**FOUNDATION SCHOOL OF COMMERCE ÁLVARES PENTEADO - FECAP**

**ÁLVARES PENTEADO UNIVERSITY CENTER**

**PROFESSIONAL MASTER'S PROGRAM IN ADMINISTRATION**

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# ESG FUND PERFORMANCE AND THE CORONAVIRUS PANDEMIC: AN ANALYSIS OF THE UNITED STATES, ITALY, AND BRAZIL

**São Paulo**

**2023**

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Article (Master's) - Alvares Penteado School of Commerce Foundation - FECAP - Alvares Penteado University Center - Professional Master's Program in Administration.

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ESG fund performance and the coronavirus pandemic: an analysis of the United States, Italy, and Brazil/ Pietro Cavazzoni. - - São Paulo, 2023.

28 p.

Advisor: Profa. Dra. Verônica de Fátima Santana

Article (Master's) - Alvares Penteado School of Commerce Foundation - FECAP - Alvares Penteado University Center - Professional Master's Program in Administration.

1. COVID-19 (Disease) - Economic aspects. 2. Performance indicators - Brazil. 3 Investment funds.

**CDD: 332.6**

Responsible Librarian: Iruama de O. da Silva, CRB-8/10268.

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Article presented to Álvares Penteado University Center, as a requirement for obtaining the title of Master in Administration.

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**São Paulo, 20 de Junho de 2023.**

# ESG Fund Performance and The Coronavirus Pandemic: An Analysis of the United States, Italy, and Brazil

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## Abstract

This research aims to evaluate the relationship between ESG scores and funds performance before and during the COVID-19 pandemic in Italy, Brazil, and the US. The literature on sustainability and investment performance in the stock markets brings mixed results, with some studies showing better performance for responsible investments and others showing worse performance due to, for instance, lower diversification. However, some studies show sustainable investments are more resilient during moments of economic uncertainty so ESG funds could have been a safer investment during the COVID-19 pandemic. Analyzing a total of 3052 funds from the US, 32 from Italy, and 2073 from Brazil from April-2013 to April-2023, and considering four different measures of performance: (i) excess total returns to the risk-free rate, (ii) Sharpe Ratio, (iii) risk-adjusted returns according to the CAPM, and (iv) risk-adjusted returns according to the Four Factor Model, we investigate how are ESG ratings related with funds performance before and during the pandemic. For the Italian funds, neither the ESG scores nor the pandemic period is related to performance. For the Brazilian funds, considering the risk-adjusted returns, though no significant performance is observed for different ESG levels nor during the pandemic in general, funds with higher ESG scores performed better in the pandemic period. For the US, though funds with higher ESG scores performed less in general, they were more resilient during the pandemic, with better (or less bad) performance.

**Keywords:** ESG; Fund Performance; COVID-19; Pricing Models.

## Resumo

Esta pesquisa tem como objetivo analisar a relação entre os escores Ambiental, Social e Governança (ESG) e o desempenho dos fundos antes e durante a pandemia de COVID-19 na Itália, no Brasil e nos Estados Unidos. A literatura sobre sustentabilidade e desempenho de investimentos nos mercados de ações apresenta resultados mistos, com alguns estudos mostrando um melhor desempenho para investimentos responsáveis e outros mostrando um

desempenho pior devido, por exemplo, à menor diversificação. No entanto, alguns estudos mostram que investimentos sustentáveis são mais resilientes durante momentos de incerteza econômica, o que poderia ter tornado os fundos ESG um investimento mais seguro durante a pandemia de COVID-19. Analisando um total de 3052 fundos dos Estados Unidos, 32 da Itália e 2073 do Brasil no período de abril de 2013 a abril de 2023 e considerando quatro medidas diferentes de desempenho: (i) retornos totais em excesso à taxa livre de risco, (ii) Índice de Sharpe, (iii) retornos ajustados ao risco de acordo com o Modelo de Precificação de Ativos Financeiros (CAPM) e (iv) retornos ajustados ao risco de acordo com o Modelo de Quatro Fatores, investigamos como os escores ESG estão relacionadas ao desempenho dos fundos antes e durante a pandemia. Para os fundos italianos, nem os escores ESG nem o período da pandemia estão relacionados ao desempenho. Para os fundos brasileiros, considerando os retornos ajustados ao risco, embora não seja observado um desempenho significativo para diferentes níveis de ESG nem durante a pandemia em geral, os fundos com escores ESG mais altos tiveram um melhor desempenho no período da pandemia. Para os Estados Unidos, embora os fundos com escores ESG mais altos tenham apresentado um desempenho geralmente inferior, eles foram mais resilientes durante a pandemia, com um desempenho melhor (ou menos ruim).

**Palavras-Chave:** Fundos ESG. Desempenho de Fundo. COVID 19. Modelos de preços.

## 1 Introduction

Environmental, Social, and Governance (ESG) comprehend issues besides the financial ones that are considered to influence corporate behavior (IFAC, 2012). The “Environment” term refers to the awareness of climate change, population growth, and their detrimental impact on the natural environment. The term “Social” encompasses the impact of corporate activities on the communities in which they operate, and the term “Governance” refers to meritocracy, diversity policies in board composition, combating all forms of corruption, pay ethics, etc. (Armstrong, 2020)

Formation of new policies and disclosure norms, like the Global Reporting Initiative (GRI), and the development of various indices formed by companies with good ESG practices all across the globe, like S&P ESG index, S&P Greenex, Environment Sustainability Index (ESI), Environment Performance Index (EPI), show the growing concern and move towards socially responsible investing (Goyal & Aggarwal, 2014). The Securities and Exchange

Commission (SEC) has even proposed a rule requiring public companies to disclose extensive climate information in their registration statements and annual filings (Cai & Kim, 2022).

In the United States (US), MSCI USA ESG Select Index has been designed to target companies with positive ESG factors. It is designed to overweight companies with a high ESG rating and underweight companies with a low rating. Tobacco and controversial weapons companies, as well as the main producers of alcohol, gambling, firearms, weapons of war, and nuclear power, do not qualify for inclusion (Ouchen, 2021). As an example in Europe, The Bank of Italy is committed first of all to sustainable economic development, giving priority in its investment choices to firms that adopt virtuous practices that respect the environment, guarantee inclusive workplaces that are mindful of human rights, and adopt the best corporate governance practices (Bank of Italy, 2019). Finally, as an example in the emerging markets, the S&P/B3 Brazil ESG Index is to serve as a broad representative index of the Brazilian equity market with an improved ESG profile and maintain similar overall industry group weights as the S&P Brazil BMI. In the index, companies with higher ESG scores have a higher weight, and companies with lower scores are incentivized to improve their programs, practices, and policies to help increase their scores and possibly their index weight (Kitchener & Rapoport, 2020).

