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ARTICLE

Performance of Equity Mutual Funds considering ESG investments, Financial Constraints, and the COVID-19 Pandemic

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ABSTRACT

In this paper, we analyzed the risk-adjusted performance of funds related to Environmental, Social and Governance (ESG-related funds), considering periods of financial constraints and the COVID-19 Pandemic. The database is comprised of 3,840 equity mutual funds in the period from January/2006 to December/2020. Each year, considering daily returns, we employed the Returns-Based Style Analysis to classify each fund as an ESG-related fund or a conventional fund; all funds in the category "Equities - Sustainability / Governance" were also considered as ESG-related mutual funds. Using daily data, for each year, the performance was estimated based on the four-factors model. The main results indicate that, on average, ESG-related funds presented higher risk-adjusted returns during periods of financial constraints. These results suggest that, during market downturns, investors tend to obtain better risk-adjusted returns for investing in green funds. A similar result was observed in relation to the COVID-19 period, suggesting that, based on the methods and procedures used, ESG-related funds achieved a better performance when compared to "conventional" funds during the Pandemic.

KEYWORDS

Investment Funds, Financial Restrictions, ESG Investments

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1. INTRODUCTION

Socially responsible investment (SRI) funds have recently shown expressive growth (Reddy et al., 2017), and there is an intense debate concerning the influence of social criteria in portfolio selection (Leite & Cortez, 2014). The literature has usually demonstrated that SRI fund performances are not statistically different from those of their conventional peers (Renneboog et al., 2008a; Leite & Cortez, 2014, 2015; Reddy *et al.*, 2017; Silva & Iquiapaza, 2017; Syed, 2017). However, SRI funds can outperform their peers during periods of market crisis (Nofsinger & Varma, 2014) and underperform them during non-crisis moments (Renneboog et al., 2008a; Leite & Cortez, 2015).

During recent times, Corporate Social Responsibility (CSR) has drawn the attention of some policy makers and the public in general, increasing the demand for socially and environmentally responsible companies. The Environmental, Social and Governance (ESG) perspective has a particular role in this context. In this way, the growth of the SRI industry can be partly justified by adjustments in regulations concerning companies' disclosure of social, environmental, and ethical issues (Renneboog et al., 2008b; Albuquerque et al., 2020). ESG principles can bring benefits to the stocks and, consequently, to the investors in the financial market (Albuquerque et al., 2020).

Environmental issues, political conditions, human rights, and armed conflicts in various countries have attracted investors' attention towards non-financial criteria for making investments in mutual funds (Renneboog et al., 2008b; Syed, 2017). As a consequence, SRI tends to be based on the growth of investors' social awareness (Petrillo et al., 2016).

Scholars have searched for evidence on sustainability to verify if social conduct can influence firms' financial performances (Leite & Cortez, 2014). In other words, researchers aim to discover if investors pay a price or obtain better returns for investing in green funds (Renneboog et al., 2008a; Nofsinger & Varma, 2014). It means that some research has investigated if investors are tolerant of suboptimal financial performance for satisfying values related to social criteria (Renneboog et al., 2008b).

Investors who make demands for SRI screening aim to link their financial, environmental, social, and ethical goals (Reddy et al., 2017). There are two points of views in this regard: on one hand, following the portfolio theory (Markowitz, 1952), SRI funds' portfolios involve less diversified (Silva & Iquiapaza, 2017), restricted investments. Consequently, these funds' performance can be penalized. Besides, for followers of the efficient market hypothesis, SRI funds cannot outperform their conventional peers (Renneboog et al., 2008b). One the other hand, SRI funds can benefit from higher performance, as their portfolios hold firms related to CSR (Corporate Social Responsibility), which can have better investment opportunities (Leite & Cortez, 2014). Following this approach, an optimization method for SRI portfolios can lead to better financial performance and, consequently, to an increase in the demand for these investments (Oikonomou et al., 2018). The performance of social and environmental investments can also announce good managerial quality even in a non-crisis period, and companies related to environmental disasters can reduce the probability of high expenses (Renneboog et al., 2008b).

Concerning the literature about investment funds, the classification of each fund category is crucial, because it helps investors decide about their investment applications. The Returns-Based Style Analysis (RBSA) is a methodology that involves risk and resource allocation strategies for different portfolios. Thus, one possibility for determining a portfolio style is to figure out the association between fund returns and market factor returns, which represent some market indexes

(Sharpe, 1992; Varga & Valli, 1998). The returns of Brazilian funds are generally associated with some market factors, involving exchange, interest, and inflation rates, besides other indicators related to fixed and variable incomes (Schutt & Caldeira, 2013; Malaquias et al., 2014; Scolese et al., 2015; Maestri & Malaquias, 2017).

The Brazilian fund industry is nowadays the tenth biggest in the world when considering assets under management. Besides equity mutual funds, there are other fund classifications in Brazil, such as fixed income funds and multimarket funds, which are similar to hedge funds in other countries, as well as foreign exchange funds (Anbima, 2018). In the first quarter of 2021, the segment of investment funds in Brazil registered a net inflow of R$ 83.8 billion, which represents an increase of 120% in comparison to the same period of 2020 (Anbima, 2021). However, the month of March/2021 was marked by uncertainties related to the COVID-19 pandemic (Anbima, 2021).

Considering the aforementioned, the main purpose of this paper is to analyze the risk-adjusted performance of ESG-related mutual funds, considering periods of financial constraints and the COVID-19 Pandemic. Particularly, this study intends to i) classify Brazilian equity mutual funds into the ESG category; ii) estimate Brazilian ESG funds' and their conventional peers' performances from 2006 to 2020, and iii) identify the effect of financial restriction periods (and the COVID-19 Pandemic) on Brazilian ESG and conventional funds' performance.

This study can expand such discussion by concentrating its analysis of the effect of allocations based on ESG criteria. Furthermore, investors from developed countries in the past two decades have invested in emerging economies, due to higher returns and reduced risk through portfolio diversification (Basu & Huang-Jones, 2015); therefore, the main results of this paper can contribute to the decision-making process of institutional and individual investors.

Our study contributes to a current state of the literature by investigating the relationship between sustainability and fund performance in the Brazilian context. Despite the increase in SRI's importance, there are few studies about this issue (Silva & Cortez, 2016), particularly in the Brazilian SRI fund industry (Silva & Iquiapaza, 2017). Thus, this paper will provide a more detailed understanding of the Brazilian financial market, focusing on ESG-related investment decisions, while addressing the effect of COVID-19 Pandemic on fund performance too.

Additionally, this paper, different from others, uses the return-based style analysis approach, considering sustainability as a market factor not only to understand the influence of some market factors on fund returns, but also to observe the relevance of sustainability for funds' performance. The appliance of the RBSA methodology in the Brazilian context is crucial because it helps monitoring funds externally and elaborate an adequate characterization of fund styles (Varga & Valli, 1998).

