INSTITUTO POLITÉCNICO DE LISBOA
INSTITUTO SUPERIOR DE CONTABILIDADE
E ADMINISTRAÇÃO DE LISBOA

HOW ARE DERIVATIVES USED BY EQUITY FUNDS IN PORTUGAL?

Fábio Rosa

Lisboa, Dezembro de 2023

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Dissertação submetida ao Instituto Superior de Contabilidade e Administração de Lisboa para cumprimento dos requisitos necessários à obtenção do grau de Mestre em Análise Financeira, realizada sob a orientação científica de Mestre Especialista José Nuno Sacadura.

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Abstract

This dissertation aims to study the use of derivatives by Portuguese equity funds and understand what fund characteristics can affect the decisions about the use of derivatives and the exposition to have. Based on data from the 34 Portuguese equity funds active in the period between January 2018 and June 2022, the information was used to produce preliminary statistics and statistical regressions, that made possible to conclude about the topic. It was found that the variables "Fund Size" and "Age", negatively affected the decision to use derivatives, and the variable "Management Fee", influenced the decision to use derivatives positively. Was further shown that, just like the decision to use derivatives, in derivatives exposition, the variables "Age" and "Fund Size" affected the exposition negatively too. However, the "Net Inflows", which were not significant to the derivatives use decision, affected the exposition positively. Some of these findings were similar to the ones made in the past, although some are contrary or new, which adds value to this dissertation, because new findings were made. Regarding to the preliminary statistics, no big differences were seen comparing the "normal" periods with the Covid-19 pandemic period, and the crisis period with Russia-Ukraine War and High Inflation.

Keywords: Derivatives; Financial Markets; Equity funds; Mutual Funds; Covid-19; Statistics

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Abbreviations List

CMVM – Comissão do mercado de valores mobiliários

APFIPP – Associação portuguesa de fundos de Investimento, Pensões e Patrimónios

OTC – Over-The-Counter

IRS – Interest Rate Swaps

CDS – Credit Default Swaps

UCITS – Undertaking for collective Investment in transferable securities

USA – United States of America

SEC – United States Securities Exchange Commission

EDGAR – Eletronic Data Gathering, Analysis, and Retrieval system

CRSP – Center for research in security prices

OLS – Ordinary Least Squares

NAV – Net Assets Value

FX – Foreign Exchange

ETF – Exchange Traded Fund

EMIR – European Market Infrastructure Regulation

1. Introduction

Derivatives are contracts between two or more parties that are dependent upon or derived from one or more underlying assets like stocks, bonds, commodities, or interest rates, for example. These contracts are used for three purposes: to speculate, to hedge positions and for arbitrage. Depending on what the person or the company wants to do, there are many strategies, and different types of derivatives to use. There are lots of different financial derivatives contracts, but the most common ones are Futures and Forwards, Options and Swaps (Fernando, 2022; Horta, Pinheiro and Sacadura, 2022).

Futures and Forwards are contracts between two parties that allow them to purchase or deliver an underlying asset at and agreed-upon price, at a future date. These agreements entail a commitment on the part of the parties to buy or sell the underlying asset, depending on the position (Long or Short, respectively), at the date agreed. In the maturity date the settlement can be physical, where the underlying is purchased or delivered by the parties, or in cash, where the parties only change cash based on the difference between the price agreed and the market price of the underlying. The main difference between Futures and Forwards is their trading characteristics. Futures are traded on an exchange and follow a standardized format, in contrast of Forwards that are traded Over-the-Counter (OTC) and can be negotiated in a tailor-made format (Fernando, 2022; Horta, Pinheiro and Sacadura, 2022).

Options, much like Futures and Forwards, are contractual agreements between two parties. These agreements allow them to purchase or deliver an underlying asset at a predetermined price, on a future date. However, they differ from each other because of their rights and obligations. Options give the buyer the right, not the obligation, to purchase (Calls) or to deliver (Puts) the underlying asset. On the other hand, this contract gives the seller the obligation to deliver (Calls) or to purchase (Puts) the underlying asset at the maturity date, if the options are of European type, or at any time if the options are of American Type. For this agreement to be fair, the buyer pays a premium to the seller at the beginning of the contract. This premium is not refundable, regardless of whether the option is exercised at the maturity. Options can be traded on an exchange or Over-the-counter (OTC) (Fernando, 2022; Horta, Pinheiro and Sacadura, 2022).

Swaps are contractual agreements that are typically employed to exchange one type of cash flow with another. There are some popular types of Swaps like:

- Interest Rate Swaps (IRS): These Swaps exchange a fixed rate loan to a variable rate loan, or the opposite;
- Currency Swaps: These Swaps are used to switch cash flows in different currencies at an agreed exchange rate;
- Credit Default Swaps (CDS): These Swaps are used to cover the potential risk of default from a counterparty, such as the issuer of a Bond;
- Equity Swaps (EQS): These Swaps are similar to Interest Rate Swaps, however in this case, the "Fixed" leg is based on the return of an equity index or an equity basket;

It's important to highlight that Swaps are only traded Over-the-Counter (OTC) (Fernando, 2022; Horta, Pinheiro and Sacadura, 2022).

One of the main users of derivatives are the Mutual Funds. Mutual Funds function as investment vehicles that allow investors to pool their money together with other investors to acquire a portfolio of securities. These funds are managed by professional asset managers who attempt to achieve the best possible performances, respecting the rules of their prospectus (A comprehensive document that has all the information needed about a Mutual Fund, like the strategy, commissions, and investment rules) (Hayes, 2022). In Portugal, the Portuguese financial markets authority (CMVM) guarantees the respect of the rules by these mutual funds.

This Dissertation aims to understand the utilization of Derivatives by a particular type of Portuguese Mutual Funds, the Equity Funds, and what characteristics affect this decision. A similar study was made in the past by Branco (2010), using all types of Mutual Funds in Portugal, but the objective is to consolidate the knowledge in this matter, see the differences from the past studies, and understand if the Covid-19 pandemic had an influence in this topic.

To make this dissertation possible a sample of 34 Portuguese Equity Funds were selected. This sample includes all the Portuguese Equity Funds that remain active from the first quarter of 2018 to the second quarter of 2022. The use of this time frame allowed for the division of the data into distinct periods, namely a "normal" period, a Covid-19 pandemic period, a recuperation period and a second crisis period. The data related to the sample and time frame selected were extracted from CMVM database, APFIPP database and Bloomberg End. These sources together provided the necessary information to the successful execution of this dissertation.

After organizing the data, some preliminary statistics were produced. Subsequently, detailed statistical analysis was performed on the data, involving regression models, to test the hypothesis proposed, using Stata and Microsoft Excel Software. After that, some conclusions about the

results were made to have a more in depth understanding of the topic and to make some comparisons with prior studies.

In the following chapter a literature review will be presented to elucidate what are known about the topic, until nowadays, and to have the necessary information to compare with the findings made in the empirical results chapter. Subsequently, a chapter will be dedicated to hypothesis development, where the research questions and the hypothesis to answer them will be presented. This will be followed with a data description and model development chapter, which have the information on the type of data used and how it was found. Additionally, in this chapter the models used will be presented. In sequence, a Preliminary Analysis and empirical results chapter will be developed. This is where the different average metrics for the variables and time frames proposed will be shown, and where the regressions and statistical results will be analysed to make conclusions and to compare the values with the prior research. After all, a conclusion chapter will present the summary of the findings and will have some suggestions for future research.

