Universidade do Minho
Escola de Economia e Gestão

Sofia Batista Ramos

Investing in sustainability during the Covid-19 pandemic: Evidence for French mutual funds

outubro de 2022

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UMinho | 2022

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Investing in sustainability during the Covid-19 pandemic: Evidence for French mutual funds

Dissertação de Mestrado
Mestrado em Finanças

Trabalho efetuado sob orientação da
Professora Doutora Maria do Céu Cortez

outubro de 2022

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Acknowledgements

Undertaking this Master in Finance program made me realize how I am passionate for the field of Finance. I reach this academic milestone with a great sense of gratitude towards this learning experience and towards everyone who have contributed to my accomplishments.

Throughout the writing of this dissertation, I have received a great deal of support and assistance. First, I would like to express my sincere gratitude to my supervisor, Professor Maria do Céu Cortez, for the continuous guidance, encouragement, and suggestions. I would also like to thank my family, boyfriend, colleagues, and friends, who have accompanied me during this work, and encouraged me to follow my goals.

Statement of Integrity

I hereby declare having conducted this academic work with integrity. I confirm that I have not used plagiarism or any form of undue use of information or falsification of results along the process leading to its elaboration.

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Investing in sustainability during the Covid-19 pandemic: Evidence for French mutual funds

Abstract

The purpose of this dissertation is to study the performance of French mutual funds with a geographical focus in Europe. To do so, two performance evaluation models were used: the Fama and French (2015) 5-factor, and the Fama and French (2018) 6-factor models. The performance of funds is first evaluated from January 2010 to July 2022 using these models in a conditional setting. Afterwards we focus on two different subperiods: One before the Covid-19 outbreak, from August 2017 to January 2020, and another one post Covid, from February 2020 to July 2022. A dummy variable was added to the models to distinguish performance and risk between subperiods. Performance is investigated across different criterion of sustainability, namely the Sustainable Finance Disclosure Regulation (SFDR) categorization, the French Socially Responsible Investment (SRI) label, and Refinitiv ESG, Environmental and Emissions scores. Furthermore, we analyse mutual funds' flows, first around the Covid-19, and second around the publication date of the SFDR. The dataset used in the performance evaluation over the longer timespan includes 303 mutual funds, while the one used in the Covid-19 analysis includes 309 mutual funds, from which we form equally and value weighted portfolios.

The results show that, in general, there are no financial gains in investing in these mutual funds. Nonetheless, when comparing performance across different levels of sustainability, more sustainable funds exhibit neutral or outperformance relative to less sustainable funds. In all, the pandemic did not influence performance in a statistically significant manner. In relation to fund flows analysis, the overall results show a higher increase of fund flows towards more sustainable funds, namely funds with the SFDR categorization of article 9 and article 8 and SRI labelled funds, being this prioritization from the investors side more evident after the Covid-19 crash.

Keywords: Covid-19; ESG; Funds flows; Performance evaluation; Socially Responsible Investments.

Investir em sustentabilidade durante a pandemia Covid-19: Evidência para fundos de investimento franceses

Resumo

O objetivo desta dissertação é analisar o desempenho de fundos de investimento franceses com foco geográfico na Europa. Para tal, foram utilizados dois modelos de avaliação de desempenho: o modelo de Fama e French (2015) de 5 fatores, e o modelo de Fama e French (2018) de 6 fatores. O desempenho dos fundos é avaliado primeiramente para o período de Janeiro de 2010 a Julho de 2022 usando estes modelos na sua forma condicional. Em seguida, focamo-nos em dois subperíodos diferentes: um antes do início da pandemia Covid-19, que compreende o período de Agosto de 2017 a Janeiro de 2020, e um depois do início da pandemia, compreendendo o período de Fevereiro de 2020 a Julho de 2022. Neste caso adicionamos uma variável *dummy* aos modelos de forma a distinguir o desempenho e risco dos fundos nestes subperíodos. O desempenho dos fundos é investigado tendo em conta diferentes critérios de sustentabilidade, como a categorização do *Sustainable Finance Disclosure Regulation (SFDR)*, a etiqueta francesa de sustentabilidade *Socially Responsible Investment (SRI)* e as pontuações de *ESG, Environmental* e *Emissions* atribuídas pela plataforma Refinitiv Eikon. Além disso, analisamos os fluxos dos fundos de investimento, primeiro em relação ao período Covid-19 e segundo em relação à data de publicação da *SFDR*. A amostra usada para a análise do período mais longo inclui 303 fundos de investimento, enquanto a usada na análise relacionada com o Covid-19 inclui 309 fundos de investimento, através das quais formamos carteiras *equally weighted* e *value weighted*.

Os resultados mostram que, em geral, não há ganhos financeiros ao investir nestes fundos de investimento. No entanto, ao comparar o desempenho de carteiras com diferentes níveis de sustentabilidade, as carteiras mais sustentáveis apresentam um desempenho neutro ou superior em relação a carteiras menos sustentáveis. No geral, a pandemia não influenciou o desempenho de forma estatisticamente significativa. Relativamente à análise dos fluxos dos fundos de investimento, os resultados globais mostram um maior aumento em fluxos de fundos mais sustentáveis, nomeadamente fundos com a categorização *SFDR* do artigo 9 e do artigo 8 e fundos etiquetados como *SRI*, sendo esta priorização por parte dos investidores mais evidente após o início da pandemia.

Palavras-chave: Avaliação de desempenho; Covid-19; ESG; Fluxos de fundos; Investimentos Socialmente Responsáveis.

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1. Introduction

The most recent health crisis that emerged in 2020 generated a major slowdown in global financial markets. During the first months of 2020, the number of infections started to increase, leading the World Health Organization (WHO) to characterize the Covid-19 as a pandemic on March 11th (WHO, 2021). Fearing economic instability, many traders started to sell their shares, and many investors moved away from financial markets. In the United States, the Dow Jones Industrial Average Index saw its biggest quarterly drop since 1987, plunging by 23%. The S&P 500 followed the same path, plunging by 20% during the same period, representing the worst loss since the 2008 financial crisis. In Europe, the drop was even steeper due to the higher spread of the disease in this area in the initial phase. According to the CNBC, the London's FTSE 100, just like the Dow Jones Industrial Average Index, also saw its biggest quarterly drop since 1987, plunging by 25%. The French CAC 40 and the German DAX dropped by 26% and 25% respectively (CNBC, 2020). Many indexes remained at the end of the first quarter of 2020 more than 20% lower than they were at the start of the year (BBC, 2020). Furthermore, besides the immediate shocks in financial markets, the COVID-19 health crisis impacted the global economy in the long-term as a result of virus contention plans that implied worldwide strict lockdowns and travel restrictions, with severe consequences, such as the disruption of the global supply chains (Orlando et al., 2022).

The covid crisis had not yet been overcome when the recent Russian invasion of Ukraine started on the February 24th, 2022, which further contributed to the rise of uncertainty. The ongoing Russia-Ukraine crisis is impacting the macroeconomic context, namely by rising energy and food prices, and thereby causing high levels of inflation (Agarwal & Kimball, 2022). Impacts are also felt in the financial markets, namely in global equity, with investor sentiment being dampened and banks with local legal entities in Russia being exposed to risk resulting from sanctions. Some commodities present high risk premiums, such as crude oil, natural gas, and gold, which is considered as a safe heaven. In addition, indirect risks as supply chain distortions, cybersecurity risks or tightening monetary policy could be even more substantial and are yet too difficult to predict (J.P.Morgan, 2022). At the same time, no country is still free of the possible challenges caused by the Covid-19 crisis.

A major issue of debate following the Covid health crisis is how it affected the growth trend towards sustainability-oriented investments and their performance. According to Schueth (2003), SRI can be defined as "the process of integrating personal values and societal concerns into investment

decision-making" (p.190) or, as the Forum for Sustainable and Responsible Investment (2021) states, as sustainable investing is "an investment discipline that considers environmental, social and corporate governance (ESG) criteria to generate long-term competitive financial returns and positive societal impact" (para.1).[1] As such, SRI enables investors to incorporate their ethical and social values in their investment decisions. In this process, investors no longer comply with neoclassical finance theory, according to which they only derive utility from financial attributes, but they also derive utility from non-financial attributes, namely those related to sustainability.

Investors have become more aware of the damaging consequences and negative impact that corporate social irresponsibility or unethical behaviour can have on society. A confirmation of that is the growth trajectory of SRI. According to the Forum for Sustainable and Responsible Investment (2020), at the start of 2020, $17.1 trillion out of $51.4 trillion under professional management in the US were managed according to sustainable investing strategies, which is equivalent to 33% or to one out of every three dollars, and represents a growth of 42% compared to 2018. The rise of SRI was also observed worldwide, as confirmed by the biennial global market report covering the period 2018-20 of the Global Sustainable Investment Alliance (2021). According to this report, sustainable investment accounted at the time for $35.3 trillion worldwide, growing by 15% in two years, and representing 36% of all professionally managed assets. SRI funds represent one of the main vehicles for investors to direct their savings towards sustainable investments.

Although SRI has a strong historical tradition in the US,[2] Europe is currently the largest market for sustainable funds, either in terms of assets under management or number of funds: by the end of June 2021, there were 3730 sustainable funds in Europe, representing around $1.8 trillion of assets under management, whereas in the US there were 437 funds, representing approximately $0.3 trillion of assets under management (Morningstar, 2021a). Furthermore, more than half of the net flows invested into the European investment fund market in 2020 were directed to sustainable funds (Morningstar and Zeb, 2021). And despite the initial shock of the Covid-19, the flows to sustainable funds in Europe recovered to record high figures by the end of 2020 (Morningstar, 2021b). Furthermore, it is worth mentioning that the European Commission (EC) has set ambitious regulatory goals aiming at a transition to a low-carbon economy. Under the European green deal, the EC announced a renewed sustainable finance strategy that includes several actions, namely the

[1] Although there are some technical variations in its meanings, we will use the expression SRI, sustainable investing or ESG investing interchangeably.
[2] For an overview of the history of SRI see, for instance Schueth (2003).

implementation of the EU taxonomy framework and other initiatives[3] that will likely shape fund managers' activities and the sustainable investment field.

The growth of SRI funds has attracted the attention of academics, who have investigated how investing with sustainability screens affects fund performance. Although the first generation of studies on SRI funds focus mainly on the US and UK market (e.g., Hamilton et al., 1993, Gregory et al., 1997) the fast pace of growth of SRI in continental SRI motivated academics to extend the investigation of SRI fund performance to other European markets, either focusing on multiple markets (e.g., Cortez et al., 2009) or on single country (e.g., Scholtens, 2005, on Dutch funds; Fernandez-Isquierdo & Matallin-Saez, 2008, on Spanish funds, Le Sourd, 2010, on French funds, and Leite et al., 2018, on Swedish funds), with most studies showing that the performance of SRI funds is not statistically different from that of conventional investments.

The resilience of SRI funds to turmoil periods has also been explored in the literature. In fact, prior to Covid-19, several studies have analysed the performance of sustainable funds during market crises. One example is Nofsinger and Varma (2014), who find that US domestic equity SRI mutual funds outperform conventional funds during market crisis periods but underperform in non-crisis periods. This is an ongoing discussion and academic research is still investigating whether socially responsible investing provide investors with downside risk protection during market crises. Therefore, the Covid-19 provides a new setting to further examine this issue. Given the pandemic's nature, there is already a growing number of studies on ESG and ethical portfolio performance during the Covid-19 crisis, that so far, report contradictory findings. While Pástor and Vorsatz (2020), Rizvi et al. (2020) and Ferriani and Natoli (2020), for example, find that responsible fund investing pays during this crisis period, Folger-Laronde et al. (2020), Omura et al. (2020) and Pavlova and Boyrie (2021) report varying results on ETFs. Three of these examine performance across different sustainability scores or ratings (Folger-Laronde et al., 2020, Pástor & Vorsatz, 2020, and Pavlova & Boyrie, 2021).

This research addresses the performance of SRI funds in France, especially in the aftermath of the Covid-19 pandemic. Although the economic recession caused by this health crisis was short-lived, the pandemic can be viewed as a sustainability catalyst (CFA Institute, 2020). The coronavirus crisis exposed the vulnerability of the financial system, labour markets, global supply chains and called attention to the relationship between ecological changes and the likelihood of disease emergence in

[3] For more details on the European strategy for sustainable finance see: https://ec.europa.eu/info/business-economy-euro/banking-and-finance/sustainable-finance/overview-sustainable-finance_en#action-plan

humans (Gibb et al., 2020). The link of the Covid crisis with sustainability has become apparent, given the interconnectedness of the economic environmental, and social systems (CFA Institute, 2020). As Adams and Abhayawansa (2022, p.1) put it, "the COVID-19 pandemic has highlighted the interconnectedness between people, planet and profits – and particularly between health, poverty, climate change and the stability of the global financial system". As such, many argue that the economic recovery post-Covid should not mean returning to business as usual, but rather represent an opportunity for a sustainable and green transition of the economy (Rousseau & Deschacht, 2020). Overall, the pandemic has increased awareness about the need for sustainable and responsible business practices and investment (Cárdenas et al., 2020). The increase in flows to sustainable mutual funds after the Covid outbreak may reflect this new perspective.

We focus on the French market since France is a global leader on sustainable finance and on environmental concerns. In fact, it hosted the 2015 Paris Climate Change Agreement, and it was the pioneer country on mandating investors to report on ESG integration and greenhouse gas emissions. As Pietrancosta and Marraud (2022, p.1) put it, "France is indeed a forerunner in terms of legal developments and an undisputed leader in social and environmental matters". We further note that the first eco-label was launched in France in 1997 (Crifo et al., 2020), and in 2015 the French government has sponsored two official SRI labels: the SRI Label for ESG funds and the Greenfin Label for Green Funds, that ensure funds quality and reinforces visibility (Mair, 2018). The SRI label can play an important informational role (Ramos et al., 2022) and investors view it as a guarantee of quality and transparency. In fact, the French SRI label is awarded if funds meet specific sustainability criteria across six categories. The requirements include the general objectives sought by the fund, the way ESG criteria is integrated in the portfolio, and the transparency in the management of the fund. Furthermore, funds must show a concrete and measurable positive impact on the development of a sustainable economy, there must be an ESG engagement policy with the companies in which the fund invests, and the companies must be able to prove the rigor of their ESG analysis method. The awarding of the label and subsequent checks are performed by external audit bodies certified by the French Accreditation Committee. Foreign SRI funds can also apply to be awarded with the SRI label, as long as they are authorized for marketing in France by the *Autorité des Marchés Financiers* (AMF) (Ministry of Economy and Finance, 2022).

Moreover, the French SRI market benefits from a very rich environment with brokers, rating agencies, proxy services along with very dynamic research both academic and private (European

Sustainable Investment Forum, 2019). Finally, we highlight that France is obviously under the recent European regulation on disclosure of information related with ESG criteria in the financial sector. The European Union's (EU's) Sustainable Finance Disclosure Regulation (SFDR) (Regulation (EU) 2019/2088) came into force on 10th March of 2021. It aims to promotes transparency of financial products' commitment with sustainability, and it applies to financial market participants and financial advisers operating in the EU. The SFDR classifies sustainable investment products according to three categories. Article 9 funds – so called 'dark green funds' - are those that have a sustainable investment objective and a more ambitious approach; Article 8 funds - so called 'light green funds' - promote environmental or social characteristics and, lastly, Article 6 funds do not fulfil the requirements of neither Article 8 or 9. Overall, article 8 comprise those funds that do consider ESG aspects in their investment process but are focused on financial materiality, whereas article 9 products aim to create an environmental and social impact alongside generating a financial return.

The month of March 2021 was marked by the introduction of the SFDR, which encouraged many management companies during this quarter to adapt the communication around their sustainable fund offer. The French market of SRI products reached €522 billion in assets under management for 962 investment funds in the first quarter of 2021. At the end of March 2021, among the nearly 1'000 sustainable funds open to French retail investors, 516 declared their adherence to Article 8 or 9 of the SFDR Regulation. However, Article 9 funds represent a minority, with less than 200 funds. The French SRI Label has also continued to grow in the first quarter of 2021, with more than 50 additional funds being awarded with this certification that covers around 60% (€383 billion) of the French sustainable fund market and accounts for half of fund inflows. As a matter of fact, when compared with the SFDR, the SRI Label considers funds with a wider range of practices, as its aim is not to target investments towards activities within a sustainable business model, but to guarantee the quality of a management process that takes sustainable criteria into account (Novethic, 2021).

The issue of whether there are differences in fund performance in the pre- and post-Covid-19 period depending on their ESG ratings, on whether they hold labels, or on their SFDR classification is therefore an interesting issue of research. This study contributes to the sustainable investment performance literature by investigating the risk-adjusted returns of French mutual funds. Firstly, we provide a global perspective by analysing overall performance from January 2010 to July 2022. Secondly, we focus on the Covid-19 crisis, with an analysis of fund performance from August 2017 to July 2022. Mutual funds are aggregated based on their ESG ratings as well as their Environmental and

Emissions scores, provided by Refinitiv Lipper Fund ESG scores, to examine whether different levels of scores are associated with better performance, and if sustainable investing provided a safeguard to investors during the Covid-19 market downturn. Moreover, this study provides further insights on investor behaviour by analysing mutual funds flows during the Covid crisis. The SFDR categorization of funds are also relevant, both in a performance and flows perspective. Therefore, our study is interesting for three reasons. First, we provide new evidence on the performance and investors' response to SRI during economic downturns. Second, we cover the most recent health crisis, which is the Covid-19 pandemic. Third, as far as we are aware of, this is one of the first studies investigating sustainable investing using the new Refinitiv Lipper Fund ESG scores and the classification established by the SFDR. Consequently, this study will have academic and practical implications.

