



Master of Science in Finance

Master's Final Work

Dissertation

Performance of Personal Pension Funds in Portugal

Beatriz Correia

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Abstract

In a society where the number of pensioners is considerably increasing and the proportion of contributors is decreasing, the social security system is becoming unaffordable, increasing the importance of personal pension plans in complementing the pensions provided by Governments. After the 2008 financial crisis, the concern related with the guarantee of an income during the retirement period increased, which lead to a major investment in retirement-oriented financial products. This work pretends to analyze the performance of personal pension plans in Portugal and to provide more information about these financial products, as the literature in Portugal related with this topic is scarce. It was found evidence that, on average, the performance of these plans is not significantly different from zero and that they underperform their benchmarks. This result might implicate that these plans are not the solution to guarantee the same standard of living once the individual retires. When compared against each other, the performance does not differ significantly between funds, and this might be related with the restrictions imposed by the Government regarding the market structure and asset allocation.

Keywords

Personal pension plans, pension funds' performance

Resumo

Numa sociedade onde o número de pensionistas está a aumentar e a proporção de contribuintes a decrescer, o sistema da segurança social está a tornar-se insustentável, aumentando assim a importância dos planos poupança reforma como complemento das pensões pagas pelo Estado. Após a crise financeira de 2008, cresceu a preocupação em garantir um rendimento durante a reforma, levando a um aumento da contribuição para produtos de longo-prazo. Esta dissertação tem como objetivo analisar o desempenho dos planos poupança reforma (PPR) em Portugal e providenciar mais informação sobre este tópico, uma vez que a literatura nesta área é escassa. Os resultados sugerem que o retorno destes planos não é significativamente diferente de zero e os mesmos têm um desempenho inferior, a portfolios equivalentes, em média. Este resultado pode implicar que os PPR não são a melhor solução a fim de garantir o mesmo nível de vida durante a reforma do indivíduo. Quando comparados entre si, os PPR apresentam rendibilidades semelhantes, o que pode ser provocado pelas restrições impostas por lei no que concerne à estrutura do mercado de fundos de pensões e à alocação dos investimentos.

Palavras-Chave

Personal pension plans, pension funds' performance

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List of abbreviations

DB – Defined Benefit Plans
DC – Defined Contribution Plans
FIM – Fundos de Investimento Mobiliário (Securities Investment Fund)
FP – Fundos de Pensão (Pension Funds)
IRA – Investment Retirement Accounts
PF – Pension Funds
PP – Pension Plans
PPB – Primary Prospectus Benchmark
PPP – Personal Pension Plans
M^2 – Modigliani–Modigliani risk adjusted performance ratio
SR – Sharpe ratio

1. Introduction

As stated in the Universal Declaration of Human Rights, Art. 22, *“Everyone, as a member of society, has the right to social security and is entitled to realization, through national effort and international co-operation and in accordance with the organization and resources of each State, of the economic, social and cultural rights indispensable for his dignity and the free development of his personality.”* One of the main concerns for Governments is to make sure individuals have a periodic income, once they retire. This is guaranteed through Social Security Systems; a pay-as-you-go system, managed by the State, where working people make mandatory contributions which are used to pay current pensions. This system can only be sustainable when contributions are higher than payments, which might not happen in the future due to the inverted population pyramid verified in most of the countries, especially in the developed ones. The health care and life quality improvement promoted the increase of average life expectancy, from 67 years in 1960 to 80 years in 2015 (Figure 1). However, this was not accompanied by a growth in the fertility rate; in fact, during the same period, the world assisted to a decrease from 3.2 children per woman to 1.7 (Figure 2), leading to a population ageing.

These two trends, as mentioned before, represent a big issue for Social Security Systems in OECD members, where the number of contributors might not be enough to compensate the increase in the number of pensioners.