Inappropriate business conduct can generate costs and risks not only for individual companies but for the economy as a whole and impact financial stability and economic growth, sometimes in the short term as well. Vice versa, companies that are more aware of ESG factors are generally less exposed to operational, legal, and reputational risks, and more oriented towards innovation and efficient resource allocation; this is why they are deemed more interesting by investors and are expected to benefit from lower cost of capital (Bank of Italy, 2019).

The Coronavirus has been a catalyst for change over the past years. The pandemic has increasingly focused attention on both the motivations associated with supporting environmentally and socially conscious companies and the success they can offer investors. The rapid recognition of the role that strategies that consider ESG factors play in investment portfolios has been influenced in part by the changes that investors themselves have experienced during the pandemic period. On the environmental front, Covid has profoundly changed our travel habits, contextualized the industry's ecological damage differently, and caused the quality of the air we breathe to improve, while also contributing tangibly to the reduction in the amount of CO2 emitted globally. Reductions in the number of flights, travel/travel restrictions, and reluctance to travel have had multiple consequences, both

economic and environmental. The stock values of companies that have traditionally scored low on many environmental metrics (airlines, automakers, and oil producers) have suffered major setbacks. The Covid-19 pandemic has highlighted the way companies care for employees, customers, and communities. Remote or socially distant work practices (and work flexibility in general) have become the new norm. At the same time, there are increasing initiatives to reduce social and racial inequalities. The virus has highlighted the gap in society between those who may have varying levels of health care, wealth, and standard of living. Individuals and communities living in poverty have been hit much harder than others. This increasing social awareness has spilled over the investment world.

ESG investments have grown significantly in recent years. According to Morningstar, global sustainable funds attracted $97 billion in net new funds in the first quarter of 2022, despite recent market turbulence and investor concerns about inflation and the war in Ukraine, reaching $2.78 trillion in AUM by the end of the first quarter of 2022 (Merlo, 2022). Plus, in the last few years, the growing supply of index funds and low-cost ETFs has significantly reduced the expense ratio that investors are willing to pay. In response, fund managers are naturally looking for ways to maintain revenue streams, and the hottest topic of the moment is ESG investing.

In this line, the objective of this research is to analyze whether and how ESG scores for mutual investment funds are related to their performance before and during the COVID-19 pandemic in the US, as the leading economic/financial power in the world, in Italy, as a country that is part of Europe and as a developed country, and in Brazil, as a developing country that is part of the BRICS and the most economically/financially important state in Latin America.

To achieve this objective, we first selected a sample of mutual equity funds with a geographical focus on these three countries and collected the weekly total returns from 2015 to 2022, as well as their ESG scores, as available in the Refinitiv database. Next, we estimated each fund's risk-adjusted returns as a measure of their performance and then analyzed whether and how this performance is related to their ESG scores and how the pandemic mediated this relationship.

The contribution that this research wants to bring is to analyze the various funds that invest mostly in ESG companies, highlighting the differences in return with the traditional market. For the academic literature, it is important because funds from the US, Italian, and Brazilian markets are analyzed and compared with each other. For investors, this research is important because it highlights the factor that ESG funds performed better during the Covid-19 crash and therefore they could increase their exposure to ESG funds benefiting from higher

returns without increasing risk factors. As far as fund managers are concerned, this research could be interesting because two countries such as Brazil and Italy are analyzed that many times are undervalued in the geographic exposure of funds, and so thanks to this research they could think about increasing their exposure to these two countries.

## 2 Literature Review

### 2.1 Fund performance

The vast and rich literature on fund performance mostly deals with the different models and methods to measure performance as well as to identify which characteristics, whether of markets or managers, are associated with better or worse performance.

First, we need to identify which instrument is most effectively able to price returns in mutual funds. The Capital Asset Pricing Model (CAPM) is probably the most prevalent in the literature and the industry, despite its commonly found weaknesses, which puts Carhart (1997) and Fama and French (1996)'s four-factor model a closely preferred one. In the context of Brazil, Matos and da Rocha (2009) conducted a study that examined the performance measurement of investment funds. They found that the CAPM is less able to capture common sources of risk among investment funds with larger assets. This performance improves with the inclusion of other factors but is associated with parameter significance issues, a result supported by the predictions in the sample. This result cannot be considered a definitive answer, but it suggests a promising way forward for future studies in which these aspects of investment funds can be better accommodated using a model along the lines of Fama and French.

The general advice for estimating expected return through the use of CAPM (Bartholdy & Peare, 2004) is to use 5 years of monthly data and a value-weighted index. But the authors show that the ability of the beta to explain differences in returns using both the CAPM and the three-factor model of Fama and French does not exceed 5%. One solution that is proposed by the article is the use of more sophisticated estimation techniques to deal with problems such as errors in the variables that appear by using a simple technique. The problem with this solution is that it requires a large amount of data and for this reason, it becomes prohibitively expensive for individual firms. The alternative is for individual firms to use professional beta providers instead of trying to estimate beta themselves, and for professional beta providers to use more complex techniques.

One problem that exists in the selection of data for analysis concerns funds that have merged or failed; this bias is called survival bias. A clear example of this bias can be seen in the study of investment fund performance, where most databases include only funds that exist today, independent of funds that existed in the past. The reason they do not exist today is because their performance was worse than the "survivors," or even multiple funds were merged into one. Therefore, the analyses are conducted on those funds with the best performance, and this bias tends to overestimate the performance of the sample of these funds.

The main problem is no longer just the overestimation of fund performance. Rather, the sample selected would not be a random sample of the total population. And, therefore, the results of the study may not be representative of the population. In the end, this is what we are looking for when we select a random sample of the population.

We are helped by the study of Elton, Gruber, and Blake (1996) which uses a sample of 361 funds classified as having a policy of investing in "common stocks" in the 1977 edition of Wiesenberger's Investment Companies to analyze previous studies of mutual funds and to estimate if they suffer from a survivorship bias, as well as to evaluate how funds that merge with other funds perform better or worse than those that do not merge. The authors find that many studies indeed suffer from survivorship bias, partly because many funds merge. The possible involvement of survivorship bias in the analysis must also be taken into consideration, as well as to evaluate how funds that merge with other funds perform better or worse than those that do not merge.

