

MEGI

Master's degree Program in
**Statistics and Information Management, with a specialization in
Risk Analysis and Management**

**Active portfolio management vs indexation: a study of
correlation linked to a pandemic scenario**

André Filipe Levita Alves

Master Thesis

presented as a partial requirement for obtaining the master's degree Program in Statistics and Information Management

NOVA Information Management School
Instituto Superior de Estatística e Gestão de Informação

Universidade Nova de Lisboa

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ACTIVE PORTFOLIO MANAGEMENT VS INDEXATION: A STUDY OF CORRELATION LINKED TO A PANDEMIC SCENARIO

By

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Master Thesis presented as partial a requirement for obtaining the Master's degree in Statistics and Information Management, with a specialization in Risk Analysis and Management.

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November 2023

Statement of Integrity

I hereby declare having conducted this academic work with integrity. I confirm that I have not used plagiarism or any form of undue use of information or falsification of results along the process leading to its elaboration. I further declare that I have fully acknowledged the Rules of Conduct and Code of Honor from the NOVA Information Management School.

Lisbon, November 2023

André Alves

Abstract

The present dissertation was done with the objective of examining the performance of actively managed funds in comparison to their benchmark in the context of the efficient market hypothesis. The research analyzes a sample of mutual funds across multiple asset classes and geographies over a given period of time. The analysis employs multiple performance metrics, such as the Greeks (alpha and beta), the Sharpe, Treynor and Information ratios, to evaluate the effectiveness of active management.

Additionally, the research explores the impact of fees and expenses on the performance of actively managed funds, which is supported by literature. The results confirmed that, on average, actively managed funds underperformed passive funds, which is not limited to but likely attributable to fees and expense. However, the analysis also identifies a subset of active funds that consistently outperform passive funds, suggesting that skilled active management still exists which may provide extra value to some investors. This research concludes with implications for investors and fund managers and offers directions for future research.

Keywords: *Portfolio management; active portfolio management; indexation; performance analysis; portfolio comparison; mutual funds.*

Sustainable Development Goals (SDG):



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List of Abbreviations

AIF – *Alternative Investment Fund*

APFIPP – *Associação Portuguesa de Fundos de Investimento, Pensões e Patrimónios*

AUM – *Assets under Management*

BPI – *Banco Português de Investimento*

CAPM – *Capital Asset Pricing Model*

CFA – *Chartered Financial Analyst*

CMVM – *Comissão do Mercado de Valores Mobiliários*

DGTW – *Daniel, Grinblatt, Titman, and Wermers*

ESG – *Environmental, Social and Governance*

GT – *Grinbald and Titman*

ICI – *Investment Company Institute*

PHEIC - *Public Health Emergency of International Concern*

PRI – *Principles for Responsible Investment*

NAV – *Net Asset Value*

PSI – *Portuguese Stock Index*

UCITS – *Undertakings for Collective Investment in Transferable Securities*

WHO – *World Health Organization*

WOS – *Web of Science*

1. Introduction

Actively managed funds are widely recognized to have historically been, and continue to be, the preferred choice for investors who seek to achieve above-average returns in more dispersed markets. This type of funds is actively managed in the sense that they require a professional portfolio manager who seeks to outperform the market, and their passive peers, by identifying investment opportunities, most of the times taking advantage of small fluctuations in price or arbitrage opportunities, and individually picking their portfolio assets to leverage on shifting market conditions. Additionally, the literature shows that the discussion over the effectiveness of active management versus passive management has been persistent for many years now. Some argue that actively managed funds can outperform passive funds over the short term, especially in more volatile markets, while others support the fact that the costs associated with active management often outweigh any potential benefits.

Active portfolio management funds are in fact known to underperform passive funds on average during rising markets while overperforming them in bear markets (Glode, 2011). To be noted that stock-picking funds have been surpassed by index-tracking funds during the last few years both in terms of assets under management and in performance. This was especially interesting during the pandemic environment as one would think actively managed funds would have an advantage over the index.

Since the beginning of the COVID-19 pandemic, articles that question the up mentioned norm have been surfacing (Nelson Brett, 2020). Actively managed funds have been surpassed by their passive benchmarks when we would expect otherwise. The literature has only presented results for the very beginning of the pandemic leaving room for further study (Pástor & Vorsatz, 2020).

To verify the usual behavior of active management funds vs passive management funds during a pandemic scenario this study considers their performances and their most relevant variables (average return, volatility, management fees and ESG compliance). This study seeks to compare the performance of actively managed funds in a context of pandemic by using several performance metrics which are well recognized in the finance circles, including: alpha, beta as well as the Sharpe/Treynor and Information ratios.

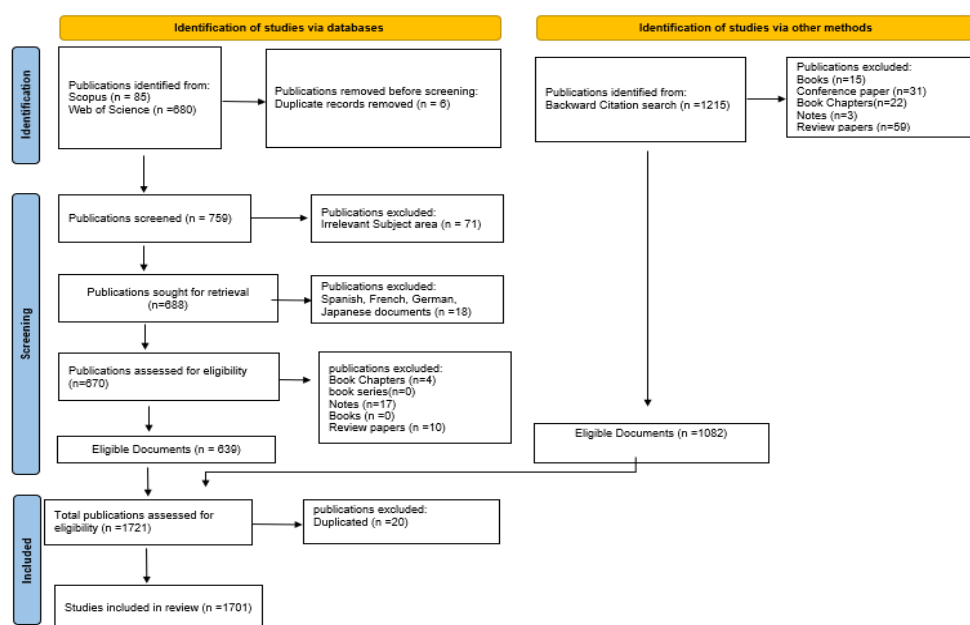
Additionally, the research will examine the impact of fees and expenses on the final return for the investors.

The study is relevant because it has practical implications for investors and fund managers. If actively managed funds are found to consistently underperform passive funds, investors may wish to reconsider their investment strategy and opt for a more passive approach. Alternatively, if skilled active management can be demonstrated, fund managers may be better able to justify the higher fees and expenses associated with active management. The research will also contribute to the academic literature on investment management by providing concrete results that the investor must consider when looking to invest, either during bear or bull markets. As research questions it is important to understand if actively managed funds have indeed surpassed their passive peers during the COVID-19 pandemic, identify them and understand if they've done so while being well risk-adjusted. Are actively managed funds getting less and less advantageous during unstable markets in light of the heavy management fees?

1.1 Paper Selection

In order to conduct the following literature review, a comprehensive review of the relevant literature on the subject as performed.

Figure 1 - Literature Review - Flow Prisma diagram

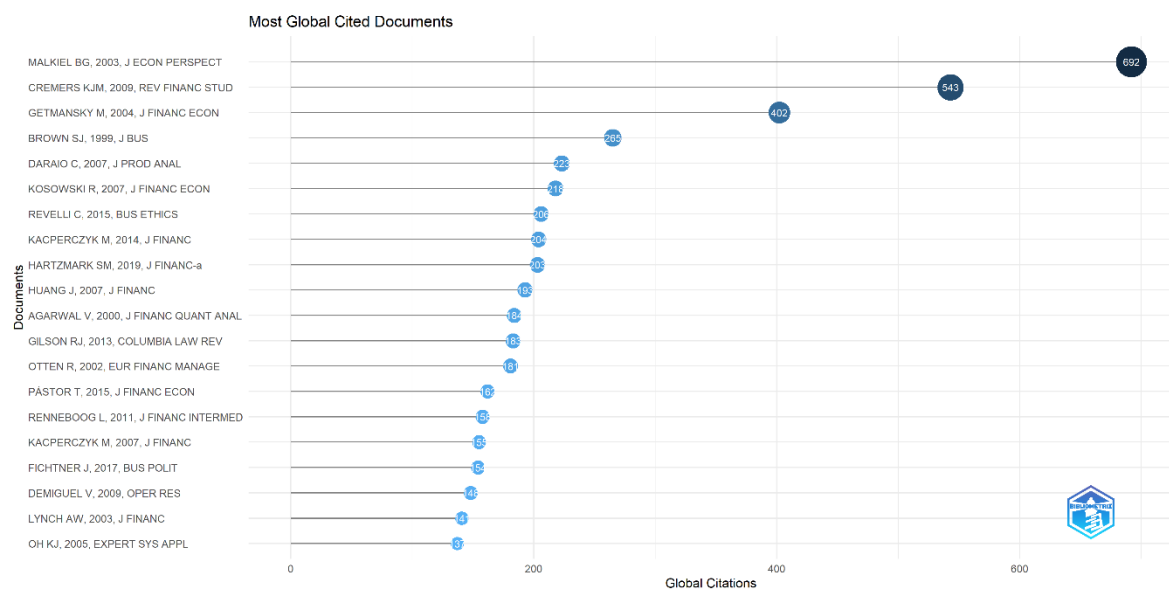


Source: Table template provided by the Supervisor

Several theories, empirical studies and best practices were collected in order to provide a solid foundation for the research and to help identify research gap.

