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Low Carbon Mutual Funds*

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Abstract

Climate change poses new challenges for portfolio management. In our not-yet-low carbon world, investors face a trade-off between minimizing their exposure to climate risks and maximizing the benefits of portfolio diversification. This article investigates how investors and financial intermediaries navigate this trade-off. After the release of Morningstar's novel carbon risk metrics in April 2018, mutual funds labeled as "low carbon" experienced a significant increase in investor demand, especially those with high risk-adjusted returns. Fund managers actively reduced their exposure to firms with high carbon risk scores, especially stocks with returns that correlated more with the funds' portfolios and were thus less useful for diversification. These findings shed light on whether and how climate-related information can re-orient capital flows in a low carbon direction.

Keywords: Behavioral finance, Portfolio management, Climate change, Investor preferences, Mutual funds, Sustainable finance

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1. Introduction

How should investors behave in the face of climate-related risks and the energy transition to a low carbon world? To answer this question, it is important to recognize that accounting for climate risks in investment decisions brings investors both benefits and costs.

On the one hand, shunning carbon-intensive, "brown" assets can reduce an investor's exposure to climate risks. These risks have yet to fully materialize, both in terms of physical consequences and societal reactions, and many observers believe that they are currently underestimated in asset prices (Stroebel and Wurgler, 2021). On the other hand, in our not-yet-low carbon economy, excluding "brown" assets and investing only in those considered "green" require investors to forego opportunities to diversify. This trade-off is particularly salient in asset management, where portfolio diversification, not only the features of individual securities, plays a crucial role in reducing overall investment risk (Markowitz, 1952).

In this article, we study how investors and asset managers navigate this trade-off. We focus on the mutual fund industry, which represents an important share of global financial markets,[1] and exploit a quasi-natural experiment involving a sudden increase in both the availability and salience of information on carbon risk (climate transition risk), that is, the class of risk deriving from the transition to a lower carbon economy. As we describe in more detail in Section 2, on April 30, 2018, Morningstar, the most important data provider in the mutual fund industry, released a new Portfolio Carbon Risk Score derived from firm-level data provided by Sustainalytics, which Morningstar has controlled since 2017. The novelty of Morningstar's Portfolio Carbon Risk Score is highlighted by the fact that it correlates only mildly with other portfolio metrics, based on previously available environmental scores from Sustainalytics, Refinitiv, and MSCI KLD. Based on its new carbon risk score, combined with relatively standard information on firms' fossil fuel involvement (FFI), Morningstar also issued an eco-label for mutual funds—the low carbon designation (LCD). We use a large sample of active European and US mutual funds to study investors' and fund managers' reactions to these information shocks produced by the publication of Morningstar's Portfolio Carbon Risk Score and its associated LCD eco-label.

We develop the conceptual framework guiding our empirical analyses in Section 3. We first confirm that, in line with extant literature (e.g., Engle *et al.*, 2020; Bolton and Kacperczyk, 2021a), individual low carbon securities are less risky than other firms, both in terms of exposure to negative climate change news and realized return volatility. We then shift our focus to the portfolio level. One may naively think that the risk properties of low carbon funds should mirror those of their low carbon holdings. Such, we find, is not the case. The investment risk of a portfolio depends not only on the variance of its individual holdings' returns, but also on the covariance of these returns (Markowitz, 1952). Empirically, while low carbon funds have lower exposure to climate risks, their volatility is not lower than that of more conventional funds. In fact, we find that the mutual funds with the lowest carbon risk scores have higher volatility than those with median scores. The source of this result is the high degree of industry concentration (Kacperczyk, Sialm, and Zheng, 2005) of low carbon funds. These funds overweight IT, retail, and healthcare firms,

1 In 2020, open-end mutual funds had some USD 63 trillion in assets under management worldwide, representing around 26% of equity and debt securities outstanding (Investment Company Institute, 2021).

while they underweight energy, materials, and utility firms. Beyond the industry concentration, the fact that low carbon funds hold fewer stocks does not significantly further explain their surprisingly high volatility. Overall, low carbon funds hold assets that, although individually less risky, have a high degree of covariance, limiting risk-sharing.

In Section 4, we study the reactions of mutual fund investors to the April 2018 information shock. Funds receiving the "Low Carbon Designation" enjoyed a substantial increase in their monthly flows relative to other funds. The economic impact of the LCD label corresponds to an average increase in flows of approximately 36 basis points each month through the end of 2018; this increase is equal to about two-thirds of the effect on flows caused by a one-standard-deviation stronger monthly financial performance.

Before the new data became available, investors likely used Morningstar's sustainability Globes as an imperfect proxy for exposure to carbon risk. Intuitively, if a fund with few Globes received the LCD, it would come as a larger surprise to investors. Consistent with this logic, we find larger effects on flows in such situations. In addition, LCD-labeled funds with strong risk-adjusted performance experienced a more pronounced flow premium. Moreover, after the publication of the LCD list—but not before—qualifying for the low carbon eco-label resulted in particularly large extra flows in months of greater attention to climate change, as measured by Google search intensity. All these results are consistent with investors taking both the benefits and the costs into account when investing in low carbon funds.

