# Utilizing Carbon Credit Offsets to Fund Affordable Housing

2023 SAS HACKATHON

# 2023 Hackathon Team

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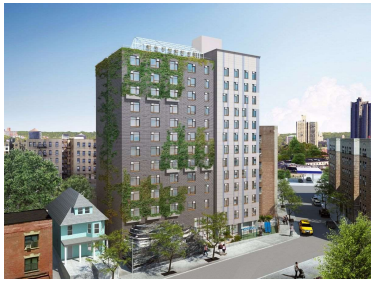
# Housing Partnership Request

A 35-year-old affordable housing agency which serves New York City has requested assistance to investigate the carbon credit offset market as a potential source of funding for “green” affordable housing projects. Their mission is “to create and preserve affordable housing and revitalize neighborhoods through community development promoted by dynamic public and private partnerships.”[1]

The hypothesis is that investors would be willing to pay a “premium” for carbon credit offsets if it reduces net carbon emissions and also serves purposes such as:

- benefits the local community,
- benefits those in need,
- improves public perception,
- or contributes to stated Environmental, Social, and Governance (ESG) goals.

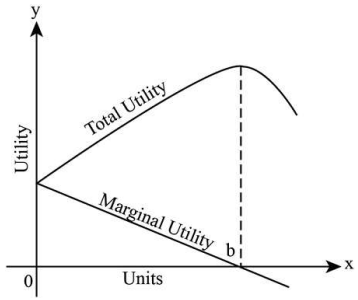


[1] https://housingpartnership.net/about/members/nyc-housing-partnership

# Justification for a Premium

The hypothesis that investors would be willing to pay a “premium” for carbon credit offsets is based off of economic theories such as utility and marginal utility, where a consumer values goods or services at different levels as they move along the utility curve.

- As one moves along the utility curve, the marginal utility changes.
- For example, as one acquires each incremental good or service, they experience diminishing marginal value with each additional acquisition.




Consider a company with a less-than-stellar reputation in the community. They may be willing to pay a premium for carbon credit offsets as a way to rebuild the trust of the community by showing its commitment to affordable housing initiatives.

Other companies may value being early adopters of green technology, and thus willing to pay a premium.

# Carbon Credit Offsets Explained

Carbon credit offsets are instruments that represent the market value of the amount of carbon that is offset by some type of carbon sequestering, diminishment, and/or prevention activity, such as through planting trees or the energy cost savings associated with solar panel installation or other green building initiatives.

One carbon credit allows the emission of one ton of carbon dioxide or equivalent value of other greenhouse gases.[1]


According to Investopedia, “Companies that pollute are awarded credits that allow them to continue to pollute up to a certain limit, which is reduced periodically.” [1]

Companies “must spend money on extra credits if their emissions exceed the cap. Second, they can make money by reducing their emissions and selling their excess allowances.” [1]

[1] https://www.investopedia.com/terms/c/carbon_credit.asp

# Why Invest in Carbon Credit Offsets?

Many companies have pledged to do their part to help stop climate change by reducing their greenhouse-gas emissions as much as possible, and have begun taking steps to do so.

For many companies, the goal of net-zero emissions cannot be obtained by solely reducing their own greenhouse-gas emissions, as it may be impossible or too cost-prohibitive to do so. In these cases, purchasing carbon credit offsets may be a way to achieve net-zero emission goals.

The carbon credit market is an immature, but growing market that "could be worth upward of $50 billion in 2030." [1]

In the case of the housing partnership, companies may be willing to invest in carbon credit offsets to support initiatives such as:

- reducing carbon emissions associated with developing new commercial and residential projects,
- increasing the stock of permanent affordable housing,
- cost savings to the occupants from the project's embedded energy efficiencies,
- and improving overall health outcomes in the area/community.

[1] https://www.mckinsey.com/capabilities/sustainability/our-insights/a-blueprint-for-scaling-voluntary-carbon-markets-to-meet-the-climate-challenge

# Challenges with Valuing Carbon Credit Offsets

Many challenges exists in performing quantitative analysis on the carbon credit offset market and attempting to quantify any such premium.

In the US, the carbon credit offset market is very fragmented and volatile. There are markets in Europe that are slightly farther along the maturity curve, but those are also volatile and do not provide highly reliable information.

Market data for carbon credit offsets is sparse at best. Some trading occurs on over-the-counter markets, however, the lack of consistency and transparency make any such data highly unreliable.

