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Investigating the Effects of Climate Policy Uncertainty on the Volatility of the U.S. Real Estate Markets

Mustafa Hasan HAMAD AMEEN [1] **Aslı AFŞAR**[2]

Abstract

As climate change worsens, dangerous weather events are becoming more frequent or serve: Even the world's wealthiest nations could not put out large-scale fires, which are raging in the world. The rise of sea levels, the deadly floods, the imbalances between the temperatures, and the uncertainty in climate policy has raised many eyebrows in the last few years. Although climate change influences many sectors including real estate markets, information regarding the impacts of climate policy uncertainty on these markets remains poor. In order to analyze the impacts of climate change uncertainty on the real estate markets in the USA. We use the Climate Policy Uncertainty (CPU) index and the Volatility of the Real Estate Markets (REMV) index based on monthly data which starts in January-2000 and ends in March-2021. This study utilized the VAR model to analyze the collected data. Surprisingly, the results of the Granger causality test show no G-causality between the CPU index and the REMV index. This means that there is no statistically significant causal relationship between these two variables in the dataset used. Further, according to the results of the Impulse response test, the variables react to the shocks which come to themself positively and provide a meaningless result to the reactions between the variables. In other words, the shocks or disturbances within the variables do not lead to predictable or significant effects on the other variable. Lastly, the Variance decomposition test results show that the variables lagged by 99% of their dynamics and lagged by 1% of the other variables' dynamics. Generally, no negative connection can be observed between the two variables in the dataset used.

Keywords: CPU index, PEMV index, VAR model, U.S. Real estate Markets, Climate Policy Uncertainty

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İklim Politikası Belirsizliğinin ABD Gayrimenkul Piyasalarının Oynaklığı Üzerindeki Etkilerinin İncelenmesi

Mustafa Hasan HAMAD AMEEN [1] **Aslı AFŞAR** [2]

Öz

İklim değişikliği kötüleştikçe, tehlikeli hava olayları daha sık veya şiddetli hale geliyor Dünyanın en zengin ülkeleri bile dünyayı kasıp kavuran büyük çaplı yangınları söndüremedi. Deniz seviyelerinin yükselmesi, ölümcül seller, sıcaklıklar arasındaki dengesizlikler ve iklim politikasındaki belirsizlik, son yıllarda pek çok kişinin dikkatini çekmektedir. İklim değişikliği, gayrimenkul da dahil olmak üzere birçok sektörü etkilese de iklim politikası belirsizliğinin bu piyasalar üzerindeki etkilerine ilişkin bilgiler yetersiz kalmaya devam etmektedir. Bu çalışmada, iklim değişikliği belirsizliğinin ABD'deki gayrimenkul piyasaları üzerindeki etkilerini analiz etmek için Ocak 2000'de başlayan ve Mart 2021'de sona eren aylık verilere dayanan İklim Politikası Belirsizlik (CPU) Endeksi ve gayrimenkul piyasalarının oynaklığı (REMV) endeksi kullanılmıştır. Toplanan verileri analiz etmek için VAR modeli kullanılmıştır. Şaşırtıcı bir şekilde, Granger nedensellik testinin sonuçları, CPU indeksi ile REMV endeksi arasında Granger nedenselik olmadığını göstermektedir. Bu da kullanılan veri setinde bu iki değişken arasında istatistiksel olarak anlamlı bir nedensellik ilişkisi olmadığı anlamına gelir. Ayrıca, etki (dürtü)-tepki analizi sonuçlarına göre değişkenler kendilerine gelen şoklara olumlu tepki vermekte ve değişkenler arasındaki tepkilere anlamsız bir sonuç vermektedir. Diğer bir deyişle, değişkenlerdeki şoklar veya bozulmalar diğer değişken üzerinde öngörülebilir veya anlamlı etkilere yol açmaz. Son olarak, varyans ayrıştırma testi sonuçları, değişkenlerin dinamiklerinin %99'u kadar, diğer değişkenlerin dinamiklerinin ise %1'i kadar geciktiğini göstermektedir. Kullanılan veri setinde genellikle iki değişken arasında negatif bir bağlantı gözlemlenmemektedir.