Initially, a combination of search words was selected which allowed to identify several publications both on WOS and Scopus platforms. These were merged and cross-referenced to eliminate duplicates before the first screening using R programming language software. The irrelevant publications were then excluded such as: irrelevant subject areas, languages other than English and Portuguese, review papers, notes, books, and book chapters/series.

Graphic 1 - Most Global Cited Documents



Source: Author

A list of the 20 most cited documents and most cited references was composed using the third-party web-interface software Biblioshiny.

Using a backward citation search, the most relevant documents were selected and the documents it was cited on were cross-referenced (after performing the same exclusion steps from the initial search) with the initial keywords results.

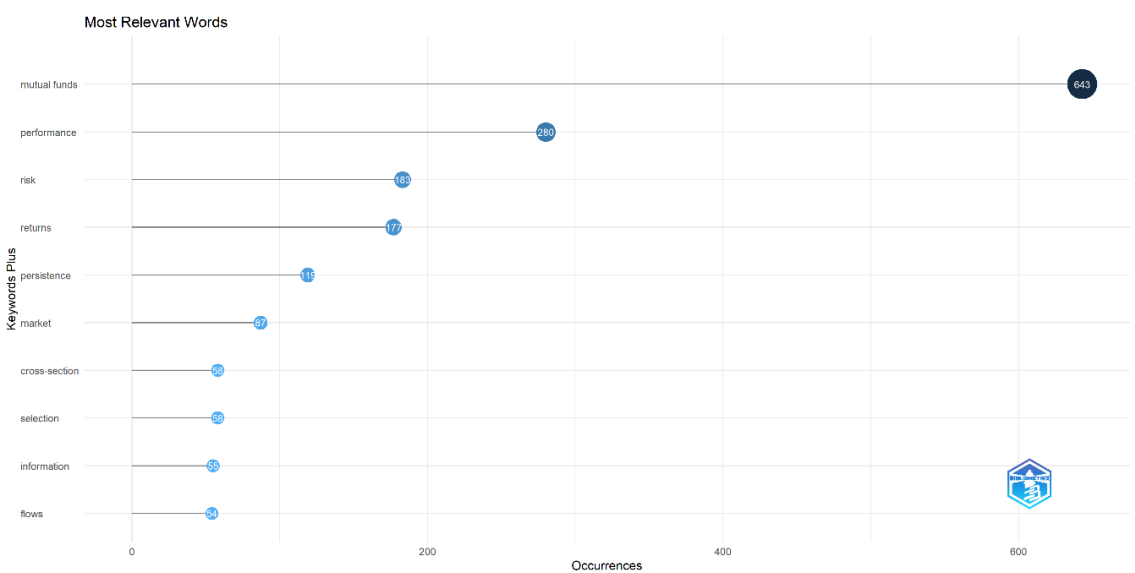
Graphic 2 - Most Local Cited References



Source: Author

The graphics below represent the most relevant words for the final database. With the aid of VOSViewer, another third-party software tool for creating and visualizing bibliometric links, a second rendering of the most relevant words and sources was produced for ease of analysis.

Graphic 3 - Most Relevant Words



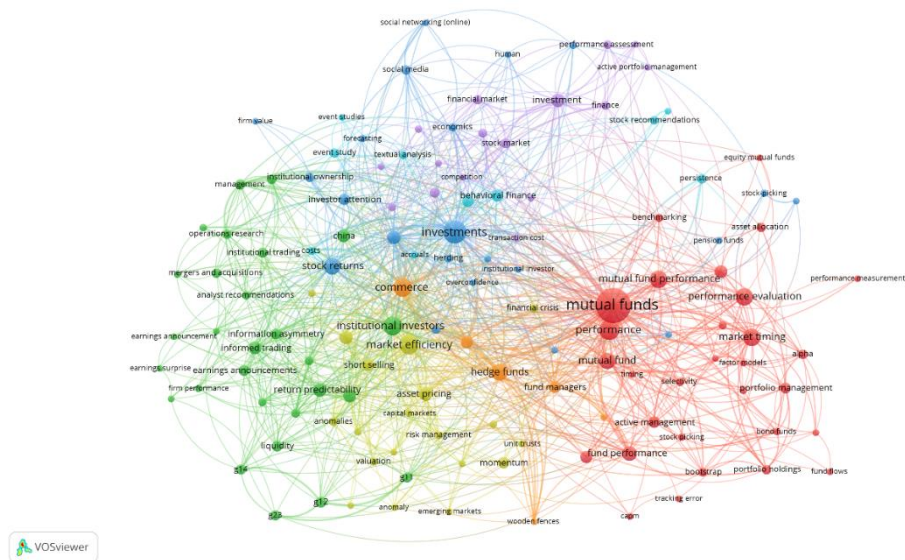
Source: Author

Figure 2 - Word Cloud



Source: Author

Figure 3 - Most Relevant Keywords and their ramifications



Source: Author

The graphic above allows not only the perception of the most relevant keywords but also the linkage between them which encouraged the use of different keywords.

The following graphics represent the most relevant sources for the final database as well as the most relevant authors. Once more, with the use of VOSViewer, a second rendering of the most relevant sources and sources was produced for ease of visualization.

Graphic 4 - Most Relevant Sources

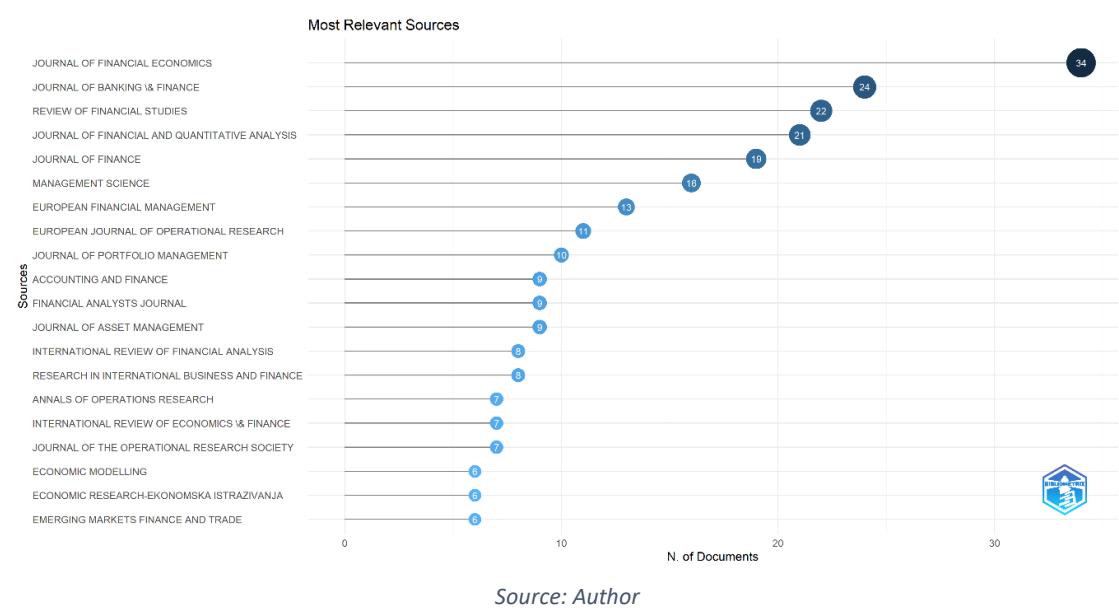
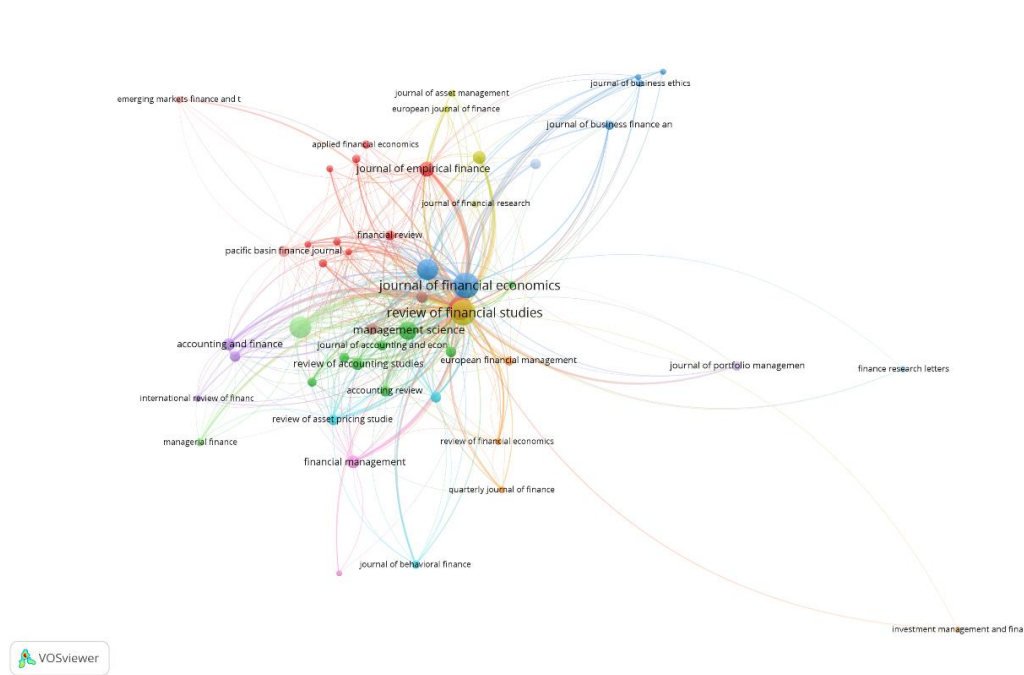
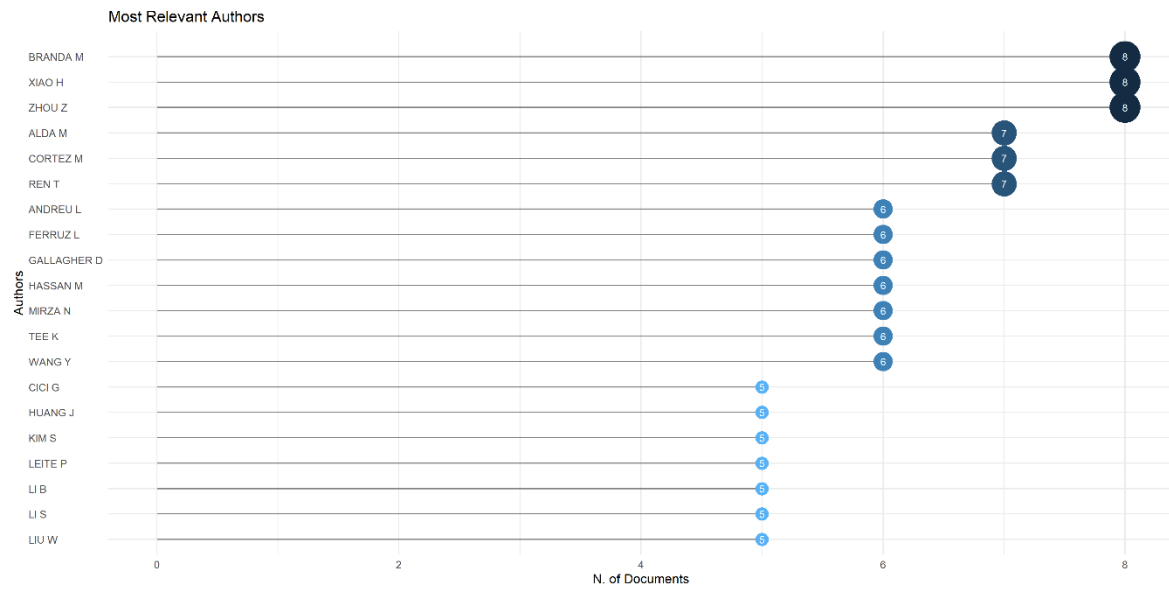


