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# The Impact of Sustainable Investments on the Hedge Fund Industry

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# Abstract

Socially responsible investments have been a prime focus of the financial world for the last couple of years and it has been on the rise ever since. This research evaluates the differences in the performance of environmental, social and governance (ESG) funds to traditional funds in the hedge fund industry from 2010 to 2015. The dataset used was collected from Lipper TASS, where 2260 regular funds have been observed, from which 25 were found to adhere to the ESG criteria. The proxy used for the performance of the funds was the net internal rate of return (net-IRR). To observe the effect of ESG on performance, the variables assets under management, management fee, incentive fee, start year, country of origin, asset class, investment approach, and liquidated funds were investigated in relation to both fund types and ESG. The evidence obtained throughout this research shows that there is no statistical difference in the performance, the management fee, or the incentive fee between ESG funds and traditional funds. The only significant difference that was found is that ESG funds have a slightly larger size compared to regular funds. Nevertheless, these findings can differ based on the dataset and the methodology adopted.


# 1. Introduction

## 1.1 Background

Sustainability has been one of the most discussed topics in recent years and the impact of financial markets concerning sustainability has been a focus of many investment banks and hedge funds. With the rise of sustainability issues and concerns, investors are becoming more conscious regarding their investments and how these investments have an impact on the world we live in. Socially responsible investing has been around for decades, although now it has been seen that it can be used to create more value for investors. Incorporating proactive investment strategies, as opposed to reactive ones, which were mostly employed in the past, has contributed significantly to the recent spike in interest. Investors are gradually understanding that impact investing may increase an investment's return in addition to the underlying social benefit. (Liberman, 2018).

Investment in businesses based on environmental, social, and corporate governance considerations is known as socially responsible investing (SRI). Investors favour businesses that share their values and avoid those that do not (Filbeck et al. 2016). According to the Forum for Sustainable and Responsible Investment (US Social Investment Forum, 2015), SRI has grown in popularity in recent years, with U.S. SRI assets under management (AUM) growing by 76% from 2012 to 2014. Whether SRI returns are different from non-SRI returns is still up for debate. Even though several studies look at how SRI affects mutual fund performance, there is no agreement on how it affects returns, and as far as we know, no research has looked at SRI hedge fund returns (Filbeck et al. 2016).

Capital reallocation has significant effects on portfolio decisions and asset price as the ESG target becomes a prominent emphasis in the hedge fund industry. However, the genuine ESG character of a company is sometimes a source of considerable ambiguity for ESG investors. Any attempt to quantify genuine ESG performance must contend with illegible and incomplete ESG data as well as unstructured methodology since there is no accurate way to assess true ESG performance. The stark discrepancy amongst ESG rating organizations serves as a useful demonstration of the ESG score's inherent ambiguity. 3 Although this uncertainty may serve as a significant barrier to sustainable investing, the impact of ESG uncertainty on asset price and portfolio selections has received little attention yet (Avramov et al., 2021).

This paper aims to identify the differences between socially responsible and traditional funds. Different characteristics of these two groups will be identified and analysed through the means of statistical tests. This paper will focus only on the hedge fund industry and the assets traded by these

complex institutional investors. Hedge funds are pooled investment vehicles that can invest in a wide variety of products, including derivatives, foreign exchange, and publicly traded securities through complex strategies such as algorithmic trading, relative value trades, and spot trades (CFI, n.d.). The period investigated in this paper is 2010 to 2015 as the effect of ESG on performance will not be hindered as much by the 2008 global financial crisis and the 5-year period has been relatively non-impacted by major events such as the pandemic in 2020. Investigating this can be very useful in understanding how ESG has an impact on the overall hedge fund industry and what are the spillovers of this particular investment focus.

The main two goals of hedge funds are to achieve consistent returns and to increase their capital under management by attracting new investors. Hence, this paper tries to understand how the socially responsible focus affects these goals. Therefore, the main research question for this paper is the following:

*"What is the impact of socially responsible investments (SRI) in terms of performance for Hedge Funds in the US, Asia, and Europe from 2010-2015?"*

A vast majority of papers investigate how hedge funds obtain returns and create values. There has been an ongoing debate regarding what is a great proxy for return in the industry and how can this be isolated from the overall benchmark. Net-IRR has been proved to work well when estimating the performance of the funds and can be used as a proxy (Diller & Kaserer, 2004). In terms of size, there is conflicting data supporting capacity limits in the hedge fund sector. While Fung, Hsieh, Naik, and Ramadorai (2008) demonstrate that inflows damage the potential of Funds of Funds to produce alpha, Goetzmann, Ingersoll, and Ross (2003) discover that successful funds are less inclined to take new money. Capacity restrictions at the investment strategy level are documented by Naik, Ramadorai, and Stromqvist (2007). The basic connection between ESG and future fund performance, however, is not the subject of any of this research. Hedge funds initially gain from an increase in fund size, but investment performance declines after funds grow above a certain optimal level, according to Getmansky (2005), who shows a positive and concave link between fund size and future performance.

One of the major considerations for investors when choosing to allocate capital to a hedge fund is management and incentive fees (Liang, 2001). A management fee is an annual charge made by a manager to pay the investment vehicle's running expenses. Typically, the charge equals 2% of a fund's net asset value (NAV) over a year. Incentive fees are seen as a reward for successful outcomes. 20 percent of the fund's profits are normally the standard for performance fees (Hedge Fund Fees, Types, and Structures | Preqin, n.d.).

The studies presented above offer an overview of how characteristics such as size, management fee, and incentive fee affect returns for the hedge funds space. This research is used as a foundation for the formulation of the four hypotheses that are used to answer the research question.

(1) There is a negative difference in the net IRR between impact funds and regular funds.
(2) There is a positive difference in fund size for impact funds compared to regular funds.
(3) There is a negative difference in management fees for impact funds compared to regular funds.
(4) There is a negative difference in incentive fees for impact funds compared to regular funds.

## 1.2 Relevance

The social relevance of the topic is strongly rooted in the fact that investments have a large impact on society and hedge funds are one of the most prominent market participants in terms of capital and volumes of trades. Hedge fund investments and capital allocation have a large impact on the success of sustainable businesses and these funds play a major role in achieving sustainable goals in the future. Observing a link between performance and socially responsible investing can be highly valuable and might present an incentive for managers to take part in sustainability development. The findings of this research paper can be proven valuable for anyone that works in the financial industry and especially for asset/portfolio managers. This investigation can also prove to be useful for governments and tax authorities which could offer incentives or tax breaks to hedge funds for becoming fully sustainable.

This paper will be an extension of the research done by Jong (2020), in which she studied the similar effect regarding ESG, but it has been done on the private equity industry compared to the hedge fund. A similar data set will be used, and the same methodology will be applied to the data. Hence, similar characteristics being examined will offer the opportunity to observe how the two industries compare and what are the differences regarding ESG investing. The hypotheses used in this paper are slightly different from Jong (2020) as the start year does not have such an impact on hedge funds compared to private equity and management and incentive fee are better variables to analyse. There have been many papers that research hedge fund performance and ESG impact on the industry, however, the intersection of the two and the extended regional and time focus has not been researched before.

The paper has been structured as follows. The following chapter will be investigating and report the previous literature that investigates returns in the hedge fund industry, the biases that are present in data, what are hedge funds and how they operate, and ESG concerning the hedge fund industry. The third chapter will present an overview of the data collected and the variables that will be used in the analysis. Chapter 4 will present the methodology applied to the data to estimate statistical effects and test the hypotheses to answer the research question. The final chapter will present the answer to the research question and a summary of the finding. At the end of the paper, the references that have been used will be presented and an appendix with explanatory figures and tables can be found there.

# 2. Literature Review:

This paper investigates the relationship between socially responsible investments and the performance of hedge funds. In this section of the paper, the study's theoretical framework will be presented, and previous academic literature will be provided and analysed to clarify the aspects that may influence the performance of hedge funds. The structure and organization of hedge funds will be examined first, following an overview of how performance has been recorded and measured in the past and the biases that persist with returns and the asset class in question. Finally, the literature on ESG's impact on fund performance will be discussed.

## 2.1 What are Hedge Funds?

Hedge Funds are typically thought of as private investment vehicles for high-net-worth individuals or institutional investors. This industry has been growing at a significant pace since 2000, from $200 billion in assets under management to more than $3 trillion today (Sullivan, 2019). These funds are structured as limited partnerships, where investors are the limited partner (LP), and the managers of the fund are the general partners (GP). The fund managers typically deposit a considerable portion of their money into the partnership as general partners to ensure that the partners' economic interests are aligned. The partnership charges investors a performance-based fee, with the potential reward to successful managers being much higher than the fixed management cost

(Fung & Hsieh, 1999). This organizational structure has lasted over half a century of rising hedge fund activity and is still the most common organizational structure.

The difference in return characteristics between hedge funds and other funds, according to Fung & Hsieh (1999), is mostly attributable to variances in trading strategies. The use of dynamic trading tactics by hedge funds differs from the use of a static, simpler buy-and-hold strategy. Another significant distinction is the use of leverage. Hedge funds commonly leverage their trades by margining their positions and by short different securities. Malkiel and Saha (2005) found out that these funds typically employ substantial leverage, they have a significantly greater impact on global securities markets than their net assets would suggest. Hedge fund trades accounted for more than half of the total daily number of shares changing hands throughout 2004, according to market makers on the NYSE floor.

Hedge fund returns are only moderately correlated with most traditional asset class indexes, according to Agarwal and Naik (2000), and Liang (2001). These studies indicate that hedge funds still deliver large excess returns or alphas after correcting for equities market exposure and other forms of systematic risk.

Two significant considerations that have to be taken into consideration regarding hedge fund practices are “Disclosure” and “Taxation”. Fung & Hsieh (1999) explain that fund managers that believe they have a “winning strategy” are clearly opposed to being subjected to full disclosure practices. Most alternative investment organizational structures are obliged to adhere to high levels of disclosure and transparency; however, private investment vehicles are omitted from some of these practices, and they have lower transparency and disclosure requirements. A consequence of this is a lack of hedge fund products offered in public markets, this problem persists today. Fung & Hsieh (1999) also mention that taxation of investment partnerships is particularly well-suited to this situation because they prevent double taxation, as opposed to the case in which the fund would be established as a limited liability corporation. As general and limited partners have diverse goals and preferences, private limited partnerships (PLPs) are the organizational structure that is most often used.

## 2.2 Hedge Funds Performance

Given the considerable interest in the hedge fund industry in recent academic articles and research, few of these compare the performance of SRI-inclined funds to that of traditional funds. This can be partially explained by their private nature and the difficulty of gaining access to individual fund data.

Many papers have been investigating the persistence of performance for hedge funds, Agarwal & Naik (2000) claim that performance is persistent. Brown et al. (1999) and Liang (1999) have underlined that the problem of performance persistency is crucial for the industry due to a higher attrition rate than other investment vehicles such as mutual funds. Brown et al. (1999) demonstrate that offshore hedge funds have positive risk-adjusted yields, but they credit this performance to the style of each manager and conclude that there is little evidence of management skill differences.

