Practical Applications of

Measuring and Optimizing the Risk and Reward of Green Portfolios

Practical Applications
Portfolio Management Research

Overview

In *Measuring and Optimizing the Risk and Reward of Green Portfolios*, from the Winter 2022 issue of ***The Journal of Impact and ESG Investing***, **Andrew Lo** of the **MIT Sloan School of Management** and **Ruixun Zhang** and **Chaoyi Zhao** of **Peking University School of Mathematical Sciences** found that green investing offered a positive alpha in the US markets over the past decade but a negative alpha in Chinese markets. The positive alpha in US markets is likely attributable to increasing attention to climate-related issues. The authors warn against discounting green investing entirely in China, as the history of green investing in the US may offer signs of what is to come in China and other developing markets. The authors analyzed companies based on several environmental measures, including carbon emissions, water consumption, and waste disposal, as measured by the Trucost Environmental dataset.

Practical Applications

- **Green portfolios of US companies with smaller carbon footprints had a positive alpha when compared with portfolios that invested in brown assets.** The positive alpha was associated with not only with carbon-related environmental measures but also noncarbon measures, including water consumption and waste disposal, signifying that green investing may not inherently sacrifice risk-adjusted returns.
- **Positive excess returns from green assets in the US were driven largely by an unanticipated increase in climate concerns over the past decade.** Climate concerns had a negative impact on the overall US market, but the negative impact was smaller on green stocks than on brown stocks, thereby supplying the positive excess returns in green portfolios.

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Key Definitions

ESG investing

ESG investing considers the environmental, social, and governance activities of investee companies. Environmental criteria evaluate a company's sustainability activities (e.g., emissions, water, and waste). Social criteria assess a company's management of social relationships (e.g., employees, consumers, surrounding communities). Governance criteria cover the rights and responsibilities of the company's management (e.g., board, shareholders, and stakeholders). ESG investing is sometimes defined more narrowly as considerations of how a company's governance, and its environmental and social impact, affect its financial performance. In this narrower sense, ESG investing is distinguished from "socially responsible investing" (SRI), which seeks to promote social and environmental good by avoiding investment (through the application of negative screens) in disfavored products or services; and from "impact investing," which aims to achieve positive social or environmental impact by investing (through the application of positive screens) in favored industries or activities.

Green companies/stocks, brown companies/stocks

Green companies are those with lower carbon emissions and levels of pollution. By contrast, brown companies are those with higher levels of carbon emissions and levels of pollution.

- **Green portfolios investing in Chinese companies with smaller carbon footprints had a negative alpha when compared with investing in brown assets.** The authors suggest that this underperformance may be due to the fact that China only recently made reducing carbon emissions a goal.

Discussion

Green investing has become increasingly relevant to financial markets. More than 130 governments around the world have made pledges to reduce carbon emissions and to work toward carbon neutrality. This is pertinent to investors for two reasons: First, investors need to know whether green firms perform better or worse than brown firms. Second, understanding the risk and reward of green portfolios will guide regulators and other stakeholders when developing policies and strategies for allocating resources to help companies reach carbon-neutral goals.

Underlying Data

The authors use two primary types of data for analyzing environmental measures and stock returns. They used the S&P's Trucost Environmental dataset to measure the environmental impact of companies included in the study. The primary measure of that dataset is made up of carbon emissions, including the total amount of carbon emitted, the intensity of carbon emissions, the monetary value of the emissions, and the impact of those emissions. In additional to carbon emissions, the authors also included data pertaining to water consumption, waste disposal, and pollution as part of the environmental measures in their analysis.

For measuring market performance, the authors used monthly data from 2006 to 2021. They included US companies listed on the NYSE, AMEX, or NASDAQ, obtained via the Center for Research in Security Prices (CRSP). They included Chinese companies listed on the Shanghai Stock Exchange or the Shenzhen Stock Exchange, obtained via the Wind database. Along with the market performance data, the authors also obtained monthly Fama–French five-factor data for both US and Chinese markets. They measured the level of climate concern using the Media Climate Change Concerns (MCCC) index, which incorporates data from 10 major US newspapers and two newswires to reflect the number of negative news stories.

