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Number 66

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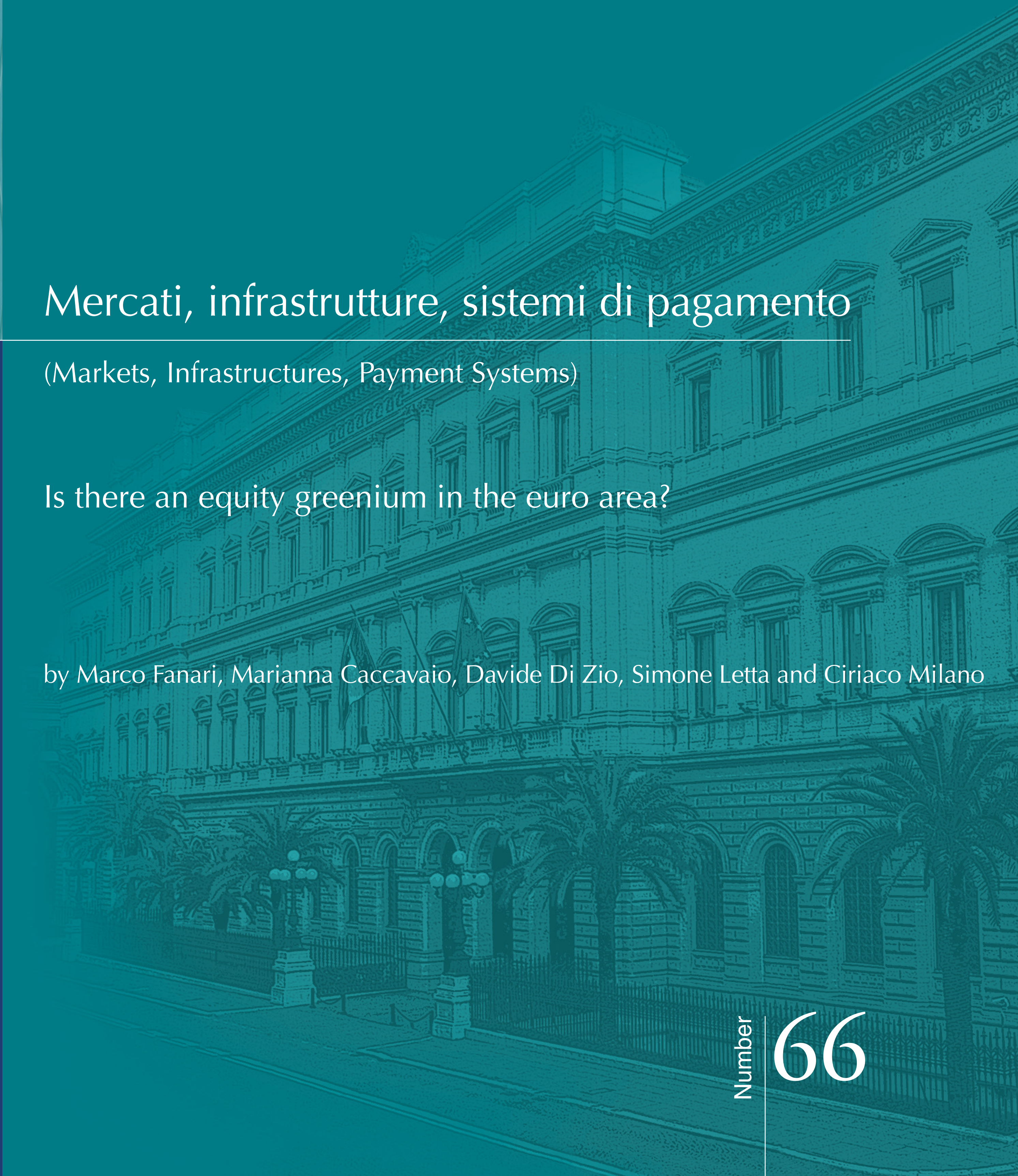

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The papers published in the 'Markets, Infrastructures, Payment Systems' series provide information and analysis on aspects regarding the institutional duties of the Bank of Italy in relation to the monitoring of financial markets and payment systems and the development and management of the corresponding infrastructures in order to foster a better understanding of these issues and stimulate discussion among institutions, economic actors and citizens.

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ISSN 2724-6418 (online)
ISSN 2724-640X (print)

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Designed and printing by the Printing and Publishing Division of the Bank of Italy

IS THERE AN EQUITY GREENIUM IN THE EURO AREA?

by Marco Fanari*, Marianna Caccavaio*, Davide Di Zio*, Simone Letta* and Ciriaco Milano*

Abstract

This paper examines the risk-return profile of sustainable equity investment strategies in the euro area in order to assess the presence of a return differential compared to the market index (equity greenium). The equity greenium includes a component related to financial risk (risk premium) and a component associated with investors' possible preference for ESG themes (preference premium). We find that the returns on sustainable investments diverge from market returns; this result is due to the different exposure to financial risk factors (risk premium), and not to the preference premium. Going forward, the emergence of certain risks not fully priced in and changes in investor preferences could lead to price adjustments and new market equilibria. This suggests the need for close monitoring of the relationship between sustainable investment strategies and the traditional ones.

KJEL Classification: G11, G12, G14

Keywords: equity greenium, preference premium, ESG.

Sintesi

Il lavoro analizza il profilo rischio-rendimento delle strategie di investimento azionario sostenibili nell'area dell'euro, per verificare la presenza di un differenziale di rendimento rispetto all'indice di mercato (*equity greenium*). L'*equity greenium* comprende una componente relativa al rischio finanziario (*risk premium*) e una associata alla possibile preferenza degli investitori per i temi ESG (*preference premium*). I risultati mostrano l'esistenza di un differenziale di rendimento dovuto a una diversa esposizione ai fattori di rischio finanziario (*risk premium*), mentre il contributo del *preference premium* risulta trascurabile. In prospettiva, l'emergere di alcuni rischi non del tutto incorporati nei prezzi e le modifiche nelle preferenze degli investitori potrebbero causare aggiustamenti dei prezzi e determinare nuovi equilibri di mercato; ciò suggerisce un attento monitoraggio del rapporto tra le strategie di investimento sostenibili e quelle tradizionali.

* Banca d'Italia, Financial Risk Management Directorate.

CONTENTS

1. Introduction[1]

In recent years investors have increasingly integrated ESG criteria into their portfolio strategies. While the surge in demand for sustainable stocks may have bolstered their performance, this effect is expected to wane as the market reaches a new equilibrium. Numerous studies examine the relationship between sustainable investments and financial performance. Theoretical models investigate this link by putting forward hypotheses on investor behaviours, time horizons, and transmission channels. In principle, all else being equal, sustainable investments should carry relatively lower (long-term) risk, resulting in lower expected return. Furthermore, expected return might fall below the level justified by reduced risk if most investors are motivated and prepared to accept some return concession for the goal of promoting socially responsible corporate choices that can make an impact on the real economy.

Accordingly, in this study 'equity greenium' indicates a lower expected return for sustainable investments. This may in principle be decomposed into two parts: (i) a financial risk component, and (ii) a preference component specific to green or ESG assets (preference premium).

This paper investigates whether sustainable investment strategies in the euro area have yielded, or might yield in the future, significantly different returns compared to the market beyond those justified by financial factors; this would suggest the existence of a preference premium. We take the perspective of a long-term investor interested in the equilibrium risk-return relationship. Our conceptual framework draws on the theoretical models of Pedersen *et al.* (2021) and Pastor *et al.* (2021). The analysis is based on the empirical approach of Pastor *et al.* (2022). The main contribution of our study lies in its geographical focus, that is the euro area, and its broad empirical scope, which encompasses climate-related concerns as well as ESG aspects more generally.