Furthermore, our research analyzes fund performances in distinct scenarios to test the influence of market downturns on equity funds' performance. This means that there will be an analysis presented considering crisis and non-crisis periods. The RBSA methodology can verify variations across the years (Schutt & Caldeira, 2013). In this way, we established specific years that correspond to financial restrictions, such as 2008 (global financial crisis), 2011, and 2013-2015 (based on the behavior of the main Brazilian stock index and on the behavior of equity mutual fund returns). We also analyze the relationship between ESG-related investment decisions and risk-adjusted fund performance in the context of COVID-19 Pandemic.

Another contribution that we point out is Brazilian sample of funds, because, this study goes beyond the use of a specific Brazilian fund classification, named "Sustainability and Governance" to identify ESG funds. In our study sample, ESG funds are separated by fund return sensitivity to the sustainability factor, in other words, the Brazilian Corporate Sustainability Index, based on the RBSA (the sample of this study also considers the funds in the category of "Sustainability and Governance" as ESG-related mutual funds).

2. LITERATURE REVIEW AND HYPOTHESES

We defined two research hypotheses according to sustainability, investment funds, and return-based style analysis literature, with emphasis on market downturns.

Regarding SRI funds, there is no consent in the literature about their performance. Many studies have shown that socially responsible investments are not related to higher returns, since SRI funds perform close to their conventional peers (Renneboog et al., 2008a; Leite & Cortez, 2014, 2015; Reddy et al., 2017; Silva & Iquiapaza, 2017, Syed, 2017). Nonetheless, SRI funds can underperform their peers, which illustrates a situation where investors pay a price for investing in green funds (Renneboog et al., 2008a) or outperform them during market downturns, which demonstrates that there are some moments when investors obtain better returns (Nofsinger & Varma, 2014).

European international funds seemed not to benefit from socially responsible investment. The performance of 54 SRI European funds, which were measured by Carhart's 4-factor model (1997), including the local factor, from 2000 to 2008, was not statistically different from that of conventional European funds (Leite & Cortez, 2014).

Another study in relation to European SRI funds presented that, overall, SRI funds are not significantly different from conventional funds. This paper sample included 17 French SRI funds and 27 British SRI funds from July 2004 to May 2009. The author considered this period to analyze if the global financial crisis in 2007 could interfere with these funds' performance. Their performance was measured by the Sharpe ratio, Jensen's alpha and Treynor. Regarding the main results, he noticed that SRI funds' performance did not differ from that of their conventional peers during pre-crisis periods neither during crises (Syed, 2017).

A study that involved Islamic SRI and conventional mutual funds from 2004 to 2014 found similar evidence; in other words, the results revealed that, in general, SRI funds perform similarly to conventional funds. This study used a risk-return adjusted model, such as Capital Asset Price Model (CAPM) (Reddy et al., 2017).

Another study analyzed the performance of a selection of SRI mutual funds from around the world, specifically from Belgium, Canada, France, Ireland, Japan, Malaysia, the Netherlands, Singapore, Sweden, the UK, and the US, from January 1991 to December 2003. The 440 SRI funds analyzed were related to the following categories: ethics, social responsibility, environment, ecology, and Christian or Islamic values. Then, considering CAPM and Carhart (1997) models, researchers noticed that the alphas of the SRI funds and of conventional funds were not statistically different, except for the SRI in France, Ireland, Sweden, and Japan, where investors used to pay a price for ethics (Renneboog et al., 2008a).

The Brazilian case is similar to those found in international research, as Silva and Iquiapaza (2017) showed. They analyzed 33 SRI funds and 373 equity funds from 2009 to 2016, whose returns were measured by Jensen's alpha and Sharpe index with regressions with panel data. Thus, the main results revealed that SRI and conventional funds had analogous performances during this period. Due to such corroborated evidence, the first hypothesis of this study corresponds to:

- **H_1:** Brazilian SRI funds and their conventional peers have similar performance.

Investment fund styles might not be persistent across the years (Schutt & Caldeira, 2013; Maestri & Malaquias, 2017). It means that, despite there not statistical differences between SRI funds' performance and conventional funds' returns during distinct market scenarios, portfolios based on socially responsible investments can perform different from their peers. It means that SRI funds may underperform their benchmarks (Renneboog et al., 2008a; Leite & Cortez, 2015) or they may hold up better than their conventional peers during market downturns (Nofsinger & Varma, 2014; Becchetti et al., 2015).

The asset management industry around the world has been affected by negative impacts, such as economic recessions (Petrillo et al., 2016) and the COVID-19 Pandemic (Anbima, 2021). Thus, it is important to consider these difficult moments for economies when analyzing investment funds performance.

Studies about corporate social responsibility (CRS) and companies' financial performance are common. In the past 20 years, they have increased the public's attention to CSR and SRI (Petrillo et al., 2016), which highlight the relevance of such issues among scholars in the financial area (Syed, 2017). Moreover, during crisis periods, stocks that follow ESG principles tend to present better performance than their counterparts (Albuquerque et al., 2020).

Consistently with the literature in favor of socially responsible investment (SRI), it is known that companies in stakeholder-oriented economies are more valuable than firms in shareholder-oriented economies (Allen et al., 2007). Moreover, these socially responsible firms may have a more stable situation with communities and regulators, and, consequently, they can be less likely to suffer with market downturns (Nofsinger & Varma, 2014). In accordance with this statement, some researchers have shown that mutual funds have a better performance during market downturns (Glode, 2010; Kosowski, 2011), mostly green funds (Leite & Cortez, 2015; Silva & Cortez, 2016).

Leite and Cortez (2015) revealed that French SRI funds performed better during market financial constraints. Similarly, Carhart's 4-factor model with a local factor (1997) indicated that these investment funds underperformed their conventional peers during a non-crisis period, but they had a better performance during crisis periods: then, they achieved conventional funds' risk-adjusted returns.

Another empirical study analyzed SRI funds' performance during different market scenarios. Silva and Cortez's paper (2016) comprised 9 US and 95 European global green funds from August 1996 to March 2015. Their performance was estimated by Carhart's 4-factor model (1997), and the main evidence demonstrated that green funds' performance increased during a crisis period.

These aforementioned studies have reported that SRI funds especially have performed better during market downturns. Furthermore, some evidence in the literature has shown that SRI funds outperform their conventional peers during periods of financial constraints (Nofsinger & Varma, 2014; Becchetti et al., 2015).

In order to investigate if investors pay or do not pay a price in socially responsible investment (SRI), Nofsinger and Varma (2014) analyzed 240 US equity funds in the SRI category, and they estimated their risk-adjusted abnormal return using factor models by Fama & French (1993) and Carhart (1997). The investigation considered the period from 2000 to 2012 in two distinct moments: crisis periods (2000-2002 and 2007-2009) and non-crisis periods (the other years). Concerning the results, these authors pointed out that SRI funds had an insignificant

underperformance during non-crisis periods, but these funds outperformed conventional funds in a 10% significance level during crisis periods.

