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# Sustainable finance disclosure regulation insights: Unveiling socially responsible funds performance during COVID-19 pandemic and Russia–Ukraine war

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## Abstract

The transition towards a more sustainable financial market demands transparency and trust from investors, objectives also pursued by the Sustainable Finance Disclosure Regulation (SFDR). Specifically, carefully assessing the risk-adjusted performance of sustainable funds empowers investors to make informed decisions in alignment with their ethical and financial objectives. This article contributes to the debate on the performance of socially responsible investment (SRI) funds in times of crisis by evaluating the risk-adjusted performance of a sample of SRI and conventional funds, ranked in light of the SFDR, during the COVID-19 pandemic and the Russia–Ukraine war. Using a two-step analysis, the results of the study show that funds with clear sustainability objectives, as defined by Article 9 of the SFDR, were able to outperform conventional funds, but only a few months after the onset of the crisis periods, thus demonstrating poor performance persistence. At the same time, sustainable funds with a focus on financial materiality, as defined by Article 8, were never able to generate significantly different risk-adjusted performance from conventional funds. Our results show that the lack of performance persistence of Article 9 funds prevents an effective hedging role for investment strategies that consider extra-financial criteria. They also confirm that the classification criteria introduced by the SFDR still need to be more specific and create more transparency in financial markets.

**KEYWORDS**
crisis, ESG policy, market transparency, SFDR, SRI funds' performance, sustainable finance

## 1 | INTRODUCTION

The theme of socially responsible investment (SRI) funds, which are mutual funds that seek to reconcile the pursuit of financial performance and the creation of shared environmental and social value, is not new but is increasingly topical. An SRI fund involves identifying, for investment, companies with high corporate social responsibility, which is valued based on environmental, social, and governance (ESG) criteria (see Renneboog et al., 2008).

The theme is becoming increasingly important due to a succession of directives and regulations that seek to channel savings towards activities that promote a more sustainable economy, that is, favour or do not compromise the achievement of ESG objectives (Beloskar et al., 2023; Pacelli et al., 2023). The European Union has launched an ambitious legislative programme to make ESG criteria a central element of the regulation of financial services (Arvidsson & Dumay, 2022). Specifically, on 27 November 2019, the European Parliament and the Council published Regulation (EU) 2019/2088 on Sustainable Finance Disclosure Regulation (SFDR), effective from 10 March 2021. The regulation states that to counter climate change, 'urgent action is needed to mobilise capital through public policies and the financial services sector'. By introducing this new regulation type, the EU seeks to change behaviour patterns in the financial sector, discouraging greenwashing and promoting responsible and sustainable investment. The new policy applies to all European financial market participants. In addition to the growing reporting obligation, among its main requirements for participants, there is the classification of mutual funds under Articles 6, 8, and 9 of the SFDR depending on the degree of ESG integration in the implemented investment strategies (Becker et al., 2022; Thun & Zülch, 2022). In particular, Article 6 of the SFDR covers *conventional funds*, which do not integrate sustainability criteria into the investment process, implying the possible presence of shares belonging to brown sectors. On the other hand, Article 8 includes *light green* funds that consider ESG aspects in their investment process but focus on financial materiality. Finally, Article 9 products include *dark green* funds that aim to make sustainable investments and generate financial returns.

The theme of SRI funds has assumed growing importance also due to changes in investors'/consumers' sensitivity towards sustainability issues (Hirshleifer, 2008; Lins et al., 2017; Nofsinger & Varma, 2014). This makes socially responsible investing a promising and potentially high-impact alternative to traditional financial investment practices, even if it could contradict the central individualistic values and premises of the financial logic (Yan et al., 2019). ESG products are no longer a niche phenomenon. Assets under management in sustainable investment strategies are experiencing robust growth, and many new ESG products are being launched yearly (Meira et al., 2022). In its latest report, 'Costs and Performance of EU Retail Investment Products 2023', ESMA pointed out that net flows to European equity, bond, and mixed ESG funds have almost tripled compared with 2020.

While there is no doubt that the new European Union's SFDR aims to facilitate investors' choices, making the classification criteria of the funds homogeneous and overcoming the inconsistencies between ESG ratings provided by the different rating companies (Berg et al., 2022), the debate on the relative performances remains open. In particular, a study on the return performance of the three categories of SFDR funds in times of crisis is essential to enable investors to make informed decisions aligned with their financial and sustainable objectives and better understand the behaviour of funds during difficult economic conditions. This type of information is essential for responsible and conscious financial management and

would make it easier to assess alignment with one's investment objectives. At the same time, an analysis of the performance of the three new categories of funds in times of crisis would enable asset managers to evaluate, adapt, and improve their investment strategies, as well as to meet investors' expectations and demonstrate the effectiveness of the strategy sustainable. Finally, studies on the performance of SFDR funds in times of recent crisis provide valuable information for policymakers, allowing them to make informed decisions, promote sustainable investment, and contribute to more effective management of systemic risks. Although several authors in the literature have recently analysed the impact of SFDR on investors (Becker et al., 2022), on financial markets (Birindelli et al., 2023; Ferriani, 2023), and on financial operators (Cremasco & Boni, 2022), none further investigated the possible difference, in terms of risk-adjusted performance, between the three categories of funds introduced by the SFDR. Although SRI has an undisputed nonfinancial utility (Auer & Schuhmacher, 2016), what distinguishes it from charitable giving is the concern for financial returns (Sparkes, 2003). SRI is based on a financial investment strategy firmly grounded in financial logic, which plays a central and dominant role in shaping the structure of an SRI fund (Besharov & Smith, 2014; Yan et al., 2019). This paper aims to contribute to improving the assessment of the alignment between investors' objectives and investment funds and provide valuable information for asset managers' strategies and policymakers' evaluations of the effectiveness of new regulation.

The financial performance of SRI funds has stimulated a lively debate in the literature. In particular, two different points of view have emerged about the link between financial performance and ESG performance, namely, 'doing good while doing well' and the contrasting 'doing good but not well'. The first supports the presence of a positive relationship between financial performance and ESG performance, thereby implying the possibility of obtaining higher returns by choosing to invest in shares evaluated positively at a social and environmental level (Becchetti et al., 2015; Brekke & Nyborg, 2005). In contrast, the second point of view supports a negative relationship between financial performance and ESG performance, indicating that commitment to social and environmental issues is a constraint capable of penalising returns (Hamilton et al., 1993; Kurtz, 1998). The literature has not yet reached a consensus on this.

In the context of studies comparing the performance of SRI and conventional funds, a significant strand of research has investigated the performance of these funds in times of crisis. However, the results of these studies have yet to reach an unequivocal conclusion. On the one hand, some studies have shown that ESG investment strategies pay off during times of crisis, guaranteeing superior returns and downside protection compared with the market or conventional investments (Albuquerque et al., 2020; Broadstock et al., 2021; Ding et al., 2021; Pástor & Vorsatz, 2020; Singh, 2020). On the other hand, other scholars have arrived at different results (Demers et al., 2021; Döttling & Kim, 2022).

The lack of unequivocal results and the relevance of the subject in light of the SFDR, along with the strategic importance of sustainable investments in the European strategy and the recent succession

of crises, justify our study. This study intends to verify whether light green and dark green funds can exhibit risk-adjusted performances better than conventional funds, limiting the risk of loss during periods of crisis.