These two articles focused on how to calculate performance correctly and a bias that should not be underestimated in fund sampling, but the next articles we discuss look at more the competitive aspect of various funds and the aspect that fund managers occupy concerning performance. Massa and Patgiri (2008), for instance, analyzed the impact of contractual incentives on mutual fund performance. The authors analyze whether high-incentive contracts induce managers to take more risk and reduce the probability of fund survival and whether funds with high-incentive contracts offer higher risk-adjusted returns and superior performance remain persistent. The results show that if incentives are higher, it increases both performance and risk such that the higher performance does not persist. If risk-adjusted performance increases, incentives prove to be a useful tool for motivating fund managers and increasing wealth.

Moving to analyze the Brazilian market, da Silva, Pereira, Fonseca, and Iquiapaza (2022) found a persistence of performance from 2010 to 2019 for Brazilian equity funds.

Furthermore, the results tell that in periods of market decline, in general, funds with greater performance persistence in the face of greater competition achieve higher performance.

Another important factor to take into consideration is the analysis of fund managers, an initial analysis to be conducted is whether fund managers with foreign origins in certain regions may possess knowledge or expertise that would allow them to gain a region-specific advantage.

Regarding the analysis of fund managers, we consider two articles, the first study was done to estimate if fund managers with foreign origins in certain regions might possess knowledge or expertise that would allow them to gain a region-specific advantage. In this research, Bai, Tangb, Wanc, and Yuksel (2021) found an economically strong and robust relationship between a fund's offshore concentration and its abnormal performance, and that the foreign origin of fund managers is an important source of information advantage in offshore markets. The results also say that the offshore concentration index (OCI) mainly affects fund performance through better stock selection. Further analysis shows that the operations of offshore concentrated funds generate higher abnormal returns than the operations of offshore diversified funds. Therefore, some fund managers create value by concentrating their portfolios on companies exposed to foreign markets, where they presumably have an informational advantage.

Again regarding the analysis of fund managers, another factor to consider is whether geographical proximity or social networks, or both, can facilitate the transfer of private information to fund managers, and if there is a relationship between European analysts with a country specialization and analysts with a sector specialization. The main result from Banegas, Gillen, Timmermann, and Wermers (2013) tells us that time-varying strategies appear to be successful in part because they better identify country and sector-specific managers with superior skills at a particular point in the business cycle. This result tells us that most of the higher-than-expected return from the market (Alpha) comes from their ability to select funds by country and sector. It also tells us that there are managers with superior skills at the country and sector level, especially those managers who have grown up in the countries in which they invest or have social relationships with people inserted in high-level positions in strategic sectors in which they invest, but that these skills may fluctuate depending on the state of the economy.

### 2.2 ESG investing and fund performance

First, we want to see if it pays to invest in ESG by analyzing the impact of ESG stocks on investment performance. The results from Auer and Schuhmacher (2015) say that the

geographic and sector focus of an ESG-based investment strategy strongly determines its outcome. In the Asia-Pacific region and the United States, ESG stock selection does not consistently increase or decrease investment performance relative to benchmarks and ESG stocks. In Europe, the authors also find no evidence of the superiority of ESG-based strategies. On the contrary, in some sectors and depending on the ESG criterion, investors pay a price for being socially responsible in stock selection, they end up with significantly lower risk-adjusted performance than passive benchmarks.

Again, to evaluate if it pays to invest in ESG, we pick a study that measures the performance of Socially Responsible Mutual Funds (SRMF) before, during, and after a crisis (Das, Chatterjee, Sunder, & Ruf, 2018). The study also goes on to examine whether ESG ratings of SRMFs result in higher risk-adjusted returns after controlling for other fund characteristics, and as the crisis period analyzed it uses the Great Recession. The results indicate that medium and low-rated SRMFs outperformed higher-rated SRMFs during all periods except during the period that overlapped with the Great Recession. Therefore, the results of this study indicate that medium and low-ESG-rated SRMFs were less resilient than those with higher ESG ratings during the economic downturn period. SRMFs with longer management tenure, age, and larger fund size were positively associated with risk-adjusted performance during the period of this study.

In addition, the results of the study from Das, Chatterjee, Sunder, and Ruf (2018) indicate that the performance of the SRMF was not significantly different from that of the market during the economic crisis period, although the SRMF underperformed the market during the overall period of this study. However, the period of existence of the SRMF and the period considered in this study are relatively short considering the more than 100 years of data now available for financial markets.

As an additional analysis, we needed a similar result with a more recent crisis, so we searched for studies that analyzed the differences and relationships between financial returns and sustainability performance of Exchange-Traded Funds (ETF) during the market downturn experienced during COVID-19. One of the articles concerning this point is written by Folger-Laronde, Pashang, Feor, and ElAlfy (2020) and it concludes that the sustainability performance of investments cannot be used alone to determine financial performance. Moreover, the sustainability performance of ETFs does not guarantee that investments are resilient during a market downturn. The statistical evidence from the paper suggests that the sustainability indicators used to measure and evaluate sustainability performance do not properly evaluate the ability to safeguard against financial losses during a market downturn.

Following the confirmations of (Folger-Laronde et al. (2020), the article by Albuquerque, Koskinen, and Santioni (2022) provides us with an explanation of why ESG stocks and ESG funds have performed relatively well during the general market crash due to COVID-19. Portfolio information was obtained from December 2019 to June 2020 for all actively managed US equity mutual funds. The final sample includes 1,699 unique mutual funds with Total Net Assets (TNA) of $3.1 trillion.

The main results of the study by Albuquerque et al. (2022) are that ESG funds, and to a lower extent non-ESG funds, contributed to the documented resilience of sustainable stocks by buying them in aggregate, with equal inflows. Surprisingly, they find that both ESG and non-ESG funds sold their non-sustainable stocks more aggressively during the crash, at equal outflows, which also contributed to the relatively better performance of sustainable stocks during the crash. Similar results are also obtained by separating funds by Low-Carbon designation.

However, investing in ESG also has some critical issues. By analyzing the relationship between the social and financial performance of companies based on ESG ratings, Halbritter, Gerhard, Dorfleitner, and Gregor (2015) can rule out the existence of a relationship between ESG ratings and returns and that it can be exploited with a trading strategy in the sense of Carhart's four-factor model. This result is not only relevant for researchers but also for investors who focus on a portfolio composition based on ESG ratings.