The remainder of this dissertation proceeds as follows. Section 2 provides a literature review while the research model and the variables are described in section 3. The data specifications are presented in section 4. Section 5 exhibits and discusses the empirical results. Finally, section 6 includes the main conclusions of this dissertation.

2. Literature review

2.1. Relationship between SRI and financial performance

A relevant strand of the literature on SRI investigates the performance of SRI funds. Some possible reasons for SRI portfolios performing differently than conventional ones are proposed by several authors. According to modern portfolio theory (Markowitz, 1952), imposing restrictions on the universe of investments will lead to suboptimal portfolios, thereby penalizing performance. Cortez et al. (2009) refer to information and monitoring costs required by screening strategies as a further argument to support the underperformance of sustainable portfolios. An additional argument supporting the underperformance hypothesis is pointed out by a stream of the literature on investor's tastes and its implications for asset prices, according to which the existence of a large number of investors with tastes favoring sustainability investments would cause a price pressure in these assets, leading them to be overpriced compared to investments that are undesirable from a sustainable point of view (Hong & Kacperzyck, 2009, Derwall et al., 2011, Pástor et al., 2021). By shunning these undesirable companies, sustainable portfolios will not be able to benefit from these abnormal returns, and thus they will underperform conventional portfolios.

However, a contrasting hypothesis supports a positive impact of social screening on portfolio performance. Bollen (2007) argues that social screens might help fund managers to identify and select companies with better management quality, which would after all have an impact on SRI risk-adjusted returns. Furthermore, it can be argued that sustainable mutual funds can provide investors additional downside protection or insurance-like protection in times of crises (Atz et al., 2022). The rationale is that companies that perform well in terms of ESG bear less risks and are thus less likely to suffer large and negative events, thereby being more resilient in turmoil periods (Nofsinger & Varma, 2014). It is also important to note that even though the theoretical model of Pástor el al. (2021) predicts that in equilibrium the expected returns of brown assets are higher than those of green assets, the authors do not preclude a better performance of green assets. In fact, they show that it is possible for green assets to outperform in times where there is an unexpected shift in consumers' and investors' tastes towards greenness.

Overall, most studies find that the performance of SRI funds is comparable to that of conventional funds.[4] This neutral effect is explained by Derwall et al. (2011) as a result of the mix of positive and negative screening strategies used by fund managers.

2.2. Sustainable funds' performance in crisis vs. non-crisis periods

Prior research on sustainable fund performance in crisis vs. non-crisis periods report contradictory findings. While some studies suggest that ESG investing is not relevant during downturns, others show that it can represent a safeguard in periods of economic stress. For example, Nofsinger and Varma (2014) find that US domestic equity SRI mutual funds outperform conventional funds during market crisis periods, while underperforming them in non-crisis periods. They also show that the outperformance in crisis periods is driven by mutual funds that focus on shareholder advocacy and ESG issues. Areal et al. (2013) find similar results in relation to US mutual funds that employ different ethical criteria. They conclude that the Vice Fund, which invests in unethical firms, outperforms the market in low-volatility markets, but underperforms in high-volatility markets. In contrast, funds categorized as socially responsible or morally responsible seem to perform better than the Vice Fund in high-volatility markets, contradicting this way the Vice Fund's claim of offering better performance during recessions.

Silva and Cortez (2016) and Muñoz et al. (2014) pursue the same line of research but focus on US and European funds. Silva and Cortez (2016) analyse green funds and find that, overall, they tend to underperform the benchmark. Particularly, they associate fund underperformance with times of lower short-term interest rates and non-crisis periods. They also report a higher green funds' performance in crisis periods than in non-crisis periods. In turn, Muñoz et al. (2014) conclude that US SRI funds show a neutral performance in crisis periods, but underperform relative to the market in normal periods, while European SR funds obtain statistically insignificant performance regardless of the market conditions. Furthermore, they find that both US and European green funds do not perform worse than other forms of SR mutual funds.

Analogous results are reported by Leite and Cortez (2015) relative to the French market. The authors find that although French SRI funds do not imply any sacrifice in terms of financial

[4] For a review of the literature on SRI fund performance see, for example, Revelli and Vivianni (2015), Friede et al. (2015) and Coqueret (2021).

performance, they do not represent a safeguard to investors during downturns. Syed (2017) reaches the same conclusion in relation to French and UK SRI fund performance, but the author also finds that SRI funds are less risky when compared to the French and UK market indices. On the other hand, Wu et al. (2017) show that the FTSE4Good index performed better and recovered its value more quickly after the 2008 financial crash in comparison with a conventional set of indexes, the FTSE 350, suggesting that SRI portfolios are more resilient during financial crises.

2.3. Sustainable funds' performance and flows during the Covid-19 crisis

Even though this is an ongoing health crisis, an increasing number of academic studies have already examined the impact of the Covid-19 pandemic on the financial markets and sustainable investing. For instance, at the corporate level, there are studies that address the performance of stocks with high sustainability in the post-Covid crisis period. In this stream of the literature, Albuquerque et al. (2020) and Ding et al. (2021) find stocks with higher ESG levels to be more resilient, as they have higher returns during the Covid crisis.

Regarding mutual funds, some studies explore fund flows during the Covid-19 crisis and document that investors' preferences towards sustainable mutual funds rated has remained strong even after this shock. For instance, Pástor and Vorsatz (2020) investigate the effect of sustainability ratings on fund flows throughout the pandemic and show that funds with higher ratings (as expressed by Morningstar globes)[5] receive more inflows. Ferriani and Natoli (2020) exploit Morningstar's ESG risk indicators to estimate the effect of ESG risk perception on investment fund flows. The authors divide the period under analysis into 3 sub-periods: Pre-crash, crash and recovery. They find that low ESG risks positively affected inflows into equity funds during the pandemic, particularly since markets crashed, and that environmental preferences remained strong. Rizvi et al. (2020) pointed out the shift in investment styles of fund managers as a response to the evolving pandemic. Managers drift from high-risk to low risk in terms of size and investment strategy, switch towards non-cyclical sectors and deviate investment from countries with higher to those with lower number of cases.

Several studies also address the performance of SRI portfolios after the outbreak of Covid-19, with the aim of exploring the how sustainable investments react to a worldwide crisis. Capelle-Blancard

[5] Morningstar introduced the globes in 2016 as a way to classify fund sustainability: funds can fall into a range of 1 globe (low-sustainable funds) to 5 globes (high sustainable funds).

et al. (2021) study the resilience of SRI strategies during the pandemic crisis by matching SR indices worldwide with their conventional benchmarks and find that the SR indices' performance is very similar to that of their benchmarks, although they report that the resilience of SR indices from regions that were most affected by Covid-19 was slightly stronger relative to SR indices from other regions. Broadstock et al. (2021) form two portfolios of stocks, namely with high and low ESG firms, covering China's CSI300 constituents. Their results show that, generally, high-ESG portfolios outperform low-ESG portfolios and that this finding holds during the Covid-19 financial crisis, with high ESG performance being more resilient and able to mitigate financial risk.

Pástor and Vorsatz (2020), who investigate the performance of US actively managed equity mutual funds during the Covid-19 pandemic, find, among other results, that a higher sustainability Morningstar rating was associated with better performance during the pandemic. Similar results were found by Rizvi et al. (2020) but in relation to social entrepreneurship funds. The authors evaluate the impact of Covid-19 on different types of actively managed funds in Europe by splitting the five months in consideration into three phases. The first one corresponds to an initial phase, when the infection was mostly contained within China. The second phase reflects the global spread of the disease, while the last one is mostly marked by the lockdowns and exponential increase across Europe. Their results show that social entrepreneurship funds exhibit superior performance when compared to other types of funds, across all the three phases. Ferriani and Natoli (2020) also analyse the average cumulative returns of the funds across three sub-periods: Pre-crash, crash and recovery. They perform the analysis for all the funds together and then divide them into high or low ESG risk level. On average, all three categories record negative returns since the beginning of the crisis, but low-ESG-risk funds achieve higher and statistically different returns than those bearing high ESG risks, especially during the recovery phase.

In contrast to the above-mentioned findings, Folger-Laronde et al. (2020), Omura et al. (2020) and Pavlova and Boyrie (2021) find underperformance of socially responsible portfolios during the Covid-19 crisis. Omura et al. (2020) focus on the financial performance of SRI indices and ESG ETFs comparing them against the market before and during the pandemic. They find an outperformance of SRI indices that increased during the Covid-19 period. However, ESG ETFs, did not generate superior performance relative to the benchmark indices. These results are aligned with those of Folger-Laronde et al. (2020) and Pavlova and Boyrie (2021), although these two studies differ from the first one in

terms of methodology since they explore the relationship between ESG scores and financial performance.

Folger-Laronde et al. (2020) divide ETFs into quintiles according to their eco-fund ratings and show that this rating is negatively related to financial returns during Covid-19, meaning that higher sustainability scores for ETFs are not a safeguard against financial losses during the severe market downturn. Yet, it is worth mentioning that their conclusions are drawn solely on ANOVA and Tukey tests of the differences in returns. Pavlova and Boyrie (2021) use risk-adjusted returns of ESG ETFs before and during the pandemic market crash and still show comparable results. They find that higher sustainability ratings of ESG ETFs did not safeguard the ETFs from losses during the downturn, but they did not perform worse than the market. For more robust results, Pavlova and Boyrie (2021) split funds using two different ESG ratings from two different data providers Morningstar and MSCI and conclude that there are no differences in terms of performance depending on the source of ESG ratings.

2.4. Performance and flows across sustainability dimensions and labels

Furthermore, some studies investigate the individual impact of each dimension of sustainability. Pástor and Vorsatz (2020), besides considering funds' Morningstar globes, also analyse their Environmental (E), Social (S) and Governance (G) dimensions during the pandemic. Guo et al. (2022) compare the performance of fossil, and non-fossil fuel investment funds. Along the same line, although not covering the Covid-19 period, both Soler-Domínguez et al. (2021) and Ceccarelli et al. (2021) focus on low-carbon mutual funds and on the recent Morningstar eco-label for mutual funds, the Low Carbon Designation (LCD)[6]. Moreover, Becker et al. (2022) analyse the effect of the introduction of the SFDR.

Pástor and Vorsatz (2020) sort funds by their overall historical sustainability and by E, S, and G Morningstar scores, categorizing them into two groups: "greener" (top 30%) and "browner" (bottom 30%). They find that funds with high sustainability scores outperform those with low score. Specifically, funds with high E scores outperform those with low E scores, while funds with high S scores underperform those with low S scores. Lastly, funds' G scores have no effect on performance. They also perform this analysis in terms of flows and find that funds with higher sustainability ratings have larger net flows during the crisis that seem to be driven by E scores and, to a smaller degree, G scores. This

[6] The LCD label was introduced by Morningstar in 2018.

suggests that investors have focused on environmental issues even during the pandemic, and also that the environmental dimension was the one that generated the outperformance of funds with high sustainability scores.

Guo et al. (2022) assess the performance of fossil, and non-fossil fuel investment funds of the Eurozone, from January 2010 to December 2020, and conclude that there is no difference between the performances of the two categories. In addition, they analyse how the performance evolved for funds that have transitioned from high carbon firms to zero-carbon investments and find that performance tends to improve when funds rebalance their portfolios towards cleaner firms. Therefore, according to these results, investors can opt for low-carbon firms without compromising on their investment targets.

Encouraging results regarding fossil fuel divestment are also shown by Soler-Domínguez et al. (2021). They examine the relationship between the LCD and the financial performance of SRI equity mutual funds from across the world, namely from Europe, the United States and Canada, and "Other" investment areas. The sample period analysed is from January 2000 to March 2018. They split the sample into several groups. First, they consider the three main investment geographical areas, and then sort the funds again into four categories according to different levels of carbon risk or fossil fuel involvement (high, low, medium, and undefined). Results state that funds with higher levels of sustainability perform better than funds with higher exposure to companies involved in carbon and fossil fuel industries. This evidence holds across all the three major markets studied. Consequently, mutual funds with the lowest carbon risk and fossil fuel portfolio involvements demonstrate the greatest returns.

Ceccarelli et al. (2021) consider open-end mutual funds domiciled in Europe and USA from April 2017 to September 2019. They report that funds that were first labelled as low-carbon enjoyed a significant increase in their monthly net flows relative to funds that didn't receive the LCD. This tendency persisted on the quarterly updates that followed, since receiving (losing) the LCD continued to translate into positive (negative) flow effects. Along with this result, they point out the importance of considering the risk properties of LCD funds, as investing consistently in a low-carbon way can compromise the portfolios' diversification. They find that low-carbon funds potentially hedge against climate change risks but entail higher idiosyncratic risk relative to the market portfolio. While funds with a high number of Morningstar ESG "Globes" are likely to offer limited hedge against climate risk, they have lower idiosyncratic risk. This conclusion was expected considering Morningstar Globes are based on "best-in-class" ESG sustainability scores, while the LCD is assigned to funds that under-weight

carbon-intensive sectors and firms. The authors also document that mutual funds actively rebalance their holdings after the introduction of the LCD. For example, mutual funds that were not initially considered low carbon subsequently reduced their portfolio Carbon Risk.

Becker et al. (2022) analyse the effect of the SFDR on mutual funds and conclude that affected funds increase their sustainability rating after the policy intervention. Additionally, they find that a better ESG label led to larger fund net inflows after the public disclosure of fund labels.

3. Methodology

In this section, we detail the methodology used in this dissertation. We explain the choice of the period under analysis, and describe the models used to evaluate the performance and flows.

3.1. Period under analysis and identification of pre and post Covid-19 period

To investigate the performance of French mutual funds from a broader perspective we selected an extensive period that goes from January 2010 to July 2022.

Regarding the research on the pandemic, there is some debate around the time interval of the Covid-19 crisis, with the time window of crisis differing across regions. The National Bureau of Economic Research (NBER), who maintains a chronology of the peaks and troughs of US business cycles, reported a peak in economic activity in February 2020 and a trough in April 2020. Hence, according to NBER (2021) the economic recession associated to the pandemic lasted two months, which makes it the shortest US recession on record. The Euro Area Business Cycle Dating Committee (EABCN) released on the 9th of November 2021 a statement on the state of the economic activity in the euro area. The Committee identifies the start of the recession in the fourth quarter of 2019 and its ending in the second quarter of 2020, making it a brief two-quarter recession (EABCN, 2021). In France, the French Business Cycle Dating Committee, created by the French Economic Association (AFSE), reached the same conclusion as EABCN recognising a peak in the last quarter of 2019 and a trough in the second quarter of 2020 (AFSE, 2022).

The perspective of this dissertation is not to perform a crisis vs. non-crisis analysis of fund performance, but rather to compare the pre-covid and post-covid period. This choice is prompted by several reasons. First, we recognise the unique nature of the Covid-19, which started outside the financial system but whose economic, environmental, and social effects have been felt worldwide. For instance, since the end of Covid-19 recession we have been facing challenges on multiple fronts from rising energy and food prices to a highly uncertain global outlook. Second, the pandemic can represent a sustainability catalyst and a tipping point in terms of transitioning to a greener economy (CFA Institute, 2020). The fact that after the outburst of the pandemic the flow of funds to sustainable investments has considerably grown supports this argument.

We consider February 2020 as the beginning of the "after Covid-19", as it is reported by NBER (2021) as the beginning of the economic crisis. We also note that the first evidence on the spread of the virus started in January 2020. In fact, on the 20th of January, the head of a Chinese government expert team confirmed human-to-human transmission of Covid-19 (AP NEWS, 2020). It is only on the 11th of March that the WHO announced the characterization of the Covid-19 as a pandemic (WHO, 2021). However, at the end of February, financial markets had already started to plunge with increasing concerns about a global economic slowdown (The New York Times, 2020). Therefore, we divide the analysis in 2 sub-periods of 2.5 years each, as follows:

- Before Covid-19: 30 months period from August 2017 to January 2020.
- After Covid-19: 30 months period from February 2020 to July 2022.

3.2. Fund flows

This study investigates investors' response to the Covid-19 pandemic, and to the publication of the SFDR by analysing fund flows during this period. Thereby, we follow Sirri and Tufano (1998) and Becker et al. (2022) and compute fund flows by considering the growth of assets under management net of reinvested returns, as shown by the following expression:

$$FLOW_{p,t} = \frac{TNA_{p,t} - TNA_{p,t-1} * \left(1 + R_{p,t}\right)}{TNA_{p,t-1}} \quad (1)$$

where $\mathrm{TNA}_{p,t}$ is a given fund p's total net assets at the end of period t and $\mathrm{R}_{p,t}$ is the fund's return during the period t. $\mathrm{FLOW}_{p,t}$ represents the growth of a fund in percentage terms. This growth is in excess of the one that would have occurred if it had no new funds flowed in and had all dividends been reinvested (Sirri & Tufano, 1998). Afterwards, we calculate the average equally-weighted monthly net flows of funds taking into consideration the different dimensions of sustainability and whether funds hold a SRI label or not. The variables total net assets, returns and fund flows are winsorized at the 1% and 99% level.

In order to study investors' response to the SFDR publication we determine 2 subperiods of 17 months each, in line with the date of application of this regulation (10th of March 2021), which results into the following specification:

- Pre-publication: 17-month period from October 2019 to February 2021.

– Post-publication: 17-month period from March 2021 to July 2022.

3.3. Performance evaluation

3.3.1. Overall performance

Jensen's (1968) alpha is a traditional measure of performance. It is based on the CAPM and is represented in the following model:

$$r_{p,t} = \alpha_p + \beta_p(r_{m,t}) + \varepsilon_{p,t} \quad (2)$$

where $r_{p,t}$ is the excess return of portfolio *p* over period *t*, $r_{m,t}$ is the excess return on the market over the same period, β_p is the systematic risk of the portfolio and $\varepsilon_{p,t}$ is the error term. If the intercept, α_p, is statistically significant and positive (negative) it represents a superior (inferior) performance of the fund in relation to the market. In this regression, both alphas and betas are constrained to be constant.