Using daily data from a sample of funds domiciled in Europe and therefore subject to the SFDR classification, we investigate the performance of these funds during periods of market crisis caused by the COVID-19 pandemic and the outbreak of the Russia–Ukraine war. In particular, the analysis is carried out over three different time windows (1 month, 6 months, and 1 year after the beginning of the crisis periods) to analyse not only the immediate, emotional response of the market but also the reaction over a relatively more extended period (Lasfer et al., 2003).

This work joins the trend of studies analysing the performance of SRI funds during times of crisis but, differently from previous studies, uses the new classification imposed by the SFDR. This choice allows us to overcome the critical issues related to the inconsistencies between sustainability ratings (Berg et al., 2022). It fills a gap in the literature analysing the effects of introducing the European regulation on the financial markets. Compared with earlier research, this study focusses on the performance of SRI funds during two recent crises, whose effects have yet to be jointly assessed. From a methodological point of view, compared with most previous studies, the study adopts some expedients that allow it to overcome some of the limitations of the earlier studies. First, by returning management costs to the historical series of returns of the mutual funds, the study neutralises the cost effect that often affects the returns of mutual investment funds (Sharpe, 1966). This procedure also makes it possible to overcome bias derived from the various classes of mutual funds and their different costs. Second, the historical period analysed, characterised by two periods of crisis of a different nature but located in a short-term time window, enables us to observe the performance of the funds in two contexts that are not structurally and profoundly different and therefore to carry out assessments regarding the market reaction in a less distorted comparative key. Third, the performance analysis of the funds is observed over three different time windows after the start of the crisis. In this way, reflections can be made on the persistence of the performances beyond the immediate emotional reaction.

Our study reveals unexpected results on the performance of the three categories of funds, ex SFDR. Our results highlight that dark green funds (Article 9) showed better risk-adjusted performance than light green (Article 8) and conventional funds (Article 6). This outperformance, however, materialised mainly within a few months of the start of the two crisis periods. In particular, the lack of persistence in the outperformance of dark green funds relative to conventional funds prevents an effective hedging role from declines for investment strategies that consider extra-financial criteria. Furthermore, there is an absence of difference in performance between light green and conventional funds that may stem from a lack of difference in content between the two classes of funds. These findings have important implications for investors, asset managers, and policymakers.

The article is structured as follows. Section 2 provides an overview of the literature related to the study of SRI fund performance, with a specific focus on articles investigating the nature of the performance of these funds in times of crisis, and develops the research hypotheses. Section 3 describes the data used and the research methods implemented. Section 4 presents the results. Section 5 discusses the main findings, and finally, the final section concludes the research article by highlighting the implications and limitations of the study.

## 2 | THEORETICAL BACKGROUND AND HYPOTHESIS

Socially responsible funds support the adoption of investment criteria based on typically extra-financial variables. Notably, such funds generally employ negative or positive screening strategies. Negative screening excludes specific sectors or companies from investments according to ESG criteria. Positive screening is based on a 'best-in-class' approach, which involves selecting investments that are particularly sensitive to and compliant with ESG issues (Widyawati, 2020). The intensity with which mutual funds adopt these investment criteria based on nonfinancial variables determines the more or less accentuated sustainability of these funds, generally measured with sustainability ratings. The sustainability rating market has grown significantly in recent years, and the most critical global rating agencies have developed their own ESG rating methodologies. As highlighted by Billio et al. (2021), however, these methodologies present substantial differences in terms of the data source used, number of indicators evaluated, weight attributed to the various pillars (E, S, and G), and definition of materiality. This, therefore, leads to a substantial incomparability of these assessments linked to the lack of a common definition, reporting standards and shared characteristics between each ESG component and between rating providers (Billio et al., 2021). A similar issue is raised by Berg et al. (2022), who highlights a substantial divergence between the ESG ratings provided by six major rating agencies stemming mainly from a fundamental disagreement on the underlying data. As highlighted by Gibson Brandon et al. (2021), the disagreement on ESG ratings has essential implications for the generalisation of academic research findings but also for asset managers who make numerous efforts to implement ESG investment strategies. Furthermore, ESG ratings say very little about the actual sustainable orientation, combining financial and extra-financial data to assess value and long-term sustainability (Escrig-Olmedo et al., 2019; Scalet & Kelly, 2010).

Currently, ESG ratings do not sufficiently enable users, investors, and rated entities to make informed decisions regarding the risks, impacts, and opportunities related to ESG factors, and as highlighted by Stubbs and Rogers (2013), reliance on the ESG raters can create biases and misleading judgements about ESG quality. As a result, confidence in ratings needs to be improved.[1]

These problems bring out the need for standards and regulatory references that uniquely define the concept of sustainable investment

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[1] https://ec.europa.eu/commission/presscorner/detail/en/qanda_23_3194

and that can guarantee greater transparency. In this regard, numerous efforts have been implemented in Europe with the publication of the new Sustainable Finance Disclosure Regulation (SFDR, EU 2019/2088). This new framework requires European financial market players to declare the alignment of their products with the framework overview of the EU taxonomy for sustainable activities (Schütze & Stede, 2021). The SFDR, in particular, defines categories in which financial products must fall according to whether the sustainability factor is considered more or less intensely (Cremasco & Boni, 2022). These categories are defined by Articles 6, 8, and 9 of the regulation. Article 6 of the SFDR includes the so-called 'conventional funds', that is, funds declaring no sustainability practices or that do not consider sustainability risks relevant (Cremasco & Boni, 2022). Article 8 represents the category of 'light green' funds, that is, funds that 'promotes, among other characteristics, environmental or social characteristics, or a combination of those characteristics, provided that the companies in which the investments are made follow good governance practices' (Regulation (EU) 2019/2088). The last category is 'dark green' funds, defined by Article 9, that is, funds which aim to create an environmental and social impact alongside generating a financial return (Becker et al., 2022). The main difference between light green and dark green funds lies in the fact that the latter are required to communicate the impact objective. Membership in Article 9, therefore, goes beyond ESG performance, requiring that maximum ESG performance is associated with generating positive impacts on general sustainability objectives defined ex ante (Bengo et al., 2022).

Since the introduction of the SFDR, various authors have tried to analyse the impact of this new classification on the behaviour of markets and financial players. Becker et al. (2022) demonstrated that the introduction of the SFDR has increased the mutual fund ESG scores and has led to a large fund inflow. Birindelli et al. (2023) found that investor awareness of the SFDR is essential in predicting European stock market prices, especially during normal and bearish market conditions. Moreover, the study by Cremasco and Boni (2022) evidenced that, despite the introduction of the SFDR, the European financial market still is characterised by ambiguity and category fuzziness. Finally, Ferriani (2023) compared the SFDR classification with the Morningstar sustainability rating. Investors, in making portfolio decisions, primarily rely on ESG ratings provided by Morningstar. Specifically, funds with higher ESG ratings attract more capital inflows. Conversely, it appears that labels provided by the SFDR do not prompt investors to 'mobilize' their fund placements. The exception is found only in Article 9 funds, where sustainability objectives are the primary focus of the investment.

However, to our knowledge, no studies have yet compared the performance of the three fund categories introduced by the SFDR. A study on the different performances of the three categories of funds could highlight critical issues in their classification and, at the same time, make the characteristics and peculiarities of each category more transparent to investors to align with their investment objectives. The need to address this problem derives from the presence in the literature of an intense but still open debate on the performance of SRI funds.

