

AlignAlytics

Personalized ESG Investing with AI

BUSN 30135

AI and Financial Information



The University of Chicago Booth School of Business

Daniel Buckman

Nikita Shaiva

Joe McDonald

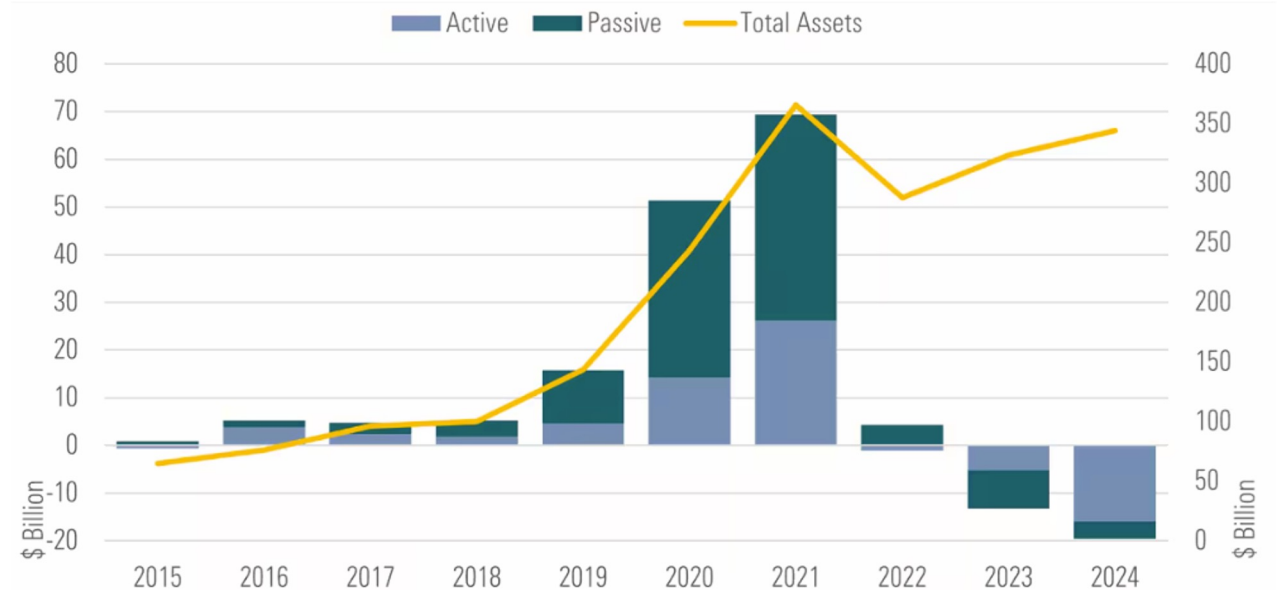
Chris Sardi

Motivation / Background

After Initial Acceleration, Interest in ESG has Tapered Off...

- 2010: ESG AUM ~\$110B ¹
- 2021: ESG AUM ~41T ²
- 2021-Present Fund flows have since reversed ³

US Sustainable Fund Flows and Assets



Source: Morningstar Sustainalytics. Data as of Jan. 16, 2025.

1. SustainableInvest.com. "Assets of Sustainable Mutual Funds and ETFs Close 2019 at \$1.6 Trillion, Up from \$113.5 Billion Ten Years Ago." SustainableInvest.com, 2020. [link](#).
1. Texas Comptroller of Public Accounts. "ESG Investing." *Fiscal Notes*, May 2023. [link](#).
1. Hale, Jon. "US Sustainable Funds Suffer Another Year of Outflows." Morningstar, February 27, 2024. [link](#).

