Are Carbon Emissions Associated with Stock Returns?

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1 Research questions

Is the estimated carbon emissions significantly different from the emissions disclosed by the company itself？
Is it appropriate to use unscaled carbon emissions or should emissions intensity be used？

2 Why are the research questions interesting?

• Global warming causes governments and international organizations to reduce carbon emissions；
• Investors and company managers are increasingly concerned about the impact of carbon emissions.
• Previous studies have shown a strong correlation between carbon emissions and corporate performance；
• They mainly rely on carbon emission data estimated by data suppliers, rather than data disclosed by firms.
• These studies use unadjusted carbon emission data, which masks true carbon performance of companies.

3 What is the paper's contribution?

(1) **Literature on Relationship between Carbon Emissions and Financial Performance**
Prior: Treating carbon emissions as a risk, investors seek compensation for it. Positive correlation between carbon emissions and stock returns.
This: Differentiated between actual carbon emission data disclosed by firms and carbon emission data estimated by data supplier.

(2) **Literature on investor preferences**
Prior: Investors may avoid investing in high carbon emitting companies due to ethical considerations, leading to a decrease in demand for their stocks.
This: Investors' preferences for certain industries may affect the relationship between carbon emissions and stock returns, rather than their preferences for specific companies' carbon emissions.
• Unadjusted carbon emissions positively related to operational performance, but it weakens when considering carbon emission intensity.

4 What hypotheses are tested in the paper?

H1: Corporate carbon emissions are positively correlated with stock returns, reflecting carbon risk pricing.
H2: Estimation data bias may exaggerate the conclusion of carbon premium.
H3: Using emission intensity can more accurately measure a company's carbon efficiency.

a) Do these hypotheses follow from and answer the research questions?
• Challenging the widely accepted view in recent years that carbon risk is priced by the market.
Do these hypotheses follow from theory or are they otherwise adequately developed?
• The paper empirically tests whether the risk premium mechanism is established, with a particular focus on whether data types and emission measures will affect the conclusion of risk pricing.
Carbon intensity is not related to returns, implying that 'investors dislike carbon' does not affect market pricing.

5 Sample: comment on the appropriateness of sample selection procedures.

Considering whether firms disclose carbon emission data(firms disclose data and firms not disclose data).

6 Dependent and independent variables: comment on the appropriateness.

The main independent variables include unadjusted carbon emissions and carbon emission intensity.

7 Regression model specification: comment on the appropriateness.

Industry fixed effects and time fixed effects were added to the model to control for the potential impact of industry and time on stock returns.

8 What difficulties arise in drawing inferences from the empirical work?

This article mainly uses "emissions ÷ sales revenue" as a measure of emission intensity.
However, there are also other standardized methods in practice and regulation, such as by assets, number of employees, energy consumption, etc.

9 Describe at least one publishable and feasible extension of this research.

The total carbon emissions ÷ sales revenue (i.e. revenue scaled emissions) as the main measurement indicator of "emission intensity" to reflect the carbon emissions per unit of economic output of the enterprise.
However, this definition has limitations in different contexts;
Carbon emissions ÷ Total assets Definition: Emission intensity=Annual carbon emissions/Year end total assets
Advantages: Reflecting carbon efficiency under capital scale, suitable for capital intensive industries;
Applicable background: Asset intensive enterprises such as manufacturing, energy, and real estate.

10 Summarize the similarities, differences, and correlations between literature.

比较维度	A). Aswani et al. (2024)	B). Bolton & Kacperczyk (2023)	C). Zhang (2025)
研究目的	质疑碳溢价存在性，聚焦数据质量与变量设定	测量全球资本市场是否定价碳转型风险	纠正碳回报研究中的"前视偏误"，重新检验
核心问题	碳排放是否真能预测股票回报？估算数据是否误导？	碳排放是否为风险因子？是否存在碳溢价？	绿色资产回报是否为风险补偿，还是投资者偏好驱动？
数据与样本	Trucost（区分估算/披露）；美股样本为主	全球 77 国，Trucost＋碳政策数据；2005–2018	全球样本（含发达＋发展中国家）；碳强度＋回报序列
变量设置	碳总量 vs 排放强度；控制数据来源偏误	排放总量＋排放增长率为核心变量	仅使用滞后可见的碳强度，避免未来信息泄露
方法与识别策略	OLS＋Heckman 选择模型＋固定效应；对比估算/披露	多维面板回归；国家×时间×行业固定效应；交互项分析	多空组合＋FF 因子调整；严格控制信息滞后结构
对彼此的回应	反驳 B 的结论基于估算误差与变量不当	未回应 A 与 C；为后两者提供了基础数据与研究靶心	批判 A 与 B 忽视"信息发布滞后"问题
共同点	都关注碳排放与股票回报关系，强调变量设定的重要性	都涉及排放测度、数据质量与碳资产横截面差异	都尝试识别碳风险是否能被市场有效定价
分歧点	是否存在碳溢价；排放总量 vs 强度；市场是否理性定价碳风险	结论方向完全不同；背后理论视角分化明显	对"碳溢价"为正的研究提出根本性挑战