## 2.1 | SRI funds' performance: An open debate

The development of socially responsible funds has led, in the literature, to the development of numerous studies on their performance and comparisons of the latter with the performance of market indices or 'conventional' funds (i.e., funds that do not adopt ESG screening criteria). At the core of all these studies is a primary question: Can good environmental/social performance be associated with good financial performance? (Delmas & Blass, 2010).

Such studies often find their foundation within several conflicting theories, such as Markowitz's portfolio theory and the social theory of the firm. According to Markowitz's theory, a reduction in the universe of possible investments, implemented with screening mechanisms, implies lower diversification, higher exposure to risk, and consequently less efficient portfolios. The classical theory of the firm implies that socially responsible investment is less financially efficient than unconstrained investment since the firms in which responsible investors invest incur higher costs (Chegut et al., 2011), reducing profitability. Furthermore, socially responsible funds bear higher monitoring or agency costs (Bauer et al., 2007; Gil-Bazo et al., 2010; Zeidan, 2022).

Conversely, the social theory of the firm suggests that the financial performance of responsible investing is superior to that of conventional investing because SRI screening techniques provide valuable information that fund managers can use to generate extra returns and to mitigate, for example, regulatory, contentious, managerial, and reputational risks (Atif & Ali, 2021; Chegut et al., 2011). In their study, Carlsson Hauff and Nilsson (2023) supported that ESG screening can reduce the high costs arising from corporate crises, environmental disasters, or legal disputes.

Numerous empirical analyses have tried to follow up on the theories above, although they have yet to reach univocal results.

Some authors have shown SRI funds to perform worse than conventional investments. Adler and Kritzman (2008) estimated that SRI funds involve lower returns due to their exclusion of some companies that could be attractive because they are able to generate above-average returns. Similarly, Fabozzi et al. (2008) and Statman and Glushkov (2009) argued that negative screening based on ESG criteria reduces returns and increases risk. By analysing a sample of French funds, Capelle-Blancard and Monjon (2014) demonstrated that excluding specific sectors based on nonfinancial variables reduces risk-adjusted performance.

On the other hand, authors such as Luther et al. (1992) and Mallin et al. (1995) have provided empirical evidence for the hypothesis that SRI funds can produce extra performance compared with conventional funds. Another contribution in this sense was provided by Gil-Bazo et al. (2010), who separately analysed the performance of SRI funds before and after fees and investigated the role played by managers in determining these variables. The study concluded that investors in SRI funds achieve higher risk-adjusted returns than they would in conventional funds both before and after fees.

Numerous studies have also shown insignificant differences in terms of performance between socially responsible funds and

conventional funds (Goldreyer et al., 1999; Hamilton et al., 1993; Shank et al., 2005; Statman, 2000).

## 2.2 | The performance of SRI funds in times of crisis

In the literature on the performance of socially responsible funds, a recent trend focusses on studying SRI funds' returns in times of crisis. This topic is linked to the insurance role that socially responsible funds can play during bearish market phases. Various studies have supported the idea that SRI funds, which select companies to invest in based on ESG criteria, can outperform conventional funds in times of market crisis. Indeed, investors seem to pay more attention to corporate behaviour during recessionary economic states (Hirshleifer, 2008). SRI funds that use positive screening select companies with good environmental data, corporate governance, and employee relations. Additionally, negative screening techniques avoid stocks more likely to suffer reputational damage on social issues. Thus, SRI portfolios may hold up better during bear markets, even at the expense of underperforming during bull markets (Nofsinger & Varma, 2014).

Kahneman and Tversky's (1979) prospect theory shows that investors are more negatively affected by losses than they are positively affected by gains of a similar magnitude. Therefore, investors would rather lose less in times of crisis than gain more in ordinary times. In fact, during times of economic crisis, worries about possible losses increase for investors.

Consistent with the prospect theory, the SRI literature suggests that ESG investors are more conservative; if a market shock generally affects investor attitudes in such a way that leads to increasing sales of equity investments, investors who prefer sustainable investments tend to keep their positions stable, which has clear repercussions on the price stability of ESG securities compared with others (Albuquerque et al., 2020). Cardillo et al. (2023) found that more sustainable firms had better stock market performance than other firms during the pandemic since they showed higher market returns, lower volatility, and higher stock market liquidity.

Nofsinger and Varma (2014) compared the performance of SRI and conventional funds in the United States during periods of market downturn brought about by the tech bubble and the global financial crisis. Their estimates showed that SRI funds significantly outperformed conventional ones during the crises, although the opposite result was obtained during the noncrisis period. These results have been driven by SRI funds adopting positive ESG screening.

More recently, Becchetti et al. (2015) examined the performance of SRI and conventional funds from January 1992 to April 2012. The study found that during the global financial crisis from December 2007 to June 2009, SRI funds outperformed conventional funds in all markets except North America. However, they showed no difference in performance when the tech bubble burst in March–November 2001, suggesting that the nature of a crisis impacts the performance of SRI funds.

Further evidence was provided by Nakai et al. (2016), who used event study methodology to argue that SRI funds in the Japanese market outperformed conventional funds in the aftermath of the insolvency of Lehman Brothers in 2008. Similarly, Omura et al. (2021) analysing returns, abnormal returns and the Sharpe ratio of a sample of SRI and conventional indices during the COVID-19 pandemic, confirmed the more significant outperformance of SRI indices.

There is no lack of studies that do not confirm the greater resilience of SRI funds compared with conventional ones during crises, where the term 'resilience' identifies the ability of a fund to have less negative or more positive performances in times of crisis. Leite and Cortez (2015) compared the performance of SRI and conventional funds during periods of market downturn caused by the bursting of the tech bubble, the global financial crisis, and the euro sovereign debt crisis. Their primary finding was that the difference between SRI and conventional funds was not significant during the crises; furthermore, SRI funds significantly underperformed conventional funds during noncrisis periods. SRI funds have reported returns comparable with conventional funds during crises. More recently, Lean and Pizzutilo (2021), focussing on a sample of SR and conventional indices, found that both performed almost the same regardless of financial market conditions.

Based on these conflicting arguments of the literature analysed and using the new classification introduced by the SFDR, we test the following hypotheses:

> **Hypothesis 1.** Dark green funds have higher risk-adjusted performance than conventional funds during crises.

> (1a) Dark green funds have higher risk-adjusted performance than conventional funds 1 month after the onset of crises.
> (1b) Dark green funds have higher risk-adjusted performance than conventional funds 6 months after the onset of crises.
> (1c) Dark green funds have higher risk-adjusted performance than conventional funds 1 year after the onset of crises.

> **Hypothesis 2.** Light green funds have higher risk-adjusted performance than conventional funds during crises.

> (2a) Light green funds have higher risk-adjusted performance than conventional funds 1 month after the onset of crises.
> (2b) Light green funds have higher risk-adjusted performance than conventional funds 6 months after the onset of crises.
> (2c) Light green funds have higher risk-adjusted performance than conventional funds 1 year after the onset of crises.

Analysing the COVID-19 crisis, Pástor and Vorsatz (2020) showed that sustainability content has a monotonic relationship with performance, with the Morningstar Sustainability Rating having emerged as one of the strongest predictors for performance. This rating is expressed on a scale ranging from one to five globes: Funds with the highest number of sustainability globes as of 31 January 2020 produced higher returns between 20 February and 30 April 2020 (i.e., in the first phase of the pandemic). In addition to fund performance, Pástor and Vorsatz (2020) analysed capital flows into and out of active mutual funds. Similar to performance, cash inflows during the crisis were generally predictable based on the funds' precrisis sustainability ratings. Indeed, when reallocating capital, investors prefer funds with high sustainability ratings and those that apply exclusion criteria.