Becchetti et al. (2015) analyzed an unbalanced sample with more than 22,000 funds from different origins (Global, North America, Europe, and Asia) and class sizes (large, middle, and small), between 1992 and 2012. This paper sample included SRI and conventional funds, whose performances were estimated by Sharpe ratio and Jensen's alphas. The main results showed that SRI funds outperformed conventional equity funds during the global financial crisis in 2007. Thus, investors seem to obtain better returns for investing in green funds during periods affected by financial constraints. Hence, we propose the second hypothesis:

- **H_2:** Brazilian SRI funds outperform their conventional peers during periods of financial constraints.

3. DATA AND METHODS

3.1. Study Sample

We used the Economatica database to collect data of Brazilian equity mutual funds. The sample period starts in January/2006 and ends in December/2020. The sample includes only equity mutual funds, based on the classification of the Brazilian Securities and Exchange Commission (*Comissão de Valores Mobiliários – CVM*) and following the sub-classifications of the Brazilian Financial and Capital Markets Association (ANBIMA).

Only funds with information for all months in each year were included in the respective year of the study sample. Moreover, funds without information for control variables were excluded. Funds closed to new investments/participants were excluded of the sample too. Table 1 informs the number of funds (and the number of observations) by sub-categories. In the quantitative analysis, to avoid concerns with extreme outliers, the scalar variables were winsorized at 0.02 (0.01 in each tail).

As presented in Table 1, the final sample is comprised of 3,840 equity mutual funds and 19,293 "fund x years" observations (1,286 funds by year, on average).

3.2. Performance Measurement

Some studies about SRI funds' performance have used different factor models for calculating the risk-adjusted abnormal returns, such as the capital asset price model (CAPM), the 3-factor model by Fama and French (1993), and the 4-factor model by Carhart (1997) (Renneboog et al., 2008a; Leite & Cortez, 2014; Nofsinger & Varma, 2014; Leite & Cortez, 2015; Silva & Cortez, 2016; Reddy et al., 2017). Other investigations have estimated fund performance using, for example, Jensen's alpha and Sharpe's ratio (Becchetti et al., 2015; Silva & Iquiapaza, 2017; Syed, 2017). In this study, we consider the Alpha of the four-factor model (three factors from Fama & French, 1993, and the momentum factor from Carhart, 1997) – returns were not multiplied by 100. The analysis considers daily returns and information on the four factors which were extracted from the Brazilian Center for Research in Financial Economics of the University of São Paulo (NEFIN/USP, 2021).

Table 1
Number of funds (and observations) per category

Sub-Category (following ANBIMA)	# funds	# funds x yearobservations
Equities - Dividends	100	648
Equities - IBOVESPA - Active	338	1,044
Equities - IBOVESPA - Active (with Leverage)	17	25
Equities - IBOVESPA - Indexed	26	68
Equities - IBrX - Active	128	476
Equities - IBrX - Indexed	11	46
Equities - Indexed	93	737
Equities - Foreign Investment	335	1,523
Equities - Free	1,992	9,048
Equities - Free (with Leverage)	20	27
Equities - Sectorial	65	450
Equities - Sectorial (Energy)	2	4
Equities - Sectorial (Telecomm.)	5	11
Equities - Small Caps	70	508
Equities - Sustainability / Governance	42	373
Equities - Value / Growth	174	1,042
Equities - Active Index	360	2,660
Mono-Stocks Funds	62	603
Total	3,840	19,293

Source: the authors.

Fund performance was estimated each year (the Alpha of the four-factor model). The Alpha was calculated considering the period from 2006 to 2020, that corresponds to complete years. In this case, the database for fund performance has 15 year/observations by fund (2006-2020) and includes information from January/2006 to December/2020. This variable was called Alpha (the Alpha of the four-factor model, calculated by each year considering daily returns). Table 2 reports the number of positive and negative alphas obtained each year considering three levels of statistical significance: 1%, 5% and 10%.

The results summarized in Table 2 indicate that the number of funds with positive (and negative) performance varies according to the level of significance considered to rank them. Therefore, the quantitative analysis of the paper considers the Alphas in the three different levels of significance to test the hypotheses. In each situation, the alphas that were not statistically significant were replaced by zero; for example, when evaluating funds that presented positive (and negative) Alphas at 1%, those positive Alphas not significant at 1% and those negative Alphas not significant at 1% were replaced by zero for the variable Alpha (sig. 1%). The same reasoning was employed for the levels of 5% and 10%.

Table 2
Number of positive and negative Alphas, per year, with different levels of significance (1%, 5% and 10%)

Year	Nº of Positive Alphas			Nº of Negative Alphas		
	p < 0.01	p < 0.05	p < 0.10	p < 0.01	p < 0.05	p < 0.10
2006	5	12	18	5	5	6
2007	18	23	39	4	5	6
2008	2	3	10	2	12	30
2009	90	165	232	61	107	163
2010	16	50	75	51	124	201
2011	1	3	4	84	231	326
2012	69	187	263	13	29	45
2013	13	58	89	16	56	95
2014	1	25	56	35	126	180
2015	0	9	37	60	128	194
2016	15	79	130	15	38	65
2017	8	43	60	22	74	141
2018	53	203	360	4	10	18
2019	64	197	306	28	71	112
2020	2	23	59	38	124	228

Source: the authors.

3.3. Fund Classification (ESG)

In order to identify funds related to ESG investment, first, based on the information of Table 1, we selected all funds in the category "Equities - Sustainability / Governance". Then, we created a variable called ESG, and funds in the category "Equities - Sustainability / Governance" received 1 in this variable, while the other funds received zero. After this stage, to identify other equity mutual funds that have ESG practices, we developed the Returns-Based Style Analysis - RBSA (Sharpe, 1992; Varga & Valli, 1998) considering four factors: a factor for market returns (Ibovespa), a factor for fixed income (30-day DI Swap), a factor for exchange rate (Dollar), and a factor for sustainable investments (ISE-B3, the Corporate Sustainability Index).

According to the Brazilian Stock Exchange (*Brasil, Bolsa, Balcão* - B3), the ISE-B3 was created in 2005 and can stimulate listed companies in adopting the ESG practices, which also can support the decision-making process of external investors of the financial market (B3, 2021). Regarding the eligible assets for ISE-B3, the following criteria is employed:

> The companies holding the 200 most liquid shares of B3 are invited to participate as eligible. The process presupposes the completion of a questionnaire composed of 7 dimensions: Economic-Financial, General, Environmental, Corporate Governance, Social, Climate Change and Product Nature and up to 40 companies make up the index portfolio (annual term). (B3, 2021).

