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POLICY ANALYSIS ARTICLE



# Overcoming misleading carbon footprints in the financial sector

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**ABSTRACT**

Financial institutions, including pension funds and insurance companies, are key investors in financial markets and important providers of funding to companies. Their investment decisions can steer the transition towards a more sustainable economy and can ensure that sufficient capital is made available for the investments needed to achieve the goals of the Paris Agreement. The development of robust carbon disclosure metrics is key to measuring the sustainability of these institutions' investment portfolios. However, common carbon disclosure metrics are unreliable, since they are prone to macroeconomic effects, such as inflation and exchange rate fluctuations. This becomes relevant when one wants to consider the change in these metrics over time. In this study, we show that when the metrics are adjusted for inflation and exchange rate fluctuations, one can observe the *real* sustainability improvement over time. We find that sustainability improvements based on existing metrics are notably one-quarter to one-third smaller when adjusted for these effects. Hence, more than one-quarter of the observed 'greening' is 'non-real'; rather it is a consequence of macroeconomic fluctuations. We propose an adjusted metric that is robust to such fluctuations and illustrate its use in evaluating pension and insurance sector investments. Various international organizations, such as the Network of Central Banks and Supervisors for Greening the Financial System (NGFS) and the Task Force for Climate-Related Financial Disclosures (TCFD), are working together to create harmonized climate-related disclosure frameworks. This study aims to contribute to the ongoing work on carbon disclosure by identifying and solving methodological issues that are currently hampering the potential of carbon disclosure metrics, such as Weighted Average Carbon Intensity (WACI).

**Key policy insights**

- Although carbon disclosure metrics are currently recommended in international reporting standards, presently there is no commonly agreed set of metrics in place.
- Adjusting relative carbon disclosure metrics for inflation and exchange rate fluctuations makes a significant difference to the level and dynamics of these metrics over time.
- Adjusting carbon disclosure metrics for inflation and exchange rate effects contributes to establishing a harmonized global framework, which can help steer the transition towards a more sustainable economy and can ensure that sufficient capital is made available for the investments needed to achieve the goals of the Paris Agreement.

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## Introduction

Pension funds and insurance companies are key investors in the financial markets and are important providers of funding to companies. Pension funds and insurance companies are often referred to as 'institutional

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investors'. Their investment decisions can steer the transition towards a more sustainable economy (Peake & Ekins, 2017). To determine the sustainability of these financial institutions' portfolios over time, robust metrics are needed (Millar et al., 2018). Carbon disclosure metrics provide transparency to determine if the financial sector is on the right track towards reaching its sustainability goals and enable regulatory bodies to determine the climate-related transition risks facing the financial sector (Campiglio et al., 2018).

Although diverse carbon disclosure initiatives have arisen in the past years, presently there is no globally accepted metric to disclose corporate and financial carbon footprints (Buchner et al., 2019). There are multiple reasons why this has not occurred yet. For instance, there are unresolved methodological, accounting and data-dependent issues that make creating one common framework challenging (Agarwala et al., 2014; NGFS, 2019). On top of that, the lack of one commonly applied metric raises additional concerns since the various existing metrics show a lack of convergence. By comparing 12 climate risk metrics from 10 different providers, Bingler et al. (2020), for example, show that firms' climate risk assessments across metrics are fairly heterogeneous. Berg et al. (2019) investigate environmental, social and governance (ESG) ratings of six rating agencies and find significant divergence among ratings of different agencies.

Given the lack of convergence in existing metrics, the Network of Central Banks and Supervisors for Greening the Financial System (NGFS) has called for a rapid convergence towards a common set of global disclosure standards, and the development of well-defined metrics and methodological standards (NGFS, 2021). Furthermore, in its recent public consultation on climate-related metrics, the Task Force for Climate-Related Financial Disclosures (TCFD) notes that metrics should ideally be disclosed consistently from year to year to facilitate comparative analysis and analysis of trends (TFCD, 2021). In practice, there currently exist a plethora of carbon metrics and methodologies (Hoepner & Rogelj, 2021).