Figure 4 - Most Relevant Journals and their ramifications



Graphic 5 - Most Relevant Authors



Source: Author

1.2 Methods Summary

In the following table I've summarized the methods used by the authors of 5 of the most cited local papers:

Table 1 - Most used methodology for the relevant papers selected.

Authors/Papers	Year	Methods
Measuring Mutual Fund Performance with Characteristic-Based Benchmarks - Daniel, Kent - Grinblatt, Mark - Titman, Sheridan - Wermers, Russ	1997	- A characteristic-based approach that uses benchmark portfolios constructed to match the characteristics of the stocks held by a mutual fund. - The GT measure, using past portfolio weights of a fund as a benchmark. - A Jensen Measure using the Carhart four factor portfolios as benchmarks. - A Jensen Measure using a value-weighted index as a benchmark.
On Persistence in Mutual fund Performance Carhart, Mark M.	1997	- Capital Asset Pricing Model (CAPM) - Carhart (1995) 4-factor model

On the Industry Concentration of Actively Managed Equity Mutual Funds • Kacperczyk, Marcin • Sialm, Clemens • Zheng, Lu	2005	7. Carhart Four-Factor Measure 8. Ferson–Schadt Conditional Measure 9. DGTW Measures 10. Industry-Adjusted Measures 11. Trade Portfolios
Unobserved actions of mutual funds • Kacperczyk, Marcin • Sialm, Clemens • Zheng, Lu	2008	12. Return Gap
Another Puzzle: The Growth in Actively Managed Mutual Funds • Gruber, Martin J • Brown, Stephen • Elton, Edwin • Udell, Gregory	1993	13. A measure of return relative to the market 14. The excess return from a single index model 15. The excess return from a four-index model.

Source: Author

2. Literature Review

Mutual funds have been quite popular investment instruments giving small or individual investors the ability to access portfolios managed by professionals in the area.

A mutual fund is a financial vehicle aggregating its shareholders' assets so they can be invested in several financial instruments such as equities, bonds, commodities, and real estate, amongst other securities. Usually, mutual funds are quite diversified, considering the regulation they comply with which might limit their investments in less liquid assets or coerce them to certain concentration limits. The shareholder participates both in the gains and the losses that the fund incurs proportionally to its share in the fund. Contrary to purchasing stocks directly (except for preferred stock), shares of a mutual fund do not grant their holders any voting rights. Mutual funds are managed by portfolio managers and/or investment advisors who might act as part of the management company or asset manager which are responsible for making investment decisions on behalf of the investors. All the fund's investment objectives, redemption clauses, management fees and participation conditions are mentioned in its prospects.

Mutual funds can be structured differently based on the form of **regulations**. European regulated funds are most often compliant with UCITS regulation (Undertakings for Collective Investment in Transferable Securities) which harmonizes all regulations within countries that belong to the European Union. Other types of regulation exist, including the Investment Company Act of 1940 and the Investment Advisers Act of 1940. These regulations are put in place to safeguard the best interests of their stakeholders and they establish several rules including disclosure and diversification requirements as well as a defined investment objective and strategy.

It is also worth distinguishing between open-ended and close-ended funds although for the sake of this thesis, we shall concentrate on open-ended funds as most mutual funds fall under this category. Close-ended funds undergo a process in which they're financed through IPOs (Initial Public Offering), where a limited number of shares are issued to raise capital. In the case of open-ended funds, normally, shares are created on a demand basis hence more shares can be issued, these being issued and taken out of circulation as a function of investors buying and selling them. In both structures, fund shares are continuously traded and affected by market fluctuations.

The price of each share in a mutual fund, denominated as Net Asset Value (NAV) per share, is calculated by dividing the total NAV of the fund by the total number of shares outstanding (i.e., total of shares held by the fund's shareholders).

Returns from mutual funds are distributed based on the dividends or interest generated by stocks and bonds within the fund's portfolio or by the excess return when these are sold. This is usually done on a quarterly or annual basis.

Mutual funds **fees** can be greater or less depending on the type of portfolio management chosen. Active portfolio-managed funds have higher management fees and administrative costs than funds whose main investment strategy consists of replicating major market indexes. Other types of fees may include redemptions fees and operating fees such as custody, accounting, and legal expenses.

Shareholders' fees consist of commissions and redemption fees. These can be paid during the purchase or the sale of shares. For funds that have a front-end load, the fees are billed when purchasing their shares. Otherwise, they have a back-end load. Mutual funds can charge other types of fees and might offer a no-load approach as well. All fees should be considered by the investors as the high returns for very actively managed funds might be slashed by their high fees (Otten & Bams, 2002).

Mutual funds might be appealing for several reasons, among which there is **diversification**. Diversification is the bread and butter of an individual or professional investor, and it involves spreading the invested capital across several types of assets or funds. An investor may directly hold a mix of stocks and bonds and be invested in a mix of commodities, real estate, Money Market/bonds, and stocks mutual funds. Risk-averse investors might achieve their desired risk-to-reward ratio by investing in mutual funds that invest in diversified securities from different geographical issuers, capitalizations, and sectors. Many mutual funds are themselves invested in other funds, which only deepens the diversification factor.

Performance on mutual funds is assessed by the annual rate of return, which can be described as the sum of dividend payments, capital gain distributions, and changes in net asset value. This is the net performance, which has been subtracted from management expenses and administration fees as previously mentioned. We can also consider a total return approach, which measures the fund's performance over a specific period and considers any revenue collected from dividends and interest. The risk-

adjusted return considers the volatility of the fund's returns in comparison to its level of risk. Other approaches for measuring performance include assessing the performance of the individual securities held by funds. The latter obviously needs to consider the fees and expenses the fund managers might charge, reducing the total return for its shareholders.

Jensen (1969) divided the concept of portfolio performance into two different elements:

The ability of the portfolio manager to increase returns through successful market predictions and the ability of the portfolio manager to reduce the amount of "insurable risk." For the sake of this thesis, we shall focus on the first dimension. Evaluating the portfolio manager's ability to predict how the markets will fluctuate can be measured by the surplus between the expected price of a security and the observed price. Jensen states that we should consider the different levels of risk when evaluating the performance, in such a way that "riskier" assets must, on average, yield higher returns than less "riskier" assets.

The performance itself has been actively debated over the last decades. One of the first limitations of the expected returns formula is that we consider a fixed expected return and a fixed risk rate, which may vary over time, confounding the variation in risks and risk premiums with average performance. Ferson and Schadt (1996) introduced a conditional performance evaluation to consider the dynamic behavior of returns. This conditional model allows the use of time-varying conditional betas, which have modified Sharpe's (1964) CAPM.

Active portfolio management mutual funds are known to underperform passive benchmarks under normal market conditions, considering their fees. Gruber (1996) calculated the average mutual fund annual performance to be around 65 basis points lower than passive market indexes from 1985 to 1994.

The concept of a fund being more or less costly in terms of fees suggests that a higher return might come along with it. This has been rather disproved by Carhart (1997), in the sense that the higher fees charged by active portfolio management funds are negatively correlated with net returns, meaning that funds charging higher fees don't necessarily have higher returns. This is also supported by Daniel, Grinblatt, Titman, and Wermers (1997), who analyzed the performance of mutual funds in the United States

from 1975 to 1994 and found that many mutual funds underperformed their passive benchmark over the long-term. They concluded that this underperformance was due to high fees and poor investment strategies.

Heaton, Polson, and Witte (2017) have developed a simple stock selection model demonstrating that randomly selecting a sample of securities from an index fund may dramatically increase the chance of underperforming the index (and inversely increasing the chance of overperforming the index).

The main advantage of active portfolio management funds is their chance to outperform during abnormal market conditions. There have been examples from Elton Gruber and Blake (1996) and (Wermers et al., 2000) of high-alpha actively managed funds that beat the Vanguard S&P Index fund for a considerably long period (from 1981 to 1993). Grinblatt and Titman (1992) found that performance was persistent among mutual funds, indicating a correlation between past and future performances. They've also found that manager skill was not an entirely consistent driver for the variations in performance.

