

A Greenwashing Index

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What Is Greenwashing?

Jay Westerveld (1986)

Hotel industry's practice of encouraging guests to reuse towels to "save the environment".

Cambridge dictionary (2013)

Behaviour or activities that make people believe that a company is doing more to protect the environment than it really is.

E.U. Taxonomy Regulation (financial sector)

The practice of gaining an unfair competitive advantage by marketing a financial product as environmentally friendly, when in fact basic environmental standards have not been met.



Is Greenwashing a Big Deal?



English EN

Se

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Screening of websites for 'greenwashing': half of green claims lack evidence



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Britain's anti-greenwashing rule for finance takes effect on May 31

By [Huw Jones](#)

April 23, 2024 12:26 PM GMT+2 · Updated 6 months ago



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US SEC cracks down on funds "greenwashing" with new investment requirement

By [Douglas Gillison](#) and [Michelle Price](#)

September 20, 2023 6:35 PM GMT+2 · Updated 21 days ago



Contribution

① We quantify greenwashing salience

- We use news articles to build a greenwashing index

Greenwashing salience has been ↗ since mid-2018. Now ~ 10% of climate risk salience.

- We study the composition of this index (sectors, topics)

The financial sector (ESG investments, green bonds and ESG ratings) is responsible for the recent increase.

② Does greenwashing salience impact investors' behaviour?

- We build an anti-ESG index

More greenwashing ⇒ ↗ anti-ESG sentiment.

- We study the impact of greenwashing on fund flows

More greenwashing ⇒ ↘ inflows in green funds.

Our definition of greenwashing

UK 2024 Sustainability Disclosure Requirements:

FCA's Handbook (UK financial sector)

Sustainability references should be:

- correct and capable of being substantiated
- **clear** and presented in a way that can be understood;
- **complete** – they should not omit or hide important information; and
- fair and meaningful in relation to any comparisons to other products or services.

Our definition of greenwashing

2018-10-25

Business News: New York Sues Exxon Over Climate Change

"Exxon built a facade to deceive investors into believing that the company was managing the risks of climate-change regulation to its business when, in fact, it was intentionally and systematically underestimating or ignoring them, contrary to its public representations," New York Attorney General Barbara Underwood said in a statement.

2021-09-27

In August, The Wall Street Journal reported that DWS struggled to define and implement an ESG strategy, at times painting a rosier-than-reality picture to investors, according to Ms. Fixler and internal emails and presentations.

but also:

2018-09-18

The problem here isn't the ESG ratings, but that they are used as though they were some sort of objective truth. In reality they are no more than a series of judgments by the scoring companies about what matters – and investors who blindly follow their scores are buying into those opinions, mostly without even knowing what they are.

Literature Review

- 1 **Text analysis to quantify climate-related risks:** Engle, Giglio, Kelly, Lee and Stroebe (2020), Ardia, Bluteau, Boudt and Inghelbrecht (2022), Sautner, Vilkov, Van Lent and Zhang (2023), Faccini, Matin and Skiadopoulos (2023)

This paper: *We focus on greenwashing*

- 2 **Detecting greenwashing at the firm level:** Bingler, Kraus, Leippold and Webersinke (2022, x2), Parise and Rubin (2023)

This paper: *We measure aggregate greenwashing salience*

- 3 **Salience effects:** Bordalo, Gennaioli, and Shleifer (2012), Huang, Nekrasov and Hong Teoh (2018)

This paper: *We study salience of greenwashing news*

- 4 **Analyzing fund flows:** Hartzmark and Sussman (2019), Van der Beck (2023), Gantchev, Giannetti and Li (2024)

This paper: *We analyze how greenwashing salience affects fund flows*

1. Measuring Greenwashing Salience

Data

- Daily paper-based Wall Street Journal articles from January 1979 to June 2022 (nearly 1m)
- Challenges: large dataset, unlabelled and imbalanced, greenwashing hard to identify
- Hand-labelled 1479 articles for validation and testing:
 - 875 climate-related
 - 60 greenwashing-related

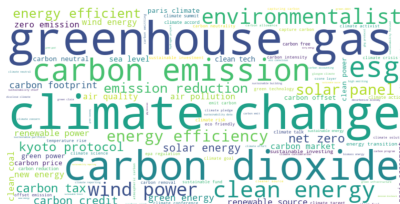
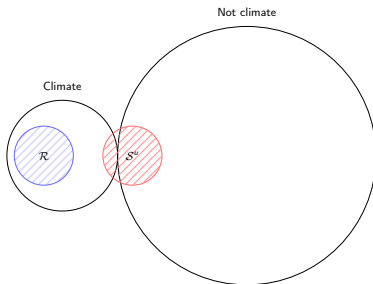


Algorithm

2 steps: Identify 1) climate risk-related articles and 2) greenwashing-related art.