2. Literature Review

The literature about the use of derivatives by mutual funds is not very extensive, however there are some articles and dissertations regarding this matter. In the following paragraphs, a literature review will be presented for better understanding of what was done in the past and to be later compared with the results of this research.

In their investigation about the use of derivatives by European UCITS equity funds, Bias, Guagliano, Haferkorn, Haimann and Kaserer (2019) discovered that 27.6% of the equity funds analysed, made at least one derivatives trade in the period selected. They also discovered that 80% of all trades were done with three types of contracts, 53% with Currency Forwards, 14% with Equity Futures and 12% with Equity Options. When they made a regression, to see which variables can explain the use of derivatives, they verified that "Fund size" effects explain 1.1% of the overall variation. "Fund family" effects increased the explanatory power to 25.7%. "Investment area", "base currency", "domicile" and "benchmark" can only explain between 2.6% and 5% on its own, with a combined explanatory power of 29.3%.

Fong, Gallagher and Ng (2005) studied the use of derivatives and its influence on Australian equity funds, during the period from 1993 to 2003. They found no evidence of significant differences on performance and risk across the derivative users and the non-derivative users. This result is consistent with the competitive cross-market equilibrium outcome, where the marginal benefit and cost of transactions in different markets are the same. It is important to note that according to the authors, the small size of derivatives exposures relative to the fund size, limits the impact of derivatives in funds' portfolios, and can explain why there were not significant differences between users and non-users.

In the Spanish Mutual funds industry, Marín and Rangel (2006) have found evidence that in general, the use of Derivatives does not improve the performance of the funds. In the sample used, is possible to see an average utilization of derivatives by equity funds of 65.4% on Domestic Equity funds, 38.7% on Foreign Equity funds and 50.2% on European Equity funds. Regarding derivatives exposition in proportion of the fund size, the Domestic Equity funds used an average of 25.7%, Foreign Equity funds used an average of 10.2% and European Equity funds used an average of 11.5%. They used a Weighted Least Squares Logit regression to understand the variables that influence the use of derivatives and a Weighted Least Squares Regression to see which variables influence the derivatives exposition in proportion to the fund size. According to the logit model used by them, the probability of using derivatives increase

with the higher number of funds in the family, the existence of other users in the family, larger size of the fund, larger management fees, charging no loads and lower dividend yields. The only variable that does not affect the use of derivatives is the fund's age. In the Exposition to Derivatives, the effects of the variables are the same, however, the fund's size had loss significance and this time, the fund's age is significant, as the younger funds are more aggressive in their position taking in derivatives.

Bias, Guagliano, Haferkorn, Haimann and Kaserer (2020) researched about what types of derivatives are traded by mutual funds, why some of them trade derivatives, while others do not, what makes some funds being more active traders, and what are the motives for trading derivatives. For the first objective, they have shown that, just like prior research, the most traded types of derivatives were Currency Forwards, Equity Futures and Equity Options, which accounts for 80% of all derivatives trades. Secondly, they discovered that the "Fund Family" was the most important determinant for a fund to use derivatives. This explained more than 34% of the overall variation. "Fund Size", "geographic focus", "base currency" or "domicile of the fund" played a minor role for this decision. Regarding the third objective, they concluded that the fund's investment strategy and the incentive schemes, as well as personal traits of the fund manager, played an important role for a fund to be a heavy user of derivatives. Finally, they found some evidence that derivatives were used to reduce transaction costs and for risk mitigation purposes. They also found, within a regression analysis, that funds which used derivatives were less exposed to downward movements in the benchmark, but also profit less from upward movements.

To understand how United States of America (USA) funds used derivatives and how derivatives contributed to performance, Kaniel and Wang (2021) made a study using data from SEC Database. Using a sample from 2019 to 2020, they were able to separate three different periods: Pre-crisis period (Before 20th January 2020), Outbreak period (From 20th January 2020 to 23rd March 2020) and Recovery period (From 24th March 2020 to 8th June 2020). They found that in normal times (Pre-crisis period) derivatives were more used to amplify market exposure than for hedging purposes, and the derivatives users significantly underperformed the non-users. During the crisis period (Outbreak and recovery periods) was possible to see that the Amplify funds (The ones that use derivatives to amplify market exposure) did not outperform in this period, refuting the hypothesis that the underperformance in normal periods was compensated by outperformance in the crisis periods. They have lost with their existing long positions when the market crashed and have lost too with the short positions opened when the market unexpectedly rebounded. However, the Hedging funds (The ones that use derivatives for

hedging purposes) outperformed during the crisis period because they had protection against market crashes.

In her study about "The use of derivatives in bond funds", applied to USA Bond funds from 2003 to 2019, Neuwirt (2021) proposed herself to study the factors that affect the decision to use derivatives, the impact of using derivatives in the performance of a fund, the impact of using derivatives in the net inflows of a fund and the determinants of derivative use over time. She found that the previous quarter return, fund size and age, had a positive significant influence in the probability of using derivatives in the quarter, while Net Inflows had a negative significant influence. Regarding the impact of using derivatives in the performance of a fund, she showed that the return is positively impacted by the use of derivatives in the previous quarter. Contrary to return, Net inflows were not significantly influenced by the use of derivatives in the previous quarter which lead her to conclude that fund managers use derivatives to increase fund performance by taking excessive risks, and as a result of that the investor do not respond with additional inflows, because they might perceive that the risk of the fund is too high for them. Finally, she studied the use of derivatives over time, and concluded that bond funds tend to increase the use of derivatives over the years.

To study the use of options by equity mutual funds in the USA, Natter, Rohleder, Schulte and Wilkens (2016), used information from different sources like SEC EDGAR database and CRSP Mutual Fund Database, for the period between 1998 and 2013. From this analysis, they concluded that using options affects positively the risk-adjusted performance of a fund and produces a significantly lower beta (Systematic risk), because options are more used for hedging purposes than for speculation, according to their findings. In addition, they showed that covered call strategies are the main drivers of the increase in performance, and protective put strategies are the main drivers of the decrease in the risk. According to their findings, the SEC fear about the option use by mutual funds is unjustified as options increase the risk-adjusted performance and reduces the systematic risk.

Cici and Palacios (2014) proposed themselves to understand the use of options by USA mutual funds. They used data from CRSP Mutual fund Database and Morningstar Direct between 2003 and 2010. The objective was to observe what types of funds use options and how the use affects the return and the risk. They found that the options, in mutual funds, are more used for risk management and hedging purposes than for risk taking or obtaining exposition. The users of option tend to be smaller, to have a higher expense ratio, to have a higher portfolio turnover and to generate lower returns than the non-users. To evaluate the effect of some characteristics

in the use or not use of options, they made a logit regression. The only variable that showed a significant influence was expense ratio, with a positive relation, which means that funds that use options tend to have a higher expense ratio. Variables like the "fund size", "age", "Portfolio turnover", "12-month past returns" and "12-month standard deviation" showed no significance, as well as the experience of the manager. An interesting conclusion is that, although there is no significance in this variable, the probability of using derivatives is negatively affected by the experience of the manager, which leads to a conclusion that more experienced managers tend to use less options than the younger ones, who are more prone to use riskier assets.