Ackermann et al. (1999) and Liang (1999), evaluate the performance of hedge funds to that of mutual funds and multiple indices. They conclude that hedge funds consistently outperform mutual funds, although to a lesser extent than market indexes. In addition, hedge fund returns are more volatile than mutual funds and indexes returns. Ackermann and Ravenscraft (1998) note that the greater legal restrictions imposed on mutual funds compared to hedge funds hamper their performance.

Due to their low correlation with other financial assets, Fung and Hsieh (1997) and Schneeweis and Spurgin (1997) demonstrate that the incorporation of hedge funds into a portfolio may dramatically enhance its risk-return profile. This poor correlation is also highlighted by Liang (1999)

and Agarwal and Naik (2000a). Amin and Kat (2001) discover that stand-alone investment hedge funds do not provide a better risk-return profile, but that a vast majority of funds categorized as inefficient on a stand-alone basis may generate an efficient reward profile when combined with the S&P500.

In their analysis, Capocci and Hubner (2004) demonstrate that one-fourth of hedge funds provide considerable positive excess returns, the majority of hedge funds seem to favour smaller equities, and many hedge funds invest in emerging market bonds. A subperiod examination revealed that, in most circumstances, the capacity to outperform remains consistent throughout time. Their main finding regarding performance persistency is that the top performing funds adhere to momentum strategies, whilst the poorest performing funds are often momentum contrarian. Second, funds with the highest performance do not invest considerably in developing market bonds, while funds with poorer performance do. Thirdly, average return funds favour equities with a high book-to-market ratio, while the best and worst performing funds may favour firms with a low book-to-market ratio.

Liang (2001) examined hedge fund returns and risk from 1990 to mid-1999, the results showed that during the 10-year bull market, hedge funds generated significant gains. market, hedge funds generated significant gains. Despite the fact that the S&P 500 had a better total return, hedge funds as a group were far less volatile than the index because of their use of cross-style diversification, dynamic hedging, cross-border investment, and several atypical financial instruments. The risk–return profile of hedge funds seems to be superior to that of pure equity trading strategies. Nevertheless, it was determined that adjustments in fees were performance-related: The underperforming funds reduced their incentive fees.

Joenvaara et al. (2021) investigate the effect of using different databases when evaluating the performance of hedge funds. Their main findings are that the average returns of hedge funds are upwardly skewed if a researcher utilizes just one commercial dataset, the average hedge fund or the sector as a whole generates considerable anomalous returns before fees but not after fees, indicating that fund managers extract the bulk of the rents, performance for hedge funds is persistent, and variables related to share restrictions, compensation structure, and diseconomies of scale are important determinants of risk-adjusted returns.

Edwards and Caglayan (2001) examine hedge fund performance, skill, and management fees. In addition, the researchers found that incentive payments are favourably associated with performance. On average, hedge funds that pay incentive fees of 20 percent or more achieve 3–6 percentage points greater annualized excess returns than funds with smaller incentive costs. These results are consistent with the views that managers possess a certain level of skill, and this can be an explanation for the outstanding performance of hedge funds during the 1990s.

## 2.3 Biases

Several biases arise exist when evaluating performance for the hedge fund industry. In previous academic literature, 4 biases as such have been discovered. It is important to recognize and understand the existence of these biases when reporting the findings of these papers.

Asness et al. (2001) explain that when indexes remove all or a portion of the returns of defunct or dissolved funds, *survivorship bias* arises. Excluding defunct funds from the index computation will generate an unreasonably high estimate of a legitimately investable hedge fund portfolio, given that defunct firms historically had extremely low returns. Moreover, TASS did not begin collecting data on defunct firms until 1994, therefore hedge fund data collected before 1994 would have a substantial survivor-ship bias and cannot be used to accurately estimate hedge fund risk and return. However, Ackermann et al. (1999) discovered that the survivorship bias is negligible, with an average size of 0.16 percent every year.

The second bias is called *backfill bias*. In contrast to mutual funds, which must declare their periodic audited returns to regulators and investors, hedge funds are not required to submit information to database publishers. Managers often form a hedge fund with seed cash and begin reporting outcomes later, assuming the early results are positive (Malkiel & Saha, 2005). This primary cause of backfill bias is sometimes referred to as incubation bias. A second source is when a fund has reported to another database in the past, but when it started reporting to TASS, it may not have disclosed all the prior data. It may have just given TASS the information it wants prospective investors to see. We were able to evaluate the backfilled returns and compare them to those returns that were contemporaneously submitted to November/December 2005 TASS since TASS shows when a hedge fund started reporting. The result should reflect the degree of upward bias in the backfilled results. Backfilled returns were, on average, almost 500 basis points (bps) more than contemporaneously stated returns (Malkiel & Saha, 2005).

According to Ackermann et al. (1999), hedge funds have an upward bias because, because they are not permitted to promote, they see presence in a database as largely a marketing tool. This bias is referred to as the self-selection bias, and it exists because funds with strong performance have less motivation to reveal their success to data providers to attract new investors since doing so might be deemed improper advertising by the SEC.

A last possible bias, termed a multiperiod sampling bias by Fung and Hsieh (2000), may emerge if certain hedge funds have very short return histories. Specifically, they suggested that if investors normally demand 36 months of history before committing capital to a hedge fund, then estimations of excess returns based on shorter return periods may be deceptive for these investors. Fung and Hsieh (2000) evaluated the use of diverse return histories and determined that this bias if it exists, seems to be negligible. In their research, they advise that all hedge funds in the sample must have at least 24 months of returns, after eliminating the first 12 months of returns for all hedge funds to adjust for any possible immediate historical bias.

## 2.4 SRI impact on Hedge Funds

Given the increased social consciousness of investors and the more favourable regulatory environment (Renneboog et al., 2008), investment strategies based on CSR metrics have become a significant area of study and practice for both academics and practitioners. Initial empirical findings from the literature on mutual funds indicated that there are no substantial performance differences between SRI and conventional funds.

Auer and Schuhmacher (2016) discovered that the geographic and industry concentration of an ESG-based investment strategy, as well as the ESG criteria, applied had a significant impact on its performance. It does not seem that picking high (low) ESG equities regularly increases or decreases investment performance compared to benchmarks and low (high) ESG stocks in Asia-Pacific and the United States. There is no evidence of the advantage of ESG-based strategies in Europe. In contrast, in particular sectors and depending on the ESG criteria, socially responsible stock selection results in considerably worse risk-adjusted performance compared to passive benchmarks. Auer and Schuhmacher (2016) mention that because private investors often compare the performance of hedge funds with market indices, these results are important for the future construction and promotion of such funds. By selecting stocks based on ESG criteria, fund managers can meet the ethical requirements of their clients, but at best they can achieve market-like returns.

Valentini (2018) suggests that activist investors place a heavy emphasis on advocating and enhancing corporate governance within the investing community. The more ESG-investing is emphasized, and the more ESG-factors are correlated with improved financial performance, the more likely activist investors will incorporate further ESG concerns into their campaign strategies. As investors, activists have a proven track record of effectively implementing changes and generating value for shareholders and their investors. With ever-increasing sums of capital committed to passive

managers, activist hedge funds are increasingly responsible for holding corporations accountable, acting as governance watchdogs, and advocating for ESG-considerations that can drive value creation.

Lieberman (2018) examined different strategies and concluded that momentum and long-term value-driving strategies are the ones that show the most persistent return. Having an SRI does not automatically mean added performance but excluding it might affect future returns. Hedge fund managers that currently use this sort of analysis in their process but do not label it as impact/ESG should consider adopting it into their language, and those who do not use it should consider it. Asset owners may need to collaborate with their hedge fund managers to carve out the portfolio components that include impact themes. If constructing a carve-out is not feasible, they might consider shifting their hedge fund allocations toward an impact orientation by selecting impact-oriented investments inside a strategy.

Filbeck et al. (2016) discovered statistically significant SRI hedge fund outperformance when utilizing an enhanced list of hedge fund characteristics, but not when using a "conventional" set of hedge fund characteristics. SRI hedge funds outperform non-SRI hedge funds by 1.50 to 2.67 percent yearly in a matched sample study utilizing the enlarged set of characteristics. The results are considerably more pronounced when isolating the global financial crisis. Using Fama and MacBeth (1973) regressions, they discovered a statistically significant and equivalent effect for the fund of funds category of hedge funds. Over the last decade, SRI hedge funds have had somewhat greater relative returns than non-SRI funds.

Hedge fund activism, according to DesJardine and Durand (2020), has a clear trade-off: benefits are shareholder-centric and short-lived, as evidenced by immediate increases in market value and profitability; however, these increases come at a mid-to-long-term cost to other stakeholders, as evidenced by decreases in operating cash flow, investment spending, and social performance.

# 3. Data

This chapter provides an overview of the data collection and dataset that has been used in the quantitative analysis of this paper. The first subchapter (3.1) presents how the data has been collected and the second subchapter (3.2) discusses the variables that were chosen and used in the models.

## 3.1 Data Collection

Fortunately, a significant number of hedge funds publish monthly reports to inform existing investors and attract new ones. Some data collectors make them accessible to the eligible public. According to Amin and Kat (2001), there are three major global hedge fund database suppliers. These include "Managed Account Reports" (MAR, 1500 funds), "Hedge Fund Research" (HFR, 1400 funds), and "TASS Management" (TASS, 2200 funds).

The majority of academic and commercial hedge fund investigations utilize these databases. Lipper TASS is one of the most frequently utilized databases in academic research and this has been chosen as a source for the paper. TASS was established in London in 1990. Tremont Capital, which had acquired TASS in 1999, sold TASS Research and the TASS database to Lipper (now a division of the global behemoth Thomson Reuters) in March 2005. According to Aggarwal and Jorion (2010a), following Tremont's acquisition of TASS, the purchasing business determined that its own hedge fund managers would contribute to the newly acquired information; in other words, the Tremont database was not directly incorporated into the TASS database. Consequently, a substantial number of Tremont funds were added to the TASS database between 1 April 1999 and 30 November 2001, a process that (according to Aggarwal and Jorion) resulted in a bogus survivorship bias. Fung and Hsieh (2009) had already identified a second bias resulting from this database merger in an earlier article. Because the column "date added to the database" relates to the date of entry into the TASS database and not the

Tremont database, data prior to this date are not necessarily backfill-biased; hence, removing such information reduces sample sizes unnecessarily. Fung and Hsieh (2000, 2001), Brown, Goetzmann, Hiraki, Otsuki, and Shiraishi (2001), and Brown, Goetzmann (2001) all utilize the TASS database.

Data suppliers capture more than just performance data. For the majority of funds, they record additional useful information, such as business name, start and finish dates, the strategy adopted, assets under management, management and incentive fees, manager names, etc. There is no unanimity on the definition of the employed strategy yet overlaps exist. TASS lists fifteen investment strategies: top-down macro, bottom-up, short selling, long bias, market neutral, opportunities, relative value, arbitrage, discretionary, trend follower, technical, fundamental, systematic, diverse, and other. These strategies may overlap, hence a fund may employ both long-bias and short-selling techniques, for instance (Liang, 2001).