Hendricks, Patel, and Zeckhauser (1993) investigated the persistence of mutual fund performance from 1975 to 1988 and the impact of this persistence on investor behavior. They found evidence of short-run persistence in mutual fund performance, meaning that mutual funds that outperformed their peers in one period were more likely to continue to outperform in the short term. They've also found that investors tend to chase past performance, a concept is known as "hot-hands", as they are more likely to invest in mutual funds that have outperformed in the recent past and that the market is not perfectly efficient, as the short-run persistence in mutual fund performance suggests that there are opportunities for mutual fund managers to generate returns that are not fully reflected in the prices of securities.

This persistence in mutual fund's performance might be clouded by a phenomenon called survivorship bias. Brown, Goetzmann, Ibbotson, and Ross (1992) find that mutual funds that are closed or merged tend to underperform compared to the surviving funds. This result is consistent with the phenomenon of survivorship bias, which can occur in mutual funds where the performance of surviving funds is overstated compared to the performance of all funds that have been launched and since ceased to exist. Management companies might close or merge mutual funds that are performing

poorly, and consequently only well performing funds survive. This may bias in the average performance of surviving funds, as the underperforming funds are not included in the calculation.

Brown, Goetzmann, Ibbotson, and Ross (1992) also highlight the importance of considering the performance of closed or merged funds when evaluating a mutual fund's historical performance, in order to avoid the upward bias that can result from survivorship bias. They also found that size, age, and past performance are factors that contribute to the survivorship of mutual funds. They find that larger and older funds are more likely to survive, while past performance is not a significant factor.

The literature has also covered the relationship between a fund's size and performance. Pástor, Stambaugh, and Taylor (2015) examine the advantages of an extensive management companies, their ability to leverage from scale economies, and their access to better research and analysis and mention two theories regarding this concept: the decreasing returns to scale at a fund level and the decreasing returns at an industry level. Because the increase of the fund's AuM (assets under management) may increase the size of the positions and consequently decrease the portfolio's returns proportional to the assets, there should be an optimal fund's size. Perold and Salomon (1991) found that this optimal size of a fund in terms of maximizing returns for investors, exists when the cost of opening new positions exceeds the opportunity cost of refraining. The reasoning behind the decreasing returns can be justified by a number of factors, these can include: an increase in transaction costs, reduced investment opportunities, and decreased flexibility. The reduced investment opportunities arise from the need generate returns that outperform the market, which may push the fund manager to invest in larger, more well-established companies known to have lesser growth potential and making it even harder to generate above-average returns. However, at the same time, larger funds are also able to spread their fixed costs across more assets, which can reduce the per-unit cost of investing. At an industry level, Pástor and Stambaugh (2012) argue that an increase in active management popularity can only make it harder for managers to outperform passive benchmarks. This market impact can be felt for large funds as well, meaning that as the industry or the fund increases in size, the more difficult it becomes to trade substantial amounts of securities without affecting their market prices, resulting in reduced returns.

The COVID-19 crisis presented a great challenge (and a great opportunity for that matter) for active portfolio management as the financial markets experienced never-before-seen turbulence. The financial market's reaction was quick and unforgiving in response to the COVID-19 pandemic, unlike anything seen in recent history, and it required active portfolio managers to make quick and strategic decisions in order to protect their portfolios (Grill et al., 2022). This was a difficult task, as the situation was rapidly changing and there was a great deal of uncertainty about the future, but as mentioned, this has also created an opportunity for above-average returns. Pastor and Vorsatz (2020) analyzed the performance for U.S. actively managed equity mutual funds for a 10-week period during the COVID-19 pandemic. They found that most actively managed funds underperformed their passive peers and that investors are focused on high sustainability funds.

Despite these challenges, several active portfolio managers were able to outperform the market during the COVID-19 crisis by making timely changes to their portfolios. Some managers shifted their portfolios towards more defensive sectors, while others tended to perform better during times of market stress by buying into the market at lower prices. Rizvi, Mirza, Naqvi, and Rahat (2020) did a preliminary study of the changes in performance and investment styles between January and May 2020 and found that there was general shift from high-risk options to low-risk options both in terms of position size and investment strategy as well as a transition of investment from countries with a higher number of COVID-19 cases to those with a lower number.

The latest literature suggests an increasing trend towards passive strategies rather than active ones and stands by the underperformance of actively managed mutual funds as opposed to indexed funds. Due to the early stages of the COVID-19 pandemic and the short period analyzed in the up mentioned literature, we are left with some leeway for further analysis. Even though the end of the pandemic has not yet been decreed by the WHO (World Health Organization), three years have passed since the health agency has declared its beginning as a PHEIC (Public Health Emergency of International Concern) and we currently face a new ongoing worldwide challenge as the Russo-Ukrainian War broke out.

3. Methodology

For the analysis and comparison of the performance between actively managed funds and index funds it is essential to have a transparent methodology that addresses the research question effectively. Based on the papers selected from the literature review results, there were various methods to keep in mind when developing the data analysis for this study, and the ones chosen are mostly accepted by the finance and academic circles. During the selection of methods, it is also important to address potential limitations and biases of the analysis along with various strategies to keep in mind in conducting data analysis.

4.1 Performance Measures

4.2 Carhart's Four-Factor Measure/Model

The Carhart Four-Factor Model is a multifactor asset pricing model developed by Mark Carhart in 1997. It is frequently used as an active management and mutual fund evaluation model. The model aims to explain the cross-sectional and time-series variations in stock returns by incorporating four factors: market risk, size, value, and momentum. The four factors in the Carhart model are defined as follows:

1. Market risk: measured by beta, which is the sensitivity of a security's returns to changes in the market portfolio returns.
2. Size: this considers the excess stock returns between small and large firms. The latter tend to have smaller returns which is considered to be the premium.
3. Value: this is defined as the difference in returns between high book-to-market firms and low book-to-market firms. This is also perceived as the premium as the latter ones tend to have smaller returns.
4. Momentum: this is roughly the excess return of winning stocks over the losing stocks. Momentum refers to the fact that well performing stocks, historically speaking, tend to continue to have good results.

The Carhart Four-Factor Model formula is given as:

$$r_{it} = \alpha_{it} + \beta_1 Mkt + \beta_2 SMB + \beta_3 HML + \beta_4 MOM + \varepsilon \quad (1)$$

where r_{it} is the total return of a stock or portfolio i at time t (also known as the cost of equity), α_{it} is the security's abnormal return at time t , β_1 , β_2 , β_3 and β_4 are the coefficients of the four factors, SMB is the size factor, HML is the value factor, and MOM is the momentum factor, and ε is the error term.

The addition of the momentum factor to the Fama and French Three-Factor Model significantly improves the explanatory power of the model, boosting it to 95% compared to the 90% of the Three-Factor Model. The Carhart Four-Factor Model is often used as a benchmark model for asset pricing and has been shown to have a joint effect on stock excess returns with the Fama and French Three-Factor Model.

4.3 The Capital Asset Pricing Model (CAPM)

The Capital Asset Pricing Model (CAPM) is a financial model that describes the relationship between systematic risk and expected return for assets, particularly stocks. This model has been developed on several occasions by some of the well-known financial economists such as William Sharpe (1964), John Lintner (1965), Jan Mossin (1966) and Jack Treynor (1962). The idea behind the model is that investors should be compensated for the systematic risk they're taking by investing in a risk-associated asset, which is measured by the asset's **beta**. Systematic risk, is also known as non-diversifiable risk, which is the risk that affects the entire market. The CAPM model considers the risk-free rate (which is typically a treasury bill rate), the market's expected returns subtracted from the risk-free rate (which is, the equity risk premium), and the relation of these elements with the asset's beta.

The CAPM plays an important role in financial modeling and asset valuation, which may be used alongside WACC (Weighted average cost of capital). The latter can be used to value a firm's capital cost while the CAPM calculates the cost of equity alone. The model is simple enough that it remains widely used within the financial

industry, especially for riskier assets, as it forecasts what investors should expect to gain from higher-risk assets, hence the presence of the market risk premium in the formula.

The model is based on several assumptions, of which:

1. Investors are rational: meaning investors are rational and make decisions based on a logical analysis of the market. They weigh the risks and returns of different assets before making investment decisions.
2. Investors are risk-averse: meaning investors prefer lower levels of risk for the same expected return. As such, investors require a higher expected return for riskier assets.
3. The market is competitive: there are no monopolies or other market imperfections, as investors can access to all available information about assets. This assumption, although heavily argued, implies that investors can buy and sell assets at the exact same price and that the market price of an asset reflects all available information.
4. All investors have the same view of the market: all investors expect the same from the market and share the same assessment of the risk and return of all assets. This assumption implies that there are no differences in the way investors perceive or analyze assets.
5. Assets are divisible and tradable: assets are infinitely divisible and can be traded in any quantity at any time with no restrictions whatsoever.

These assumptions are the foundation of the CAPM model, which has been heavily debated. It is important to note that the assumptions are idealized and do not necessarily hold in the real world. Investors may not always be rational, have homogeneous expectations, and markets may not always be perfectly competitive. Nonetheless, the CAPM remains a valuable tool for estimating expected returns and assessing investment risk.

The CAPM formula can be expressed as:

$$E[R_{x,t}] = R_{f,t} + \beta_x(E[R_{m,t}] - R_{f,t}) \quad (2)$$

where $E[R_{x,t}]$ is the expected return on investment, $R_{f,t}$ is the risk-free rate at time t , β_x is the beta of the asset, and $E[R_{m,t}]$ is the expected market return. The CAPM

calculation works on the existence of several elements, including the risk-free rate, the market return, and the beta of the asset being analyzed.

4.4 Jensen's Measure

Jensen's measure, also known as Jensen's alpha, is a risk-adjusted performance measure used to evaluate the performance of a portfolio or investment. It was developed in 1968 by Michael Jensen and it compares the average return of a portfolio or investment to the return predicted by the Capital Asset Pricing Model (CAPM) as opposed to using a benchmark like the S&P 500 Index.