Anahtar Kelimeler: CPU Endeksi, PEMV Endeksi, VAR modeli, ABD Emlak Piyasaları, İklim Politikası Belirsizliği

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Introduction

The uncertainty of climate change policy is the topic of many conferences, debates, and research papers Yohe & Oppenheimer, 2011; Painter, 2011; Adler &Hadron, 2014 The cause for that is the prevalence of a significant degree of uncertainty in climate change which appears to be a source of concern for many climate experts (Meah, 2019). Climate skeptic lobbyists' favorite primary message is that the science of climate change is ambiguous or unverified (Lawson, 2011). Many people around the world are suffering from climate change and their lives are under threat due to natural disasters such as tsunamis, wildfires, earthquakes, floods, and the rise of sea levels. The recent extreme weather headlines seem like something out of a science fiction novel: Even the world's wealthiest nations could not put out large-scale fires, which are raging in the world. In July 2021, deadly flooding in Germany and Belgium entirely wiped away buildings and cars, leaving over 1,000 people missing. Hundreds of people died as a result of flooding in China. The Pacific Northwest of the United States, which is famed for its cold environment, had temperatures of over (100 degrees Fahrenheit) for many days. In addition, between June and mid-July 2021, the arctic lost an area of sea ice the size of Florida (Levin et al., 2021).

We hear all the time after a huge flood catastrophe that people say, we have been living here for 30 years and it is never flooded! But the rapid changes in air pollution and the rise of climate change risks such as the rise of sea levels and carbon emissions double the risks and the real estate sector is one of the major sectors which reacts to the changes that come to the climate. If we go back in time to the 1950s and 1960s, insurers in the U.S. were unable to effectively comprehend the flood risk associated with specific properties, and they began to withdraw from the market. As a result, the federal government stepped in to create the national flood insurance program in order to safeguard the most susceptible households. They effectively chose a 100-year flood zone with a 1% annual chance of flooding as a sort of baseline, assuming that it would be relatively infrequent throughout a 30-year mortgage (Botts, 2021). So it is a 100-year flood zone, and nothing can be guaranteed. On the other side, while the United States does not have a nationwide carbon tax, there is general recognition that such a policy may be implemented in the future. The potential of a future carbon price raises the risk of investing in the capital that will be utilized in conjunction with fossil fuels (Fried et al., 2021).

Certainly, the climate has altered continuously throughout the planet's history; 12,000 years ago, sea levels were about (400 feet) lower than they are today. When cities were not built along the coast, though, sea level rises were not an issue. So, one of the most important aspects of climate change is that we have constructed a lot of cities, infrastructure, and houses in locations where climate change is extremely severe. The broad view among scientists is that we have substantially accelerated this over the last few centuries by releasing massive volumes of carbon dioxide and other greenhouse gases. On the other hand, real estate is one of the most significant sources of carbon emissions, and as such, it has the potential to make a significant contribution to climate change mitigation. There are social and private benefits to sustainable real estate. In many circumstances, improvements to a building's energy efficiency pay off rapidly in the form of higher rents, which in turn generate asset value. A strong drive to internalize the social cost associated with a building's carbon footprint, such as via

carbon taxes, will further strengthen the case for sustainable real estate.

These uncertainties in climate change have raised many eyebrows in the last three decades. Many researchers believe that these uncertainties can influence the investors' decisions in the real estate markets. Therefore, climate risks must be understood and assessed so that they may be handled and managed to minimize the negative effects on value and profit. As we look at the VIX index in the U.S. markets, we can see that the index is intended to indicate investors' expectations for future US stock market volatility, or how much the S&P 500 Index will change over the following 30 days. The index also known as the market's "fear gauge," is a tool that investors use to assess market risk, dread, and stress before making investment choices. When the VIX rises, it indicates that traders in the S&P 500 options market expect market volatility to rise. In this manner, we aim to determine the interactions between the two indices in the U.S. market in order to give a clear understanding of the climate change risks to the fluctuations in the real estate markets. This paper answers the questions of real estate agents, investors, insurance companies, and portfolio managers and assists them to make better decisions in their investments and assess the climate risks in the market.