The data used comes from 13 579 hedge funds, from which only 25 have been identified as ESG-focused funds. TASS also gathers data on the focus of the funds and each of the funds that have been reported to focus on social responsibility has been taken as ESG. The data retrieved has a monthly frequency and the start date is 1st of January 2010 to the 31st of December 2015. The regions investigated are the Americas and Europe. A large number of hedge funds are registered in countries that offer tax benefits such as the Cayman Islands and Bermuda, hence only looking into North America can leave out important findings. This investigation will investigate both live funds and funds that have been closed or liquidated. Table 1 presents an overview of the database and the number of observations in each category.

Due to the difference in observations between ESG funds and non-ESG, differences in characteristics of the two groups might arise. As an example, the asset under management could be considerably distinct for the socially responsible funds compared to the non-responsible funds, or the management fees can also have drastic differences between the two groups. Hence, matching will be applied to control for this. After matching the AUM of ESG funds with the AUM of non-ESG funds, the number of observations for non-ESG funds decreased to 2260 and the number of observations for ESG funds is 25. The 11 319 funds that were eliminated from the dataset did not have data inputs for most of the variables researched and hence, had to be removed.

*Table 1. Overview of the dataset.*

| Category | Observations | Mean net-IRR | Mean AUM (mil) | Mean Start Year | Mean Management Fee | Mean Incentive Fee |
|---|---|---|---|---|---|---|
| ESG | 25 | 0.56% | 1 221.96 | 2002 | 1.33% | 14.21% |
| Live | 318 | 0.53% | 23 756.13 | 2000 | 1.39% | 14.98% |
| Liquidated | 1942 | 0.17% | 4 800.76 | 2001 | 1.43% | 14.66% |
| Equity | 1803 | 0.26% | 8 687.43 | 2001 | 1.42% | 15.04% |
| Fixed Income | 1161 | 0.27% | 4 596.56 | 2000 | 1.41% | 14.12% |
| Commodity | 494 | 0.18% | 5 164.12 | 2001 | 1.41% | 13.38% |
| Currency | 932 | 0.22% | 4 335.22 | 2001 | 1.43% | 14.68% |
| Real Estate | 502 | 0.20% | 11 042.41 | 2002 | 1.40% | 12.79% |
| European | 551 | 0.06% | 11 573.3 | 2001 | 1.42% | 10.20% |
| US Hedge | 545 | 0.41% | 19 241.91 | 1999 | 1.28% | 16.41% |
| Other Hedge* | 1164 | 0.27% | 2 895.23 | 2002 | 1.49% | 16.06% |
| **All** | 2260 | 0.25% | 9 283.65 | 2001 | 1.42% | 14.71% |

*Note.* This table provides an overview of the main characteristics of the hedge funds analysed. The first column depicts the category of the fund based on a certain criterion. The second column provides the number of observations for each category. The third column presents the average rate of return for hedge funds, the third shows the average of assets under management, and the last two columns' portray the average management fees and incentive fees. (*Americas excluding the US, including Singapore, Mauritius, Australia, and Japan)

## 3.2 Variables

The proxy for performance is the net internal rate of return (IRR). The IRR is a time-weighted return expressed as a percentage. The importance of using IRR is that funds have different time spans, and this can have a consequence on the return. The differences in time span have to be accounted for when comparing two funds and IRR distinguishes between time horizons (Jong, 2020). The IRR also takes cash flow differences into consideration. The net cash flow is discounted so that the net present value is equal to zero, allowing funds with varying initial investments and returns to be compared. Consequently, the IRR is the annual return on investment and a reliable indicator of additional value. The higher the IRR, the greater the net cash flows and thus the returns. The net IRR is the IRR after accounting for administration fees and carried interest (Jong, 2020).

The variable size is given by the assets under management for each hedge fund, this measure is reported monthly as well. AUM is the total market value of the investments that a person or entity manages on behalf of clients. AUM changes due to the flow of money in and out of the fund and the price performance of the assents in the fund. Incentive and management fees are usually calculated as a percentage of the AUM.

The variable domicile represents the country where the fund originated or in which it operates. This variable can isolate the geographical effect on performance for each fund and it is a categorical variable. The variables incentive and management fees are also reported for each period, and it is reported as a percentage of AUM. An incentive fee is a fee charged by a fund manager based on a fund's performance over a given period. A management fee is a charge levied by an investment manager for managing an investment fund. The management fee is intended to compensate the managers for their time and expertise in selecting investments and managing the fund. It also includes other items such as investor relations (IR) expenses and the administration costs of the fund.

The categorical variable type describes what are the assets that the fund invests in and manages. The different types are equities, fixed income, commodities, currency, and real estate and other. Each fund can take one type or have overlapping types. For example, a fund can invest in both equities and commodities, or be a sole equity trading fund. Inception year is a variable that describes the founding year of the fund varies from 1969 to 2015. The categorical variable strategy looks into the approach that each fund is taking, there are 15 strategies in the database.

To evaluate the differences between the ESG funds and non-ESG on the ROR a dummy variable is added to the regression and descriptive statistics, where the non-ESG group will be used as the reference group.

# 4. Methodology

This chapter provides an overview of the research methodology that has been applied to investigate the data. Section 4.1 will be discussing the descriptive statistics of the main variables from the database. Section 4.2 investigates inferential statistics such as t-tests and chi-squared tests. The last section will present the regression analysis used to measure the impact of the independent variables on the rate of return.

## 4.1 Descriptive Statistics

To find the variability of the variables discussed above, descriptive statistics will be used. For the residuals to follow a more accurate normal distribution, the dependent variable has been winsorized at 1% and 99% levels. This means that the outliers of the values beyond 1% and 99% levels have been removed from the data. This practice allows the residuals to have a smaller kurtosis and more symmetry. Using the measures of central tendency will help identify the differences in net IRR for ESG funds and non-ESG funds.

A further transformation has been done to the independent variable size by using its logarithm. This has been done as the AUM is highly skewed and hence applying the logarithm, the variable will follow a more normal distribution. All other variables present in the regression analysis have been kept the same and no transformations have been performed, hence no biases might arise from the transformation of data.

After the transformation of the variables, a correlation between the variables has been analysed. A correlation between the independent variables could influence their coefficient, and consequently, the coefficient could indicate an inaccurate relationship with the dependent variable. Therefore, a correlogram is created. The following formula is used to determine the relationship between two variables:

$$corr(Y,Z) = \frac{cov\ (Y,Z)}{\sqrt{var(Y)var(Z)}}$$

In the case of variables with high collinearity, these must be transformed or replaced by an instrumental variable when performing the regression analysis.

Matching will be applied to observe the effect of the treatment group, the ESG funds, compared to the traditional funds. The purpose of matching is to generate two classes with comparable features, except the treatment. Computing the average treatment effect (ATE) results in the addition of a weight to the net IRR. The ATE is a tool used for comparing treatments. The ATE evaluates the difference in averages between the treatment group and the control group. Consequently, the weighted net IRR will be used as the dependent variable for the regression analysis.

The central tendency measures, such as the mean and median, will serve to indicate the relationship between the various variables and the performance of ESG funds. The measurements of variability will assist in adjusting the dependent variables so that the estimated model meets the assumptions of regression analysis.

A 95% confidence interval will be used to ensure the significance of the results, this being determined by the standard errors (SE). The SE measures the standard deviation to the mean of random variables within the dataset. The following formula has been used to calculate the SE:

$$SE_{\mu_x} = \frac{s}{\sqrt{n}}, with\ s = \sqrt{\frac{\sum_{i=1}^{n}(x_i - \mu_x)^2}{n-1}}\ and\ \mu_x = \frac{\sum_{i=1}^{n} x_i}{n}$$

Robust standard errors will be used to control for heteroskedasticity in the model. Homoskedasticity is an important factor for the data as the error term would be the same for all the independent variables. The error terms are anomalies that can be found in the data and are completely random. The assumption of homoskedasticity must be satisfied for the multiple regression analysis.

## 4.2 Inferential Statistics

A two-way t-test will be performed to test if the net IRR between the ESG funds and normal funds differs significantly. This test is performed to observe if there is a positive or negative effect of sustainable funds on net IRR. The t-test illustrates the impact of ESG funds on net IRR relative to traditional funds.

The same procedure will be performed to test the differences in size between the two groups. This will provide evidence if there is a significant difference, either positive or negative. The results of this test will be used to answer the second hypothesis, to see if there is any advantage or disadvantage to having a larger or smaller amount of assets under management for each of the groups. Matching will be performed to eliminate this problem.

For the third hypothesis, another test will be done to observe if there is a significant difference in management fees between the two fund types. In the case that a significant difference is found, a weighted variable will be calculated and used in the model. The net IRR of traditional funds for a certain management fee will be weighted, hence the differences between the two groups will be diminished. For all the other independent variables a chi-square test will be done to evaluate if these variables have a significant difference in net IRR.

A propensity score test will be conducted to see if the matching technique results in a more accurate estimate than not matching and just adding size as a control variable. This test will determine for each variable if the means of the two samples are equal. The test will determine if the bias percentage is less than ten and the variance ratio is between 0.7 and 1.5. B must be less than or equal to 0.25. Using this framework, the t-test determines if the mean of the treatment and control variables vary substantially. The matching model yields a more accurate estimate than the unmatched model if the reported values fall within the intervals provided and the null hypothesis cannot be rejected. As a result, the dependent variable in the regression should be the weighted net IRR for size after matching.

## 4.3 Regression Analysis

In this model, the net IRR will be the dependent variable and it is used to measure the performance of the fund. A dummy variable is used to differentiate between the funds, with a value of 1 if the fund is ESG and 0 for traditional funds. The regression is then run to account for factors that have an impact on net IRR. Multiple control variables will be used to answer the hypothesis previously mentioned, an overview of these variables is shown in Table 2.

Table 2. *Regression Analysis Variables Overview*

| Variable | Description |
|---|---|
| Net_IRR | The net IRR is a discount rate that makes the net present value (NPV) of all cash flows equal to zero. |
| ESG | Dummy for ESG funds with traditional funds as the reference group |
| Fund_Size | AUM of the fund at the end of each month. |
| Management_Fee | The management fee each fund requires the investors to be paid for managing a portfolio |
| Incentive_Fee | The incentive fee that is retained by the fund from the investment profits |
| i.Year | The categorical variable of when the fund was founded |
| i.Country | The categorical variable of the country where the fund is operating |
| i.Asset | The categorical variable of which asset class the fund invests in |
| i.Approach | The categorical variable for the investment approach each fund is taking |
| Graveyard | Dummy variable which has the value 1 for liquidated funds and 0 for live funds |

*Note:* Table 2 contains descriptions of every value that will be used for the regression.