The formula for Jensen's alpha can be obtained from the CAPM as follows:

$$\alpha_x = R_{x,t} - E[R_{x,t}] \quad (3)$$

Therefore:

$$E[R_{x,t}] = R_{f,t} + \beta_x(E[R_{m,t}] - R_{f,t}) + \varepsilon_t \Rightarrow R_{x,t} - R_{f,t} = \beta_x(R_{m,t} - R_{f,t}) + \varepsilon_t$$

$$R_{x,t} - R_{f,t} = \alpha_x + \beta_x(R_{m,t} - R_{f,t}) + \varepsilon_t \Rightarrow \alpha_x = R_{x,t} - [R_{f,t} + \beta_x(R_{m,t} - R_{f,t}) + \varepsilon_t]$$

Where:

$R_{x,t}$ = Realized Portfolio Return

$R_{f,t}$ = Risk-Free Rate

$R_{m,t}$ = Expected Market Return

β_x = Portfolio Beta

The new variable α_x is Jensen's Alpha, which can have a positive or negative value. This measure represents the difference between the actual return of the portfolio and the expected return predicted by the CAPM. If the Jensen's alpha is positive, it means that the portfolio has outperformed the benchmark return, meaning that the portfolio manager has successfully exceeded the performance of the market, while a negative Jensen's alpha indicates that the portfolio has underperformed the benchmark return.

The Jensen's measure is used to evaluate the performance of investment managers based on the average return on the portfolio or investment. It measures the level of variance of the return on a portfolio from the average rate of return or investment's beta.

4.5 Sharpe Ratio

The Sharpe ratio is another widely used financial metric for measuring the risk-adjusted return of an investment or portfolio, developed by William Sharpe (1966). The ratio calculates the difference between the returns of the investment and the risk-free return, divided by the standard deviation of the investment returns (i.e., β). The resulting number represents the additional amount of return that an investor receives per unit of increase in risk.

In simpler terms, the Sharpe ratio measures the excess return earned by an investment relative to the amount of risk taken. The higher the Sharpe ratio, the better the investment performed on a risk-adjusted basis. It is a useful tool for comparing the performance of different investments or portfolios that have different levels of risk.

The Sharpe ratio can be used to evaluate a single stock or investment, or an entire portfolio. A portfolio with a higher Sharpe ratio is considered to be better and preferable to its competitors. When comparing two assets, the one with a higher Sharpe ratio appears to provide better return for the same risk, which is usually attractive to investors.

The Sharpe ratio formula is as follows:

$$S_{x,t} = \left(\frac{R_{x,t} - R_{f,t}}{\sigma_{x,t}} \right) \quad (4)$$

where $R_{x,t}$ is the expected portfolio return, $R_{f,t}$ is the risk-free rate of return, and $\sigma_{x,t}$ is the standard deviation of portfolio return (or volatility). The ratio can be graded based on thresholds, with a Sharpe ratio of less than one considered bad.

4.6 Treynor Ratio

The Treynor measure, also known as the Treynor ratio or reward-to-volatility ratio, is a financial metric that evaluates the performance of an investment portfolio by considering the amount of risk the investor takes. Specifically, it measures the excess return earned by the portfolio per unit of systematic risk, which is represented by the portfolio's beta.

The formula for calculating the Treynor measure is as follows:

$$T_{x,t} = \left(\frac{R_{x,t} - R_{f,t}}{\beta_{x,t}} \right) \quad (5)$$

Unlike the Sharpe ratio, which uses the standard deviation of the portfolio as a measure of risk, the Treynor measure uses beta as a measure of systematic risk. A higher Treynor measure indicates that the portfolio has earned a greater excess return per unit of systematic risk taken on.

In the end, the Sharpe ratio considers the total risk of the portfolio, which includes both systematic and unsystematic risk, while the Treynor ratio only considers systematic risk, which is measured by the portfolio's beta. In other words, the Sharpe ratio accounts for both diversifiable and non-diversifiable risk, while the Treynor ratio only accounts for non-diversifiable risk.

Another difference between the two ratios is that the Sharpe ratio evaluates the portfolio manager based on the rate of return and diversification. In contrast, the Treynor ratio evaluates the portfolio based on the excess return generated for each unit of systematic risk.

4.7 Information Ratio

The information ratio simply measures a portfolio's risk-adjusted rate of return compared to a benchmark index. It is often used to gauge managers' skill of mutual funds, hedge funds, and other financial professionals to evaluate the risk-adjusted performance of investment strategies or portfolios.

The information ratio is defined as the active return of an investment compared to a benchmark index relative to the volatility of the active return. It represents the additional amount of return an investor receives per unit of increase in risk. More specifically, it is calculated by dividing the active return by the tracking error, which is the standard deviation of the excess return with respect to the benchmark rate of return.

The formula for calculating the information ratio is as follows:

$$\text{Information Ratio} = \frac{\alpha_x}{\sigma_{x,t}} \quad (6)$$

where α_x is the alpha and $\sigma_{x,t}$ is the tracking error, meaning the standard deviation of the excess return with respect to the benchmark rate of return.

It is worth noting that the information ratio is similar to the Sharpe ratio, which also measures risk-adjusted returns, but instead of comparing the portfolio returns to a benchmark index, the Sharpe ratio compares them to a risk-free rate.

The information ratio is a valuable metric for investors to assess the performance of investment managers and their portfolios. By using this ratio, investors can compare the risk-adjusted returns of different portfolios similar to both ratios previously defined.

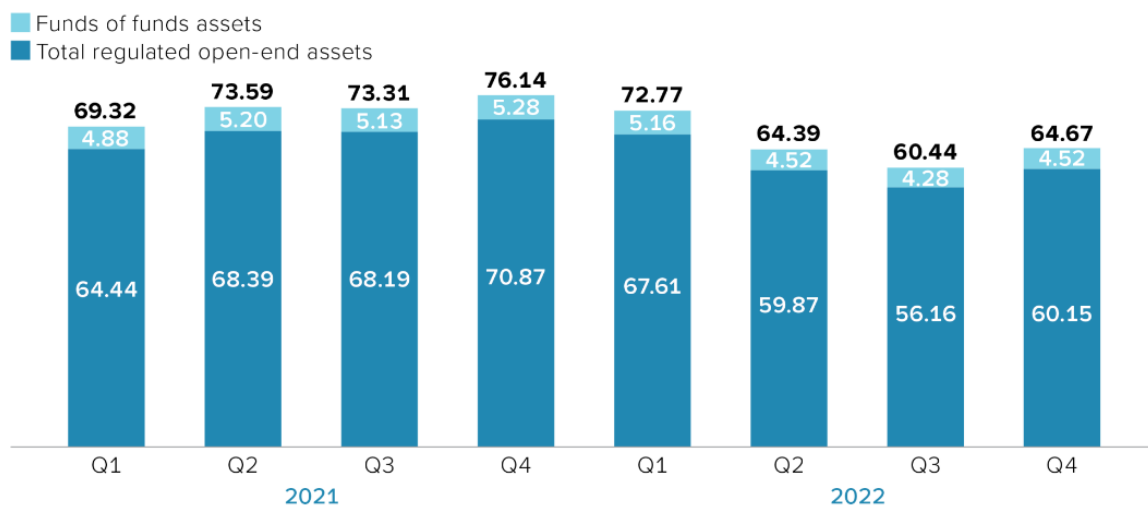
5 Results and Discussion

5.1 Mutual Funds Industry

5.1.1 Current State

According to the ICI (Investment Company Institute), a leading association representing regulated investment funds, the United States represents the largest piece of the pie in terms of AuM, with total net assets amounting to \$23.41 trillion as of March 2023, an increase of 3 percent compared to the previous year (\$22.74 trillion as of March 2022) although quite lower compared to the \$26.96 trillion as of 2021. These opposing figures represent the turn of events that came with the COVID-19 pandemic.

Graphic 6 - Worldwide Assets of Regulated Open-End Funds



Source: ICI

The global industry for regulated funds has since its ups and downs and seemed to pick up the year after the start of the pandemic having its highest point in Q4 of 2021. Although, since then, the industry seems to be more unstable.

Mutual funds remain nonetheless attractive as an investment option for many individuals and institutions, with their declining management fees.

5.1.2 In Portugal

The mutual funds industry in Portugal has seen substantial development since its inception in 1986. Portugal has several mutual funds and ETFs that invest in a wide range of asset classes, including equities, fixed income, commodities, and alternatives.

In terms of investment funds domiciled in Europe, UCITS and AIFs had a combined value of EUR 20.8 trillion at the end of Q3 2021. Luxembourg and Ireland are the two largest domiciles for UCITS and AIFs, respectively, followed by Germany, France, and the United Kingdom. Furthermore, assets under management (AUM) in Europe have grown almost annually from 2008 to 2021 to 32.2 trillion euros, covering all client funds and assets managed on their behalf.

On average, the assets under the management of domestic equity funds represent circa 1/3 of the assets under the management of all equity funds in Portugal (Alves and Mendes, 2010).

As per APFIPP (*Associação Portuguesa de Fundos de Investimento, Pensões e Patrimónios*), a Portuguese association representing the interests of the Management of Securities Investments Funds, Real Estate Investments Funds and Pension Funds, the assets under discretionary management as of 31st March 2023 as ascended to over 24.865 million euros which translates to a 14,6% increase over the previous month and a 2,3% increase since the beginning of the year. However, this represents a decrease of 8.3% from March 2022.

The biggest asset manager in Portugal is Caixa Gestão de Ativos, with an amount of assets under management of over 8.210 million euros and a national market share of 33%, followed by Santander Asset Management with a 21,1% market share and GNB – Gestão de Patrimónios with a market share of 15,4%.