Considering the well-known limitations of the single-factor model (namely its inability to capture other recognized sources of systematic risk), we are going to use two alternative multi-factor models: the Fama and French (2015) 5-factor model and Fama and French (2018) 6-factor model. The models are expressed as follows:

$$r_{p,t} = \alpha_p + \beta_{p1}(r_{m,t}) + B_{p2}(SMB_t) + B_{p3}(HML_t) + B_{p4}(RMW_t) + B_{p5}(CMA_t) + \varepsilon_{p,t} \quad (3)$$

$$r_{p,t} = \alpha_p + \beta_{p1}r_{m,t} + B_{p2}(SMB_t) + B_{p3}(HML_t) + B_{p4}(RMW_t) + B_{p5}(CMA_t) + B_{p6}(MOM) + \varepsilon_{p,t} \quad (4)$$

where SMB_t is the difference in returns between a portfolio of small stocks and a portfolio of large stocks, HML_t is the difference in returns between a portfolio of high book-to-market stocks and a portfolio of low book-to-market stocks. RMW_t is the difference between the returns on diversified portfolios of stocks with robust and weak profitability and CMA_t is the difference between the returns on

diversified portfolios of the stocks of low and high investment firms. MOM_t is the difference in returns between a portfolio of past winners and a portfolio of past losers. β_{p1}, β_{p2}, β_{p3}, β_{p4}, β_{p5} and β_{p6} are the coefficients of each factor.

Although the previous multi-factor models do a better job in capturing relevant sources of systematic risk compared to the single-index model, they still are criticized in the literature for ignoring time-varying risk and risk premiums, which can lead to biased estimates of performance (Jagannathan and Wang, 1996). As such, we turn to conditional models, namely to the one developed by Christopherson et al. (1998), which extends the Ferson and Schadt (1996) model by allowing not only for time-varying betas, but also for time-varying alphas. This means that this model allows both fund risk and performance to change with economic conditions, which are represented by public information variables. Incorporating the public information variables into Eq. 1 leads to the following regression:

$$r_{p,t} = \alpha_{0p} + A'_p Z_{t-1} + \beta_{0p} r_{m,t} + \beta'_p (Z_{t-1} r_{m,t}) + \varepsilon_{p,t} \quad (5)$$

where Z_{t-1} is a vector of deviations of the public information available at time *t-1* from the (unconditional) average values, α_{0p} is an average alpha, A'_p is a vector that measures the response of the conditional alpha of portfolio p to the information variables, β_{0p} is an average beta, β'_p is a vector that measures the response of the conditional beta of portfolio *p* to the information variables.

The factor models mentioned above are used in their conditional form. The extension of the Fama and French (2015) 5-factor model and Fama and French (2018) 6-factor model to a conditional setting results in the following models:

$$r_{p,t} = \quad (6)$$
$$\alpha_p + A'_p Z_{t-1} + \beta_{p1}(r_{m,t}) + \beta'_{p1}(Z_{t-1} r_{m,t}) + \beta_{p2}(SMB_t) +$$
$$\beta'_{p2}(Z_{t-1} SMB_t) + \beta_{p3}(HML_t) + \beta'_{p3}(Z_{t-1} HML_t) + \beta_{p4}(RMW_t) +$$
$$\beta'_{p4}(Z_{t-1} RMW_t) + \beta_{p5}(CMA_t) + \beta'_{p5}(Z_{t-1} CMA_t) + \varepsilon_{p,t}$$

$$r_{p,t} = \quad (7)$$
$$\alpha_p + A'_p Z_{t-1} + \beta_{p1}(r_{m,t}) + \beta'_{p1}(Z_{t-1} r_{m,t}) + \beta_{p2}(SMB_t) +$$
$$\beta'_{p2}(Z_{t-1} SMB_t) + \beta_{p3}(HML_t) + \beta'_{p3}(Z_{t-1} HML_t) + \beta_{p4}(RMW_t) +$$
$$\beta'_{p4}(Z_{t-1} RMW_t) + \beta_{p5}(CMA_t) + \beta'_{p5}(Z_{t-1} CMA_t) + \beta_{p6}(MOM_t) +$$
$$\beta'_{p6}(Z_{t-1} MOM_t) + \varepsilon_{p,t}$$

The conditional factor models are used to assess funds' performance on a broader time horizon, namely from January 2010 to July 2022.

3.3.2. Fund performance pre- and post- Covid-19

In order to distinguish performance before and after Covid-19, we incorporate a dummy variable into the multi-factor models. Some studies such as Pavlova and Boyrie (2021) and Nofsinger and Varma (2014), only add the dummy variables to the alpha term, thereby allowing for different performance in different market states while forcing the risk coefficients to remain constant regardless of market conditions. Considering this limitation, we will extend the dummy variables to the risk factors, in the spirit of Areal et al. (2013), Leite and Cortez (2015) and Silva and Cortez (2016) when using a dummy for different market states. Under this approach, the Fama and French (2015) 5-factor model and Fama and French (2018) 6-factor model result in the following expressions:

$$r_{p,t} = \alpha_p + \alpha_{AC,p}D_{AC,t} + \beta_{p1}(r_{m,t}) + \beta_{AC,p1}(r_{m,t}D_{AC,t}) + \beta_{p2}(SMB_t) + \beta_{AC,p2}(SMB_tD_{AC,t}) + \beta_{p3}(HML_t) + \beta_{AC,p3}(HML_tD_{AC,t}) + \beta_{p4}(RMW_t) + \beta_{AC,p4}(RMW_tD_{AC,t}) + \beta_{p5}(CMA_t) + \beta_{AC,p5}(CMA_tD_{AC,t}) + \varepsilon_{p,t} \quad (8)$$

$$r_{p,t} = \alpha_p + \alpha_{AC,p}D_{AC,t} + \beta_{p1}(r_{m,t}) + \beta_{AC,p1}(r_{m,t}D_{AC,t}) + \beta_{p2}(SMB_t) + \beta_{AC,p2}(SMB_tD_{AC,t}) + \beta_{p3}(HML_t) + \beta_{AC,p3}(HML_tD_{AC,t}) + \beta_{p4}(RMW_t) + \beta_{AC,p4}(RMW_tD_{AC,t}) + \beta_{p5}(CMA_t) + \beta_{AC,p5}(CMA_tD_{AC,t}) + \beta_{p6}(MOM_t) + \beta_{AC,p6}(MOM_tD_{AC,t}) + \varepsilon_{p,t} \quad (9)$$

where $D_{AC,t}$ is a dummy variable that takes the value of 0 before the Covid-19 (from August 2017 to January 2020) and the value of 1 otherwise (after the crisis, i.e., from February 2020 to July 2022).

Performance analysis is performed across different sustainability scores as well as considering funds with the SRI label and the SFDR classification.

4. Data

In this section we describe the data used. We present descriptive statistics on ESG, Environmental and on Emissions scores; on SFDR articles; and on SRI labelled funds. Furthermore, summary statistics are also presented for the several variables used in the models.

4.1. Fund dataset, ESG scores, categorization, and returns

For the identification of French mutual funds and sustainability scores we used the Refinitiv Eikon Fund Screener, selecting active funds domiciled in France. We only considered equity funds classified by the AMF as "*Actions Internationales*" or "*Actions zone Euro*", and with a geographical focus on "*EuroZone*" or "*Europe*". Additionally, we excluded funds with less than 24 monthly observations and funds for which the observations of returns didn't match the ones of TNA. These criteria led to a sample of 303 funds for the global analysis and to a sample of 309 funds for the Covid-19 analysis.

After defining our samples, we used Refinitiv Eikon Lipper Fund to access funds' sustainability scores. Refinitiv Lipper Fund ESG scores was launched on 7th July of 2020 and provides independent overall fund level scores, which describe the sustainability of a particular investment fund. The ESG score is an aggregate score drawn on three pillars (Environmental, Social and Governance). In turn, the Environmental pillar score is based on the scores of three categories: Resources use, Emissions, and Innovation. Fund scores are built up from the ESG ratings of the underlying holdings. Only funds that meet their eligibility criteria are assigned with an ESG fund score: a portfolio must have a minimum of 10 securities, and individual ESG security scores must be available for 70% of the portfolio (Refinitiv, 2020). For our analysis, we used three of the scores provided by the database: the ESG, Environmental pillar, and Emissions scores. The Environmental pillar, together with the Emissions scores often get the most attention from climate-sensitive investors as many of them are focused on reducing their carbon footprints.

For the Covid-19 analysis, and based on ESG, Environmental and Emissions' scores, we assign mutual funds into the following categories:

- High: Funds with scores from 75% to 100%.

- Medium: Funds with scores from 50% to 75%.
- Low/Undefined: Funds with scores from 0% to 50%, including funds for which Refinitiv Eikon does not report scores.

Funds with the highest scores are the most sustainable, and funds with the lowest scores are the least sustainable. The subdivision of funds into the 3 categories and across ESG, environmental and emissions dimensions is presented in table 1. Given the sample size, the lowest rated funds are combined with the undefined ones. The dataset includes 309 mutual funds, of which 119 don't have scores. We can observe that, generally, scores are higher for the Emissions' dimension with 51% of funds having a score superior to 75%.

Table 1. Categorization of Funds based on sustainability scores

Categories	Score	ESG		Environmental		Emissions	
		Freq.	%	Freq.	%	Freq.	%
High	75% to 100%	118	38%	105	34%	158	51%
Medium	50% to 75%	71	23%	79	26%	31	10%
Low/Undefined	0% to 50%	120	39%	125	40%	120	39%
		309	**100%**	**309**	**100%**	**309**	**100%**

This table describes the distribution of the 309 funds of our Covid-19 sample among three sustainability levels (*High; Medium and Low/Undefined*) for each of the three different sustainability dimensions under analysis (*ESG; Environmental and Emissions*). From the 309 funds, 119 funds didn't receive a score from Refinitiv Lipper Fund and are included in the *Undefined* category.

Refinitiv Eikon Fund Screener also indicates the SFDR's categorization of funds, which is presented in table 2. Must funds fall into article 8. 34 funds are under the undefined category, which are funds that don't report an article according to Refinitiv Eikon.

Table 2. Categorization of funds based on SFDR's articles

SFDR	Frequency	%
Article 9	42	14%
Article 8	157	51%
Article 6/Undefined	110	36%
	309	**100%**

This table describes the distribution of the 309 funds of our Covid-19 sample across articles 9, 8, and 6 of the SFDR. From the 309 funds, 34 funds didn't receive a score from Refinitiv Lipper Fund and are included in the Undefined category.

Lastly, the Covid-19 analysis compares SRI labelled funds vs. non labelled funds. The identification of those with the SRI label was done through the official website of the label[7], which is supported by the French Ministry of Economy, Finance and Recovery. As shown in table 3, 77 funds out of the 309 have received the SRI label.

Table 3. Categorization of funds based on SRI Label

SRI Label	Frequency	%
Labelled	77	25%
Non-Labelled	232	75%
	309	**100%**

This table describes the distribution of the 309 funds of our Covid-19 sample between SRI labelled funds and non-labelled funds.

4.2. Fund returns, flows, and portfolio formation

To analyse fund performance and flows, we collected monthly returns and monthly TNAs of funds from January 2010 to July 2022. Both were retrieved in US dollars from Refinitiv Eikon. The funds' returns are computed in a discrete way.

For each category of funds, we constructed two portfolios: An equally weighted and a value weighted portfolio. The equally weighted portfolio is constructed based on the average monthly returns of each fund, while the value-weighted method also considers the size of each fund (TNA).

4.3. Risk factors, benchmark, and public information variables

To assess fund performance, the data that proxies for the risk factors models is expressed in US dollars and it is obtained from the Kenneth French data library[8]. Since the funds considered have a geographical focus on Europe, we collected the European Fama and French factors, and also considered the European market factor of Fama and French as the benchmark for our analysis. The risk-free rate is also collected from this website.

In relation to the public information variables, we used two lagged variables to include in the conditional factor models. Several variables have been shown to be helpful in predicting returns, but we

[7] https://www.lelabelisr.fr/comment-investir/fonds-labellises/?_parent_type=actions&_sort=title_asc
[8] http://mba.tuck.dartmouth.edu/pages/faculty/ken.french/data_library.html#Developed

stick only to the short-term interest rate (STR) and to the dividend yield (DY), which were used in several studies to proxy for the state of the economy, including in Ferson and Warther (1996). The yield on the Euribor 1-month, collected from the statistical data warehouse of the European Central Bank[9] is used as a proxy to the short-term interest rate, while the dividend yield is based on the STOXX Europe 600 Index and it was collected from Refinitiv Eikon. We applied the stochastic detrending procedure of Ferson et al. (2003) to the variables by subtracting their 12-month moving average. Additionally, they are used in their corresponding mean zero values (Bernhardt & Jung, 1979). These procedures allow to avoid the common highly autocorrelation of the variables and possible scale effects on the results. Furthermore, the variables are lagged by one-month as investors make their decisions based on past information.

4.4. Summary statistics

Table 4 presents some summary statistics for the two portfolios under the global analysis, which are formed based on 303 funds. Additionally, it reports summary statistics for risk factors and for the public information variables. The period covered goes from January 2010 to July 2022.

Both the equally and the value weighted portfolios show positive average excess returns. We can observe that they have negative skewness, close to zero, meaning that are almost symmetric, but with the left tail longer than the right tail. Neither portfolio exhibits significant excess kurtosis, and according with the Jarque Bera test we cannot reject the null hypothesis of a normal distribution at the 5% level of significance.

For what regards the risk factors, most of them present positive average returns except for the HML and the CMA factors. According to the results of the Jarque Bera test, we cannot reject that the Market (MKT) and the SMB factor follow a normal distribution, while for the remaining risk factors we can reject the normality hypothesis at the 5% significance level.

[9] https://sdw.ecb.europa.eu/quickview.do?SERIES_KEY=143.FM.M.U2.EUR.RT.MM.EURIBOR1MD_.HSTA

Table 4. Summary statistics of the variables used in the global analysis

	Obs.	Mean (%)	Standard Deviation (%)	Maximum (%)	Minimum (%)	Skewness	Excess Kurtosis	Jarque-Bera (JB)	p- value (JB)
All Eq. Weighted	151	0.3322	5.2897	17.3471	-16.2381	-0.1949	0.5907	3.1510	0.2069
All Val. Weighted	151	0.3665	5.3179	16.7784	-15.0229	-0.1748	0.3706	1.6330	0.4420
MKT	151	0.5207	5.0347	16.6200	-15.4400	-0.2235	0.6857	4.2150	0.1215
SMB	151	0.1852	1.6700	4.7200	-5.0700	0.0932	0.4577	1.5370	0.4638
HML	151	-0.2327	2.9031	12.0900	-11.3000	0.6664	3.3101	80.1100	0.0000
RMW	151	0.3842	1.6526	3.5200	-5.4000	-0.5128	0.3094	7.2210	0.0270
CMA	151	-0.1494	1.4691	5.2200	-4.3900	0.0819	1.2804	10.4800	0.0053
MOM	151	0.8603	3.2119	8.9400	-18.3900	-1.3135	8.0172	447.8000	0.0000
STR	151	0.0000	18.5699	52.0823	-60.9144	-0.7317	2.9649	68.7800	0.0000
DY	151	0.0000	33.0838	74.1413	-85.7754	-0.0151	0.0445	0.0182	0.9909

This table presents summary statistics for the monthly excess returns of the equally (All Eq. Weighted) and value weighted (All Val. Weighted) portfolios of our global sample composed by 303 mutual funds. The table also presents the summary statistics for all risk factors: The monthly of the MKT, SMB, HML, RMW, CMA, and MOM. Lastly, summary statistics are also presented for the public information variables: Short-term interest rate (STR) and dividend yield (DY). The descriptive statistics presented are the number of observations, mean, standard deviation, maximum, minimum, skewness, excess kurtosis, the Jarque Bera test for normality and its corresponding p-value. The period of analysis starts in January 2010 and ends in July 2022.

Table 5 presents summary statistics for the risk factors and the different portfolios under the Covid-19 analysis, covering the period from August 2017 to July 2022. The portfolios are based on 309 mutual funds.

Most portfolios show average positive excess returns apart from the SFDR 6/Undefined equally weighted portfolio, with a negative average excess return of -0.0059%. We can observe that excess returns are generally higher for the most sustainable portfolios. For example, both equally and value weighted averages are higher for the SFDR 9 portfolios in comparison with the SFDR 8 and SFDR 6/Undefined ones. In turn, the average excess returns of SFDR 8 are higher in comparison with their SFDR 6/Undefined counterparts. According to the Jarque Bera test, we cannot reject the null hypothesis of a normal distribution for 22 out of the 30 portfolios under analysis, while we reject a normal distribution for the remaining 8 portfolios, at the 5% level of significance.

Regarding the risk factors, most of them present positive average returns except for the HML and the CMA factors. According to the results of the Jarque Bera test, we can't reject that the SMB and the CMA factors follow a normal distribution, while for the remaining risk factors we can state that they don't follow a normal distribution for a significance level of 5%.