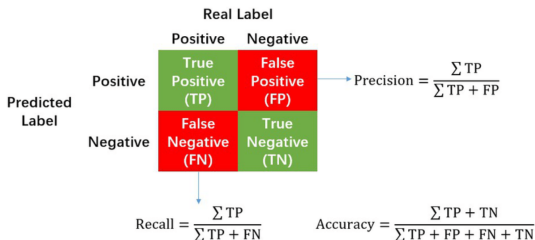
- Semi-supervised algorithm of King, Lam, and Roberts (2017): iterative discovery of documents
- Start with dictionary to obtain \mathcal{R}
- Undersampling of \mathcal{S}
- Hard voting with 3 classifiers (naive Bayes, random forest, support vector)
- Hyperparameters tuned on the validation set
- Iterate until convergence

Training set:



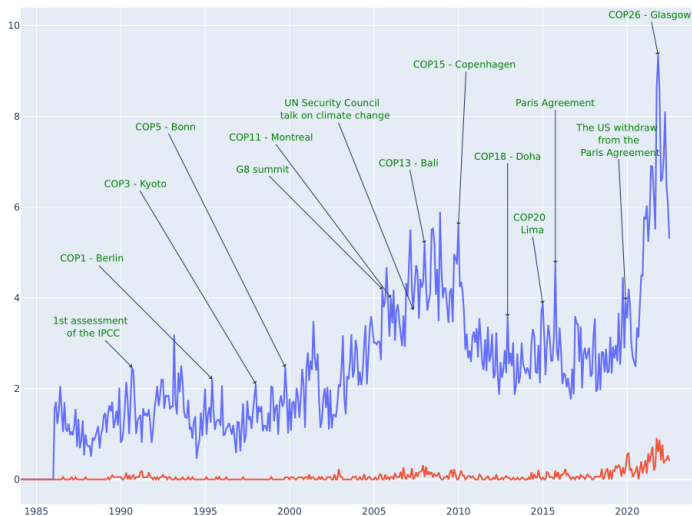
Out-of-Sample Performance

Step		Accuracy	Precision	Recall	F-score	AUC
1. Climate	This paper, BoW	90.8	89.7	95.4	92.5	89.8
	This paper, Word2Vec	89.1	86.8	96.1	91.2	87.5
	Engle et al. (2020)	79.6	77.2	92.9	84.3	76.7
	Sautner et al. (2023)	79.7	77.5	92.5	84.3	76.9
2. Greenwashing	This paper, Word2Vec	97.4	73.9	56.7	69.7	77.9
	This paper, BoW	96.8	71.4	33.3	58.1	66.4
	Engle et al. (2020)	95.5	42.9	30.0	39.5	64.2
	Sautner et al. (2023)	95.4	40.9	30.0	38.1	64.1