Table 2 - Top Asset Managers in Portugal

Sociedade Gestora	Março 2023		Fevereiro 2023		Dezembro 2022		Variação Mensal (%)	Variação desde início ano (%)
	Milhões €	Quota	Milhões €	Quota	Milhões €	Quota		
Caixa Gestão de Ativos	8 210,0	33,00%	5 147,6	23,70%	8 007,9	32,90%	59,50%	2,50%
Santander Asset Management	5 252,6	21,10%	5 200,4	24,00%	5 153,1	21,20%	1,00%	1,90%
GNB - Gestão de Patrimónios	3 831,8	15,40%	3 798,1	17,50%	3 688,9	15,20%	0,90%	39%
BPI Gestão de Ativos	3 825,9	15,40%	3 821,1	17,60%	3 800,7	15,60%	0,10%	0,70%
Montepio Gestão de Activos	1 490,8	6,00%	1 484,3	6,80%	1 474,2	6,10%	0,40%	1,10%
Crédito Agrícola Gest	1 402,7	5,60%	1 389,7	6,40%	1 348,9	5,50%	0,90%	4,00%
Bankinter Gestion Activos - Suc, Portugal	738,3	3,00%	746,4	3,40%	735,6	3,00%	-1,10%	0,40%
Optimize Investment Partners	78,6	0,30%	77,1	0,40%	73,5	0,30%	1,90%	69%
Heed Capital	19,9	0,10%	20,2	0,10%	19,0	0,10%	-1,30%	4,90%
LYNX Asset Managers	15,2	0,10%	15,4	0,10%	14,8	0,10%	-1,30%	2,50%
Total	24 865,7	-	21 700,3	-	24 316,5	-	14,60%	2,30%

Source: APFIPP

In terms of clientele, Insurance companies hold most of the AuM (45,3%), followed by Other Investors (33,6%) and Pension Funds (14,3%), 95% of which is held by Portuguese residents.

As per APFIPP March Informative Note, the asset class with more weight overall is Public Debt (55.1%), followed by securities investment funds (20%).

5.2 Data

This analysis was based on four equity mutual funds mainly or completely invested in the Portuguese market (residually in the Spanish market). The aim was to assess the ability of the funds (and their managers) to outperform the performance of the selected benchmark. For the benchmark, the *PSI Geral* (Portuguese Stock Index) was chosen as an obvious choice given its aggregation of the biggest Portuguese companies. The decision between using the *PSI-20* and *PSI Geral* concluded that the second would be broader given the *PSI-20* currently aggregates only 16 companies while *PSI Geral* currently aggregates 37 companies hence providing a more conclusive state of the Portuguese equity market. The risk-free rate assumed in order to calculate all the metrics below was the Portuguese 10-Year Treasury Bond yield retrieved from *BPstat* (*Banco de Portugal*). The fund's dataset used was extracted from *Investing.com*, a financial markets platform that provides real-time data on various financial instruments.

Their composition was extracted from CMVM. As for the benchmark, the performance, and composition of *PSI Geral* was retrieved from *Euronext* and *BPstat*. Both the benchmark's, the risk-free rate and the funds' performance calculations were based on the monthly return.

To take into account the fluctuations in the equity market during the COVID-19 pandemic, the period considered for this analysis was between November 2019 and April 2023.

5.3 Fund's Strategy

The four equity mutual funds chosen were *Caixa Ações Portugal Espanha*, *BPI Portugal*, *GNB Portugal Ações*, and *IMGA Ações Portugal*.

Caixa Ações Portugal Espanha – Fundo de Investimento Mobiliário Aberto de Ações, previously named *Caixagest - Fundo de Investimento Mobiliário Aberto de Ações* was launched in 1996 and is managed by Caixa de Gestão de Ativos, S.A., the asset management subsidiary of the Caixa Geral de Depósitos Group.

As per the prospectus, its investment strategy is based on Iberian equity, investing at least 85% in Portuguese and Spanish companies. The fund may also invest in convertible bonds or any other instrument that grants a share subscription. The remainder may be invested in public debt (including government bonds, treasury bills and other money market instruments), private debt and other debt securities. The fund may use derivatives for hedging purposes including amongst others: swaps, futures and forwards, swaps, and options.

As per portfolio analysis done on the 13th of May 2023, the fund was 99% invested in equity, of which, 2/3 are invested in Spain and the rest in Portugal (as of today, the fund is mostly invested in Spain).

BPI Portugal Fundo de Investimento Aberto de Ações was launched in 1992 and is managed by BPI Gestão de Ativos - Sociedade Gestora de Organismos de Investimento Coletivo, SA, the asset management subsidiary of the BPI Group.

As per the prospectus, its investment strategy relies on holding Portuguese equity on a long-term horizon, investing at least 85% in this category. The fund may invest in equity, corporate and governmental bonds (including convertible bonds), warrants and money market instruments (Treasury bills, commercial paper, and certificates of deposit). The fund may invest in other similar funds up to 10%. The fund may also use derivatives for hedging purposes including futures, options, and credit default swaps. For speculation purposes, the fund may also use futures, options, warrants and FX forwards.

As per portfolio analysis done on the 13th of May 2023, the fund was 70% directly invested in equity, of which 67% was invested in the Portuguese market and the remainder in Spain. The fund also holds about 15% in Treasury bills and around 10% in certificates of deposit.

GNB Portugal Ações – Fundo de Investimento Mobiliário Aberto de Ações previously named *Espírito Santo Portugal Ações (1997)* and *NB Portugal Ações (2015)*, was launched in 1997 and is managed by GNB – Fundos Mobiliários, Sociedade Gestora de Organismos de Investimento Coletivo, S.A. (previously named GNB – Sociedade Gestora de Fundos de Investimento Mobiliário, S.A.), the asset management subsidiary for the Novobanco Group.

As per the prospectus, its investment strategy relies on equity, investing at least 85% in this category. The fund may invest in other similar funds up to 10%. The fund may also use derivatives for hedging purposes.

As per portfolio analysis done on the 13th of May 2023, the fund was more than 80% invested in Portuguese equity and marginally in Spanish equity (around 5%). The fund is also invested around 10% in certificates of deposit.

IMGA Ações Portugal – Fundo de Investimento Aberto de Ações previously named *AF Ações Portugal (2000)* and *Millennium Ações Portugal – Fundo de*

Investimento Aberto de Ações Nacionais (2005) was launched in 1995 and is managed by IM Gestão de Ativos, Sociedade Gestora de Organismos de Investimento Coletivo, S.A., the current biggest management company in Portugal, managing over 30 funds for Milleniumbcp, ActivoBank, Crédito Agrícola, EuroBic, Bison Bank, Banco Invest, Banco Big and Banco Best.

As per prospectus, its investment strategy relies on the direct or indirect investment in Portuguese equity, being at least 85% invested in this category at all times. The fund may invest in other similar funds up to 10%. The fund may also use derivatives for hedging purposes. For liquidity management purposes, the fund may hold certificates of deposit and governmental bonds.

As per portfolio analysis done on the 13th of May 2023, the fund was 85% directly invested in equity, out of which 81% in Portuguese equity. The fund also held around 5% in a money market fund, 4% in bonds, 18% in a PSI-20 future and 5% in cash.

5.4 Descriptive Statistics

The initial statistical measures considered were, the mean, minimum and maximum returns, volatility, correlation, and p-value.

The geometric mean was chosen over the arithmetic mean as it is more appropriate for series of returns that may exhibit correlation. Since most returns in the finance world are somehow correlated, which could certainly be the case during this study, the geometric mean considers the dependency between returns.

Table 3- Descriptive statistics

Fund	Mean	Minimum	Maximum	Volatility	Correlation	p-value
IMGA Ações Portugal A	0,47%	-20,14%	21,10%	6,47%	0,8066	0,8226
Caixa Ações Portugal Espanha	0,19%	-22,80%	26,10%	6,82%	0,7203	0,6743
BPI Portugal	0,75%	-15,13%	21,69%	6,06%	0,8272	0,9720
GNB Portugal Ações	0,44%	-19,37%	17,03%	5,89%	0,8305	0,7697
PSI Geral	0,84%	-12,5%	11,8%	5,04%	-	-

Source: Author

From the results in the table above we can see most fund's mean returns stand close to their benchmarks', with *BPI Portugal* coming very close to it. It is also important to highlight that *Caixa Ações Portugal Espanha* strayed further away from the benchmark which can be a result of its slightly different composition, which is also composed of Spanish equity.

In regard to the fund's minimum and maximum returns, the results were close to each other, with *BPI Portugal* standing out as the lowest one and closest to their benchmark. *Caixa Ações Portugal Espanha* had the lowest minimum return over this period, but it also had the highest maximum return, which goes hand in hand with its volatility, being the highest amongst all the funds. Overall, *BPI Portugal* has performed the best out of the four funds, with its lower volatility, minimum/maximum, and mean returns closer to their benchmark.

The correlation between the funds and their benchmark was also calculated, this being the statistical dependency between two variables, in this case, their returns. This measure may assume values from -1 to 1, indicating that the fund's returns have a perfectly negative/positive relation with their benchmark, respectively. The closer the value is to 0, the less correlated the variables are, assuming that 0 means they are uncorrelated. From the correlation coefficients calculated above, we understand the four fund's returns are mostly correlated to their benchmark, with *BPI Portugal* being the most correlated, one and *Caixa Ações Portugal Espanha* being the least correlated which is in line with what was previously said.

Additionally, a t-test was performed to assess the equality of the means of each fund and their benchmark. The t-test is a statistical measure used to understand if there is a significant difference between the means of two groups, in this case the average returns. This statistical test relies on the calculated p-value to determine if there is enough evidence to reject the null hypothesis, which is the equality of the average returns of the funds and benchmark.

For this t-test, a confidence level of 95% ($\alpha=0.05$) was used, and from the results, we can assume the null hypothesis is not rejected as the p-value is well over 5%. This result supports the idea that the fund's return had similar returns to the benchmark.

5.5 Performance Measures

5.5.1 CAPM

The monthly risk-free rate was extracted from BPstat, the statistics platform for Banco de Portugal. The CAPM parameters were calculated using a simple linear regression.