Table 5. Summary statistics of the variables used on the Covid-19 analysis

	Obs.	Mean (%)	Std. Dev. (%)	Max. (%)	Min.(%)	Skewness	Excess Kurtosis	Jarque-Bera (JB)	p- value (JB)
All Eq. Weighted	60	0.0389	5.3426	17.3898	-16.2294	-0.1570	1.5296	6.0960	0.0475
All Val. Weighted	60	0.1243	5.2685	17.0331	-15.0504	-0.1177	1.1881	3.6680	0.1598
SFDR 9 Eq. Weighted	60	0.1616	5.2106	16.6167	-14.9316	-0.1601	1.1604	3.6230	0.1634
SFDR 9 Val. Weighted	60	0.2180	5.1735	16.1919	-14.2825	-0.1824	0.9275	2.4830	0.2889
SFDR 8 Eq. Weighted	60	0.0386	5.3866	17.5145	-16.4161	-0.1688	1.5310	6.1450	0.0463
SFDR 8 Val. Weighted	60	0.1083	5.2792	17.0864	-15.0665	-0.1117	1.2006	3.7280	0.1550
SFDR 6/Und. Eq. Weighted	60	-0.0059	5.3460	17.5070	-16.4467	-0.1379	1.6507	7.0020	0.0302
SFDR 6/Und. Val. Weighted	60	0.0559	5.3798	17.9950	-15.9659	-0.0496	1.5201	5.8020	0.0550
SRI Eq. Weighted	60	0.0791	5.3737	17.2290	-16.0719	-0.1827	1.3455	4.8600	0.0881
SRI Val. Weighted	60	0.1008	5.3558	16.6289	-15.8149	-0.2378	1.1651	3.9590	0.1381
NO SRI Eq. Weighted	60	0.0254	5.3346	17.4432	-16.2820	-0.1485	1.5905	6.5450	0.0379
NO SRI Val. Weighted	60	0.1363	5.2276	17.2482	-14.6606	-0.0527	1.2192	3.7440	0.1538
ESG HIGH Eq. Weighted	60	0.0586	5.3213	18.2116	-15.9455	-0.0519	1.7764	7.9160	0.0191
ESG HIGH Val. Weighted	60	0.1908	5.1325	17.3506	-13.8716	0.0152	1.2199	3.7220	0.1555
ESG MEDIUM Eq. Weighted	60	0.0542	5.4538	16.0485	-16.7759	-0.3276	1.1608	4.4420	0.1085
ESG MEDIUM Val. Weighted	60	0.0655	5.4112	15.3597	-16.4294	-0.3767	0.9972	3.9050	0.1419
ESG LOW Eq. Weighted	60	0.0094	5.3543	17.3754	-16.1830	-0.1381	1.5066	5.8650	0.0533
ESG LOW Val. Weighted	60	0.0913	5.3125	17.7948	-15.3075	-0.0319	1.4485	5.2550	0.0723
ENV HIGH Eq. Weighted	60	0.0636	5.3693	18.4451	-16.1357	-0.0437	1.8231	8.3280	0.0155
ENV HIGH Val. Weighted	60	0.1313	5.3455	18.2008	-15.2803	-0.0127	1.5031	5.6500	0.0593
ENV MEDIUM Eq. Weighted	60	0.0501	5.3336	16.0970	-16.3429	-0.3102	1.2314	4.7530	0.0929
ENV MEDIUM Val. Weighted	60	0.1714	5.1556	14.6457	-14.2239	-0.3268	0.5996	1.9670	0.3740
ENV LOW Eq. Weighted	60	0.0109	5.3771	17.3204	-16.2357	-0.1462	1.4588	5.5340	0.0629
ENV LOW Val. Weighted	60	0.0787	5.3557	17.8214	-15.5355	-0.0423	1.4343	5.1610	0.0757
EMI HIGH Eq. Weighted	60	0.0640	5.2661	17.5359	-15.7497	-0.1067	1.5735	6.3040	0.0428
EMI HIGH Val. Weighted	60	0.1488	5.1790	16.7412	-14.4023	-0.1072	1.0718	2.9870	0.2246
EMI MEDIUM Eq. Weighted	60	0.0211	5.8627	16.7010	-18.8387	-0.3841	1.3604	6.1020	0.0473
EMI MEDIUM Val. Weighted	60	0.0555	5.9641	16.4217	-19.0446	-0.4093	1.2262	5.4340	0.0661
EMI LOW Eq. Weighted	60	0.0094	5.3543	17.3754	-16.1830	-0.1381	1.5066	5.8650	0.0533
EMI LOW Val. Weighted	60	0.0913	5.3125	17.7948	-15.3075	-0.0319	1.4485	5.2550	0.0723
MKT	60	0.3128	5.0945	16.6200	-15.4400	-0.2337	1.5120	6.2620	0.0437
SMB	60	0.0148	1.6593	4.7200	-5.0700	0.2555	1.2981	4.8660	0.0878
HML	60	-0.2898	3.5252	12.0900	-11.3000	0.7511	3.5979	38.0000	0.0000
RMW	60	0.3290	1.6094	3.4600	-5.4000	-0.8617	1.8823	16.2800	0.0003
CMA	60	-0.4003	1.8076	5.2200	-4.3900	0.2865	0.9989	3.3150	0.1906
MOM	60	0.5665	3.6388	8.5000	-18.3900	-2.1193	10.8457	339.0000	0.0000

This table presents summary statistics for the monthly returns of the equally and value weighted several portfolios under analysis: All the funds; SFDR 9, 8, and 6/Undefined; SRI labelled and non-labelled funds; and the three categories of scores (high, medium, low) for each of the three sustainability dimensions (ESG, Environmental, and Emissions). The table also presents the summary statistics for all risk factors – the monthly excess returns of the MKT, SMB, HML, RMW, CMA, and MOM. The portfolios are constructed from the Covid-19 sample of 309 mutual funds. The descriptive statistics presented are the number of observations, mean, standard deviation, maximum, minimum, skewness, excess kurtosis, the Jarque Bera test for normality and its corresponding p-value. The period of analysis starts at August 2017 and ends in July 2022.

5. Empirical Results

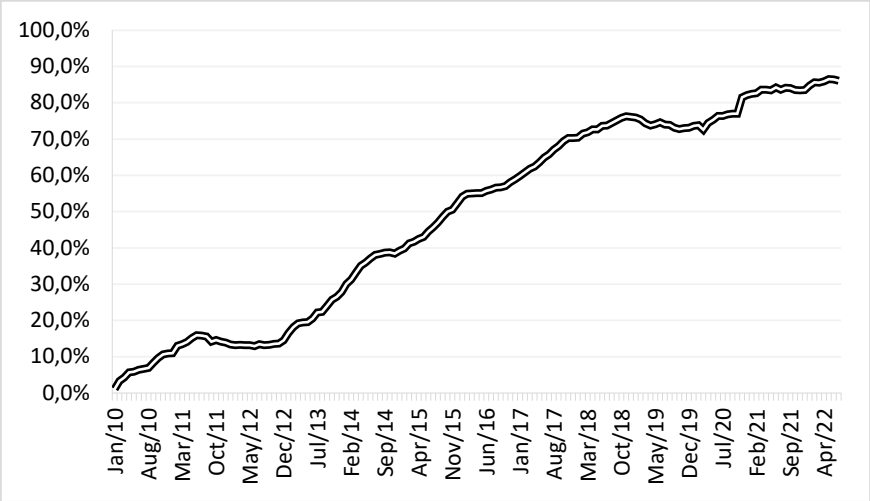
In this section, we report the evolution of fund flows and the results of fund performance evaluation. We subdivide this section into 3 sub-sections. Firstly, we describe the evolution of fund flows on a global perspective and then focused on Covid-19 period and on the date the SFDR regulation came into force. Secondly, we evaluate performance on a global perspective, from 2010 to 2022, using conditional multi-factor models. Lastly, we report the results of the performance evaluation across sustainability categories and dimensions on a pre and post Covid-19 outbreak perspective.

5.1. Analysis of fund flows

5.1.1. Overall flows

Graph 1 shows the growth of fund flows in percentage terms over the period from January 2010 to July 2022, covering our entire global sample of 303 mutual funds. Overall, fund flows show a consistent increase during the entire period. We can highlight the months from July 2011 to December 2012 where we can observe a decrease of flows, which coincide with the 2011 financial crisis in Europe. Furthermore, the graph presents a flatter evolution of flows during 2019, followed by a slight increase afterwards.

Graph 1. Overall Funds' Flows from 2010 to 2022

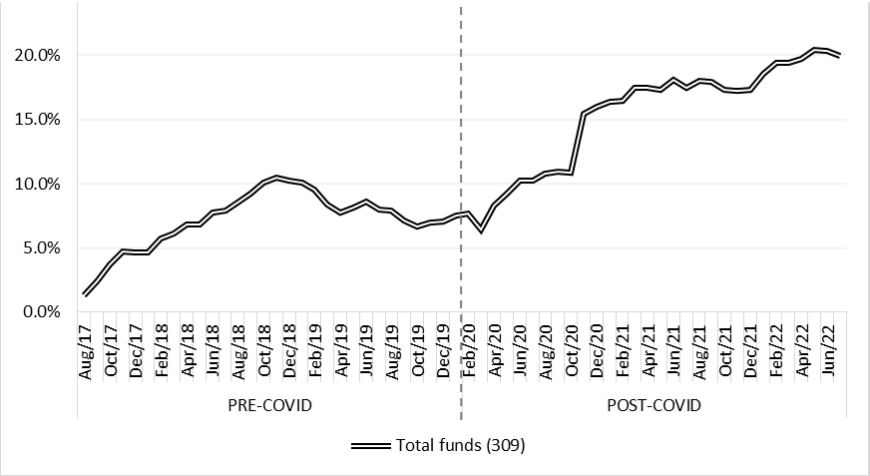


This graph presents the monthly cumulative average of flows in percentage terms from January 2010 to July 2022. The analysis includes the entire global sample (303 funds).

5.1.2. Flows before and after the Covid-19 outbreak

Graph 2 illustrates flows, on a monthly basis, from August 2017 to July 2022. It includes the entire Covid-19 sample of 309 mutual funds. We can easily identify that during these 5 years there is a general trend of growing flows to mutual funds. However, a decrease of flows is observed some months before the Covid-19 outbreak, followed by a rebound right after the 2-month crisis period.

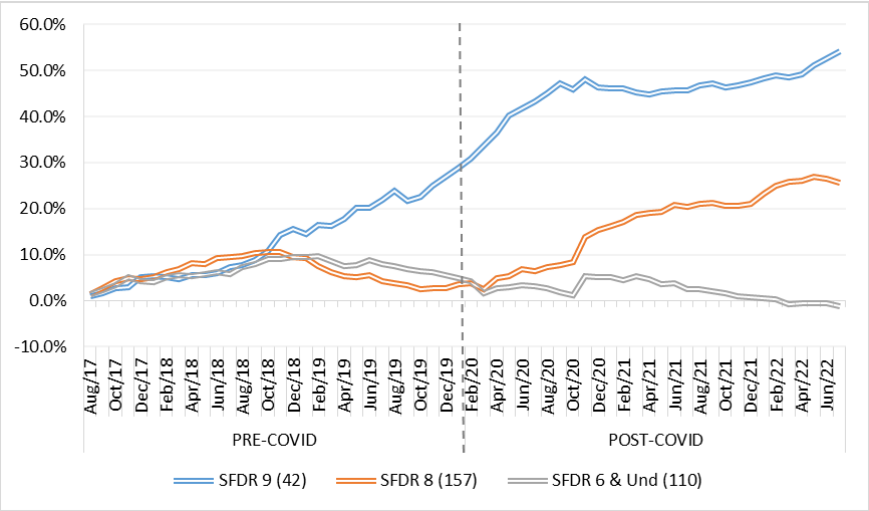
Graph 2. Overall Funds' Flows – Covid-19



This graph presents the monthly cumulative average of flows in percentage terms from August 2017 to July 2022. It is subdivided in two periods: Pre-covid from August 2017 to January 2020 and Post-covid from February 2020 to July 2022. The analysis includes the entire Covid-19 sample (309 funds).

Graph 3 presents the evolution of flows according to the different SDFR categories in which they fall into. We can observe that funds have similar levels of flows until the end of 2018. Afterwards, flows start to slowly grow apart, with article 9 funds experiencing a clear superior growth. Flows of article 8 and article 6/undefined funds follow a similar trend until around the Covid-19 outbreak and start to grow apart afterwards, with article 8 having a visible superior growth compared to those classified as article 6/undefined. This shift after the Covid-19 outbreak and the clear superior growth of funds of article 9 suggest that investors prioritize funds of articles 9 and 8 of the SFDR in detriment to funds of article 6/undefined. This prioritization was more evident during and after the Covid-19 crash.

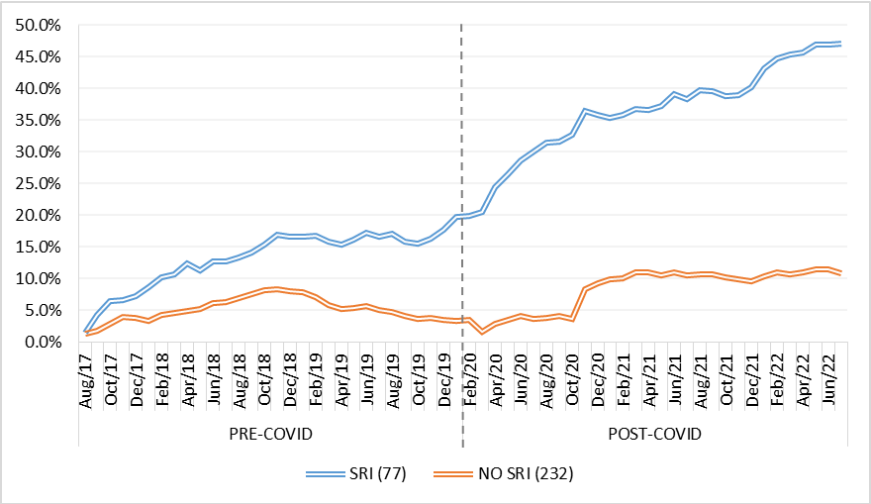
Graph 3. Funds' Flows based on SFDR's articles – Covid-19



This graph presents the monthly cumulative average of flows in percentage terms from August 2017 to July 2022. It is subdivided in two periods: Pre-covid (from August 2017 to January 2020) and Post-covid (from February 2020 to July 2022). The analysis includes the entire Covid-19 sample (309 funds) and shows the growth of fund flows according to the SFDR classification (9, 8 and 6) and for the funds for which a SFDR categorization wasn't reported (Undefined). The number of funds of each category is indicated between brackets in the legend box.

Graph 4 also shows a pre and post Covid-19 perspective of fund flows, but distinguishing between funds that awarded with an SRI label and unlabelled funds. Similar to what was observed in respect to the SFDR articles, we can identify a preference of investors towards sustainability, as SRI labelled funds show a superior growth, with a slightly more pronounced growth in the months after the beginning of the Covid-19 crisis.

Graph 4. Funds' Flows based on the SRI Label – Covid-19



This graph presents the monthly cumulative average of flows in percentage terms from August 2017 to July 2022. It is subdivided in two periods: Pre-covid (from August 2017 to January 2020) and (Post-covid from February 2020 to July 2022). The analysis includes the entire Covid-19 sample (309 funds) and shows the growth of fund flows for SRI labelled funds and non-labelled funds. The number of funds of each category is indicated between brackets in the legend box.

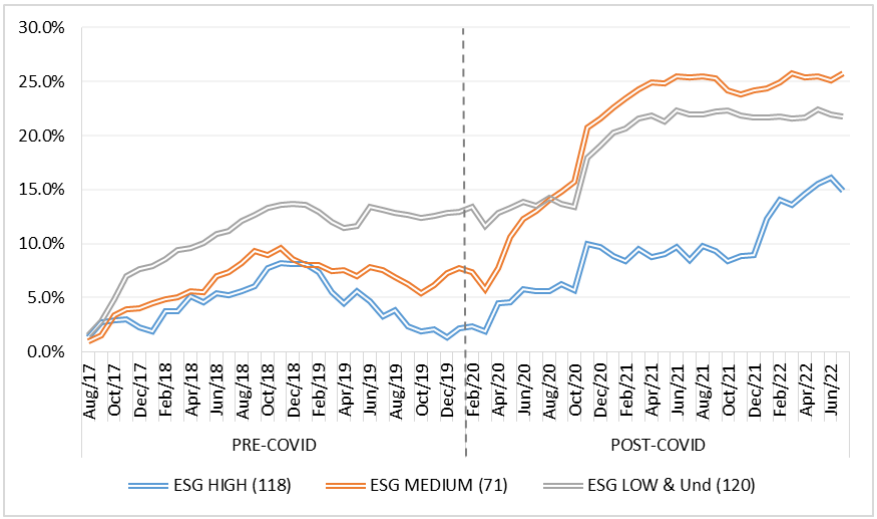
This clear preference of investors towards sustainability, which is further boosted in the pandemic, is also documented by Pástor and Vorsatz (2020), who show that funds with higher sustainability ratings, expressed by Morningstar globes, receive more inflows after the Covid-19 shock. Our findings are also consistent with Ferriani and Natoli (2020), who observe that funds with a low Morningstar ESG risk indicator present higher inflows during the pandemic.

The following graphs - graph 5, 6 and 7 - present the evolution of fund flows in percentage terms for different levels of sustainability based on three dimensions - ESG, Environmental and Emissions - respectively. In contrast to what we have observed in the previous graphs, in relation to scores of Refinitiv Eikon Lipper Fund we cannot directly link higher scores of sustainability with higher fund flows.

The different levels of ESG and Environmental scores follow a similar path. In both graph 5 and 6 the most sustainable category (High) is the one with the lowest flows. Additionally, we can observe that after the Covid-19 outbreak the growth of the *Medium* sustainability category surpassed the *Low/Undefined* category for both ESG and Environmental scores.

