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The geopolitical risk index effect on the energy market, emissions and climate change

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Abstract. Over time, global crises have affected the energy market much more than major geopolitical events. In recent years, humanity has been faced with the Covid 19 crisis, which has caused great disruption in the energy market and unprecedented phenomena in oil prices.
Also, during the same period, due to the decrease in global production and the low demand for energy, there were unusually large reductions in emissions across the planet. In the post-covid era, the world is faced with the crisis of the Russian -Ukrainian war and the corresponding surge in gas and oil prices. As these critical geopolitical events have the dynamic to affect the entire world, this investigation utilizing the Geopolitical Risk index of Caldara and Iacoviello (2021) aims to identify if events related to energy, green investments, or measures of pollutant emission assessments can be predicted.
I) Can the Geopolitical Risk Factor (GPR) be a tool for predicting events related to the energy crisis?
II) GPR can be a reference point for green investments
III) Does the GPR have the possibility to be a measure of pollutant emission assessment?
Keywords: GPR, energy market, emissions, RAS**,**

1. Introduction

With the outbreak of the Covid 19 crisis, which was an unprecedented problem of our time, a significant slowdown in global trade was observed, and this had the effect of dragging the energy market along. The markets that mainly showed significant variation are: crude oil, gasoline, heating oil and natural gas. The prolonged duration of the pandemic created a great impact on the economy and the capital market, and for the first time in its modern history, the crude oil market showed negative prices. Since the beginning of the pandemic at the beginning of 2020, international fossil fuel markets have shown unusual fluctuations, the main characteristic of which is the negative value of crude oil prices. It was also observed that all the means and standard deviations of volatility values after the outbreak of the pandemic are significantly larger than their counterparts in the pre-pandemic era.

The global community has pledged to reduce consumption of fossil fuels to protect the environment, in recent years, there has been a decline in the market share held by crude oil and a significant rise in demand for natural gas. With the goal of transitioning to a low-carbon energy mix, the reshaping of the global energy system is already underway. Despite all this, however, the research of Zepei and Haizhen in 2023, pointed out that the price of oil is the reference price for the formation of natural gas prices. In addition, oil and natural gas are non-renewable energy sources, and their depletion to the end will cause serious consequences for humanity, thus efforts to transition to sustainable energy should be intensified. Currently, however, the widespread use of the traditional energy model cannot be replaced.

Pursuant to Yuru L. et al, there are two approaches to accounting for carbon emissions models: The first is based on intermediate use and the second is based on final consumption and total production. In calculating national and regional carbon emissions from energy combustion, the GTAP 10 database includes six energy products: coal, crude oil, natural gas, petroleum products, electricity, and natural gas distribution. The results showed that while global carbon emissions could be reduced by up to 6%, they ultimately remained unchanged. The transport sector achieved a significant reduction of 18.4% in carbon dioxide emissions, mainly due to the suspension of international trade.

In contrast to the period of covid 19 and immediately after the invasion of Ukraine by Russia in February 2022, the global energy market saw a huge increase in the prices of oil and especially natural gas which dragged the entire energy market upwards as a result, essentially the exclusion of Russian deposits from the traditional markets of the West. Correspondingly, in the field of carbon dioxide emissions, you see an increase mainly due to the high need for transport.

2. The GPR *(geopolitical risk index)*

Undoubtedly, the covid 19 pandemic, as well as the invasion of the Russians in Ukraine, are major geopolitical events affecting various sectors, in addition to the energy and shipping market.

Assessing the term, geopolitical science is the study of geography and politics and how it affects states. The term geopolitics is more complex and contested as it includes

many concepts and approaches, with geography and its political influence as paramount issues. The media often refer to geopolitical crises to describe the impact of international crises and international violence.

According to Caldara & Iacoviello (2021), geopolitical risk is the threat of realization and escalation of adverse events related to wars, terrorism, tensions between countries and political factors that affect the smooth course of international relations.

The development of GPR was initially based on the fact that until then, no other indicator could predict geopolitical crises in real-time and be consistent in its reliability. The index receives data from the moment it is discussed or published in the press, making it accessible to businesses and academia. After systematic recording in the study of articles and recording of leading English-language newspapers from 1900 to the present, compared with the corresponding macroeconomic data, they proved that where the index shows a high value, the chances of economic failure increase, investment decreases and unemployment increases. In this historical path, the high values of the index are identified with important events such as Germany's invasion of the Czech Republic in 1938, the start of the second world war, the Normandy landings in 1944, the crisis in Iran in 1946, the Cuban crisis in 1962, the 1963 nuclear threat and the 9/11 terrorist attack.

In its modern version, the GPR index, since 1985, begins to automatically record, using keywords, the electronic archives of the ten largest newspapers in circulation in North America and Canada, such as: the Financial Times, the Daily Telegraph, the New York Times, the Wall Street Journal, the USA Today, the Chicago Tribune, the Globe and Mail, the Los Angeles Times, the Washington Post, and the Guardian.

The monthly value of the GPR is obtained by summing the articles of the above newspapers that refer to geopolitical risks and then dividing them by the total sum of the articles published in the same newspapers. The articles are selected using a special calculation and a dictionary which, using specific words, classifies the articles into the corresponding categories.

At Continuity are presented the basic words keys where they have indicated at machines search of articles and are counted in the calculator of the GPR; these are: War words, Peace words, Military words, Nuclear bigrams, Terrorism words, Actor words, allies, and Phases like Threat words, Peace disruption words, threat, Buildup words buildup, War begin OR breakout words, Actor fight words advance and Terrorism act words. Index values are provided in open access from the Economic Policy Uncertainty at https://www.policyuncertainty.com/gpr.

