

Resource Efficiency as a Mechanism to Achieve Superior Social and Economic Performance

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Research Context

The growing prominence of ESG issues in academic research, public debate, and financial markets has made sustainability topics an integral part of how firms are evaluated, valued, and financed.

Research Problem

ESG ratings are widely applied but lack empirical consistency, as differing methodologies and disclosure practices among providers lead to low comparability and limited reliability for financial analysis.

Goal

The goal of this study is to develop an objective and data-driven measure of corporate resource efficiency that can serve as a reliable indicator for identifying firms with the potential to achieve superior financial and social performance.

Research methodology

This study employs an input-oriented Variable Returns to Scale (VRS) DEA model to measure firm-level resource efficiency. DEA is a non-parametric, frontier-based method that evaluates the relative efficiency of decision-making units (firms) by comparing how effectively they transform inputs (resources used) into outputs (economic outcomes and environmental consequences).

Inputs	Outputs
Electricity consumption	Net Income
Water consumption	CO ₂ -Emissions (i)
Property, Plant & Equipment (PPE)	Waste generation (i)
Selling, general & administrative expenses (SG&A)	
Cost of Goods Sold (COGS)	
Labour	

Table 1: Exemplary inputs and outputs for resource efficiency model. (i) = inverse

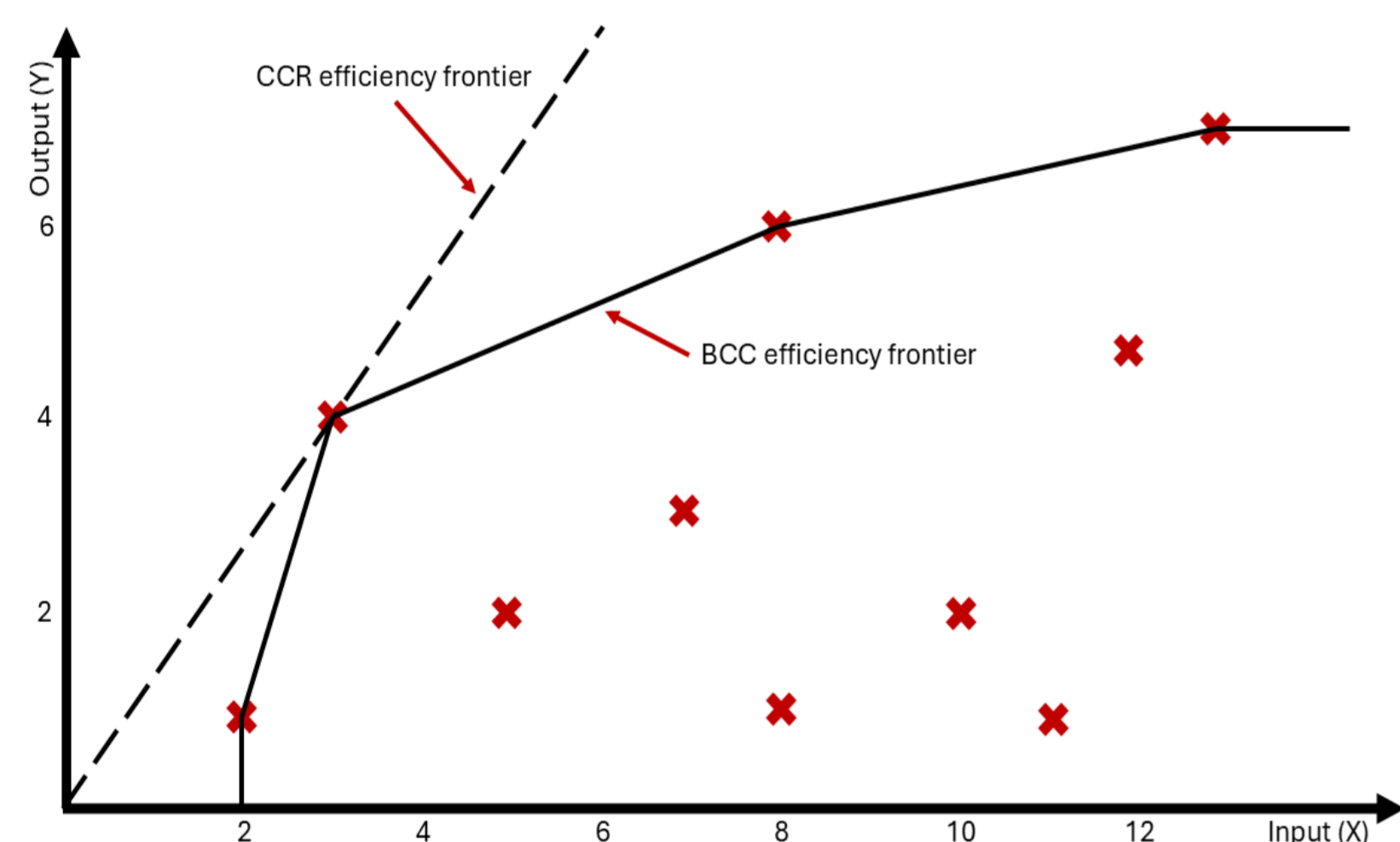


Figure 1: Own depiction of the CCR and the BCC efficiency frontier.

Portfolio construction

Objective: Test if top 30 resource efficient firms (via DEA) outperform benchmark

Process:

- ❖ Rank firms annually by DEA efficiency score
- ❖ Screen Top 50 for 12-month price history → select Top 30
- ❖ Construct equal-weighted portfolios using total returns
- ❖ Rebalanced annually in July using prior year-end scores

Findings

The FFF focused on three practitioner-focused hypotheses. Various input-output combinations were tested to optimize the DEA model, with results remaining robust even when substituting Net Income for Revenue, Free Cash Flow, or EBITDA.

- ❖ **Hypothesis 1** examined whether a strategy based on the thirty most resource-efficient firms (measured via DEA) outperforms the S&P 1'500 benchmark. This hypothesis could be confirmed (regarding both total and risk-adjusted returns).
- ❖ **Hypothesis 2** tested whether the same strategy exceeded the performance of a portfolio of the thirty highest ESG-rated firms. Again, it outperformed cumulatively over the fifteen-year period (see Figure 2).
- ❖ **Hypothesis 3** assessed whether the strategy generated statistically significant alpha after controlling for standard risk factors, which was confirmed.

Overall, the findings consistently validate resource efficiency as a strong and reliable signal of superior financial performance.