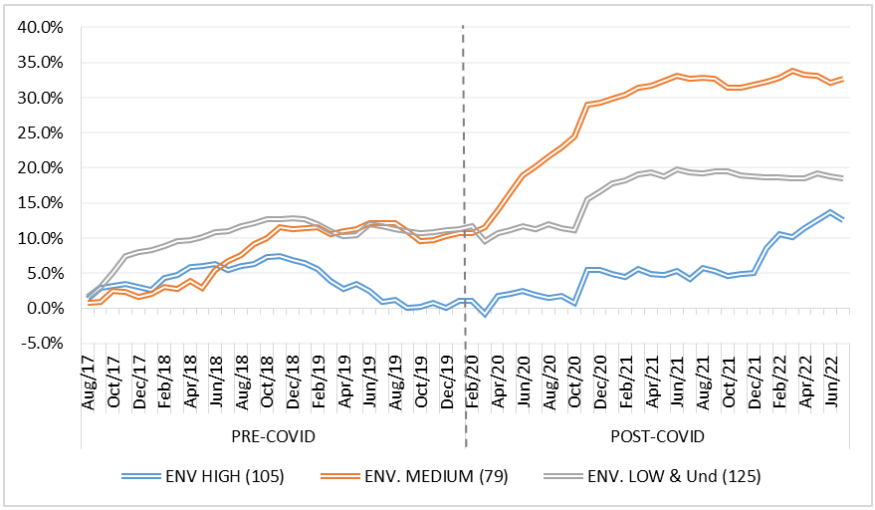
Graph 7 shows that funds from the *High* and *Low/Undefined* categories of emissions' scores follow a similar growth trend, while the *Medium* category experiences a decrease of flows.

Graph 5. Funds' Flows based on ESG scores – Covid-19



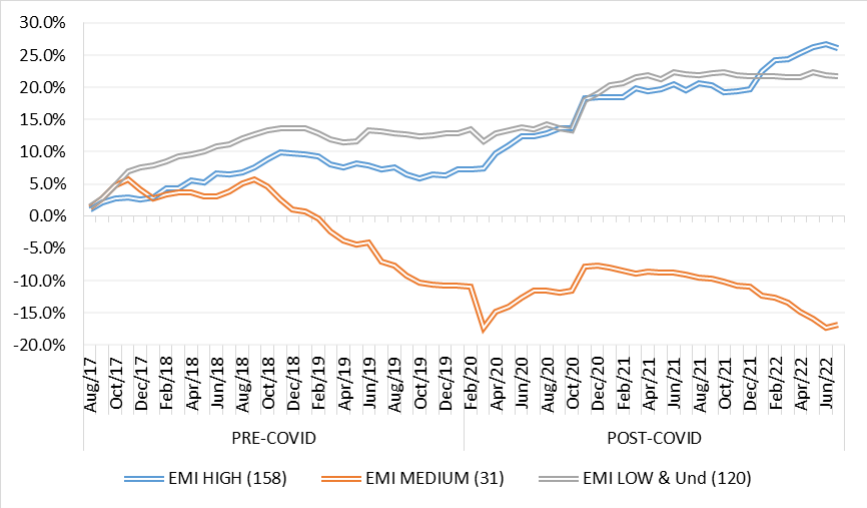
This graph presents the monthly cumulative average of flows in percentage terms from August 2017 to July 2022. It is subdivided in two periods: Pre-covid (from August 2017 to January 2020) and Post-covid (from February 2020 to July 2022). The analysis includes the entire Covid-19 sample (309 funds) and shows the growth of fund flows for three different levels of ESG scores: High (75%-100%); Medium (50%-75%) and Low/Undefined (0%-50%). The scores are retrieved from Refinitiv Eikon Lipper Fund. The number of funds of each category is indicated between brackets in the legend box.

Graph 6. Funds' Flows based on Environmental scores – Covid-19



This graph presents the monthly cumulative average of flows in percentage terms from August 2017 to July 2022. It is subdivided in two periods: Pre-covid (from August 2017 to January 2020) and Post-covid (from February 2020 to July 2022). The analysis includes the entire Covid-19 sample (309 funds) and shows the growth of fund flows for three different levels of Environmental scores: High (75%-100%); Medium (50%-75%) and Low/Undefined (0%-50%). The scores are retrieved from Refinitiv Eikon Lipper Fund. The number of funds of each category is indicated between brackets in the legend box.

Graph 7. Funds' Flows based on Emissions' scores – Covid-19

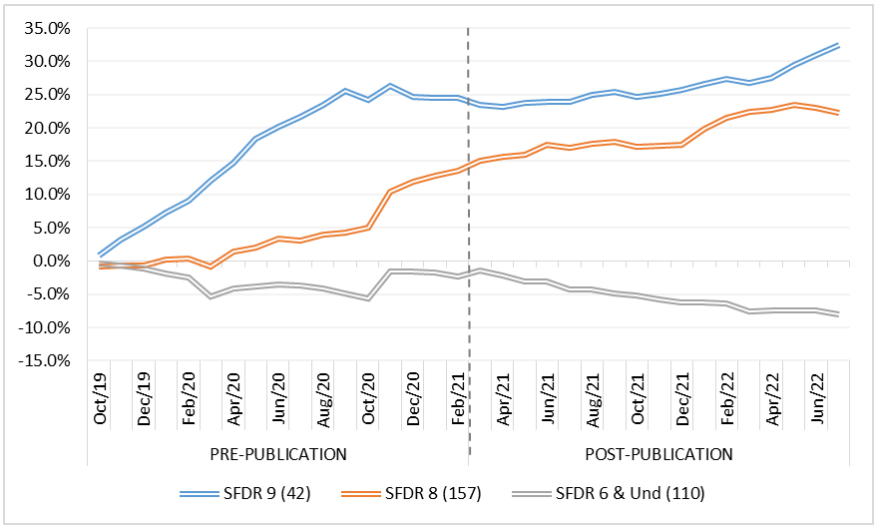


This graph presents the monthly cumulative average of flows in percentage terms from August 2017 to July 2022. It is subdivided in two periods: Pre-covid (from August 2017 to January 2020) and Post-covid (from February 2020 to July 2022). The analysis includes the entire Covid-19 sample (309 funds) and shows the growth of fund flows for three different levels of Emissions' scores: High (75%-100%); Medium (50%-75%) and Low/Undefined (0%-50%). The scores are retrieved from Refinitiv Eikon Lipper Fund. The number of funds of each category is indicated between brackets in the legend box.

5.1.3. Flows before and after the SFDR publication

Graph 8 is similar to graph 3 as it illustrates the evolution of flows on a monthly basis for funds in different SFDR classifications. However, in graph 8 we have a separation of a pre-publication and a post-publication period, in respect to the publication date of the SFDR of the 10th of March of 2021. We observe that, as the publication date comes closer the flows start to grow apart presenting a clear separation between funds of article 9 and 8 and funds falling to article 6 and undefined. This separation is visible before the publication date, however from the publication date onwards we observe that flows of funds under article 6/undefined decrease further, while flows of funds of articles 8 and 9 continue to grow. This is consistent with the results of Becker et al. (2022), who analyse the effect of the SFDR on investors and find that Article 8 and 9 funds experienced larger fund net inflows after the public disclosure of the SFDR classification. Our finding is also in line with Ceccarelli et al. (2021), who report that funds first labelled as low-carbon enjoyed a significant increase in their monthly net flows relative to funds that did not receive the LCD.

Graph 8. Funds' Flows based on SFDR's articles – Publication date



This graph presents the monthly cumulative average of flows in percentage terms from October 2019 to July 2022. It is subdivided in two periods: Pre-publication (from October 2019 to February 2021) and Post-publication (from March 2021 to July 2022) -two 17-month periods pre and post the SFDR regulation came into force in 10th of March 2021. The analysis includes 309 funds and shows the growth of funds for the different SFDR articles (9, 8 and 6) and for the funds for which a SFDR categorization wasn't reported (Undefined). The number of funds of each category is indicated between brackets in the legend box.

5.2. Overall performance evaluation

For the current and following subsections, it is important to notice that all the results were corrected for autocorrelation and heteroscedasticity using the Newey and West (1987) method. Moreover, a result is referred to as "statistically significant" if it presents a significance at least at the conventional 5% level, and if not highlighted otherwise.

In table 6 we present the results of the performance evaluation on a global perspective, from January 2010 to July 2022, using the Fama and French (2015) 5-factor model (hereinafter 5-factor model) and the Fama and French (2018) 6-factor model (hereinafter 6-factor model) in their conditional specification. The regressions are performed for equally and value weighted portfolios including all the funds of our global sample (303 funds). Moreover, a Wald test was applied to the models to assess the joint hypotheses of the conditioning information variables being equal to zero.

As the main focus of this dissertation is to assess portfolio financial performance, we will pay more attention to the alpha term (α) – the abnormal return. As can be seen, the abnormal returns are negative and statistically significant, meaning that these portfolios underperformed the market. The conditional alphas of the short-term rate (α_{STR}) and of the dividend yield (α_{DY}) present opposite signs as these variables are differently associated with returns. However, the only statistically significant

conditional alpha is the short-term alpha of the equally weighted portfolio in the 6-factor model, with a negative coefficient. The negative sign of the coefficient means that, in times of higher short-term rates, this portfolio returns are lower. As short-term rates can be viewed as a measure of expected inflation (Fama & Schwert, 1977), periods of higher short-term rates are often linked to expansion periods, lower risk and therefore also lower returns.

Regarding the risk factors, all market βs (MKT) are positive, statistically significant at the 1% level, and higher than 1, indicating investors bear a higher market risk by investing in these portfolios.

In what regards the size factor (SMB), the value weighted portfolio presents a negative and statistically significant coefficient in both models, while the equally weighted portfolio shows a neutral exposure to this factor, reflecting the fact that the value weighted portfolio is more exposed to large cap funds. In periods of higher short-term rates, the equally weighted portfolio presents positive and significant size coefficients, being therefore more exposed to small companies.

When looking at the book-to-market factor (HML), we can see that the value weighted portfolio exhibits negative coefficients in both models, thus showing a higher exposure to growth companies. However, in periods of higher short-term rates, we observe positive and significant coefficients for both portfolios in the 6-factor model, suggesting a higher exposure to value companies in expansion periods.

Additionally, all the profitability (RMW) coefficients are negative and statistically significant, which suggests that these portfolios are more exposed to less profitable firms. Nevertheless, in periods of high short-term rates the portfolios are more exposed to more profitable firms, with all coefficients being statistically significant, except for the value weighted portfolio in the 5-factor model. Another outcome worth noticing is that in periods of higher dividend yields, usually associated with recession periods, the value weighted portfolio in the 6-factor model shows a negative and significant RMW coefficient, being more exposed to less profitable firms.

Likewise, in periods of higher dividend yields we also observe that in the 5-factor model the value weighted portfolio shows a negative and significant relation to the investment factor (CMA), suggesting a higher exposure to aggressive companies. Moreover, and still in periods of higher dividend yields, in the 6-factor model the momentum (MOM) factor is negative and statistically significant at the 1% level for both the equally and value weighted portfolios, meaning that the portfolios are more exposed to companies with poor performance in the recent past.

All the four regressions present a high adjusted explanatory power (R^2), which implies confidence in these models. The results of the Wald tests show that the joint hypothesis of no time varying αs is rejected at conventional levels of significance. Yet, the joint hypotheses of time varying βs, and αs and βs are always rejected. Overall, the results of the Wald test suggest that allowing for time-varying risk is indeed relevant in performance evaluation.[10]

[10] Even if the evidence of time-varying alphas is not supported, we note the argument of Ferson et al. (2008) that using the model that allows for time-varying betas but not time-varying alphas will generated bias results.

Table 6. Conditional Fama and French (2015) 5-factor model and Fama and French (2018) 6-factor model (2010-2022)

Fama and French (2015) 5-factor model

	All funds	
	Eq. Weighted	**Val. Weighted**
α_p	-0.0020***	-0.0015***
α_{STR}	-0.0053*	-0.0052
α_{DY}	0.0001	0.0002
β_{MKT}	1.0438***	1.0582***
$\beta_{MKT*STR}$	0.0847	0.0814
β_{MKT*DY}	-0.0882*	-0.1012**
β_{SMB}	0.0461	-0.0703**
$\beta_{SMB*STR}$	0.4310**	0.3735*
β_{SMB*DY}	-0.0755	-0.0453
β_{HML}	-0.0594	-0.1020**
$\beta_{HML*STR}$	0.8234*	0.7429
β_{HML*DY}	0.0711	0.1177
β_{RMW}	-0.1149***	-0.1449***
$\beta_{RMW*STR}$	1.0544**	0.8824
β_{RMW*DY}	-0.1620	-0.1791
β_{CMA}	-0.0247	-0.0617
$\beta_{CMA*STR}$	-0.3203	-0.2914
β_{CMA*DY}	-0.2932	-0.3880**
W_1	0.2069	0.4110
W_2	0.0225	0.0185
W_3	0.0322	0.0248
Adj. R^2 (%)	98.77	98.73

Fama and French (2018) 6-factor model

	All funds	
	Eq. Weighted	**Val. Weighted**
α_p	-0.0022***	-0.0017***
α_{STR}	-0.0070**	-0.0072*
α_{DY}	0.0010	0.0012
β_{MKT}	1.0427***	1.0566***
$\beta_{MKT*STR}$	0.1140	0.1145
β_{MKT*DY}	-0.0947*	-0.1094**
β_{SMB}	0.0416	-0.0753**
$\beta_{SMB*STR}$	0.4066**	0.3408*
β_{SMB*DY}	-0.0867	-0.0550
β_{HML}	-0.0509	-0.0926**
$\beta_{HML*STR}$	1.0600**	1.0148**
β_{HML*DY}	-0.2064	-0.1937
β_{RMW}	-0.1010**	-0.1276***
$\beta_{RMW*STR}$	1.1782***	1.0098**
β_{RMW*DY}	-0.2235*	-0.2454**
β_{CMA}	-0.0261	-0.0630
$\beta_{CMA*STR}$	-0.4685	-0.4629
β_{CMA*DY}	-0.0900	-0.1571
β_{MOM}	0.0083	0.0083
$\beta_{MOM*STR}$	0.1327	0.1614
β_{MOM*DY}	-0.1615***	-0.1821***
W_1	0.0875	0.2253
W_2	0.0003	0.0001
W_3	0.0001	0.0001
Adj. R^2 (%)	98.81	98.79

This table shows the regression estimates of the conditional Fama and French (2015) five-factor model (eq. 6) and of the Fama and French (2018) six-factor model (eq. 7) for the period between January 2010 and July 2022, regarding the equally and value weighted portfolios of our global sample (303 funds). The table reports the abnormal returns (αp), the conditional α coefficients (α_{STR}, α_{DY}), the systematic risk (β_{MKT}), the regression coefficients of size (SMB), book-to-market (HML), profitability (RMW), investments (CMA) and momentum (MOM) factors, and the conditional β coefficients ($\beta_{MKT*STR}$, β_{MKT*DY}, $\beta_{SMB*STR}$, β_{SMB*DY}, $\beta_{HML*STR}$, β_{HML*DY}, $\beta_{RMW*STR}$, β_{RMW*DY}, $\beta_{CMA*STR}$, β_{CMA*DY}, $\beta_{MOM*STR}$, β_{MOM*DY}). The Adj. R^2 refers to the adjusted coefficient of determination. Standard errors were corrected for heteroscedasticity and autocorrelation by following Newey and West (1987), and as in Baum (2006), the number of lags is determined by the rule of thumb: $^4\sqrt{N}$, where N is the number of observations. To identify the statistical significance of the coefficients, asterisks were used to represent the level of significance of 1% (***), 5% (**) and 10% (*). W1, W2 and W3 correspond to p values of Wald tests on the null hypothesis of no time-varying alphas, no time-varying betas and no time-varying alphas and betas, respectively.

5.3. Performance evaluation before and after the Covid-19 outbreak

5.3.1. Aggregate assessment of fund performance

In this subsection, we report the results of fund performance evaluation focused on the pre- and post- Covid-19 event, covering the period from August 2017 to July 2022. Just to recall, to evaluate fund performance the 5-factor model and the 6-factor model include a dummy variable in the α term and in the risk factors (as in Areal et al.2013; Leite & Cortez, 2015; Silva & Cortez, 2016).

Table 7 presents an overview of the performance of equally and value weighted portfolios formed on the sample of funds used to assess the pre- and post- Covid-19 period (309 funds). Looking at the abnormal returns for the period before the Covid-19, all the portfolios show a negative and statistically significant performance at the 1% level. After the outburst of Covid-19, there is no statistically significant change in performance. Thus, we conclude that the Covid-19 didn't have any significant impact in the performance of these portfolios.

Regarding the risk factors, before the pandemic, all market βs (MKT) are positive, statistically significant at the 1% level, and with a systematic risk greater than 1. In what concerns the book-to-market factor (HML), the coefficients of the value weighted portfolio in both models are negative and significant before the Covid-19, while the equally weighted portfolio is neutral to this risk factor, indicating that the value weighted portfolio is more exposed to growth companies. The profitability factor (RMW), prior to Covid-19, has a negative and significant coefficient for the value weighted portfolio according to the 5-factor model, which suggests that this portfolio is more exposed to less profitable firms. Similar to the abnormal returns, none of the risk factor coefficients associated with the dummy for the period after the Covid-19 is statistically significant, therefore it is safe to say that the Covid-19 didn't have an impact on the exposure of the portfolios to these sources of systematic risk.

Lastly, the adjusted R^2 of both portfolios in both models show a high level, meaning that the models do a good job in explaining the performance of these portfolios.