Currently, there are various carbon disclosure metrics being used that aim to measure the carbon intensity of an institutions' portfolio. In general, these measurements can be classified into two sets: absolute and relative disclosure metrics. Absolute metrics typically measure total emissions of a portfolio in tons of $CO_2$ equivalent emissions. Relative carbon disclosure metrics normalize emissions, for instance, by company size or revenue. Relative metrics thus account for the fact that larger companies tend to emit more as they produce more, and thereby allow for the international comparison of institutions' portfolios. The TCFD distinguishes five main metrics in their 2017 report: (i) Weighted Average Carbon Intensity (WACI); (ii) Carbon Intensity (CI); (iii) Carbon Footprint (CFP); (iv) Total Carbon Emissions (TCE) and (v) the exposure to carbon-related assets. In this study, the focus is on relative carbon footprints. First, because these metrics allow for an international comparison of institutions' portfolios. Second, because the absolute metrics – the TCE and the exposure to carbon-related assets – are simply not affected by exchange rate and inflation effects.

More specifically, the focus of this study is on the WACI, since it is the metric that serves as the recommended method by which an investor should disclose their respective financial carbon intensity, according to the TCFD. Going forward, the WACI serves as our base metric to describe in detail how all relative carbon footprint metrics are affected by macroeconomic effects that hamper accurate carbon disclosure. Additionally, we perform a robustness check using the CI and CFP metrics (see Appendix 1).

## Methods and data

### *Methods*

The WACI of an institutional investor can be derived in two steps. First, the carbon intensity of an investment is calculated by dividing the carbon emissions of the issuing company by its revenues. Second, the WACI is determined as the weighted average of all the carbon intensities of the investments in the portfolio of the financial investor (TFCD, 2017):

$$WACI_{i,t} = \sum_{j}^{n} \left( \frac{current\ value\ investment_{i,j,t}}{current\ value\ portfolio_{i,t}} \bigstar \frac{issuer's\ Scope\ 1\ and\ 2\ GHG\ emissions\ (in\ tonnes)_{i,j,t}}{issuer's\ revenue\ (in\ millions)_{i,j,t}} \right) \quad (1)$$

where the left fraction represents the portfolio *weight* – i.e. the weight of an investment in the total portfolio of investments – and the right fraction corresponds to the *carbon efficiency* of the issuer of that investment. In

Equation (1), *i* represents the institution (insurance company or pension fund), *j* represents the asset that is issued (i.e. a bond or equity of a specific issuing company) and *t* is the year. The summation over *j*, therefore, implies that the carbon intensity is first computed for each asset *j* and then added over all *n* assets in a portfolio of investments held by the institution *i*.

The WACI is a so-called relative carbon metric, as it normalizes the issuer's emissions by its revenues and thereby measures how efficient a company is with their emissions. This also enables one to compare metrics over different companies (across and within sectors) and portfolios, and to analyse trends in the carbon intensity over time.

An exchange rate effect arises in the calculation of the WACI if a portfolio consists of investments issued in different currencies. By using an exchange rate time series to convert the different currencies into one currency at every point in time *t*, an exchange rate effect will appear when considering the WACI over time. This works as follows: with the exception of the emissions in the numerator of the carbon intensity, the remaining three variables are expressed in monetary terms. Given how the WACI is defined, and since the unit of the metric is dependent on a currency, it is prone to reflect exchange rate fluctuations. The two formulas (2a) and (2b) show that the choice of the currency influences the WACI. While the currency effect drops out in the left-hand side of the formula, the choice for a currency influences the right-hand side of the formula.€

$$\sum_{j}^{n}\left(\frac{current\ value\ investment_{i,j,t}(€)}{current\ value\ portfolio_{i,t}(€)} \bigstar \frac{issuer's\ Scope\ 1\ and\ 2\ GHG\ emissions\ (in\ tonnes)_{i,j,t}}{issuer's\ revenue\ (in\ millions)_{i,j,t}(€)}\right) \tag{2a}$$

$$\sum_{j}^{n}\left(\frac{current\ value\ investment_{i,j,t}(\$)}{current\ value\ portfolio_{i,t}(\$)} \bigstar \frac{issuer's\ Scope\ 1\ and\ 2\ GHG\ emissions\ (in\ tonnes)_{i,j,t}}{issuer's\ revenue\ (in\ millions)_{i,j,t}(\$)}\right) \tag{2b}$$

When a large share of the investments in a portfolio is denoted in one currency (the 'dominating currency') that differs from the currency used in the unit, the exchange rate effect becomes larger. By contrast, the exchange rate effect is not an issue if the currency used to denote the metric is, for instance, pegged to the dominating currency (such that the exchange rate does not fluctuate).