Based on the evidence presented, we test the following research hypothesis:

> **Hypothesis 3.** Dark green funds have higher risk-adjusted performance than light green funds during crises.

> (3a) Dark green funds have higher risk-adjusted performance than light green funds 1 month after the onset of crises.

> (3b) Dark green funds have higher risk-adjusted performance than light green funds 6 months after the onset of crises.

> (3c) Dark green funds have higher risk-adjusted performance than light green funds 1 year after the onset of crises.

## 3 | DATA AND METHODOLOGY

The dataset used in this study consists of daily returns gross of management costs relating to 490 European equity funds belonging to the European Equity category. The choice of the domicile of the funds (Europe) was derived from the need to use mutual funds classified based on the recent European SFDR regulation (Cremasco & Boni, 2022). In particular, to overcome possible bias derived from the different management costs applied to the funds present in the sample (Chegut et al., 2011), it was decided to restore the daily value of the total expense ratio (TER) to the daily returns using the following procedure:

$$GrossR_{it} = \frac{1 + R_{it}}{1 - DailyTER_i} - 1,$$

where $R_{it}$ represents the daily return of fund $i$ on day $t$ and $DailyTER_i$ represents the daily TER relating to fund $i$.

Furthermore, our sample exclusively includes accumulation funds belonging to the same institutional class or, where this is not present, retail. The various classes of each fund differ in some variables, such as ongoing charges or whether they are distributed rather than

accumulating (Zhu, 2020). Such differences in the literature should be treated more adequately despite being crucial. The institutional class of a fund is characterised by lower costs, which is reflected in higher performance. Thus, for example, the performance of an SRI fund could be higher when compared with another fund because an institutional class is compared with a retail class. Also, unlike Munoz et al. (2014), who followed the procedure of Renneboog et al. (2011) to aggregate the different classes of each fund with a two-step methodology, our study presents an element of originality, reattributing the pertinent costs to each class (Sharpe, 1966). At this point, all funds are valued based on a single class, and the evaluation of the manager's skill is not distorted by the different costs of distributing the funds.

To overcome survivorship bias (Chegut et al., 2011), 'dead' funds (i.e., mutual funds that existed at the beginning of our reference period and have since ceased to exist) were also included in the sample. Therefore, these are funds with truncated historical series whose non-inclusion in the analysis may lead to overestimating average returns (Carhart et al., 2002; Elton et al., 1996).

The data were extracted from the Refinitiv database, which allows mutual funds to be classified according to SFDR guidelines. The benchmark used in the analysis is MSCI Europe, which almost all the funds in our study use in their information material and performance reviews. Instead, the euro short-term rate (ESTER) represents the risk-free rate.

Our analyses cover the crisis periods related to the COVID-19 pandemic and the Russian–Ukrainian war. Specifically, for the first crisis period, we used data from the official start of the pandemic, that is, 20 February 2020 (Döttling & Kim, 2022; Folger-Laronde et al., 2022; Pástor & Vorsatz, 2020) to 20 February 2021. Regarding the conflict in Ukraine, we used data from the day of Russia's first attack on Ukraine, that is, 24 February 2022 (Boungou & Yatié, 2022) to 24 February 2023.

To test the hypotheses, risk-adjusted performance was calculated through the information ratio (IR) (Gupta et al., 1999).

Various return indicators, risk, and risk-adjusted performance are calculated for a more comprehensive assessment. In particular, for each fund, in addition to the geometric mean of the returns, the alpha (Edwards & Caglayan, 2001), the standard deviation of the returns (Derwall & Koedijk, 2009; Schröder, 2007), the tracking error volatility (Aber et al., 2009; Petajisto, 2013), the maximum drawdown (Heidorn et al., 2009; Riley & Yan, 2022), the Sharpe ratio (Kourtis, 2016; Miralles-Quirós et al., 2019; Prol & Kim, 2022), and the Sortino ratio (Billio et al., 2021) were calculated. MATLAB software was used to calculate all indicators. A brief description of the calculated indicators is provided in Table 1.

The selected indicators were calculated at 1 month, 6 months, and 1 year from the beginning of the crises using MATLAB routines built by the authors. This made it possible to analyse not only the immediate, emotional response of the market but also the reaction over a relatively longer period to observe performances in a period of adjustment concerning the persistence of the crisis and to evaluate the persistence of the identified performances.

**TABLE 1** Return, risk, and risk-adjusted performance indicators (authors' calculations).

| Indicator | Definition | Formula |
|---|---|---|
| **Performance indicators** | | |
| Alpha | Excess return of the fund with respect to the benchmark | $Alpha = R_p - R_{bmk}$ |
| **Risk indicators** | | |
| Standard deviation | Volatility of fund returns | $\sigma_p = Stdev(R_p)$ |
| Tracking error volatility | Volatility of the difference between the performance of a fund and that of its benchmark | $T.E.V. = Stdev(R_p - R_{bmk})$ |
| Maximum drawdown | Maximum observed loss from a peak to a trough of a fund, before a new peak is attained | $M.D.D. = \frac{Trough\ Value - Peak\ Value}{Peak\ Value}$ |
| **Risk-adjusted performance indicators** | | |
| Sharpe ratio | Excess return per unit of volatility | $Sharpe\ ratio = \frac{R_p - R_f}{\sigma_p}$ |
| Information ratio | Amount of excess return of the fund with respect to the benchmark for each relative risk unit | $Information\ ratio = \frac{R_p - R_{bmk}}{T.E.V.}$ |
| Sortino ratio | Excess return for each unit of downside risk | $Sortino\ ratio = \frac{R_p - R_f}{DSR}$ |

*Note*: This table describes the calculated indicators. The first column indicates the name of the indicators. The second column provides a brief definition of the calculated indicators. The third column indicates the calculation formula.

After calculating the indicators, a two-step procedure was implemented to test the significance of the differences in the performance of the three fund classes. In the first step, we implemented a one-way analysis of variance (ANOVA) test (Chang et al., 2019; Folger-Laronde et al., 2022), as it is widely used to analyse differences among three or more groups (Kucuk et al., 2016; Lee, 2012). In particular, for each indicator in Table 1, we tested the null hypothesis that no significant difference exists between the means of all the groups. We can write the null hypothesis as

$$H_0: \text{it is true that } \mu_{art6} = \mu_{art8} = \mu_{art9}.$$

As a consequence, our alternative hypothesis is that there is a significant difference between the groups, and so that at least one of the three groups is different from the others:

$$H_1: \text{it is not true that } \mu_{art6} = \mu_{art8} = \mu_{art9}.$$

Where the results of the ANOVA test reveal statistically significant differences between groups, these are investigated further by performing appropriate post hoc analyses to verify the significance of the pairwise differences (Landrum & Ohsowski, 2018; Tsai & Liao, 2017; Wilson et al., 2013). During post hoc analysis, one compares pairs of groups and identifies all the pairs that show significant differences. This hierarchical procedure is based on the premise that if the omnibus test is significant, at least two groups must exist that are significantly different, and vice versa (Tian et al., 2018).
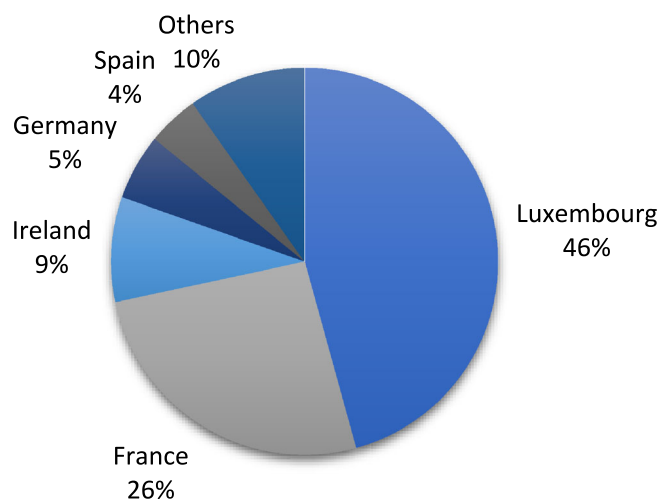
## 3.1 | Sample characteristics

The sample analysed is characterised by the preponderant presence of light green funds (241). The 174 remaining funds are classified as conventional. Finally, there are 67 dark green funds and eight unclassified funds.