Using USA equity funds, between 1992 and 1994, Koski and Pontiff (1999) observed that 21% of the funds in the sample used derivatives. Via phone inquiry, they understood that most of the funds used derivatives for hedging purposes (45%) and only 9% admitted using derivatives for speculation. They showed that the "Fund family" and a "High Asset Turnovers" are the main drivers which improve the probability to use derivatives. The risk of the funds, adjusted to the type of fund, according to the authors was not changed by using derivatives or not. The same was found for the performance.

Garcia-Appendini and Rangel-Hilt (2009) studied the Italian equity mutual funds, between December 2002 and May 2007. In 2005 a new regulation on the use of derivatives by Italian mutual funds was made to harmonize the Italian funds with the European regulation, and this was expected to be revolutionary, because that regulation was more flexible for funds to use derivatives. They observed the differences before and after the regulation was launched. They saw that before the regulation around 53% of the funds used derivatives, but with the new regulation, that number increased to 63%. The allocation in derivatives followed the same path, increasing from 4.11% to 4.96%, between the ones that use them. This meant that the regulation was not as revolutionary as expected. Regarding the risk and return of the funds, the new regulation increased the alpha of the funds, and simultaneously reduced the overall risk of the funds that used derivatives. However, the funds that didn't use derivatives increased the performance and had a similar overall risk reduction, which means that the regulation was not a "game changer" in the use of derivatives by Italian mutual funds.

With evidence from the Hedge Fund Industry, Chen (2010) studied the derivatives use and risk taking in this industry. The sample used was from 1994 to 2006. During this period 71% of these hedge funds traded derivatives, which is a sharp contrast with some literature on mutual funds that shown 21% of usage (Koski and Pontiff, 1999). Chen found that hedge funds with higher minimum investment, higher fees, shorter capital lookup period and effective audit

service are more likely to use derivatives than others. He saw too that the use of derivatives usually reduces the risk of the hedge fund, while the performance (manipulation-proof) remains similar between users and non-users. Derivatives use does not affect the flow performance relation in the hedge funds, which means that investors had not been influenced by the use of derivatives.

Cao, Ghysels and Hatheway (2001) used a sample of 471 funds from USA, collecting 2154 financial statements from SEC Database. This sample allow them to study the effects of derivatives use in an investment portfolio. They found that funds which use larger amounts of derivatives tend to have greater returns than the ones which use smaller amounts or do not use at all. They discovered too that the use of derivatives depends positively on the past returns of the fund. This can infer that derivatives are used for other reasons than cash management or managerial incentive gaming.

A more recent study made by Afrina, Beg, Zayed, Hossain and Shahi (2020) aimed to understand the influence of the Covid-19 pandemic in the financial derivatives market. They found that the epidemic, as expected, contributed to instability and unpredictability in the markets and the magnitude of the epidemic was positively correlated with the specific financial exchange reactions. The same as occurred with the derivative instruments which were having unexpected movements and a high level of instability (Higher volatility).

Branco (2010) made a study applying the use of derivatives by mutual funds, to the Portuguese reality. Using a sample of various types of mutual funds, between 2002 and 2009, was able to reach some conclusions about the Portuguese scenario, which didn't exist before. He saw that around 51,5% of the equity funds used derivatives at least once, during the time frame selected. The Fixed income funds had a lower percentage of utilization (32,3%), while the retirement equity funds had a higher percentage of usage (59,2%). In terms of the derivatives' allocation, the equity funds were the heaviest users with a percentage of 16,7%, while the Fixed Income funds and the retirement equity funds used an amount of 4,2% and 5,1%, respectively. Regarding the types of derivatives that were more used, Futures and Forwards largely dominate in the three categories defined (foreign exchange derivatives, interest rate derivatives and equity derivatives), with percentages of 75%, 83% and 57% respectively. The other derivatives had a usage percentage higher or lower depending on the category. Options were more used than swaps in the foreign exchange and equity types, however in the interest rate type Swaps were more used than Options. After the descriptive statistics, some models were made. The first two models were a logit one to understand the variables that affect the use of derivatives and an

OLS one to understand the variables that affect the allocation to derivatives. He concluded that the "Fund Size" was the only one that significantly affects the probability of using derivatives (A bigger fund had a higher probability to use derivatives than a smaller one) and concluded too that the "Age of the fund" was the only one to significantly affect the allocation to derivatives (A younger fund tended to use a higher allocation to derivatives than an older one). Regarding the performance of the funds, there weren't significant differences between the funds which use derivatives and the ones which do not use.

Aragon and Martin (2010) studied the derivatives usage applied to the Hedge Fund industry, between 1999 and 2006. According to the literature, in the mutual fund industry, derivatives were usually used for hedging purposes rather than to obtain exposition. However, the hedge fund industry was more likely to use derivatives in a speculative way. They discovered that between the Hedge Funds, derivatives users tend to be larger, have lower volatility, a higher Sharpe ratio and excess return.

Brown, Gallagher, Steenbeek and Swan (2005) in their study about the patterns of equity fund holdings and transactions, used a sample of Australian equity funds, from 1995 to 2002. According to their literature review, Kahneman and Tversky (1979) suggested that individuals tend to lock in gains and gamble on losses. The authors tried to verify this finding with their Australian equity funds sample. They found no evidence on this type of trading behaviour on the aggregate fund level, because their sample only permitted them to observe this behaviour in individual securities.

In their study about Mutual Fund performance and flows during the Covid-19 crisis, Pástor and Vorsatz (2020) used a sample of USA equity funds from 2017 to 2020. They found that most of the funds underperformed the benchmarks during this period. They observed too that funds with higher ranks of sustainability and quality performed better and were more favoured by the investors when they decided to invest capital in the markets (Higher inflows).

Chevalier and Ellison (1997) tried to understand the risk-taking behaviour of the mutual funds, with a sample from USA mutual funds from 1982 to 1992. They showed that funds tended to increase the risk of their portfolios between September and December in order to achieve best year-to-date results, and consequently have better inflows. Their findings were consistent with the prior literature.

Alsubaiei, Calice and Vivian (2021) studied the impact of Credit Default Swaps on the equity mutual funds of 24 developed and Emerging markets countries. They made three findings that were important to the topic studied. First, they discovered evidence that the equity funds

performance and the sovereign CDS spreads have a negative relationship, which means that with the increase of default risk, the equity instruments tend to have worst performances. Then they found that the equity funds tend to have lower inflows in periods that the sovereign CDS spreads are increasing. Finally, they observed that the other two findings were more intensified on the emerging markets that in the developed markets.