To mitigate this problem, a multi-pillar system, developed by the World Bank in 1994, was promoted - a flexible system that intended to address the population needs and to provide more security against the economic, demographic, and political risks faced by pension systems. The first pillar is publicly managed as part of a country’s social security system; it is a mandatory defined benefit scheme, financed by collecting taxes from

workers and paying out immediately to pensioners. The second pillar is privately managed and it is provided by companies in the form of occupational pension plans; these are essentially mandatory defined contribution schemes and are funded by the employer and the employee. The third pillar consists on a voluntary defined contribution scheme, where an individual decides to make contributions to a plan, known as personal pension scheme or individual retirement account. This last pillar is the subject of this work.

A Personal Pension Plan (PPP) is an individual retirement account whose purpose is to provide a lifetime income security during the retirement period. In these plans, contributions are made during an employee's working life and accumulated into a fund managed by an insurance or financial institution. During the retirement period, the individual will receive the total amount invested plus the return from this fund in the form of periodic payments. The investor bears both the financial and the longevity risk.

In Portugal, PPPs were created in 1989, under the name *Plano Poupança Reforma*, and are described on the *Decreto-Lei n° 205/89* (Appendix A). The aim of these plans is to encourage long-term savings (Figure 4 shows the significantly decrease of the saving rate) which will complement the pension provided by the social security during retirement (Figure 3 shows the increase of social security expense as a percentage of GDP since 1970). PPPs are Tax-Deferred accounts (Appendix B shows how PPPs are taxed), managed by specialized entities, such as investment fund management companies, pension fund management companies and insurance companies. Since these are long-term investments, they should be characterized by solid investments, so fund managers need to respect the rules established by the law when constructing the fund. Individuals can be repaid only when they retire, if the contributions started at least 5 years before, or

when they face long-term unemployment or a serious illness and incapability of working. Withdrawals in other conditions than these are subject to penalizations.

PPPs are divided in two major categories: insurance, which guarantee a minimum return, and funds, which are more volatile and do not guarantee a return. Almost 90%¹ of the plans held by households are in the form of insurance PPPs, however the investment in funds PPPs has been increasing, as individuals start perceiving insurance PPPs have very low returns. The purpose of this study is to assess the performance of personal pension plans in the form of funds in Portugal, using performance indicators, such as the Sharpe ratio and the Modigliani risk-adjusted performance ratio, and comparing them to some benchmarks. The results suggest that the performance of these funds is not significantly different from zero and its lower, on average, than their benchmarks.

This work is divided as follows: in section II, the literature review related with the personal pension funds topic; in section III it will be described the data and the methodology used; in section IV the results will be presented; and in section V conclusions, limitations and future research.

2. Literature Review

According with the Life-Cycle hypothesis, individuals tend to save less when their income is lower or when expenses are expected to be higher (Modigliani and Brumberg, 1954). One of the main concerns in the OECD countries is the low households' saving rate, which implies that individuals are not saving enough for retirement, resulting in a decline of their standard of living in this period (McCarthy and Pham, 1995), especially when the state pension provision is facing financial difficulties given the current demographic changes (Disney et al., 2000).

¹ 2016 data

Considering that investment decisions are related with tax savings and with the guarantee of an income during retirement (Barrero and Laborda, 2007), countries developed tax-deferred accounts, in order to encourage people saving for their retirement. In these accounts contributions are tax deductible and taxes over interests are paid only when funds are withdrawn.

Individuals can choose between two investment vehicles when setting up a personal plan: profit option, where investment returns are smoothed over time, or non-profit option, where contributions are used to buy units whose value corresponds to an investment fund and the pension value depends on the return of this investment (Gregory and Tonks, 2004).

2.1. Personal pension plans vs Other saving accounts

The major PPPs' disadvantage relative to other savings accounts is the fact that returns cannot be withdrawn before retirement in case of need (Samwick, 1998). It is reasonably to think in these two forms of saving as substitutes, but some studies show the opposite. Rossi (2006) states that private pension plans and conventional forms of saving are complementary, whereas the first one has a retirement purpose, and the second form of investment is made for precautionary reasons. Also, individuals who save in one form are more likely to save in other forms as well (Venti and Wise, 1991).