Following the run of the model, the coefficients of the variables will exhibit if the variable has a positive or negative effect on net IRR. Using Variance Inflation Factors (VIF), the independent variables will be evaluated for multicollinearity. This procedure will determine the degree to which independent variables are correlated. VIFs between 1 and 5 show a moderate correlation that is insufficient to warrant modified measurements. For meaningful findings, the independent variables should have a low degree of collinearity. The regression equation is the following:

$$Net_{IRR} = \alpha + \beta_1\, ESG + \beta_2\, Fund_{size} + \beta_3\, Management_{fee} + \beta_4\, Incentive_{fee} + \beta_5\, i.Year + \beta_6\, i.Country + \beta_7\, i.Asset + \beta_8\, i.Approach + \beta_9\, Graveyard + \varepsilon_i$$

The second model of the regression contains an interaction term between ESG funds and the asset class to observe their interaction effect. On average hedge funds that invest in equity have a higher net IRR compared to funds that trade currency or commodity contracts. The interaction effect between the two variables was introduced to examine if a certain asset is more beneficial for ESG funds and hence if it has a higher or lower impact compared to traditional funds. In the case in which one asset class has a higher impact on performance, future managers might be able to incorporate ESG directives easier for the respective asset class. The new regression equation is estimated below:

$$Net_{IRR} = \alpha + \beta_1\, D.ESG * i.Asset + \beta_2\, Fund_{size} + \beta_3\, Management_{fee} + \beta_4\, Incentive_{fee} + \beta_5\, i.Year + \beta_6\, i.Country + \beta_7\, i.Asset + \beta_8\, i.Approach + \beta_9\, D.Graveyard + \varepsilon_i$$

# 5. Empirical Results

This chapter will be looking into the empirical results that have been obtained through the application of the methodology described above. Firstly, the descriptive statistics will be analysed and discussed, then the statistical tests and the results from performing them will be analysed. Finally, the regression analysis will be reviewed.

## 5.1 Descriptive Statistics

Due to the nature of the data that was analysed, not all the factors that influence return have been analysed, hence the findings presented below are somewhat limited. A full overview of the descriptive statistics for every variable can be found in Table 1, Appendix.

Figure 1, Appendix presents the histogram of the net-IRR after the 1% and 99% percentiles were dropped and it can be observed that the observations follow an approximately normal distribution. However, Figure 2, Appendix shows that the AUM histogram has 2 means and a split in data. This is one of the limitations of data and for future research, data could be split into 2 clusters showing similar characteristics.

Table 1, Appendix shows that both the mean and the median net-IRR of ESG funds are on average lower, implying that ESG might have a negative impact on the performance of a fund. The standard deviation of the ESG group is higher, although having a smaller number of observations, hence it can be considered that the returns are more spread compared to the non-ESG funds. For the AUM, ESG funds have a higher size, by a small margin, while also having a smaller standard deviation. This could mean that ESG funds can have more investments and manage a higher amount of money. Looking into the start year, ESG funds are on average younger compared to non-ESG funds. This can be attributed to the fact that ESG is a newer approach to investing and more funds have just started to implement it in their investment approach.

The management fee for the ESG funds is on average lower, however, the median for both groups is the same. This is in line with previous findings and plenty of ESG funds are looking to attract new investors by offering services at a discount and increasing in size faster. Similar findings were present for the incentive fee, with ESG having a lower mean. All these variables will be again tested for significance in the following chapters.

## 5.2 T-Tests and Chi-squared test

The t-tests were performed to investigate the difference in IRR is significant for the two groups. The Chi-squared test was used on the categorical variables to check if they follow the distribution and their significance. Table 3 shows an overview of all the tests performed. A table with the abbreviations used in Table 3 can be found in Appendix.

Table 3. *Results of statistical tests for each of the variables.*

| Variable | Test | Mean NESG | Mean ESG | Difference | T-stat / Chi-stata | P-value |
|---|---|---|---|---|---|---|
| NIRR | t-test | 0.001 | -0.026 | 0.027 | 1.356 | 0.175 |
| LN(AUM) | t-test | 6.322 | 6.409 | -0.087 | -1.232 | 0.218 |
| MF | t-test | 1.418 | 1.375 | 0.042 | 2.330 | 0.019 |
| IF | t-test | 14.657 | 14.397 | -0.260 | -0.977 | 0.329 |
| SY | $Chi^2$ | A: 0.01% | A: 0% | - | 722.277 | 0.000 |
| | | B: 0.02% | B: 0% | | | |
| | | C: 19.33% | C: 24.67% | | | |
| | | D: 70.95% | D: 75.33% | | | |
| | | E: 0.01% | E: 0% | | | |
| Country | $Chi^2$ | US: 26% | US: 13.93% | - | 2.7e+03 | |
| | | E*: 24.72% | E*: 30.23% | | | |
| | | A*: 47.67% | A*: 46.28% | | | |
| | | AS: 0.01% | AS: 0% | | | |
| Asset | $Chi^2$ | EQ: 74.76% | EQ: 70.29% | - | 276.172 | 0.000 |
| | | CO: 0.01% | CO: 0% | | | |
| | | FX: 0.01% | FX: 6.49% | | | |
| | | FE: 6.36% | FE: 9.55% | | | |
| | | RE: 17.15% | RE: 13.67% | | | |
| Approach: | $Chi^2$ | AR: 40.49% | AR: 35.80% | - | 277.188 | 0.000 |
| | | BU: 36.07% | BU: 44.17% | | | |
| | | CT: 0.01% | CT: 0% | | | |
| | | DR: 0.03% | DR: 9.90% | | | |
| | | DS: 0.02% | DS: 0% | | | |
| | | DV: 0.05% | DV: 9.90% | | | |
| | | FU: 0.04% | FU: 0% | | | |
| | | LB: 0.05% | LB: 0% | | | |
| | | MN: 0.01% | MN: 0.01% | | | |
| | | ND: 0.01% | ND: 0% | | | |
| | | OP: 0.01% | OP: 0% | | | |
| | | O: 0.01% | O: 0% | | | |
| | | SB: 0.01% | SB: 0% | | | |
| | | SQ: 0.02% | SQ: 0% | | | |
| | | TC: 0.01% | TC: 0% | | | |
| | | TD: 0.01% | TD: 0% | | | |
| | | TF: 0.01% | TF: 0% | | | |
| Dead | $Chi^2$ | D*: 76.58% | D*: 64.72% | - | 58.526 | 0.000 |
| | | L: 23.42% | L: 35.28% | | | |

*Note.* Table 3 contains the results from the inferential statistics tests for each of the variables investigated. The first column shows the variable, then the type of test, followed by the mean of the Non-ESG group and then the ESG group. The last 3 columns show the difference between the means, the test statistic, and the respective p-value.

The first t-test performed on the net-IRR has a p-value larger than 0.05 and hence it can be concluded that the two groups are similar in their characteristics, by rejecting the alternative hypothesis. For the size of the funds, it can be concluded the same results as for net IRR and the ESG and non-ESG funds share similar characteristics. The third t-test investigates if there are significant differences in management fees for the two groups. The result of the test is 2.330 with a respective p-value lower than 0.05 and hence the two groups are different significantly at 5% levels in terms of management fees. However, when a similar test was applied to the incentive fee variable, the

differences were much smaller and the t-test statistic was small as well, with a p-value of 0.329. This shows that there are no significant differences between the two groups when looking at incentive fees.

All the other variables have been tested with Chi-squared tests. Firstly, looking at the start year it can be seen that most hedge funds were founded between 2000 and 2010 for both groups, however, the non-ESG group had some much older hedge funds, starting in 1969 and the ESG groups had observations only after 1990. This is in line with the previous data and results obtained above since ESG funds are a much newer type of fund than regular ones. Looking into the domicile country, the vast majority of funds are located in the Americas, predominantly in the Cayman Islands with 36.02% of all funds for the non-ESG and 31.83% for ESG funds. There are considerably fewer ESG funds in the US, compared to the EU and there are no ESG funds in Asia at the moment, according to the data. This may be an impact due to new regulations and goals of the EU that are looking into decreasing carbon emissions and rewarding companies for their green approach or strategy. In the case of asset classes, equities are the most present type of fund, which was expected from the industry, as stock is the easiest to trade and it can be used to achieve higher sustainability in firms. Real Estate and Other came as the second largest category with 17.15% of non-ESG funds and 13.67% of the ESG funds being part of this industry. There is no ESG commodity fund in the database used and there is a large discrepancy between the currencies funds of non-ESG which has only 0.01% and the ESG which has 6.49% of all funds. This can be somewhat misleading due to the large difference in the number of observations between the two groups. The approach that has been taken by most non-ESG funds is arbitrage, while for ESG funds it has been bottom up. Most of the observations have been found to use these two approaches. The ESG funds also engage in directional and diversified approaches with each having 9.90% of funds that operate in this way.

Following the methodology of Jong (2020) matching has been tried for the size and net-IRR, however, this process failed, and the matching has been found to be insignificant for both size and net-IRR. When trying to estimate the ATE using both probit and logit models, both coefficients showed p-values much larger than 5% levels, hence no weight has been added to the net-IRR (Table 8 and 9, Appendix). For the regression analysis, only the standardized net-IRR will be used, and it can be concluded that the methodology that Jong (2020) took might be restricted to only specific data and cannot be applied to different database.

## 5.3 Regression Analysis

The regression model will be used to observe how the independent variables affect the dependable variable net-IRR. Before the regression was performed the variables were tested for correlation (Table 2 and Table 3, Appendix). The variation of two variables is measured and reported in the covariance matrix. When the covariance is positive, the two variables vary in the same direction and when a negative covariance is found, the two variables differ in opposite directions. The covariance of two independent variables is equal to 0. The independent variable shows a low correlation with every other variable, however, for the AUM it can be observed a stronger negative correlation between start year and AUM and a positive low correlation between incentive fee, country, and liquidated funds. Management fees and incentive fees are somewhat correlated and there is a negative slight correlation between country and management fee. Following the analysis, the VIF for the variables is estimated and it can be concluded that there is no multicollinearity, hence no adjustments must be made. An overview of this process is available in Table 4, Appendix.

Both models estimated have a very low R-squared due to the limitations imposed by the data. For the validity of results, homoscedasticity has been ensured using robust standard errors and the assumptions of multiple linear regression are tested.

For the first model (Table 4, Appendix), a significant equation is reported given by the p-value equal to 0.00 (F(87, 83761) – 5.92) with an r-squared value of 0.006. This means that the model can

only explain 0.6% of the observations, which is a very low percentage. Looking at the coefficients in the regression, it can be observed that ESG has a coefficient equal to -0.0298861, which means that ESG negative impact on net-IRR. This means that if a fund is ESG the net-IRR will decrease by 0.03, however, the coefficient has a p-value equal to 0.15, which is above the 5% level and hence the coefficient is insignificant. The size variable has a coefficient equal of 0.0104011. This coefficient is positive and is significant at the 99% level having a p-value of 0.00, smaller than 1%. This coefficient says that if there is an increase in size of 1 there will be an 0.01 increase in net-IRR. The management fee variable has a coefficient of -0.0015768. This coefficient is negative and has a p-value of 0.714, which is higher than 0.05, hence, it is insignificant at 5% level. This means that if the management fee is increased by 1, the net-IRR will decrease by 0.0016. The incentive fee has a small coefficient of 0.0008694, which is positive and has a p-value of 0.005, which is significant at 95% level. The effect of this coefficient is that if there is an increase in incentive fee by 1, there will be an increase in net-IRR of 0.0009. The year variable has no significant coefficients and on average it has a positive effect. Looking into the domicile country it can be inferred that all countries besides Saint Martin have a negative effect on net-IRR, but only Austria, Bahamas, Germany, Netherlands, and Switzerland have significant coefficients. Regarding the asset class that these funds operate with, a significant negative effect has been observed for currencies, however, all the other coefficients are insignificant and negative. There is also a significant negative effect given by the contrarian approach to investing, but all other approaches are insignificant. Finally, the live funds have a positive and significant effect on net-IRR.