Below is a summary table with the main papers, findings and samples used:

Paper	Main Findings	Sample
Afrina, T., Beg, T., Zayed, N., Hossain, M. & Shahi, S. (2020). An analysis of the effects of Corona Virus (Covid-19) on International Financial Derivatives Market	The Covid-19 pandemic contributed, as expected, to financial markets instability and unpredictability.	Financial Derivatives data until 2020
Alsubaiei, B. J., Calice, G. & Vivian, A. (2021). Sovereign CDS and mutual funds: Global Evidence	Found evidence that equity performance and sovereign CDS spreads have a negative correlation. The same was found to the Inflows. These findings were more intensified in the emerging markets than in the developed markets.	Equity mutual funds from 24 Emerging markets and developed countries, from 2008 to 2017
Aragon, G. O. and Martin, J. S. (2010). A unique view of hedge fund derivatives usage: Safeguard or Speculation?	Found that while mutual funds tend to use derivatives more with a hedging purpose, hedge funds tend to use them more in a speculative way. Between the Hedge funds derivatives users tend to be larger, have lower volatility, higher Sharpe ratio and excess return.	USA Hedge funds, from 1999 to 2006
Bias, D., Guagliano, C., Haferkorn, M., Haimann, M., & Kaserer, C. (2019). Use	28% of the funds were derivatives users. The most used types of derivatives were Currency futures, Equity Futures and Equity Options. The variables "Fund Size" and "Fund Family" played a major role on explaining the use of derivatives,	All the UCITS Equity funds in activity on 31st December 2015, during the

of derivatives by UCITS equity funds	while the variables "Investment area", "Base currency", "Domicile" and "Benchmark" played a minor role.	period from July 2016 to December 2016.
Bias, D., Guagliano, C., Haferkorn, M., Haimann, M., & Kaserer, C. (2020). Mutual Funds and Derivatives: Evidence from Linked Fund-Trade Data	The most traded types of derivatives were Currency Futures, Equity Futures and Equity Options. "Fund Family" was the most significant variables for a fund to use derivatives, while "Fund Size", "Geographic focus", "Base currency" and "Domicile of the fund" played a minor role. Derivatives were used to reduce transactions costs and to mitigate risk. They found that funds which use derivatives were less exposed to downward movements on the benchmark, but profit less with the upward movements.	All the UCITS Equity funds in activity on 31st December 2015, during the period from July 2016 to December 2016.
Branco, F. R. (2010). A utilização de derivados pelos fundos de investimento mobiliário em Portugal	Found that around 52% of the equity funds, 32% of the fixed income funds and 59% of the equity retirement funds used derivatives. In terms of exposition, they had 17%, 4% and 5% respectively. Futures and Forwards dominate in terms of utilization in the three categories (Foreign exchange, interest rate and equity). "Fund Size" was the only variable that significantly affected the probability of using derivatives and "Age of the fund" was the only one that significantly affected the exposition to derivatives. Regarding the performance there was no significant difference between users and non-users.	Portuguese mutual funds, from 2002 to 2009
Brown, S., Gallagher, D., Steenbeek, O. & Swan, P. (2005). Double or nothing: Patterns of equity fund	Found no evidence that individuals tend to lock their gains and gambling on losses, to aggregate fund level, however found evidence to this behaviour on individual stocks.	Australian Equity funds, from 1995 to 2002

holdings and transactions		
Cao, C., Ghysels, E. & Hatheway, F. (2001). Derivatives do affect mutual funds returns: How and when?	Found that funds which use larger amounts of derivatives perform better than funds which use smaller amounts or do not use at all. Derivatives use depends positively on past returns of the fund.	USA mutual funds, from 1997 to 1999
Chen, Y. (2010). Derivatives Use and Risk Taking: Evidence from the Hedge Fund Industry	Found that 71% of the funds used derivatives. Hedge funds with higher minimum investment, higher fees, shorter capital lookup period and effective audit service are more likely to use derivatives. The use of derivatives reduces the risk while maintaining the performance. The use of derivatives does not affect the flow-performance relation.	USA Hedge funds, from 1994 to 2006
Chevalier, J. & Ellison, G. (1997). Risk taking by mutual funds as a response to incentives	Found that funds tend to increase their risk between September and December, to have better year-to-date results and consequently have better inflows. Their findings were consistent with the flow-performance theory.	USA mutual funds, from 1982 to 1992
Cici, G., & Palacios, L. F. (2014). On the use of options by mutual funds: Do they know what they are doing?	Found that options are more used for hedging purposes than to obtain exposition. Option users tend to underperform the non-users, be smaller, have a higher expense ratio and have a higher portfolio turnover. The only characteristic that shows positive significance to the probability of using options was "Expense ratio".	USA Mutual funds, from 2003 to 2010
Fong, K., Gallagher, D., & Ng, A. (2005). The Use of Derivatives by Investment Managers and Implications for	Found no evidence of differences in performance and risk between derivatives users and non-users.	Australian Equity funds, from 1993 to 2003.

Portfolio Performance and Risk		
Garcia-Appendini, E. & Rangel-Hilt, T. A. (2009). Do derivatives enhance or deter mutual fund risk-return profiles? Evidence from Italy	After the change on the regulation 53% of the funds used derivatives, however, after the new regulation that number improved to 63%. The exposition to derivatives improved too, from 4.11% to 4.96%. After the new regulation, both derivatives users and non-users improved their performance and reduced their risk.	Italian Equity funds, from 2002 to 2007
Kaniel, R. & Wang, P. (2021). Unmasking Mutual Fund Derivative Use	Found evidence that in normal periods, funds use derivatives more to amplify market exposure than for hedging purposes and the derivatives users significantly underperformed the non-users. In the Covid-19 pandemic the derivatives users underperformed the non-users too, which eliminates the possibility that the underperformance in normal periods was compensated by overperformance in crisis periods.	USA mutual funds, from 2019 to 2020
Koski, J. L., & Pontiff, J. (1999). How are derivatives used? Evidence from the mutual fund industry	21% of the funds in their sample used derivatives. The majority of the derivatives users used them for hedging purposes (45%). The characteristic "Fund Family" and "High Asset Turnovers" are the main drivers to the probability of using derivatives. The risk and the performance were not different between derivatives users and non-users.	USA Equity funds, from 1992 to 1994
Marín, J. & Rangel, T. (2006). The Use of Derivatives in the Spanish Mutual Fund Industry	In general, the use of derivatives does not improve the performance of the funds. They found that derivatives were used 65% by domestic equity funds, 39% by foreign equity funds and 50% by European equity funds. Regarding to derivative exposition, this was 26% on domestic equity funds, 10% on foreign equity	All the Spanish mutual funds in activity between 1995 and 2005.

	funds and 12% on European equity funds. The "Fund Size", "Fund Family", "Management Fee" and "Dividend yield" were the variables that significantly affect the probability to use derivatives. To the derivatives exposition, the significant variables were the same, however the "Fund Age" was significant too.	
Natter, M., Rohleder, M., Schulte, D., & Wilkens, M. (2016). The benefits of Option Use by Mutual Funds	Using options affects positively the risk adjusted performance of a fund, and reduces the systematic risk, because they are more used for hedging purposes than for speculation. Covered Calls are the main driver to the increase in performance, and protective puts are the main driver to decrease in risk.	USA Equity funds, from 1998 to 2013
Neuwirt, A. M. (2021). The use of derivatives in bond funds	Found that "Previous quarter return", "Fund Size" and "Age" have a significant positive influence on the probability of using derivatives, while "Net Inflows" have a significative negative influence. Fund's performance is significatively affected by the use of derivatives in the quarter before, according to her findings. On the other hand, Net Inflows were not significantly influenced by the use of derivatives in the quarter before. Bond Funds tend to increase the use of derivatives over time.	USA Bond Funds, from 2003 to 2019
Pástor, L., Vorsatz, M. B. (2020). Mutual Fund Performance and Flows during the Covid-19 crisis	Found that most of the funds underperformed the benchmark during the Covid-19 pandemic crisis. Funds with higher ranks of quality and sustainability suffer less with the adverse market conditions and were more favoured by the investor with the inflows when they decided to reinvest.	USA Equity funds, from 2017 to 2020

Table 1 – Main papers, findings and samples used.