2.2. Contributions to personal pension plans

When studying personal pension plans it is important to evaluate their impact on national savings (the sum of public with private saving). It is expectable a decrease in public revenues, since IRAs are tax-deductible, but private saving depends on how these plans are financed and how high their returns are. Contributions to these accounts can be financed from three different sources (Attanasio and DeLeire, 2002): decrease in

consumption, which represents new savings; shift the investment from other financial products; or invest the amount that would be invested even in the absence of individual retirement accounts. These authors found evidence that individuals are reshuffling existing savings. However, this conclusion is not universal. Some authors defend that contributions to personal pension plans represent new saving, through reductions in consumption or increase in income (Guariglia and Markose, 2000).

2.3. The investor's profile

It is also interesting and relevant to analyze the consumers' profile; however, this analysis can be difficult due to the heterogeneity among households (Gale and Scholz, 1994). General conclusions are similar between different studies: contributions to PPPs are positively correlated with age, income and degree of education; married people have more propensity to make contributions, but larger families tend to save less; PPPs' consumers have less debt and households who have in past accumulated more illiquid financial assets are more likely to continue saving in this form. Households prefer to maintain their wealth in cash and near-cash investments, and the proportion invested in riskier assets declines with age and increases with wealth. There is also a tendency for women to be more conservative, which might result in less retirement income. Women are expected to live longer than men (83 years against 78 years²), so the retirement wealth must support a longer period. One of the explanations for this conservatism might be the lower average income when comparing with the male's average income (Bajtelsmit and Bernasek, 1996). For Bodie and Crane (1997) the retirement-oriented investment should be concentrated in equities and long-term fixed-income securities and the portfolio must be diversified to mitigate the inherent risks. For Blake, Wright and Zhang (2014), the

² *Average life expectancy at birth for OECD members, World Bank, 2015*

contribution rate to PPPs should not be constant over time and it reflects the trade-off between current and future consumption, the individuals' risk aversion level and the changes in income over the life-cycle. The lack of knowledge of individuals to assess the performance of their investments might result in a vulnerability to low income during retirement (Petraki and Zalewska, 2015); so, individuals must be provided with the right information, education and experience, so they will tend to control better their investments, making better choices.

In Portugal, the proportion invested in life insurance and pension funds has been gaining importance since the 1990s as people start perceiving the importance of these financial products to complement the social security benefits received during retirement (Cardoso, Farinha and Lameira, 2008).

2.4. The performance of personal pension plans

The future benefits of private pension funds are exposed to several risks, namely the systematic risk, the systemic risk and the agency risk. The systematic risk is the risk inherent to the market; the systemic risk is associated with the possibility of an event to trigger a collapse in a certain market; the agency risk is the risk that the management of a company will use his authority to benefit itself rather than the shareholders. Another risk concerning these plans is the risk associated with investments in foreign currencies, namely the exchange rate, the settlement risk and the liquidity risk. To mitigate these risks, governments established rules regarding the pension's market structure, the funds' performance and the asset allocation. The regulation prevents the funds to be completely different from each other, which unable investors to choose the funds that better suit their needs accordingly with their age, wealth and risk aversion. These restrictions cause a

herding effect: funds will end up investing in similar assets, and, therefore, performance between funds will not be so different (Srinivas, Whitehouse and Yermo, 2000).

Srinivas, Whitehouse and Yermo (2000) studied the performance of pension plans in LATAM countries. They found that asset allocation and performance are similar across pension funds. They also found evidence that these funds underperform their benchmarks, though their volatility is lower. The authors defend that these results are related with portfolio homogeneity: there is a limit of one fund per manager, however, the reaction to market events tend to be the same between managers, in part due to the restrictions imposed to the pensions' asset allocation.

Gregory and Tonks (2004) tested the performance of personal pension plans in the UK. The authors found evidence that the average performance of these accounts is not significantly different from zero; also, the performance of these schemes may be associated with the ability of the fund manager.

Petraki (2012) also studied the personal pension plans in the UK. The author found evidence that PPPs outperform their benchmarks both in raw terms (the difference between the portfolios) and in risk-adjusted terms. Petraki also found evidence that the performance of the fund is better when funds are young; bear markets are found to have a stronger impact than bull market conditions; and fund performance is positively correlated with the provider's size.

