Analyzing Carbon Market Data

Team 74

Business Problem

The PNUMA – Programa de Las Naciones Unidas para el Medio Ambiente look forward to increase confidence in carbon markets from a data analysis perspective considering the growing uncertainty regarding transparency in the generation of carbon credits.

There is a high diversity of projects that search to achieve voluntary objectives through the implementation of emission reduction actions in various sectors of the economy, from the forestry sector to public transportation. This diversity of actors and methodologies used bring uncertainty to the companies that buy them, the civil society and the authorities.

The carbon markets have been developed in a mainly voluntary way (goals for reducing and offsetting emissions from companies that voluntarily decide to buy carbon credits for corporate social responsibility and to demonstrate some type of commitment to offsetting their emissions), which means that carbon markets are not standardized and those are very different from each other and it is difficult to account for their robustness.

Business Impact

The impact of this analysis is to know if the generation of carbon credits in the voluntary market has effectively contributed to changing the emission trajectories in the countries that host the projects and if the differentiation of the projects could explain the quality or robustness of the projects. The questions we will solve with this analysis are as follow:

1. In which sectors do carbon credits have a greater, lesser or no impact?
2. Is there a relationship between the issuance of carbon credits and greenhouse gas emissions?
3. In which regions, sectors or countries it is possible to see a better understanding of the impact?

Data

Voluntary Registry Offsets Database - Version 4 — 2021

https://gspp.berkeley.edu/faculty-and-impact/centers/cepp/projects/berkeley-carbon-trading-project/offsets-database

Berkeley Carbon Trading Project's Voluntary Registry Offsets Database contains all carbon offset projects listed globally by four major voluntary offset project registries: American Carbon Registry (ACR), Climate Action Reserve (CAR), Gold Standard, and Verra (VCS). These four registries generate almost all the world's voluntary market offsets.

Description of the project data:

Column	Description
Project ID	The identification number given by the registries
Project Name	Name of the project on the registry.
ARB Project	Yes = all projects listed on ARB's Issuance & Retirements table or listed as 'proposed' or 'active' ARB projects by the registries. No = all other projects.
Voluntary Status	The status of the project on the voluntary market as designated by the registry.
Scope	Each project falls under a scope according to https://gspp.berkeley.edu/assets/uploads/page/Offsets-Database-ScopesTypes-v4.pdf
Type	Each project is categorized by a type according to https://gspp.berkeley.edu/assets/uploads/page/Offsets-Database-ScopesTypes-v4.pdf
Reduction / Removal	Each project type is categorized as Reductions, Permanent removals, Impermanent removals, or Mixed.
Methodology / Protocol	Defines the eligibility, emissions calculations, and monitoring requirements for specific project types.
Region	Region where the project takes place.
Country	The country where the project takes place.
State	The state or province where the project takes place.

Project	Site Location
	More details on the location of the project.
Project Developer	The person or organization responsible for developing the offset project. This is often the facility owner, project owner, or offset consultant.
Total Credits Issued	The total number of credits issued by the registry from the start of the project.
Total Credits Retired	The total number of credits retired or cancelled from the start of the project.
Total Credits Remaining	The difference between credits issued and credits retired.
First Year of Project	The first year when credited reductions/removals occurred, marked by the end of the first reporting period.
Credits Issued by Vintage Year (reductions/removals occurring in 1996 - 2021)	Credits issued by year when reductions/removals occurred, often called the vintage year, taken as the year of the end of the reporting period.
Credits Retired in 1996 – 2021	Lists credits retired/canceled by the retirement year.
Credits Retired in Year Unknown	Lists credits retired with no retirement date.
Credits remaining by vintage 1996 – 2021	Lists credits remaining and available in each issued vintage year.
Project Owner	The organization, company, or individual who owns the offset project.
Offset Project Operator	The organization, company, or individual which operates the offset project.
Authorized Project Designee	The organization, company, or individual that has first right of refusal for credits issued.
Verifier	Each registry requires a certified third party to verify that the project complies with the requirements of the protocol and that the claimed reductions are monitored and reported as per the requirements of the protocol.
Estimated Annual Emissions Reductions	Some registries note the emissions reductions that the developer expects to produce annually as submitted in early project documents.