Motivation / Background

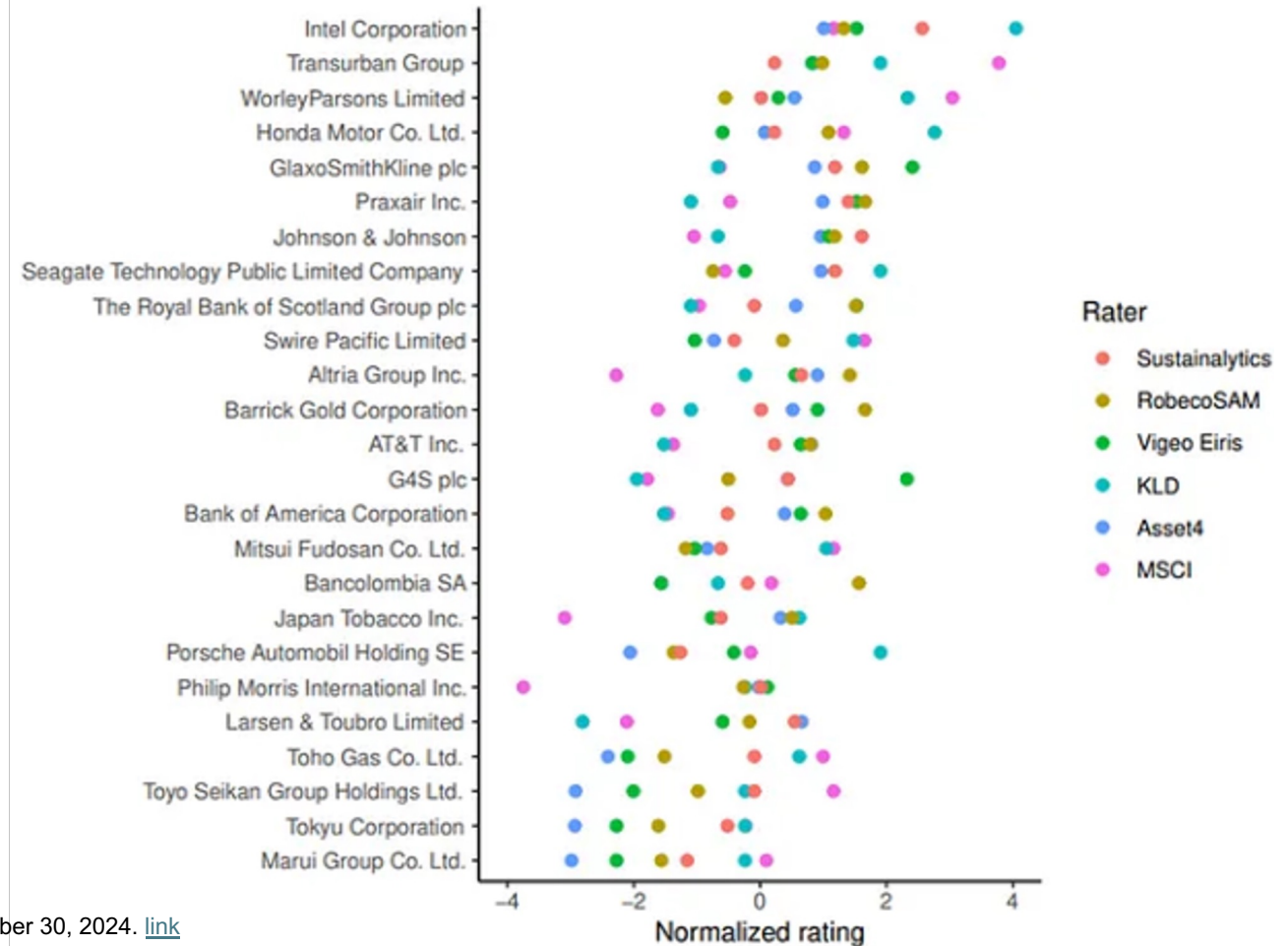
Why the Pullback?

- Financial Underperformance ¹
- Lack of Transparency & Personalization ^{2,3}
 - Differing frameworks and weighting schemes generate conflicting scores and confusion
 - One-size-fits-all not suitable for unique value judgments

1. "US ESG Funds Bleed Less Money in Q2 2024." Morningstar. [link](#).

1. Calastone. "Global Fund Flows 2024 – Navigating Change: Investors Turn to Bonds." December 30, 2024. [link](#)

1. Berg, Florian. "Aggregate Confusion: The Divergence of ESG Ratings." MIT Sloan School of Management, 2022. [link](#).



Our Solution

Transparency:

- Main purpose of scores is impact, not financial risk
- Use company **alignment to UN Sustainable Development Goals (SDGs)**
- Build scorecard based upon UN SDG indicators, rather than conflicting proprietary framework

Personalization:

- People have differing definitions of social good; **users choose own weighting scheme** to reflect their values



Use Cases

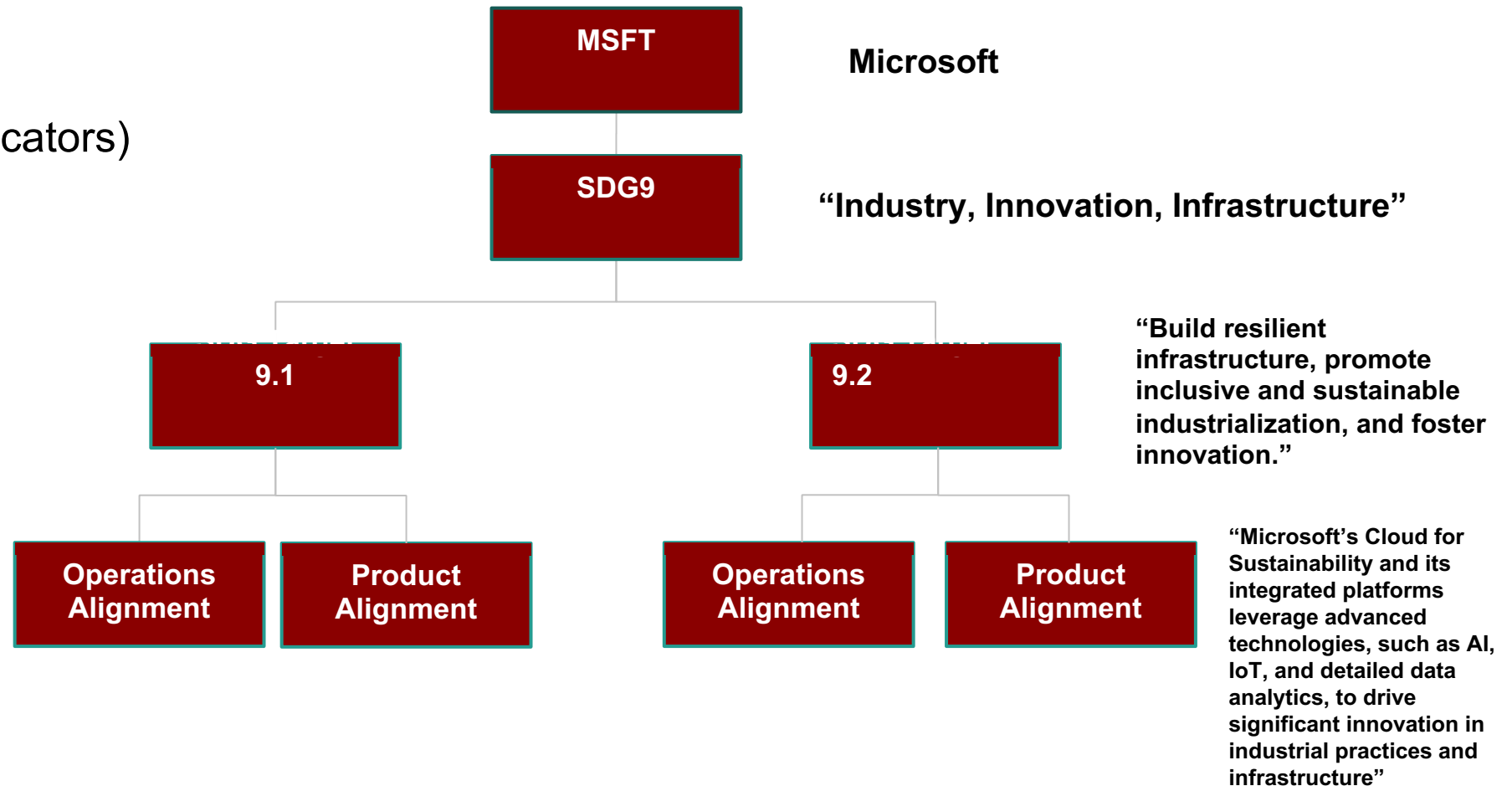
- **Asset Owners & Asset Managers (Particularly Impact-Driven) ~\$50T Projected Market Opportunity**
 - Quantifying impact alignment of current portfolio
 - Build custom portfolios with targeted SDG alignment screens (within and/or across asset classes)
 - Impact-based shareholder engagement
 - Impact-linked incentive structuring
- **Corporations**
 - Stakeholder engagement and communication
 - Aligning operations and products with specific SDG targets
 - SFDR & impact reporting
 - Impact-linked compensation