With respect to assigning premium values, many of the components do not have easily assignable dollar values. Things such as public perception, value obtained by greenhouse-gas reduction, etc. are difficult to quantify.

# Comparable Markets

Given the lack of data on the carbon credit offsets market, other comparable markets can be observed, many of which have had similar growing pains to the carbon credit offsets such as cryptocurrencies, derivatives markets, and options markets.

For the hackathon application, these highly complex markets present challenges to be able to obtain data and create valuable insights given the limited timeframe we have.

As a result, we chose to look at another comparable market that is more easily understood by the average person: the hybrid car market.

The hybrid car market has been around for a number of years now and the idea is that consumers who purchased hybrid cars were willing to pay a "premium" based on their own perceived values for things like reduction in carbon emissions or being early adopters of green technology while also realizing quantifiable benefits such as gas savings.

# Calculator Components

To establish how premiums could be computed in the carbon credit offset market, we built a calculator using data from the hybrid car market as an example.

The calculator leverages data that was available to compute the following metrics:

◦ Hybrid car premium: time series data quantifying the difference in MSRP between hybrid and gas powered models of the same make and model of automobile.

◦ Pollution reduction: estimated lifetime CO2 emission savings by hybrid vehicles compared to their gas counterparts based off of gallons of gasoline saved during the vehicles lifetime.

◦ Opportunity cost: estimated lifetime fuel savings based off of MPG and time series analysis of historical fuel prices.

# Calculator Components (continued)

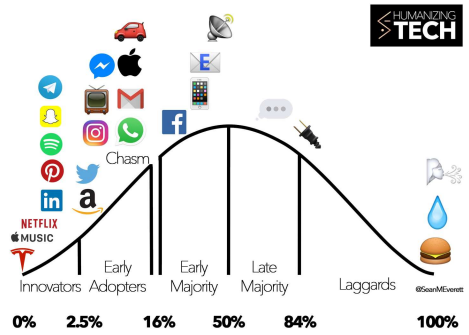
Due to the lack of readily available data, the following qualitative components were simulated:

◦ Change agent type: Indicates where a company falls on the adoption curve.

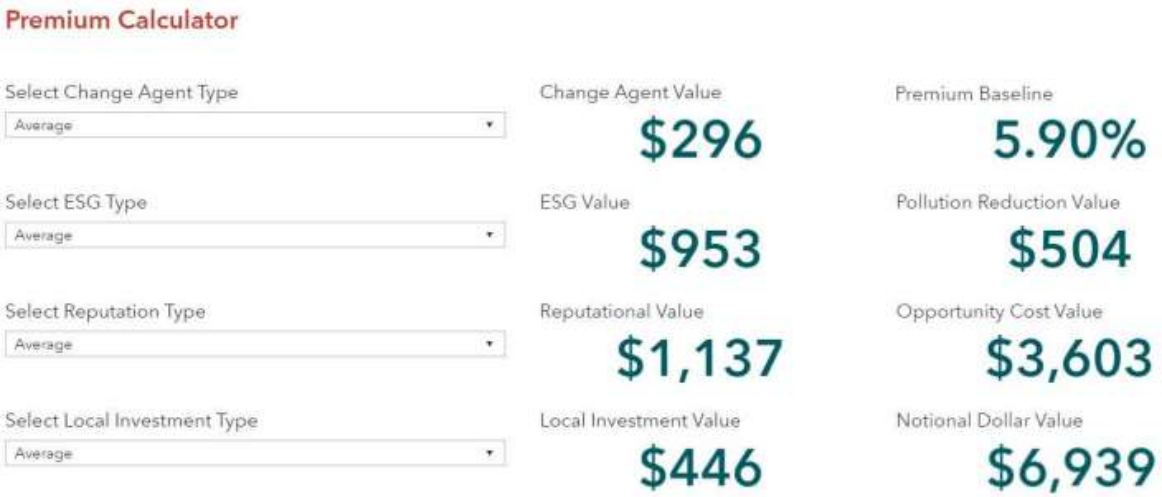
◦ ESG status: Indicates the emphasis placed on Environmental, Social, and Governance (ESG) goals.

◦ Reputational status: Denotes how the company is perceived by its customers, the public, etc.

◦ Local investment involvement: Describes the level of existing investment in one's local community.