To the classification of SRI funds, previous literature, in general, has selected specific categories that include some/all of these screenings: environment, social responsibility, ethics, and religion (Renneboog et al., 2008a; Leite & Cortez, 2014; Nofsinger & Varma, 2014; Becchetti et al., 2015; Leite & Cortez, 2015; Silva & Cortez, 2016; Reddy et al., 2017; Silva & Iquiapaza, 2017).

Observing the definition of ISE from B3, our decision related to the use of such index is in line with previous research.

Considering that the factor for market returns (Ibovespa) and the factor for sustainable investments (ISE-B3) can present a positive correlation, we followed two steps to run the RBSA: i) in the first step, each year, for each fund, using daily returns and the RBSA (Sharpe, 1992; Varga & Valli, 1998), we estimated the loadings for three factors: the fixed income factor, the exchange rate factor, and the sustainable investments factor; ii) in the second step, each year, for each fund, using daily returns and the RBSA (Sharpe, 1992; Varga & Valli, 1998), we estimated the loadings for three factors: the fixed income factor, the exchange rate factor, and the market returns factor. Then, for each fund and for each year, we calculated the difference between the loading values for the factors ISE and the Ibovespa (these values were obtained using the multivariate RBSA). By definition, these loadings range from 0 to 1.

The descriptive statistics of these differences (ISE loadings *minus* Ibovespa loadings) indicated that 25% of the observations had a value larger than 0.122, 20% of the observations had a value larger than 0.136, 15% of the observations had a value larger than 0.151, and 10% of the observations had a value larger than 0.179 (p75=0.122; p80=0.136; p85=0.151; p90=0.179). So, we chose the value of 0.175 as a cut point to start the analysis. Therefore, each year, funds with a positive difference between these loadings (ISE *minus* Ibovespa) larger than 0.175 also received 1 in the ESG dummy variable (these funds are presumed to have, in the respective year, more investments considering ESG principles).

Based on the procedures described, the ESG dummy variable includes: all funds in the category "Equities - Sustainability / Governance" (see Table 1) and all funds that, in the respective year, based on the RBSA, presented higher loading value in the ISE factor when compared to the loading value of the Ibovespa factor (a difference higher than 0.175). Using these procedures, we observed that 11.8% of the number of observations are from ESG funds. For a robustness checking, we also developed the analysis using six additional cut points: 0.10; 0.125; 0.15; 0.2; 0.225; and 0.25.

3.4. Financial Restrictions

We considered two criteria to construct the variable related to financial restrictions: i) the average daily returns of equity mutual funds during the period (2006-2020); and ii) the average daily returns of the Ibovespa during the period (2006-2020). We observed that the returns of Ibovespa and the returns of equity mutual funds were negative in the year of 2008, that corresponds to the world financial crisis. Moreover, from 2006 to 2020, the years 2011, 2013 and 2015 also presented negative average values for Ibovespa and fund returns. Finally, 2014 presented negative average returns for equity funds and low average return for Ibovespa.

Therefore, we created a dummy variable for financial restrictions, receiving 1 for the years 2008, 2011, 2013, 2014 and 2015, and zero for the other years. The year of 2020 was marked by the COVID-19 pandemic, but the average daily returns for the Ibovespa and for equity mutual funds were higher than zero. Therefore, we decided to conduct an additional analysis segregating the year 2020 instead of including this year in the variable financial restrictions.

3.5. Hypotheses Tests

As observed in some Brazilian studies about investment funds (Bono Milan & Eid, 2014; Malaquias & Eid, 2014; Malaquias & Mamede, 2015; Malaquias & Pontes, 2018; Guimarães & Malaquias, 2020), some fund characteristics can interfere with fund performance. Thus, we

also considered five variables regarding fund characteristics: the fund's age in the beginning of each year; the fund's Total Net Assets (TNA) in the beginning of each year, represented by the Natural Logarithmic of the TNA; Administration Fees; a dummy for Performance Fees; a dummy for funds of funds.

We employed a panel data regression to test the hypotheses. In order to select the best model (Fixed Effects, Random Effects, or Pooled) we evaluated the results of three tests: Hausman test; the Lagrange Multiplier (LM) Breusch/Pagan; and the Chow test. The results suggested that the Fixed Effects model presented the most appropriate adjustment. Therefore, our analysis is based on the Fixed Effects Model. The quantitative model is presented in Equation 1.

$$Alpha_{it} = \beta_0 + \beta_1 ESG_{it} + \beta_2 Crisis_t + \beta_3 ESG * Crisis_{it} + \beta_4 TNA(NL)_{it} + \beta_5 FoF_{it} + \beta_6 Fee\text{-}Adm_{it} + \beta_7 Fee\text{-}Perf_{it} + \beta_8 Age_{it} + \varepsilon_{it} \quad (1)$$

Where:

Alpha = represents the four factor Alpha, for each year, for each fund; ESG = this is a dummy variable that scores 1 for funds classified as sustainable and 0 for the other cases; Crisis = this is a dummy variable that scores 1 for the years 2008, 2011, 2013, 2014, and 2015, and 0 for the other cases; ESG * Crisis = this is an interaction between the variables ESG and Crisis; TNA(NL) = represents the Natural Logarithmic of the TNA in the beginning of each year; FoF = this is a dummy variable that scores 1 for Funds of Funds and 0 for the other cases; Fee-Adm = represents the maximum amount of management fees that each fund charges (in % per year); Fee-Perf = this is a dummy variable that scores 1 for funds that have performance fees and 0 for the other cases; Age = represents the age of the funds (in years) at the beginning of each year.

To avoid concerns related with multicollinearity, we estimated the Variance Inflation Factor (VIF) for each quantitative model. We also employed the Breusch-Pagan / Cook-Weisberg test to analyze heteroscedasticity in the models and the Shapiro-Wilk test to verify whether the dependent variable follows a normal distribution.

4. RESULTS

4.1. Descriptive Statistics

Table 3 presents the descriptive statistics of study variables. Panel A of Table 3 reports the descriptive statistics for dummy variables, while Panel B of Table 3 informs the descriptive statistics for scalar variables. Concerning funds' performance, measured by the four-factors Alpha, on average these sample funds demonstrated positive risk-adjusted returns (based on daily returns). We considered some specific moments of financial constraints, and these crisis times corresponded to 35.6% of the total number of observations. Moreover, our study had 11.8% of the observations from funds classified as ESG funds (cutoff = 0.175).