The second regression (Table 4, Appendix) contains an interaction effect between ESG funds and the asset class that they manage. The coefficient of this is -0.0095539, it is negative and has a p-value of 0.124. This makes the coefficient insignificant as it is higher than 0.05, hence, it cannot explain if choosing a specific asset class for the ESG fund will help with performance. The size variable has a coefficient equal of 0.0104001. This coefficient is positive and is significant at the 99% level having a p-value of 0.00, smaller than 1%. This coefficient says that if there is an increase in size of 1 there will be an 0.01 increase in net-IRR. The management fee variable has a coefficient of -0.0015707. This coefficient is negative and has a p-value of 0.715, which is higher than 0.05, hence, it is insignificant at 5% level. This means that if the management fee is increased by 1, the net-IRR will decrease by 0.0016. The incentive fee has a small coefficient of 0.0008691, which is positive and has a p-value of 0.005, which is significant at 95% level. The effect of this coefficient is that if there is an increase in incentive fee by 1, there will be an increase in net-IRR of 0.0009. Similar results were found when compared to the first model regarding all the variables examined in the previous model.

Given the results presented above, the effect of ESG on the performance of hedge funds is ambiguous and cannot be measured at a significant level. However, looking at the means of the two groups, from descriptive statistics, it can be inferred that ESG funds have on average lower returns compared to non-ESG funds. Consequently, due to insufficient statistical evidence, the first hypothesis must be rejected. For the second hypothesis that investigates the size effect, it can be concluded that there is a positive and significant difference between the two funds and the second hypothesis will not be rejected as well. The third hypothesis that evaluates if there is a significant negative difference in management fees, can be rejected as well due to insufficient statistical evidence. The last hypothesis stating that there is a negative difference in incentive fee is as well rejected, as it failed to pass the t-test, although it had a positive significant effect in the regression.

# 6. Conclusion

This paper investigates the difference in performance for ESG funds when compared to non-ESG funds. Based on the previous research and literature, most opinions are on the side that ESG's focus on a hedge fund now can harm performance as the products that are ESG have more limitations and are more scarce, hence smaller volumes and trades. Some research argues that ESG might be a valuable tool to attract new investors to your business and obtain benefits from the government, however at this time, this might not be the case due to inflation pressure and the probability of recession. This paper concludes that the effect of ESG in the hedge fund industry for the period investigated is ambiguous and it cannot be measured appropriately using the methodology and data applied.

The first hypothesis must be rejected as applying the t-test, it can be observed that the groups are statistically similar, and no significant difference has been found. Nevertheless, when adding ESG to the regression analysis the coefficient was negative and insignificant, hence no effect on net-IRR can be attributed to ESG. The second hypothesis has been examined and it investigates if there is a difference in size between ESG and non-ESG funds. Here it can be stated that the hypothesis will not be rejected as there is a significant and positive difference between the two groups. This is consistent with previous findings as ESG can help managers attract new investors that want to achieve performance by using sustainable assets and products. These findings were supported by both the statistical test and by the regression analysis. The third hypothesis investigates if there is a difference between the groups in terms of the management fees. This hypothesis must be rejected, even though the test statistic was significant and showed a small negative difference, however when controlled using the regression it can be observed that the coefficient of this variable is insignificant. Regarding the fourth hypothesis, no significant difference was found between the two groups and the hypothesis must be rejected. The statistical test showed no significant difference between the two groups; however, a small positive and significant coefficient was found when applying the regression analysis.

One of the problems that were encountered during this research is data. The data obtained has a much smaller number of observations for ESG funds compared to non-ESG funds. Therefore, it has been particularly hard to obtain significant results from the methodology applied. Nevertheless, the data is self-reported and might contain different biases that were explained in the literature. The second problem is that net-IRR might not be the best proxy for value and using different measures might have led to a better estimation of the effect. The third limitation is that many of the non-ESG funds that have been investigated have in their portfolio ESG assets and investments in this space. As TASS database will only indicate that a hedge fund is ESG only if the fund has all investments and assets that are socially responsible. Therefore, it is hard to evaluate if ESG influences non-ESG funds, that do invest some or even most of their portfolio in such assets.

In terms of future research, I would advise using different databases such as Prequin or HFR databases, or a combination of multiple databases that contain more data points for ESG funds. A more detailed data set might offer more explanatory power that can isolate the effect of ESG on performance. As ESG is considered a newer way of investing, a different period should be investigated, such as 2015-2022, hence observing if there are more funds that decided to convert their strategy to ESG or if these funds have become more valuable and profitable due to new regulations and tax incentives for these funds. A different approach could be taken in terms of methodology and a more advanced model can be developed as the regression analysis has very limited explanatory power. For the regression itself, more independent variables could be added to the model to offer more explanatory power. Such variables could be the number of investors, lock-up period, trade volume, the standard deviation of the funds, organizational structure, and much more. Nevertheless, future research should also try to estimate the effect of each of the components of ESG, therefore the effect of environmental, social, and governance effects can be approximated, and the effect observed for each of these variables. Lastly, a different proxy for value could be estimated and tested for its effect

instead of net-IRR, such proxies could be the funds' alpha, return on investments or return on capital employed.

To answer the research question that states *"What is the impact of socially responsible investments (SRI) in terms of performance for Hedge Funds in the US, Europe, and Asia from 2010-2015?"*, it can be concluded that there is no significant difference between ESG funds and non-ESG funds, and we can observe a small negative effect. There is strong statistical evidence that shows an increase in assets under management for the ESG funds compared to traditional funds. Nevertheless, there was too little statistical evidence to suggest that ESG funds have a different management fee or different incentive fee compared to regular funds.

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# Appendix

Table 1. *Overview of statistical findings.*

| Variable | | Obs | Mean | Median | Standard Deviation | Skewness | Kurtosis |
|---|---|---|---|---|---|---|---|
| NIRR | ESG | 754 | -0.026 | -0.005 | 0.629 | -0.325 | 4.501 |
| | Non-ESG | 93 542 | 0.001 | 0.010 | 0.544 | -0.168 | 5.545 |
| LN(AUM) | ESG | 754 | 6.409 | 6.440 | 1.225 | 0.180 | 1.704 |
| | Non-ESG | 93 542 | 6.322 | 6.014 | 1.935 | 0.036 | 4.418 |
| SY | ESG | 754 | 2002 | 2003 | 3.473 | -0.654 | 2.300 |
| | Non-ESG | 93 542 | 2001 | 2002 | 4.584 | -1.274 | 6.176 |
| MF | ESG | 754 | 1.376 | 1.5 | 0.392 | -0.411 | 3.244 |
| | Non-ESG | 93 542 | 1.418 | 1.5 | 0.496 | 0.188 | 5.322 |
| IF | ESG | 754 | 14.396 | 20 | 6.146 | -0.478 | 1.925 |
| | Non-ESG | 93 542 | 14.656 | 20 | 7.289 | -0.852 | 2.508 |

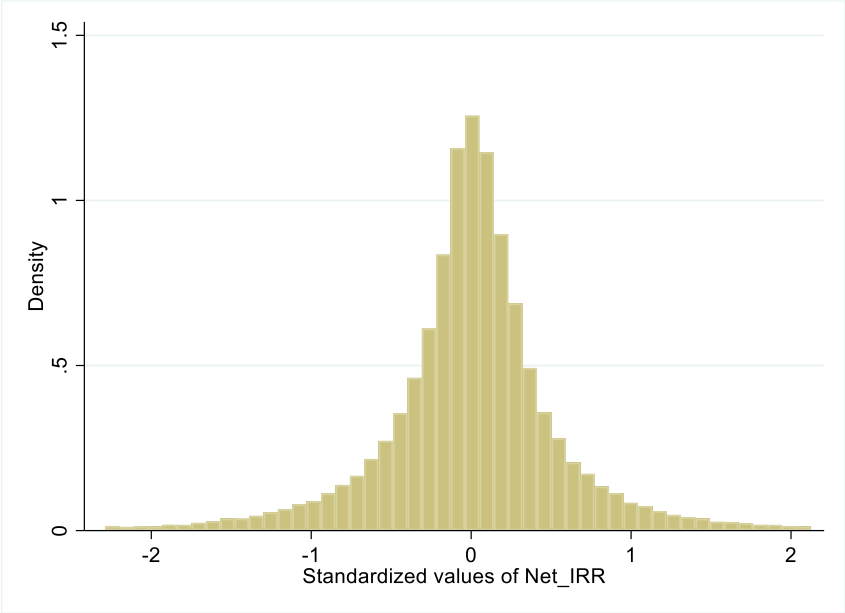
*Note.* Table 1 provides an overview of the main characteristics of each variable analyzed such as mean, median, standard deviation, skewness and kurtosis. An approximation to three decimal places was applied.

Table 2. *Abbreviations used in the research.*

| Abbreviations | Full Name |
|---|---|
| NIRR | Net internal rate of return. |
| AUM | Assets under management |
| ME | Management Fee |
| IE | Incentive Fee |
| SY | Start Year |
| 1960-1980 | A. |
| 1980-1990 | B. |
| 1990-2000 | C. |
| 2000-2010 | D. |
| 2010-2016 | E. |
| Europe | E* |
| Americas | A* |
| Asia | AS |
| Equities | EQ |
| Commodities | CO |
| Currencies | FX |
| Fixed Income | FE |
| Real Estate and Other | RE |
| Arbitrage | AR |
| Bottom-up | BU |
| Contrarian | CT |
| Directional | DR |
| Discretionary | DS |
| Diversified | DV |
| Fundamental | FU |
| Long Bias | LB |
| Market Neutral | MN |
| Non-Directional | ND |
| Opportunistic | OP |
| Other | O |
| Short Bias | SB |
| Systematic Quant | SQ |
| Technical | TC |
| Top-Down Macro | TD |
| Trend Follower | TF |
| Dead | D* |
| Live | L |

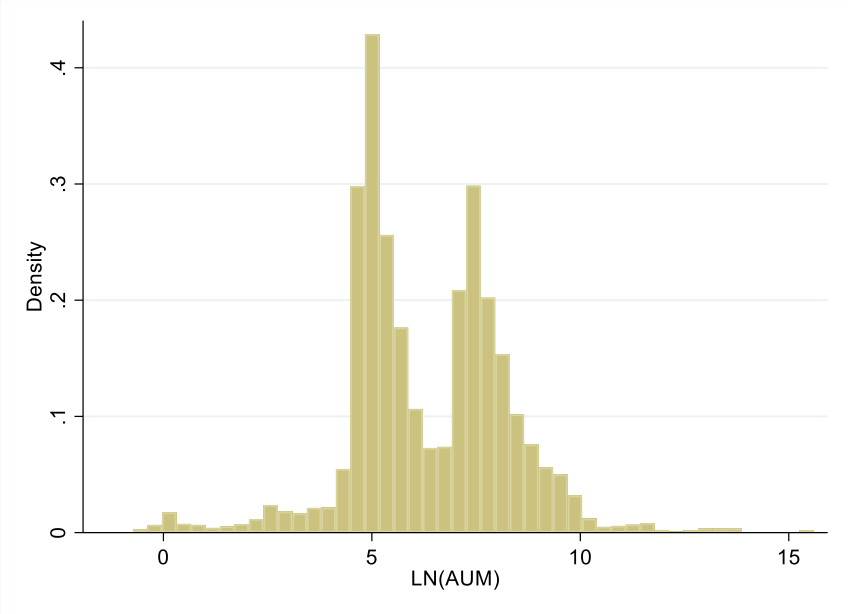
*Note.* Table 2 contains a list of the abbreviations used in this research paper.