Another point that needs investigation is the implications that disagreement between the various rating companies that deliver ESG ratings could have on the performance of ESG portfolios, Billio, Costola, Hristova, Latino, and Pelizzon (2020) explain that the observed ESG disagreement among rating agencies dissipates the effect of ESG investor preferences on asset prices, to the point that even when there is agreement, the agreement is so weak that it has no impact on the financial performance of ESG portfolios. The theoretical motivation for this result is that the amount invested is so small that there is no significant financial impact. Financial performance would be different if all major ESG rating agencies agreed on a common set of metrics. This would lead to more homogeneous stock selections and, consequently, the identification of a single benchmark. In this way, both active and passive ESG investment funds would have the opportunity to focus their investments on the same securities and thus generate a significant impact on asset prices. In contrast, although sustainable and responsible investing has grown significantly in recent years, there is no difference in financial performance compared to its non-ESG counterpart.

One question we asked was if Morningstar's high or low ESG rating has an impact on fund performance. Steen, Moussawi, and Gjolberg (2019) show there is no difference in volatility and average returns between high and low-rated portfolios, therefore, this result says that there are no current benefits from sustainability screening. The results also show that high-sustainability portfolios have a higher share of idiosyncratic risk, implying a lower rating ratio.

In the study by Statman and Glushkov (2016), who use all funds in the MSCI-ESG database, excluding from the analysis of the Real Estate Investment Trust (REIT) and companies with common stock incorporated outside the United States, such as Accenture Plc (Ireland) or Barrick Gold Corp (Canada). These criteria correspond to 4,904 separate stocks out of a total of 5,576 names in the MSCI-ESG between 1991 and 2011, building a factor model that extends the common four-factor asset-pricing model into a six-factor model by adding two social responsibility factors. They use this model as a tool to classify mutual funds as socially responsible mutual funds and to measure their performance. The results indicate that the lack of statistically significant differences between the performance of socially responsible mutual funds and conventional mutual funds is likely the result of socially responsible investors' preference for stocks of companies with the Top-Bottom Factor (TMB, that is reflecting criteria such as good employee relations) and the Accepted-Shunned factor (AMS, that is reflecting criteria such as the exclusion of high tobacco companies).

In our study, it is crucial to analyze whether systematic ESG-related risk is priced by the mutual fund market. Is the study of Jin (2017), who analyze large value, large blend, large growth, mid-cap value, mid-cap blend, mid-cap growth, small value, small blend, and small growth. US-domiciled equity funds denominated in USD and invested in the United States are then selected. After that, all available funds, alive and obsolete, during the sample period are included, and funds with a track record of more than 60 months are selected. Concluding that the recent growth in Responsible Investing (RI) can be more intuitively explained through the extended six-factor model which is a five-factor model (the five factors are market risk, the outperformance of small versus big companies, the outperformance of high book/market versus small book/market companies, profitability, and investment) plus one factor that indicates the exposure to ESG-related factor.

According to Jin (2017), by refining the six-factor model, investors can better understand the significant role of the systematic ESG-related factor and the nature of the observed return difference between RI and Conventional Investing (CI), broadening the extent to which ESG weighting contributes to financial performance by properly accounting for the downside protection offered by RI. A prevailing objection against RI is that RI should give up

financial performance to some extent because it inherently imposes limits on diversification. RI can still add value by providing downside protection even when its ex-post performance is considered suboptimal. Institutional investors, who have missions closely associated with asset protection, would have a positive preference for the downside protection offered by RI.

Now that we have analyzed all the characteristics and performance of funds that invest in ESG companies, it is time to ask whether socially responsible (SR) mutual funds are generally more ethical than conventional mutual funds. To obtain a measure of actual risk-adjusted performance, Utz and Wimmer (2014) used the Sharpe ratio in the revised form of Sharpe (1994), which quantifies the trade-off between return and volatility. The financial results show no convincing evidence documenting either outperformance or underperformance of SR mutual funds. When considering pure average excess return, both types of funds show rather depressing results. Moreover, no fund type was able to generate positive alpha on average. They consider their results regarding ethical performance as partly surprising. According to the authors, ISR is a heterogeneous investment sector, with different strategies concerning all kinds of environmental, social, and ethical issues. However, all of these funds operate under the "SRI" label. Analyzing if these SR mutual funds are more ethical in general than conventional mutual funds. An investor who wants to avoid the least ethical funds among those available can do this by purchasing SR mutual funds. Analyzing the fund's actual holdings, there is no guarantee, in any way, that the label "SR mutual fund" will exclude firms that are clearly unethical.

The SEC's proposals to contrast this phenomenon are two. The first one aims to expand regulation on fund naming, and the second one aims to improve and standardize disclosures of ESG factors considered by funds and advisers. In Europe, a similar anti-greenwashing regulation, known as the Sustainable Finance Disclosure Regulation (SFDR), aims to prevent fund companies from exaggerating sustainability claims to make their products seem more attractive and to provide more clarity to investors seeking to get a clearer picture. Cai and Kim (2022) conclude that regulators are taking serious steps to identify misconduct, so the initial advantages that fund managers pioneering this industry used to charge outsized fees could disappear quickly.

## 3 Methodology

### 3.1 Sample and data

The sample and data used in this thesis focused on three countries: the United States as the strongest and most developed capital market in the world; Italy as a developed European

economy, and Brazil as it represents a developing economy part of the acronym BRICS (Brazil, Russia, India, China, South Africa). The period used in the analysis of funds is from April 2013 to April 2023 to investigate the impact of the pandemic on funds' performance. We selected equity funds with a geographical focus only on Brazil, the United States of America, and Italy. This yielded 3,051 funds for USA., 2,061 for Brazil, and 32 for Italy.

### 3.2 Data analyses

Funds' performance is measured in four different ways. First, we use excess returns over the risk-free rate, the Sharpe Ratio, which is a unit of return for each unit of risk, calculated as the ratio between the excess returns and their standard deviation in each year for each country. Further, we consider two asset pricing models to yield risk-adjusted returns as the other two measures for the funds' performance. First, we estimate the Capital Asset Pricing Model (CAPM), used in the studies of Banegas et al. (2013), Auer and Schuhmacher (2015), da Silva et al. (2022), Utz and Wimmer (2014), and then, the Four Factor Model, which was used for the articles of Das et al (2018), Halbritter et al. (2015) and Matos and da Rocha (2009).