Table 7. Fama and French (2015) 5-factor model and Fama and French (2018) 6-factor model (All Covid-19)

Fama and French (2015) 5-factor model

	All funds	
	Equally W.	**Value W.**
α_p	-0.0031***	-0.0024***
α_D	0.0010	0.0009
β_{MKT}	1.0730***	1.0702***
β_{MKT*D}	-0.0253	-0.0121
β_{SMB}	0.0300	-0.1007
β_{SMB*D}	0.0157	0.0273
β_{HML}	-0.1905*	-0.2259**
β_{HML*D}	0.0683	0.0586
β_{RMW}	-0.1860*	-0.2272***
β_{RMW*D}	-0.0916	-0.0255
β_{CMA}	0.0561	0.0298
β_{CMA*D}	-0.0719	-0.0568
Adj. R^2 (%)	98.98	99.02

Fama and French (2018) 6-factor model

	All funds	
	Equally W.	**Value W.**
α_p	-0.0032***	-0.0025***
α_D	0.0011	0.0012
β_{MKT}	1.0738***	1.0711***
β_{MKT*D}	-0.0266	-0.0173
β_{SMB}	0.0293	-0.1016
β_{SMB*D}	0.0175	0.0380
β_{HML}	-0.1880	-0.2230**
β_{HML*D}	0.0630	0.0318
β_{RMW}	-0.1827*	-0.2233
β_{RMW*D}	-0.0947	-0.0283
β_{CMA}	0.0558	0.0294
β_{CMA*D}	-0.0690	-0.0337
β_{MOM}	0.0035	0.0041
β_{MOM*D}	-0.0062	-0.0277
Adj. R^2 (%)	99.17	98.98

This table shows the regression estimates of the Fama and French (2015) five-factor model (eq. 8) and of the Fama and French (2018) six-factor model (eq. 9) with a dummy variable for the period between August 2017 and July 2022, regarding the equally and value weighted portfolios of our Covid-19 sample (309 funds). The table reports the abnormal returns (αp), the returns differential after the Covid-19 outbreak (αp_D), the systematic risk (β_{MKT}), the regression coefficients of size (SMB), book-to-market (HML), profitability (RMW), investments (CMA) and momentum (MOM) factors, and the β coefficients for after Covid-19 (β_{MKT*D}, β_{SMB*D}, β_{HML*D}, β_{RMW*D}, β_{CMA*D}, β_{MOM*D}). The Adj. R^2 refers to the adjusted coefficient of determination. Standard errors were corrected for heteroscedasticity and autocorrelation by following Newey and West (1987), and as in Baum (2006), the number of lags is determined by the rule of thumb: $\sqrt[4]{N}$, where N is the number of observations. To identify the statistical significance of the coefficients, asterisks were used to represent the level of significance of 1% (***), 5% (**) and 10% (*).

5.3.2. Fund performance according to the SFDR classification of funds

According to the SFDR, funds should self-classify themselves as article 9, article 8 funds, or article 6 funds. Article 9 funds correspond to funds that have sustainable goals as their objective (so called 'dark-green' funds) and Article 8 are those that promote environmental or social characteristics (so-called 'light-green' funds). In practice, the classification of funds under articles 8 or 9 has been treated by financial markets as an unofficial label of sustainability (EFAMA, 2021), which is supported by increasing flows into article 8 and 9 funds (Becker et al., 2022). In fact, the SFDR classifications do

reflect different fund sustainability levels, as such, we aim to assess whether there are differences in performance in funds that fall into different SFDR classifications.

Table 8 presents the results of fund performance evaluation depending on their SFDR categorization into article 6, 8 and 9. The table also shows the regression estimates of the differences portfolios.

When analysing abnormal returns, we can see that portfolio alphas before Covid-19 are negative and statistically significant, except in the case of the SFDR 9 value weighted portfolio in the 6-factor model, which is neutral. Again, there are no significant differences in performance after the pandemic. When looking at the difference portfolios in the 6-factor model, before the outbreak of Covid-19, we observe a significant outperformance of the equally weighted SFDR 9 portfolio over the SFDR 8 portfolio. The results also show that, in both models, both the equally and value weighted portfolios of the SFDR 9 portfolios significantly outperformed the SFDR 6/Undefined portfolios. Furthermore, the equally weighted portfolio of the SFDR 8 outperformed the SFDR 6/Undefined portfolio. The differential returns in the period after the Covid-19 are insignificant.

All portfolios, in both models, present significant market βs (MKT) that are greater than 1. In relation to the size factor (SMB), the article 9 value weighted portfolio presents a negative and significant coefficient in the 5-factor model, while the equally weighted portfolio is neutral with respect to this risk factor, indicating that the value weighted portfolio is more exposed to large caps. Concerning the book-to-market factor (HML), in both models, the article 9 SFDR portfolios, together with the value weighted article 8 SFDR portfolio exhibit negative and statistically significant coefficients, meaning that these portfolios are more exposed to growth companies. In respect to the profitability factor (RMW), in the 5-factor model, all the coefficients of the value weighted portfolios are negative and statistically significant. The same occurs in the 6-factor model but only in relation to the value weighted portfolios of article 9 and 8 SFDR portfolios. We thus conclude that these value weighted portfolios are more exposed to less profitable firms.

Once again, we do not observe any significant difference in the exposure of the portfolios to the risk factors in the period after the pandemic. The adjusted R^2 are all above 98%, which shows a high accuracy of the models.

Table 8. Fama and French (2015) 5-factor model and Fama and French (2018) 6-factor model (SFDR Covid-19)

Fama and French (2015) 5-factor model						
	SFDR 9		SFDR 8		SFDR 6/Undefined	
	Equally W.	Value W.	Equally W.	Value W.	Equally W.	Value W.
α_p	-0.0020***	-0.0014**	-0.0029***	-0.0026***	-0.0038***	-0.0032***
α_D	0.0008	0.0011	0.0004	0.0005	0.0019	0.0017
β_{MKT}	1.0480***	1.0463***	1.0762***	1.0656***	1.0776***	1.1018***
β_{MKT*D}	0.0002	0.0144	-0.0122	-0.0058	-0.0535	-0.0551
β_{SMB}	-0.0709	-0.1560**	-0.0177	-0.0931	0.1345	-0.0686
β_{SMB*D}	0.0917	0.1255	-0.0208	-0.0136	0.0405	0.0307
β_{HML}	-0.1923**	-0.2296**	-0.1789*	-0.2745***	-0.2063*	-0.1091
β_{HML*D}	-0.0532	-0.0714	0.0908	0.1351	0.0821	0.0415
β_{RMW}	-0.1131	-0.1969**	-0.1851*	-0.2426***	-0.2141*	-0.1943**
β_{RMW*D}	-0.1378	-0.0504	-0.0576	-0.0031	-0.1244	-0.0960
β_{CMA}	0.0027	0.0652	0.0667	0.0244	0.0620	0.0504
β_{CMA*D}	0.0500	0.0483	-0.1249	-0.1085	-0.0436	-0.1063
Adj. R^2 (%)	98.56	98.49	98.90	98.97	98.96	98.84

Differences Fama and French (2015) 5-factor model						
	SFDR 9 - SFDR 8		SFDR 9 - SFDR 6/Und.		SFDR 8 - SFDR 6/Und.	
	Equally W.	Value W.	Equally W.	Value W.	Equally W.	Value W.
α_p	0.0009*	0.0012	0.0018***	0.0018**	0.0009***	0.0007*
α_D	0.0004	0.0007	-0.0011	-0.0006	-0.0015**	-0.0013**
β_{MKT}	-0.0282*	-0.0193*	-0.0296*	-0.0555***	-0.0014	-0.0362***
β_{MKT*D}	0.0124	0.0202	0.0537	0.0696	0.0413***	0.0494**
β_{SMB}	-0.0532	-0.0628	-0.2054***	-0.0874	-0.1522***	-0.0246
β_{SMB*D}	0.1125*	0.1390*	0.0512	0.0948	-0.0613	-0.0442
β_{HML}	-0.0134	0.0449	0.0140	-0.1205	0.0274	-0.1654***
β_{HML*D}	-0.1440**	-0.2065**	-0.1354	-0.1129	0.0087	0.0936**
β_{RMW}	0.0719	0.0458	0.1010	-0.0026	0.0291	-0.0484
β_{RMW*D}	-0.0802	-0.0473	-0.0134	0.0456	0.0668	0.0929
β_{CMA}	-0.0640	0.0408	-0.0593	0.0148	0.0047	-0.0260
β_{CMA*D}	0.1749*	0.1568	0.0936	0.1546	-0.0813	-0.0022

Fama and French (2018) 6-factor model						
	SFDR 9		SFDR 8		SFDR 6/Undefined	
	Equally W.	Value W.	Equally W.	Value W.	Equally W.	Value W.
α_p	-0.0017***	-0.0012	-0.0029***	-0.0026***	-0.0040***	-0.0033***
α_D	0.0009	0.0012	0.0004	0.0007	0.0021	0.0019
β_{MKT}	1.0385***	1.0412***	1.0762***	1.0674***	1.0833***	1.1049***
β_{MKT*D}	0.0003	0.0128	-0.0122	-0.0118	-0.0571	-0.0582
β_{SMB}	-0.0622	-0.1514*	-0.0177	-0.0948	0.1293	-0.0714
β_{SMB*D}	0.1051	0.1366	-0.0209	-0.0020	0.0407	0.0335
β_{HML}	-0.2220**	-0.2452**	-0.1789	-0.2688***	-0.1886	-0.0994
β_{HML*D}	-0.0770	-0.0937	0.0910	0.1057	0.0765	0.0320
β_{RMW}	-0.1527	-0.2177**	-0.1850*	-0.2350**	-0.1905	-0.1814*
β_{RMW*D}	-0.0958	-0.0278	-0.0576	-0.0096	-0.1485	-0.1088
β_{CMA}	0.0065	0.0672	0.0667	0.0237	0.0597	0.0491
β_{CMA*D}	0.0971	0.0824	-0.1252	-0.0851	-0.0528	-0.1052
β_{MOM}	-0.0419	-0.0221	0.0000	0.0080	0.0250	0.0136
β_{MOM*D}	-0.0109	-0.0154	0.0002	-0.0315	-0.0131	-0.0135
Adj. R^2 (%)	98.56	98.45	98.85	98.93	98.93	98.79

Differences Fama and French (2018) 6-factor model						
	SFDR 9 - SFDR 8		SFDR 9 - SFDR 6/Und.		SFDR 8 - SFDR 6/Und.	
	Equally W.	Value W.	Equally W.	Value W.	Equally W.	Value W.
α_p	0.0013***	0.0014*	0.0024***	0.0021**	0.0011***	0.0007*
α_D	0.0005	0.0005	-0.0012	-0.0006	-0.0016*	-0.0011*
β_{MKT}	-0.0377***	-0.0262**	-0.0449***	-0.0636***	-0.0071*	-0.0374***
β_{MKT*D}	0.0125	0.0246	0.0574*	0.0710*	0.0450***	0.0464**
β_{SMB}	-0.0445	-0.0566	-0.1914***	-0.0799	-0.1470***	-0.0234
β_{SMB*D}	0.1260**	0.1387*	0.0645	0.1032	-0.0616	-0.0355
β_{HML}	-0.0431	0.0236	-0.0334	-0.1458*	0.0097	-0.1694***
β_{HML*D}	-0.1680***	-0.1994*	-0.1534	-0.1256	0.0146	0.0738
β_{RMW}	0.0324	0.0174	0.0379	-0.0363	0.0055	-0.0536
β_{RMW*D}	-0.0382	-0.0182	0.0527	0.0810	0.0909	0.0993
β_{CMA}	-0.0601	0.0436	-0.0532	0.0181	0.0070	-0.0255
β_{CMA*D}	0.2223**	0.1676	0.1499	0.1876	-0.0724	0.0200
β_{MOM}	-0.0420***	-0.0301	-0.0670***	-0.0357	-0.0250***	-0.0056
β_{MOM*D}	-0.0111	0.0161	0.0022	-0.0019	0.0133	-0.0180

This table shows the regression estimates and of the Fama and French (2015) five-factor model (eq. 8) and of the Fama and French (2018) six-factor model (eq. 9) with a dummy variable for the period between August 2017 and July 2022, regarding the equally and value weighted SFDR portfolios of our Covid-19 sample (309 funds). It also presents the regression estimates for the difference between portfolios. The table reports the abnormal returns (αp), the returns differential after the Covid-19 outbreak (α_D), the systematic risk (β_{MKT}), the regression coefficients of size (SMB), book-to-market (HML), profitability (RMW), investments (CMA) and momentum (MOM) factors, and the β coefficients for after Covid-19 (β_{MKT*D}, β_{SMB*D}, β_{HML*D}, β_{RMW*D}, β_{CMA*D}, β_{MOM*D}). The Adj. R^2 refers to the adjusted coefficient of determination. Standard errors were corrected for heteroscedasticity and autocorrelation by following Newey and West (1987), and as in Baum (2006), the number of lags is determined by the rule of thumb: $^4\sqrt{N}$, where N is the number of observations. To identify the statistical significance of the coefficients, asterisks were used to represent the level of significance of 1% (***), 5% (**) and 10% (*).

5.3.3. Performance of labelled versus non-labelled funds

Sustainability labels certified by third-party entities have emerged and become popular in Europe. In France, the Socially Responsible Investment label acts as a well-known tool that fund managers can resort to communicate to investors the sustainable attributes of their products. In this section, we assume that labelled funds indeed comply with more rigorous sustainability standards and compare fund performance pre- and post-Covid according to whether they are awarded with the French SRI label.

Table 9 presents the results regarding the performance of equally and value weighted portfolios of labelled and non-labelled funds, as well as the performance of the difference portfolio.

Concerning abnormal returns, the alphas before the pandemic are negative and statistically significant in both models. Yet, observing the results of the difference portfolios, the alpha of the equally weighted portfolio of labelled funds is higher than that of the non-labelled funds at the 5% level. This outperformance of the equally weighted portfolio of labelled funds compared to non-labelled funds holds for both models. Nevertheless, in the post-Covid period the performance of labelled funds seems to decrease to a higher extent than their non-labelled peers.

The systematic risk (MKT) coefficients are positive, greater than 1, and statistically significant for all portfolios. With respect to other risk factors, the book-to-market factor (HML) is negative and statistically significant in both models in the case of the non-labelled value weighted portfolio, which shows a higher exposure to growth companies. Analysing the profitability factor (RMW), in both models, we find negative and statistically significant coefficients for all portfolios, except for the non-labelled equally weighted portfolio, which shows a neutral relation with this risk factor. Therefore, most portfolios are more exposed to less profitable firms.

Overall, there are no significant differences in the risk exposure in the post-pandemic period. Additionally, the adjusted R^2 are all high, implying that our results are robust.

Table 9. Fama and French (2015) 5-factor model and Fama and French (2018) 6-factor model (SRI Label Covid-19)

Fama and French (2015) 5-factor model					Differences	
	Labelled		Non-Labelled		Labelled - Non-Labelled	
	Equally W.	Value W.	Equally W.	Value W.	Equally W.	Value W.
α_p	-0.0023***	-0.0021**	-0.0034***	-0.0026***	0.0011**	0.0004
α_D	0.0000	-0.0004	0.0014	0.0017	-0.0014**	-0.0021**
β_{MKT}	1.0730***	1.0710***	1.0729***	1.0695***	0.0001	0.0015
β_{MKT*D}	-0.0030	0.0024	-0.0327	-0.0198	0.0297**	0.0222
β_{SMB}	-0.0483	-0.0959	0.0566	-0.1028	-0.1049***	0.0069
β_{SMB*D}	0.0200	0.0685	0.0136	0.0058	0.0063	0.0627
β_{HML}	-0.1620	-0.1851*	-0.2004*	-0.2483***	0.0385	0.0632
β_{HML*D}	0.0143	-0.0079	0.0867	0.0953	-0.0724	-0.1032
β_{RMW}	-0.2048**	-0.2290***	-0.1797*	-0.2270***	-0.0250	-0.0021
β_{RMW*D}	-0.0541	0.0116	-0.1040	-0.0436	0.0499	0.0552
β_{CMA}	0.0090	-0.0567	0.0726	0.0753	-0.0636	-0.1319*
β_{CMA*D}	-0.0528	0.0377	-0.0791	-0.1059	0.0264	0.1436
Adj. R^2 (%)	98.80	98.52	99.00	99.09		

Fama and French (2018) 6-factor model					Differences	
	Labelled		Non-Labelled		Labelled - Non-Labelled	
	Equally W.	Value W.	Equally W.	Value W.	Equally W.	Value W.
α_p	-0.0023***	-0.0022**	-0.0035***	-0.0026***	0.0012**	0.0004
α_D	0.0000	-0.0003	0.0014	0.0019*	-0.0015*	-0.0022**
β_{MKT}	1.0712***	1.0719***	1.0746***	1.0703***	-0.0034	0.0016
β_{MKT*D}	-0.0028	-0.0006	-0.0345	-0.0258	0.0317**	0.0252
β_{SMB}	-0.0466	-0.0967	0.0551	-0.1035	-0.1017***	0.0068
β_{SMB*D}	0.0220	0.0743	0.0154	0.0189	0.0066	0.0554
β_{HML}	-0.1677	-0.1823*	-0.1953*	-0.2459**	0.0277	0.0636
β_{HML*D}	0.0109	-0.0226	0.0809	0.0632	-0.0699	-0.0858
β_{RMW}	-0.2124**	-0.2252**	-0.1729	-0.2237***	-0.0394	-0.0015
β_{RMW*D}	-0.0461	0.0084	-0.1108	-0.0455	0.0647	0.0538
β_{CMA}	0.0098	-0.0570	0.0719	0.0750	-0.0622	-0.1320*
β_{CMA*D}	-0.0449	0.0494	-0.0778	-0.0773	0.0329	0.1266
β_{MOM}	-0.0081	0.0040	0.0072	0.0034	-0.0153	0.0006
β_{MOM*D}	-0.0009	-0.0157	-0.0079	-0.0328	0.0070	0.0171
Adj. R^2 (%)	98.75	98.45	98.95	99.06		

This table shows the regression estimates of the Fama and French (2015) five-factor model (eq. 8) and of the Fama and French (2018) six-factor model (eq. 9) with a dummy variable for the period between August 2017 and July 2022, regarding the equally and value weighted SRI labelled, and non-labelled portfolios of our Covid-19 sample (309 funds). It also presents the regression estimates for the difference between portfolios. The table reports the abnormal returns (αp), the returns differential after the Covid-19 outbreak (α_D), the systematic risk (β_{MKT}), the regression coefficients of size (SMB), book-to-market (HML), profitability (RMW), investments (CMA) and momentum (MOM) factors, and the β coefficients for after Covid-19 (β_{MKT*D}, β_{SMB*D}, β_{HML*D}, β_{RMW*D}, β_{CMA*D}, β_{MOM*D}). The Adj. R^2 refers to the adjusted coefficient of determination. Standard errors were corrected for heteroscedasticity and autocorrelation by following Newey and West (1987), and as in Baum (2006), the number of lags is determined by the rule of thumb: $\sqrt[4]{N}$, where N is the number of observations. To identify the statistical significance of the coefficients, asterisks were used to represent the level of significance of 1% (***), 5% (**) and 10% (*).