Similarly, inflation rate effects impact the WACI if a portfolio is assessed over time. One needs to adjust the monetary variables for inflation by choosing and deflating to a base year. This must be done to properly describe how the portfolio's actual WACI is evolving in 'real' terms. The reasoning follows the same logic as adjusting nominal GDP for inflation, or house price indexes, over time.

We propose to adjust the WACI by correcting the monetary values for exchange rate and inflation effects. While the methodology advocated by the TCFD as summarized above does not adjust monetary values for exchange rates and inflation, the Intergovernmental Panel on Climate Change (IPCC) offers an approach to convert currencies and to account for inflation (Krey et al., 2014). This method proposes to normalize all currencies across space and time by using a fixed currency. This can be best explained by using an example. Suppose one converts 2019 U.S. Dollars (USD) to 2012 Euros (EUR). This requires two steps:

(1) Deflate the 2019 USD to its 2012 equivalent using an appropriate deflator (e.g. Consumer Price Index).
(2) Convert the 2012 USD to 2012 EUR using the constant 2012 spot market exchange rate between the two currencies.

By using a constant exchange rate (i.e. at one point in time), one can both address the inflation and exchange rate effect at once. The main advantage is that it simultaneously attempts to control for both effects. The constant exchange rate addresses the inflation effect by transforming a monetary variable from *nominal* to *real*, while also controlling for the exchange rate effect because it uses an exchange rate fixed in time. Using a constant exchange rate eliminates the effect because there are no fluctuations, as present with an exchange rate time series (Turner et al., 2019).

## Data

Emissions data, issuing companies' revenue and enterprise value are obtained from Refinitiv ESG. In this study, metrics are calculated based on scope 1 and scope 2 emissions, in line with the current TCFD recommendation.

Table 1 shows the definitions of the scope 1, scope 2 and scope 3 emissions. Scope 3 emissions are the broadest category and therefore hardest to accurately quantify without a harmonized framework in place. Refinitiv also reports scope 3 emissions. However, the accuracy of the data is questionable and therefore is not incorporated in the analysis for two main reasons. First, currently companies are free to determine the boundaries of their supply chain. Second, if several actors in a supply chain report scope 3 emissions, then some of these emissions are likely to be double counted (Warmerdam et al., 2019). Note that although the inclusion of scope 3 emissions is essential to determine actual carbon intensity levels, it does not influence the argument made that inflation and exchange rate effects should always be accounted for when reporting relative carbon disclosure metrics (irrespective of the scope(s) that is (are) considered).

We use data on Dutch pension funds and insurance companies to illustrate the impact of our proposed adjustments to the WACI. The data on the investments of Dutch pension funds and insurance companies are provided by De Nederlandsche Bank and are confidential. See Appendix 2 for further details on the data used.

## Results

When the WACI is adjusted for inflation and exchange rate fluctuations, one can observe the *real* improvement of the WACI over time. Figure 1 shows the adjusted and unadjusted WACIs for the Dutch insurance and pension fund sectors. The observed differences between the adjusted and unadjusted WACI are substantial. For pension funds, over the period 2012–2019, the unadjusted WACI decreases 34.4% (from 382.9 to 250.9 $tCO_2$ eq./MEUR invested), while the adjusted WACI decreases 24.1% (from 382.9 to 290.6 $tCO_2$ eq./MEUR invested). The difference is 10.4 percentage points, meaning that approximately one-third of the observed 'greening' in the unadjusted WACI is 'non-real'. Similarly, for insurers the (un)adjusted WACIs decrease by 30.1% and 23.7% respectively. Here, more than one quarter of the observed 'greening' in the unadjusted WACI is 'non-real'.