Petraki and Zalewska (2015) also studied these accounts' performance in the UK making a comparison with T-bills and benchmarks. the authors found evidence that funds focused on emerging markets are more profitable; the performance of the funds whose investments are in domestic assets, was not so different from zero; funds concentrated in UK equities were negatively affected by the 2008 financial crisis; the risk was higher

when international investments were made. The authors found evidence that PPPs outperform their benchmarks in the long and short run which implicates that the primary prospectus benchmarks are not challenging pension funds when it comes to long-term performance targets. They also found evidence that PPPs outperform T-bills in the long-run but not in the short-run.

3. Data and Methodology

3.1 Data

This section describes the data used in this study and reports some general statistics that illustrate the development of the personal pension fund market in Portugal.

The data is provided by Autoridade de Supervisão de Seguros e Fundos de Pensões (ASF) and by Associação Portuguesa de Fundos de Investimento, Pensões e Patrimónios (APFIPP). Currently (September 2017), there are 85 personal pension plans divided in three classes: 26 pension funds (denominated as FP from now on), 44 pension plans based on life insurance and 15 securities investment funds (denominated as FIM from now on). The first two classes are supervised by ASF and the last one is supervised by Comissão do Mercado de Valores Mobiliários (CMVM). For each fund was collected the fund's name, provider's name, inception date and fund's class (Table 1). Daily returns are available since 1989. Information regarding investors' profile, contributions, fund's value and asset allocation are provided at a cross-sectional level.

Currently there are 27 providers in the personal pension market. Figure 5 shows the number of PPP and pension providers between 1989 and 2017; in 1989 there was 5 individual pension plans provided by 4 institutions; between 1989 and 2000 the number of pension funds available increased to 20, while the number of providers increased to 10 institutions; on the following decade (2000-2010), there was 37 more pension funds and

9 more institutions. From 2010 to 2017 the number of personal pension plans increased from 57 to 85 and the number of providing institutions increased from 19 to 27.

The following market analysis is based on ASF information which does not include the personal pension plans under the life insurance class.

Nowadays, personal pension plans only represent 2.4% of the total Portuguese pension funds market (Figure 6). Contributions to these plans increased significantly between 2011 and 2015, this tendency can be justified by two factors (Figure 7). First, after the 2008 financial crisis, the household saving rate increased in response to the uncertainty related with future income (both during the working period and the retirement period). Second, the investment in these plans was promoted through tax incentives, the guarantee of a return and the creation of new plans. However, in 2016, the contributions' value decreased. Regarding de plans' value (Figure 8); the value depends on the returns of the securities that are included in these plans and it has been increasing, but not significantly, since 2011.

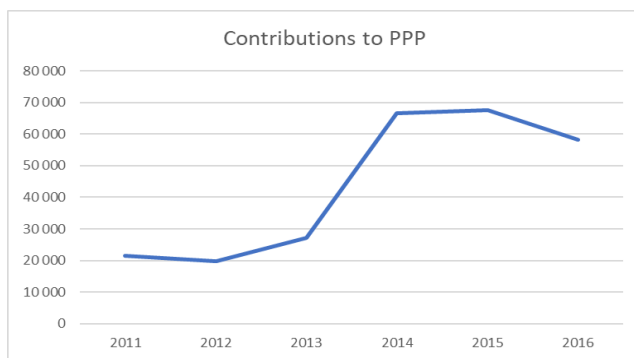


Figure 7. Contributions PPP, in thousands of euros, (ASF, 2011-2016)