We show that sustainable indices in the euro area have performed better than conventional market indices. However, recent data show a decline in realized returns of sustainable investments, possibly revealing a shift in market conditions or investor preferences. Furthermore, our recent estimates indicate that the *ex-ante* greenium[2] has widened to 0.5-0.8 percentage points across five sustainable equity indices; the greenium of the two most incisive ones is around 1.5 per cent. Against this background, in this paper we show to what extent the *realized* risk-return profile of sustainable investments has diverged from that of the market index, across strategies and sample periods. Our econometric analysis shows that, on average, the equity performance differential is either not significant or it depends on the exposure to standard risk factors already documented in the literature, i.e. it responds to the financial risk component. This latter finding is confirmed by introducing long/short portfolios that specifically capture the sustainability features of companies.

However, since the estimated ex ante equity greenium tends to widen, it is not clear that the future risk-adjusted performance of sustainable investments will continue to be explained by standard financial factors alone. We note that a risk-adjusted return concession on sustainable portfolios, responding to the preference component, would be consistent with the notion that motivated investors are prevailing in the market and the market is in equilibrium. Then, firms that care about sustainability

[1] We wish to thank Paolo Angelini, Gioia Cellai, Francesco Columba, Paolo Del Giovane, Tommaso Perez, Antonio Scalia, Luigi Federico Signorini, Stefano Siviero and an anonymous referee for their useful comments and suggestions.

[2] Here the *ex-ante* greenium refers to the equity greenium consistent with the first methodology of Pastor *et al.* (2022), that is, the implied cost of capital (ICC) differential of the sustainability indices with respect to the market index.

will enjoy a lower cost of capital vis-à-vis firms that do not care. In turn, the cost of capital is a key condition for sustainable firms to carry out new investments and thus achieve the sustainability objectives for the economy, be they green climate transition or other ESG goals.

The paper is structured as follows. Section 2 presents the literature review. Section 3 outlines the conceptual framework. Section 4 investigates the historical risk-return profile of the leading sustainable equity indices in the euro area and presents the analysis of the expected risk and return on a forward-looking basis. Section 5 shows the results of the econometric analysis of the link between risk-adjusted returns and sustainability. Section 6 explores the connection between the excess return of sustainable securities and investment flows. Section 7 concludes.

2. Literature review

Despite the large amount of research on sustainable finance over the past decade, the relationship between sustainable criteria and financial performance in the equity market is not unequivocally established.

Several thematic reviews present the key empirical findings on sustainable equity investments. At the aggregate level, there are no clear conclusions on the link between sustainability and the financial performance of ESG investing (Coqueret, 2022; Hornuf and Yuksel, 2024).

Many factors may explain why the literature fails to identify a robust and economically significant link between sustainability objectives and traditional risk-return goals. A key issue is data gaps: both the poor quality of available data (Eccles *et al.*, 2017) and the short length of the time series. These challenges are made worse by the absence of a common framework among ESG score providers (Anselmi and Petrella, 2023; Berg *et al.*, 2022), the risk of greenwashing (Lyon and Montgomery, 2015), and the unique characteristics of the different E, S, and G factors that are not easily captured by a single ESG score (Philipponnat, 2023). While regulatory efforts will gradually lead to improved data availability, significant challenges remain in comparing results across studies that focus on different countries, industrial sectors (Bannier *et al.*, 2019; Adriaan Boermans and Galema, 2023), and financial management practices (Hubel and Sholz, 2020; Matos, 2020). These difficulties are exacerbated by the challenge of measuring the impact of sustainability on variables such as employee well-being, innovation, pollution, and long-term growth (Van Holt and Whelan, 2021). Finally, there is a growing agreement that sustainable strategies offer asymmetric benefits, especially during social or economic crises.[3]

The identification becomes more complex when climate-related aspects are considered. While investors do react to climate-related risks, leading to changes in asset prices, in the cost of capital for firms and in various assessments of financial risk, financial markets likely underprice these risks (Campiglio *et al.*, 2022; Giglio et. al, 2021; Rebonato, 2023). If this is the case, long-term investors should be aware of a new type of risk: gradual or abrupt price corrections. In this context, empirical research can only provide answers to well-defined questions within a specific geographical area and time period.

[3] The non-linear nature of this relationship is explored in depth by Fernandez *et al.*, 2019, and Rubbainy *et al.*, 2021.

Against this background, we set out to investigate the relationship from the perspective of a long-term investor aiming at the balance of sustainability goals with traditional financial objectives, with a focus on the euro area and a broad view of sustainability, covering also climate aspects.

The theoretical literature provides a framework for understanding the relationship between sustainability and profitability based on equilibrium models. Common assumptions include future sustainability dynamics, the investor's time horizon and characteristics (such as their composition and the dispersion of the ESG preferences), and, particularly for climate risk, the transmission channels (Campiglio *et al.*, 2022). Assumptions about future macroeconomic scenarios are crucial to obtain comparable results. In this regard, NGFS climate scenarios help mitigate this source of uncertainty (NGFS, 2019). Additionally, assumptions about the time horizon significantly affect the results, especially concerning climate risk. The effect of climate risk on optimal allocation is much less pronounced for investors who can rebalance their portfolio compared to long-term buy-and-hold investors (Cosemans *et al.*, 2023).

Some equilibrium models postulate that investors with ESG preferences are willing to accept lower expected return in exchange for sustainability benefits (Pastor *et al.*, 2022; Pedersen *et al.*, 2021). Other models estimate the cost of capital according to the composition of the investor base (Berk and van Binsbergen, 2021; Cheng *et al.*, 2023). In equilibrium models, sustainability can either be disregarded or considered as a factor in estimating expected return, or even integrated into the investor's utility function alongside risk and return. The equilibrium outcome depends on the composition of investors and the dispersion of their ESG preferences: the higher the share of investors with strong ESG preferences, the lower the expected return compared to that estimated with the capital asset pricing model.

Sustainability-conscious investors divest from companies with low ESG ratings or high greenhouse gas emissions, leading to an increase in the cost of capital for these firms. If this increase is significant, sustainable companies will grow at the expense of 'brown' companies, benefiting society as a whole. Several models explore this hypothesis, but conclusions can differ based on the proportion of green to brown investors and whether non-green investors are active or passive. For instance, Cheng *et al.* (2023) provide empirical evidence showing a significant increase in the cost of capital for brown companies, while Berk and van Binsbergen (2021) find this increase to be statistically insignificant, suggesting that active stewardship might be a more effective strategy than divestment. As for macroeconomic finance models that incorporate climate factors, the study of how climate-related events may affect financial asset prices requires assumptions about their transmission channels. These assumptions affect the conclusions on the sign and magnitude of risk premiums. There are two primary transmission channels for climate risk, both of which can simultaneously influence the outcomes, leading to differing or even opposing conclusions, as often found in the literature (Giglio *et al.*, 2021).

Under the first transmission channel, uncertainty about the dynamics of climate change is treated as a direct source of economic risk. When climate risk materializes, it causes economic damage, which results in reduced consumption and a decline in the value of assets positively exposed to climate risk. Consequently, these assets demand a positive risk premium, while those negatively exposed to climate risk display a negative risk premium since these assets provide an insurance against climate risk (Engle *et al.*, 2020). Under the second transmission channel, uncertainty about climate damage stems from uncertainty about the future trajectory of economic activity. In this case, a growing economy, with high consumption, exacerbates climate damage. The pricing implications are the opposite of the first scenario: assets positively exposed to climate risk involve a negative risk premium, while those negatively exposed involve a positive one. (Alessi *et al.*, 2021; Wen *et al.*, 2020). Investments that mitigate climate damages (negatively exposed to climate risk) tend to pay off in times when consumption levels are already high and therefore marginal utility is low. As a result, these investments carry a positive risk premium.

The heterogeneity in the approaches makes it challenging to identify a clear link between sustainability and climate strategies, on the one side, and their performance for long-term investors, on the other side. However, long-term investors should consider three robust propositions (Atz *et al.*, 2023): (i) ESG integration generally outperforms screening or divestment strategies; (ii) ESG investing offers asymmetric benefits, particularly during social or economic crises; and (iii) decarbonization strategies have the potential to capture a climate risk premium.