Table 3

Descriptive statistics for the study variables

Panel A:					Panel B:					
Variables	n	Mean	Dummy = 1	Dummy = 0	Variables	n	Mean	Std. Dev.	Min	Max
ESG (dif > 0.10)	19,293	0.332	6,410	12,883	Alpha	19,293	0.00078	0.042	-0.114	0.107
ESG (dif > 0.125)	19,293	0.247	4,766	14,527	Alpha (sig. 1%)	19,293	-0.00001	0.016	-0.114	0.107
ESG (dif > 0.15)	19,293	0.166	3,199	16,094	Alpha (sig. 5%)	19,293	0.00037	0.024	-0.114	0.107
ESG (dif > 0.175)	19,293	0.118	2,279	17,014	Alpha (sig. 10%)	19,293	0.00061	0.029	-0.114	0.107
ESG (dif > 0.20)	19,293	0.082	1,582	17,711	TNA(NL)	19,293	17.285	1.689	6.908	23.264
ESG (dif > 0.225)	19,293	0.057	1,100	18,193	Fee-Adm	19,293	1.462	1.140	0.000	4.000
ESG (dif > 0.25)	19,293	0.035	672	18,621	Age	19,293	6.362	5.543	1.000	26.000
Crisis	19,293	0.356	6,876	12,417						
FoF	19,293	0.389	7,503	11,790						
Fee-Perf	19,293	0.383	7,380	11,913						

Source: the authors.

This Table reports the descriptive statistics of the study database. Alpha variable is represented in four different ways: i) Alpha, as the output of the four factor Alpha; and ii) Alpha (sig. 1%), Alpha (sig. 5%) and (Alpha sig. 10%), replacing by zero the four factor Alphas that were not significant at 1%, 5% and 10%, respectively. The variable ESG also varies through different cutoffs, ranging from 0.10 to 0.25.

Notes: Alpha = represents the four factor Alpha, for each year, for each fund (period from January/2006 to December/2020); TNA(NL) = represents the Natural Logarithmic of the TNA in the beginning of each year; Fee-Adm = represents the maximum amount of management fees that each fund charges (in % per year); Age = represents the age of the funds (in years) at the beginning of each year; ESG = this is a dummy variable that scores 1 for funds classified as sustainable and 0 for the other cases; Crisis = this is a dummy variable that scores 1 for the years 2008, 2011, 2013, 2014, and 2015, and 0 for the other cases; FoF = this is a dummy variable that scores 1 for Funds of Funds and 0 for the other cases; Fee-Perf = this is a dummy variable that scores 1 for funds that have performance fees and 0 for the other cases.

Regarding fund characteristics, 38.9% of funds are funds of funds, and 38.3% have performance fees. Additionally, these funds charge, on average, 1.462% as management fees (based on the maximum amount of management fees per year), and the logarithm of the average of Total Net Assets corresponds to 17.285.

4.2. Hypotheses Test

To analyze how ESG funds and their conventional peers perform during different economic scenarios, this paper used a panel data regression, as described in Equation 1. Specifically, the hypotheses tests are conducted through a panel data with fixed effects (after the analysis of the three tests: Hausman test; the Lagrange Multiplier Breusch/Pagan; and the Chow test, the Fixed Effects Model was the most appropriate).

Table 4 presents, for all dependent variables, the non-significant relationship between the variable ESG and funds' estimated alphas. It means that there are not significant differences between SRI's risk-adjusted returns and conventional funds' risk-adjusted returns during non-crisis periods. This evidence is in line with our first hypothesis, which reinforces that SRI funds perform close to their conventional peers, and it endorses previous literature evidence about this subject (Renneboog et al., 2008a; Leite & Cortez, 2014, 2015; Reddy et al., 2017; Silva & Iquiapaza, 2017, Syed, 2017).

In the scenario of financial restrictions, the results suggest a positive and significant effect of the variable ESG on funds' risk-adjusted performance ($p<0.05$ in the four columns). This relationship supports our second hypothesis about SRI funds' better performance during market downturns. It is in line with previous studies (Nofsinger & Varma, 2014; Becchetti et al., 2015) and it buttresses that, during periods of financial constraints, when financial markets usually undervalue, social and environmental screening can reduce the likelihood of high costs (Reeneboog et al., 2008b), and investors tend to obtain higher risk-adjusted returns for investing in green funds (Nofsinger & Varma).

Additionally, we considered five variables as fund characteristics, which are common in the literature about investment funds, for controlling the study econometric model. Two of them (the dummies for Funds of Funds - *FoF*, and for funds that have Performance Fees - *Fee-Perf*) were omitted of the analysis due the use of a fixed effects model. Two variables presented a significant and negative relationship with performance (Age and Funds' TNA). We observed a negative and significant relationship between fund size (TNA-NL) and alphas at the level of 1%. This evidence is not in line with previous literature about investment funds (Bono Milan & Eid, 2014; Malaquias & Mamede, 2015; Malaquias & Pontes, 2018); it suggests that not necessarily larger funds obtain large benefits from scale economies.

In relation to the variable Age, different from Malaquias and Mamede's study (2015), our results suggest that younger funds in the sample tend to present the best risk-adjusted performance. The effect of management fees on the risk-adjusted performance of the funds was not statistically significant in our analysis. This result is different from Malaquias and Eid (2014), which demonstrated that this fee can be related to the way funds perform.

As a robustness check, we developed an additional round of analysis, and the main results are summarized in Appendix A. In the case of these new analyzes, we considered other cutoffs to classify the funds of the sample as ESG-related funds, also keeping the analysis with four dependent variables. The main results indicated that the crisis period had a negative and significant effect (at 1% in all cases) on a fund's performance. Moreover, the performance of ESG funds was positive during the crisis period in the majority of the models (20 models), reinforcing the role of ESG

investments during market turmoil. In relation to the performance of sustainable funds during non-crisis periods, it was better than the performance of conventional funds only in 9 of the 28 models tested. Another result that deserves attention is the fact that the equations considering more rigorous criteria to classify ESG funds (cutoffs larger than 0.17) resulted in a strong effect of these funds during crisis, as we can see in Appendix A.

Finally, we performed an additional analysis based on the COVID-19 Pandemic period, as summarized in Table 5 for the cutoff of 0.175 and in Appendix B for the cutoffs between 0.10 and 0.25.