Project Walkthrough

Overview of Scoring Methodology

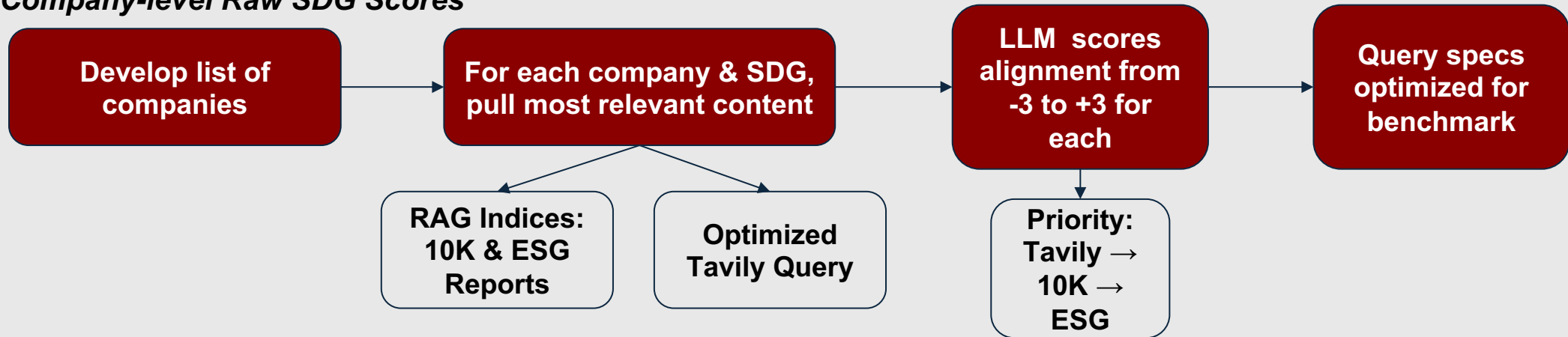
- 27 Companies
- 17 SDGs
- 169 Targets (231 Indicators)

- -3 to +3 for both product and operational alignment score
- roll up to average target score
- roll up to average SDG score