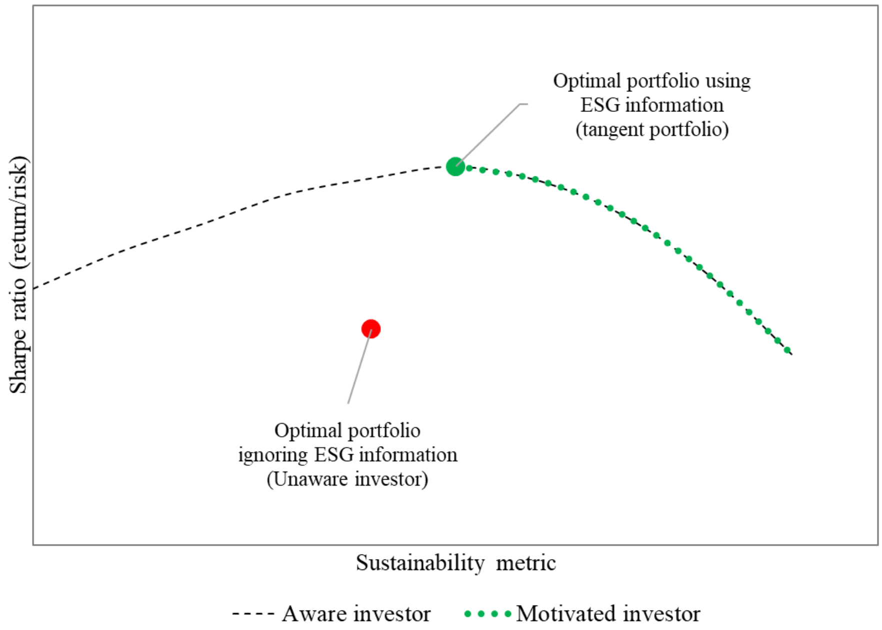
3. Conceptual framework

The conceptual framework for our analysis is based on the equilibrium models of Pedersen *et al.* (2021) and Pastor *et al.* (2021). The first model considers three types of investors - unaware, aware, and motivated - each with a distinct portfolio choice. Unaware investors, who disregard ESG information and lack sustainability preferences, make their portfolio decisions based solely on the traditional mean-variance model (Markowitz, 1952). Aware investors, while also lacking a preference for sustainability, integrate ESG information into their decision-making process, leading to more accurate risk and return estimates for each security (Fig. 1).[4] Finally, motivated investors gather information on sustainability and have a preference for it, which shapes the risk-return assessment and the investors' utility function. Consequently, motivated investors consider a three-dimensional space defined by risk, return, and sustainability (represented by the ESG score or other sustainability metrics). They may select a portfolio with a less favourable risk-return profile than the tangent portfolio but with a superior ESG score.

[4] The most likely ESG-unaware investor's frontier has an irregular shape in the aware investor's space because the unaware investor does not consider the ESG information, therefore the selected portfolios are not the efficient ones (they are efficient only in the information set ignoring ESG effects). Both the unaware and the aware investor combine their respective tangency portfolios (without and with ESG information) with the risk-free asset according to their risk aversion level.

Figure 1

Risk, return, and sustainability in the aware investor's space



Source: Pedersen *et al.* (2021)

In the model of Pastor *et al.* (2021), all investors acknowledge that sustainability contributes to explaining expected returns, but they have different preferences for it, including the possibility to favour poorly sustainable securities. The authors emphasize that the historically higher actual returns from sustainable assets do not necessarily imply higher expected return for the future. Instead, the expected equilibrium return should be lower owing to: (i) a preference premium, whereby investors forego part of their expected return to enhance the sustainability profile of their portfolio; and (ii) a risk premium, because investors pay a kind of insurance to shield themselves from specific sustainability-related risks.[5]

In three-dimensional models, equilibrium prices depend not only on the coexistence of different investor categories with heterogeneous information and ESG preferences, but also on the share of each investor category within the market. The variety of ESG tastes leads investors with preferences for greater sustainability to select allocations along the right-hand side of the efficient frontier, far from the tangent portfolio (Fig. 1). However, this choice could be undermined in the case of a sizeable share of investors with lesser sustainability preferences. In such a scenario, motivated investors may no longer be willing to forego their returns, as doing so would not have a meaningful impact on the environment and society, but would instead benefit less ESG-conscious investors.

In the following section, we examine the return differential of sustainable investment strategies in the euro area, both historically and prospectively, to preliminarily assess whether these differences can be attributed also to a preference premium. The existence of the latter would suggest the predominance of motivated investors who pursue sustainable investment strategies.

[5] For example, if the economic cycle were to deteriorate due to increased climate risk, more sustainable securities would achieve higher returns compared to less sustainable ones.

4. Empirical analysis

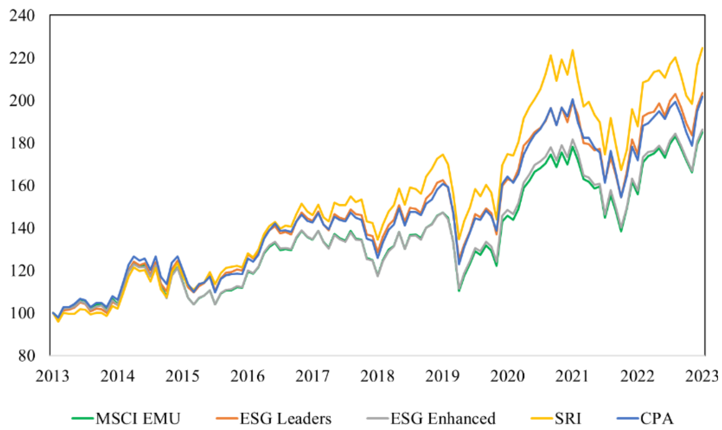
4.1 Risk-adjusted returns

To illustrate the sustainable investment strategies that may be implemented in the euro area, we consider five MSCI sustainable indices constructed from the common parent MSCI EMU index, which covers large and mid-cap stocks across ten markets in the euro area:[6] MSCI EMU Low Carbon Target (henceforth LCT), MSCI EMU ESG Enhanced Focus CTB (ESG Enhanced), MSCI EMU ESG Leaders (ESG Leaders), MSCI EMU Climate Paris Aligned (CPA), and MSCI EMU SRI (SRI).[7] Over the past decade, these sustainable indices have outperformed the market index (Fig. 2), although in the last two years their performance relative to the market index has turned negative (Table 1).[8]

Figure 2

Sustainable equity indices in the euro area

(31 December 2013=100; monthly frequency)



Source: Based on Bloomberg data.

[6] Austria, Belgium, Finland, France, Germany, Ireland, Italy, the Netherlands, Portugal, and Spain.

[7] The MSCI EMU Low Carbon Target index weights stocks based on their carbon exposure in the form of carbon emissions and fossil fuel reserves. The MSCI Enhanced Focus CTB index is designed to maximize exposure to positive ESG factors while reducing the carbon equivalent exposure to carbon dioxide (CO_2) and other greenhouse gases (GHG) as well as their exposure to potential emissions risk of fossil fuel reserves by thirty per cent. The MSCI EMU ESG Leaders index is a free float-adjusted market capitalization-weighted index designed to represent the performance of companies that are selected based on ESG criteria; these criteria exclude constituents based on involvement in specific business activities, as well as ESG ratings and exposure to ESG controversies. The MSCI EMU Climate Paris Aligned index is designed to support investors seeking to reduce their exposure to transition and physical climate risks and who wish to pursue opportunities arising from the transition to a lower-carbon economy while aligning with the Paris Agreement requirements; the index incorporates the TCFD recommendations and is designed to exceed the minimum standards of the EU Paris-Aligned Benchmark. The MSCI EMU SRI index provides exposure to companies with outstanding ESG ratings and excludes companies whose products have negative social or environmental impacts.

[8] The MSCI EMU Low Carbon Target has been excluded from the graph because its time series is available only from 2020. However, it has been taken into consideration in the subsequent analysis.

Table 1

Total return of sustainable equity indices in the euro area

(per cent)

	2021	2022	2023	Cumulated 2014-2023
MSCI EMU	22.2	-12.5	18.8	95.5
ESG Leaders	22.4	-12.5	16.7	114.8
ESG Enhanced	22.4	-13.3	18.3	95.7
SRI	28.0	-16.0	19.7	144.0
CPA	22.2	-14.3	17.4	110.0

Source: Based on Bloomberg data.