Therefore, we use the U.S. Climate Policy Uncertainty (CPU) index and the volatility of the real estate markets data in the Equity Market Volatility (EMV) index in the same country. It is necessary to mention that the CPU index is a newly constructed index that has recently been created by (Gavriilidis, 2021). Gavriilidis constructs this index based on the Economic Policy Uncertainty (CPU) index's theory. He gathers all the articles regarding the uncertainty and the topics related to climate change in eight different major newspapers in the U.S.A. from January 2000 till March 2021. Then, he compares the number of relevant articles per month to the total number of articles in the same month for each newspaper. The eight series are then standardized to a unit standard deviation and averaged across newspapers by month. Finally, over the period 2000: M1-2021: M3, the averaged series are normalized to a mean value of 100 (EPU, 2021). Our study is divided into five different parts. It starts with the introduction in the first phase and provides literature in the second part. The third one includes the data and methodology used in the process and the fourth part contains the data analysis and findings in the fifth section. Finally, we conclude the study in the fifth section.

Literature Review

According to a study conducted by the California Climate Change Center, the rise of sea levels is estimated by a 4.6-foot rise that threatens the 100-year flood event or damages 3,500 roadway miles and nearly 30 wastewater treatment plants. Moreover, new guidance estimates that the global sea levels might increase twice as much. As sea levels rise, not only will roads and highways along the coast be flooded, but they will also act as barriers to the inland migration of wetlands, beaches, and other coastal resources (Heberger et al., 2009). A report conducted by Dieter et al., in 2015 shows that Fannie Mae understands that constructing and powering homes has an environmental impact. In fact, private families are responsible for nearly 20% of U.S. greenhouse gas emissions and consume 9.7 trillion gallons of water per year (Dieter et al., 2015). Strauss et al., (2015) investigate the carbon choices impact on US cities by the rise of sea levels in the future. They discover that territory that is home to more than 20 million people is entangled in unabated climate change and that it is broadly spread among different

states and coasts. The overall area contains 1,185–1,825 municipalities with land that is home to more than half of the existing population, including at least 21 cities with populations exceeding 100,000 people. If the West Antarctic Ice Sheet remains stable, more than half of these communities would be able to avoid this commitment under substantial carbon reductions. Similarly, more than half of the threatened territory in the United States might be spared (Straussa et al., 2015). Bienert in a report in 2016 examines the impacts of climate change on the real estate sector in different regions around the globe. It includes Asia, Africa, North America, Central, and South America, Europe, and Australasia. It forecasts a variety of climate-related changes that could result in property damage and loss. Sea level rise, growing urban floods in riverine and coastal areas, and a predicted increase in forest fires due to an increase in the number and intensity of drought seasons, as well as rising temperatures, are among them in North America and Northern Europe (Bienert, 2016). South America and Southern Europe, on the other hand, are threatened by water stress due to the rise of temperature and irregular occurrences of heavy rain in the future which can be a cause for property damage. Moreover, fires during hot, dry, and windy summers can cause substantial property damage in Australia (Bienert, 2016). Shahid et al., examine the impact of climate change and the Malaysian real estate sector in 2017. They found that the climate change risks will increase property lifecycle costs and increase the chance of property destruction. Furthermore, the government's aim of reducing GHG emissions by up to 45 percent by 2030 may have an impact on property prices and the sector's overall growth in Malaysia. Moreover, the results show that in the short term, the adoption of GHG emission reduction policies will have the greatest impact on Malaysia's property sector, while in the long term, the physical danger posed by variable climate and related extremes will have the greatest impact (Shahid, Pour, Wang, Shourav, Minhans, & Ismail, 2017). A research carried out by Myers et al., examines the implications of future sea-level rise using a variety of data sources in order to better comprehend the dangers. The study indicates that the financial consequences for local governments will be a loss of rates connected with total property loss and value decreases in the USA (Myers, et al., 2018). Semenenko et al, in 2019 examined the relationship between climate change and real estate prices. They believe that weather patterns have a direct correlation with real estate returns. According to their study, the changes in daily temperature volatility are inversely connected to direct real estate returns (Semenenko & Yoo, 2019).