PERs (Credits Issued in Future Years)	Lists credits which are ex-ante, which are credits issued before the carbon emission reductions are realized. Reforestation and afforestation projects, for example, may sell credits for expected future tree growth.
Registry / ARB	For filtering and sorting purposes, ARB projects (including all projects listed on ARB's Issuance & Retirements table or listed as 'proposed' or 'active' ARB projects by the registries) are listed in this column as "ARB" rather than by the registry that initially issued the credits.
ARB Project Detail	Some of the projects from the ACR, CAR, and Verra registries are also registered as compliance offsets under the California Air Resources Board's (ARB's) offset program and can be used by California emitters to comply with the state's cap-and-trade requirements. These projects use ARB-approved protocols. Yes Listed as a compliance offset project in ARB's offset project table Yes - Early Action Listed as an early action project in ARB's offset project table Proposed Listed as a proposed or active ARB offset project by the registry but not yet listed in ARB's own project table Terminated Listed as a terminated ARB project by the registry Inactive Listed as an inactive ARB project by the registry
Project Listed	The date that the project was listed on the registry, declaring the project's intention to generate carbon offset credits with a final version of the project design document.
Project Registered	The date that the project was registered as a registry offset project.
ARB ID	The California Air Resources Board assigned each of its projects with its own ID number.
CCB / Certifications	Verra's Climate, Community & Biodiversity (CCB) Standards independently verify carbon offsets for other co-benefits related to conserving biodiversity and supporting local communities. Their ongoing status and current compliance to CCB is notated as follows- Validated, Verified, Under Validation, & Under Verification. Other registries also can list other certifications.

Project Type	The registry's designation of type/sector as downloaded from the registry website.
Registry Documents	Link to the registry site where you can download project documents.
Project Website	External project website.
Credits Issued in 1996 – 2021	Credits issued by issuance year.
Notes from Registry	Notes from the registry.
Notes from Berkeley Carbon Trading Project	Unique attributes, findings, and context discovered during our data processing.
Date added to database	The database version and release date when the project was added.

CO2 emissions (metric tons per capita)

https://data.worldbank.org/indicator/EN.ATM.CO2E.PC

World Bank: This dataset contains the total Greenhouse gasses emitted by country, since 1970 to 2018. It also contains some countries summarized as regions.

The dataset we are taking is from *World Development Indicators: Energy dependency, efficiency and carbon dioxide emissions* from the Environment topic (http://wdi.worldbank.org/table)

Table "Data" (wide format)

1. Country Name (String)
2. Country Code (String)
3. Indicator Name (Category, only one)
4. Indicator Code (Category, only one)
5. Date (columns)

Table "Metadata – Countries" (long format)

1. Country Name (String)
2. Country Code (String)
3. Region (String)
4. Income_Group (Category)

Table "Metadata – Indicators (long format)

1. INDICATOR_CODE (String)
   2. INDICATOR_NAME (String)
   3. SOURCE_NOTE (String)

Methods

Some of the visualizations of interest and that will be provided by the EDA are the following:

   1. Behavior of carbon emissions over time in differents regions
   2. Behavior of carbon markets by regions and segments
   3. Correlation between the behavior of emission and carbon markets
   4. different graphs and segmentation of variables to determine possible patterns between the two evaluated behaviors

Interface

The interface include three pages, first page content of EDA, second page content evaluation of relation (positive or negative) in the two behaviors, three page include conclusions and recommendations

Milestones

Timeline

Pending to define

Concerns

Regardless of all the mishaps or novelties that may arise in the process, we trust that we will dedicate our best efforts to get ahead in this project.