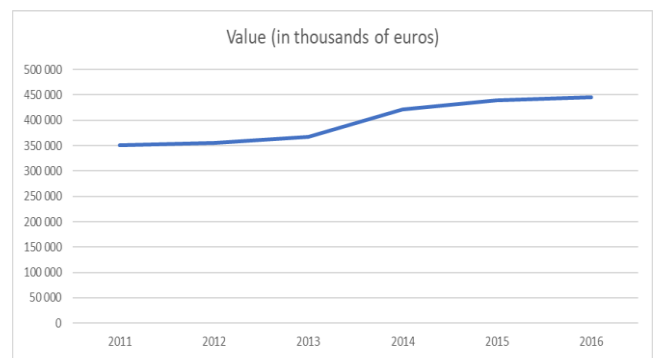


Figure 8. PPPs' value, in thousands of euros, (ASF, 2011-2016)

The number of participants declined 17.60% between 2010 and 2015, increasing 5.32% in 2016; from the 66,607 participants, 53.21% are male, though the proportion of women investing in these plans has been increasing (Figure 9). During the period in

analysis the trend has been shifting, participants aged between 56-60 have been the main holders of personal pension plans; however, the weight of the thresholds 41-46 and over 65 is increasing (Figure 10). This is the result of a higher concern in saving for retirement and the increase of the retirement age. Regarding its asset allocation, these funds invest mainly in bonds (corporate and government), liquid assets and stocks (Figure 11). The asset allocation is restricted by law, which makes it similar across pension funds.

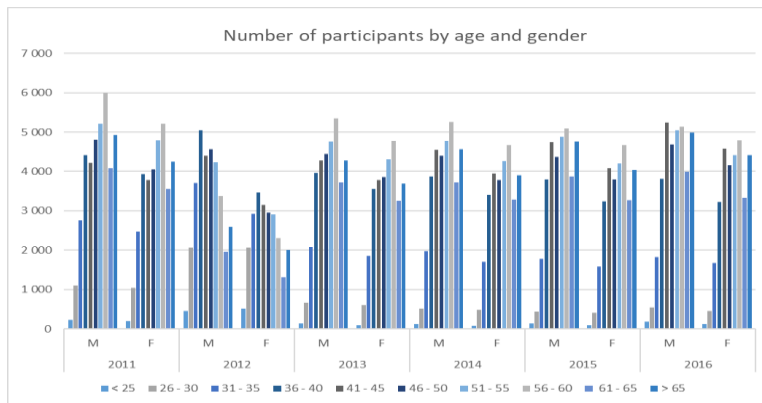


Figure 10. Number of Participants by gender and age (ASF reports: *Estatísticas de Fundos de Pensões*, 2011-2016)

3.2 Methodology

The first issue concerning the methodology of this work is how to measure funds' performance. Sharpe (1966) developed a risk-adjusted return ratio which measures the average return earned in excess of the risk-free rate per unit of total risk. The Jensen's alpha measures the difference between an asset's verified return and its expected return according to the CAPM model (Jensen, 1968). Treynor introduced a risk adjusted return ratio (Treynor, 1965). The Modigliani risk-adjusted performance ratio (M^2) measures the returns of a portfolio adjusted for the risk of a benchmark's portfolio (Modigliani and Modigliani, 1997). Previous work on fund's performance rely on single and multi-index CAPM models or on the Arbitrage Pricing Theory. Some research uses a benchmark to compare the fund's return and/or risk-adjusted ratios as a performance measure.

The choice of the benchmark is also an important issue. In order to minimize the risk, funds invest in different asset classes, which makes it inappropriate to choose a single index as a benchmark.

In this work, it will be used a benchmark to compare the fund's performance. These benchmarks were chosen based on the information provided by institutions on their annual reports.

Three performance measures are used in this work, the Sharpe-ratio, the difference in returns of the fund and its benchmark and the M^2 measure (Appendix C shows how these measures are calculated).

As mentioned previously, there are 85 personal pension plans on the Portuguese market, 5 of them opened in 2017, so they are excluded from this analysis. For personal funds under the life insurance class it is not possible to collect enough data to perform this analysis. This leads to a total sample of 40 plans, whose value was collected from APFIPP database on a daily basis. The period of observation is from December 1989 to December 2016. Monthly returns data were collected, with a total of 5,403 observations. The risk of the funds is calculated as the standard deviation of the monthly returns.