3. Hypothesis development

In this chapter, based on the literature review and the data that was possible to collect, some research questions and hypothesis were developed based on the objectives of this dissertation.

3.1. Derivatives Use

The first objective of this study was to understand if the decision to use derivatives was influenced by some of the fund characteristics. Based on this objective the first research question proposed was "Is the decision to use derivatives affected by one or more of the fund characteristics?". To answer this research question, the hypothesis formulated was the following:

H1: The decision to use derivatives is affected by one or more of the fund characteristics.

According to the literature review is expected that the hypothesis will not be rejected, because in some studies the variables "Fund Size" (Branco, 2010 and Neuwirt, 2021), "Fund Family" (Bias et al., 2020 and Koski and Pontiff, 1999), "Assets turnover" (Koski and Pontiff, 1999), "Expense ratio" (Cici and Palacios, 2014), "Quarter return" and "Age" (Neuwirt, 2021), were significant to the decision of using derivatives. In the Data description and Model development chapter, the model used to answer this research question will be presented (Chapter subsection 4.2.1), and then, in the Empirical results chapter, the answer will be concluded (Chapter subsection 5.2.1).

3.2. Derivatives Exposition

The second objective of the dissertation was to understand if some of the fund characteristics affected the derivatives exposure that the fund had. To address this topic the research question proposed was "What fund characteristics affect the exposition to derivatives?". In order to answer this research question, a hypothesis was made:

H2: The exposition to derivatives is affected by some characteristics of the fund.

Is expected that the exposition to derivatives will be affected by the age of the fund (Branco, 2010), and consequently, the hypothesis will not be rejected. In the Data description and Model development chapter, the model will be presented (Chapter subsection 4.2.2) and explored to reach the conclusions in the Empirical results chapter (Chapter subsection 5.2.2).

4. Data description and Model development

4.1. Sample construction

To conduct this study, a sample of 34 Portuguese equity funds has been chosen. This sample contains all the equity funds in Portugal that were active during the period from January 2018 to June 2022. This time frame can reflect some different types of periods, one considered "normal" market conditions (January 2018 to March 2020), a crisis period (March 2020 to November 2020) caused by the Covid-19 pandemic, a recovery period (November 2020 to February 2022) and another crisis period (February 2022 to June 2022) caused by the Russia and Ukraine war and significant inflation pressures, which led to interest rate hikes by the central banks and consequently an increase in funding costs. The chosen funds were the following:

- BPI Ações Mundiais - Fundo De Investimento Aberto De Ações
- BPI Africa - Fundo De Investimento Aberto De Acções
- BPI América - Fundo De Investimento Aberto De Acções
- BPI Ásia Pacífico Fundo De Investimento Aberto De Acções
- BPI Euro Grandes Capitalizações - Fundo De Investimento Aberto De Acções
- BPI Europa - Fundo De Investimento Aberto De Acções
- BPI Ibéria - Fundo De Investimento Aberto De Acções
- BPI Portugal - Fundo De Investimento Aberto De Acções
- BPI Selecção - Fundo De Investimento Aberto De Fundos Misto De Acções
- BPI Universal - Fundo De Investimento Aberto De Fundos De Acções
- Caixa Acções EUA - Fundo De Investimento Mobiliário Aberto De Acções
- Caixa Ações Europa Socialmente Responsável - Fundo De Investimento Mobiliário Aberto De Acções
- Caixa Ações Líderes Globais - Fundo De Investimento Mobiliário Aberto De Ações
- Caixa Ações Oriente - Fundo De Investimento Mobiliário Aberto De Acções
- Caixa Ações Portugal Espanha - Fundo De Investimento Mobiliário Aberto De Acções
- Caixagest Acções Emergentes - Fundo De Investimento Mobiliário Aberto De Acções
- Fundo De Investimento Mobiliário Aberto Santander Acções América

- Fundo De Investimento Mobiliário Aberto Santander Acções Europa
- IMGA Acções América - Fundo De Investimento Aberto De Acções
- IMGA Acções Portugal - Fundo De Investimento Aberto De Acções
- IMGA European Equities - Fundo De Investimento Aberto De Ações
- IMGA Global Equities Selection - Fundo De Investimento Aberto De Ações
- IMGA Iberia Equities Esg - Fundo De Investimento Aberto De Ações
- Montepio Acções Europa - Fundo De Investimento Mobiliário Aberto De Acções
- Montepio Euro Energy - Fundo De Investimento Mobiliário Aberto De Acções
- Montepio Euro Financial Services - Fundo De Investimento Mobiliário Aberto De Acções
- Montepio Euro Healthcare - Fundo De Investimento Mobiliário Aberto De Acções
- Montepio Euro Utilities - Fundo De Investimento Mobiliário Em Acções
- Montepio Multi Gestão Dinâmica - Fundo De Investimento Mobiliário De Fundos Aberto De Acções
- Multi Gestão Mercados Emergentes - Fundo De Investimento Mobiliário De Fundos Aberto De Acções
- GNB Mercados Emergentes - Fundo De Investimento Aberto De Acções
- GNB Momentum Sustentável - Fundo De Investimento Aberto De Acções
- GNB Portugal Acções - Fundo De Investimento Aberto De Ações

Firstly, the Portfolio holdings and some granular information of the chosen funds were extracted from CMVM database on a quarterly basis. These documents were important sources to obtain some key variables like:

- Portfolio allocations: Percentage of the fund invested in the different categories of financial instruments defined;
- Fund Size: Size of the fund calculated according to the CMVM rules;
- Derivatives exposure: Absolute Notional invested in derivatives in percentage of the Fund Size;
- Investment Area: The geography where the fund invests primary;
- Age of the fund: Number of years since the creation of the fund;

- Dummy variables on the use or not of derivatives: "1" if the fund uses derivatives in that period and "0" if the fund doesn't use derivatives in that period, and if yes, which ones were used (Type of derivative).

Subsequently, monthly reports from APFIPP have been collected for the periods chosen. These reports provided crucial information about the Inflows and Outflows of the funds under study. This information was necessary to calculate the Net Inflows, and then express this number as a percentage of the Fund Size. This percentage-based representation enables the indicator to be comparable between the different funds.