The adjusted WACI is expressed in one currency; in this analysis, the EUR. As the largest currency in the pension fund portfolio – in this case the USD – appreciates, asset positions and company revenues originally denoted in USD become larger in value when they are converted into EUR, even if the *real* monetary value remains unchanged. A larger revenue in the denominator of the WACI, in turn, reduces the value of the carbon *efficiency* (i.e. the right fraction of the formula, see Equation 1). In other words, as the USD appreciates relative to the EUR, the standard WACI expressed in EUR decreases, other things equal.

Our proposed adjustment affects Dutch insurers and pension funds in different ways, which is by and large explained by the differences in portfolio compositions between the two financial sectors. Insurers predominantly hold investments in EUR (71.6% in EUR and 17.5% in USD in 2019Q4), which leads to the inflation adjustment applied to investments denoted in EUR to have the largest weight in the impact of the adjustment. By contrast, pension funds mostly invest in USD (44.9% USD and 23.6% EUR in 2019Q4), while the WACI presented here is denoted in EUR. In this context, if one denotes a WACI in EUR, this leads to the applied adjustment being more sensitive to the USD-EUR exchange rate.

The composition of an investment portfolio determines the size of the difference between the adjusted and unadjusted metrics. Nevertheless, the results of our analysis carry over to any financial institution that has invested in countries with different currencies and/or countries that have faced inflation over time. This may, for example, also apply to commercial banks, mutual funds or asset managers with international portfolios. The implications of our study also hold for alternative relative carbon footprints, e.g. the Carbon Intensity

**Table 1.** Definition of scope 1, 2 and 3 emissions.

| Scope | Definition |
|---|---|
| Scope 1 | Direct company's emissions, e.g. emissions from a production plant that the company owns |
| Scope 2 | Indirect company's emissions produced through their energy consumption, e.g. heating, cooling, steam and electricity production that are outsourced to a third party, but are used by the main company for its activities |
| Scope 3 | Indirect company's emissions that occur throughout their production chain – both up and downstream. These can include emissions emitted during the production of purchased inputs, employees commuting, the refrigeration of a beverage in a store before it's sold |

Source: Bhatia et al. (2011).

