The Global fossil energy prices trend analysis under the impact of climate change by visualization techniques

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(1) Overview

The global fossil energy price is pushed to enter a new episode recently. For example, the Newcastle coal future price jumps up from around 70 USD/MT before 2021 to more than 400 USD/MT several times in the middle year of 2022. Many articles and discussions in the website blame this rocky high prices to the Russia-Ukraine war. However, some authors focus on the impacts of climate change. In fact, some clues of the rocky high prices can be found from the " Price and Taxes" published by IEA. The relationship between fossil fuel prices and the climate change issue was concerned in some papers (e.g. Borge-Diez et al., 2022；Francescutto and Mathys, 2022；European Central Bank, 2022). However, none of these papers concentrates on the fossil energy prices trend analysis. Based on the data from IEA and BP, this paper studies the "global fossil energy prices trend under the impact of climate change". Some interesting and surprising results are observed.

(2) Methods

After reviewing all related articles, we tackle this issue step by step as below:

1. Collect the annual fossil energy (i.e. oil, gas and coal) price data respectively for top 20 greenhouse emission countries and some selected countries (i.e. more notable such as more volatile price) from IEA, and the related fossil energy production and consumption data from BP.
2. Choose the year of 2004 as the turning point for reflecting the biggest change of climate change policy due to the implementation of the EU emission trade scheme (EUETS) since 2005.
3. Produce the fossil energy prices trend of selected countries from 1996 to 2021 by visualization techniques.
4. Draw the box and whisker plot, dash board figures of wholesale price index and the quantities of production/consumption (e.g. Figure 1 & Figure 2).
5. Obtain the fossil prices deviated trend for selected countries through the comparison of prices before and after 2004.
6. Find the relationship between the price trend and fossil energy production/consumption gap for each country of the selected countries.
7. Conclusions and suggestions.

(3) Results

These authors find the impact of climate change policy on the fossil energy prices trend may be much larger than the common expectation from our study. The box and whisker plot of the annual coal wholesale price index of selected OECD countries is drawn in Figure 1. The red circle dot represents the price level before 2004, and the blue circle dot represents the price level after 2004 (including 2004). The darkest red and darkest blue circle dots represent the earliest year (1996) and the latest year (2021) respectively, while the lighest color cicle dots represent those years in the middle observing period. It is observed that most of the blue circles dots locate in the upper sides for every countries, and the darkest red and darkest blue dots locate in the bottom and the top respectively for many countries.

The above results show that the coal prices for most countries are much higher after 2004. The cases in Findland and Turkey are worthy to be investigated. Coal price indices of 1996 and 2021 in Findland are 116.3 and 572.5 (around **5** times), while the indices of Turkey are 4.6 and 732.4 (around **160** times). No wonder the Turkey government plans to address some supportive policy to calm down the coal price recently. **It should be notified that the Russia-Ukraine war occurs in 2022, while the rocky price in this paper is found in 2021.**After examining the relationship between the price trend and fossil energy production/consumption gap, it is found that the rocky high price is more likely resulted from the energy mix structure. The inbalance of supply and demand causes the uncontroled price jump such as the production and consumption unbalanced trend in Turkey (Figure 2). The similar situation is also found in Findland.

(4) Conclusions

Recent stronger climate change policy implemented by many countries bring more pressure for the fossil energy market and push up the market price. Rather than the impact from Russia-Ukraine war, this paper finds the climate change policy may play more important role in pushing up the fossil energy price. Shutting down the coal mine is the main climate change policy for many countries. However, coal price will jump up to higher level if the coal supply is not fully replaced by other clean energy. This paper captures the trend of fossil energy price, production/consumption by making good use of the visualization techniques.The examples of Turkey and Findland reveals that the world economy system can run more steadily if all governments can make better climate change policy.

Major References

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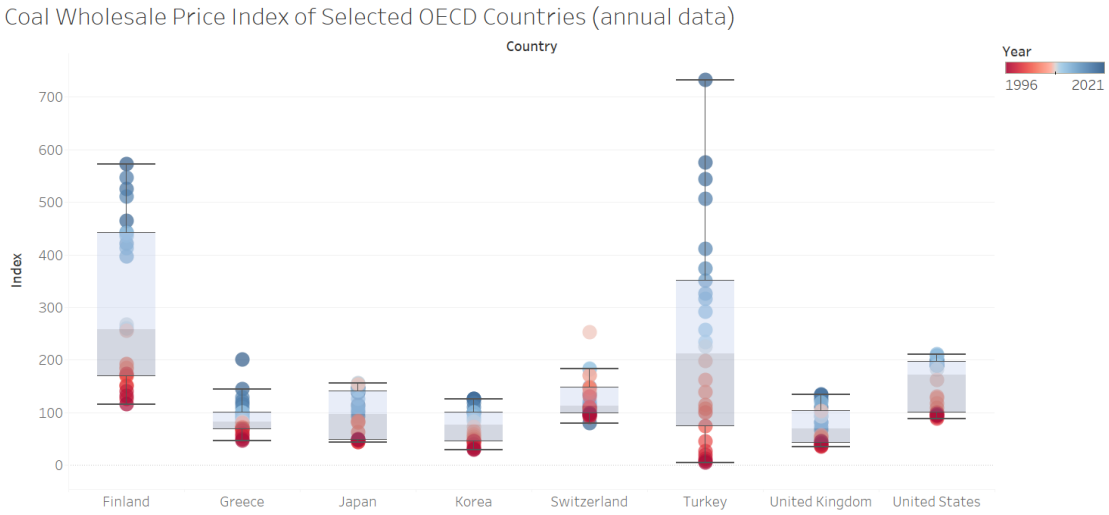

Figure 1: Coal Wholesale Price Index of Selected OECD Countries (Annual Data)
Data Sources: Original data are collected from "Price and Taxes", IEA.

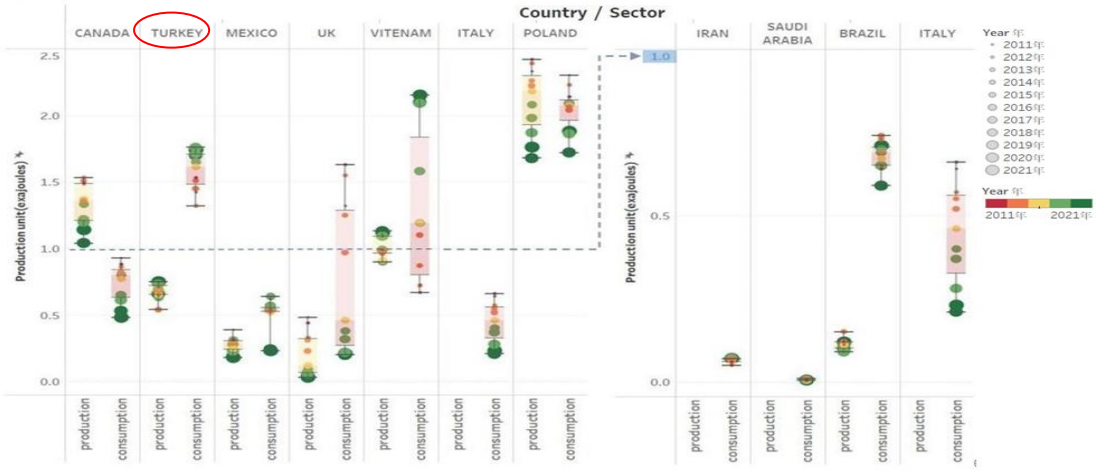

Figure 2: Coal Production and Consumption for Selected Countries (Annual Data)
Data Sources: Original data are collected from BP Statistical Review of World Energy.