Overview of Workflow

Company-level Raw SDG Scores



Personalized Outputs



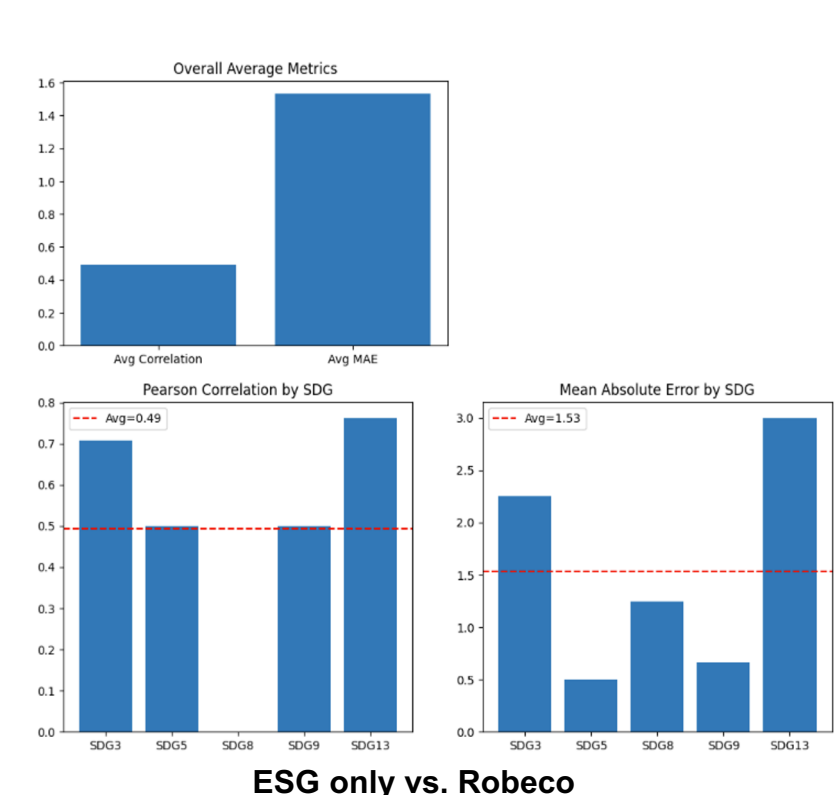
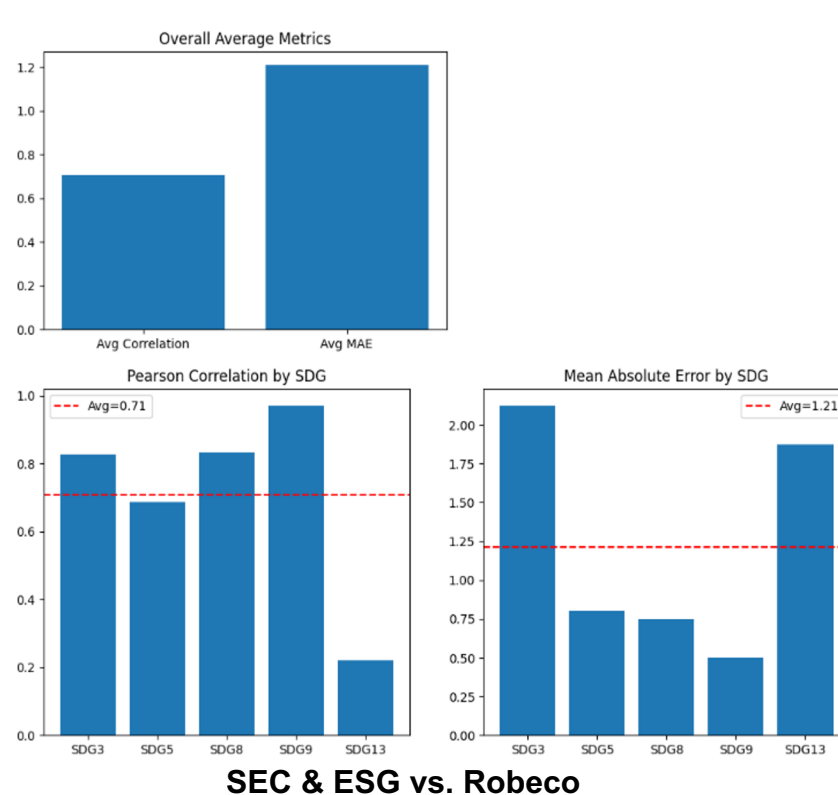
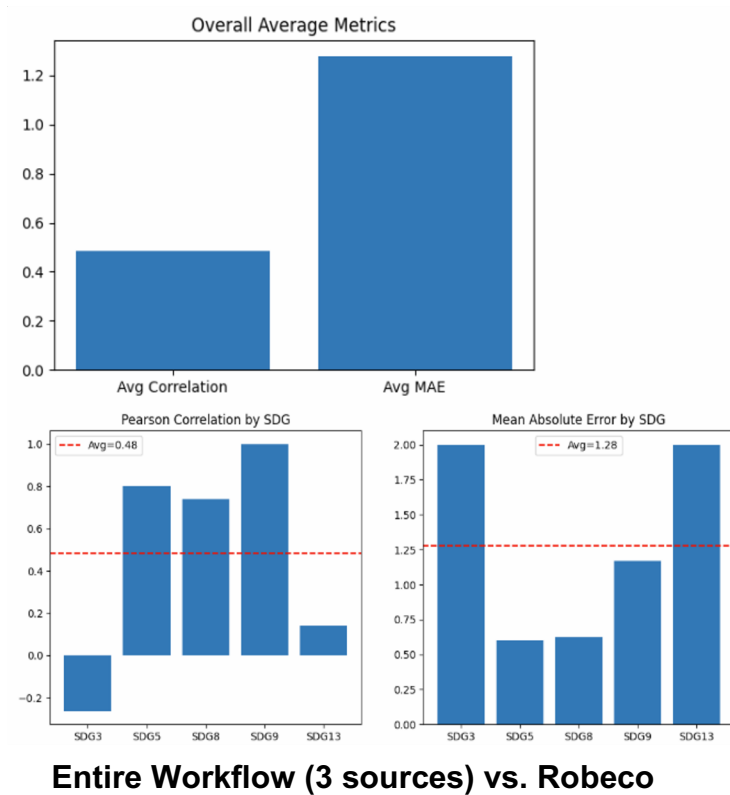
Benchmarking Process - Part 1