To assess whether the return differential can be attributed to the distinct risk profiles of sustainable strategies or to investor preferences for sustainability, we first decompose the difference between the risk-return ratio of the sustainable index *i* and that of the market index *mkt* at time *t*. This enables us to disentangle the contribution of return and risk, as follows:

$$D_{i,t} = \frac{Return_{i,t}}{Risk_{i,t}} - \frac{Return_{mkt,t}}{Risk_{mkt,t}} =$$

$$= \frac{Return_{i,t} - Return_{mkt,t}}{Risk_{mkt,t}} + Return_{i,t}\left(\frac{1}{Risk_{i,t}} - \frac{1}{Risk_{mkt,t}}\right) =$$

$$= Return\ contribution_{i,t} + Risk\ contribution_{i,t}$$

To obtain the decomposition of the risk-return differential for the five sustainable indices, we employ the annual realized return; risk is defined as the annualized standard deviation of the last 12 monthly observations.[9] The results can be shown on a graph, where, for each index and year, the return contribution is plotted on the y-axis and the risk contribution is plotted on the x-axis. Points on the bisector of the second and fourth quadrants represent yearly observations where the risk-adjusted return of the sustainable index matches that of the market index. Points below (above) the bisector represent cases where the risk-adjusted return of the sustainable index is lower (higher) than that of the market.

Until 2020, sustainability strategies generally exhibit a better risk-return profile compared to the market index (Fig. 3a, blue points above the red bisector). However, in 2021-2023 the risk-adjusted return of sustainable indices has worsened (Fig. 3a, yellow points below the red bisector). The investment strategies that differ more from the market index owing to a stronger sustainability tilt (such as ESG Leaders, CPA, and SRI; Fig. 3b, light blue points) show greater deviations compared to indices with less pronounced tilts (ESG Enhanced and LCT; Fig. 3b, orange points).

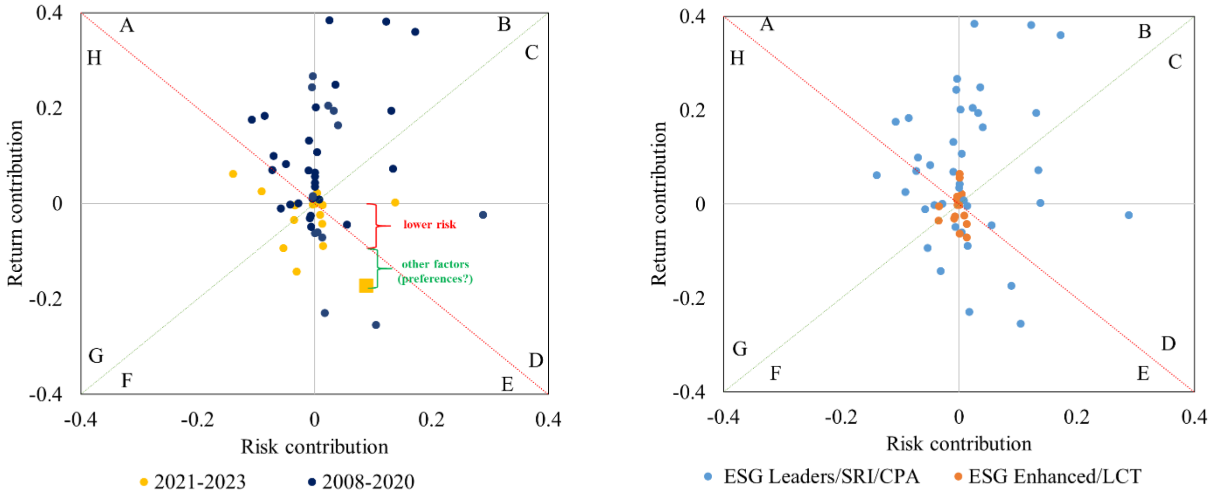
[9] Alternative risk measures have also been tested, such as Value-at-Risk (VaR), exponential moving average (EWMA), and GARCH, along with other time frames (3 and 5 years), but the qualitative messages remain unchanged. One might argue whether standard deviation is the best measure, especially when addressing sustainability risks. It could be adequate if the returns for the period in question also incorporate ESG considerations. Alternatively, at least to quantify climate risks, expected losses given a forward-looking climate risk scenario (e.g. Climate VaR) could be adopted, although the challenge remains of integrating it with financial risk measures. This could be an interesting topic for future research papers.

Figure 3

Risk-return ex-post differential
between sustainable strategies and the market index

(a) sustainable strategies after 2020 (yellow points) show a worse risk-return profile compared to the market

(b) more incisive sustainable strategies (blue points) show a greater deviation compared to the market



Source: Based on Bloomberg data.

Specifically, the eight areas capture:

Sustainable strategies with a better risk-return profile compared to the market

A = return increases more than offsetting risk; B = return increases with a risk reduction (return increase prevails); C = risk reduction and return increase (risk reduction prevails); D = risk reduction larger than offsetting return reduction.

Sustainable strategies with a worse risk-return profile compared to the market

E = return reduction larger than offsetting risk reduction; F = return reduction and risk increase (return reduction prevails); G= risk increase and return reduction (risk increase prevails); H = risk increases more than the offsetting return increase.

For illustrative purposes, we focus on the observations in the fourth quadrant, where both the risk and return of sustainable strategies are lower than those of the market index. Points above the bisector of the second and fourth quadrant (in the D area) are cases where sustainable indices have recorded lower returns than the market index but not as low as it would be expected given their lower risk. This implies that the risk-return profile of sustainable indices is better than that of the market index. Conversely, points below the bisector (in the E area) indicate that the return differential is larger than that justified by the lower risk, resulting in a worse risk-return profile for sustainable indices. The latter case may suggest the presence of a preference premium, as in Pastor *et al.* (2021), or, in the terms of Pedersen *et al.* (2021), a prevalence of motivated investors. For example, consider the yellow square in the E area of Fig. 3a. It represents the risk-return ratio differential between the SRI index and the market, observed in 2022. Only part of the negative differential can be attributed to lower return justified by a lower risk (red curly bracket); the remaining part might be due to a preference premium (green curly bracket).

Part of the difference between the performance of the sustainable indices and the market index can be attributed to the causes identified by Pastor *et al.* (2021, 2022) for the US stock market. Specifically, they investigate the determinants of the green-minus-brown (GMB) spread – the difference between the returns of the stocks with strong environmental profiles (green stocks) and those less sustainable (brown stocks) – observed between November 2012 and December 2020. If ESG concerns strengthen, customers may shift their demand for goods and services towards greener providers (the customer channel), and investors may derive greater utility from holding stocks of greener firms (the investor channel). Both of these channels contribute to the ex-post positive GMB return. However, outperformance driven by the investor channel tends to be followed by lower expected performance of GMB going forward. In other words, GMB's future performance is inversely related to past performance.

In a similar vein, we examine whether the positive return differential observed in the past for sustainable stock indices in the euro area is likely to persist in the future or if, as the recent trend suggests, we could expect lower returns going forward.

4.2 Expected risk-adjusted returns

We adapt the methodology of Pastor *et al.* (2022) to check for the presence of an expected return differential between the sustainable indices and the market in the euro area. In their empirical analysis, the authors find that returns recorded by US green stocks have outperformed those of brown stocks in recent years, probably due to the customer and investor channels. To assess whether this phenomenon may persist in the future, the authors estimate the difference between expected return for green and brown securities, based on the implicit cost of equity capital (ICC).[10] This variable is estimated by equating the present value of a company's future residual income to its market capitalization (see the Appendix for details). Residual income is the net profit minus the opportunity cost for the company shareholders.[11] The authors estimate future earnings for the first three years using regressions on the balance sheet data of the previous ten years and assume a convergence to industry profitability for the subsequent years. The results indicate an average expected annual return differential of -1.4 per cent for US green securities over the period from November 2012 to December 2020. Applying the same method to euro area sustainable indices reveals that, compared to the market index, sustainable indices have lower expected return (Table 2, column 2). This difference, averaging -0.8 per cent in 2023, is more pronounced for indices with more impactful sustainable strategies. We conduct the same analysis by replacing the regression-based estimates of net earnings for the first three years with analysts' forecasts, which broadly confirm the negative differential between sustainable indices and market indices (Table 2, column 3).