Table 4
Performance of sustainable funds during the periods of financial restrictions

Variables	Alpha			Alpha (sig. 1%)			Alpha (sig. 5%)			Alpha (sig. 10%)		
	Coef.	Signif.		Coef.	Signif.		Coef.	Signif.		Coef.	Signif.	
ESG	-0.001	0.607		-0.001	0.310		0.000	0.822		0.000	0.683	
Crisis	-0.024	0.000	***	-0.004	0.000	***	-0.009	0.000	***	-0.012	0.000	***
ESG * Crisis	0.012	0.000	***	0.002	0.000	***	0.003	0.012	**	0.002	0.040	**
TNA(NL)	-0.006	0.000	***	-0.002	0.000	***	-0.003	0.000	***	-0.004	0.000	***
FoF	*(omit.)*			*(omit.)*			*(omit.)*			*(omit.)*		
Fee-Adm	0.494	0.192		-0.091	0.699		-0.069	0.786		0.086	0.835	
Fee-Perf	*(omit.)*			*(omit.)*			*(omit.)*			*(omit.)*		
Age	-0.002	0.000	***	-0.0005	0.000	***	-0.001	0.000	***	-0.001	0.000	***
Constant	-0.596	0.283		0.165	0.632		0.156	0.675		-0.053	0.930	
num of obs. =	19,293			19,293			19,293			19,293		
num of groups =	3,840			3,840			3,840			3,840		
R-sq: within =	0.109			0.028			0.049			0.058		
between =	0.027			0.007			0.011			0.016		
overall =	0.008			0.004			0.007			0.005		

Source: the authors.
This Table reports the results of four regression models that differ in terms of the level of significance for Alpha (the dependent variable). Alpha variable is represented in four different ways: i) Alpha, as the output of the four factor Alpha; and ii) Alpha (sig. 1%), Alpha (sig. 5%) and (Alpha sig. 10%), replacing by zero the four factor Alphas that were not significant at 1%, 5% and 10%, respectively. All models were estimated using panel data with fixed effects (after conducting the Hausman test; the Lagrange Multiplier (LM) Breusch/Pagan; and the Chow test to select the most appropriate model). Hypotheses tests consider robust standard errors, since the Breusch-Pagan / Cook-Weisberg test indicated heteroscedasticity ($p<0.01$) and the dependent variables do not follow a normal distribution (based on the Shapiro-Wilk test for normal data, $p<0.01$).
Notes: Alpha = represents the four factor Alpha, for each year, for each fund (period from January/2006 to December/2020); ESG = this is a dummy variable that scores 1 for funds classified as sustainable and 0 for the other cases; Crisis = this is a dummy variable that scores 1 for the years 2008, 2011, 2013, 2014, and 2015, and 0 for the other cases; ESG * Crisis = this is an interaction between the variables ESG and Crisis; TNA(NL) = represents the Natural Logarithmic of the TNA in the beginning of each year; FoF = this is a dummy variable that scores 1 for Funds of Funds and 0 for the other cases; Fee-Adm = represents the maximum amount of management fees that each fund charges (in % per year); Fee-Perf = this is a dummy variable that scores 1 for funds that have performance fees and 0 for the other cases; Age = represents the age of the funds (in years) at the beginning of each year; *$p<0.10$; **$p<0.05$; ***$p<0.01$; VIF statistics = lower than 5 for the models.

Table 5

Performance of sustainable funds during the periods of financial restrictions and during the COVID-19 Pandemic

Variables	Alpha			Alpha (sig. 1%)			Alpha (sig. 5%)			Alpha (sig. 10%)		
	Coef.	Signif.		Coef.	Signif.		Coef.	Signif.		Coef.	Signif.	
ESG	-0.001	0.537		-0.001	0.241		-0.001	0.512		0.000	0.943	
Crisis	-0.025	0.000	***	-0.004	0.000	***	-0.010	0.000	***	-0.012	0.000	***
ESG * Crisis	0.011	0.000	***	0.003	0.000	***	0.003	0.006	***	0.003	0.023	**
Covid	-0.008	0.000	***	-0.001	0.008	***	-0.007	0.000	***	-0.010	0.000	***
ESG * Covid	-0.012	0.008	***	0.003	0.000	***	0.010	0.000	***	0.009	0.001	***
TNA(NL)	-0.005	0.000	***	-0.001	0.000	***	-0.002	0.000	***	-0.003	0.000	***
FoF	*(omit.)*			*(omit.)*			*(omit.)*			*(omit.)*		
Fee-Adm	0.497	0.191		-0.091	0.699		-0.068	0.790		0.088	0.831	
Fee-Perf	*(omit.)*			*(omit.)*			*(omit.)*			*(omit.)*		
Age	-0.002	0.000	***	-0.0004	0.000	***	-0.001	0.000	***	-0.001	0.000	***
Constant	-0.611	0.272		0.163	0.636		0.144	0.698		-0.070	0.907	
num of obs. =	19,293			19,293			19,293			19,293		
num of groups =	3,840			3,840			3,840			3,840		
R-sq: within =	0.112			0.029			0.054			0.067		
between =	0.027			0.007			0.010			0.016		
overall =	0.008			0.004			0.008			0.005		

Source: the authors.

This Table reports the results of four regression models that differ in terms of the level of significance for Alpha (the dependent variable). Alpha variable is represented in four different ways: i) Alpha, as the output of the four factor Alpha; and ii) Alpha (sig. 1%), Alpha (sig. 5%) and (Alpha sig. 10%), replacing by zero the four factor Alphas that were not significant at 1%, 5% and 10%, respectively. All models were estimated using panel data with fixed effects. Hypotheses tests consider robust standard errors, since the Breusch-Pagan / Cook-Weisberg test indicated heteroscedasticity ($p<0.01$) and the dependent variables do not follow a normal distribution (based on the Shapiro-Wilk test for normal data, $p<0.01$).

Notes: Alpha = represents the four factor Alpha, for each year, for each fund (period from January/2006 to December/2020); ESG = this is a dummy variable that scores 1 for funds classified as sustainable and 0 for the other cases; Crisis = this is a dummy variable that scores 1 for the years 2008, 2011, 2013, 2014, and 2015, and 0 for the other cases; ESG * Crisis = this is an interaction between the variables ESG and Crisis; Covid = this is a dummy variable that scores 1 for the year of 2020, and 0 for the other cases; ESG * Covid = this is an interaction between the variables ESG and Covid; TNA(NL) = represents the Natural Logarithmic of the TNA in the beginning of each year; FoF = this is a dummy variable that scores 1 for Funds of Funds and 0 for the other cases; Fee-Adm = represents the maximum amount of management fees that each fund charges (in % per year); Fee-Perf = this is a dummy variable that scores 1 for funds that have performance fees and 0 for the other cases; Age = represents the age of the funds (in years) at the beginning of each year; *p<0.10; **p<0.05; ***p<0.01; VIF statistics = lower than 5 for the models.

The results of this new round of tests (Table 5 and Appendix B) also suggest that the performance of ESG funds was equivalent to the performance of their counterparts during non-crisis periods, in line with the results in Table 4 and in line with the arguments of H1. Additionally, during the period marked by the COVID-19 Pandemic, ESG-related mutual funds also presented better performance when compared to the performance of "conventional" funds (as reported in Appendix B). The effect of COVID-19 Pandemic on the relationship between ESG-related investments and fund performance was equivalent to the effect observed for the financial restrictions period. This

result can indicate that ESG-related funds presented better performance during the COVID-19 period when compared to the other funds and other periods.