Robeco SDG Alignment Scores

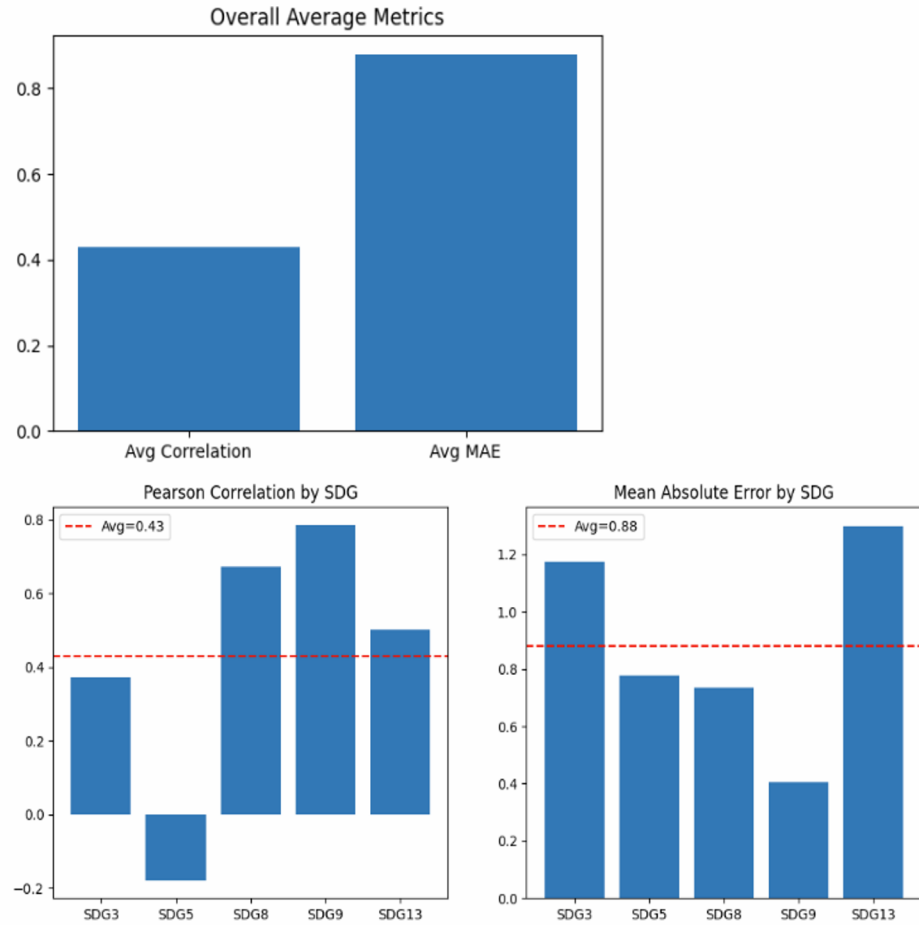
- **Robeco scores companies on all 17 SDG metrics with a scale of -3 to 3** based on a rules-based/systematic framework according to specific KPIs (e.g. % of revenue sourced from key areas, % of recycled materials used, etc.).
- They published **very sparse scoring** for a handful of companies open source on website (below)
- Where there was overlap, **we ran a Pearson correlation and MAE** (did not want MSE to punish losses more greatly)
- Note: we were not completely tied to the benchmark, as we thought our methodology was more nuanced and transparent
 - However, provided a (noisy) **sense check**

Benchmarking Process - Part 2

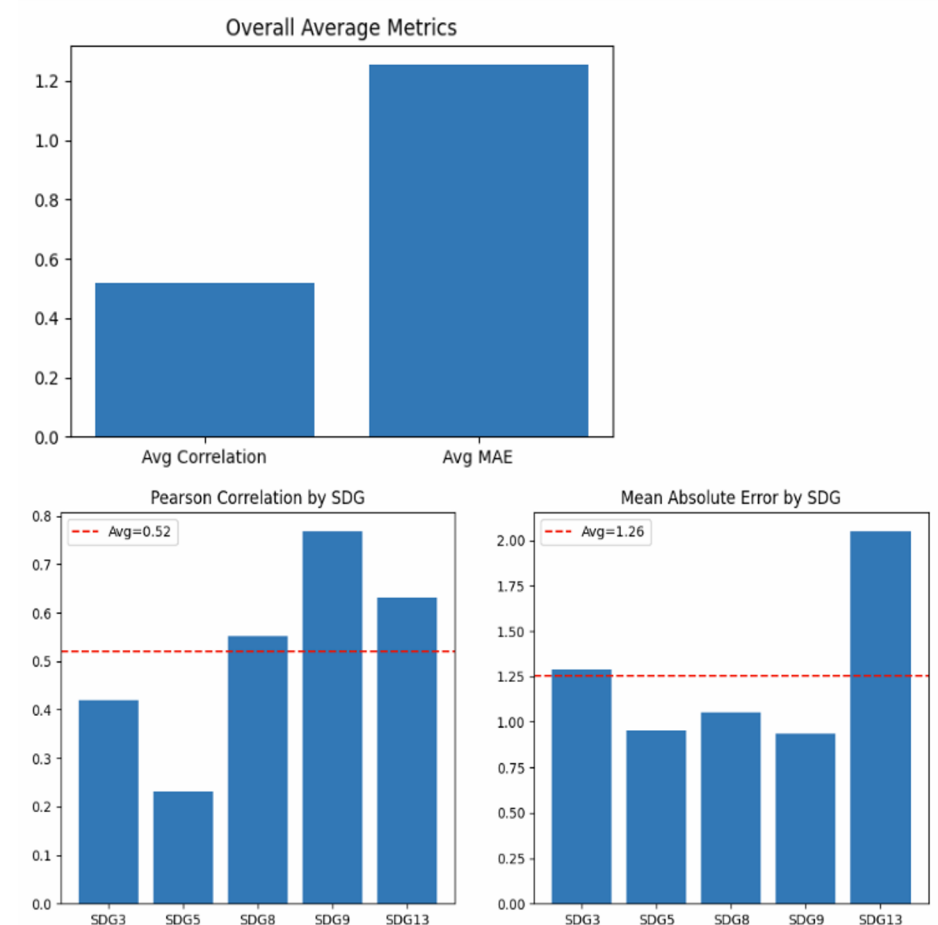
Tavily offers a unique take, while RAG on **SEC + ESG** produce stronger correlations with Robeco's existing scoring.