2. Greenwashing Index

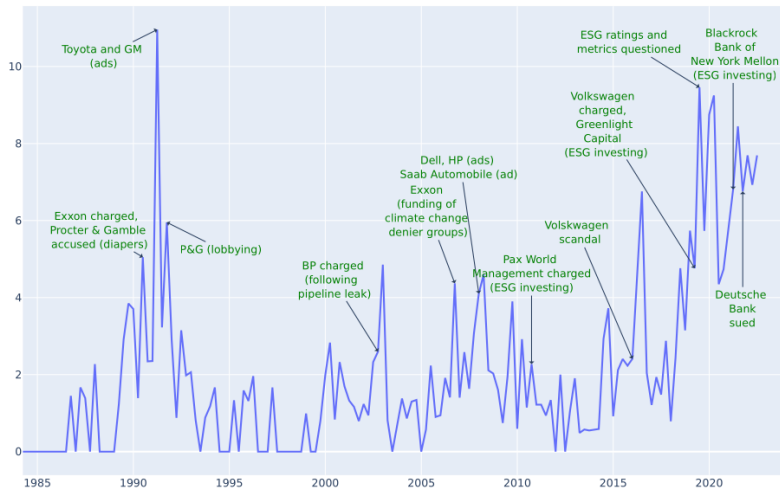
Overall Greenwashing Salience



Greenwashing $\sim 0.5\%$ of news since 2018

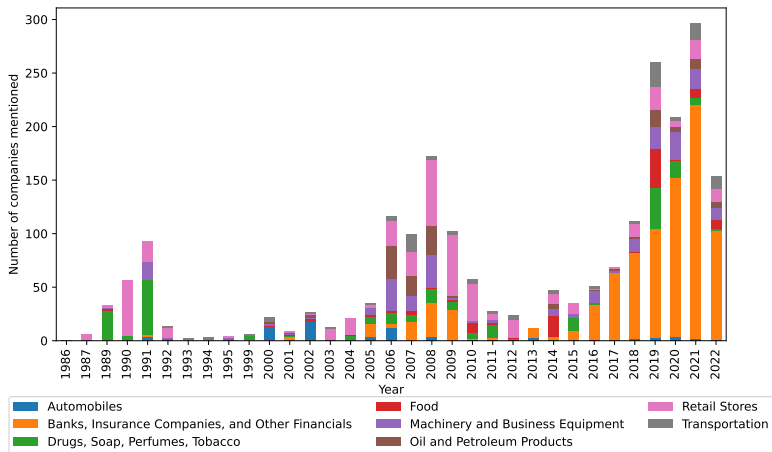
Greenwashing Index

A relative index: Fraction of climate risk-related articles



- Before 2018: greenwashing mostly < 5% climate risk discussion
- Since 2018: around 8%.

Firms and Industries



- Dominance of the financial sector since 2016

Topic Analysis

Keyword Assisted Topic Model (keyATM) of Eshima, Imai, and Sasaki (2023)

- Improves upon LDA (Latent Dirichlet Allocation) in terms of topic interpretability and measurement
- Generative model: each document has a topic probability distribution, each topic has a word probability distribution
- Human in the loop approach: enables to provide prior topics with keywords \Rightarrow Keyword topics and no-keyword topics
- Time varying version

Topics

Topic	%	Most characteristic words
Disclosure	12.4%	sustainability, group, firm, report, investor, data, plan, impact, disclosure, financial
Asset Management	8.4%	fund, investment, investor, asset, etf, investing, manager, portfolio, sustainable, management
Shareholder activism	6.8%	corporate, shareholder, public, executive, issue, board, proposal, vote, social, activist
Emissions	6.5%	carbon, climate, emission, change, global, world, business, target, gas, greenhouse
Labels	6.1%	product, consumer, green, store, marketing, sale, label, environmentally, food, brand
ESG Ratings	5.4%	esg, stock, index, firm, risk, investor, score, rating, governance, morningstar
Law suits	4.5%	claim, state, general, official, case, action, federal, law, spokesman, agency
Green bonds	3.5%	bond, green, bank, project, finance, market, credit, investor, debt, issuer
Alternative energies	3.3%	energy, power, price, plant, clean, market, technology, solar, alternative
Recycling	3.3%	plastic, bag, paper, recycling, recycled, packaging, bottle, waste, diaper cup
Fossil fuels	2.6%	industry, oil, fuel, exxon, car, gas, fossil, coal, shell, global
Construction	2.2%	group, program, building, real, energy, forest, certification, standard, council, green

3. Does Greenwashing Salience Affect Investors' Behavior?

Impact of Greenwashing on Anti-ESG Sentiment

- "Opinions" from the WSJ
- Neg./pos. climate sentence: contains "climate" word + neg./pos. word
- Neg. climate opinion: $\frac{\# \text{neg. climate sentences}}{\# \text{pos. climate sentences}} > 1$
- Anti-ESG index: $\frac{\# \text{negative climate opinions}}{\# \text{climate opinions}}$

	<i>Anti - ESG_t</i>	
	Since 2000	Since 2010
GS_{t-1}	0.363	0.429
GS_{t-2}	0.642**	0.578**
GS_{t-3}	0.742***	0.513*
Observations	266	150
R^2	0.038	0.061

- Greenwashing GS_t and Climate CS_t shocks, computed as the innovations of an AR(1) model applied to each index
- Do investors invest less in ESG funds?

Impact of Greenwashing on Flows

- 7,613 Morningstar open-end funds and ETFs domiciled in the United States from August 2018 until June 2022
- "Advertized green" funds: 392 funds with a "green" word in their title
- Regressions at the share class level (retail vs. institutional)
- Greenwashing GS_t and Climate CS_t shocks, computed as the innovations of an AR(1) model applied to each index

$$\begin{aligned} \text{Rel. flows}_{i,t} = & \sum_{h=1}^3 a_h GS_{t-h} \times D_{5G \setminus 5S,i,t} + \sum_{h=1}^3 b_h GS_{t-h} \times D_{5S \setminus 5G,i,t} \\ & + \sum_{h=1}^3 c_h GS_{t-h} \times D_{5S \cap 5G,i,t} + \sum_{h=1}^3 d_h GS_{t-h} \times D_{5S \cap 5G,i,t} \times \text{Ad. green}_i \\ & + \text{Fund fixed effects}_i + \text{Month fixed effects}_t + \text{Controls}_{i,t-1} \end{aligned}$$

- Add lagged share class-specific variables: Ad. green, globe and star ratings, size, flows, returns and trend variables: $GS_{t-3:t-1}$, $CS_{t-3:t-1}$
- Control for climate effects