5. CONCLUSION

The main purpose of this paper was to analyze the risk-adjusted performance of ESG-related mutual funds, considering periods of financial constraints and the COVID-19 Pandemic. The sample of the study was comprised of 3,840 equity mutual funds, during the period from January/2006 to December/2020, using daily data. The performance was estimated each year using the four-factor model (three factors from Fama & French, 1993, and the momentum factor from Carhart, 1997). Moreover, the classification of ESG-related funds considered a specific Brazilian fund classification, named "Sustainability and Governance", as well as the funds returns sensitivity to the sustainability factor, in other words, the Brazilian Corporate Sustainability Index, based on the RBSA.

Concerning the descriptive statistics, considering the initial cutoff for funds classification, 11.8% of the sample comprised observations from ESG-related funds (all of these funds are equity mutual funds). About fund characteristics, 38.9% of the observations are from funds invested in other funds ("funds of funds"), and 38.3% are from funds that have performance fees. On average, the risk-adjusted performance was positive during the entire period, since the average Alpha was higher than zero (except in the analysis replacing by zero non-significant Alphas at 1%).

The main results are in line with our hypotheses and corroborate previous literature studies. Taking into account our first hypothesis, the lack of a significant relationship between the variable ESG and the risk-adjusted returns of funds indicates that Brazilian SRI funds / ESG-related funds perform close to their conventional peers in accordance with the previous research (Renneboog et al., 2008a; Leite & Cortez, 2014, 2015; Reddy et al., 2017; Syed, 2017; Silva & Iquiapaza, 2017). Nonetheless, it is known that investors of SRI funds consider a non-financial utility; then, as reported by Renneboog, Horst and Zhang (2008b), it is expected that Brazilian investments on SRI continue to grow despite the lower risk-adjusted return during non-crisis periods. It is also important to note that these results have been interpreted considering average values; it means that some ESG-related funds can achieve better performance of some conventional funds during non-crisis periods, an issue that can be extended by further research.

Regarding our second hypothesis, the positive relationship between the dummy ESG and funds' alphas during periods of financial restrictions revealed that ESG-related investment funds may hold up better during periods of financial constraints, also as they may have during the COVID-19 Pandemic. Therefore, during market downturns, investors tend to obtain better risk-adjusted returns for investing in green funds (Nofsinger & Varma, 2014; Becchetti et al., 2015).

As for limitations of this study, we point out the period of analysis, which comprises the period between January/2006 and December/2020, since we considered the moment when the time series of ISE started. The procedures used to identify and classify funds into the ESG category may also represent a study limitation, since other tools could be employed to identify ESG funds. In this regard, for future research, we suggest an analysis based on the portfolio holdings of the funds during the period of analysis, for example, considering funds that have at least 50% of their portfolio holdings invested in companies related to ESG practices. This additional analysis can complement and expand the results reported in this paper.

This study contributes to the current literature in several respects. First, we highlight the lack of studies about investments in SRI funds despite the relevance of this subject to investors. Thus, this paper adds new evidence about Brazilian green funds. In addition, we point out the use of

the RBSA methodology to identify SRI funds, considering their sensitivity to the ISE index, also using different cutoffs to test the study hypotheses. In order to expand previous research on ESG-related funds, we use a criterion to classify the funds that considers both the Brazilian equity fund class named "Sustainability and Governance" and the results of the RBSA. Finally, the empirical results of this paper are in accordance with the literature in the defense of green funds. SRI funds may achieve a better performance during crisis because their portfolios hold firms less likely to suffer with market downturns due to their more stable relations with communities and regulators; during the COVID-19 Pandemic, an equivalent result was observed.

Therefore, this paper presents some implications for Brazilian policy makers, because it illustrates how green investments can result in better risk-adjusted return, particularly during periods of financial constraints. Thus, governments could develop regulatory initiatives to stimulate SRI investments. Moreover, concerning investors, the results of this study show that, although investors may require a lower rate of return from SRI investment in view of personal values related to social and environmental issues, they may promote financial and social advantages to Brazilian green investments.

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AUTHOR'S CONTRIBUTION

TMG: Conceptualization (Equal); Methodology (Supporting); Project administration (Equal); Visualization (Equal); Writing-original draft (Equal); Writing-review & editing (Equal). **RFM**: Conceptualization (Equal); Methodology (Lead); Project administration (Equal); Visualization (Equal); Writing-original draft (Equal); Writing-review & editing (Equal).

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CONFLICTS OF INTEREST

There is no conflict of interest to report in this submission.

Appendix A

Performance of sustainable funds during the periods of financial restrictions, using different cutoffs to classify them

Alpha	Cutoff	ESG	Crisis	ESG_Crisis
Alpha	ESG (dif > 0.10)	+ ***	– ***	+ *
Alpha (sig. 1%)	ESG (dif > 0.10)	*n.s.*	– ***	*n.s.*
Alpha (sig. 5%)	ESG (dif > 0.10)	+ ***	– ***	– ***
Alpha (sig. 10%)	ESG (dif > 0.10)	+ ***	– ***	– ***
Alpha	ESG (dif > 0.125)	+ ***	– ***	+ **
Alpha (sig. 1%)	ESG (dif > 0.125)	*n.s.*	– ***	*n.s.*
Alpha (sig. 5%)	ESG (dif > 0.125)	+ ***	– ***	– **
Alpha (sig. 10%)	ESG (dif > 0.125)	+ ***	– ***	+ ***
Alpha	ESG (dif > 0.15)	+ **	– ***	+ ***
Alpha (sig. 1%)	ESG (dif > 0.15)	*n.s.*	– ***	+ **
Alpha (sig. 5%)	ESG (dif > 0.15)	+ **	– ***	*n.s.*
Alpha (sig. 10%)	ESG (dif > 0.15)	+ ***	– ***	*n.s.*
Alpha	ESG (dif > 0.175)	*n.s.*	– ***	+ ***
Alpha (sig. 1%)	ESG (dif > 0.175)	*n.s.*	– ***	+ ***
Alpha (sig. 5%)	ESG (dif > 0.175)	*n.s.*	– ***	+ **
Alpha (sig. 10%)	ESG (dif > 0.175)	*n.s.*	– ***	+ **
Alpha	ESG (dif > 0.20)	*n.s.*	– ***	+ ***
Alpha (sig. 1%)	ESG (dif > 0.20)	– ***	– ***	+ ***
Alpha (sig. 5%)	ESG (dif > 0.20)	*n.s.*	– ***	+ **
Alpha (sig. 10%)	ESG (dif > 0.20)	*n.s.*	– ***	*n.s.*
Alpha	ESG (dif > 0.225)	*n.s.*	– ***	+ ***
Alpha (sig. 1%)	ESG (dif > 0.225)	– ***	– ***	+ ***
Alpha (sig. 5%)	ESG (dif > 0.225)	*n.s.*	– ***	+ ***
Alpha (sig. 10%)	ESG (dif > 0.225)	*n.s.*	– ***	+ **
Alpha	ESG (dif > 0.25)	*n.s.*	– ***	+ ***
Alpha (sig. 1%)	ESG (dif > 0.25)	– ***	– ***	+ ***
Alpha (sig. 5%)	ESG (dif > 0.25)	*n.s.*	– ***	+ ***
Alpha (sig. 10%)	ESG (dif > 0.25)	*n.s.*	– ***	+ ***

Source: the authors.