Benchmarking Process - Part 3



Claude 3.7 Sonet vs. Robeco



Deepseek R1 vs. Robeco

Benchmarking Process - Part 4

Takeaways

- Largest correlation ($r > .7$) when running **o3 mini on SEC + ESG data**
- **While we replicated Robeco's proprietary scoring, we thought Tavily provided relevant signal – this becomes the authoritative source**
- Reasoning models by querying Perplexity produce similar results

Demo!

AlignAlytics

Please rate each of the 17 UN Sustainable Development Goals on a scale from 0 (not important) to 7 (extremely important). These scores represent how much weight you want to place on each SDG.

Show Results

1 No Poverty

End poverty in all its forms everywhere



2 Zero Hunger

End hunger, achieve food security and improved nutrition

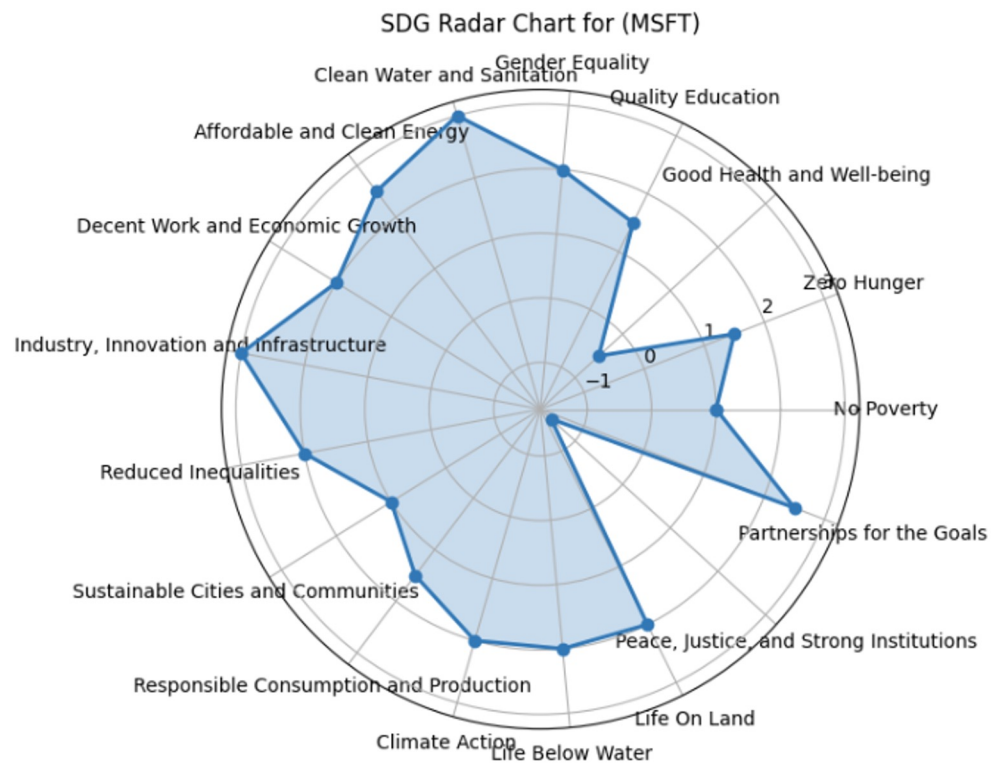


3 Good Health and Well-being

Ensure healthy lives and promote well-being for all

Demo Part 2

Company SDG Radar Mapping



Justification Form

Enter the MSFT SDG you want explanations for: 4

Ticker	Goal	Type	Value
MSFT	4	Score	1
MSFT	4	Product Explanation	Microsoft's sustainability products, su
MSFT	4	Operations Explanation	The company's emphasis on a growth mind

Do you want to see results for another SDG? (y/n): Y

Enter the MSFT SDG you want explanations for: 9

Ticker	Goal	Type	Value
MSFT	9	Score	2.5
MSFT	9	Product Explanation	The company's innovative product portfc
MSFT	9	Operations Explanation	Their operational practices, such as ir

Do you want to see results for another SDG? (y/n): N

Limitations & Future Directions

- Lack of data (Scoring Companies and Benchmarks)
 - ◆ MSCI benchmark
 - ◆ Private and non-US companies
 - ◆ Would like to do an indicator level analysis and optimize run-time as the target level analysis takes 45 min/company, and indicator level likely hours (never completed)

- User Restrictions (OpenAI & Tavily)
 - ◆ Tavily API queries have limitations on usage (1000 credits/user)
 - ◆ Tavily queries have to be written concisely – would prefer more nuance in the request
 - ◆ OpenAI API queries have limitations on tokens (need a better method to condense Tavily-pulled documents, if doc token length too long, read first and last chunks of document)

- Other impact metrics, portfolio construction tools

Questions?