5.3.4. Performance based on different sustainability dimensions

We further formed high, medium, and low-rated portfolios based on funds' aggregate ESG score and their scores in individual dimensions, namely the Environmental and emissions scores. Tables 10, 11 and 12 show the performance results of the high, medium, and low-rated portfolios formed on ESG, Environmental and on Emissions scores, as well as the difference portfolios.

In table 10, all portfolios exhibit negative and statistically significant abnormal returns, whatever model is used. However, the significance of the alpha of the medium-rated ESG equally weighted is weak (only at the 10% level in both models) and the same applies to the low-rated ESG value weighted portfolio in the case of the 6-factor model. Concerning the abnormal returns after Covid-19, we can state that performance didn't change significantly in most cases. However, in the 6-factor model the results show a positive and significant shift in performance of the high-rated ESG value weighted portfolio. The performance of this portfolio increased in the post pandemic, shifting from a negative to a positive abnormal return.

Once again, the systematic risk (MKT) coefficients are positive and statistically significant for both models and for all portfolios. In both models, regarding the size factor (SMB), the high-rated portfolios, present negative and statistically significant coefficients, while the medium and low-rated portfolios exhibit neutral coefficients. This indicates that portfolios with high ESG ratings present a higher exposure to large companies, which is confirmed also by the statistically significant differences across portfolios.

Considering the book-to-market factor (HML), in both models we find negative and statistically significant coefficients, indicating a high portfolio exposure to growth companies. In the 5-factor model this applies to the high and medium rated value weighted portfolios, as well as the low-rated equally weighted portfolio. In the 6-factor, this only applies to the high and medium-rated value weighted portfolios.

The profitability factor (RMW) shows negative and significant coefficients for the high-rated portfolios, in both models, and for the low-rated value weighted portfolio in the 5-factor model.

Overall, the exposure to the risk factors did not change significantly after the pandemic. Lastly, looking ate the adjusted R^2, it can be seen that all portfolios show a high indicator, meaning that the models are reliable.

Table 10. Fama and French (2015) 5-factor model and Fama and French (2018) 6-factor model (ESG scores Covid-19)

Fama and French (2015) 5-factor model						
	ESG HIGH		ESG MEDIUM		ESG LOW	
	Equally W.	Value W.	Equally W.	Value W.	Equally W.	Value W.
α	-0.0024***	-0.0018***	-0.0029*	-0.0033**	-0.0040***	-0.0025***
α_D	0.0008	0.0018*	-0.0009	-0.0004	0.0024	0.0011
β_{MKT}	1.0564***	1.0433***	1.0703***	1.0782***	1.0906***	1.0783***
β_{MKT*D}	0.0172	0.0139	-0.0320	-0.0469	-0.0628	-0.0252
β_{SMB}	-0.1917***	-0.2517***	0.2134	0.1446	0.1399	-0.0469
β_{SMB*D}	0.0181	0.0100	0.0258	0.1129	0.0067	-0.0079
β_{HML}	-0.0797	-0.2206**	-0.2518*	-0.3035**	-0.2627**	-0.1628*
β_{HML*D}	0.0097	0.0657	0.0885	0.0993	0.1130	0.0079
β_{RMW}	-0.1830***	-0.2821***	-0.1283	-0.1757	-0.2227*	-0.2028**
β_{RMW*D}	-0.1204	0.0111	0.0082	0.1483	-0.1228	-0.1980*
β_{CMA}	0.1033	0.0980	-0.1182	-0.1302	0.1170	0.0324
β_{CMA*D}	-0.0855	-0.1112	0.0681	0.1447	-0.1448	-0.1066
Adj. R^2 (%)	99.18	99.01	98.18	98.12	98.71	98.69

Differences Fama and French (2015) 5-factor model						
	ESG HIGH - ESG MEDIUM		ESG HIGH - ESG LOW		ESG MEDIUM - ESG LOW	
	Equally W.	Value W.	Equally W.	Value W.	Equally W.	Value W.
α	0.0006	0.0015	0.0017*	0.0007	0.0011	-0.0008
α_D	0.0017	0.0021	-0.0016	0.0007	-0.0033***	-0.0015
β_{MKT}	-0.0140	-0.0349	-0.0343*	-0.0350**	-0.0203	-0.0001
β_{MKT*D}	0.0491	0.0608	0.0799***	0.0391*	0.0308	-0.0217
β_{SMB}	-0.4052***	-0.3963***	-0.3316***	-0.2048***	0.0736	0.1915**
β_{SMB*D}	-0.0077	-0.1029	0.0114	0.0179	0.0191	0.1208
β_{HML}	0.1720	0.0829	0.1829**	-0.0578	0.0109	-0.1407*
β_{HML*D}	-0.0788	-0.0336	-0.1033	0.0579	-0.0245	0.0914
β_{RMW}	-0.0547	-0.1064	0.0396	-0.0794	0.0943	0.0270
β_{RMW*D}	-0.1286	-0.1372	0.0024	0.2092*	0.1310	0.3463**
β_{CMA}	0.2215	0.2282	-0.0137	0.0655	-0.2352*	-0.1626
β_{CMA*D}	-0.1536	-0.2559	0.0593	-0.0046	0.2129	0.2513

Fama and French (2018) 6-factor model						
	ESG HIGH		ESG MEDIUM		ESG LOW	
	Equally W.	Value W.	Equally W.	Value W.	Equally W.	Value W.
α	-0.0023***	-0.0021***	-0.0030*	-0.0031**	-0.0041***	-0.0025*
α_D	0.0008	0.0023**	-0.0009	-0.0006	0.0025*	0.0013
β_{MKT}	1.0554***	1.0499***	1.0713***	1.0728***	1.0930***	1.0777***
β_{MKT*D}	0.0171	0.0008	-0.0332	-0.0415	-0.0653	-0.0305
β_{SMB}	-0.1909***	-0.2577***	0.2126	0.1495	0.1377	-0.0464
β_{SMB*D}	0.0194	0.0313	0.0272	0.1078	0.0093	0.0054
β_{HML}	-0.0826	-0.2003**	-0.2488	-0.3203**	-0.2554*	-0.1647
β_{HML*D}	0.0072	0.0086	0.0842	0.1164	0.1047	-0.0236
β_{RMW}	-0.1869**	-0.2551***	-0.1244	-0.1981	-0.2129*	-0.2053
β_{RMW*D}	-0.1163	-0.0142	0.0044	0.1706	-0.1325	-0.1940
β_{CMA}	0.1037	0.0953	-0.1186	-0.1280	0.1160	0.0327
β_{CMA*D}	-0.0808	-0.0734	0.0698	0.1422	-0.1428	-0.0750
β_{MOM}	-0.0041	0.0287	0.0042	-0.0237	0.0103	-0.0027
β_{MOM*D}	-0.0012	-0.0652	-0.0056	0.0240	-0.0114	-0.0303
Adj. R^2 (%)	99.15	99.00	98.10	98.04	98.66	98.65

Differences Fama and French (2018) 6-factor model						
	ESG HIGH - ESG MEDIUM		ESG HIGH - ESG LOW		ESG MEDIUM - ESG LOW	
	Equally W.	Value W.	Equally W.	Value W.	Equally W.	Value W.
α	0.0007	0.0010	0.0018*	0.0004	0.0012	-0.0006
α_D	0.0017	0.0028	-0.0017	0.0009	-0.0033***	-0.0019
β_{MKT}	-0.0159	-0.0229	-0.0376**	-0.0278	-0.0217	-0.0049
β_{MKT*D}	0.0503	0.0423	0.0824***	0.0314	0.0321	-0.0110
β_{SMB}	-0.4034***	-0.4072***	-0.3286***	-0.2114***	0.0748	0.1959**
β_{SMB*D}	-0.0078	-0.0765	0.0102	0.0259	0.0179	0.1025
β_{HML}	0.1662	0.1200	0.1728*	-0.0356	0.0066	-0.1556*
β_{HML*D}	-0.0769	-0.1078	-0.0974	0.0321	-0.0205	0.1399
β_{RMW}	-0.0625	-0.0570	0.0261	-0.0498	0.0885	0.0072
β_{RMW*D}	-0.1206	-0.1848	0.0162	0.1798	0.1369	0.3646**
β_{CMA}	0.2222	0.2233	-0.0124	0.0626	-0.2346*	-0.1607
β_{CMA*D}	-0.1506	-0.2156	0.0621	0.0017	0.2127	0.2172
β_{MOM}	-0.0083	0.0524*	-0.0144	0.0314	-0.0061	-0.0210
β_{MOM*D}	0.0044	-0.0891*	0.0102	-0.0349	0.0058	0.0543

This table shows the regression estimates of the Fama and French (2015) five-factor model (eq. 8) and of the Fama and French (2018) six-factor model (eq. 9) with a dummy variable for the period between August 2017 and July 2022, regarding the equally and value weighted ESG portfolios of our Covid-19 sample (309 funds). It also presents the regression estimates for the difference between portfolios. The table reports the abnormal returns (αp), the returns differential after the Covid-19 outbreak (α_D), the systematic risk (β_{MKT}), the regression coefficients of size (SMB), book-to-market (HML), profitability (RMW), investments (CMA) and momentum (MOM) factors, and the βcoefficients for after Covid-19 (β_{MKT*D}, β_{SMB*D}, β_{HML*D}, β_{RMW*D}, β_{CMA*D}, β_{MOM*D}). The Adj. R^2 refers to the adjusted coefficient of determination. Standard errors were corrected for heteroscedasticity and autocorrelation by following Newey and West (1987), and as in Baum (2006), the number of lags is determined by the rule of thumb: $\sqrt[4]{N}$, where N is the number of observations. To identify the statistical significance of the coefficients, asterisks were used to represent the level of significance of 1% (***), 5% (**) and 10% (*).

Table 11 reports the performance results regarding portfolios formed on the Environmental scores. The abnormal returns are negative and statistically significant in both models, except for medium-rated equally and value weighted portfolios in the 5-factor model and the medium-rated value weighted in the 6-factor model, which exhibit a neutral performance. According to the alphas of the difference portfolios, we can observe that the performance differentials between the medium and low scored equally weighted portfolios are positive and statistically significant in both models. Therefore, before the Covid-19, the medium-rated equally weighted portfolio outperformed the low scored portfolio. After Covid-19, there are no statistically significant differences in performance in any portfolio, although the results of the difference portfolio suggest that post-Covid the medium-rated portfolios decreased its performance to a higher extent than the low-rated portfolio.

Regarding the market factor (MKT), all portfolios report greater than 1 and statistically significant coefficients. In relation to the size factor (SMB), and similarly to what is observed in the portfolios formed on the ESG scores, the high-rated environmental portfolios exhibit negative and statistically significant coefficients in both models. This suggests that portfolios with a high environmental score present a higher exposure to large companies, which is confirmed also by the statistically significant differences in the case of the medium and low-rated portfolios.

Concerning the book-to-market factor (HML), some portfolios present negative and statistically significant coefficients, namely both medium-rated portfolios and the equally weighted low scored portfolio in the 5-factor model, along with the medium-rated value weighted portfolio in the 6-factor model. Thus, these portfolios are more exposed to growth companies.

In relation to the profitability factor (RMW), in both models, the high-rated portfolios and the value weighted medium-rated portfolios show negative and statistically significant coefficients, indicating a higher exposure to less profitable firms. In the period after the pandemic, in the 5-factor model, the coefficient of the medium scored value weighted portfolio shows a positive and statistically significant differential coefficient, increasing its exposure to more profitable firms. In the 6-factor model, this differential is significant only at the 10% level.

No further significant changes were observed in the post pandemic period. All portfolios present high adjusted explanatory power (Adj. R^2), showing accurate models.

Table 11. Fama and French (2015) 5-factor model and Fama and French (2018) 6-factor model (Environmental scores Covid-19)

Fama and French (2015) 5-factor model						
	ENV. HIGH		ENV. MEDIUM		ENV. LOW	
	Equally W.	Value W.	Equally W.	Value W.	Equally W.	Value W.
α_p	-0.0024***	-0.0021***	-0.0026*	-0.0021	-0.0042***	-0.0030***
α_D	0.0010	0.0016	-0.0014	-0.0007	0.0025	0.0017
β_{MKT}	1.0678***	1.0785***	1.0420***	1.0343***	1.0968***	1.0894***
β_{MKT*D}	0.0127	0.0099	-0.0069	-0.0086	-0.0686*	-0.0382
β_{SMB}	-0.1971***	-0.2534***	0.1318	-0.0194	0.1638	0.0148
β_{SMB*D}	0.0192	0.0396	0.0120	0.0440	0.0075	-0.0143
β_{HML}	-0.0517	-0.1465	-0.2661**	-0.3982***	-0.2632**	-0.1801*
β_{HML*D}	-0.0119	0.0220	0.1210	0.1634	0.1059	0.0239
β_{RMW}	-0.1469**	-0.2250***	-0.1885	-0.2677**	-0.2139*	-0.1862**
β_{RMW*D}	-0.1715*	-0.1276	0.0780	0.2904**	-0.1350	-0.2147*
β_{CMA}	0.1087	0.1392	-0.0753	-0.0973	0.1015	0.0177
β_{CMA*D}	-0.0839	-0.1413	0.0165	0.0857	-0.1235	-0.0851
Adj. R^2 (%)	99.19	99.05	98.52	98.60	98.65	98.59

Differences Fama and French (2015) 5-factor model						
	ENV. HIGH - ENV. MEDIUM		ENV. HIGH - ENV. LOW		ENV. MEDIUM - ENV. LOW	
	Equally W.	Value W.	Equally W.	Value W.	Equally W.	Value W.
α_p	0.0002	-0.0001	0.0018*	0.0009	0.0016***	0.0009
α_D	0.0024	0.0024	-0.0016	0.0000	-0.0039***	-0.0024*
β_{MKT}	0.0258	0.0442**	-0.0290	-0.0109	-0.0548**	-0.0550***
β_{MKT*D}	0.0197	0.0185	0.0813***	0.0482**	0.0617**	0.0297
β_{SMB}	-0.3289***	-0.2340**	-0.3609***	-0.2682***	-0.0320	-0.0342
β_{SMB*D}	0.0072	-0.0044	0.0117	0.0539	0.0044	0.0583
β_{HML}	0.2144**	0.2517***	0.2116**	0.0336	-0.0028	-0.2181***
β_{HML*D}	-0.1330	-0.1414	-0.1178	-0.0019	0.0151	0.1395*
β_{RMW}	0.0416	0.0427	0.0671	-0.0388	0.0254	-0.0815
β_{RMW*D}	-0.2495*	-0.4180***	-0.0365	0.0871	0.2129**	0.5051***
β_{CMA}	0.1840	0.2365	0.0072	0.1216	-0.1767*	-0.1150
β_{CMA*D}	-0.1004	-0.2270	0.0396	-0.0562	0.1400	0.1708

Fama and French (2018) 6-factor model						
	ENV. HIGH		ENV. MEDIUM		ENV. LOW	
	Equally W.	Value W.	Equally W.	Value W.	Equally W.	Value W.
α_p	-0.0023***	-0.0022**	-0.0027**	-0.0023*	-0.0042***	-0.0029***
α_D	0.0010	0.0018	-0.0012	-0.0004	0.0026*	0.0017
β_{MKT}	1.0664***	1.0793***	1.0445***	1.0403***	1.0982***	1.0857***
β_{MKT*D}	0.0126	0.0053	-0.0106	-0.0173	-0.0692	-0.0394
β_{SMB}	-0.1959**	-0.2542***	0.1295	-0.0249	0.1625	0.0181
β_{SMB*D}	0.0216	0.0495	0.0170	0.0561	0.0069	-0.0063
β_{HML}	-0.0559	-0.1439	-0.2583*	-0.3798***	-0.2588*	-0.1915
β_{HML*D}	-0.0164	-0.0024	0.1066	0.1288	0.1062	0.0080
β_{RMW}	-0.1525**	-0.2215***	-0.1782	-0.2431**	-0.2081	-0.2013*
β_{RMW*D}	-0.1654	-0.1300	0.0680	0.2666*	-0.1410	-0.1983
β_{CMA}	0.1092	0.1389	-0.0763	-0.0997	0.1009	0.0192
β_{CMA*D}	-0.0761	-0.1201	0.0239	0.1035	-0.1274	-0.0605
β_{MOM}	-0.0060	0.0036	0.0110	0.0260	0.0062	-0.0160
β_{MOM*D}	-0.0026	-0.0252	-0.0175	-0.0420	-0.0016	-0.0109
Adj. R^2 (%)	99.15	99.01	98.46	98.55	98.54	98.54