[10] Pastor *et al.* (2022) present two approaches for estimating the equity greenium: an ex-ante approach using ICC data and an ex-post one based on ex-post GMB return. Here we use the same ex-ante estimation, while we consider the ex-post approach in the next section.

[11] Indeed, a company can report a positive net income without necessarily creating value for shareholders, if the earnings do not exceed the cost of equity capital.

Table 2

Ex-ante return differential for 2023

(percentage points)

Index	Based on earnings estimated with regressions	Based on earnings forecasted by analysts
ESG Enhanced	-0.2	+0.1
LCT	-0.2	-0.1
ESG Leaders	-0.4	-0.5
CPA	-1.5	-1.1
SRI	-1.6	-0.9
Mean	-0.8	-0.5

Source: Based on MSCI, LSEG and IBES data.
The ICC of the index is calculated as weighted average of the ICC of each constituent, based on its market capitalisation.

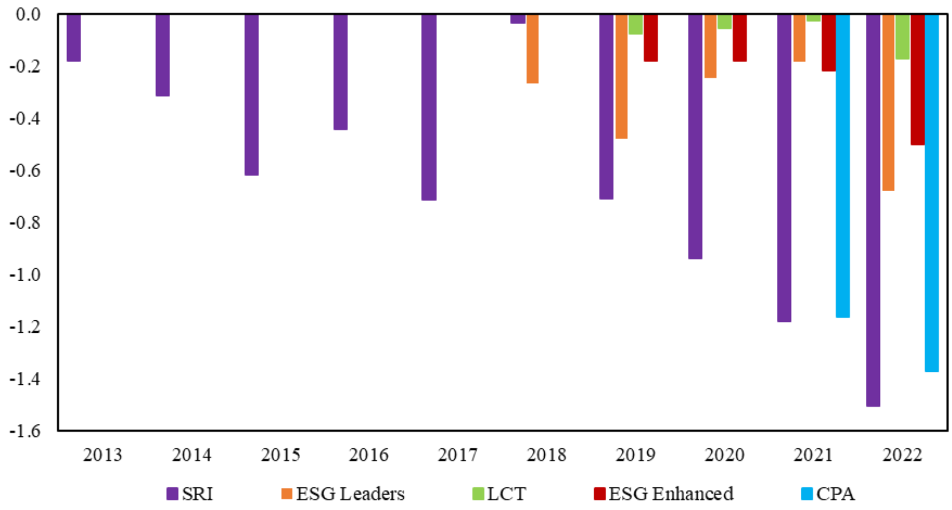
We also estimate the expected return between 2013 and 2022. Although partly conditioned by the short data sample available for certain sustainable stock indices, the results seem to corroborate the earlier evidence for 2023 (Fig. 4).

This evidence suggests that even for the euro area stock market, the expected return of sustainable investment strategies is lower than that of the market index. Therefore, it is reasonable to expect that over the medium to long term, equity portfolios integrating sustainability criteria will yield a lower return compared to the market. According to Pastor *et al.* (2022) this negative return differential can be justified by the fact that sustainable strategies are likely to be less exposed to certain risks due to the firms': (i) resilience to environmental and social risks; (ii) long-term stability; (iii) regulatory compliance; (iv) enhanced brand reputation; (v) access to capital; (vi) adaptation to changing consumer preferences. However, the return differential can be even more negative than that justified by reduced risk if there is a predominance of motivated investors whose required return includes a negative preference premium.

Figure 4

Ex-ante return differential

(percentage points)



Source: Based on MSCI, LSEG and IBES data.

5. Regression analysis of the return differential

We would like to establish whether the return differential of sustainable indices compared to the market index observed in recent years is statistically significant. If so, we would like to assess whether this difference is due to the presence of a preference premium after controlling for the exposure of the indices to known risk factors (Fama and French, 1993; Carhart, 1997) and to additional factors linked to customer demand for green goods and services. We use the methodology proposed by Pastor *et al.* (2022) which consists of two steps.

The first step of the analysis seeks to determine which fraction of the return differential can be attributed to the exposure to known risk factors. For this purpose, we estimate a linear regression of the monthly excess returns of the sustainable indices relative to the market (dependent variable) over the risk factors of the extended model of Fama and French (2015) and the Carhart (1997) factor:

$$r_{i,t} = \alpha + \beta_{i,MKT} MKT_t + \beta_{i,SMB} SMB_t + \beta_{i,HML} HML_t + \beta_{i,RMW} RMW_t + \beta_{i,CMA} CMA_t + \beta_{i,WML} WML_t + \varepsilon_{i,t} \quad (1)$$

where: $r_{i,t}$ is the return differential of the sustainable index i over the market return; MKT_t is the difference between the return of the value-weighted market portfolio and the risk-free rate; SMB_t is the return on a diversified portfolio of small-cap stocks minus the return on a diversified portfolio of large-cap stocks; HML_t is the difference between the returns on diversified portfolios of stocks with high and low book-to-market ratio; RMW_t is the difference between the returns on diversified portfolios of stocks with robust and weak operating profitability; CMA_t is the difference between the returns on diversified portfolios of the stocks of companies with low and high investment expenses, proxied by the change in total assets, which we call conservative and aggressive; WML_t is the momentum factor defined as the difference between the return on the equally-weighted portfolio of the highest performing firms and that of the lowest performing firms; $\varepsilon_{i,t}$ is the error term.

The regression results show that for some indices, such as LCT and ESG Leaders, the regression coefficients are not significant,[12] revealing that these indices are not distinguishable from the market index (Table 3). For other indices, such as ESG Enhanced and CPA, the return differential can be partly attributed to some of the Fama-French factors. Furthermore, the negative and significant value of the HML coefficient in both specifications indicates that the two sustainable indices are tilted toward growth stocks. Conversely, the WML coefficient suggests a lower exposure to the momentum factor.[13]

Regarding the excess return of the SRI index, the significance of the constant suggests the possible existence of additional risk sources not accounted for by the six factors.

Table 3

Return differential of sustainable indices

Variable	(1) ESG Leaders		(2) ESG Enhanced		(3) SRI		(4) LCT		(5) CPA	
MKT	0.010	-0.002	0.004	-0.003	0.032**	0.021	0.002	0.002	-0.012	-0.019*
	(0.94)	(-0.20)	(0.72)	(-0.74)	(2.36)	(1.43)	(0.63)	(0.47)	(-1.43)	(-1.94)
SMB	-0.018	-0.032	-0.007	-0.013	-0.023	-0.027	-0.003	-0.011	0.093***	0.099***
	(-0.56)	(-0.98)	(0.52)	(-1.01)	(-0.61)	(-0.67)	(0.37)	(-1.07)	(3.69)	(3.22)
HML	-0.037*	-0.077*	-0.023**	-0.051***	-0.148***	-0.240***	-0.002	-0.003	-0.152***	-0.189***
	(0.052)	(-1.86)	(-2.39)	(-2.62)	(-4.96)	(-3.74)	(-0.43)	(-0.40)	(-7.83)	(-5.44)
RMW		-0.072		-0.063**		-0.084		-0.028**		-0.037
		(-1.19)		(-2.58)		(-1.06)		(-2.05)		(-0.75)
CMA		-0.030		-0.023		0.045		-0.019		0.014
		(-0.66)		(-1.02)		(0.66)		(-1.29)		(0.25)
WML		-0.033		-0.022**		-0.066***		0.002		-0.034**
		(-1.54)		(-2.32)		(-2.70)		(0.25)		(-2.08)
Constant	0.057	0.108**	-0.003	0.033	0.090	0.161**	-0.008	-0.006	-0.003	0.031
	(1.35)	(2.17)	(-0.15)	(1.59)	(1.48)	(2.54)	(-0.62)	(-0.43)	(-0.08)	(0.73)
N	195	195	133	133	195	195	48	48	121	121
P > F	0.15	0.19	0.04	0	0	0	0.90	0.23	0	0
Adj. R2	0.02	0.05	0.06	0.17	0.15	0.18	-0.05	0.01	0.51	0.52

The standard errors for coefficients are calculated using a Newey –West estimator.
Robust t- statistics in parentheses
* $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$

The second step of the methodology proposed by Pastor *et al.* (2022) involves regressing the sum of the constant and the residuals, estimated in the first step, on additional variables such as those related to climate concerns and earning shocks. Since the constant term retains statistical significance

[12] The null hypothesis that the model with no independent variables fits the data as well as the estimated regression cannot be rejected.
[13] We assessed the robustness of our findings by re-estimating the models over distinct sub-periods. Further regressions conducted on a sample of 48 observations common to all indices and a sample of 121 observations common to all indices except the LCT index confirm the results obtained.

exclusively in regressions conducted using the SRI index, the new regression is conducted on this index only.