Impact of Ratings on Flows

	Time Fixed Effects		
	All	Retail	Institutional
$D_{5G \setminus 5S}$	0.001	0.001	0.001
$D_{5S \setminus 5G}$	0.017***	0.015***	0.020***
$D_{5G} \times D_{5S}$	0.020***	0.020***	0.020***
Ad. green $\times D_{5G} \times D_{5S}$	0.021***	0.010	0.027***
$GS_{t-1} \times D_{5S \setminus 5G}$	-0.011	-0.009	-0.016
$GS_{t-1} \times D_{5G \setminus 5S}$	-0.011	-0.004	-0.028
$GS_{t-1} \times D_{5G} \times D_{5S}$	0.024	0.035	0.005
$GS_{t-1} \times \text{Ad. green} \times D_{5G} \times D_{5S}$	-0.157***	-0.029	-0.238***
$GS_{t-2} \times D_{5S \setminus 5G}$	-0.051**	-0.041*	-0.070*
$GS_{t-2} \times D_{5G \setminus 5S}$	-0.008	-0.006	-0.010
$GS_{t-2} \times D_{5G} \times D_{5S}$	-0.031	-0.035	-0.034
$GS_{t-2} \times \text{Ad. green} \times D_{5G} \times D_{5S}$	-0.200***	-0.036	-0.324***
$GS_{t-3} \times D_{5S \setminus 5G}$	-0.059**	-0.053***	-0.069**
$GS_{t-3} \times D_{5G \setminus 5S}$	-0.034**	-0.037***	-0.028
$GS_{t-3} \times D_{5G} \times D_{5S}$	-0.051*	-0.099**	0.017
$GS_{t-3} \times \text{Ad. green} \times D_{5G} \times D_{5S}$	-0.153***	-0.060	-0.258***
Controls	Yes	Yes	Yes
Observations	531241	378842	151124
R^2	0.044	0.042	0.043

Impact of Greenwashing on Flows

	Fund Fixed Effects		
	All	Retail	Institutional
GS_{t-1}	0.002	0.004	-0.002
GS_{t-2}	-0.004	-0.007	0.003
GS_{t-3}	-0.026**	-0.028**	-0.019
Controls	Yes	Yes	Yes
Observations	531241	378842	151124
R^2	0.026	0.023	0.026

Impact of Greenwashing on Flows

	Time & Fund Fixed Effects		
	All	Retail	Institutional
$D_{5G \setminus 5S}$	-0.003***	-0.002**	-0.003**
$D_{5S \setminus 5G}$	0.012***	0.010***	0.013***
$D_{5G} \times D_{5S}$	0.020***	0.009***	0.011***
Ad. green $\times D_{5G} \times D_{5S}$	0.021***	0.006	0.030***
$GS_{t-1} \times D_{5S \setminus 5G}$	-0.003	-0.004	-0.002
$GS_{t-1} \times D_{5G \setminus 5S}$	-0.010	-0.003	-0.026
$GS_{t-1} \times D_{5G} \times D_{5S}$	0.030	0.041	0.009
$GS_{t-1} \times \text{Ad. green} \times D_{5G} \times D_{5S}$	-0.134***	0.002	-0.204***
$GS_{t-2} \times D_{5S \setminus 5G}$	-0.037***	-0.025**	-0.058***
$GS_{t-2} \times D_{5G \setminus 5S}$	0.003	0.007	-0.007
$GS_{t-2} \times D_{5G} \times D_{5S}$	-0.019	-0.020	-0.029
$GS_{t-2} \times \text{Ad. green} \times D_{5G} \times D_{5S}$	-0.172***	0.012	-0.280***
$GS_{t-3} \times D_{5S \setminus 5G}$	-0.030*	-0.025	-0.041*
$GS_{t-3} \times D_{5G \setminus 5S}$	-0.008	-0.008	-0.007
$GS_{t-3} \times D_{5G} \times D_{5S}$	-0.026	-0.068*	0.025
$GS_{t-3} \times \text{Ad. green} \times D_{5G} \times D_{5S}$	-0.126***	-0.019	-0.220***
Controls	Yes	Yes	Yes
Observations	531241	378842	151124
R^2	0.025	0.022	0.024

Conclusion

- ① Using NLP, we build a greenwashing index and show that greenwashing has become more important since 2018.
- ② The increase in the greenwashing index has been driven by the financial sector.
- ③ Increases in attention to greenwashing are followed by increases in anti-ESG sentiment.
- ④ Increases in greenwashing are followed by decreases in (green) fund inflows.

Thank you!

Appendix

Impact of Greenwashing on Anti-ESG sentiment (in levels)

	<i>AntiESG_t</i>	
	Since 2000	Since 2010
GW_{t-1}	0.347	0.470*
GW_{t-2}	0.567**	0.353
Controls	No	No
Observations	266	150
R^2	0.028	0.053

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