3. The GPR and energy market

Almost everyone agrees to counter climate change, and we should turn more and more to clean fuels and renewable energies. This policy is encouraged by most states and can be considered a reasonable approach to dealing with this issue. Global warming and climate change generally result from the widespread use of fossil fuels. But what about the energy market in situations of uncertainty and geopolitical risk? In recent years, humanity has faced a series of conflicts and geopolitical risks linked to areas of the planet that are important energy producers. This increases uncertainty in the entire energy market since alternative options should be considered to substitute the markets that are no longer accessible. Another parameter that must be considered is that, given the conflicts, the relations and agreements between the involved states which are disrupted, and as a result, they are contested. There is difficulty in implementing gal in the climate cooperation agreements. It seems impossible to prioritize the climate during war tensions and political unrest. Thus, an interconnection of geopolitical risk and climate risk types appears, which passes through economic uncertainty creating energy market volatility.

Yi Jin et al (2023), stated in their research the need to combine geopolitical risks with climate risks and the energy market and examine their integration and how they interact. With data drawn from the Emergency Database Events (EM - DAT), which records climate change events monthly and reports the total number of people affected as well as the number of deaths per country, created a climate risk index which is formulated per month and per country, based on the amount of damage caused by climate change, the number of people affected and the number of deaths.

One recording of the data was made for the period from February 2002 to December 2022 considering the 13 countries that are responsible for the highest emissions of pollutants on the planet. These countries were: Australia, Canada, China, France, Germany, Japan, Mexico, Russia, Saudi Arabia, Ukraine, United Kingdom, USA and Venezuela. The data were analyzed using the BEKK _ GARCH and BK methods.

The above research's results show a strong correlation between Geopolitical Risk, Climate Risk and Energy Market, with geopolitical risk clearly impacting energy markets. Subsequently, the price of crude oil is positively correlated with Climate Risk.

The results, in addition to revealing the need for substantive policy cooperation and decisions to address climate change, also demonstrate the importance of using GRP to conclude both the Climate and the energy market.

4. Geopolitical Risk and Green Investments

As mentioned above, climate change is now a fact, and every year there are more and more unprecedented weather phenomena with devastating economic effects and loss of human life. The main culprit of this situation is generally accepted to be the use of fossil fuels. The evolution of technology and policies to address climate change enables markets to invest in renewable energy sources increasingly imperative.

Technological progress and the substantial reduction in the cost of energy production through the use of renewable energy sources, combined with the fact that fossil fuels

burden the environment on the one hand and the other, the producing countries are limited worldwide, enables companies and states to enter the global energy production market and contribute to the global energy fuel mix, where until now 86% of it is occupied by fossil fuels. However, the appearance of new energy producers on the global market is changing the energy and geopolitical field. Securing sources of energy or supply routes was a key parameter of prevailing and determining the winners in all conflicts. On the other hand, a country's access to energy self-sufficiency is intertwined with its economic development and prosperity, thus closely linked to the geopolitical environment. In addition, the global effort against climate change leads to commitments to change the energy mix. It sets targets such as the one decided by The Intergovernmental Panel on Climate Change (IPCC), a group convened by the United Nations, to reduce the temperature by $1.5\ ^{0}$ C.

In the paper presented by Floros Flouros et all in 2022 on the effect of geopolitical risk on green investments, they measured the effect of geopolitical risk through the GPR coefficient on green investments in 171 countries and came to the following conclusions: as a geopolitical risk coefficient, increases it harms renewable energy investments in each case. This negative GPR – RAS correlation is observed at short- and long-term horizons. Also, when the effect of the production level is added to the analysis, it is observed that the negative correlation between them increases. Perhaps this indicates that the more production there is, the more energy will be needed, and given that the fuel mix remains with a very large contribution of fossil fuels, the high energy demand is expected to cause a corresponding increase in investment in energy production. Also important as an element of the present research is that the results of the geopolitical risk factor comparison are reliable for all countries, and no other variable shows a corresponding universal and consistent result, which highlights the GPR as a very reliable factor. All the above leads to the conclusion that investments in Renewable Energy Sources could succeed and be an essential part of the solution to the energy problem only if the geopolitical constraints and tensions that limit them are considered.

5. Observations of the respondents

Geopolitical crises have always concerned humanity and are an important factor of instability in many areas. Thus arose the need to create a reliable, easily accessible factor that could measure geopolitical risk assessments. That's what Dario, Caldara and Matteo Iacoviello in 2021 implemented on behalf of the FED, which has been an important benchmark for many research questions. As shown by the research presented, GPR can be a tool for predicting the energy market and energy crises. Also, given the circumstances, it can be correlated with all fossil fuel indicators (Yuru. L. et al, 2023), able to give us results for estimating pollutant emissions with great reliability.

Also, in the field of green investments and decisions and policies around them, the GPR is reliable and useful, as it has been shown to be negatively correlated with the development of RES.

6. Conclusions

Covid 19 crisis and then Russia's invasion of Ukraine created a prolonged climate of geopolitical uncertainty, which created, on the one hand, the energy crisis recently experienced and, on the other hand, affected emissions and investments in RES, and updated the importance of geopolitical risks in a global scale.

Using GPR as an estimator, it was shown that as geopolitical uncertainty increases, energy risk increases, as do pollutant emissions.

So political instability, wars, and conflicts burden the economy and the environment, so it follows that dealing with climate change is an essential issue of international cooperation and political stability.

Given the effectiveness and reliability, and utility of the GPR, its impact on the emissions resulting from the maritime transport of fossil fuels could be investigated in the future.

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