Barnett et al., (2020) surveyed the pricing uncertainty contains by climate change. According to the results of the survey, in general, it shows that investors regard climate threats as significant investment hazards. While some investors have begun to include climate risks in their investment procedures, the industry as a whole is still in the early stages of doing so. Many investors, for example, are still oblivious to the basics of identifying and managing carbon and stranded asset risks. Long-term and larger investors, in general, appear to be better equipped for the transition to a low-carbon economy (Barnett et al., 2020). Moreover, according to a growing body of evidence, a lack of transparency and rising flood risk due to climate change are causing millions of Americans to jeopardize their safety and financial prospects (Hersher, 2020). Tiwari et al., (2020) conducted a study regarding how climate change affects the real estate market. According to their analysis, climate change will put a significant strain on economies, wreaking havoc on real estate (property) in both the short and long term. Moreover, they prove that climate change provides five major difficulties to the sector

(Tiwari & Hurlimann, 2020). Baldauf et al, also suggest that house prices reflect differing perspectives on long-term climate change threats (Baldauf et al., 2020).

The First Street Foundation in a report illustrates the highest and lowest flood risk states in the USA. The results show that West Virginia (24.4 percent), Louisiana (21.1 percent), Florida (20.5 percent), Idaho (14.8 percent), and Montana (14.2 percent) are the top five states with the highest proportion of properties at risk, whereas Arizona (3.7 percent), Nevada (3.7 percent), Washington, D.C. (5.3 percent), Colorado (5.7 percent), and Maryland (6.2 percent) have the lowest proportion of properties at risk (FSF, 2020). Moreover, the foundation issues new data which reveals the flood risk of every home in the United States (FSF, 2020). In America, real estate companies and investors concern more about the climate change risks. Relator.com has become the first website to reveal information on a home's flood risk, as well as how climate change may raise that risk in the coming decades, perhaps signifying a big shift in customers' access to climate-related information (Realtor.com, 2020; Hersher & Sommer, 2020). Nevertheless, Refdin.com (2021) and Estately.com (2021) in cooperation with the Flood Factor website provide data and information regarding the flood risks in the U.S. (Floodfactor, 2021).

It has been illustrated by He (2021) in a survey that climate change has a negative impact on housing prices. Essentially, this means that places in riskier locations are cheaper or significantly less expensive (He, 2021). Botts gives Miami Beach region as an example of the affected areas by the sea level. He mentions that the neighborhoods in the region look like Venice in Italy when they get king tide or high tides and the streets get flooded (Botts, 2021). Moreover, he adds that many residences were constructed just outside the 100-year flood zone and there is a rising awareness that these residences are not safe if you are just outside of them. As a result, everyone is looking very closely.

Halary et al., believe that Buildings that are subjected to climate change may lose value. Not only will the expenses of heating, cooling, and protecting high-risk buildings begin to climb, but older, less energy-efficient structures may fail to meet local carbon emission limits, leaving them stranded in the future. Tenant demand and rental revenue will certainly decline over time as businesses with their utility expenses and ESG goals look for greener pastures (Halary & Bonifacio , 2021). The situation in California State is abnormal as well. The cost of modifying the state's coastal infrastructure is anticipated to be in the billions, if not trillions of dollars over time (Armao, 2021). Sadasivam argues the harmful impacts of Hurricane Harvey which happened in 2017 in Texas that cost millions of dollars to the mortgage markets and thousands of families faced financial hardships due to the storm. This also affected the property prices and the insurers (Sadasivam, 2021). As we look at Hawaii, weather whiplash has taken on a whole new meaning in December 2021 in the state (Brooker, 2021). Furthermore, the weather is strange everywhere around the country. The rainiest fall on record in parts of the Pacific Northwest and British Columbia caused catastrophic flooding and mudslides with more than 2 feet of rain forecast, Hawaii's blizzard warning transformed into catastrophic floods, prompting officials to declare a state of emergency. At the beginning of December 2021, 65 meteorological stations from Virginia to Wyoming set records for high temperatures. In certain parts of Alaska November was the coldest on record (Brooker, 2021). The ocean has always been fundamental to the U.S. vision of infrastructure. Presently, ocean-based climate solutions have the potential to generate up to one-fifth of the global greenhouse gas (GHG) emission reductions required to

keep global warming to 1.5 degrees Celsius, which scientists think is necessary to mitigate climate change concerns (Meyers, Carter, & Goldstein , 2021). In addition, more than ever, the state of Florida requires future-ready community development and infrastructure projects to mitigate the effects of extreme weather and flooding, reduce local air pollution, lower family and business energy bills, and increase economic mobility (Majumder et al., 2021).