About the geographical domicile of the funds in the sample, there is a prevalence of funds in Luxembourg, followed by France and Ireland (Figure 1).

Table 2 provides information about the mutual funds that were analysed. The total expense ratio (TER) of the funds in the sample shows higher expenses for conventional funds. The total net assets (TNA) under management describes a situation in which, on average, sustainable funds manage a decidedly more considerable amount of assets than nonsustainable funds, which is synonymous with the fact that the mutual fund market is moving increasingly towards sustainability.

Since our study aims to evaluate two particularly close crisis periods simultaneously, a correlation analysis of the time series of returns was carried out to ensure that the performance of the first is independent of the performance of the second crisis period. The



**FIGURE 1** Mutual funds by domicile. Others: 2% Finland; 2% Denmark; 1% Belgium; 2% Sweden; 2% Netherlands; and 1% Italy.

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**TABLE 2** Characteristics of the funds analysed.

|  | No. funds | Average TER | Average TNA |
|---|---|---|---|
| Funds Article 6 (conventional) | 174 | 1.67 | 291.10 |
| Funds Article 8 (light green) | 241 | 1.60 | 464.61 |
| Funds Article 9 (dark green) | 67 | 1.50 | 444.21 |
| Unclassified | 8 | 2.24 | 56.59 |
| Total | 490 |  |  |

*Note*: The table briefly describes the sample of funds analysed. In particular, the table indicates, for each category, the number of funds (no. funds), the average total expense ratio (average TER), and the total net assets under management (average TNA).
*Source*: Refinitiv database.

correlation analysis in Table 3 shows a very low correlation between the returns of the first crisis period and those of the second. Therefore, the substantial independence of the time series avoids the risk that the performance during the COVID-19 period influences the performance during the war.

# 4 | RESULTS

## 4.1 | Descriptive analysis: COVID period

Table 4 shows that the risk-adjusted performance indicators (i.e., the Sharpe ratio, the information ratio, and the Sortino ratio), despite their negative or close to zero values, exhibit better values for dark green funds 1 month and 6 months after the outbreak of the COVID-19 pandemic. This is particularly true for the IR, which has decidedly higher values for dark green funds. Furthermore, a positive relationship between performance and sustainability content can be highlighted.

From a return point of view, the funds seem to bear more minor losses in the first two time windows as the sustainability content increases. Although the average returns of the three classes of funds (under Articles 6, 8, and 9) are negative, lower losses can be observed for dark green and light green funds compared with conventional funds; the dark green funds have the most negligible negative returns. Alpha, which has positive or very close to zero values, rewards the greater integration of the sustainability factor in the investment process.

Considering the risk component inherent in the three types of funds, sustainable funds are less risky than nonsustainable funds over the first two windows when maximum drawdown and tracking error volatility are considered.

When analysing the risk-adjusted performance indicators 1 year after the outbreak of the COVID-19 pandemic, the positive relationship between performance and sustainability content is broken: Although dark green funds exhibit the highest performance, light green funds underperform dark green and conventional funds. This is particularly evident for the 1 year average indicators.

The same considerations apply when analysing the geometric mean of returns and alphas. Dark green funds represent the category

**TABLE 3** Correlation between the returns of the two crises periods.

| Time window | Correlation COVID–war |
|---|---|
| One month | .031203 |
| Six months | .031026 |
| One year | .05933 |

*Note*: The table analyses the correlation between the returns produced by the funds in the COVID period and those produced in the War period.

with the highest returns, while light green funds represent the category with the lowest returns.

From the perspective of riskiness, the main differences are found in maximum drawdown, whose values reveal lower riskiness as the sustainability content of the funds increases. On the other hand, standard deviation and tracking error volatility have virtually identical values for the three categories of funds.

## 4.2 | Descriptive analysis: War period

Table 5 shows the indicators 1 month, 6 months, and 1 year after the official start date of the Ukraine war. An initial analysis of the results enables us to highlight the substantial differences between the two crisis periods. In particular, the period relating to the war in Ukraine seems to have less impact on the equity markets. Unlike the COVID-19 period, there are average positive or close to zero returns and positive values for the risk-adjusted performance indicators. Despite the numerous elements of dissimilarity between the two crisis periods analysed (COVID-19 and war), the results are similar if we consider the differences between the three different categories of funds.

Analysing risk-adjusted performance, measured with the Sharpe, the information, and the Sortino ratios, dark green funds perform better than conventional and light green funds in the 1 and 6 month average indicators. Furthermore, a positive relationship between performance and sustainability content can be highlighted.

The average return reveals that sustainable funds bear fewer losses than conventional funds. Light and dark green funds show better results than conventional funds in terms of average returns and alpha 1 and 6 months after the official start date of the Ukraine war.

**TABLE 4**  One month, 6 months, and 1 year average indicators for COVID-19.

| | 1 month average indicators | | | 6 months average indicators | | | 1 year average indicators | | |
|---|---|---|---|---|---|---|---|---|---|
| | Article 6 | Article 8 | Article 9 | Article 6 | Article 8 | Article 9 | Article 6 | Article 8 | Article 9 |
| G. mean. | −0.339 | −0.332 | −0.321 | −0.116 | −0.112 | −0.086 | 0.018 | −0.005 | 0.031 |
| Alpha | −0.002 | 0.005 | 0.017 | −0.056 | −0.052 | −0.027 | −0.062 | −0.086 | −0.049 |
| Dev. st. | 0.033 | 0.032 | 0.033 | 0.022 | 0.022 | 0.021 | 0.017 | 0.017 | 0.016 |
| TEV | 0.016 | 0.015 | 0.013 | 0.011 | 0.011 | 0.009 | 0.009 | 0.009 | 0.007 |
| MaxDD | 0.336 | 0.315 | 0.283 | 0.336 | 0.316 | 0.283 | 0.336 | 0.316 | 0.283 |
| Sharpe | −10.304 | −10.209 | −9.874 | −5.031 | −4.966 | −3.870 | 1.485 | −0.013 | 2.277 |
| I.R. | −0.185 | 0.307 | 1.615 | −6.087 | −6.337 | −3.768 | −8.510 | −11.870 | −7.739 |
| Sortino | −9.313 | −9.240 | −9.118 | −6.300 | −6.218 | −4.857 | 1.993 | 0.064 | 2.991 |

*Note*: The table provides the average indicators of the three fund categories (Articles 6, 8, and 9) 1 month, 6 months, and 1 year after the official start of the COVID-19 pandemic.