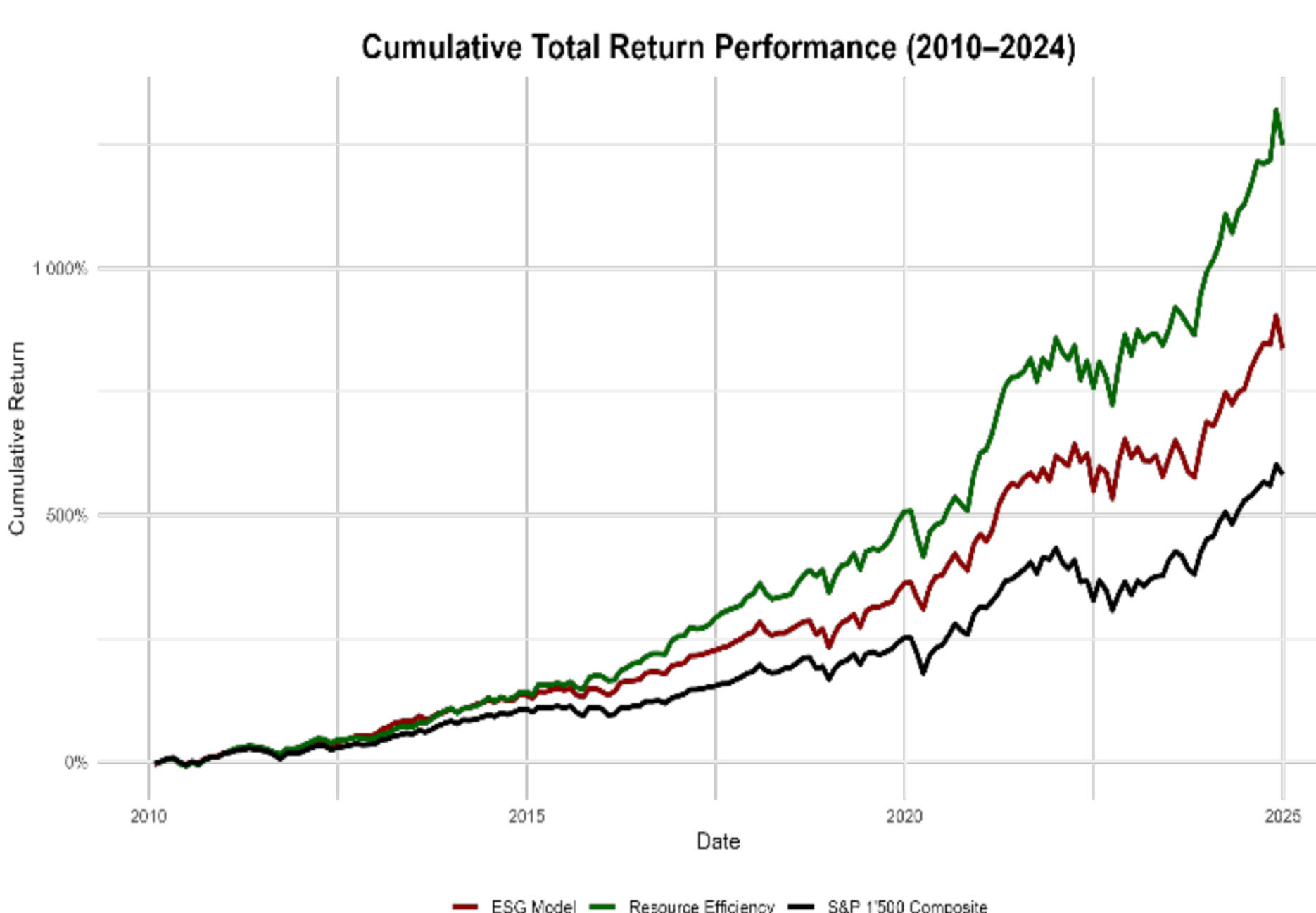


Figure 2: Exemplary cumulative performance of the Resource Efficient portfolio, the ESG portfolio, and the S&P 1'500 Composite as benchmark.

Future research

We recognise there are areas, which fall outside the scope of the conducted study but are worthwhile examining in future projects:

- ❖ Due to data restrictions, developed model(s) ought to be tested on further alternative universes/index constituents
- ❖ Given limited historic reporting for ESG metrics, future studies should be conducted to verify results over time
- ❖ Variable combination tested extensively, yet potentially better combination remains for scholars to be discovered
- ❖ Applied DEA methodology proved effective, yet alternative techniques could potentially yield even better results

Conclusion

The research conducted has demonstrated that DEA-based resource-efficiency scores provide a robust and operationally grounded alternative to conventional ESG ratings in explaining cross-sectional stock return variation in corporations' stock performance.

The conducted research and its findings generate impact in several ways:

- ❖ **Scientific:** Advances sustainable finance research by introducing a validated, quantitative framework for assessing firm resource efficiency.
- ❖ **Societal:** Promotes transparency and accountability by linking environmental performance to economic outcomes.
- ❖ **Practical:** Equips investors with an objective tool to identify firms that combine sustainability with superior financial returns.

Overall, the findings of the project suggest that financial performance and sustainable resource use can reinforce rather than oppose each other.

Further readings

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