Addoum et al., show that New York commercial properties exposed to flood risk trade at a huge persistent discount following Hurricane Sandy's landfall by using a thorough property-level transaction record. Furthermore, despite mostly avoiding direct hurricane-related damage, commercial properties in Boston are nonetheless suffering from post-Sandy price penalties. Property prices in Chicago, on the other hand, remain unaffected by the storm. These findings are consistent with a continuous shift in the importance of flood risk throughout the northeastern seaboard in the aftermath of Sandy's landfall and reflect hurricanes' northward movement caused by climate change (Addoum et al., 2021). According to a study conducted by the Union of Concerned Scientists, climate change and the rise of sea levels can impact the U.S. real estate markets in different ways. What they discovered via their investigation was that the sea levels rise had a huge influence across the country. As a result, by 2045, within the usual 30-year mortgage provided now, there will be over 300,000 houses in jeopardy across the country, and by 2100 the number will rise to 2.4 million (Cleetus, 2021). Climate risk also impacts the mortgage credits and the price of mortgage guarantees (Ouazad, 2021). Meanwhile, Segal displays that climate change will hurt markets, but it has not yet been priced into all asset classes, securities, or nations, leaving chances for active managers with possibilities. Moreover, institutional investors have differing opinions on how climate change will affect their investments. Climate change creates an investment risk for real estate, according to 48% of institutional investors polled in the PGIM research, while 38% see it as an opportunity. Infrastructure is viewed as a danger by 41% of respondents, while it is viewed as an investment opportunity by 67% (Segal, 2021). Furthermore, Graig believes that floods are dangerous risks to the mortgages and real estate markets in the U.S.A. (Craig, 2021). In another study conducted by Stanford University, uninformed purchasers and insufficient disclosure laws increase financial risks, which could disrupt the real estate market. As climate change causes more frequent extreme weather, the hazard is likely to grow (Hino & Burke, 2021). In some areas, such as Florida, one out of every six houses is located in a floodplain. Flooding damage prices have increased as more people build homes in places vulnerable to cyclones, sea-level rise, and other inundation dangers. Overall flood damages in the United States have tripled since 2000 (Jordan , 2021).

Data and Methodology

In order to analyze the impact of climate change uncertainty on the volatility of the real estate markets in the USA. We use the Climate Policy Uncertainty (CPU) index and the real estate markets EMV index based on monthly data which starts from Jan-2000 and ends in Mar-2021. The CPU index is a newly launched index by (Gavriilidis, 2021) and the data for both indices are gathered on the (PU Indices, 2021) website. We used the Vector Autoregression (VAR) model in (Eviews) program to examine the collected data.

We provide a descriptive statistics table first which contains the nature of the data and

the results are shown in the Appendix-1 table. Second, we employ the ADF unit root test (Dickey & Fuller, 1979) to determine the stationary status of the data. And then, we apply the Heteroskedasticity, Autocorrelation, and AR graph tests, respectively. Finally, we apply the Granger causality test (Granger, 1987), Impulse response test, and variance decomposition test respectively to determine the interactions between the two variables.

Data analysis and Findings

The results of the descriptive statistics which are shown in table 1 conclude the statistical status of the data. As we look at the CPU index has an average value of the mean of 6.51, a Standard deviation of 0.74, with a normal Skewness because it has a zero skew 0.21 and the distribution is symmetric around its mean, its Kurtosis is a mesokurtic normal distribution with a kurtosis 0.98 and the Jarque-bera is 43.60. On the other hand, the average value of mean for REMV is 0.74, the Standard deviation is 4.25, a long-right tail positive Skewness because the 3.27 is higher than three, with a leptokurtic high Kurtosis which is 17.21 and the Jarque-bera is constrained normally 2591.303.

