatility in the US market under the influence of the uncertainties of climate change. The outcomes of the study can be supported by the claims of (Keane, 2020); (Pattee, 2021); (Dunn, 2021): (Doshi, 2021). According to the results, there is no such fear that the critics and research papers claimed in the last twenty years in the USA regarding the climate risks and oil markets. Notstandingwith the oil industry continues to cry wolf but they raking in profits. Also, the study provides a clear understanding of the current uncertainties in the petroleum markets and climate risks. Investors in the oil and gas industry can have a better prediction by reading this paper, and also analyzing twenty years of interaction between the two variables can prove whether climate change affects the US petroleum markets or not. Thereby, the perspective of investors, especially those who predominantly use an environmental, social, and governance (ESG) perspective may change towards the oil and gas companies.

However, we suggest that investors, financial advisors, policymakers, and banks should take climate risks seriously when they invest in energy firms and petroleum markets in the future (Sommer, 2021). Since many research papers have proved that the oil industry changes fast, and the number of employers diminishes in the sector, in contrast, renewable energy projects get more attention worldwide. Particularly, the clean energy sector gets more attention from the societies and local governments in the US. Therefore, the prices soar highs and ache lows in the U.S. petroleum markets due to the uncertainties and the future plans of climate change. Moreover, we suggest researchers use different tests and models by utilizing the same time data series (index) in order to know the exact linkage between the two variables in the future. Given that the index is new and it is preferable to be tested by various models and methods. Finally, if the damaging effects of climate change have been hidden until now, it is very unlikely that such a thing will happen any longer, because the world is seriously trying to apply a new pattern and invest more in renewable energy. Thereby, the petroleum market and the oil industry may face a serious issue in the forth coming years.

ACKNOWLEDGMENT

This paper has not received any financial support from anywhere.

DECLARATION OF ETHICAL STANDARDS

The authors of the paper submitted declare that nothing which is necessary for achieving the paper requires ethical committee and/or legal-special permissions.

CONTRIBUTION OF THE AUTHORS

Mustafa H. Hamad Ameen: Methodology, Conceptualization, Investigation, Software, Validation, Formal analysis, Writing - Original Draft, Writing - Review & Editing, Visualization, Resources.

Aslı Afşar: Methodology, Conceptualization, Investigation, Supervision, Writing - Original Draft, Writing - Review & Editing, Visualization, Resources.

CONFLICT OF INTEREST

The authors declare that there is no conflict of interest regarding the publication of this paper.

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