The inclusion of a climate concern indicator should reveal whether the heightened focus on sustainability in recent years has boosted the prices of green stocks and their indices, potentially at the expense of brown firms' stocks. The inclusion of an earning shock indicator (ES) tries to ascertain whether there are different effects for firms with quarterly results that significantly deviate from analysts' estimates. This indicator is intended to capture unexpected surges in customer demand for green goods and services.[14]

According to Bua *et al.* (2024) climate concerns may be captured by means of two indices, namely the Physical Risk Index (PRI) and the Transition Risk Index (TRI). They are constructed with a text-based approach and distinguish the effect of both climate risk sources on stock values. As in Pastor *et al.* (2022), we focus on transition risk and therefore we use only the TRI index and its lagged value. We estimate the following model:

$$r_t = \alpha + \beta_1 TRI_t + \beta_2 TRI_{t-1} + \beta_3 ES_{SRI,t} + \varepsilon_t \qquad (2)$$

where: r_t is the sum of the constant and residuals from the regression in the first step for the SRI index (equation 1); TRI_t is the unexpected change in climate concerns; $ES_{SRI,t}$ is the earning shock indicator tailored for the SRI index.

We assume that, in equilibrium, all dependent variables in equation (2) have an expected mean of zero; hence the intercept, if negative, can be interpreted as the ex-ante expected premium on the most sustainable stocks.[15] However, the estimated regression (Table 4) is not significant, i.e. the null hypothesis that all of the coefficients on the independent variables are equal to zero cannot be rejected. Thus, although the constant in the first step indicated the presence of an excess return for the SRI index, accounting for the exposure to known risk factors, this return cannot be attributed to unexpected changes in climate concerns or earning shocks.

[14] For each security, the earning shock is computed as the stock returns in excess of the market during the three-trading day windows centred on earnings announcement dates.
[15] See Pastor *et al.* (2022) for further details about this interpretation.

Table 4

SRI return differential

Variable	SRI
TRI	0.527
	(0.78)
L.TRI	0.011
	(0.02)
ES_SRI	4.871
	(0.92)
Constant	0.258**
	(2.21)
N	124
P > F	0.672
Adj. R2	-0.012

The standard errors for coefficients are calculated using a Newey – West estimator.

Robust t- statistics in parentheses

* $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$

Overall, the results obtained for the sustainable indices indicate that one or more of the following statements apply to the return differential: (i) it is not statistically different from zero; (ii) it is partly explained by the different exposure to known risk factors; (iii) it is not due to changes in concerns about climate sustainability or earning shocks. In the case of the SRI index a positive return differential is observed even after controlling for climate concerns and earning shocks. This result could be attributed to idiosyncratic effects, which could be more pronounced in a less diversified index. The SRI index includes only 48 securities, less than a quarter of the parent index, with the top five issuers accounting for approximately 50 per cent of the index's total market capitalization. Conversely, other indices have a number of constituents comparable to the parent index (as in the ESG Enhanced and Low Carbon Target indices) or approximately half its size (as in the ESG Leader and CPA indices). Therefore, there is no evidence of a (negative) preference premium on the part of investors for sustainable or green assets.

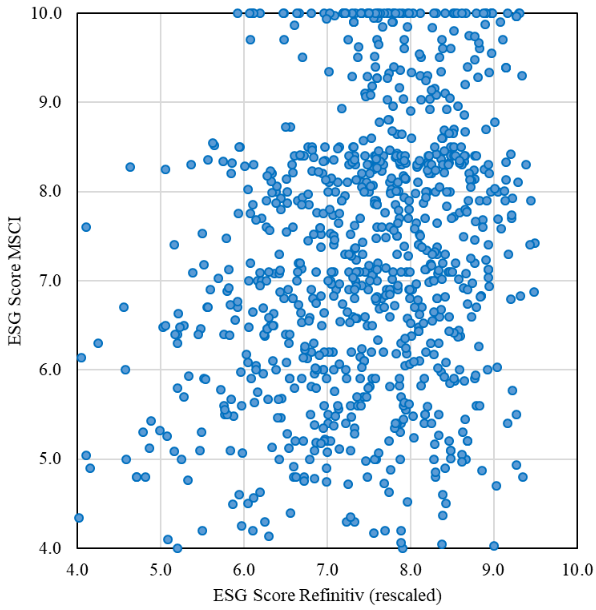
To challenge these results, we employ a second approach based on the methodology of Pastor *et al.* (2022), using returns from long/short portfolios based on E and ESG scores from multiple providers. Compared to the return differential between sustainable indices and the market index, the long-short portfolio emphasizes sustainability characteristics by taking opposite investment positions between the most sustainable and least sustainable stocks.

We employ the E score from MSCI and the ESG scores from MSCI and LSEG.[16] LSEG scores are available from December 2015 to December 2023, whilst MSCI scores cover a shorter period starting from September 2020. The MSCI score ranges from 0 to 10, and the LSEG score from 0 to 100. The differences in the methodologies employed by the providers result in a low correlation between the scores; this is more pronounced for ESG scores (Fig. 5). Leveraging different metrics and providers allows us to assess whether the empirical results are robust across the scoring methodologies.

[16] The LSEG E score's weight necessary to get the unadjusted E score is not available.

Figure 5

ESG scores - MSCI and LSEG



Source: Based on MSCI and LSEG data.

The construction of the long/short portfolios starts with the calculation of the unadjusted E and ESG sustainability scores (respectively $G_{E_{i,t-1}}$ and $G_{ESG_{i,t-1}}$) for firm i at the beginning of month t:[17]

$$G_{E_{i,t-1}} = -(10 - E_{score\,i,t-1}) \times E_{weight\,i,t-1}/100$$

$$G_{ESG_{i,t-1}} = -(10 - ESG_{score\,i,t-1})$$

where $E_{weight\,i,t-1}$ is the environmental pillar weight that measures by how much the environmental pillar contributes to the aggregated ESG score.

The final sustainability scores $g_{E_{i,t}}$ and $g_{ESG_{i,t}}$ are given by:

$$g_{E_{i,t}} = G_{E_{i,t-1}} - \bar{G}_{E_t}$$

$$g_{ESG_{i,t}} = G_{ESG_{i,t-1}} - \bar{G}_{ESG_t}$$

where $\bar{G}_{E_t}$ and $\bar{G}_{ESG_t}$ are the value-weighted average of $G_{E_{i,t}}$ and $G_{ESG_{i,t}}$ across all firms i. We compute $g_{E_{i,t}}$ and $g_{ESG_{i,t}}$ for each stock in the MSCI EMU with non-missing data. The return of the long/short portfolio in a given month is computed as the difference between the weighted average return of the stocks in the top third of the final sustainability score distribution (in descending order) and those in the bottom third.

