Modeling the Macroeconomic Risk of Climate Change

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Abstract

Climate change is one of the hottest topics in our everyday lives. The analysis of Climate Risk is likewise gaining importance quite rapidly in the financial sector. In this thesis, I am introducing the basic concepts of Climate Risk, and I perform an analysis examining the effects of some basic climate variables (temperature and precipitation) on some macroeconomic variables (GDP per capita and Crop Production Index) on a country level. For this analysis, I am using some methods of time series analysis, most importantly the ARIMAX model, to describe the effects of the weather variables on the macroeconomic time series, and of course, the effects of their own past values. Before the modeling exercise, I performed clustering on the countries based on the values of their weather variables and GDP per capita, to help me contextualize my findings. I also filtered the countries based on a Granger-causality test, to only examine cases where there seems to be a causal connection between the weather and macroeconomic series. I also evaluate the results of the analysis, where it becomes evident that my methods are not sufficient enough to catch the risk posed by climate change in the GDP (but even here there are small but notable results). Because of this setback, I have also performed a similar analysis on the Crop Production Index of countries, which was much more successful. In these analyses I focus on examining the effect of temperature, anticipating that its increase causes problems in the majority of the countries. After building the ARIMAX models for the relevant countries, and highlighting some of the results, I have also built some slightly different, but still very similar models for forecasting GDP per capita and the Crop Production Index of different countries, based on 5 different climate scenarios.