Appendix

Competitive Analysis

<u>Solutions:</u>	Financial-Risk Focus:	Impact Focus:	Public Markets Applications:	Alignment to SDG Targets	Customization to User Values:
ESG Ratings (MSCI, Sustainalytics, Refinitiv, etc.)	X	?	X		
SDG Alignment Solutions				?	
Impact Investing Frameworks (GIIN, etc.)		X		X	X
Our Solution		X	X	X	X

Sourcing Companies

- To test our benchmark, we used a Pearson Correlation and Mean Absolute Error (MAE) against Robeco's SDG alignment scores.
- Given limited open source data availability for Robeco's SDG alignment scores, this limited the scope of companies we could evaluate

```
test_companies = [  
    {"ticker": "NVDA", "name": "Nvidia Corporation"},  
    {"ticker": "AAPL", "name": "Apple Inc."},  
    {"ticker": "MSFT", "name": "Microsoft Corporation"},  
    {"ticker": "AMZN", "name": "Amazon.com, Inc."},  
    {"ticker": "GOOGL", "name": "Alphabet Inc."},  
    {"ticker": "META", "name": "Meta Platforms, Inc."},  
    {"ticker": "TSLA", "name": "Tesla, Inc."},  
    {"ticker": "AVGO", "name": "Broadcom Inc."},  
    {"ticker": "BRK.B", "name": "Berkshire Hathaway Inc."},  
    {"ticker": "WMT", "name": "Walmart Inc."},  
    {"ticker": "JPM", "name": "JPMorgan Chase & Co."},  
    {"ticker": "LLY", "name": "Eli Lilly and Company"},  
    {"ticker": "V", "name": "Visa Inc."},  
    {"ticker": "ORCL", "name": "Oracle Corporation"},  
    {"ticker": "MA", "name": "Mastercard Incorporated"},  
    {"ticker": "XOM", "name": "Exxon Mobil Corporation"},  
    {"ticker": "UNH", "name": "UnitedHealth Group Incorporated"},  
    {"ticker": "NFLX", "name": "Netflix, Inc."},  
    {"ticker": "COST", "name": "Costco Wholesale Corporation"},  
    {"ticker": "HD", "name": "The Home Depot, Inc."},  
    {"ticker": "CVX", "name": "Chevron"},  
    {"ticker": "MRK", "name": "Merck"},  
    {"ticker": "ABBV", "name": "AbbVie"},  
    # {"ticker": "COST", "name": "CostCo"},  
    {"ticker": "PEP", "name": "PepsiCo"},  
    {"ticker": "PG", "name": "Procter and Gamble"},  
    {"ticker": "BAC", "name": "Bank of America"},  
    {"ticker": "JNJ", "name": "Johnson & Johnson"},  
    {"ticker": "CRM", "name": "Salesforce"}  
]
```

RAG & Tivaly Query

10-K RAG

Used pre-populated RAG of SEC filings from class

Custom ESG Data RAG

Uploaded most recent ESG reports for companies in scope

Tivaly Query

Filtered non-reputable sources (kept academic/industry reports and financial news sources only)

- Used similarity search to query 3 most overlapping nodes of text for each SDG Target
- Combined results into “All Queries” list

SDG Target Scoring Process

- After RAG/query completed, asked o3-mini API to rate each target from -3 to +3 and produce structured output

```
if not fallback:
    prompt = f"""
    You are an expert in ESG (Environmental, Social, and Governance) analysis.
    Please analyze the sentiment of the following SDG-related content regarding corporate policies and sustainability impact.
    When assessing the product impact, focus on the effect of the company's product portfolio on the relevant SDG.
    When assessing the operational impact, focus on the company's operations in relation to the SDG.
    Assume 0 is the average score among all public companies.

    Return structured JSON output in the following format:
    {{
      "Product": {{
        "sentiment": -3, -2, -1, 0, 1, 2, or 3,
        "explanation": "One-sentence summary of how the product portfolio aligns with this goal."
      }},
      "Operations": {{
        "sentiment": -3, -2, -1, 0, 1, 2, or 3,
        "explanation": "One-sentence summary of how the company's operations align with this goal."
      }}
    }}
```

Mapping to User Preferences

1. Users rank alignment with a given SDG from 0-7

2. Model normalizes scores to sum to 1

3. Raw company SDG scores → personalized weighted avg.

SDG 16: Peace, Justice, and Strong Institutions

Description: Promote peaceful and inclusive societies for sustainable development, provide access to justice for all, and
Your rating (0-7): 2

SDG 17: Partnerships for the Goals

Description: Strengthen the means of implementation and revitalize the Global Partnership for Sustainable Development.
Your rating (0-7): 3

Initial normalized weights (only SDGs with a nonzero rating):

SDG 1 (No Poverty): 0.022
SDG 2 (Zero Hunger): 0.044
SDG 3 (Good Health and Well-being): 0.067
SDG 4 (Quality Education): 0.089
SDG 5 (Gender Equality): 0.111
SDG 6 (Clean Water and Sanitation): 0.022
SDG 7 (Affordable and Clean Energy): 0.067
SDG 10 (Reduced Inequalities): 0.044
SDG 11 (Sustainable Cities and Communities): 0.067
SDG 12 (Responsible Consumption and Production): 0.111
SDG 13 (Climate Action): 0.156
SDG 14 (Life Below Water): 0.067
SDG 15 (Life On Land): 0.022
SDG 16 (Peace, Justice, and Strong Institutions): 0.044
SDG 17 (Partnerships for the Goals): 0.067

Note: SDGs with a rating of 0 have been omitted. The remaining SDGs are weighted according to your personal preferences.