Table 4 - CAPM parameters

Fund	α	p-value	β	p-value	R ²
IMGA Ações Portugal A	-0,0032	0,6022	1,0365	0,0000	0,6506
Caixa Ações Portugal Espanha	-0,0053	0,4869	0,9754	0,0000	0,5189
BPI Portugal	-0,0004	0,9450	0,9946	0,0000	0,6842
GNB Portugal Ações	-0,0032	0,5392	0,9711	0,0000	0,6897

Source: Author

The beta differs from the correlation as it tells us how much the returns of a fund move when compared to the benchmark. Since all beta values are statistically significant and close to 1 (i.e., benchmarks beta), we can assume that the return of *PSI Geral* is very much linked to the fund's returns.

As for the alpha, the ability to beat the market, it is expected that it is negative for the funds as none of them could outperform the benchmark.

The R-squared differs from the correlation as it measures the proportion of variance in the regression model that is explained by the benchmark. It is then logical that *Caixa Ações Portugal Espanha* displays a smaller figure.

5.5.2 Jensen's Measure

As explained above, Jensen's alpha measures the excess return of the fund in comparison to its expected return. This measure is adjusted for market returns and risk-free rates using the beta calculated in the CAPM. As expected, all the figures are

negative which means the fund's managers couldn't earn enough return in order to be compensated for the risk they are taking.

Table 5 - Jensen's Measure

Fund	Jensen's alpha
IMGA Ações Portugal A	-0,2357
Caixa Ações Portugal Espanha	-0,3290
BPI Portugal	-0,0572
GNB Portugal Ações	-0,2217

Source: Author

Out of the four funds, *BPI Portugal* presents the alpha closest to zero which is in line with its beta, which also comes very close to zero.

5.5.3 Treynor's Ratio

As previously explained, this is another metric for the performance of a fund where the excess return over the risk-free rate is compared with the beta calculated in the CAPM.

This measure is also known as the reward-to-volatility ratio as we're determining how much excess return we earn per unit of risk (systematic risk).

Table 6 - Treynor's ratio

Fund	Treynor's ratio
IMGA Ações Portugal A	0,1860
Caixa Ações Portugal Espanha	0,0761
BPI Portugal	0,3559
GNB Portugal Ações	0,1851
PSI Geral	0,1134

Source: Author

In the table above, we may see that none of the funds had a return/risk ratio better than the benchmark, with BPI Portugal coming the closest and *Caixa Ações Portugal Espanha* having the least favorable ratio.

5.5.4 Sharpe's Ratio

The difference between Treynor's Ratio and Sharpe's Ratio comes down to the risk measure used. We use the beta of the fund's return to calculate the Treynor's ratio, comparing the return to the systematic risk (beta) whereas for the Sharpe's ratio we use the fund's return's standard deviation.

Table 7 - Sharpe's Ratio

Fund	Sharpe's ratio
IMGA Ações Portugal A	2,9781
Caixa Ações Portugal Espanha	1,0881
BPI Portugal	5,8439
GNB Portugal Ações	3,0514
PSI Geral	8,2059

Source: Author

The expected result, as above, is very similar to the results in the Treynor's ratio calculation. Again, we're calculating how much excess return we earn over the risk-free rate per unit of risk, this time, the volatility of the portfolio.

5.5.5 Information Ratio

As previously explained, the information ratio measures the relation between the active return of an investment, translating into the difference between the return of the fund and the benchmark, and the volatility of said active return. The volatility of the difference between the fund and the benchmark's return is also known as the tracking error.

Table 8 - Tracking error and Information ratio

Fund	Avg. Active return	Tracking error	Information ratio
IMGA Ações Portugal A	-0,28%	3,78%	-0,0749
Caixa Ações Portugal Espanha	-0,55%	4,67%	-0,1179
BPI Portugal	-0,04%	3,36%	-0,0123
GNB Portugal Ações	-0,35%	3,24%	-0,1079

Source: Author

From the results above, we understand that all the funds have negative information ratios due to their negative active return but more importantly we identify the most consistent funds through the tracking error. Although *GNB Portugal Ações* had the second worst active return, it was the most consistent fund throughout the 41 months period in comparison to the benchmark. *BPI Portugal* naturally had the highest average active return but also the highest information ratio in light of its low volatility.

5.6 Fees and Other Costs

All mutual funds charge fees in order to cover their operational and management costs. It is important to understand which fees each fund charges as this may drastically differ from one fund to the other and have a significant impact on the investor's return.

In the case of actively managed funds, the fees are usually much higher than those of the Index funds to compensate the portfolio manager.

Table 9 - Fund's fees

Fund	Direct fees		Indirect fees				
	Subscription	Redemption	Management	Deposit	Research	Supervision	Others
IMGA Ações Portugal A	0,00%	0,00%	2,175%	0,075%	-	-	0,02%*
Caixa Ações Portugal Espanha	0,00%	0%/1,5% below 1Y	1,900%	0,10%	0,06%	0,0012%	-
BPI Portugal	0,00%	0%/1% below 3M	1,195%	0,08%	0,015%*	0,0012%	0,0071%*
GNB Portugal Ações	0,00%	0,00%	1,500%	0,05%	-	0,0012%	0,0193%*

Legend: *Not a fixed cost. In percentage of the NAV as of 2023

Source: Fund's prospectus provided on Management Companies institutional website

These may be split into direct and indirect fees, in the sense that direct fees are directly paid by the investors whereas indirect fees are paid out of the fund's assets and not as a direct charge to the shareholder. Direct fees include subscription and redemption fees, while indirect fees may include management fees, deposit fees as well as research and supervision fees, among others. Other fees may include audit costs, banking fees, and legal and regulatory costs.

As shown in Table 9, the highest cost for the investor lies in the management fee, with other fees varying slightly. Most importantly, we note a significant difference between *BPI Portugal* and *IMGA Ações Portugal* management fees, resulting in almost

double the cost for the latter. In fact, if we don't account for redemptions below three months, *BPI Portugal* is the fund charging the smallest fee while *IMGA Ações Portugal* is on the other extreme.

Only *BPI Portugal* and *Caixa Ações Portugal Espanha* charge fees on redemptions before three months or one year (respectively). This may or may not be important to the investors considering their investment strategy and horizon. As an example, the total fees for a position held for almost one year in *Caixa Ações Portugal Espanha* would be nearly triple the amount for *BPI Portugal*.

5.7 ESG Commitment

It is worth noting that all funds are openly contributing to a sustainable economy, combining long-term profitability with social justice and environmental protection. The increasingly high demand for ESG-compliant investments from investors poses an opportunity for mutual funds to align themselves with these values in order to capture higher inflows.

BPI Portugal has developed a “Sustainability Risk Integration” model which is based on three principals: the inclusion of ESG factors in the investment decision making process, the long-term commitment of the management company of the fund with the companies in which it invests, being actively part of the companies' decisions through voting rights, and the strong engagement with said companies in controversial ESG-related matters. The fund is also a signatory of the Principles for Responsible Investment (PRI) since 2019, a list of six principles formulated by the finance community and backed by the United Nations contributing to more sustainable investments. Moreover, the fund has also joined the United Nations Global Compact initiative in 2021, based on the CEO's commitment to follow ten principles on Human Rights, Labor Rights, Environment and Corruption.

Caixa Ações Portugal Espanha and *IMGA Ações Portugal* are also signatories of the United Nations Principles for Responsible Investment.

5.8 Spanish Market

As much as Portugal and Spain are neighboring countries, it is compelling to compare their financial markets as they can be quite different in several dynamics. For the purpose of this study, a similar selection of four of the biggest equity mutual funds invest in the Spanish equities market was collected from the Investing.com platform. The benchmark used was naturally the IBEX 35 Index, the main index used in Spain's stock exchange, composed of 35 of the most important stocks listed. As for the risk-free rate, and similar to the Portuguese market, the 10-Year Spanish Treasury Bond yield was chosen.

Table 10 - Descriptive statistics

Fund	Mean	Minimum	Maximum	Volatility	Correlation	p-value
Santander Acciones Españolas A	0,08%	-27,29%	30,19%	8,96%	0,7960	0,8748
ING Direct Fondo Naranja Ibex 35	0,18%	-22,29%	25,26%	6,69%	0,9991	0,8972
Caixabank Bolsa Índice España Estándar	0,21%	-22,10%	25,28%	8,11%	0,6750	0,8416
BBVA Bolsa Índice	0,18%	-52,21%	97,95%	18,47%	0,1494	0,6472
IBEX 35	-0,0043%	-22,2%	25,2%	6,65%	-	-

Source: Author

The funds strategy is similar to the strategy employed by the Portuguese peers, meaning their main focus is the Spanish Market, investing the large majority (at least 75%) or all of their portfolio, in Spanish equity.

The Spanish scenario is quite different from the Portuguese one, in the sense that, on average, all of the actively managed funds surpassed their benchmark. There is also quite a bit more volatility in all of the funds, having higher maximum and smaller minimum variations.

Table 11 - CAPM parameters

Fund	α	p-value	β	p-value	R ²
Santander Acciones Españolas A	0,0026	0,7632	1,0715	0,0000	0,6336
ING Direct Fondo Naranja Ibex 35	0,0019	0,0002	1,0050	0,0000	0,9982
Caixabank Bolsa Índice España Estándar	0,0036	0,7006	0,8223	0,0000	0,4556
BBVA Bolsa Índice	0,0152	0,5976	0,4145	0,3452	0,0223

Source: Author

For the alphas, although all of the funds present a positive value, only one of them is statistically relevant, meaning, we can assume it effectively surpassed the market.

As for their beta values, we can assume that three of the fund's returns are very much linked to the IBEX 35, one of them being slightly less. One of the funds displayed a much lower beta but it isn't statistically relevant. This also goes hand in hand with the very low r-squared value.