Since July 2020, long-short portfolios constructed using the three scores have shown diverging performances (Fig. 6). Portfolios based on the ESG scores from LSEG and MSCI have reported a

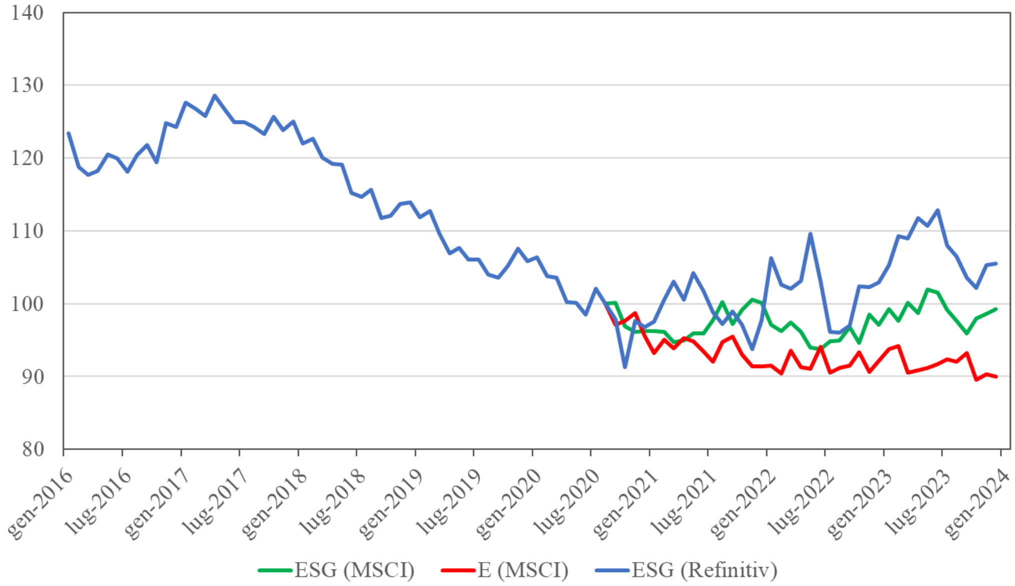
[17] The LSEG ESG score is scaled down by a factor of 10.

positive return and a zero cumulative return, respectively. The portfolio based on the MSCI E-score has experienced a negative return.

Figure 6

Cumulative return of long/short portfolios

(base=100, august 2020)



Source: Based on MSCI and LSEG data.

The regression has been run under three model specifications, namely the Fama-French three-factor model, the Carhart model and the Fama-French five-factor model extended for the momentum factor (Table 5).

Table 5

Long/short portfolio returns

Variable	E – SCORE (MSCI)			ESG – SCORE (MSCI)			ESG – SCORE (LSEG)		
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)
MKT	-0.037	-0.005	-0.028	0.073	0.067	0.060	0.174***	0.188***	0.195***
	(0.79)	(-0.07)	(-0.34)	(1.35)	(1.11)	(0.98)	(4.42)	(3.41)	(3.37)
SMB	0.256	0.248	0.089	-0.221	-0.219	-0.289*	-0.319***	-0.327***	-0.342***
	(1.25)	(1.20)	(0.38)	(-1.50)	(-1.47)	(-1.84)	(-3.12)	(-3.09)	(-2.94)
HML	0.211***	0.249***	0.192	-0.281***	-0.288***	-0.345***	0.534***	0.554***	0.445***
	(3.56)	(4.25)	(1.23)	(-5.03)	(-3.54)	(-2.04)	(6.17)	(5.57)	(2.90)
RMW			-0.383*			-0.215			-0.230
			(-1.81)			(-0.83)			(-1.05)
CMA			-0.288			-0.099			0.026
			(-1.00)			(-0.67)			(0.13)
WML		0.079	0.081		-0.016	-0.015		0.044	0.037
		(0.82)	(0.85)		(-0.19)	(-0.18)		(0.66)	(0.55)
Constant	-0.393	-0.431	-0.292	0.222	0.229	0.318	-0.327	-0.361	-0.303
	(1.43)	(-1.62)	(-0.92)	(1.09)	(1.04)	(1.09)	(-1.55)	(-1.50)	(-1.24)
N	40	40	40	40	40	40	96	96	96
P > F	0	0	0	0	0	0	0	0	0
Adj. R2	0.12	0.11	0.12	0.33	0.31	0.29	0.55	0.55	0.54

The standard errors for coefficients are calculated using a Newey –West estimator.
Robust t- statistics in parentheses. * $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$

The results broadly confirm the previous findings. The long-short portfolios are primarily exposed to the HML factor, which is significant in nearly all specifications. However, the portfolios show a negative exposure to this factor in the specifications in columns 4, 5, and 6, while the exposure is positive in columns 7, 8, and 9. This evidence seems to reflect the heterogeneity in ESG score methodologies among the providers (Fig. 5). Furthermore, the results confirm the absence of a statistically significant intercept across the specifications, suggesting that there is no preference premium associated with investing in sustainable securities during the sample period.

The difference between the return on sustainable strategies and the market return is partly explained by the varying exposure to known market factors. Therefore, unlike the findings of Pastor *et al.* (2022) for the U.S. stock market, we cannot infer the presence of a green preference premium in the euro area stock market.

6. Sustainable flows and assets

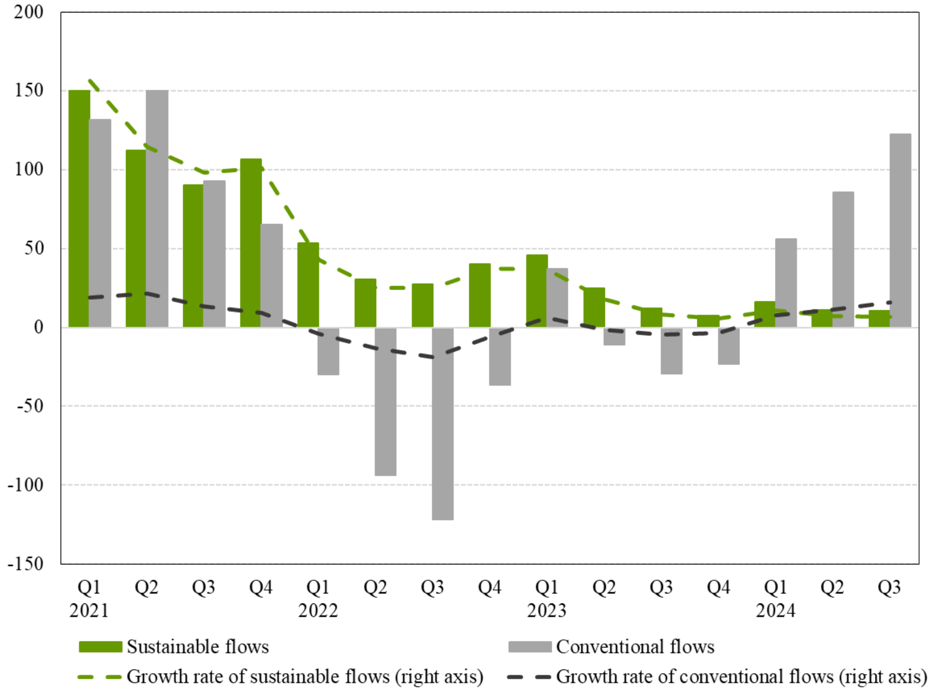
In an alternative regression, Pastor *et al.* (2022) use net cash flows into ESG funds and the total value of assets under their management as variables to capture changes in investor preferences, but they do not find any link with the excess return of green securities. A comparable analysis has been carried out in what follows for the euro area. According to Morningstar, since 2021, the growth in flows of sustainable mutual funds and ETFs in Europe has averaged 3 per cent on a quarterly basis, compared to zero average growth for those with conventional strategies (Fig. 7).[18]

[18] We refer to the organic growth rate, defined by Morningstar as the cumulative flow for the period divided by the total net assets at the start of the period.