Table 1: Descriptive Statistics

	Mean	**Std.Dev**	**Skewness**	**Kurtosis**	**Jarque_bera**
CPU	6.519640	0.743132	0.210947	0.985543	43.60733
REMV	0.743132	4.259876	3.274649	17.21119	2591.303*

The table 2 provides the result of the ADF unit root test. The outcomes illustrate that the data is stationary for both Intercept and Trend-intercept.

Table 2: ADF Unit Root Test

ADF UNIT ROOT TEST	**Intercept**	**Trend& Intercept**
CPU	<0.01	<0.01
REMV	<0.01	<0.01

And also, the table 3 table shows that the Heteroskedaticity exists between the data. This can be helpful to run our model.

Table 3: Heteroskedasticity Test

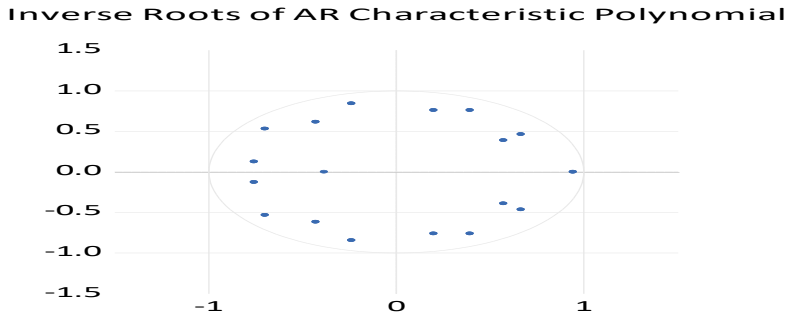
Heteroskedasticity test result	
Prob.	0.3006

According to table 4, the data is stationary given that all the variables are greater than 10%. Hence, we can say that the data is constrained. This would be another sign that the data is healthy.

Table 4: Autocorrelation LM Test

Prob.
0.4455
0.4546
0.4677
0.2678
0.5449
0.1431
0.8626
0.8503
0.4600
0.9553

The last section in the roots test will be the AR roots graph as shown in the graph below:



Grapgh 1: AR Roots Grapgh

We can see that all the roots are located inside the cycle. This tells us that the data is ready now to be utilized by other tests. Our VAR model was created at 9 and the number of roots is doubled in the cycle above.

Table 5: Granger Causality Test

Granger Causality		
CPU ≠ > REMV	0.5299	Accept
REMV ≠ > CPU	0.2450	Accept

The results of the Granger causality test show no G-causality cause between the CPU index and REMV index. In other words, there is no G-causality between the two indices.

- "CPU ≠ > REMV" indicates that the null hypothesis of "CPU does not Granger cause REMV" cannot be rejected, as the p-value (0.5299) is greater than the threshold of significance (0.05).
- "REMV ≠ > CPU" suggests that the null hypothesis of "REMV does not Granger cause CPU" also cannot be rejected, as the p-value (0.2450) is again greater than the significance threshold.

Based on the provided results, there is no significant evidence to conclude that either "CPU" Granger causes "REMV" or "REMV" Granger causes "CPU" in the analyzed data. This means that the changes in CPU cannot determine or predict the real estate market's direction in the future. And the changes in the real estate market cannot be used to predict the future changes of climate change in the U.S.A.