The Table in this Appendix reports the results of 28 regression models that differ in terms of the cutoff used to classify ESG funds and in terms of the level of significance for Alpha (the dependent variable). Alpha variable is represented in four different ways: i) Alpha, as the output of the four factor Alpha; and ii) Alpha (sig. 1%), Alpha (sig. 5%) and (Alpha sig. 10%), replacing by zero the four factor Alphas that were not significant at 1%, 5% and 10%, respectively. All models were estimated using panel data with fixed effects and they contain the control variables presented in Equation 1; in this table, only the sign of the coefficients for the main variables of interest are reported. Hypotheses tests consider robust standard errors, since the Breusch-Pagan / Cook-Weisberg test indicated heteroscedasticity ($p<0.01$) and the dependent variables do not follow a normal distribution (based on the Shapiro-Wilk test for normal data, $p<0.01$).

Notes: Alpha = represents the four factor Alpha, for each year, for each fund (period from January/2006 to December/2020); ESG = this is a dummy variable that scores 1 for funds classified as sustainable and 0 for the other cases; Crisis = this is a dummy variable that scores 1 for the years 2008, 2011, 2013, 2014, and 2015, and 0 for the other cases; ESG * Crisis = this is an interaction between the variables ESG and Crisis; *p<0.10; **p<0.05; ***p<0.01; VIF statistics = lower than 5 for the models.

Appendix B

Performance of sustainable funds during the periods of financial restrictions and during the COVID-19 Pandemic, considering other cut points to classify them

Alpha	Cutoff	ESG	Crisis	ESG_Crisis	Covid	ESG_Covid
Alpha	ESG (dif > 0.10)	+ ***	– ***	*n.s.*	– ***	*n.s.*
Alpha (sig. 1%)	ESG (dif > 0.10)	*n.s.*	– ***	*n.s.*	– ***	+ ***
Alpha (sig. 5%)	ESG (dif > 0.10)	+ **	– ***	– *	– ***	+ ***
Alpha (sig. 10%)	ESG (dif > 0.10)	+ ***	– ***	– ***	– ***	+ *
Alpha	ESG (dif > 0.125)	+ ***	– ***	+ **	– ***	*n.s.*
Alpha (sig. 1%)	ESG (dif > 0.125)	*n.s.*	– ***	*n.s.*	– **	+ ***
Alpha (sig. 5%)	ESG (dif > 0.125)	+ **	– ***	– *	– ***	+ ***
Alpha (sig. 10%)	ESG (dif > 0.125)	+ ***	– ***	– **	– ***	+ **
Alpha	ESG (dif > 0.15)	+ *	– ***	+ ***	– ***	*n.s.*
Alpha (sig. 1%)	ESG (dif > 0.15)	*n.s.*	– ***	+ **	– ***	+ ***
Alpha (sig. 5%)	ESG (dif > 0.15)	*n.s.*	– ***	*n.s.*	– ***	+ ***
Alpha (sig. 10%)	ESG (dif > 0.15)	+ **	– ***	*n.s.*	– ***	+ ***
Alpha	ESG (dif > 0.175)	*n.s.*	– ***	+ ***	– ***	– ***
Alpha (sig. 1%)	ESG (dif > 0.175)	*n.s.*	– ***	+ ***	– ***	+ ***
Alpha (sig. 5%)	ESG (dif > 0.175)	*n.s.*	– ***	+ ***	– ***	+ ***
Alpha (sig. 10%)	ESG (dif > 0.175)	*n.s.*	– ***	+ **	– ***	+ ***
Alpha	ESG (dif > 0.20)	*n.s.*	– ***	+ ***	– ***	– ***
Alpha (sig. 1%)	ESG (dif > 0.20)	– ***	– ***	+ ***	– ***	+ ***
Alpha (sig. 5%)	ESG (dif > 0.20)	*n.s.*	– ***	+ **	– ***	+ ***
Alpha (sig. 10%)	ESG (dif > 0.20)	*n.s.*	– ***	+ *	– ***	+ ***
Alpha	ESG (dif > 0.225)	*n.s.*	– ***	+ ***	– ***	– ***
Alpha (sig. 1%)	ESG (dif > 0.225)	*n.s.*	– ***	+ ***	– ***	+ ***
Alpha (sig. 5%)	ESG (dif > 0.225)	*n.s.*	– ***	+ ***	– ***	+ ***
Alpha (sig. 10%)	ESG (dif > 0.225)	*n.s.*	– ***	+ ***	– ***	+ ***
Alpha	ESG (dif > 0.25)	*n.s.*	– ***	+ ***	– ***	– ***
Alpha (sig. 1%)	ESG (dif > 0.25)	– **	– ***	+ ***	– ***	+ ***
Alpha (sig. 5%)	ESG (dif > 0.25)	*n.s.*	– ***	+ ***	– ***	+ ***
Alpha (sig. 10%)	ESG (dif > 0.25)	*n.s.*	– ***	+ **	– ***	+ ***

Source: the authors.

The Table in this Appendix reports the results of 28 regression models that differ in terms of the cutoff used to classify ESG funds and in terms of the level of significance for Alpha (the dependent variable). Alpha variable is represented in four different ways: i) Alpha, as the output of the four factor Alpha; and ii) Alpha (sig. 1%), Alpha (sig. 5%) and (Alpha sig. 10%), replacing by zero the four factor Alphas that were not significant at 1%, 5% and 10%, respectively. All models were estimated using panel data with fixed effects and they contain the control variables presented in Equation 1; in this table, only the sign of the coefficients for the main variables of interest are reported. Hypotheses tests consider robust standard errors, since the Breusch-Pagan / Cook-Weisberg test indicated heteroscedasticity ($p<0.01$) and the dependent variables do not follow a normal distribution (based on the Shapiro-Wilk test for normal data, $p<0.01$).

Notes: Alpha = represents the four factor Alpha, for each year, for each fund (period from January/2006 to December/2020); ESG = this is a dummy variable that scores 1 for funds classified as sustainable and 0 for the other cases; Crisis = this is a dummy variable that scores 1 for the years 2008, 2011, 2013, 2014, and 2015, and 0 for the other cases; ESG * Crisis = this is an interaction between the variables ESG and Crisis; Covid = this is a dummy variable that scores 1 for the year of 2020, and 0 for the other cases; ESG * Covid = this is an interaction between the variables ESG and Covid; *p<0.10; **p<0.05; ***p<0.01; VIF statistics = lower than 5 for the models.