Figure 1. *Net-IRR Histogram*




*Note.* Figure 1 contains a histogram of the net_IRR after it has been windonized.

Figure 2. *AUM Histogram*




*Note.* Figure 2 contains a histogram of the AUM after the logarithm has been applied.

Table 3. *Variables correlogram*

| | Net IRR | LNAUM | Year | M. Fee | I. Fee | Country | Dead | Asset | Approach |
|---|---|---|---|---|---|---|---|---|---|
| NIRR | 1.000 | | | | | | | | |
| LNAUM | 0.046 | 1.000 | | | | | | | |
| SY | -0.008 | -0.298 | 1.000 | | | | | | |
| MF | -0.006 | -0.146 | 0.150 | 1.000 | | | | | |
| IF | 0.025 | 0.131 | 0.049 | 0.148 | 1.000 | | | | |
| Country | 0.013 | 0.316 | -0.271 | -0.166 | -0.081 | 1.000 | | | |
| Dead | 0.041 | 0.116 | -1.03 | -0.041 | 0.021 | 0.067 | 1.000 | | |
| Asset | -0.003 | -0.007 | 0.052 | -0.013 | -0.103 | -0.038 | -0.080 | 1.000 | |
| Approach | 0.002 | 0.003 | 0.085 | 0.006 | -0.013 | 0.014 | 0.050 | 0.027 | 1.000 |
| ESG | -0.005 | 0.006 | 0.015 | -0.012 | -0.015 | -0.015 | 0.026 | -0.004 | -0.019 |

*Note.* Table 3 shows the correlation between the variables used in the research. All outputs have been approximated to 3 decimals.

Table 4. *Variables covariances*

| | Net IRR | LNAUM | Year | M. Fee | I. Fee | Country | Dead | Asset | Approach |
|---|---|---|---|---|---|---|---|---|---|
| Net IRR | 0.299 | | | | | | | | |
| LNAUM | 0.048 | 3.636 | | | | | | | |
| SY | -0.020 | -2.631 | 21.493 | | | | | | |
| MF | -0.002 | -0.136 | 0.338 | 0.237 | | | | | |
| IF | 0.099 | 1.792 | 1.628 | 0.520 | 51.829 | | | | |
| Country | 0.070 | 0.095 | -12.019 | -0.775 | -5.607 | 91.480 | | | |
| Dead | 0.010 | -0.204 | -0.204 | -0.009 | 0.064 | 0.274 | 0.185 | | |
| Asset | -0.001 | -0.010 | 0.172 | -0.005 | -0.531 | -0.257 | -0.025 | 0.513 | |
| Approach | 0.003 | 0.014 | 1.141 | 0.009 | -0.269 | 0.390 | 0.063 | 0.057 | 8.442 |
| ESG | -0.000 | 0.001 | 0.007 | -0.001 | 0.001 | -0.013 | 0.001 | -0.000 | -0.005 |

*Note.* Table 4 shows the covariences between the variables used in the research. All outputs have been approximated to 3 decimals.

Table 5. *Regression Analysis Model 1*

| Net IRR | Coef. | Std. Err. | t | P-value | 95% Conf. Interval | |
|---|---|---|---|---|---|---|
| DESG | -.0298861 | .0207408 | -1.44 | 0.150 | -.0705379 | .0107657 |
| LNAUM | .0104011 | .0012058 | 8.63 | 0.000 | .0080377 | .0127645 |
| MF | -.0015768 | .004296 | -0.37 | 0.714 | -.009997 | .0068434 |
| IF | .0008694 | .0003118 | 2.79 | 0.005 | .0002583 | .0014805 |

| iYear | | | | | | |
|---|---|---|---|---|---|---|
| 1977 | .1124152 | .2541322 | 0.44 | 0.658 | -.385682 | .6105123 |
| 1981 | .015862 | .0917174 | 0.17 | 0.863 | -.1639034 | .1956274 |
| 1983 | .0554679 | .1061158 | 0.52 | 0.601 | -.1525183 | .2634541 |
| 1984 | .0944671 | .0719215 | 1.31 | 0.189 | -.0464984 | .2354326 |
| 1985 | .0833801 | .0804619 | 1.04 | 0.300 | -.0743245 | .2410847 |
| 1986 | .0138247 | .0814096 | 0.17 | 0.865 | -.1457375 | .1733869 |
| 1987 | .0189185 | .071624 | 0.26 | 0.792 | -.1214641 | .159301 |
| 1988 | .0048972 | .0753305 | 0.07 | 0.948 | -.14275 | .1525444 |
| 1989 | .0200198 | .0703525 | 0.28 | 0.776 | -.1178706 | .1579102 |
| 1990 | .0643543 | .0688252 | 0.94 | 0.350 | -.0705425 | .199251 |
| 1991 | .0413878 | .0673699 | 0.61 | 0.539 | -.0906565 | .1734322 |
| 1992 | .0488137 | .0680257 | 0.72 | 0.473 | -.0845162 | .1821435 |
| 1993 | .051587 | .0672903 | 0.77 | 0.443 | -.0803015 | .1834755 |
| 1994 | .0279073 | .066674 | 0.42 | 0.676 | -.1027732 | .1585879 |
| 1995 | .0279269 | .0669832 | 0.42 | 0.677 | -.1033597 | .1592135 |
| 1996 | .0228845 | .0664609 | 0.34 | 0.731 | -.1073782 | .1531473 |
| 1997 | .0644295 | .0662491 | 0.97 | 0.331 | -.0654181 | .1942772 |
| 1998 | .0574676 | .0661158 | 0.87 | 0.385 | -.0721188 | .1870541 |
| 1999 | .0634312 | .0660771 | 0.96 | 0.337 | -.0660795 | .1929418 |
| 2000 | .0594914 | .066112 | 0.90 | 0.368 | -.0700877 | .1890704 |
| 2001 | .0717385 | .0659632 | 1.09 | 0.277 | -.0575488 | .2010257 |
| 2002 | .0555739 | .0659029 | 0.84 | 0.399 | -.0735953 | .184743 |
| 2003 | .0662691 | .065749 | 1.01 | 0.314 | -.0625985 | .1951366 |
| 2004 | .0516114 | .0658033 | 0.78 | 0.433 | -.0773626 | .1805854 |
| 2005 | .0626801 | .0658828 | 0.95 | 0.341 | -.0664498 | .1918099 |
| 2006 | .0740195 | .0658984 | 1.12 | 0.261 | -.0551409 | .2031799 |
| 2007 | .0380963 | .0668403 | 0.57 | 0.569 | -.0929102 | .1691027 |
| 2008 | .0997248 | .0793646 | 1.26 | 0.209 | -.0558292 | .2552788 |
| 2009 | .0587277 | .0918854 | 0.64 | 0.523 | -.1213669 | .2388222 |
| 2010 | .0508237 | .0925459 | 0.55 | 0.583 | -.1305656 | .232213 |
| 2011 | -.2142431 | .1078216 | -1.99 | 0.047 | -.4255726 | -.0029136 |
| 2012 | .1022353 | .0879739 | 1.16 | 0.245 | -.0701928 | .2746634 |
| 2013 | .0564967 | .0835077 | 0.68 | 0.499 | -.1071777 | .2201711 |
| 2014 | .0564545 | .0988912 | 0.57 | 0.568 | -.1373715 | .2502805 |
| 2015 | -.0933379 | .0922668 | -1.01 | 0.312 | -.2741801 | .0875042 |
| 2016 | -.0575935 | .0821123 | -0.70 | 0.483 | -.2185329 | .1033458 |
| Country | | | | | | |
| Austria | -.109689 | .0483634 | -2.27 | 0.023 | -.2044809 | -.0148971 |
| Bahamas | -.0795971 | .0359797 | -2.21 | 0.027 | -.1501169 | -.0090772 |
| Bermuda | -.0401105 | .0266768 | -1.50 | 0.133 | -.0923969 | .0121759 |
| Brazil | .091155 | .0692621 | 1.32 | 0.188 | -.0445981 | .226908 |

| | | | | | | |
|---|---|---|---|---|---|---|
| Canada | -.0820059 | .0334233 | -2.45 | 0.014 | -.1475153 | -.0164965 |
| Cayman Islands | -.0259779 | .0258589 | -1.00 | 0.315 | -.0766611 | .0247053 |
| Curacao | -.0154462 | .0365622 | -0.42 | 0.673 | -.0871078 | .0562153 |
| Finland | -.1778011 | .0863053 | -2.06 | 0.039 | -.3469587 | -.0086434 |
| France | -.0482053 | .027759 | -1.74 | 0.082 | -.1026126 | .0062021 |
| Germany | -.1027343 | .0463822 | -2.21 | 0.027 | -.193643 | -.0118255 |
| Guernsey | -.0299682 | .0283884 | -1.06 | 0.291 | -.0856093 | .0256728 |
| Ireland | -.0193911 | .0278301 | -0.70 | 0.486 | -.0739378 | .0351557 |
| Italy | -.0346569 | .0356742 | -0.97 | 0.331 | -.104578 | .0352642 |
| Japan | .022181 | .0696104 | 0.32 | 0.750 | -.1142549 | .1586168 |
| Jersey | -.0674328 | .0329761 | -2.04 | 0.041 | -.1320657 | -.0027998 |
| Liechtenstein | .1070946 | .0458133 | 2.34 | 0.019 | .017301 | .1968883 |
| Luxembourg | -.067345 | .0272766 | -2.47 | 0.014 | -.1208069 | -.013883 |
| Malta | .0633118 | .0701699 | 0.90 | 0.367 | -.0742205 | .2008442 |
| Mauritius | -.0589576 | .0427101 | -1.38 | 0.167 | -.1426691 | .0247539 |
| Netherlands | -.0912478 | .0418405 | -2.18 | 0.029 | -.1732548 | -.0092409 |
| Saint Martin | 0 | (omitted) | | | | |
| Vincent And The Grenadin | -.0544337 | .0706589 | -0.77 | 0.441 | -.1929247 | .0840572 |
| Singapore | -.0152893 | .0960435 | -0.16 | 0.874 | -.2035337 | .1729552 |
| Sweden | -.0347634 | .0356135 | -0.98 | 0.329 | -.1045654 | .0350387 |
| Switzerland | -.0732781 | .0281576 | -2.60 | 0.009 | -.1284668 | -.0180895 |
| United States | -.0183702 | .026055 | -0.71 | 0.481 | -.0694377 | .0326974 |
| Virgin Islands (British) | -.0295052 | .026811 | -1.10 | 0.271 | -.0820545 | .0230441 |
| Asset | | | | | | |
| Currencies | -.1062008 | .02876 | -3.69 | 0.000 | -.1625701 | -.0498314 |
| Equities | -.0270777 | .0204299 | -1.33 | 0.185 | -.06712 | .0129647 |
| Fixed Income | -.02774 | .0216556 | -1.28 | 0.200 | -.0701848 | .0147048 |
| Real Estate or Other | -.0240435 | .0210061 | -1.14 | 0.252 | -.0652152 | .0171282 |
| Approach | | | | | | |
| Bottom Up | -.0021877 | .0045184 | -0.48 | 0.628 | -.0110437 | .0066684 |
| Contrarian | -.0624525 | .022179 | -2.82 | 0.005 | -.1059232 | -.0189817 |
| Directional | -.0093835 | .011324 | -0.83 | 0.407 | -.0315784 | .0128114 |
| Discretionary | -.0176383 | .0152314 | -1.16 | 0.247 | -.0474916 | .012215 |
| Diversified | .0009126 | .0092576 | 0.10 | 0.921 | -.0172322 | .0190575 |
| Fundamental | .0047167 | .0106007 | 0.44 | 0.656 | -.0160607 | .025494 |
| Long Bias | -.0010587 | .0094268 | -0.11 | 0.911 | -.019535 | .0174177 |
| Market Neutral | -.0154509 | .0180803 | -0.85 | 0.393 | -.0508881 | .0199863 |