#### *3.2.1 CAPM*

The CAPM as Ross, Westerfield, Jaffe, and Lamb (2015) said is one of the most widely used models for defining the cost of capital. For the CAPM, the expected return on an asset is a linear function of only three variables: the beta (asset sensitivity to market return), the risk-free rate of return, and the expected market rate of return, according to the following formula:

$$r_{it} - r_{ft} = \alpha + \beta(r_{mt} - r_{ft}) + \varepsilon_{it}. \qquad (1)$$

In Equation (1), $r_{it}$ is the corresponding value of the total return of the investment in the fund $i$ in the month $t$, $r_{ft}$ is the risk-free rate, $\beta$ is the beta of the investment, $r_m - r_f$ is the Market premium, and $\varepsilon_i$ is the idiosyncratic risk, with zero mean. Therefore, we estimate Equation (1) separately for each country, using Ordinary Least Squares (OLS), and extract the residuals as the CAPM risk-adjusted returns for each fund in each month ($r_{it}^{CAPM}$).

The CAPM is based on some strong premises, including that the investments are short-term (you ignore what can happen in the long run), that there are no fees or transaction fees on trading, that all investors use the Markowitz portfolio selection model, and that investor expectations are consistent. But Matos and da Rocha (2009) point out that the CAPM is not

able to capture the common sources of risk among investment funds, especially those with higher equity and a higher yield accumulated than the market.

### *3.2.2 Four Factor Model*

The three-factor model proposed by Fama and French (1996) is an alternative to the CAPM for estimating the expected return. In this model, to explain the excess yield that remains with the CAPM, two additional factors are included: the size and the relationship between the book and market value. Therefore, for every stock, to estimate the excess return, the estimates of the beta for each of the factors from the following regression of the time series are obtained:

$$r_{it} - r_{ft} = \alpha + \beta_1(r_{mt} - r_{ft}) + \beta_2 SMB_t + \beta_3 HML_{\ t} + \varepsilon_{it}. \qquad (2)$$

In Equation (2), $SMB$ (Small Minus Big) is the historic excess returns of small-cap companies over large-cap companies, and $HML$ (High Minus Low) means the historic excess returns of value stocks (high book-to-price ratio) over growth stocks (low book-to-price ratio).

The three-factor model, however, failed to explain the trend of continuous short-term yields. For this reason, Carhart (1997) builds a four-factor model using the 3-factor model of Fama-French (Fama & French, 1996), plus an additional factor capturing the 12-month returns trend (momentum effect). The fourth factor is formed as the difference between the return on a portfolio of shares in companies that have had the highest returns in the last 12 months and a portfolio of shares in companies that have had the lowest returns in the last 12 months. This fourth factor is denoted as $WML$ (Winners minus Losers):

$$r_{it} - r_{ft} = \alpha + \beta_1(r_{mt} - r_{ft}) + \beta_2 SMB_t + \beta_3 HML_{\ t} + \beta_4 WML_t + \ \varepsilon_{it}. \qquad (3)$$

Therefore, we estimate Equation (3) separately for each country, using OLS, and extract the residuals as the Four-Factor risk-adjusted returns for each fund in each month ($r_{it}^{4F}$).

To estimate the models from Equation (1), the CAPM, and Equation (3), the Four-factor Model, we collected data on the risk factors and the risk-free rates from Keneth French's Data Library[i] for the US and Italy (for which we considered the European data), and from the Center for Research in Financial Economics (Nefin) of the University of São Paulo (USP)[ii] for Brazil.

### *3.2.3 Fund Performance and ESG in the COVID-19 Pandemic*

The last step of the research is to analyze how ESG scores are associated with funds' performance before and during the COVID-19 pandemic. For each country sample, we estimate Equations (4), (5), (6), and (7) for each of the four performance measures:

$$r_{it} - r_{ft} = \beta_0 + \beta_1 ESG_i + \beta_2 COVID_t + \beta_3 ESG \times COVID_{it} + \varepsilon_{it}; \quad (4)$$

$$SharpeRatio_{ft} = \beta_0 + \beta_1 ESG_i + \beta_2 COVID_t + \beta_3 ESG \times COVID_{it} + \varepsilon_{it}; \quad (5)$$

$$r_{it}^{CAPM} = \beta_0 + \beta_1 ESG_i + \beta_2 COVID_t + \beta_3 ESG \times COVID_{it} + \varepsilon_{it}; \quad (6)$$

$$r_{it}^{4F} = \beta_0 + \beta_1 ESG_i + \beta_2 COVID_t + \beta_3 ESG \times COVID_{it} + \varepsilon_{it}. \quad (7)$$

In Equations (4), to (7), $ESG$ is the ESG Combined Score for each fund (time constant variable), $COVID$ is a dummy variable indicating the months from April-2020 to March-2023. If $\beta_1$ is positive and statistically significant, it means that funds with a higher ESG Combined Score have higher returns. If $\beta_2$ is negative and statistically significant, it means that funds have lower returns during the COVID-19 pandemic. Finally, if the interaction between the $ESG$ and $COVID$ variables is positive and statistically significant, it means that, during the pandemic, funds with higher ESG scores performed better (or less bad). The next section brings details about Refinitiv's ESG scores.

### *3.2.4 Refinitiv's ESG measures*

Refinitiv's ESG scores are a data-driven evaluation of companies' relative ESG performance and capacity, incorporating and accounting for industry materiality and company size biases (Refinitiv, 2022). The model includes two overall ESG scores: (i) ESG score, which measures a company's ESG performance based on verifiable data in the public domain, and (ii) ESGC score, which overlays the ESG score with ESG controversies to provide a comprehensive assessment of the company's sustainability impact and conduct over time.

The availability of the two overall scores and the underlying category ratings allows users to adopt and apply the score that meets their requirements, mandates, or investment

criteria. According to Refinitiv (2022), the model is fully automated, data-driven, and transparent, making it free of subjectivity and hidden calculations or inputs.

The ESG scores from Refinitiv capture more than 630 company-level ESG measures, which are grouped into 10 categories that form the scores of the three pillars and the final ESG score, which reflects the company's ESG performance, commitment, and effectiveness based on publicly reported information. The environmental pillar comprises three categories: resources use, emission, and innovation; the social pillar comprises four categories: workforce, human rights, community, and product responsibility; and the governance pillar comprises the remaining three categories of data: management, shareholders, and CSR strategy. Each pillar score is a relative sum of the category weights, which vary by industry for environmental and social categories. For governance, the weights remain the same for all sectors. Pillar weights are normalized to percentages between 0 (lowest) and 100 (highest). The ESG score is formed by these three pillars (Refinitiv, 2022).