Regarding benchmarks, it was collected the monthly returns of different indexes, for the period 1999-2016, from Bloomberg database. Taking into consideration the information contained on the funds' annual report, it was constructed a benchmark for the personal pension funds (Table 2). Appendix D describes the benchmarks used.

Investment type	Benchmark
Government Bonds	Barclays EurAgg TR
Corporate Bonds	BBgBarc EurAgg 1-5 Yr
Stocks	FTSE, Dow Jones, Eurostoxx 50, MSCI Europe, MSCI World
Liquidity	Euribor 1M
Other Investments	Euribor 6M

Table 2. Benchmarks used per investment type

To mitigate possible issues related with stationarity, since monthly returns are found to have strong time-series properties, data was converted into yearly returns, through the arithmetic average method, for both returns and volatilities. A year is considered to be the first one for a fund, if there are, at least, 6 monthly observations. This leads to a total sample of 38 plans and a total of 501 observations.

For comparison reasons, the sample will be divided in funds under the FIM class and funds under the FP class. It will also be divided into funds whose mainly investment is in stocks (equity funds) and funds that are more conservative (fixed income funds).

First it will be tested if the difference in mean returns, sigma and Sharpe ratio (pension fund's average return, sigma and Sharpe ratio minus that of benchmark's) is different from zero. The null hypothesis is: the means are equal to zero. After, it will be tested if the difference in returns and the Modigliani-Modigliani measure are significantly different from zero. The null hypothesis is: the difference in returns (or the M^2 measure) is not different from zero. T-statistics at 5% significance level (Appendix E).

Results are shown on the next section.

4. Results

The portfolio diversification allows personal pension plans to have a low standard deviation, which means that these might be low risk investments, on average. This diversification helped to minimize the impact of negative events in the PPPs performance.

Considering the period 1990-2016, the average monthly return was 0.448% (Figure 12). These plans were more volatile in the periods 1997-2001 and 2008-2016. Between July 98 and October 98, the PPPs' monthly returns were affected by the 1997 Asian financial crisis. After the Russian market collapse, international stocks market, from USA to Japan, reached new lows, as investors' confidence level was shaken by the

unpredictability in the world's financial markets. In 2001 and 2002 the decrease of the returns is justified, among other reasons, by the Dotcom bubble; until 2001 there was a high speculation around internet, with many internet-based companies being founded and a lot of people wanting to invest on them. After that, many companies started to report huge losses and some had to shut down. The terrorist attacks of 11th September, accelerated the stock markets drop, persisting the negative returns in 2002. The biggest drop on the personal pension plans' return occurred in 2008, during the world financial crisis. This crisis started on the real state US market and it quickly spread worldwide. The impact of this crisis in Portugal was severe, and the economy is still trying to recover.

As shown by Figure 13, the PPP' average yearly return has a decreasing tendency.

Regarding benchmarks, their performance has been following the same trend as PPPs' (Figures 14 and 15). Though, on average, personal pension funds underperform their benchmarks. This gap is more relevant for the period 1999-2001 (Figure 16).

Figure 17 shows the histogram for PPPs' average returns. Between 1999 and 2016, the mean average return was 2.235% and its standard deviation was 5.512% (Figure 17). It presents a negative skewness of -1.261 and a kurtosis of 8.089. More than 50% of the observations are on the right side of the histogram, which implies that returns from these funds are not significantly different from zero.

Regarding Benchmarks, for the same period, the average return mean was 7.329% and its standard deviation was 7.679%. It presents a positive skewness of 0.149 and a kurtosis of 10.489 (Figure 18).

Figure 19 shows the distribution of the difference in returns. Between 1999 and 2016, the returns of personal plans were, on average, lower than the benchmarks' return. This distribution also presents a negative skewness of -1.155. On a risk-adjusted basis, based

on the Modigliani-Modigliani measure, this plans also underperform their benchmarks (Figure 20). The skewness was still negative, -2.23, and the kurtosis was 14.63.