Finally, some extractions from the Bloomberg End were made to acquire some more key variables like:

- Management fee: Percentage of the fund used to pay for the services of the management company;
- Net Assets Value (NAV) per share: Fund Size divided by the number of shares outstanding;
- Fund performance: Variation in percentage between the NAV per share of each date;
- Volatility: Annualized Standard deviation between the performance of the funds, calculated according to the CMVM rules, presented on the regulation nº 2/2015, article 73º;
- Excess return: Return of the fund minus the Return of the selected benchmark;

These variables were chosen based on the most used ones on the literature and the ones that were considered relevant to the study proposed. To use as benchmarks for calculating the "Excess return", indexes were chosen based on the investment area of the fund. The Benchmarks selected were:

- S&P 500 Index to the funds that invested in America;
- MSCI World Index to the funds that invested globally;
- MSCI Emerging Markets Index to the funds that invested in Emerging markets;
- PSI Index to the funds that invested in Portugal;
- An index composed 50% by the PSI Index and 50% by the IBEX 35 Index for the funds that invested in Iberian peninsula;
- STOXX Europe 600 Index for the funds that invested in Europe;
- S&P Pan Africa Price Index to the funds that invest in Africa.

By using these benchmarks tailored by the geographical scope of the funds, is ensured that the performance can be appropriately compared between different funds.

4.2. Model development

In this section, the objective is to present the models which were used to answer the research questions proposed. To analyse the data and to make the regressions, the software used were Stata and Microsoft Excel.

4.2.1. Derivatives Use

To analyse the first research question and hypothesis proposed a Random effects Panel data Logistic regression model was made using the fund name as the panel variable (Variable that serves as the panel identifier, allowing to track individual performance over time) and the quarters as the time variable (These variable allows to see the changes in the variables over the time, in this specific case, on a quarterly basis). The dependent variable used was a binary dummy variable (0 or 1) which indicated whether the fund had derivatives in his portfolio at the end of the quarter. The independent variables used were some of the ones described in the Sample construction subchapter: "Logarithmic Fund Size"; "Age"; "Excess return"; "Net Inflows"; "Management fee"; "Investment Area". Both Fixed effects and Random effects regressions were considered, however, based on the Hausman test results, was suggested to use the Random effects model over the Fixed effects one. The equation of the model was the following:

$$\text{Derivatives\_User}_i = \alpha_i + \beta_1 \text{LnFundSize}_i + \beta_2 \text{Age}_i + \beta_3 \text{Excess\_Return}_i + \beta_4 \text{Net\_Inflows}_i + \beta_6 \text{Management\_Fee}_i + \beta_6 \text{Investment\_Area}_i + \varepsilon_i, \quad (4.1)$$

The α symbol represents the constant of the regression, the β symbol represents the coefficient of the regression to each variable used, and the ε symbol represents the error variable in the regression.

This model aims to examine how the fund characteristics affect the probability of using derivatives. The results from this model will help answering the first research question.

The descriptive Statistics of the variables used are presented on Appendix 2.

4.2.2. Derivatives Exposition

The second research question and hypothesis proposed were analysed by a Fixed effects Panel data OLS regression model, using the fund name as the panel variable, and the quarters as the

time variable. In this case, the dependent variable was the exposition to derivatives, which was the sum of the notional that the fund had in derivatives in absolute values, divided by the Fund Size, so that it can be comparable between the different funds, as explained on the sample construction subchapter. The independent variables chosen to explain the dependent variable were: "Age"; "Logarithmic Fund Size"; "Excess return"; "Net Inflows"; "Management Fee"; "Investment Area". Just like the first regression made, both fixed and random effects models were considered, in order to see which one is appropriate to the objective of this regression. Using the Hausman test, was possible to see that the Fixed effects model fits better in this specific case. The equation of the model was the following:

$$\text{Derivatives\_Exposure}_i = \alpha_i + \beta_1 \text{LnFundSize}_i + \beta_2 \text{Age}_i + \beta_3 \text{Excess\_Return}_i + \beta_4 \text{Net\_Inflows}_i + \beta_5 \text{Management\_Fee}_i + \beta_6 \text{Investment\_Area}_i + \varepsilon_i, \quad (4.2)$$

The α symbol represents the constant of the regression, the β symbol represents the coefficient of the regression to each variable used, and the ε symbol represents the error variable in the regression.

This model has the objective to understand if the characteristics of a fund influence the exposure to derivatives. These results will help to answer the second research question.

With these equations and the database that was built in Excel based on the data described on the sample construction subchapter, it was possible to use the Stata Software to achieve the empirical results presented in the next chapter.

The descriptive Statistics of the variables used are presented on Appendix 2.

5. Preliminary Analysis and Empirical Results

5.1. Preliminary Analysis

Based on the data that was possible to collect some preliminary statistics and statistical models were developed. With the preliminary statistics presented in this chapter is possible to see the percentage of funds that used derivatives and what types were more used during the time frame selected. Also, what was, between the users, the average exposure to derivatives, the average portfolio allocations, the average portfolio returns, volatility and excess return, the average net inflows, the average age, and the average Fund Size. A comparison between the performance of derivatives users and non-users of derivatives will be presented too.

With the information in Appendix 1, is possible to see that considering the entire time frame, around 41% of the equity funds in Portugal used derivatives. Comparing this with prior research, some divergences can be highlighted, for example, Marin and Rangel (2006) found that around 65% of the Spanish equity funds used derivatives and Garcia-Appendini and Rangel-Hilt (2009) found that around 63% of the Italian equity funds were derivative users, while Bias et al. (2019) showed that 28% of the European equity funds used derivatives and Koski and Pontiff (1999) found that 21% were users. With these examples, it can be determined that the amount of funds that use derivatives differs significantly depending on the geographical area and the type of funds that are analysed. By analysing the data with the different periods in the time frame, was possible to see a significant decrease in the utilization of derivatives during and after the Covid-19 period, comparing to the period before the pandemic, which is considered "normal" market conditions.

It is possible to see that in the entire time frame, the most used type of derivatives, between the users, were the Equity Futures with an average utilization of 84%. This didn't change over the different periods, the utilization percentage was always between 80% and 85%. The second most used type of derivatives were the Foreign Exchange (FX) Futures with an average utilization of 35%. Just like the Equity Futures the utilization does not change over the different periods of the time frame, with a range between 34% and 36%. The funds did not use Forwards or Swaps during the time frame analysed. The Options were less used than the Futures, but the FX Options had an average utilization of 1% and the Equity Options an average utilization of 6%. In the Options, it was possible to see a difference between the periods of the time frame because they were only used in the period pre-Covid 19 and after that they were not used. Comparing these results with the ones found by Branco (2010) is possible to see big differences

especially in the interest rate options, however this can be caused because in Branco's study, he used all types of funds, including bond funds, while in this study, only equity funds were used.

On average the funds analysed had around 19 years old, which means that they were experienced in the market. Further in this dissertation, in the Empirical results subchapter, will be possible to see if this variable influences the probability to use derivatives, and the exposure to derivatives. Regarding the Fund size, the average size was 55 million, which alone does not have any meaning, however, is always good to know the size of the funds in the sample, to have a better understanding about the size of the Portuguese equity funds, comparing to another geographies. Just like the age, this will be another of the variables used in the models proposed, to see if it influences the probability of using derivatives. Analysing the different periods, we can see a severe decrease in the average fund size during the Covid-19 period which can be caused by the negative market conditions and more significant amounts of outflows.