Figure 7

Sustainable and conventional flows in Europe

(billion dollars; percent)



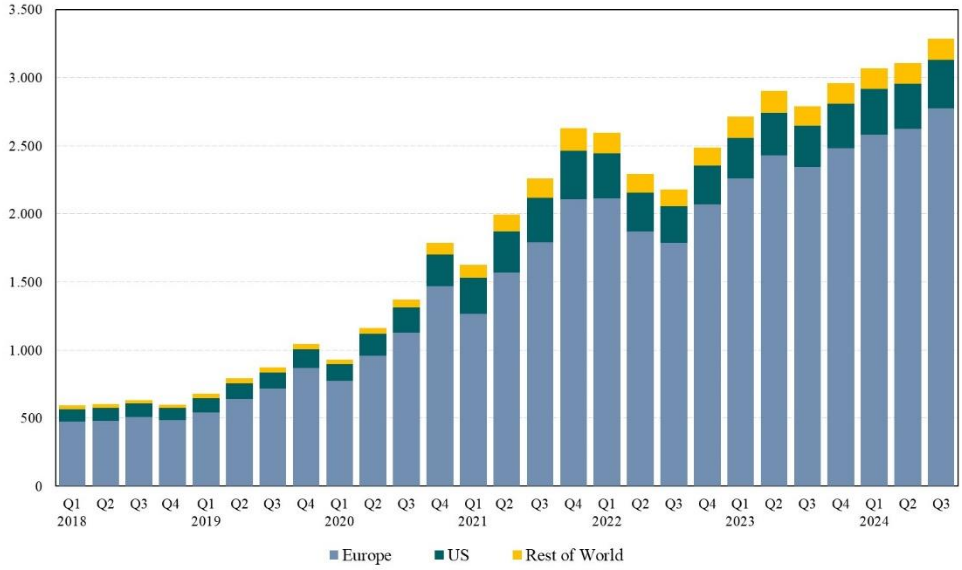
Source: Morningstar Direct.

Even though the difference in growth rates has gradually narrowed, Europe remains the leading geographic area for sustainable investments. In 2024, European funds and ETFs labelled as sustainable managed $2.775 trillion in assets, representing 84 per cent of global sustainable assets under management (Fig. 8).

Figure 8

Global sustainable mutual funds and ETFs

(market values in billion dollars)



Source: Morningstar Direct.

Flows and assets under management (AUM) of ETFs tracking SRI indices may account for the excess return of the SRI index that remains after controlling for standard risk factors (eq. 2). For this purpose, two additional variables have been defined to measure shifts in investor demand for green securities. The first variable (*Flows Norm*) represents the total flows into ETFs tracking SRI indices, while the second (*AUM Norm*) corresponds to the assets under management of these ETFs. Both variables have been normalized relative to the market capitalization of a representative stock market index for the euro area.

Two models have been then estimated. In the first, the excess return of the SRI index relative to the market, adjusted for the traditional risk factors, has been regressed on: (i) the two new variables; (ii) the climate concern indicator (Transition Risk Index, TRI); and (iii) the earning shocks. In the second model, the climate concern and earning shock indicators have been omitted. Table 6 shows the results of this alternative analysis.

Table 6

SRI extra-return

(monthly data, January 2016 - December 2023)

Variable	SRI	SRI
ΔTRI_t	0.538 (0.57)	
ΔTRI_{t-1}	-0.181 (-0.22)	
Earning Shocks	1.425 (0.18)	
Flows_Norm	-32860.822 (-0.87)	-30411.214 (-0.79)
AuM_Norm	0.001 (0.84)	0.001 (0.75)
Constant	0.294** (2.15)	0.296** (2.18)
N	96	96
F	0.425	0.363
P>F	0.830	0.697
Adj.R2	-0.0345	-0.0130

The standard errors for coefficients are calculated using a Newey – West estimator. Robust t- statistics in parentheses * $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$

In both specifications, the additional regressors are not statistically significant, consistent with the findings of Pastor *et al.*. The inclusion of alternative variables as proxies for demand factors does not explain the performance of sustainable strategies relative to the market.

7. Conclusion

In this paper we explore the risk and return dynamics of sustainable investment strategies within the euro area equity market. Drawing on existing theoretical models, our empirical analysis tries to ascertain whether sustainable strategies yield a return differential compared to the market index and to identify the underlying factors. The data show that both historical and expected returns of sustainable investment strategies may differ from those of the market.

However, the econometric analysis for recent years reveals that the ex-post return differential is not significant after controlling for well-known financial risk factors, as in the Fama-French model. This holds true for investment strategies that hinge on climate change objectives, as well as for strategies that have a broader ESG focus. Our results thus depart from the empirical evidence for the United States, where a statistically significant, although contained, preference premium has been documented.

On the other hand, the analysis of the implied cost of capital shows that, in the euro area equity market, the expected return of sustainable investment strategies is currently lower than that of the market. Therefore, one could expect that, over the medium to long term, equity portfolios integrating sustainability criteria might underperform the market.

The widespread adoption of ESG criteria in investment management is a relatively recent practice. Any conclusion is thus preliminary and subject to re-evaluation to account for a number of factors: regulatory and policy changes, shifts in consumer and investor preferences, corporate responses to new ESG challenges, and improvements in data quality. Demand for sustainable assets may thus shift, leading to a new equilibrium where a preference premium for sustainable investments might emerge. This would lower the cost of capital for sustainable firms, consistently with the idea that the investor channel of sustainability strategies is capable of producing real effects in the economy. Sustainable investors would then have to face the trade-off.

Appendix

The implied cost of capital methodology

The empirical analysis of Pastor *et al.* (2022) on the difference between expected return for sustainable and non-sustainable securities is based on the implicit cost of equity capital using a multi-stage residual income formulation (Gebhardt *et al.* 2001):

$$M_{i,t} = B_{i,t} + \sum_{n=1}^{11} \frac{\frac{E_t[NI_{i,t+n}]}{E_t[B_{i,t+n-1}]} - r_{i,e}}{(1+r_{i,e})^n} E_t[B_{i,t+n-1}] + \frac{\frac{E_t[NI_{i,t+12}]}{E_t[B_{i,t+11}]} - r_{i,e}}{r_{i,e}(1+r_{i,e})^{11}} E_t[B_{i,t+11}]$$

where

$M_{i,t}$ is the market capitalization of company i in year t of evaluation,

$B_{i,t}$ is the book value of equity,

$r_{i,e}$ is the implicit cost of equity capital,

$E_t[\,]$ is the expected value (given the information available in year *t*),

$NI_{i,t+n}$ is the net income excluding extraordinary income components.

The difference in the numerator of the two sums ($\frac{E_t[NI_{i,t+n}]}{E_t[B_{i,t+n-1}]} - r_{i,e}$) represents the residual income of company i in year $t+n$. The model involves discounting the residual income for the subsequent eleven years and a delayed perpetuity. Earnings and balance sheet estimates for the first three years are obtained through pooled cross-section regressions estimated on balance sheet data from the previous ten years. This specification draws from Hou *et al.* (2012):

$$NI_{i,t+n} = \alpha_0 + \alpha_1 A_{i,t} + \alpha_2 D_{i,t} + \alpha_3 DD_{i,t} + +\alpha_4 NI_{i,t} + +\alpha_5 NegNI_{i,t} + \alpha_6 AC_{i,t} + \varepsilon_{i,t+n}$$

where

$A_{i,t}$ is the total assets,

$D_{i,t}$is the dividend payment,

$DD_{i,t}$is the dummy variable that equals 1 for dividend payers and 0 otherwise,

$NI_{i,t}$is the net income before extraordinary items,

$NegNI_{i,t}$is a dummy variable equals 1 for firms with earnings and 0 otherwise,

$AC_{i,t}$is accruals calculated as the difference between earnings and cash flows from operations.

The book value is updated considering earnings and dividends (clean surplus accounting).[19]
For the subsequent eight years, estimates of the two variables are derived assuming that the ratio between them (interpretable as the rate of return on capital) converges linearly to the sector's historical median, while for $n \geq 12$ the residual income is a perpetuity.

The estimation of the expected return of company i is obtained by identifying the rate $r_{i,e}$ that equals the present value of future residual incomes to its market capitalization ($M_{i,t}$).

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[19] The clean surplus accounting allows for the calculation of the equity book value based on net earnings and distributed dividends. $B_{t+n} = B_{t+n-1} + NI_{t+n} - D_{t+n}$ where D_{t+n} is the dividend distributed in year $t+n$.

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