The ESGC score comprises the ESG score in addition to the ESG controversies, as noted from global media sources, aiming to discount the ESG performance score based on negative media stories. When companies are involved in ESG controversies, the ESGC score is calculated as a weighted average of ESG scores and ESG controversies by fiscal period, with recent controversies reflected in the most recently completed period. When companies are not involved in ESG disputes, the ESGC score is equal to the ESG score (Refinitiv, 2022). The methodology is the same for all countries.

## 4 Results

### 4.1 Descriptive analyses

Table 1 shows some macroeconomic variables for the three countries of the sample, namely the Gross Domestic Product (GDP), Imports, Exports, and Stock Market Capitalization, using data from the World Bank[iii] for the year of 2021.

Table 1
**Macroeconomic variables**

| | Italy | Brazil | US |
|---|---|---|---|
| GDP | 2110 B US$ | 1610 B US$ | 23300 B US$ |
| Imports | 639 B US$ | 307 B US$ | 3400 B US$ |
| Exports | 688 B US$ | 323 B US$ | 2540 B US$ |
| Market capitalization | 800 B US$ | 990 B US$ | 40000 B US$ |

Table 1 shows the US has the largest economy and stock market, as measured by the US$ GDP and Stock Market Capitalization, respectively, followed by Italy, and then, Brazil. The pattern is similar to the trade variables. The economic data of Italy and Brazil are similar, but we must take into consideration that Brazil has four times the population of Italy and covers a territory almost 30 times the size of Italy.

Table 2 shows the descriptive statistics of the ESG scores for each country. ESG Combined Score is an overall company score based on the reported information in the environmental, social, and corporate governance pillars (ESG Score) with an ESG Controversies overlay. The environmental pillar comprises measures on resource use, emissions, and innovation. The social pillar comprises measures on workforce, human rights, community, and product responsibility. The governance pillar comprises measures on management, shareholders, and Corporate Social Responsibility (CSR). Higher values indicate better scores[iv].

The first thing that can be seen from Table 2 is that the number of listed funds in Italy is only 32, which can be attributed to two different factors. First, the Italian economic structure is characterized by several small-to-medium-sized companies that are not listed on the stock exchange, this has contributed to the insufficient development of the Italian stock market, both compared with Europe and compared with the United States and Brazil. The second factor is the aggressive fight that the European Union is implementing against greenwashing, recently the European Union approved the Sustainable Finance Disclosure Regulation (SFDR) intending to provide tools that can enable investors to orient themselves in the diverse world of ESG funds. This plan incorporates a set of interconnected regulations designed to promote sustainable investments, the SFDR helps investors by requiring greater transparency in indicating how well financial products consider environmental and social characteristics, constitute sustainable investments, or set sustainable goals. The idea is for this information to be presented in a more standardized way to help investors distinguish and compare the many sustainable investment strategies. Accordingly, we notice that the mean and median of all the main ESG indicators are higher in the Italian-domiciled funds except for the ESG Controversial Score where we see an equality between Brazil and Italy while for the US it remains lower.

Regarding the ESG Combined Score index, we see that funds domiciled in Italy present a standard deviation that is half of Brazil and the United States, we also note that the lowest and the highest value present in the data are from funds domiciled in Brazil.

Table 2
**ESG variables**

| | | N | Mean | Median | Standard Deviation | Minimum | Maximum |
|---|---|---|---|---|---|---|---|
| ESG Combined Score | US | 3085 | 53,93 | 55,06 | 6,27 | 24,77 | 69,2 |
| | Italy | 32 | 64,08 | 64,92 | 3,27 | 55,17 | 69,14 |
| | Brazil | 2073 | 53,05 | 54,15 | 7,35 | 11,05 | 81,25 |
| Environment Pillar Score | US | 3085 | 55,25 | 62,05 | 16,62 | 3,3 | 86,1 |
| | Italy | 32 | 69,41 | 72,76 | 9,72 | 40,82 | 81,69 |
| | Brazil | 2073 | 54,49 | 54,6 | 10,28 | 6,5 | 92,72 |
| Social Pillar Score | US | 3085 | 67,24 | 72,07 | 11,5 | 29,62 | 88,4 |
| | Italy | 32 | 77,46 | 78,84 | 6,39 | 59,69 | 86,01 |
| | Brazil | 2073 | 65,81 | 66,57 | 7,97 | 16,26 | 92,02 |
| Governance Pillar Score | US | 3085 | 65,82 | 68,15 | 7,39 | 21,17 | 80,61 |
| | Italy | 32 | 70,65 | 71,54 | 5,96 | 56,67 | 80,18 |
| | Brazil | 2073 | 61,11 | 61,7 | 9,25 | 13,15 | 95,18 |
| ESG Controversies Score | US | 3085 | 68,53 | 63,14 | 20,37 | 11,64 | 100 |
| | Italy | 32 | 76,38 | 73,65 | 11,48 | 58,77 | 100 |
| | Brazil | 2073 | 75,86 | 77,99 | 16,4 | 4,99 | 100 |

Regarding the Environmental Pillar Score index, we see how Brazil- and Italy-domiciled funds present a standard deviation that is almost identical, and the US-domiciled ones are 50% higher, with the lowest value in the US-domiciled funds and the highest value in the Brazil-domiciled funds. For the Social Pillar Score index, we see how funds domiciled in Brazil and Italy present a very similar standard deviation and the US ones about 60 percent higher, with the lowest and highest values present in funds domiciled in Brazil. For the Governance Pillar Score index, we find the lowest standard deviation is in the Italian-domiciled funds with a 50% higher level in Brazil, while in the US-domiciled funds, the standard deviation is twice as high as the Italian ones, with the lowest and highest values present in the Brazilian-domiciled funds.

Regarding the ESG Controversial Score index, we see that the lowest standard deviation is present in funds domiciled in Italy with a 50% higher level in Brazil, while in funds domiciled in the United States, the standard deviation is about twice as high as in Italy, and the minimum value is present in funds domiciled in Brazil and the maximum value of 100 we can find in funds domiciled in each of the 3 countries considered in the analysis. An interesting fact that we can find is that in all the indicators we analyzed the minimum value is significantly always higher for funds domiciled in Italy.