In Section 5, we employ a dataset of monthly portfolio holdings to study the reactions of fund managers to the release of Morningstar's portfolio and firm-level carbon risk information. We show that, after April 2018, fund managers actively rebalanced their portfolios to reduce their carbon risk. On average, relative to the period before the publication of Morningstar's carbon risk metrics, mutual funds reduced their position in the average high carbon risk firm by about 0.17 basis points of their assets under management (AUM) per month. This effect is economically meaningful, considering that the median monthly position change is zero for the whole sample and 2.8 basis points for non-zero position changes.

Managers reacted to carbon risk not only with a one-shot rebalancing of their portfolios, but also by integrating the new information into their flow-driven investment decisions after the initial shock. In particular, we observe that funds experiencing large negative net flows sold high carbon risk assets more aggressively than did other funds, while funds experiencing high inflows increased their stakes in low carbon risk assets.

Further cross-sectional evidence indicates that, as we expected, funds with higher *ex ante* industry concentration reacted more strongly to the release of the new carbon risk information. For these funds, shifting to lower carbon risk assets is less likely to decrease (and may even increase) their diversification. They are also likely to serve clients who are less interested in broad diversification in the first place. Importantly, we find that when managers reduced their positions in stocks with a score of medium or high carbon risk, they did so more aggressively for those with a higher return covariance with the remainder of the portfolio, consistent with an attempt to preserve diversification.

This article contributes, first, by providing insights into the benefits and costs of green investment products. Existing research suggests that firms with better environmental performance have lower exposure to climate-related risks, and are priced accordingly (e.g., Engle *et al.*, 2020; Bolton and Kacperczyk, 2021a, 2021b; Huynh and Xia, 2021; Ilhan, Sautner, and Vilkov, 2021; Ramelli *et al.*, 2021b; Hsu, Li, and Tsou,

2022). However, how the risk properties of individual green securities translate to the portfolio level is still largely unexplored and, as we show, not obvious. The trade-off at the portfolio level that we highlight in this context is consistent with the theoretical literature on green investing.[2]

Second, we complement the literature on whether and why investors prefer socially responsible investment products (e.g., Bollen, 2007; Renneboog, ter Horst, and Zhang, 2011; Riedl and Smeets, 2017; Bassen *et al.*, 2019; Hartzmark and Sussman, 2019; Barber, Morse, and Yasuda, 2021; Bauer, Ruof, and Smeets, 2021; Geczy, Stambaugh, and Levin, 2021; Anderson and Robinson, 2022). The responses to the quasi-natural experiment that we analyze highlight both the costs and benefits of socially responsible investment products, crucial for understanding the complexity of investor behavior on sustainability issues. In terms of costs, low carbon investing asks investors to pay a price in terms of lower sectoral diversification, at least in the short term. Generic sustainable ratings/products, in contrast, are usually based on "best in class" approaches precisely to allow investors to not give up any sectoral diversification. In terms of benefits, the event we analyze allows a focus on investors' specific climate-related preferences. As documented by Hartzmark and Sussman (2019), the investors we study had already self-selected into funds based on their generic sustainability preferences. Our results indicate that both the cost and benefit sides of low carbon investing shape investor responses.

Third, we complement the literature on professional money manager behavior. Several studies consider fund manager behavior as a function of traditional financial performance metrics, but in recent years, ESG factors, and climate-related considerations in particular, have gained importance in the industry. For instance, Krueger, Sautner, and Starks (2020) and Ilhan *et al.* (2023) provide survey evidence on the importance of climate risks for institutional investors. Bolton and Kacperczyk (2021a) show that institutional investors apply carbon-related screens and Choi, Gao, and Jiang (2023) document a decrease in institutional investors' exposure to carbon-intensive domestic firms after 2015. Fund managers change their holdings after shifts in climate risk perception due to natural disasters (Alok, Kumar, and Wermers, 2020) or extreme heat events (Alekseev *et al.*, 2021). Gantchev, Giannetti, and Li (2022) study fund managers' trading behavior with respect to firms' sustainability, focusing on the price pressure implications on individual stocks. Our article contributes to this literature by studying how fund managers actively changed their portfolio holdings following increased transparency on climate risks in the mutual fund industry.

2 In Heinkel, Kraus, and Zechner (2001) and Pástor, Stambaugh, and Taylor (2020b), for instance, divestment from "brown" assets is negatively related to investor risk aversion, because deviating from the market portfolio implies incurring diversification risks. Similarly, Boyle *et al.* (2012) explore the effects on optimal portfolios of the need to balance asset diversification ("Markowitz's view") and asset familiarity ("Keynes' view"). Wagner (2011) develops a model in which investors forgo diversification benefits to hedge liquidation risks. Pedersen, Fitzgibbons, and Pomorski (2021) analyze optimal portfolios when considering environmental, social, and governance (ESG) risks and preferences. In contemporaneous work, Hambel, Kraft, and van der Ploeg (2022) theoretically explore the interplay between governmental climate actions and portfolio diversification from a macro-finance perspective. Of course, low carbon investing can come in different shapes. For instance, Andersson, Bolton, and Samama (2016) and Bolton, Kacperczyk, and Samama (2022) outline approaches to reducing CR with small tracking errors and sector-weighted deviations.