Scope 1, 2, and 3 emissions

Scope 1 emissions are a company's direct carbon emissions from its own activities and from resources it owns and controls. Scope 2 emissions are a company's indirect carbon emissions from electricity purchased and used. Scope 3 emissions are a company's indirect carbon emissions from sources it does not own or control but that arise from its activities.

Fama–French three-factor and five-factor models

Factor investing is an approach to security selection based on objective attributes that historically have been associated with excess returns. The Fama–French three-factor model started with a stock's beta and added size (e.g., small cap) and value (e.g., high ratio of book value-to-market equity) as factors of superior returns. The Fama–French five-factor model added profitability and investment as additional factors.

> "Using the MCCC index as a proxy, we find that an increase in climate concerns has an overall negative effect on the market and that the negative effect on green stocks is smaller than that on brown stocks, thus leading to positive excess returns for 'green-minus-brown' portfolios."
>
> **—Measuring and Optimizing the Risk and Reward of Green Portfolios**

US Green Portfolios

Based on the authors' findings, green portfolios constructed to invest in US companies that use carbon-related measures produce positive alpha when controlling for Fama–French factors. These positive returns, referred to as "greenium," appear to stem from an unexpected increase in climate concerns within society, as measured by the MCCC index. While climate concerns have historically had a negative impact on the broad market, such shocks hit green stocks less hard than they did brown assets. Therefore, the alpha that a green portfolio provided cannot be attributed to higher-than-expected returns.

Similar results were found by the authors when analyzing non-carbon environmental measures. The authors concluded that investors may not need to limit themselves to low-carbon companies to earn excess returns, as it is possible that portfolios broadly constructed around environmental measures may produce similar results.

Chinese Green Portfolios

Whereas green portfolios of US companies produce positive alpha, the performance of green portfolios of Chinese companies appeared to be negative. Brown assets perform better than green assets, thereby indicating a cost to environmental investing in the Chinese market. The negative alpha is associated with both low-carbon investments and investments focused on other environmental factors.

The authors hypothesize that the negative performance of green portfolios in China may be due to China's recent embrace of carbon neutrality as a publicly stated goal. In contrast to the US, green investing has only recently started to gain traction with Chinese investors, upon the inclusion of carbon-neutrality goals in the Chinese government's "Fourteenth Five-Year Plan." As carbon reduction and other environmental measures are implemented across China, the costs incurred by Chinese companies to act in a more environmentally responsible manner may be lessened.

Conclusions

The negative alpha generated by green assets in China does not mean that green investing should be discounted entirely by investors. The US is more developed in terms of green investing, and the US market may offer signs of what is to come in China and other emerging markets that are rapidly developing and utilizing green investments.

Similarly, as greeniums were largely generated by carbon concerns in US society rather than through the generation of positive returns, investors should remain vigilant of the potential risks that green assets may have within a portfolio.

> "Our empirical results demonstrate that investing toward carbon neutrality does not always sacrifice risk-adjusted returns. The positive greeniums in the US market over the past decade may provide clues for where emerging markets are heading next."
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> **—Measuring and Optimizing the Risk and Reward of Green Portfolios**

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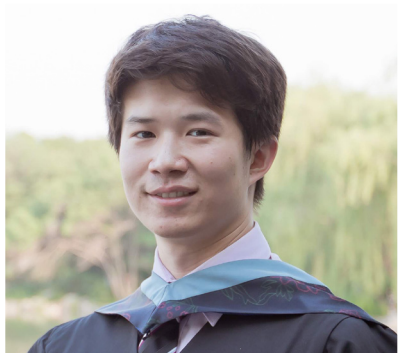

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