Tables 3, 4, and 5 show the descriptive statistics for the total returns in excess of the risk-free rate ($r_i - r_f$), the Sharpe Ration, and the excess risk-adjusted returns according to the

CAPM ($r_i^{CAPM}$) and to the Four-Factor Model ($r_i^{4F}$) for, Italy, Brazil, and the US samples, disaggregated between the before (April-2013 to Dec-2019) and during (Jan-2020 to April-2023) COVID-19 periods.

Table 3
**Descriptive statistics for Italy sample**

| | Variable | N | Mean | Standard Deviation |
|---|---|---|---|---|
| Before COVID-19 | $r_i - r_f$ | 2,170 | 0.652 | 5.243 |
| | Sharpe Ratio | 2,170 | 0.173 | 1.033 |
| | $r_i^{CAPM}$ | 2,170 | -0.009 | 2.665 |
| | $r_i^{4F}$ | 2,170 | 0.019 | 2.418 |
| During COVID-19 | $r_i - r_f$ | 1,215 | 0.592 | 7.575 |
| | Sharpe Ratio | 1,215 | 0.120 | 0.990 |
| | $r_i^{CAPM}$ | 1,215 | 0.017 | 2.672 |
| | $r_i^{4F}$ | 1,215 | -0.034 | 2.326 |

Through Table 3, we analyze the Italian ESG funds before and during COVID-19 and we can see how the discounted return from risk-free and the Sharpe Ratio are similar in the two periods, but lower during the pandemic. Analyzing the risk-adjusted return according to the CAPM, we notice an improved performance during COVID-19, but the opposite is seen with the Four-Factor model.

Table 4
**Descriptive statistics for the Brazil sample**

| | Variable | N | Mean | Standard Deviation |
|---|---|---|---|---|
| Before COVID-19 | $r_i - r_f$ | 66,354 | 0.757 | 8.463 |
| | Sharpe Ratio | 66,227 | 0.088 | 1.031 |
| | $r_i^{CAPM}$ | 66,354 | -0.236 | 4.547 |
| | $r_i^{4F}$ | 66,354 | -0.257 | 4.460 |
| During COVID-19 | $r_i - r_f$ | 68,892 | -0.306 | 10.431 |
| | Sharpe Ratio | 68,838 | -0.042 | 1.044 |
| | $r_i^{CAPM}$ | 68,892 | 0.227 | 4.398 |
| | $r_i^{4F}$ | 68,892 | 0.247 | 4.429 |

Analyzing the Brazilian funds from Table 4, we see that excess returns (and the Sharpe Ratio by extension) were positive before the pandemic but turned negative during the COVID-19 months. However, once controlling for the risk factors of the CAPM (market factor) and the

Four-Factor (market factor plus size, BTM, and momentum factors), we see the opposite: negative returns before the pandemic and positive returns during the pandemic.

Table 5
**Descriptive statistics for the US sample**

| | Variable | N | Mean | Standard Deviation |
|---|---|---|---|---|
| Before COVID-19 | $r_i - r_f$ | 195,830 | 0.874 | 3.926 |
| | Sharpe Ratio | 195,728 | 0.346 | 1.790 |
| | $r_i^{CAPM}$ | 195,830 | 0.001 | 2.004 |
| | $r_i^{4F}$ | 195,830 | 0.022 | 1.984 |
| During COVID-19 | $r_i - r_f$ | 114,810 | 0.625 | 6.744 |
| | Sharpe Ratio | 114,777 | 0.157 | 1.027 |
| | $r_i^{CAPM}$ | 114,810 | But | 3.039 |
| | $r_i^{4F}$ | 114,810 | -0.037 | 2.973 |

For the US funds in Table 5, all returns are lower on average in the pandemic period and, except for the Sharpe Ratio, more volatile (higher standard deviation). The performance is worse when considering the CAPM and Four-Factor risk-adjusted models, whose returns are negative during the pandemic.

In conclusion by analyzing the three tables together we can say that, before the pandemic, US funds had the highest return, followed by the Brazilian funds and then the Italian ones, but during the pandemic, the Brazilian ones suffered the most, showing negative returns. Considering the risk-adjusted returns, the US funds also performed better before the pandemic, but worse during the pandemic.

### 4.2 Regression analyses

Table 6 shows the regression results of Equations (4) to (7) for the Italian sample. The p-value is too high and therefore none of the coefficients are significant, so apparently, there is no relation between Italian funds' returns and their ESG score, before or during COVID-19.

Table 6
**Regression results for Italy**

| | *Dependent variable:* | | | |
|---|---|---|---|---|
| | $r_i - r_f$ | Sharpe Ratio | $r_i^{CAPM}$ | $r_i^{4F}$ |
| | (1) | (2) | (3) | (4) |
| ESG Combined Score | -0.004 | -0.003 | -0.006 | -0.007 |
| | (0.040) | (0.007) | (0.017) | (0.015) |
| COVID-19 | -0.732 | -0.203 | -1.021 | -1.070 |
| | (4.335) | (0.713) | (1.871) | (1.673) |
| ESG Combined Score x COVID-19 | 0.010 | 0.002 | 0.016 | 0.016 |
| | (0.068) | (0.011) | (0.029) | (0.026) |
| Constant | 0.892 | 0.341 | 0.385 | 0.488 |
| | (2.564) | (0.422) | (1.106) | (0.989) |
| Observations | 3,385 | 3,385 | 3,385 | 3,385 |
| $R^2$ | 0.00003 | 0.001 | 0.0001 | 0.0002 |
| Adjusted $R^2$ | -0.001 | -0.0002 | -0.001 | -0.001 |
| F Statistic | 0.033 | 0.746 | 0.130 | 0.258 |

*Note:* $^{*}$p<0.1; $^{**}$p<0.05; $^{***}$p<0.01

Table 7 shows the regression results of Equations (4) to (7) for the Brazilian sample. Considering the excess returns over the risk-free rate and the Sharpe Ratio, we found that during the COVID-19 period, funds performed worse than in the pre-pandemic period, but ESG scores are not relevant to balance this relationship. However, when considering the risk-adjusted returns, both from the CAPM and from the Four-Factor model, we can see that the higher the ESG score, the higher the fund performance during the pandemic. We can say that during the COVID-19 period, if an investor had invested in the Brazilian funds that focused in the ESG area they would have earned better returns than non-ESG Brazilian investment funds.

