DEPARTMENT OF ECONOMICS AND BUSINESS

Master of Science in Business Analytics

Collect, process, enrich and visualize data on climate adaptation investment

Capstone Project Summary

by

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Cambridge Econometrics created a climate change scenario analysis by a macroeconomic model to see the economic impact of climate change under different circumstances. The aim of current capstone project is to develop a comprehensive data set on adaptation investment, which serves as a modelling input for a macroeconomic model used by Cambridge Econometrics. The purpose of the modelling input is to make the scenario analysis more precise and enable the model to forecast the economic impact of climate change. The macroeconomic model is called E3ME model, which is the flagship product of Cambridge Econometrics. One of CE's R&D goals this year to capture climate change adaptation within E3ME, focus particularly on adaptation to gradual physical risks. The motivation of current project was to improve the model for the next release by additional historical data about climate change adaptation investment. This data can be used as a direct modelling input, exploring climate change scenarios with different level of adaptation.

Changes in climate have caused impacts on natural and human systems on all in recent decays. There is an evidence for climate-change impacts, which is the most comprehensive for natural systems. People and societies must always cope with climate, climate variability, and extremes, with varying degrees of success. The observed and projected climate-change impacts must be given a reaction from humanity, which can also address broader risk-reduction and development objectives. (IPCC, Climate Change 2014 - Impacts, Adaptation and Vulnerability, 2014)

According to IPCC, "adaptation is the process of adjustment to actual or expected climate and its effects. In human systems, adaptation seeks to moderate or avoid harm or exploit beneficial opportunities. In some natural systems, human intervention may facilitate adjustment to expected climate and its effects". (IPCC, Annex II Glossary, 2014) The goal of adaptation is to reduce our vulnerability to the harmful effects of climate change (like sea-level encroachment, more intense extreme weather events or food insecurity). It also encompasses making the most of any potential beneficial opportunities associated with climate change (for example, longer growing seasons or increased yields in some regions). As a contrast, "mitigation is a human intervention to reduce the sources or enhance the sinks of greenhouse gases". (IPCC, Annex II Glossary, 2014) Mitigation is aimed at tackling the causes and minimizing the possible impacts of climate change.

Beside the initial motivation, to enrich E3ME model, current capstone project aims to provide insight about what are the common topics of adaptation spending. The collected data is applicable for further analysis in itself without the macro-econometric model to explore patterns

in adaptation investment allocation, which is still a messy field if one wants to understand global resource allocation.

The goal is to analyze titles and summaries of climate change related projects. The result can tell us, what are the common topics of adaptation and mitigation spending in countries with different income level.

The project covered five subtasks:

1. **Data collection**: comparison of publicly available datasets and pick a data source for further analysis.
2. **Data transformation**: creating granular data from the picked data source.
3. **Data exploration**: visualizing the processed data to explore trends in global climate change spending.
4. **Text-based classification**: enriching the dataset with further data to create a new variable by classifying climate change related projects.
5. **Text analysis**: analyzing unstructured text to create an insight about topic of the climate change related projects by country income level.

The first phase of the project was data collection. The aim was to identify potential data sources and compare them to be able to pick the most comprehensive and granular data set. The process of data collection was an iterative process. The chosen data sets for further analysis are provided by two international organization: Climate Funds Update (CFU) and Climate Policy Initiative (CPI).

Climate Funds Update is an independent website that provides information and data on the growing number of multilateral climate finance initiatives designed to help developing countries address the challenges of climate change. Climate Funds Update tracks data on pledges, deposits and the project approvals made by multilateral climate change funds. The data set contains relevant information for current project, such as the project titles, project summary, fund, country, country's income level and useage (adaptation or mitigation).

Climate Policy Initiative releases the Global Landscape of Climate Finance annually. The 'Updated View on the Global Landscape of Climate Finance 2019' contains data about climate change finance for 2017 and 2018. Global Landscapes of earlier years are also available, which

contain climate change finance data from 2013 to 2016. The data on earlier years are not published in .xlsx format, thus, data on earlier years have been collected manually.

The CPI data set served as a modeling input for Cambridge Econometrics. The data transformation created a granular historical data set. The processed data set has been enriched by the Climate Funds Update data set by text-based classification, which resulted the physical risk type variable for the adaptation spending. The collected and processed data shows, that global adaptation spending has increased by 2018. Still, the vast majority of climate finance flows were mitigation. It is a further analytics opportunity to predict the adaptation and mitigation growing rate to see future climate change finance share.

The final part of the report was a text analysis, which created clusters in adaptation and mitigation projects. Countries in different income level target different projects. Low and lower middle income adaptation projects target food supply, agriculture and vulnerable fields. Low and lower middle income mitigation projects target sustainability. Upper middle income adaptation and mitigation projects target technology, industry, energy efficiency and infrastructure.

Bibliography

IPCC. (2014). *Annex II Glossary*.

IPCC. (2014). *Climate Change 2014 - Impacts, Adaptation and Vulnerability.*