| | | | | | | |
|---|---|---|---|---|---|---|
| Non Directional | .0238682 | .0247612 | 0.96 | 0.335 | -.0246636 | .0723999 |
| Opportunistic | -.0247892 | .0241983 | -1.02 | 0.306 | -.0722178 | .0226393 |
| Other | .1107719 | .0706633 | 1.57 | 0.117 | -.0277276 | .2492715 |
| Short Bias | -.1057503 | .072555 | -1.46 | 0.145 | -.2479575 | .0364569 |
| Systematic Quant | .0115949 | .0161967 | 0.72 | 0.474 | -.0201505 | .0433403 |
| Technical | .0803693 | .0967659 | 0.83 | 0.406 | -.1092911 | .2700297 |
| Top Down Macro | .0186223 | .0277976 | 0.67 | 0.503 | -.0358607 | .0731054 |
| Trend Follower | -.0348999 | .0487047 | -0.72 | 0.474 | -.1303607 | .0605608 |
| | | | | | | |
| Dead | | | | | | |
| Live | .0484527 | .0046771 | 10.36 | 0.000 | .0392856 | .0576197 |
| Constant | -.083854 | .0741668 | -1.13 | 0.258 | -.2292203 | .0615123 |

*Note.* Table 5 shows the outcome of the first regression model for all the variables used.

Table 6. *VIF for model 1*

| Variable | VIF | 1/VIF |
|---|---|---|
| DESG | 1.04 | 0.958565 |
| LNAUM | 1.51 | 0.664410 |
| MF | 1.25 | 0.801405 |
| IF | 1.43 | 0.697152 |
| iYear | | |
| 1977 | 1.08 | 0.922973 |
| 1981 | 2.03 | 0.492476 |
| 1983 | 1.62 | 0.615806 |
| 1984 | 6.14 | 0.162978 |
| 1985 | 3.06 | 0.327021 |
| 1986 | 3.00 | 0.333626 |
| 1987 | 6.36 | 0.157277 |
| 1988 | 4.10 | 0.243761 |
| 1989 | 7.66 | 0.130484 |
| 1990 | 11.08 | 0.090244 |
| 1991 | 18.09 | 0.055277 |
| 1992 | 13.87 | 0.072088 |
| 1993 | 20.04 | 0.049906 |
| 1994 | 31.77 | 0.031479 |
| 1995 | 26.26 | 0.038074 |
| 1996 | 37.45 | 0.026701 |
| 1997 | 47.17 | 0.021200 |
| 1998 | 52.81 | 0.018935 |
| 1999 | 70.77 | 0.014131 |
| 2000 | 68.79 | 0.014537 |
| 2001 | 89.90 | 0.011124 |
| 2002 | 98.47 | 0.010155 |
| 2003 | 123.08 | 0.008125 |
| 2004 | 149.41 | 0.006693 |

| | | |
|---|---|---|
| 2005 | 136.86 | 0.007307 |
| 2006 | 77.87 | 0.012842 |
| 2007 | 30.70 | 0.032572 |
| 2008 | 3.33 | 0.300021 |
| 2009 | 2.04 | 0.490678 |
| 2010 | 2.07 | 0.483698 |
| 2011 | 1.60 | 0.625558 |
| 2012 | 2.31 | 0.433123 |
| 2013 | 2.87 | 0.347956 |
| 2014 | 1.80 | 0.554442 |
| 2015 | 2.05 | 0.486630 |
| 2016 | 2.80 | 0.356985 |
| Country | | |
| 2 | 1.42 | 0.705453 |
| 3 | 2.03 | 0.491513 |
| 4 | 13.74 | 0.072794 |
| 5 | 1.17 | 0.851752 |
| 6 | 2.61 | 0.382660 |
| 7 | 43.90 | 0.022778 |
| 8 | 2.18 | 0.458554 |
| 9 | 1.10 | 0.909810 |
| 10 | 7.89 | 0.126704 |
| 11 | 1.49 | 0.670873 |
| 12 | 5.55 | 0.180315 |
| 13 | 7.03 | 0.142311 |
| 14 | 2.30 | 0.434044 |
| 15 | 1.17 | 0.854950 |
| 16 | 2.58 | 0.387102 |
| 17 | 1.51 | 0.662115 |
| 18 | 8.49 | 0.117794 |
| 19 | 1.19 | 0.841372 |
| 20 | 1.59 | 0.630305 |
| 21 | 1.61 | 0.621065 |
| 23 | 1.21 | 0.829764 |
| 24 | 1.08 | 0.923482 |
| 25 | 2.15 | 0.465339 |
| 26 | 6.32 | 0.158175 |
| 27 | 37.71 | 0.026515 |
| 28 | 13.48 | 0.074209 |
| Asset | | |
| 2 | 2.22 | 0.449663 |
| 3 | 19.38 | 0.051608 |
| 4 | 8.34 | 0.119910 |
| 5 | 13.24 | 0.075539 |
| Approach | | |
| 2 | 1.34 | 0.745448 |

| | | |
|---|---|---|
| 3 | 1.05 | 0.955322 |
| 4 | 1.07 | 0.934681 |
| 5 | 1.09 | 0.920062 |
| 6 | 1.15 | 0.870086 |
| 7 | 1.13 | 0.884100 |
| 8 | 1.12 | 0.892652 |
| 9 | 1.08 | 0.927134 |
| 10 | 1.05 | 0.953292 |
| 11 | 1.05 | 0.952055 |
| 12 | 1.07 | 0.933281 |
| 13 | 1.01 | 0.993883 |
| 14 | 1.07 | 0.935710 |
| 15 | 1.01 | 0.994997 |
| 16 | 1.06 | 0.945276 |
| 17 | 1.08 | 0.925272 |
| 2.Dead | 1.15 | 0.869715 |
| | | |
| Mean VIF | 16.09 | |

*Note.* Table 6 shows an overview of the VIF test for all the variables in the first regression model.

Table 7. *Regression Analysis Model 2*

| Net IRR | Coef. | Std. Err. | t | P-value | 95% Conf. | Interval |
|---|---|---|---|---|---|---|
| interaction | -.0095539 | .0062132 | -1.54 | 0.124 | .0217317 | .0026239 |
| LNAUM | .0104001 | .0012058 | 8.63 | 0.000 | .0080368 | .0127634 |
| MF | -.0015707 | .0042958 | -0.37 | 0.715 | .0099904 | .0068491 |
| IF | .0008691 | .0003118 | 2.79 | 0.005 | .000258 | .0014802 |
| | | | | | | |
| iYear | | | | | | |
| 1977 | .1126159 | .2541278 | 0.44 | 0.658 | .3854725 | .6107042 |
| 1981 | .0158635 | .0917172 | 0.17 | 0.863 | .1639015 | .1956286 |
| 1983 | .0554131 | .1061157 | 0.52 | 0.602 | .1525728 | .2633991 |
| 1984 | .0944086 | .0719214 | 1.31 | 0.189 | .0465568 | .235374 |
| 1985 | .0833613 | .0804617 | 1.04 | 0.300 | -.074343 | .2410657 |
| 1986 | .0137494 | .0814096 | 0.17 | 0.866 | .1458128 | .1733115 |
| 1987 | .0189181 | .0716239 | 0.26 | 0.792 | .1214641 | .1593002 |
| 1988 | .0048077 | .0753305 | 0.06 | 0.949 | .1428395 | .1524549 |
| 1989 | .0199674 | .0703525 | 0.28 | 0.777 | -.117923 | .1578577 |
| 1990 | .0643375 | .068825 | 0.93 | 0.350 | -.070559 | .1992341 |
| 1991 | .0413577 | .0673698 | 0.61 | 0.539 | .0906865 | .1734019 |
| 1992 | .0487779 | .0680256 | 0.72 | 0.473 | .0845518 | .1821076 |
| 1993 | .0515269 | .0672903 | 0.77 | 0.444 | .0803616 | .1834154 |
| 1994 | .0278617 | .066674 | 0.42 | 0.676 | .1028188 | .1585421 |
| 1995 | .0278591 | .0669825 | 0.42 | 0.677 | .1034259 | .1591442 |