The funds analysed in the sample were equity funds, which were expected to have a higher percentage of the portfolio allocation on stocks, Exchange Traded Funds (ETFs) and mutual funds. This did not change in the Portuguese case, around 73% of the fund was allocated to stocks and around 20% was allocated to funds.

Between the users of derivatives, the average exposition to derivatives (Sum of the derivatives instruments notional) was around 19%, which is a higher value than the one (12%) found by Marin and Rangel (2006) and the one (5%) found by Garcia-Appendini and Rangel-Hilt (2009). The derivatives exposition, similarly to the fund size and the derivatives usage, decreased heavily over time during the Covid-19 pandemic and the second crisis period.

Observing the Net Inflows in percentage of the fund size, can be observed that it was negative, considering the entire time frame (-0,20%). This means that more people were selling the shares of the funds than buying them. This was obviously not good and means that the investors were not confident about the funds and the market in the time frame selected. However, in the period after the covid-19 period, the named "recuperation period", the Net inflows were positive by around 4%, which shows, probably, some investors trying to benefit with the possible rebound of the market, after the crash.

Volatility was on average around 16% for the entire time frame, and increased, as expected, in the crisis periods (Covid-19 and War/High Inflation periods).

The average returns were around 1% positive and had an excess return of 0,05%, which means that the Portuguese Equity funds beat the market in the time frame observed on average by 0,05%. The benchmarks used were described on the sample construction subchapter. In

accordance with Pástor and Vorsatz findings, the Portuguese funds underperformed the benchmarks during the Covid-19 period. As expected, the returns were negative in the crisis periods, but recovered on the non-crisis periods.

Comparing the performance of the derivatives users with the non-users of derivates, was found that derivatives users had a better performance than the non-users (1,11% vs. 0,84%), considering the entire time frame. However, if the comparison was made with the Excess return, non-users (0,17%) had a better performance than the users (-0,10%), comparing with the benchmark. The Net Inflows were positive for the derivatives users (0,19%), but were negative to the non-users (-0,55%). In the prior research, Marín and Rangel (2006) found that the use of derivatives did not improve the performance in Spanish funds and Kaniel and Wang (2021) concluded the same for the USA mutual funds, which is not consistent with the findings of this study. On the other hand, Natter, Rohleder, Schulte and Wilkens (2016) found that Options use improved the risk-adjusted performance of the USA funds, Koski and Pontiff (1999) and Branco (2010) found that there was no significant difference in the performance of non-users of derivatives and derivatives users, for USA and Portugal funds, respectively.

5.2. Empirical Results

5.2.1 Derivatives Use

Using the Radom Effects Panel Data Logistic Regression model proposed was possible to identify fund characteristics that improved the likelihood of using derivatives. The variables "Fund Size" and "Age" were significant to a confidence level of 5% while the variable "Management Fee" was significant to a confidence level of 10%, as shown in Appendix 2.

According to the results on Appendix 3, the coefficient of the variable "Fund Size" was negative, which means that a smaller fund had a higher probability of using derivatives than a bigger one. Similarly, the coefficient of the variable "Age" was negative, which induces that a younger fund had more probability to use derivatives than an older one. The "Management fee", which was not as significant as the other two variables, was negative too, which means that funds with lower management fees had a higher probability to be derivatives users. This is not directly correlated, however can induce that less experienced managers, who have lower wages, have a bigger probability to use derivatives.

The results for the variable "Fund Size" were inconsistent with the results of Branco (2010), who discovered that a bigger fund tend to have a higher probability of using derivatives, and

the other variables were not significant on his study. However, the results for the variable "Management Fee" were consistent with Cici and Palacios (2014) who concluded that less experienced managers were more prone to use derivatives than older ones, while all the other variables were not significant for them. With Neuwirt (2021) the results were inconsistent for the variables "Age" and "Fund Size" because on her study, they had a positive impact on the probability of using derivatives, which means that older and larger funds were more propitious to be derivative users.

According to the results of the study and to answer the research question, the hypothesis is not rejected, as expected, due to the significance of some variables in the model. The inconsistent results with other prior studies can be caused by the different countries of the funds analysed on some articles and the different time frames used, as this the study had a pandemic period and a crisis period included in the time frame selected and is more recent than most of prior studies considered.

5.2.2. Derivatives Exposition

Observing the results from the Fixed Effects Panel Data OLS Regression model, became evident that the variables "Investment Area" and "Management Fee" presented collinearity, leading to their exclusion from the regression analysis. The results showed that the variables "Age", "Fund Size" and "Net Inflows" were all significant to a confidence level of 5%.

In Appendix 4 is possible to observe that the variable "Age" had a negative coefficient, which induces that a younger fund tends to have a higher exposure to derivatives. This finding is consistent with the one observed by Branco (2010) and Marín and Rangel (2006) in their studies.

Similarly, the variable "Fund Size" had a negative relationship with the dependent variable too, which indicates that a smaller fund tends to have higher exposure to derivatives. In prior studies this variable was not significant.

Lastly, the variable "Net Inflows" had a positive relationship with the dependent variable, which can induce that funds with higher amounts of Net Inflows in percentage of the Fund Size, tend to have higher expositions to derivatives. Like "Fund Size", "Net Inflows" were also not significant in the prior studies made about this topic.

With these findings the hypothesis proposed is not rejected, as expected, due to the significance of some fund characteristics in the derivatives exposure of a fund.

6. Conclusion

To gain a deeper understanding into the use of derivatives in the Portuguese equity funds industry, this study was made, using all the equity funds in activity between January 2018 and June 2022.

Two research question have been developed during the study: "Is the decision to use derivatives affected by one or more of the fund characteristics?" and "What fund characteristics affect the exposition to derivatives?".

These research questions were important to understand whether the characteristics of a fund affect their decision to use derivatives and their exposition to derivatives. The results were aligned to prior research in some variables, however, diverge in others. Regarding the probability of using derivatives, the findings about the variables "Fund Size" and "Age" were inconsistent with the findings of Branco (2010) and Neuwirt (2021), while to the Exposition to derivatives, the findings were similar to Branco (2010), in the variable "Age". On the other hand, the variables "Fund Size" and "Net Inflows" were significant in this study, but in prior research were not.

In addition to the regression results, some preliminary Analysis were made, comparing different periods, including the Covid-19 Pandemic period. These findings contributed to develop the knowledge about the use of derivatives in Portugal, a topic previously analysed only by Branco (2010), using a time frame between 2002 and 2009. This study extended the analysis to encompass crisis periods such as the Covid-19 pandemic and the Russia/Ukraine war and using a more updated data sample.

It was found that the percentage of derivatives users change significantly with the different geographies and time frames used, because the values were significatively different between the different studies made. The results of this study showed an average percentage of 41% for the derivatives users, however decreased over time. The most used types of derivatives in Portuguese equity funds were the Equity Futures and the Foreign Exchange Futures. Options were used too, but with a much lower percentage of utilization, and Swaps and Forwards were not used at all.

