YoujiVest

YoujiVest Carbon Emission Metrics

Methodology and Definitions

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Introduction

Climate change presents one of the greatest sustainability challenges and opportunities to capital markets and global economies. China, as one of the world's major economies, will both benefit and contribute to solving the present carbon-induced climate crisis through its pledge on achieving peak carbon emission before 2030 and carbon neutrality before 2060.

These challenges and opportunities, as well as a clear consensus amongst policy makers, regulators, and institutional investors on what the most relevant climate risk metrics should be, set the stage for the creation of a comprehensive, accurate, and easy-to-understand carbon emissions metrics on China/Asia and its companies.

Up until now, this kind of carbon emissions metrics was lacking for developing countries and its publicly listed companies. YoujiVest's Carbon Emissions Metrics ("CEM") has been created to address this void. By leveraging this data, not only are users empowered to manage their investments' carbon exposure, but also equipped to mitigate their portfolios' climate risks and construct signals to extract climate alpha.

What is YoujiVest Carbon Emissions Metrics (CEM)

YoujiVest CEM provides both companies' actual disclosed, and estimated carbon emissions data.

Actual Disclosed

YoujiVest CEM is a suite of carbon emissions metrics designed to offer precise greenhouse gas (GHG) emissions for Chinese companies in the form Carbon Dioxide equivalent (CO_2e) and other relevant associated metrics, namely Carbon Intensity (CI) and Carbon Footprint (CF). While CO_2e is the most widely adopted carbon emissions standard reported by companies, it alone does not fully convey companies' carbon or climate risk exposure, as factors such as company size and sectors can significantly influence the interpretation. Therefore, to normalize CO_2e, CEM computes two additional metrics, Carbon Intensity and Carbon Footprint.

In short, CEM offers three carbon data metrics on companies:

- CO2e provides the amount of total carbon dioxide equivalent emitted by a company over its annual fiscal year and is measured in metric tonne. It includes primarily Scope 1 and Scope 2 emissions, and on rare occasions, also includes Scope 3. Scope 1 emissions are those directly produced or occurred on sources controlled by the company itself. Scope 2 emissions are indirect emissions produced by mainly power generators from whom the company's consumed electricity and power. Scope 3 are all other indirect emissions not covered by Scope 2. Finally, CO2e is an aggregated metric that combines six major GHGs: Carbon Dioxide, Methane, Nitrous Oxide, Hydrofluocarbons, Perfluorcarbons, and Sulphur Heaxflouride

- CI provides the amount of CO2e emitted in metric tonnes per million dollar revenue generated by the company on an annual, fiscal year basis. This ratio normalizes CO2e emissions for companies of various size (measure in revenue terms) and makes their comparison more meaningful. Without it, larger companies and/or companies in more fossil-fuel energy intensive sectors will always appear to emit larger carbon amount

- CF provides the amount of CO2e emitted in metric tonnes per million dollar market capitalization of the company. This ratio normalizes CO2e emissions for companies of various size (measure in market value terms) and makes their comparison more meaningful. Without it, larger companies and/or companies in more fossil-fuel energy intensive sectors will always appear to emit larger carbon amount

Furthermore, CEM's current coverage is publicly listed companies on the Hong Kong Exchange (HKEX), where climate disclosure requirements have been more clearly outlined and adopted. CEM will expand coverage to more China A-share and Indonesia companies as their carbon disclosures become available, or if necessary, provide estimated carbon emissions data.

All three carbon metrics, CO2e, CI and CF are based on disclosed annual fiscal year figures, with historical data going back to 2017, although sparse data are available back to 2010.

Estimated Carbon emissions data model

It is not uncommon for companies to disclose little to no information on their carbon emissions, and in these situations, we apply our proprietary estimation model described below. While the general principles and formulas governing our emission estimations are provided, the details involving proprietary methodologies and trade secrets are skipped over to ensure IP protection.

CEM estimation model is intended to estimate a company's Scope 1 and 2 Greenhouse Gas (GHG) emissions in the standard unit of CO2e metric tons. The foundation of the model is based on a **Geo-industry Specific** approach where both historical and current reported CO2e by companies around the world are captured, aggregated, and decomposed into more than 1000 unique emitting groups.

Each of these emitting groups reflects a specific set of business attributes that best characterize its sectors, industries, products, and geographies. Next, within each emitting group, its individual constituent companies' carbon intensity CI and carbon footprint CF are calculated, and then converted into grouped averaging factors. We have carbon intensity factors on a variety of financial metrics F to ensure our estimated emission does not deviate too much from potential sector and industry norms.