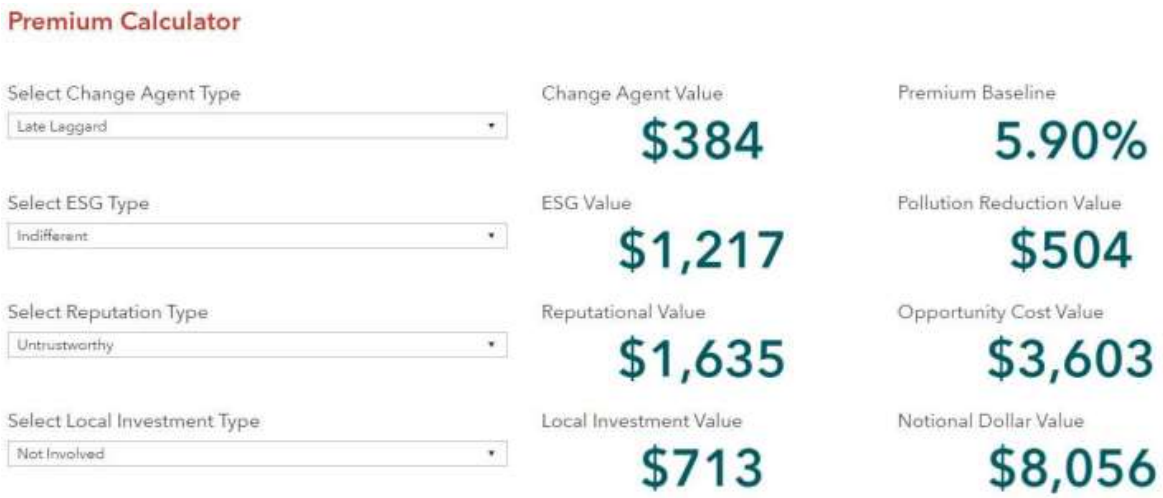



# Premium Calculator – Baseline



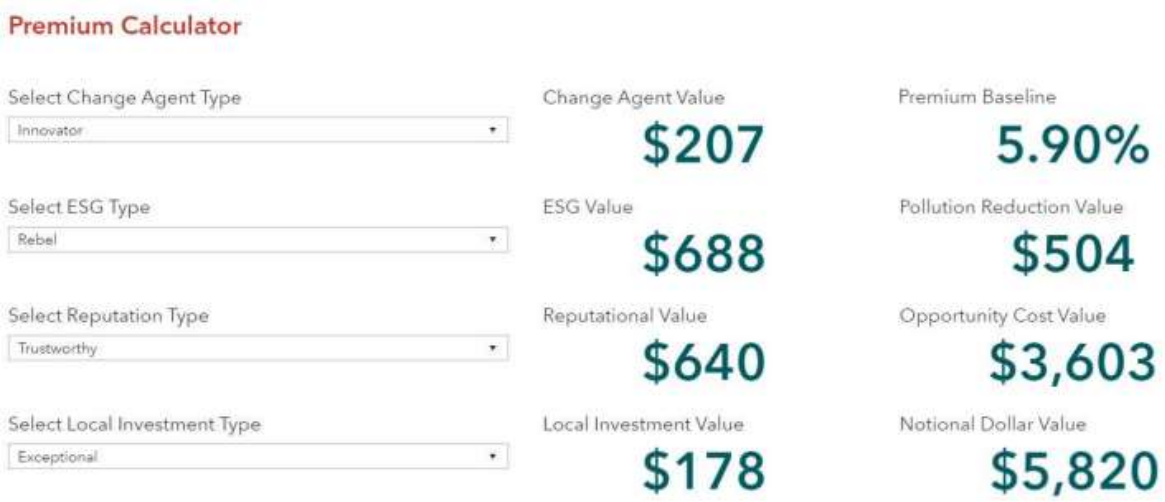

An entity with average rankings for change agent type, ESG status, reputational status, and local investment involvement would pay a premium of $6,939.