The fund size in Portuguese funds decreased severely during the Covid-19 pandemic, likely due to the adverse market conditions and significant outflows. Comparing the exposure to derivatives with some prior research, this study showed higher exposure, although it decreased

over time. Considering the average of the entire period, the Net Inflows were negative reflecting lack of confidence of investors in invest their money on the financial markets and mutual funds.

The volatility, as expected, increased during the crisis periods, and had an average value of 16%. The performance was positive by approximately 1%, with an excess return of 0,05%, indicating that the funds performed better than the benchmarks.

When comparing the performance of derivatives users and non-users, users performed better and had higher Net Inflows. These findings were consistent with Natter, Rohleder, Schulte and Wilkens (2016) conclusions, however, were inconsistent with all the other studies observed in the literature review that aborded this specific comparison.

For future studies, it would be interesting to use more granular and dynamic data, like the one present in the EMIR reports (Derivatives trades), that I can't have access. This information could probably improve the results because it will be easier to understand the derivatives' role within the portfolios, than with static monthly and quarterly information. Expanding this research to other types of Portuguese mutual funds may also offer new insights into the different interactions between the variables.

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8. Appendices

10.1. Appendix 1: Preliminary Analysis

	Average - Preliminary Analysis				
	Full Sample	**Pre Covid-19 period**	**Covid-19 period**	**Recuperation period**	**2nd crisis period**
Derivative Users	41,01%	45,22%	37,25%	37,65%	38,24%
Derivative Non-Users	58,99%	54,78%	62,75%	62,35%	61,76%
Age	18,78	17,50	19,00	19,80	21,00
Fund Size	55 418 326,92	37 873 477,32	43 748 756,37	75 465 819,95	92 983 348,53
Allocation in Stocks	73,19%	77,15%	71,38%	69,44%	69,47%
Allocation in Bonds	0,54%	0,38%	0,90%	0,60%	0,48%
Allocation in Funds	20,24%	16,82%	20,81%	23,78%	24,22%
Allocation in Liquidity	6,31%	6,08%	7,09%	6,38%	5,89%
Allocation in Others	-0,28%	-0,43%	-0,17%	-0,20%	-0,06%
Derivatives Exposure (% of Fund Size) (Between Users)	18,91%	22,90%	15,76%	16,45%	13,79%
FX Futures (Between Users)	34,73%	34,20%	36,97%	34,32%	34,52%
Equity Futures (Between Users)	83,62%	85,48%	84,19%	81,36%	80,95%
IR Futures (Between Users)	0,00%	0,00%	0,00%	0,00%	0,00%
FX Forwards (Between Users)	0,00%	0,00%	0,00%	0,00%	0,00%
Equity Forwards (Between Users)	0,00%	0,00%	0,00%	0,00%	0,00%
IR Forwards (Between Users)	0,00%	0,00%	0,00%	0,00%	0,00%
FX Options (Between Users)	1,16%	2,62%	0,00%	0,00%	0,00%
Equity Options (Between Users)	5,91%	13,30%	0,00%	0,00%	0,00%
IR Options (Between Users)	0,65%	1,47%	0,00%	0,00%	0,00%
FX Swaps (Between Users)	0,00%	0,00%	0,00%	0,00%	0,00%

10.1. Appendix 1: Preliminary Analysis (Continuation)

	Average - Preliminary Analysis				
	Full Sample	**Pre Covid-19 period**	**Covid-19 period**	**Recuperation period**	**2nd crisis period**
Equity Swaps (Between Users)	0,00%	0,00%	0,00%	0,00%	0,00%
IR Swaps (Between Users)	0,00%	0,00%	0,00%	0,00%	0,00%
Net Inflows (% of Fund Size)	-0,20%	-2,31%	-1,04%	3,56%	0,07%
Volatility	16,42%	12,75%	27,66%	13,98%	20,32%
Excess return	0,05%	0,27%	-1,25%	-0,11%	1,47%
Return	0,93%	1,09%	-3,25%	5,86%	-5,74%

Table 2 – Average Preliminary Analysis

	Derivatives user	**Derivatives non-user**
Return	1,11%	0,84%
Excess return	-0,10%	0,17%
Net Inflows	0,19%	-0,55%

Table 3 – Comparison between derivatives users and non-users

10.2. Appendix 2: Descriptive Statistics

	Age	Ln VLGF	Derivatives Exposure %	Derivatives User	% Performance	% Excess return	% Net Inflows	Management Fee	Investment Area	Volatity
Mean	18,7778	16,5617	0,0784	0,4101	0,0093	0,0005	-0,0020	0,0174	3,7941	0,1642
Standard Error	0,2809	0,0512	0,0063	0,0199	0,0037	0,0017	0,0053	0,0002	0,0814	0,0038
Median	20,0000	16,4892	0,0000	0,0000	0,0231	-0,0004	-0,0051	0,0190	4,0000	0,1371
Standard Deviation	6,9482	1,2675	0,1570	0,4923	0,0927	0,0412	0,1305	0,0053	2,0131	0,0932
Sample Variance	48,2779	1,6065	0,0247	0,2423	0,0086	0,0017	0,0170	0,0000	4,0525	0,0087
Kurtosis	-0,7234	1,7453	19,5169	-1,8719	1,5791	1,8244	58,4285	1,4656	-1,5102	3,8948
Skewness	-0,3021	0,9680	3,6553	0,3663	-0,9246	-0,0524	-5,0859	-1,0779	-0,1295	1,8385
Minimum	1	14,32	0,00%	0	-36,14%	-17,77%	-149,58%	0,00%	1	3,23%
Maximum	32	21,49	133,74%	1	23,85%	15,76%	56,52%	2,50%	7	58,27%
Count	612	612	612	612	612	612	612	612	612	612

Table 4 – Descriptive Statistics of the variables used in the models.

10.3. Appendix 3: Derivatives Use Regression

Independent Variables	Coefficient	Significance
Fund Size	-1,39556 **	0,016
Age	-0,27033 **	0,015
Excess return	2,51414	0,538
Net Inflows	1,57e-8	0,388
Management Fee	-195,963 *	0,096
Investment Area	-0,23636	0,625
Constant	28,34792 ***	0,002
Observations	612	
Groups	34	

Table 5 – Random effects Panel data logistic regression. This panel regression reports the influence of some funds' characteristics in the probability of using derivatives. The symbols *, ** and *** represent significance levels of 10%, 5% and 1% respectively.

10.4. Appendix 4: Derivatives Exposition Regression

Independent Variables	Coefficient	Significance
Fund Size	-0,03016 **	0,024
Age	-0,01303 ***	0,000
Excess return	0,06821	0,478
Net Inflows	0,07401 **	0,028
Management Fee	0	
Investment Area	0	
Constant	0,82274 ***	0,000
Observations	612	
Groups	34	

Table 6 – Fixed Effects Panel data OLS regression. This table reports the influence of some funds' characteristics in the exposition to derivatives that the fund wants to have. The symbols *, ** and *** represent significance levels of 10%, 5% and 1% respectively.