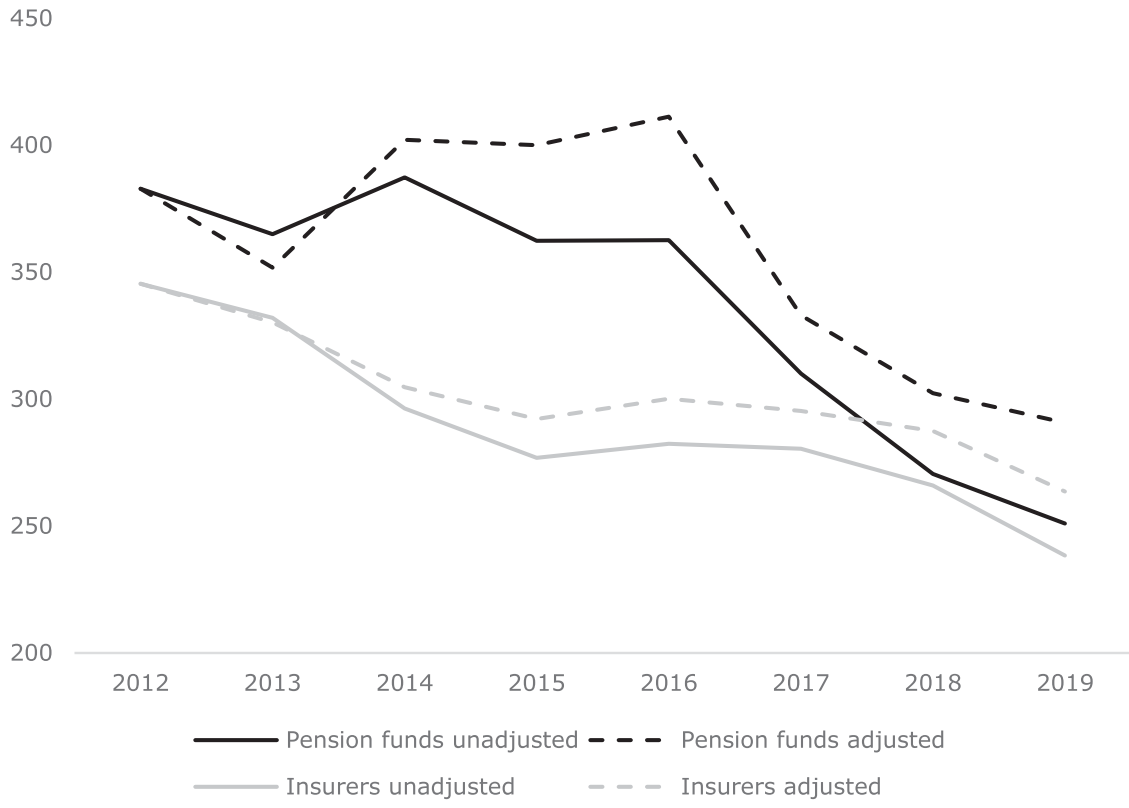


**Figure 1.** Insurers' and pension funds' (un)adjusted WACIs.

(CI) metric. From 2012 to 2019, the unadjusted CI for the Dutch pension fund sector decreased on average by 23.9% while the adjusted CI – i.e. the same metric adjusted for inflation and exchange fluctuations – shows an improvement of only 13.6% over the same period. While the exact evolution over time of alternative metrics differs compared to the WACI, the proposed adjustment has a similar impact (see Appendix 1).

## Conclusion

Carbon disclosure metrics are of the utmost importance to enable central banks and supervisors to determine whether the financial sector is on the right track toward reaching its sustainability goals and to monitor transition risks in the portfolio of financial institutions. Moreover, the existence of harmonized metrics and a global framework is critical for potential further steps or measures, such as climate-related financial (policy) instruments (D'Orazio, 2021).

We show that adjusting relative carbon disclosure metrics for inflation and exchange rate fluctuations makes a significant difference in the level and dynamics of these metrics over time. From 2012 to 2019, the standard – i.e. unadjusted WACI for the Dutch pension fund and insurance sector decreased on average by 34.5% and 31.0% respectively. The adjusted WACI – i.e. the WACI adjusted for inflation and exchange fluctuations – however, shows an improvement of only 24.1% and 23.7% respectively over the same period. In sum, more than one-quarter of the observed 'greening' is 'non-real', but rather a consequence of these macroeconomic effects. While the standard WACI is valid to observe and compare portfolios at a certain point in time, our results show that to meaningfully interpret and compare the WACI over a particular time horizon, it is necessary to correct for inflation and exchange rate fluctuations. As the results are significant and similar for other relative carbon disclosure metrics, we recommend adjusting these metrics for these macroeconomic effects.

We also identify some areas for further research in this field. The impact of the inflation and exchange rate effect should be tested for other asset classes (e.g. sovereign bonds, loans, and mortgages) and other financial sectors (e.g. banks or mutual funds). Depending on the direction of the exchange rate effect (i.e. appreciation or depreciation) and the inflation effect (i.e. inflation or deflation), the adjusted metric may show the opposite effect. That is, adjusted metrics can show larger sustainability improvements compared to their unadjusted counterparts. Since these variables vary by location, the direction and size of the results are thus very much dependent on the geographical composition of the portfolio and the period that is studied. For example, it may be interesting to replicate this study with data from regions that have experienced deflation to gain a better understanding of the adjusted metrics evolution relative to the unadjusted metric.

Going forward, global climate-accountancy standard setters, currently spearheaded by the Sustainability Standards Board (SSB) of the Trustees of the IFRS Foundation, should be aware of this measurement issue and act accordingly. Robust and comparable sustainability information based on transparent methodologies should complement the financial information already available and should be readily available for all market participants, shareholders and other stakeholders. Then, and only then, can one infer the role the financial sector plays in reaching net-zero emissions by 2050.

## Disclosure statement

No potential conflict of interest was reported by the author(s).

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