**TABLE 5**  One month, 6 months, and 1 year average indicators for the war period.

| | 1 month average indicators | | | 6 months average indicators | | | 1 year average indicators | | |
|---|---|---|---|---|---|---|---|---|---|
| | Article 6 | Article 8 | Article 9 | Article 6 | Article 8 | Article 9 | Article 6 | Article 8 | Article 9 |
| G. mean. | −0.001 | 0.001 | 0.012 | −0.049 | −0.038 | −0.028 | 0.029 | 0.027 | 0.020 |
| Alpha | 0.026 | 0.028 | 0.039 | 0.090 | 0.101 | 0.111 | 0.043 | 0.041 | 0.034 |
| Dev. st. | 0.021 | 0.021 | 0.021 | 0.014 | 0.013 | 0.014 | 0.012 | 0.012 | 0.012 |
| TEV | 0.012 | 0.012 | 0.010 | 0.010 | 0.010 | 0.009 | 0.009 | 0.009 | 0.008 |
| MaxDD | 0.093 | 0.091 | 0.084 | 0.144 | 0.141 | 0.144 | 0.179 | 0.174 | 0.181 |
| Sharpe | 0.047 | 0.069 | 0.605 | −2.959 | −2.531 | −1.807 | 2.286 | 2.071 | 1.453 |
| I.R. | 2.210 | 2.550 | 3.758 | 10.338 | 11.286 | 13.168 | 5.214 | 5.170 | 4.614 |
| Sortino | 0.184 | 0.230 | 1.110 | −3.986 | −3.479 | −2.557 | 3.337 | 3.009 | 2.126 |

*Note*: The table provides the average indicators of the three fund categories (Articles 6, 8, and 9) 1 month, 6 months, and 1 year after the official start of the war period.

Looking at the risk component inherent in the three types of funds, there are no strong differences between the three categories of funds in the first two time windows analysed. Only in the first-time window, dark green funds have a lower maximum drawdown than the other two categories of funds.

Although in the first two time windows, the average indicators point to a situation in which performance improves as sustainability content increases, this situation is completely reversed in the 1 year indicators.

When analysing the risk-adjusted performance indicators 1 year after the start of the crisis, conventional funds have a higher Sharpe, information, and Sortino ratios than light and dark green funds. Furthermore, a negative relationship between performance and sustainability content can be highlighted.

Analysing the geometric mean of returns, we find a situation in which the mean values reward the conventional funds. The same relationship is confirmed when analysing the alphas. Also, in this case, a negative relationship between performance and sustainability content emerges.

Looking, finally, at the risk component of the funds, again, indicators with very similar average values emerge. Furthermore, analysing the maximum drawdown, dark green funds are slightly riskier.

## 4.3 | Results of ANOVA and post hoc tests: COVID-19 period

The ANOVA tests (Table 6) reveal statistically significant differences between the three fund classes regarding risk-adjusted performance in the first time window analysed. The results of the post hoc tests show that 1 month after the outbreak of the COVID-19 pandemic, dark green funds suffered less from the market downturn than conventional and light green funds. In particular, dark green funds had significantly higher risk-adjusted performance when considering the information ratio than conventional funds ($p < .01$), in the first time window, confirming Hypothesis 1a. In contrast, the results do not allow Hypothesis 2a to be confirmed. Light green funds never show significantly different risk-adjusted performance than conventional

**TABLE 6** ANOVA and post hoc comparison results (COVID-19 period).

| | ANOVA | | Post hoc tests | |
|---|---|---|---|---|
| | **F statistic** | **p (significance)** | **Significant comparisons** | **p (significance)** |
| One month | | | | |
| Geometric mean | 5.58 | .004 (<.01) | Article 9 > Article 6 | $p = .013^*$ |
| Alpha | 5.58 | .004 (<.01) | Article 9 > Article 6 | $p = .013^*$ |
| Standard deviation | 2.37 | .305 | No significant difference between groups | |
| TEV | 1.25 | .041 | No significant difference between groups | |
| Maximum drawdown | 6.16 | <.001 | Article 9 < Article 6 | $p = .002^{**}$ |
| Sharpe ratio | 1.25 | .29 | No significant difference between groups | |
| Information ratio | 6.97 | .001 (<.05) | Article 9 > Article 6 | $p = .001^{**}$ |
| | | | Article 9 > Article 8 | $p = .02^*$ |
| Sortino ratio | 2.23 | .108 | No significant difference between groups | |
| Six months | | | | |
| Geometric mean | 5.73 | .004 | Article 9 > Article 6 | $p = .004^{**}$ |
| | | | Article 9 > Article 8 | $p = .013^*$ |
| Alpha | 5.73 | .004 | Article 9 > Article 6 | $p = .004^{**}$ |
| | | | Article 9 > Article 8 | $p = .013^*$ |
| Standard deviation | 2.20 | .112 | No significant difference between groups | |
| TEV | 13.84 | <.001 | Article 9 < Article 6 | $p < .001^{***}$ |
| | | | Article 9 < Article 8 | $p = .008^{**}$ |
| Maximum drawdown | 17.51 | <.001 | Article 9 < Article 6 | $p < .001^{***}$ |
| | | | Article 9 < Article 8 | $p = .002^{**}$ |
| Sharpe ratio | 5.14 | .006 | Article 9 > Article 6 | $p = .01^{**}$ |
| | | | Article 9 > Article 8 | $p = .013^*$ |
| Information ratio | 3.61 | .02 | Article 9 > Article 6 | $p = .03^*$ |
| Sortino ratio | 5.15 | .006 | Article 9 > Article 6 | $p = .01^{**}$ |
| | | | Article 9 > Article 8 | $p = .012^*$ |
| One year | | | | |
| Geometric mean | 6.31 | .002 | Article 9 > Article 8 | $p = .013^*$ |
| | | | Article 6 > Article 8 | $p = .023^*$ |
| Alpha | 6.31 | .002 | Article 9 > Article 8 | $p = .013^*$ |
| | | | Article 6 > Article 8 | $p = .023^*$ |
| Standard deviation | 3.28 | .04 | No significant difference between groups | |
| TEV | 11.56 | .003 | Article 9 < Article 6 | $p < .001^{***}$ |
| | | | Article 9 < Article 8 | $p = .008^{**}$ |
| Maximum drawdown | 17.51 | <.001 | Article 9 < Article 6 | $p < .001^{***}$ |
| | | | Article 9 < Article 8 | $p = .002^{**}$ |
| Sharpe ratio | 6.93 | .001 | Article 9 > Article 8 | $p = .009^{**}$ |
| | | | Article 6 > Article 8 | $p = .015^*$ |
| Information ratio | 6.55 | .002 | Article 9 > Article 8 | $p = .03^*$ |
| | | | Article 6 > Article 8 | $p = .008^{**}$ |
| Sortino ratio | 6.67 | .001 | Article 9 > Article 8 | $p = .011^*$ |
| | | | Article 6 > Article 8 | $p = .017^*$ |

*Note*: The table provides the results of ANOVA and subsequent post hoc tests for the COVID period. Where ANOVA tests showed no statistically significant differences between groups, no further analysis was done. Otherwise, post hoc tests allowed pairwise comparisons to be made. The results of the post hoc tests are reported in the last column.
$^*p < .05$, $^{**}p < .01$, and $^{***}p < .001$.

funds. At the same time, light green funds underperformed dark green funds statistically significantly at 1 month ($p < .05$) after the onset of the COVID-19 pandemic. This result allows confirmation of Hypothesis 3a.