Differences Fama and French (2018) 6-factor model						
	ENV. HIGH - ENV. MEDIUM		ENV. HIGH - ENV. LOW		ENV. MEDIUM - ENV. LOW	
	Equally W.	Value W.	Equally W.	Value W.	Equally W.	Value W.
α_p	0.0004	0.0001	0.0019	0.0007	0.0015**	0.0006
α_D	0.0022	0.0022	-0.0016	0.0001	-0.0038***	-0.0022
β_{MKT}	0.0219	0.0391**	-0.0318*	-0.0064	-0.0537**	-0.0454**
β_{MKT*D}	0.0232	0.0226	0.0818***	0.0446**	0.0586*	0.0220
β_{SMB}	-0.3254***	-0.2293**	-0.3584***	-0.2723***	-0.0330	-0.0430
β_{SMB*D}	0.0046	-0.0067	0.0147	0.0557	0.0101	0.0624
β_{HML}	0.2024**	0.2358**	0.2030**	0.0475	0.0005	-0.1883**
β_{HML*D}	-0.1230	-0.1312	-0.1226	-0.0104	0.0005	0.1208
β_{RMW}	0.0257	0.0216	0.0556	-0.0203	0.0299	-0.0419
β_{RMW*D}	-0.2334	-0.3966***	-0.0244	0.0684	0.2090**	0.4650***
β_{CMA}	0.1855	0.2386	0.0083	0.1197	-0.1772*	-0.1188
β_{CMA*D}	-0.1000	-0.2237	0.0512	-0.0596	0.1512	0.1641
β_{MOM}	-0.0169	-0.0224	-0.0122	0.0197	0.0048	0.0421
β_{MOM*D}	0.0149	0.0168	-0.0010	-0.0143	-0.0159	-0.0311

This table shows the regression estimates of the Fama and French (2015) five-factor model (eq. 8) and of the Fama and French (2018) six-factor model (eq. 9) with a dummy variable for the period between August 2017 and July 2022, regarding the equally and value weighted Environmental portfolios of our Covid-19 sample (309 funds). It also presents the regression estimates for the difference between portfolios. The table reports the abnormal returns (αp), the returns differential after the Covid-19 outbreak (α_D), the systematic risk (β_{MKT}), the regression coefficients of size (SMB), book-to-market (HML), profitability (RMW), investments (CMA) and momentum (MOM) factors, and the β coefficients for after Covid-19 (β_{MKT*D}, β_{SMB*D}, β_{HML*D}, β_{RMW*D}, β_{CMA*D}, β_{MOM*D}). The Adj. R^2 refers to the adjusted coefficient of determination. Standard errors were corrected for heteroscedasticity and autocorrelation by following Newey and West (1987), and as in Baum (2006), the number of lags is determined by the rule of thumb: $^4\sqrt{N}$, where N is the number of observations. To identify the statistical significance of the coefficients, asterisks were used to represent the level of significance of 1% (***), 5% (**) and 10% (*).

Table 12 reports the results regarding the portfolios formed on the emissions scores. Starting with the abnormal return, we observe negative and statistically significant coefficients in relation to high and low-rated portfolios in both models. The coefficients of the medium-rated portfolios show a neutral performance in the pre pandemic period. When looking at the difference portfolios, we verify that in the 5-factor model, before the Covid-19, the high-rated equally weighted portfolio significantly outperformed the low-rated one. In the post pandemic period, there are some significant changes in performance, namely, in the 5-factor model, the abnormal return of the medium-rated value weighted portfolio decreases. The same occurs in the 6-factor model in the medium-rated equally weighted portfolio.

In relation to the market factor (MKT), all portfolios report greater than 1 and statistically significant coefficients, apart from the medium-rated equally weighted portfolio in the 6-factor model, which coefficient isn't statistically significant.

Considering the size factor (SMB), in both models the high-rated value weighted portfolio presents negative and statistically significant coefficients, meaning that this portfolio is more exposed to large companies. We can state that this applies also in comparison with the medium and low emissions portfolios, as the differences across portfolios are negative and statistically significant.

In relation to the book-to-market factor (HML), the high-rated value weighted portfolio presents negative and significant coefficients in both models. The same is observed in respect to the low-rated equally weighted portfolio in the 5-factor model. This suggests that these portfolios are more exposed to growth companies.

Additionally, the outputs show negative and statistically significant coefficients in the profitability factor (RMW) in relation to high-rated portfolios and to the low-rated value weighted portfolio, indicating a higher exposure to less profitable firms.

No significant changes were verified in the exposure to risk factors in the post pandemic period. All portfolios present high adjusted explanatory power (Adj. R^2), implying reliable results.

Table 12. Fama and French (2015) 5-factor model and Fama and French (2018) 6-factor model (Emissions scores Covid-19)

Fama and French (2015) 5-factor model						
	EMI. HIGH		EMI. MEDIUM		EMI. LOW	
	Equally W.	Value W.	Equally W.	Value W.	Equally W.	Value W.
α_p	-0.0024***	-0.0021***	-0.0032	-0.0041	-0.0040***	-0.0025***
α_D	0.0006	0.0010	-0.0018	-0.0009***	0.0024	0.0011
β_{MKT}	1.0538***	1.0527***	1.1001***	1.1522**	1.0906***	1.0783***
β_{MKT*D}	0.0074	0.0120	-0.0446	-0.1191	-0.0628	-0.0252
β_{SMB}	-0.1391*	-0.2146***	0.4656*	0.3946	0.1399	-0.0469
β_{SMB*D}	0.0201	0.0446	0.0278	0.1600	0.0067	-0.0079
β_{HML}	-0.1281	-0.2542***	-0.2290	-0.2024	-0.2627**	-0.1628*
β_{HML*D}	0.0259	0.0692	0.1094	0.1317	0.1130	0.0079
β_{RMW}	-0.1732**	-0.2606***	-0.1108	-0.1093	-0.2227*	-0.2028**
β_{RMW*D}	-0.0778	0.0488	-0.0403	0.0788	-0.1228	-0.1980*
β_{CMA}	0.0685	0.0803	-0.2335	-0.3716	0.1170	0.0324
β_{CMA*D}	-0.0488	-0.0574	0.0854	0.1279	-0.1448	-0.1066
Adj. R^2 (%)	99.17	99.17	96.99	96.76	98.71	98.69

Differences Fama and French (2015) 5-factor model						
	EMI. HIGH - EMI. MEDIUM		EMI. HIGH - EMI. LOW		EMI. MEDIUM - EMI. LOW	
	Equally W.	Value W.	Equally W.	Value W.	Equally W.	Value W.
α_p	0.0008	0.0020	0.0016**	0.0004	0.0008	-0.0016
α_D	0.0024	0.0019	-0.0018*	-0.0001	-0.0042**	-0.0020
β_{MKT}	-0.0462	-0.0995***	-0.0368**	-0.0256*	0.0095	0.0738***
β_{MKT*D}	0.0520	0.1312***	0.0701***	0.0373*	0.0182	-0.0939**
β_{SMB}	-0.6047***	-0.6092***	-0.2790***	-0.1677***	0.3257**	0.4415**
β_{SMB*D}	-0.0077	-0.1154	0.0134	0.0525	0.0211	0.1679
β_{HML}	0.1009	-0.0518	0.1346*	-0.0914**	0.0337	-0.0396
β_{HML*D}	-0.0835	-0.0626	-0.0871	0.0613	-0.0036	0.1239
β_{RMW}	-0.0624	-0.1514	0.0495	-0.0579	0.1118	0.0935
β_{RMW*D}	-0.0376	-0.0300	0.0450	0.2468***	0.0825	0.2768
β_{CMA}	0.3020	0.4518	-0.0485	0.0478	-0.3505	-0.4040
β_{CMA*D}	-0.1342	-0.1854	0.0960	0.0492	0.2302	0.2346

Fama and French (2018) 6-factor model						
	EMI. HIGH		EMI. MEDIUM		EMI. LOW	
	Equally W.	Value W.	Equally W.	Value W.	Equally W.	Value W.
α_p	-0.0024***	-0.0022***	-0.0033	-0.0037	-0.0041***	-0.0025***
α_D	0.0006	0.0013	-0.0019***	-0.0015	0.0025*	0.0013
β_{MKT}	1.0533***	1.0562***	1.1016	1.1422***	1.0930***	1.0777***
β_{MKT*D}	0.0063	0.0042	-0.0420*	-0.1041*	-0.0653	-0.0305
β_{SMB}	-0.1386	-0.2178***	0.4643	0.4037	0.1377	-0.0464
β_{SMB*D}	0.0234	0.0579	0.0195	0.1389	0.0093	0.0054
β_{HML}	-0.1297	-0.2433***	-0.2243	-0.2333	-0.2554*	-0.1647
β_{HML*D}	0.0183	0.0340	0.1281	0.1915	0.1047	-0.0236
β_{RMW}	-0.1754**	-0.2462***	-0.1046	-0.1503	-0.2129*	-0.2053**
β_{RMW*D}	-0.0752	0.0354	-0.0476	0.1186	-0.1325	-0.1940
β_{CMA}	0.0687	0.0789	-0.2342	-0.3675	0.1160	0.0327
β_{CMA*D}	-0.0402	-0.0328	0.0636	0.0963	-0.1428	-0.0750
β_{MOM}	-0.0024	0.0153	0.0066	-0.0436	0.0103	-0.0027
β_{MOM*D}	-0.0068	-0.0393	0.0165	0.0721	-0.0114	-0.0303
Adj. R^2 (%)	99.13	99.14	96.87	96.64	98.66	98.65

Differences Fama and French (2018) 6-factor model						
	EMI. HIGH - EMI. MEDIUM		EMI. HIGH - EMI. LOW		EMI. MEDIUM - EMI. LOW	
	Equally W.	Value W.	Equally W.	Value W.	Equally W.	Value W.
α_p	0.0009	0.0015	0.0017*	0.0003	0.0008	-0.0012
α_D	0.0025	0.0028	-0.0019*	0.0000	-0.0044**	-0.0028
β_{MKT}	-0.0483	-0.0861**	-0.0397**	-0.0215	0.0086	0.0645**
β_{MKT*D}	0.0482	0.1083**	0.0716***	0.0348*	0.0233	-0.0736*
β_{SMB}	-0.6029***	-0.6215***	-0.2764***	-0.1714***	0.3265**	0.4501
β_{SMB*D}	0.0040	-0.0810	0.0141	0.0525	0.0102	0.1335
β_{HML}	0.0946	-0.0101	0.1256*	-0.0787	0.0311	-0.0686
β_{HML*D}	-0.1098	-0.1575	-0.0864	0.0576	0.0235	0.2150
β_{RMW}	-0.0708	-0.0959	0.0375	-0.0409	0.1084	0.0549
β_{RMW*D}	-0.0276	-0.0831	0.0573	0.2294**	0.0849	0.3125
β_{CMA}	0.3029	0.4464	-0.0473	0.0462	-0.3502	-0.4002
β_{CMA*D}	-0.1038	-0.1292	0.1026	0.0422	0.2065	0.1714
β_{MOM}	-0.0090	0.0589	-0.0127	0.0180	-0.0037	-0.0409
β_{MOM*D}	-0.0233	-0.1115	0.0046	-0.0091	0.0279	0.1024

This table shows the regression estimates of the Fama and French (2015) five-factor model (eq. 8) and of the Fama and French (2018) six-factor model (eq. 9) with a dummy variable for the period between August 2017 and July 2022, regarding the equally and value weighted Emissions portfolios of our Covid-19 sample (309 funds). It also presents the regression estimates for the difference between portfolios. The table reports the abnormal returns (αp), the returns differential after the Covid-19 outbreak (α_D), the systematic risk (β_{MKT}), the regression coefficients of size (SMB), book-to-market (HML), profitability (RMW), investments (CMA) and momentum (MOM) factors, and the β coefficients for after Covid-19 (β_{MKT*D}, β_{SMB*D}, β_{HML*D}, β_{RMW*D}, β_{CMA*D}, β_{MOM*D}). The Adj. R^2 refers to the adjusted coefficient of determination. Standard errors were corrected for heteroscedasticity and autocorrelation by following Newey and West (1987), and as in Baum (2006), the number of lags is determined by the rule of thumb: $^4\sqrt{N}$, where N is the number of observations. To identify the statistical significance of the coefficients, asterisks were used to represent the level of significance of 1% (***), 5% (**) and 10% (*).

6. Conclusion

This dissertation explores the performance of French mutual funds with a geographical focus on Europe. For this purpose, two performance evaluation models were used: the Fama and French (2015) 5-factor, and the Fama and French (2018) 6-factor models. The performance of funds is first evaluated from January 2010 to July 2022 using the multi-factor models in a conditional setting, allowing for both time-varying betas and time-varying alphas (Christopherson et al., 1998).

Since the Covid-19 outbreak, we have been facing challenges on multiple fronts, from rising energy and food prices to a highly uncertain global outlook. Therefore, after exploring the global performance on a longer period, we focus on two different subperiods: One before the Covid-19 outbreak from August 2017 to January 2020, and another after it, from February 2022 to July 2022. Thereby, a dummy variable was added to the models, not only in the alpha term but also in the risk factors (Areal et al., 2013; Leite & Cortez, 2015; Silva and Cortez, 2016), to distinguish between subperiods. Performance is investigated across different criterion of sustainability, namely the SFDR categorization, the French SRI label, and Refinitiv ESG, Environmental and Emissions scores.

Furthermore, we investigate mutual funds' flows, first around the Covid-19 to understand if investors prioritized sustainability during the crisis and, second, around the publication period of the SFDR to verify whether investors valued more these funds after this classification came into force.

The dataset used in the longer timespan for the performance evaluation includes 303 mutual funds, while the one used in the Covid-19 analysis includes 309 mutual funds. We were able to divide the Covid-19 sample into different groups of sustainability by retrieving SFDR classification and Refinitiv sustainability scores from Refinitiv Eikon Lipper Fund, and SRI information from the official website of the label.

For what regards investors response to sustainability around the Covid-19, our study of fund flows evolution allowed us to observe that investors gave preference to the SFDR categorization of article 9 over the article 8, and preference to article 8 over the article 6/Undefined, with more sustainable funds showing a clear superior growth, mainly after the Covid-19 outbreak. The same behaviour is observed in relation to SRI labelled funds when compared to non-labelled funds, with SRI labelled funds revealing a superior growth, which is slightly more pronounced in the months after the pandemic. However, in relation to sustainability scores of Refinitiv Eikon, we cannot directly associate

higher scores of sustainability with higher fund flows. Overall, results show a higher increase of fund flows in respect to more sustainable funds, namely funds with the SFDR categorization of article 9 and article 8 and SRI labelled funds, being this prioritization more evident after the Covid-19 crash. These results are in line with some previous studies such as Ferriani and Natoli (2020) and Pástor and Vorsatz (2020).

In the analysis of fund flows around the publication date of the SFDR, we observed that, as the publication date gets closer, the flows start to grow apart, with article 9 and 8 funds experiencing a clear growth whereas flows of article 6/Undefined funds decrease. Our findings are consistent with those ones of Becker et al. (2022), who analyse the effect of the SFDR on investors and find that a better ESG label led to larger fund net inflows after the public disclosure of the SFDR classification. This also goes in line Ceccarelli et al. (2021), who report that funds first labelled as LCD enjoyed a significant increase in their monthly net flows relative to non-labelled funds.

Overall, this dissertation shows that, in general, there are no financial gains in investing in these mutual funds. Nonetheless, when comparing performance across different levels of sustainability, we observe that more sustainable funds either outperform or at least perform as well as less sustainable funds.

Indeed, our results, show a statistically significant outperformance of the article 9 SFDR equally weighted portfolio over the article 8 SFDR portfolio in the Fama and French (2018) 6-factor model. The article 9 SFDR portfolios also perform better than the SFDR 6/Undefined portfolios. Furthermore, the equally weighted portfolio of article 8 funds outperformed those classified as SFDR 6 or Undefined. In relation to SRI labelled portfolios, we concluded that the SRI labelled equally weighted portfolio outperformed the non-labelled portfolio.

When investigating performance across different levels of environmental scores, we find that the medium-rated equally weighted portfolio outperformed its low-rated peer (the least sustainable portfolio). Regarding the emissions scores, we find that the high-rated equally weighted portfolio performed better than the low-rated one in the Fama and French (2015) 5-factor model.

As to abnormal returns pre- and post-covid, in general, our results show that the pandemic did not influence performance in a statistically significant manner. The only exceptions show an increase in performance after the Covid-19 outbreak. This was observed in the Fama and French (2018) 6-factor model with respect to the high-rated ESG value weighted portfolio, which experiences a statistically

significant increase in performance in the post pandemic period. Similarly, when portfolios are formed based on emissions, the medium-rated value weighted portfolio in the Fama and French (2015) 5-factor model, as well as the medium scored equally weighted portfolio in the Fama and French (2018) 6-factor model, show an improvement in performance after the outbreak of the pandemic.

To conclude, it is important to refer some limitations of this research. First, we did not have access to the funds' time series of ESG, Environmental and Emission scores. Therefore, we assume the most recent scores available on Refinitiv Eikon Lipper Fund hold for all the Covid-19 period analysed. Along the same line, we take into consideration the SFDR categorization and the attribution of the SRI label available in June 2022, assuming these fund attributes remained static in the past. Second, we considered sustainability scores only from one data provider (i.e., Refinitiv Eikon), and the definition of the cut-offs for defining different categories of sustainability, namely high, medium and low, were defined by us. Therefore, not only the results are subject to the possibility of sustainability scores differing across data providers, as documented in literature (e.g., Berg et al., 2020), but also to the subjectivity of the cut-offs chosen to define high/medium/low sustainability categories.

For future research, it would be interesting to investigate fund performance based on portfolios of funds that are formed on a dynamic basis, rather than on a static sustainability classification. In addition, an interesting avenue of future research would involve comparing fund performance when funds are ranked based on ESG scores of alternative rating agencies.

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