Table 12 - Jensen's measure, Treynor's/Sharpe's Ratio

Fund	Jensen's alpha	Treynor's ratio	Sharpe's ratio
Santander Acciones Españolas A	0,0209	0,0006	0,0073
ING Direct Fondo Naranja Ibex 35	0,0794	0,0600	0,9015
Caixabank Bolsa Índice España Estándar	0,0900	0,0906	0,9187
BBVA Bolsa Índice	0,0660	0,1403	0,3149
IBEX 35	-	-0,0189	-0,2844

Source: Author

In terms of performance, and in light of the results above, we can assume that all of the funds have managed to outperform the IBEX 35, even if very slightly so.

At first glance, there is an apparent contrast between these results and their Portuguese counterparty ones, in the sense that, although the Portuguese mutual funds had positive Treynor and Sharpe's ratios, which were generally much higher than their Spanish peers, they displayed a negative alpha meaning they couldn't surpass the market. The reason behind this could be explained by the much lower, in fact, negative performance from the IBEX 35 compared to the PSI Geral. In addition to this, the Spanish Treasury bonds displayed a higher performance than the Portuguese Treasury bonds (on average, 0,71% vs 0,61%, respectively).

Table 13 - Fund's fees

Fund	Direct fees		Indirect fees		Others
	Subscription	Redemption	Management	Deposit	
Santander Acciones Españolas A	-	-	2,150%	0,150%	-
ING Direct Fondo Naranja Ibex 35	-	-	0,990%	0,10%	-
Caixabank Bolsa Índice España Estándar	-	-	1,000%	0,02%	-
BBVA Bolsa Índice	-	-	1,100%	0,10%	0,40%

Source: Fund's prospectus provided on Management Companies institutional website

Although the Spanish funds don't disclose the other fees they charge as openly as the Portuguese funds, we can analyze the management fee as the most important one. Three of the funds hover around 1% while *Santander Acciones Españolas A* more than doubles this amount. This is an important detail as it might greatly impact the return for the investor, especially because this was the fund with the overall worst performance.

6. Conclusions and Future Works

The objective of this master's thesis was to examine the performance of actively managed funds in comparison to their passive peers in the context of the efficient market hypothesis. The study of these two investment strategies has been an ongoing debate over the past decades and especially interesting during an important period such as the COVID-19 pandemic was deemed relevant as no other academic literature was found on this particular subject. On the one hand, investment in index funds has seen a rise over the last few years, standing out as a reliable and simple choice. On the other hand, having an experienced investment manager may be preferred for other types of investors, or for diversification purposes, for that matter, which can be especially important over uncertain periods (political or economic instability).

We have seen the impact of the pandemic on the amount of overall assets under management in mutual funds, which has, in fact impacted the whole financial markets, with investors rethinking their desired portfolio allocation in a flight to quality movement (Kumail et al., 123AD). In order to draw relevant conclusions, several research methodologies and data analysis techniques were used, as well as the metrics deemed appropriate to understand if there was a significant difference in the active portfolio managed mutual funds.

What we came to understand is that on the Portuguese equity funds, although there was a positive realized return over the chosen period of 41 months, there was also a statistically significant underperformance in relation to the *PSI Geral*. In fact, it is important to mention that only one fund had, on average, a higher return than the Portuguese treasury bonds. The only fund coming close to the market's performance was *BPI Portugal*, which, despite having a higher return than the risk-free rate, couldn't match the benchmark's performance. The funds *IMGA Ações Portugal A* and *GNB Portugal Ações* followed both in terms of realized return over 41 months and average return. Lastly came the fund *Caixa Ações Portugal Espanha*, which halved the returns of the previous two funds. It is also important to highlight that, on average, the Portuguese market had a slightly higher return than the Portuguese treasury bonds. In terms of volatility, this goes hand in hand with the calculated correlation between the funds and the benchmark, with the most correlated fund, *GNB Portugal Ações*, being the least volatile fund. The fund *BPI Portugal* naturally comes second as it also has a

very similar correlation with the benchmark, followed by *IMGA Ações Portugal A* and lastly, *Caixa Ações Portugal Espanha*. The t-test was performed using a confidence level of 95% with the purpose of understanding if the funds had, on average, a return close to the benchmark. As we could observe, all the p-values were above 5%, which may suggest the fund's return was indeed close to the benchmark, on average. Moreover, the beta calculated for the four funds is statistically significant and very close to 1, meaning that their variation tended to follow the *PSI Geral*. Overall, all funds present negative Jensen's alpha values, with *BPI Portugal* being very close to zero, followed by *GNB Portugal Ações* and *IMGA Ações Portugal A* with very similar values, and *Caixa Ações Portugal Espanha* coming last. There's a clear difference between *BPI Portugal* alpha, which, along with the fact that the value is close to zero, suggests that the fund's return is slightly below what would be expected based on its level of systematic risk, according to the CAPM. Additionally, the Treynor's ratio observed puts *BPI Portugal* on the podium once again, coming close to the value calculated for *PSI Geral*. This is completely aligned with its beta (close to 1), meaning that the fund is earning a return in line with the amount of systematic risk it is exposed to. The three other funds rank similarly to the average return over 41 months. Between *IMGA Ações Portugal A* and *GNB Portugal Ações*, we understand that, despite the lower average return of the latter, it nearly matches the Treynor's ratio of the former as it also has a lower beta. Moreover, the Sharpe's ratio calculated for all four funds suggests that *BPI Geral* offered a better return in light of its volatility, i.e., the total risk, despite having a slightly higher volatility than *GNB Portugal Ações*, compensated by its much higher average return.

Since one of the objectives of this thesis was also to understand the impact of the fees charged by the managers to actively manage the funds in the investor's returns, this was also assessed from the information presented in the fund's prospectus. The fees that are directly or indirectly charged to the investor may have a large impact on the overall return. As expected, the heaviest contributor to the overall fees is the management fee, which ranges from 1.195% (*BPI Geral*) to 2.175% (*IMGA Ações Portugal A*), representing a near 1% difference between the most and the least onerous funds. Although other factors should be considered, the alpha is often a representation of the maximum an investor should pay for the active management of a portfolio. Considering this last argument, all funds would have performed poorly, with negative

net gains. This is especially aggravated for the worst performing funds such as *IMGA Ações Portugal A* and *Caixa Ações Portugal Espanha*.

Finally, and in the interest of comparing the Portuguese market scenario to a foreign market during the same period, specifically on the equity funds scope, four Spanish equity mutual funds were chosen and we've analyzed the same metrics as for the Portuguese funds. The results were fairly different between the two markets, both in terms of the overall market, which performed worse than the Portuguese market, but also in terms of the performance metrics for the funds themselves. As mentioned, the Spanish funds performed worse than their Portuguese peers over the same period, displaying average returns over 41 months below half of the returns of the latter. They were also considerably more volatile, with *BBVA Bolsa Índice* standing out with more than double the volatility of the other three funds. *BBVA Bolsa Índice* is a clear outlier, as it significantly differs in practically all metrics, having a much lower correlation and beta than the other three funds. Nonetheless, all funds managed to outperform the chosen benchmark (*IBEX 35*), which translates into positive alphas for all four funds, and although none of them are statistically significant, they still hold an important analytical value. The Treynor and Sharpe's ratios also displayed consistent results, in which all the funds had positive values, meaning they achieved a good risk-adjusted performance, even if very marginally for the most part, especially for *Santander Acciones Españolas A*. In terms of fees, the Spanish funds are slightly less taxing than the Portuguese ones, resulting nevertheless, in a negative return for the investor due to their poor performances. In summary, the Portuguese funds present higher returns than the Spanish funds when adjusted for total and systematic risk but fall short when compared to the market.

It is apparent that the COVID pandemic has forced portfolio managers and the asset managers themselves to approach risk management differently. On a global scale, we find that most active funds underperformed passive benchmarks, which contradicts the idea that actively managed funds can leverage and benefit from volatile economic situations. The idea conveyed in the literature is that, during this period, investors have preferred funds with higher sustainability ratings which mandate that asset managers should follow this trend. Active managers were generally not nimble enough to hedge their portfolios when the markets turmoil surged especially because investors searching for active management demand higher returns and portfolio managers tend to hold

riskier assets and low cash reserves which degrades their creditworthiness even more. In times when a rare opportunity to deliver very high returns presents itself, portfolio managers couldn't overperform passive funds, at least not consistently.

Overall, the objective was accomplished, and we can observe from the results of the empirical study that the index exhibited better results compared to actively managed funds in the Portuguese market, although the same cannot be said for the Spanish market. The benchmark chosen, the *PSI Geral* managed to outperform the chosen equity mutual funds, in line with the positive trend and popularity observed in the funds industry. It is important to mention that some studies have found exceptions to this statement, in particular for ESG-compliant funds, although in a very small manner, which can be further explored in future research as the market is becoming much more ESG aware.

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Appendix

Key Conferences:

Morningstar Investment Conference: This annual conference is hosted by Morningstar, and gathers many different finance professionals, such as portfolio managers, large investors, and other financial advisors, in order to discuss the latest topics in the finance world and create a space where we listen to the expert's insights and forecasts. This year's conference was held in April, and the main topics discussed were, amongst others, the investments in Climate Tech, Central Banks interest rates, as well as Morning Star's view on passive strategies from BlackRock, Vanguard, and iShares.

Lipper Fund Awards: The Lipper Fund Awards are attributable to notable mutual funds and are hosted by Refinitiv, one of the largest providers of financial markets data and analytics, especially in the mutual fund realm. The event awards funds that show superior performance in their category both in terms of risk-adjusted performance, but also in terms of consistency over 3, 5, and 10-year periods.

Investment Company Institute (ICI) General Membership Meeting: This annual conference is hosted by the Investment Company Institute (ICI), a trading association representing several international investment companies, including the mutual fund industry. The institution aims to distribute knowledge on the mutual funds industry and other investment companies, promote the compliance of moral norms, and share their interests among stakeholders.

CFA Institute Annual Conference: This annual event is organized by the CFA Institute, an international association providing a set of skills, ethics, and various certification programs to investment professionals. The conference covers the latest topics on market trends and challenges in the investment industry as well as compliance and regulatory norms.