Six months after the start of the COVID-19 pandemic, ANOVA and subsequent post hoc tests allow confirmation of the findings that emerged in the first time windows. Here, in particular, it appears that dark green funds performed better than conventional funds in terms

of Sharpe ratio ($p < .01$), information ratio ($p < .05$), and Sortino ratio ($p < .01$), confirming Hypothesis 1b. Again, light green funds did not show significantly different performance from conventional funds, not confirming Hypothesis 2b, but, on the contrary, underperformed dark green funds statistically significantly in terms of Sharpe ratio and Sortino ratio ($p < .05$), confirming Hypothesis 3b.

Expanding the time horizon and analysing post hoc test results 1 year after the start of the pandemic, our findings change. Light green funds show the worst risk-adjusted performance. Article 8 funds significantly underperform dark green and conventional funds regarding information, Sharpe, and Sortino ratios, confirming the Hypothesis 3c and not supporting Hypothesis 2c. At the same time, no statistically significant differences emerge between conventional and dark green funds, not confirming the Hypothesis 1c. Thus, a substantial closeness in the behaviour of conventional and dark green funds emerges.

## 4.4 | Results of ANOVA and post hoc tests: War period

In the first month after the start of the Russian–Ukrainian conflict, ANOVA tests revealed statistically significant differences among the three classes of funds in terms of risk-adjusted performance (Table 7). The results of subsequent post hoc tests allow this result to be further investigated. The results show that dark green funds outperformed conventional funds statistically significantly in the first window. Particularly when considering the information ratio, the statistical significance of the difference in risk-adjusted performance becomes very strong ($p < .001$), confirming Hypothesis 1a. Again, just as in the pandemic period, light green funds did not perform significantly differently from conventional funds. Hence, Hypothesis 2a is not confirmed. At the same time, dark green funds significantly outperformed light green funds, confirming Hypothesis 3a.

Widening the time horizon and considering a 6 month window, ANOVA tests show statistically significant differences among the three classes of funds in terms of risk-adjusted performance. In detail, post hoc tests show a statistically significant difference between conventional and dark green funds. The latter, in particular, have a significantly higher information ratio ($p < .001$) and allow confirmation of Hypothesis 1b. Again, light green funds did not perform differently from conventional funds. Hypothesis 2b, therefore, cannot be accepted. At the same time, dark green funds showed a significantly higher information ratio than light green funds ($p < .05$), confirming Hypothesis 3b.

Expanding the time horizon further and analysing the results 1 year after the official start of the conflict, however, all three hypotheses (Hypotheses 1c, 2c, and 3c) are rejected, since the three classes of funds exhibit substantially similar risk-adjusted performance. Again, as in the case of the COVID-19 pandemic, therefore, as the time horizon expands, there is a substantial closeness between the performance of sustainable and conventional funds.

## 5 | DISCUSSION

The study's findings and their relationship with the hypotheses are summarised in Table 8. In comparing the risk-adjusted performance of the three classes of funds established by the SFDR, a substantial split emerges between the results over the very short term and those over a longer time horizon. In particular, there is evidence of outperformance of sustainable funds relative to conventional funds, which, however, tends to materialise only immediately after the crisis event and then disappears as time passes (1 year after the onset of crises).

Observing the overall results, referring to the two crises periods, our analyses reveal an outperformance of dark green funds towards conventional funds, which disappears when we consider the results 1 year after the onset of crisis periods; therefore, the Hypothesis 1 ('Dark green funds have higher risk-adjusted performance than conventional funds during crises') is confirmed only for 1 and 6 months since the beginning of the crises.

The result is sharper when Hypothesis 2 is considered ('Light green funds have higher risk-adjusted performance than conventional funds during crises'). Light green funds, as defined by Article 8 of the SFDR, have never shown significantly different risk-adjusted performance from conventional funds. This result holds both in shorter time windows and over longer time horizons. In particular, 1 year after the onset of the pandemic, light green funds showed the worst risk-adjusted performance, underperforming both conventional and dark green funds.

Finally, concerning Hypothesis 3 ('Dark green funds have higher risk-adjusted performance than light green funds during crises'), the results show an outperformance of dark green funds towards light green funds that materialises in the case of the pandemic period in all time windows analysed. In the case of the Ukrainian War, on the contrary, the outperformance disappears when we consider the results 1 year after the onset of the crisis. These results suggest that the nature of a crisis impacts the performance of SRI funds, according to Becchetti et al. (2015).

These results allow us to consider not only the ability of SRI funds to generate extra return or provide downside protection but also the persistence of the funds themselves.

Although in the very short term, our results are in line with those of other studies according to which the sustainability factor ensures better performance in periods of the market downturn (Becchetti et al., 2015; Nakai et al., 2016; Nofsinger & Varma, 2014), over longer time horizons, there is no evidence of statistically significant differences between SRI and conventional funds in terms of risk-adjusted performance during the crises. The latter result aligns with evidence from Leite and Cortez (2015).

This dichotomy between short and 1 year outcomes after the onset of crisis periods allows us to draw some interesting conclusions about the performance persistence of SRI funds, that is, the ability of a fund to maintain its performance ranking relative to other funds over some time (Lean et al., 2015). Our results provide initial evidence on the absence of performance persistence of dark green funds, theoretically confirming the evidence of Leite and Cortez (2013), who

**TABLE 7** ANOVA and post hoc comparison results (war period)

|  | ANOVA | | Post hoc tests | |
|---|---|---|---|---|
|  | **F statistic** | **p (significance)** | **Significant comparisons** | **p (significance)** |
| **One month** | | | | |
| Geometric mean | 6.68 | .001 | Article 9 > Article 6<br>Article 9 > Article 8 | p = .002**<br>p = .006* |
| Alpha | 6.68 | .001 | Article 9 > Article 6<br>Article 9 > Article 8 | p = .002**<br>p = .006* |
| Standard deviation | 0.29 | .75 | No significant difference between groups | |
| TEV | 3.42 | .18 | No significant difference between groups | |
| Maximum drawdown | 5.16 | .006 | Article 9 < Article 6<br>Article 9 < Article 8 | p = .006**<br>p = .03* |
| Sharpe ratio | 5.39 | .005 | Article 9 > Article 6<br>Article 9 > Article 8 | p = .009**<br>p = .009** |
| Information ratio | 13.01 | <.001 | Article 9 > Article 6<br>Article 9 > Article 8 | p < .001***<br>p < .001*** |
| Sortino ratio | 5.82 | .003 | Article 9 > Article 6<br>Article 9 > Article 8 | p = .009**<br>p = .009** |
| **Six months** | | | | |
| Geometric mean | 3.59 | .028 | Article 9 > Article 6 | p = .04* |
| Alpha | 3.59 | .028 | Article 9 > Article 6 | p = .04* |
| Standard deviation | 3.09 | .21 | No significant difference between groups | |
| TEV | 3.68 | .15 | | |
| Maximum drawdown | 4.37 | .112 | | |
| Sharpe ratio | 4.92 | .008 | Article 9 > Article 6 | p = .008** |
| Information ratio (IR) | 8.93 | <.001 | Article 9 > Article 6<br>Article 9 > Article 8 | p < .001***<br>p = .015* |
| Sortino ratio | 4.10 | .017 | Article 9 > Article 6 | p = .018* |
| **One year** | | | | |
| Geometric mean | 0.78 | .457 | No significant difference between groups | |
| Alpha | 0.78 | .457 | No significant difference between groups | |
| Standard deviation | 2.42 | .090 | No significant difference between groups | |
| TEV | 10.195 | .006 | Article 9 < Article 6<br>Article 9 < Article 8 | p = .001**<br>p = .002** |
| Maximum drawdown | 3.54 | .17 | No significant difference between groups | |
| Sharpe ratio | 0.984 | .375 | No significant difference between groups | |
| Information ratio | 0.303 | .739 | No significant difference between groups | |
| Sortino ratio | 1.022 | .36 | No significant difference between groups | |