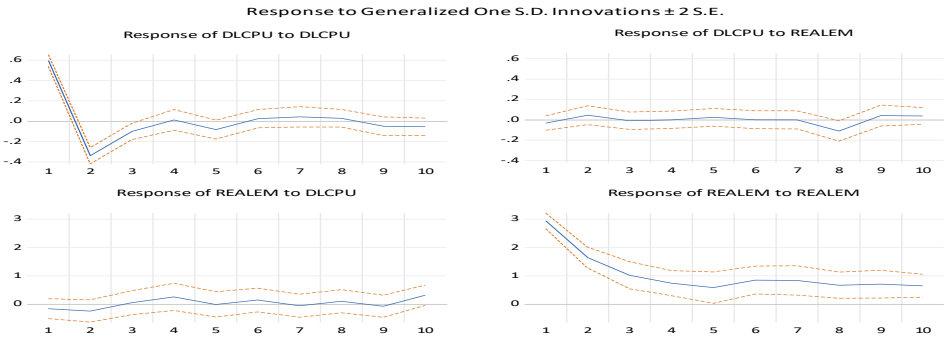


Figure 1: Impulse Response TestAnother important test in our model is the Impulse response test. This can help us to determine the reactions of each shock come to the indices. As we look at the first figure on the left hand, it shows the reactions that come to the CPU index as a result of its shocks. The CPU index positively reacts to each shock that comes to itself for two periods positively. The second and third figures provide no meaning between the indices. The last figure shows the reaction of the REMV index to the shocks that come to the index. As can be seen here, it shows a five-month positive impact on the shocks that come to the real estate markets. These results support the outcomes of the Granger causality test.

Table 6: Variance Decomposition

CPU	
CPU Dynamics	**REMV Dynamics**
100.0000	0.000000
99.89924	0.150765
99.80448	0.195519
99.80454	0.195455
99.73012	0.269877
99.72979	0.270214
99.73047	0.269532
97.37328	2.626720
97.10099	2.899011
96.89292	3.107080

The Variance decomposition test is important to determine the connection between the two variables. In this test, the CPU index lagged about 99% by its dynamics while lagged only 1% by the dynamics of the REMV index. This is when the CPU index is a dependent variable. The results of this test show how one variable is affected by the

other one. The percentage of the lagged variable is the sign of the percentage of affection. In the table above, in the short run, shocks of REMV do not cause the CPU. However, in the long run, that is quarter 8, an innovation or shock to CPU accounts for 97.37 percent variation of the fluctuation in CPU, and a shock to REMV can cause 2.63 percent fluctuation in CPU.

Table 7: Variance Decomposition

REMV	
REMV Dynamics	**CPU Dynamics**
0.292783	99.70722
0.734706	99.26529
0.695532	99.30447
1.170320	98.82968
1.141195	98.85881
1.232165	98.76783
1.193990	98.80601
1.226174	98.77383
1.220044	98.77998
1.785892	98.21411

As we look at the REMV data whıch it is dependent in the table above. It shows that the REMV is lagged by approximately 2% by the dynamics of the CPU index and lagged by 98% of its dynamics. It means that, in the short run which is determined as quarter 3 here, the real estate market is only caused by its shocks. Meanwhile, in the long run, that is quarter 10, a shock to the CPU can cause a 1.79 percent fluctuation in REMV. The results of this test also support the results of the Granger causality test results.

Conclusion

In conclusion, our study examined the relationship between climate policy uncertainty and the volatility of U.S. real estate markets using the Climate Policy Uncertainty (CPU) index and the U.S. real estate markets EMV index. The results from the VAR model indicated no significant correlation between the two indices, suggesting that climate policy uncertainty cannot be used to predict the volatility of U.S. real estate markets.

Despite the lack of direct association found in our analysis, it is important to acknowledge that previous literature has consistently demonstrated the environmental and financial risks posed by climate change on the U.S. real estate markets. Therefore, it is crucial for stakeholders to recognize and address these risks despite the absence of a strong relationship with policy uncertainties in the dataset used for our study.

Our research contributes to the existing literature by employing a comprehensive twenty-year dataset that analyzes climate and real estate market indices separately. Additionally, we utilized three different tests to determine the correlation between these indices, further strengthening the validity of our findings. Our results align with the claim made by Segal (2021) that real estate investors perceive climate change as an opportunity for increased investments and financial gains.

However, we emphasize the importance of real estate agents, insurance companies, and policymakers taking climate risks seriously. While our study suggests that the risks in U.S. real estate markets are currently low, it is imperative to remain vigilant and proactive in addressing potential future challenges arising from climate change.

For investors, real estate agents, and portfolio managers, our results indicate that the level of risk and stress in the market is currently low, presenting opportunities for capital growth. Therefore, we recommend these stakeholders to feel more confident in their decision-making processes regarding the risks and uncertainties associated with climate change and its impact on the real estate markets.

Furthermore, we encourage researchers to explore alternative methodologies using the same dataset, as it may yield different outcomes and provide valuable insights. By applying different analytical approaches to determine the relationship between climate and real estate market indices, researchers can further enrich our understanding of the reactions and interactions between these factors.

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