For a given company, its carbon emission C is the sum of the carbon emission of its product segments C_p. Each C_p is the average of the derived emissions based on the calculated CI factors.

$$C_p = \left(\sum_i^{Factors} CI_i * F_i \right)/N$$

CI_i: Carbon Intensity Factor i

F_i: Financial Metric corresponding to specific Carbon Intensity Factor i

N: Number of available Carbon Intensity Factors

Through matching these group average carbon metrics with their respective non-GHG disclosed companies' revenues and market capitalizations, these companies CO_2e can be deduced. Furthermore, with the now available estimated CO_2e from each company, its normalized metrics such as carbon intensity and carbon footprint can also be calculated.

Alignment with PCAF

Partnership for Carbon Accounting Financials North America (PCAF NA) aims to lead and inspire other financial institutions, measure what matters, drive loans and investments, and meet goals to reduce greenhouse gas (GHG) emissions.
For listed equities, PCAF has proposed the below Data Quality Score table as an indicator, where 1 means most robust carbon emission data.

YoujiVest CEM disclosed data meets with Score 1 in PCAF data quality, and estimated data meets with Score 2 in PCAF data quality. All carbon emission intensity factors are derived from actual reported carbon emission figures. The factors are then combined with a wide range of financial data to come up with the estimated carbon emission data, which matches with the description of PCAF score 2.

Data Quality Score (Highest to Lowest)	Description
Score 1	Audited GHG emissions data from the clients or third-party data provider, in accordance with the GHG Protocol, combined with financial data (enterprise value) from the clients.
Score 2	Non-audited GHG emissions data and/or primary data from the clients or third-party data provider, where primary data is converted to CO_2e emissions using verified emission factors specific to the emissions source, combined with financial data (enterprise value) from the clients.
Score 3	Estimated GHG emissions based on primary data per type of sector (provided by third-party data provider), combined with estimated enterprise value of the clients.
Score 4	Estimated GHG emissions based on specific studies (LCA or sector databases) per type of sector/company, combined with estimated enterprise values.
Score 5	EEIO databases (i.e., EXIOBASE or GTAP) that provide sector-level data per country on emissions per million dollar of revenue, OR Emissions intensity factors (emissions avoided per million euro invested) per sector from own system or peer financial institutions.

Benefits of YoujiVest Carbon Emissions Metrics (CEM)

As global markets and governments have adopted and integrated climate considerations into the institutional investment framework, it is now imperative to access a comprehensive, systematically captured, and robustly maintained source of carbon exposure data. The world is aligned on treating carbon exposure as the single most important climate risk factor, and CEM allows for unprecedented visibility into who is likely to flourish or languish under this new sustainability regime. Armed with CEM, investors can:

- Meet rising demand for portfolio climate risk reporting and investment regulations

- Analyze peer group, industry, and sector climate risk exposure

- Augment bottom-up, company level carbon research for securities selection

- Incorporate climate factors into passive and index strategies

- Construct climate and sustainability risk models and alpha signals

Data Collection

CEM begins with deploying a combination of web crawling and NLP (natural language processing) techniques to identify, compile, extract, and sanitize relevant company filings containing disclosed carbon emission data. These filings must be primary sources of information disclosed by the companies themselves, namely their annual reports, Corporate Social Responsibility (CSR) reports, and other Sustainability reports. The frequency of review is annual as these reports containing carbon emissions data are mostly disclosed on an annual basis; however, data are updated ongoingly as fiscal year reporting periods vary between companies.

From there, our climate expert analysts conduct actual human interpretation and calculation of CO2e, CI and CF based on often disparate and non-standardized carbon disclosures, before submitting them into production.

YoujiVest's analysts have been specially trained to decipher and interpret carbon emissions data in a consistent and objective manner, with several layers of built-in quality and error checking procedures. For example, any significant deviations from previous disclosed emissions values or industry average will raise red flags in the system prompting further review.

Because of our scalable research and data capture process, we strive to cover all HKEX listed companies that disclosed their carbon emissions without any minimum thresholds on market capitalization, trading liquidity, benchmark inclusion, sectors and industries involvement, etc. This makes CEM the world's most complete carbon emissions database on Asia publicly companies.

Data Maintenance

CEM is maintained and updated ongoingly as companies publish their annual filings throughout the year. Our system also monitors IPOs and other existing companies with improved carbon disclosure practices, and captures these newly released carbon data into the database.

We are always on a look out for coverage expansion, and actively seek for new companies to capture their carbon emissions as soon as they make such information public.

Features Summary

Features	Description
Carbon Data Items	Companies' Annual Total Carbon Emissions, Carbon Intensity, Carbon Footprint
Data Sources	Annual reports, CSR reports, and other company sponsored Sustainability reports
Coverage & Update	Over 4000 listed companies' disclosure carbon emission data in China/HongKong/Taiwan. Ongoing update as companies release their carbon emissions information in APAC region.
History	As early as 2010. More comprehensive coverage begins in 2017 to Present, constrained only by company's own disclosure practices.

Additional Information

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