# Premium Calculator – High End



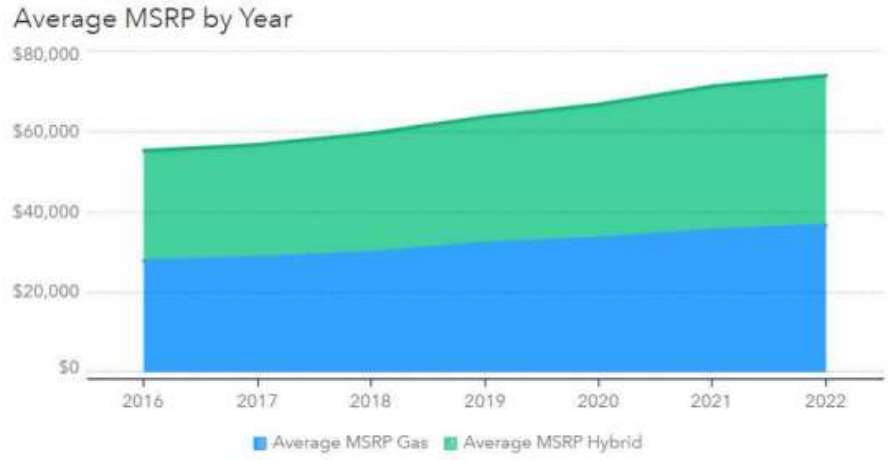

An entity with the worst possible rankings for change agent type, ESG status, reputational status, and local investment involvement would pay a premium of $8,056 to improve their perceived status in each area.

# Premium Calculator – Low End




An entity with the best possible rankings for change agent type, ESG status, reputational status, and local investment involvement would pay a premium of $5,820, as they have already established themselves as an innovator, trustworthy, an ESG advocate and exceptional in their local community.

# Hybrid Premium

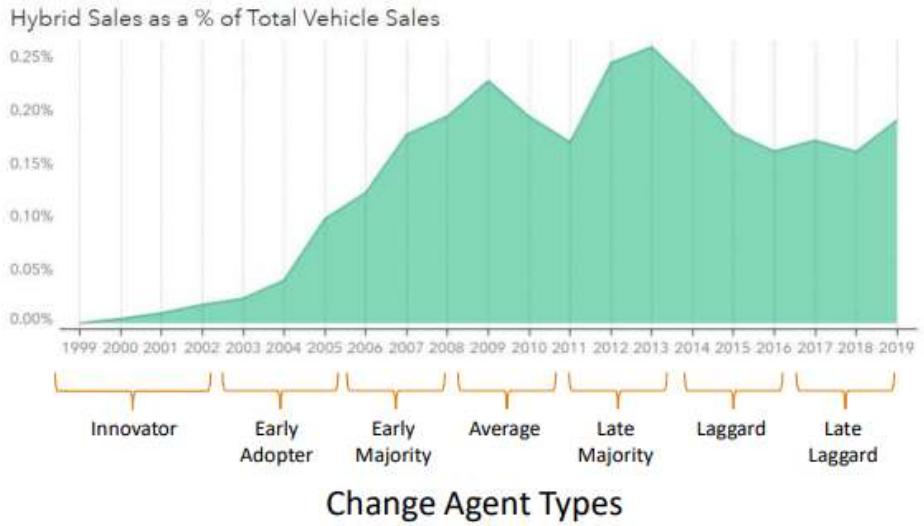



Source: Kelley Blue Book (KBB.com)

The green shaded area represents the average difference in MSRP for hybrid versions of the same make and model compared to gas powered versions.

Over this sample, the hybrid premium was 5.90%.

# Hybrid Vehicle Adoption Curve




Source: Federal Reserve Economic Data

# Tools and Data Used

The SAS VIYA platform was used to ingest, transform, simulate, analyze, and visualize the data for this project. The cloud based nature of the platform allowed the international team to work collaboratively in real-time.

SAS Studio was used for coding aspects of this project, while SAS Visual Analytics was used for exploratory analytics, basic statistical procedures, and for the development of the visuals and calculator.

The data used in this analysis was obtained from various sources including: Federal Reserve Economic Data (fred.stlouisfed.org), fueleconomy.gov, epa.gov, kbb.com.

In cases where data was not available but was needed, basic statistical procedures were used to simulate data.

# Next Steps – Housing Authority

Discuss potential areas of exploration with industry experts and housing partnership leaders.

Acquire relevant carbon credit trading data from over-the-counter markets and European markets.

Perform more sophisticated data simulations for components where data isn't readily available using more advanced comparable markets like derivative or options market as the base.

Obtain data to estimate coefficients for the qualitative rankings (change agent, ESG, reputation, local investment).

# Special Thanks

… to our SAS partners for their guidance, support and encouragement through our Hackathon journey!

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Arnold Oji

Chris Parrish