| | | | | | | |
|---|---|---|---|---|---|---|
| 1996 | .0228529 | .0664607 | 0.34 | 0.731 | .1074096 | .1531154 |
| 1997 | .0644399 | .0662489 | 0.97 | 0.331 | .0654075 | .1942872 |
| 1998 | .057465 | .0661157 | 0.87 | 0.385 | .0721212 | .1870512 |
| 1999 | .063414 | .066077 | 0.96 | 0.337 | .0660964 | .1929244 |
| 2000 | .059523 | .0661119 | 0.90 | 0.368 | .0700558 | .1891018 |
| 2001 | .0717188 | .065963 | 1.09 | 0.277 | .0575682 | .2010058 |
| 2002 | .0554777 | .0659029 | 0.84 | 0.400 | .0736914 | .1846469 |
| 2003 | .0663047 | .0657489 | 1.01 | 0.313 | .0625627 | .1951721 |
| 2004 | .0516323 | .0658032 | 0.78 | 0.433 | .0773414 | .1806061 |
| 2005 | .062639 | .0658826 | 0.95 | 0.342 | .0664904 | .1917684 |
| 2006 | .074127 | .0658985 | 1.12 | 0.261 | .0550335 | .2032876 |
| 2007 | .0380982 | .0668401 | 0.57 | 0.569 | -.092908 | .1691043 |
| 2008 | .0997156 | .0793645 | 1.26 | 0.209 | .0558382 | .2552693 |
| 2009 | .0587477 | .0918851 | 0.64 | 0.523 | .1213464 | .2388419 |
| 2010 | .0509087 | .0925458 | 0.55 | 0.582 | .1304803 | .2322977 |
| 2011 | -.2142051 | .1078214 | -1.99 | 0.047 | .4255342 | -.002876 |
| 2012 | .1022373 | .0879737 | 1.16 | 0.245 | .0701905 | .2746651 |
| 2013 | .0566783 | .0835061 | 0.68 | 0.497 | .1069929 | .2203496 |
| 2014 | .0564732 | .0988911 | 0.57 | 0.568 | .1373525 | .2502988 |
| 2015 | -.093344 | .0922663 | -1.01 | 0.312 | .2741853 | .0874973 |
| 2016 | -.057682 | .0821122 | -0.70 | 0.482 | .2186213 | .1032573 |
| | | | | | | |
| Country | | | | | | |
| Austria | -.1095621 | .0483467 | -2.27 | 0.023 | .2043212 | -.014803 |
| Bahamas | -.0794855 | .0359741 | -2.21 | 0.027 | .1499945 | -.0089765 |
| Bermuda | -.0397986 | .0266355 | -1.49 | 0.135 | .0920039 | .0124067 |
| Brazil | .0913938 | .0692487 | 1.32 | 0.187 | -.044333 | .2271207 |
| Canada | -.0818003 | .0333933 | -2.45 | 0.014 | -.147251 | -.0163497 |
| Cayman Islands | -.0257817 | .025824 | -1.00 | 0.318 | .0763964 | .0248331 |
| Curacao | -.0151937 | .0365358 | -0.42 | 0.678 | .0868035 | .0564161 |
| Finland | -.177593 | .0862929 | -2.06 | 0.040 | .3467265 | -.0084596 |
| France | -.0480795 | .0277286 | -1.73 | 0.083 | .1024274 | .0062683 |
| Germany | -.1025171 | .0463566 | -2.21 | 0.027 | .1933757 | -.0116584 |
| Guernsey | -.0297486 | .0283554 | -1.05 | 0.294 | .0853249 | .0258277 |
| Ireland | -.0191762 | .0277923 | -0.69 | 0.490 | -.073649 | .0352965 |
| Italy | -.03444 | .0356473 | -0.97 | 0.334 | .1043085 | .0354284 |
| Japan | .0224686 | .0695953 | 0.32 | 0.747 | .1139376 | -.1588747 |
| Jersey | -.0673085 | .0329503 | -2.04 | 0.041 | .1318909 | -.0027261 |
| Liechtenstein | .1073243 | .0457926 | 2.34 | 0.019 | .0175713 | .1970773 |
| Luxembourg | -.0670371 | .0272484 | -2.46 | 0.014 | .1204438 | -.0136304 |
| Malta | .0635735 | .0701561 | 0.91 | 0.365 | .0739319 | .2010789 |

| | | | | | | |
|---|---|---|---|---|---|---|
| Mauritius | -.058758 | .0426884 | -1.38 | 0.169 | -.142427 | .024911 |
| Netherlands | -.0910347 | .0418162 | -2.18 | 0.029 | .1729941 | -.0090753 |
| Saint Martin | 0 | (omitted) | | | | |
| Vincent And The Grenadine | -.0541721 | .070639 | -0.77 | 0.443 | -.192624 | .0842798 |
| Singapore | -.0151112 | .096034 | -0.16 | 0.875 | -.203337 | .1731147 |
| Sweden | -.0344425 | .035579 | -0.97 | 0.333 | .1041771 | .035292 |
| Switzerland | -.0730884 | .0281239 | -2.60 | 0.009 | .1282109 | -.0179659 |
| United States | -.0181533 | .0260173 | -0.70 | 0.485 | -.069147 | .0328405 |
| Virgin Islands (British) | -.0292132 | .0267757 | -1.09 | 0.275 | .0816935 | .023267 |
| | | | | | | |
| Asset | | | | | | |
| Currencies | -.1069122 | .0287369 | -3.72 | 0.000 | .1632364 | -.050588 |
| Equities | -.0270688 | .0204298 | -1.32 | 0.185 | -.067111 | .0129734 |
| Fixed Income | -.0276268 | .0216563 | -1.28 | 0.202 | .0700728 | .0148193 |
| Real Estate or Other | -.0238754 | .0210069 | -1.14 | 0.256 | .0650488 | .017298 |
| | | | | | | |
| Approach | | | | | | |
| Bottom Up | -.0022496 | .0045177 | -0.50 | 0.619 | .0111043 | .0066051 |
| Contrarian | -.0624286 | .0221785 | -2.81 | 0.005 | .1058984 | -.0189589 |
| Directional | -.0094758 | .0113212 | -0.84 | 0.403 | .0316653 | .0127137 |
| Discretionary | -.0176304 | .015231 | -1.16 | 0.247 | .0474831 | .0122223 |
| Diversified | .0010043 | .0092588 | 0.11 | 0.914 | .0171428 | .0191514 |
| Fundamental | .0047001 | .0106007 | 0.44 | 0.657 | .0160773 | .0254775 |
| Long Bias | -.0010815 | .0094268 | -0.11 | 0.909 | -.019558 | .017395 |
| Market Neutral | -.0155516 | .0180807 | -0.86 | 0.390 | .0509896 | .0198865 |
| Non Directional | .0237689 | .0247616 | 0.96 | 0.337 | .0247636 | .0723013 |
| Opportunistic | -.0248285 | .0241984 | -1.03 | 0.305 | .0722572 | .0226001 |
| Other | .1113207 | .0706588 | 1.58 | 0.115 | .0271699 | .2498113 |
| Short Bias | -.105709 | .0725549 | -1.46 | 0.145 | .2479159 | .036498 |
| Systematic Quant | .0116446 | .0161956 | 0.72 | 0.472 | .0200986 | .0433879 |
| Technical | .0803976 | .0967656 | 0.83 | 0.406 | .1092622 | .2700574 |
| Top Down Macro | .018611 | .0277975 | 0.67 | 0.503 | .0358719 | .0730939 |
| Trend Follower | -.0349934 | .0487048 | -0.72 | 0.472 | .1304545 | .0604677 |
| | | | | | | |
| Dead | | | | | | |
| Live | .0484312 | .0046766 | 10.36 | 0.000 | .0392651 | .0575974 |
| Constant | -.0840555 | .074155 | -1.13 | 0.257 | .2293986 | .0612877 |

*Note.* Table 7 shows the outcome of the second regression model for all the variables used.

Table 8. *VIF for model 2*

| Variable | VIF | 1/VIF |
|---|---|---|
| interaction | 1.04 | 0.964770 |
| LNAUM | 1.50 | 0.664453 |
| MF | 1.25 | 0.801483 |
| IF | 1.43 | 0.697161 |
| iYear | | |
| 1977 | 1.08 | 0.923002 |
| 1981 | 2.03 | 0.492477 |
| 1983 | 1.62 | 0.615806 |
| 1984 | 6.14 | 0.162977 |
| 1985 | 3.06 | 0.327021 |
| 1986 | 3.00 | 0.333625 |
| 1987 | 6.36 | 0.157277 |
| 1988 | 4.10 | 0.243760 |
| 1989 | 7.66 | 0.130484 |
| 1990 | 11.08 | 0.090244 |
| 1991 | 18.09 | 0.055277 |
| 1992 | 13.87 | 0.072088 |
| 1993 | 20.04 | 0.049906 |
| 1994 | 31.77 | 0.031479 |
| 1995 | 26.26 | 0.038075 |
| 1996 | 37.45 | 0.026701 |
| 1997 | 47.17 | 0.021200 |
| 1998 | 52.81 | 0.018935 |
| 1999 | 70.77 | 0.014131 |
| 2000 | 68.79 | 0.014537 |
| 2001 | 89.90 | 0.011124 |
| 2002 | 98.47 | 0.010155 |
| 2003 | 123.08 | 0.008125 |
| 2004 | 149.41 | 0.006693 |
| 2005 | 136.86 | 0.007307 |
| 2006 | 77.87 | 0.012842 |
| 2007 | 30.70 | 0.032572 |
| 2008 | 3.33 | 0.300021 |
| 2009 | 2.04 | 0.490679 |
| 2010 | 2.07 | 0.483698 |
| 2011 | 1.60 | 0.625558 |
| 2012 | 2.31 | 0.433123 |
| 2013 | 2.87 | 0.347968 |
| 2014 | 1.80 | 0.554442 |
| 2015 | 2.05 | 0.486632 |
| 2016 | 2.80 | 0.356984 |
| Country | | |

| | | |
|---|---|---|
| 2 | 1.42 | 0.705938 |
| 3 | 2.03 | 0.491663 |
| 4 | 13.69 | 0.073020 |
| 5 | 1.17 | 0.852078 |
| 6 | 2.61 | 0.383345 |
| 7 | 43.78 | 0.022840 |
| 8 | 2.18 | 0.459215 |
| 9 | 1.10 | 0.910068 |
| 10 | 7.88 | 0.126982 |
| 11 | 1.49 | 0.671611 |
| 12 | 5.53 | 0.180735 |
| 13 | 7.01 | 0.142698 |
| 14 | 2.30 | 0.434697 |
| 15 | 1.17 | 0.855319 |
| 16 | 2.58 | 0.387707 |
| 17 | 1.51 | 0.662712 |
| 18 | 8.47 | 0.118037 |
| 19 | 1.19 | 0.841699 |
| 20 | 1.58 | 0.630944 |
| 21 | 1.61 | 0.621784 |
| 23 | 1.20 | 0.830229 |
| 24 | 1.08 | 0.923661 |
| 25 | 2.14 | 0.466239 |
| 26 | 6.31 | 0.158554 |
| 27 | 37.61 | 0.026592 |
| 28 | 13.44 | 0.074405 |
| Asset | | |
| 2 | 2.22 | 0.450383 |
| 3 | 19.38 | 0.051608 |
| 4 | 8.34 | 0.119902 |
| 5 | 13.24 | 0.075532 |
| Approach | | |
| 2 | 1.34 | 0.745665 |
| 3 | 1.05 | 0.955361 |
| 4 | 1.07 | 0.935135 |
| 5 | 1.09 | 0.920099 |
| 6 | 1.15 | 0.869868 |
| 7 | 1.13 | 0.884095 |
| 8 | 1.12 | 0.892638 |
| 9 | 1.08 | 0.927088 |
| 10 | 1.05 | 0.953261 |
| 11 | 1.05 | 0.952047 |
| 12 | 1.07 | 0.933398 |
| 13 | 1.01 | 0.993883 |
| 14 | 1.07 | 0.935834 |
| 15 | 1.01 | 0.995000 |

| | | |
|---|---|---|
| 16 | 1.06 | 0.945278 |
| 17 | 1.08 | 0.925262 |
| 2.Dead | 1.15 | 0.869879 |
| | | |
| Mean VIF | 16.08 | |

*Note.* Table 8 shows an overview of the VIF test for all the variables in the second regression model.

Table 9. *Matching outcome ATE Probit*

| Net IRR | Coef. | Std. Err. | z | P>z | 95% Conf. | Interval |
|---|---|---|---|---|---|---|
| ATE ESG | | | | | | |
| (1 vs 0) | -.0507808 | .0444351 | -1.14 | 0.253 | -.137872 | .0363104 |

*Note.* Table 9 shows an overview of the matching outcome and the weight of the ATE for the probit model.

Table 10. *Matching outcome ATE Logit*

| Net IRR | Coef. | Std. Err. | z | P>z | 95% Conf. | Interval |
|---|---|---|---|---|---|---|
| ATE ESG | | | | | | |
| (1 vs 0) | -.050776 | .0444347 | -1.14 | 0.253 | -.1378664 | .0363145 |

*Note.* Table 10 shows an overview of the matching outcome and the weight of the ATE for the logit model.