*Note*: The table provides the results of ANOVA and subsequent post hoc tests for the war period. Where ANOVA tests showed no statistically significant differences between groups, no further analysis was done. Otherwise, post hoc tests allowed pairwise comparisons to be made. The results of the post hoc tests are reported in the last column.
*p < .05, **p < .01, and ***p < .001.

found performance persistence in SRI funds at 6, 12, and 36 month horizons. Even if preliminary, this result is particularly important from the investors' point of view. Indeed, in the absence of performance persistence, the guiding role of past returns is lost, and investors may choose to apply passive asset management strategies to make investment decisions (Lean et al., 2015).

In addition, our results lead us to question whether the absence of difference in performance between light green and conventional funds may stem from an absence of difference, in terms of content, between the two classes of funds and thus from a lack of clarity in European regulation leading to problems in classifying instruments. Although the introduction of the SFDR can be seen as an innovation that can counteract greenwashing through strict labels established at the European level, there may need to be more clarity about the sustainability content. This intuition is reinforced by recent statements by Morningstar analysts, according to which 23% of light green funds

**TABLE 8**  Summary of hypotheses (confirmed and rejected).

| | COVID-19 pandemic | | | Russia–Ukraine war | | |
|---|---|---|---|---|---|---|
| | Hypothesis 1: Dark green > conventional | Hypothesis 2: Light green > conventional | Hypothesis 3: Dark green > light green | Hypothesis 1: Dark green > conventional | Hypothesis 2: Light green > conventional | Hypothesis 3: Dark green > light green |
| a. 1 month | Confirmed | Rejected | Confirmed | Confirmed | Rejected | Confirmed |
| b. 6 months | Confirmed | Rejected | Confirmed | Confirmed | Rejected | Confirmed |
| c. 1 year | Rejected | Rejected | Confirmed | Rejected | Rejected | Rejected |

*Note*: The table provides a summary of the results achieved. The results are grouped by the crisis period analysed (COVID-19 pandemic and Russia–Ukraine war). For each time window (rows), the table highlights whether the ANOVA and post hoc tests allowed confirmation or rejection of the three hypotheses formulated (columns).

include weapons manufacturers, fossil fuel giants, and tobacco companies in their investments.[2] Indeed, there needs to be more clarity about the role of some controversial sectors in achieving the sustainable development goals set by the United Nations. As Cremasco and Boni (2022) point out, the SFDR currently has ill-defined boundaries and is, therefore, unable to achieve its ultimate goal of transparency on sustainability claims. Therefore, it is up to policymakers to establish more rigid boundaries and clearly define their vision of sustainability.

# 6 | CONCLUSIONS

The concern for financial returns distinguishes socially responsible investing from charitable giving. This entails the need to measure the performance of financial instruments which, despite having environmental and social objectives, represent investment strategies firmly anchored to financial logic. Numerous studies in the literature have analysed the performance of SRI funds, sometimes identifying the sustainability factor and ESG investment criteria as a kind of protection from bearish market phases, other times finding insignificant differences between SRI and conventional funds or, in other cases, underperformance of SRI funds.

In this context, our article aims to analyse the performance of SRI funds during the recent market crises caused by the COVID-19 pandemic and the Russian–Ukrainian conflict in light of the new classification of mutual funds introduced by the SFDR. This European regulation attempts to discourage greenwashing and promote sustainable investments and defines three categories of funds, conventional, light green, and dark green, depending on the degree to which ESG criteria are integrated into the investment process.

Using three different time windows for the two crises periods analysed, the results show that dark green funds produced better risk-adjusted performance than light green and conventional funds. This outperformance, however, materialised mainly within a few months of the start of the two crises periods. One year after the onset of the market crises, dark green funds did not show significantly different risk-adjusted performance from conventional funds. Our results

highlight that light green funds, which consider ESG aspects in their investment process but focus on financial materiality, did not outperform conventional funds and underperformed dark green funds almost every time.

Our study has important implications for investors, asset managers, and policymakers. In particular, the lack of persistence in the outperformance of dark green funds relative to conventional funds prevents an effective hedging role from declines for investment strategies that consider extra-financial criteria. This represents an important implication for both investors and portfolio managers. From the perspective of fund managers, the study illuminates how the three categories of funds perform in times of crisis, which is essential for assessing the resilience of investment strategies and the ability to protect investors' capital in times of volatility. Fund managers can draw lessons from how funds have responded to past crises and change their strategies to better deal with similar situations in the future. Furthermore, investors often have clear expectations regarding return and risk, and the study's findings can help fund managers assess whether they are meeting those expectations and whether they can deliver solid results even in adverse circumstances. Finally, the study is of great interest to policymakers. In times of financial or economic crises, it is crucial to understand how sustainable funds perform compared with traditional funds. The study can help policymakers evaluate whether sustainable funds are more or less subject to systemic risks and whether they can contribute to greater financial stability. Furthermore, the results can help policymakers evaluate the effectiveness of regulations and public policies related to sustainable investments. The absence of statistically significant differences between light green funds and conventional ones leads us to ask whether there is an actual difference, in terms of content, between the two categories of funds. Abductive logic tells us that 'if it looks like a duck, walks like a duck, and quacks like a duck, it just may be a duck', and this could have important implications for investors, which, according to Rzeźnik et al. (2021), are often more attentive to sustainability labels than to the actual degree of ESG integration. Our results also induce some reasoning about the ability of SFDR to create more transparency in financial markets. As highlighted by Cremasco and Boni (2022), our study supports that the SFDR currently has loose boundaries and cannot achieve its ultimate goal of transparency on sustainability claims. Therefore, it is incumbent on policymakers to be able to

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[2]https://www.bloomberg.com/news/articles/2022-08-29/asset-managers-renaming-esg-funds-told-to-brace-for-backlash

set stricter boundaries and clearly define their vision of sustainability to avert market escapes dictated by confusion and ambiguity.

Our study has limitations that can be translated into future research directions. The first limitation concerns the time horizon that was analysed. It would be interesting to analyse how the three fund classes behaved over longer periods. Another limitation concerns the classification of funds according to the three articles of the SFDR. In the study, we assumed that the funds in the sample during the COVID period belonged to the same SFDR category in which they have appeared since 2021. However, it is not excluded that during the entire period considered, there may be migrations dictated by changes in management and/or in approach to sustainability. Future studies could also use the event study methodology to study the behaviour of the funds around the two events considered and to test the statistical significance of any anomalous behaviour. Further studies could investigate the impact of managerial skills in managing institutions of funds or different fund distribution techniques on fund performance and flow. Finally, there is a need for studies that critically analyse the broad topic of SRIs by discussing their ability to create significant social or environmental impact or the constant search for maximising returns that might lead managers to make ethical trade-offs. The galloping topic of greenwashing opens up numerous opportunities for debate about the actual sustainability of certain financial products and the green orientation of managers.

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