Table 7
**Regression results for Brazil**

| | *Dependent variable:* | | | |
|---|---|---|---|---|
| | $r_i - r_f$ | Sharpe Ratio | $r_i^{CAPM}$ | $r_i^{4F}$ |
| | (1) | (2) | (3) | (4) |
| ESG Combined Score | -0.004 | -0.001 | 0.001 | 0.001 |
| | (0.005) | (0.001) | (0.002) | (0.002) |
| COVID-19 | -1.297*** | -0.170*** | 0.020 | 0.040 |
| | (0.358) | (0.039) | (0.168) | (0.167) |
| ESG Combined Score x COVID-19 | 0.004 | 0.001 | 0.008*** | 0.009*** |
| | (0.007) | (0.001) | (0.003) | (0.003) |
| Constant | 0.966*** | 0.132*** | -0.277** | -0.306*** |
| | (0.250) | (0.027) | (0.118) | (0.117) |
| Observations | 135,246 | 135,065 | 135,246 | 135,246 |
| $R^2$ | 0.003 | 0.004 | 0.003 | 0.003 |
| Adjusted $R^2$ | 0.003 | 0.004 | 0.003 | 0.003 |
| F Statistic | 140.755*** | 178.127*** | 126.730*** | 151.520*** |

*Note:* $^{*}$p<0.1; $^{**}$p<0.05; $^{***}$p<0.01

Table 8 shows the regression results of Equations (4) to (7) for the US sample. Except for the Sharpe Ratio, we see that over the sample period, funds with a high ESG Combined Score have performed a little less. This is consistent with the results from Auer and Schuhmacher (2015) that investors pay a price for being socially responsible in stock selection. Also, in general, funds performed worsened during the pandemic.

Table 8
**Regression results for the US**

| | *Dependent variable:* | | | |
|---|---|---|---|---|
| | $r_i - r_f$ | Sharpe Ratio | $r_i^{CAPM}$ | $r_i^{4F}$ |
| | (1) | (2) | (3) | (4) |
| ESG Combined Score | -0.003* | 0.003*** | -0.003*** | -0.003*** |
| | (0.002) | (0.001) | (0.001) | (0.001) |
| COVID-19 | -0.554*** | -0.171*** | -0.318*** | -0.375*** |
| | (0.167) | (0.050) | (0.079) | (0.078) |
| ESG Combined Score x COVID-19 | 0.006* | -0.0003 | 0.006*** | 0.006*** |
| | (0.003) | (0.001) | (0.001) | (0.001) |
| Constant | 1.047*** | 0.178*** | 0.174*** | 0.194*** |
| | (0.102) | (0.031) | (0.048) | (0.047) |
| Observations | 310,640 | 310,505 | 310,640 | 310,640 |
| $R^2$ | 0.001 | 0.004 | 0.0001 | 0.0002 |
| Adjusted $R^2$ | 0.001 | 0.004 | 0.00005 | 0.0002 |
| F Statistic | 57.580*** | 373.589*** | 6.140*** | 21.133*** |

*Note:* $^{*}$p<0.1; $^{**}$p<0.05; $^{***}$p<0.01

However, an interesting result from Table 8 is that ESG funds performed better than normal funds during the COVID-19 period, considering the excess returns and the risk-adjusted returns from the CAPM and the Four-Factor models. Therefore, though the pandemic worsened the performance of US equity funds, those focused on higher ESG investments suffered less. Funds with a zero ESG score, during the pandemic, performed 0.554 less (0.318 for the CAPM risk-adjusted returns and 0.375 for the Four Factor risk-adjusted returns). However, funds with the median ESG Combined score level (55.06) performed only 0.246 less[v]. Considering the CAPM risk-adjusted returns, the performance for a fund with a zero ESG Combined Score was 0.318 lower during the pandemic, but funds with the median ESG Score performed 0.012 better during the pandemic[vi]. Considering the Four Factor risk-adjusted results, the performance for funds with a zero ESG Combined Score performed 0.375 less during the pandemic, but those with the median ESG Score performed only -0.045 less[vii].

Considering the results from Tables 6, 7, and 8, we found evidence consistent with better (or less bad) performance for funds with higher ESG scores during the pandemic for both Brazil and the US. These results are consistent with the previous literature that socially responsible investment is more resilient during economic downturns (Albuquerque, Koskinen, & Santioni, 2022). For the Italian funds, the lack of significant results might be due to the lower number of funds in the sample or because of their higher ESG scores, so no difference is found among those with lower and higher scores.

## 5 Concluding Remarks

This research aimed to analyze whether and how ESG scores for investment funds are related to their performance before and during the COVID-19 pandemic, in three different countries: Italy, US, and Brazil. We selected a sample of equity mutual funds with a geographic focus on these three countries and collected weekly total returns from April-2013 to April-2023, as well as their ESG scores, as available in the Refinitiv database.

To estimate funds' performance, we considered risk-free excess returns, the Sharpe Ratio, and risk-adjusted returns according to two asset pricing models (CAPM and the Four-Factor Model). Then, we ran several multiple regressions to intersect the returns with the ESG scores before and during the pandemic.

The results indicate that Brazilian funds performed worse in the period during COVID-19, but those funds with higher ESG scores performed better than the average Brazilian funds during COVID-19. For Italian funds, we cannot say if there are correlations between returns and ESG scores because the coefficients for the Italian sample were not statistically significant. For US

funds, we found that though in general funds with higher ESG scores perform less than the average US fund, during the pandemic, on average US funds with higher ESG scores performed better (or less bad) than those with lower ESG scores.

The fact that the COVID-19 crisis was a health and humanitarian crisis and not "man-made" like, for example, the 2008 or dot-com crisis may have greatly influenced people's thinking by focusing on sustainability and pushed the performance of these funds upward. Therefore, these results show that sustainable investments are particularly resilient during periods of economic uncertainty such as the period during the COVID-19 pandemic, reinforcing the need for investors to focus on investments with higher ESG scores.

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[i] https://mba.tuck.dartmouth.edu/pages/faculty/ken.french/data_library.html
[ii] https://nefin.com.br/
[iii] https://databank.worldbank.org/
[iv] https://www.refinitiv.com/en/financial-data/company-data/esg-data#overview
[v] -0.554 + 0.006*55.06 = -0.246.
[vi] -0.318 + 0.006*55.06 = 0.012.
[vii] -0.375 + 0.006*55.06 = -0.045.