Would you like to adjust any SDG ratings? (y/n): n

No adjustments made to SDG ratings.

User Output Functionality - Part 1

Rate each UN SDG on a scale of 0 (not important) to 7 (extremely important).

SDG 1: No Poverty

Description: End poverty in all its forms everywhere.

Your rating (0-7): 1

SDG 2: Zero Hunger

Description: End hunger, achieve food security, improve nutrition, and promote sustainable agriculture.

Your rating (0-7): 3

SDG 3: Good Health and Well-being

Description: Ensure healthy lives and promote well-being for all at all ages.

Your rating (0-7): 4

SDG 4: Quality Education

Description: Ensure inclusive and equitable quality education and promote lifelong learning opportunities for all.

Your rating (0-7): 3

SDG 5: Gender Equality

Description: Achieve gender equality and empower all women and girls.

Your rating (0-7): 4

SDG 6: Clean Water and Sanitation

Description: Ensure availability and sustainable management of water and sanitation for all.

Your rating (0-7): 5

Top Companies by Raw & Personalized Weighted Avg. SDG Score

Top 10 companies by weighted personalized SDG score:

	Ticker	weighted_score
14	PEP	1.9870
0	NVDA	1.9690
9	LLY	1.8950
2	MSFT	1.8765
11	UNH	1.5790
1	AAPL	1.5520
3	AMZN	1.5055
15	JNJ	1.4380
5	META	1.3200
13	COST	1.0690

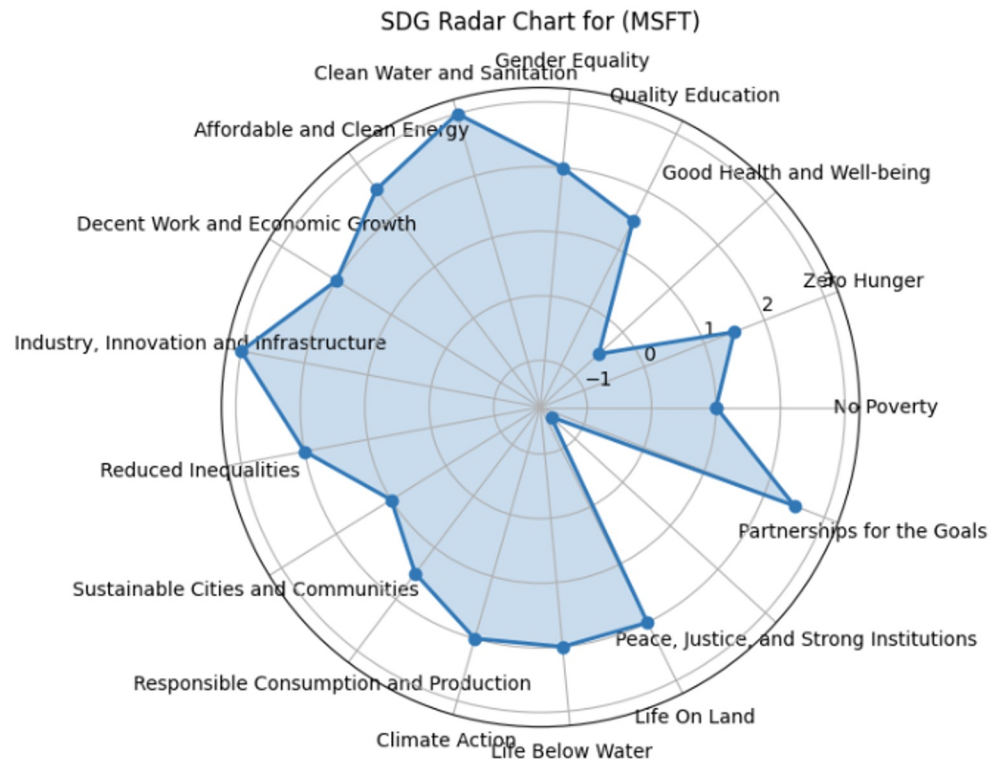
Enter the SDG number (1-17) to see the top companies: 5

Top 10 companies for SDG5:

	Ticker	SDG5
11	UNH	3.0
14	PEP	3.0
0	NVDA	2.0
2	MSFT	2.0
9	LLY	2.0
12	NFLX	2.0
15	JNJ	2.0
7	BRK.B	1.5
3	AMZN	1.0
5	META	1.0

User Output Functionality - Part 2

Company SDG Radar Mapping



Justification Form

Enter the MSFT SDG you want explanations for: 4

Ticker	Goal	Type	Value
MSFT	4	Score	1
MSFT	4	Product Explanation	Microsoft's sustainability products, su
MSFT	4	Operations Explanation	The company's emphasis on a growth mind

Do you want to see results for another SDG? (y/n): Y

Enter the MSFT SDG you want explanations for: 9

Ticker	Goal	Type	Value
MSFT	9	Score	2.5
MSFT	9	Product Explanation	The company's innovative product portfc
MSFT	9	Operations Explanation	Their operational practices, such as in

Do you want to see results for another SDG? (y/n): N