Table 3 shows the previous results in more detail. In raw terms, comparing the average returns, personal pension funds in Portugal perform identically. Funds under the FIM class and funds under the FP class, on average, perform identically; the difference between the securities investment funds and their benchmarks is lower than the difference between pension funds and their benchmarks, on average. Though fixed income funds have a lower return and volatility, on average, when compared to equity funds, this difference is not so significant; the difference between funds that invest more in equities and their benchmarks, is, on average, lower than the difference between the more conservative funds and their benchmarks.

The results for the first test are exhibited in table 4. Remembering, the null hypothesis is: the difference in mean return, sigma and Sharpe ratio is equal to zero. It was found no statistical evidence that the difference in mean return and sigma are equal to zero, one should reject the null hypothesis at a 5% significance level. On average, PPPs have lower volatilities and lower returns than benchmarks. These validates what was stated before, Portuguese personal pension plans, on average, underperform their benchmarks. On a risk-adjusted return basis, the null hypothesis is not rejected, once, at a 5% significance level, the statistical evidence suggests that the difference in mean Sharpe ratio is equal to zero.

Table 5 shows the results for the second statistical test. Remembering, the null hypothesis is: the difference in returns and/or the Modigliani-Modigliani risk adjusted ratio is not significantly different from zero. Regarding the difference in returns, there is no statistical evidence that this value is not significantly different from zero. Therefore,

one should reject the null hypothesis at a 5% significance level. This is accordingly with the previous results that PPP underperform their benchmarks, on average. Considering the total sample, it was found no statistical evidence that the Modigliani-Modigliani measure is not significantly different from zero at a 5% significance level, so the null hypothesis should be rejected. On a risk-adjusted basis, the plans also underperform their benchmarks.

Sample	Fund	Variable	Mean	Standard Deviation
Total PPP (#obs = 501)	PPP	Return	0,022	0,055
		Sigma	0,109	0,075
		Sharpe Ratio	-0,401	0,870
	Benchmark	Return	0,073	0,077
		Sigma	0,121	0,091
		Sharpe Ratio	0,418	2,277
Securities Investment Fund (#obs = 176)	PPP	Return	0,023	0,062
		Sigma	0,111	0,083
		Sharpe Ratio	-0,407	0,862
	Benchmark	Return	0,042	0,079
		Sigma	0,153	0,122
		Sharpe Ratio	-0,075	0,679
Pension Funds (#obs = 325)	PPP	Return	0,022	0,051
		Sigma	0,108	0,070
		Sharpe Ratio	-0,398	0,875
	Benchmark	Return	0,090	0,070
		Sigma	0,104	0,062
		Sharpe Ratio	0,684	2,747
Equity (#obs = 63)	PPP	Return	0,021	0,088
		Sigma	0,186	0,090
		Sharpe Ratio	-0,058	0,431
	Benchmark	Return	0,045	0,086
		Sigma	0,180	0,103
		Sharpe Ratio	0,038	0,511
Fixed Income (#obs = 438)	PPP	Return	0,023	0,049
		Sigma	0,098	0,066
		Sharpe Ratio	-0,451	0,906
	Benchmark	Return	0,077	0,075
		Sigma	0,113	0,086
		Sharpe Ratio	0,472	2,420

Table 3. PPP and benchmark's return, sigma and Sharpe ratio

Sample	Variable	Coefficient	Standard Error	T-Statistics	P-Value
Total PPP (#obs = 501)	Return	0,281	0,022	12,960	0,000
	Sigma	0,727	0,022	33,577	0,000
	Sharpe Ratio	-0,031	0,018	-1,702	0,089
Securities Investment Funds (#obs = 176)	Return	0,4916	0,042	11,675	0,000
	Sigma	0,5849	0,030	19,341	0,000
	Sharpe Ratio	0,1376	0,105	1,309	0,192
Pension Funds (#obs = 325)	Return	0,235	0,024	9,969	0,000
	Sigma	0,928	0,029	32,114	0,000
	Sharpe Ratio	-0,042	0,019	-2,227	0,027
Equity (#obs = 63)	Return	0,673	0,083	8,139	0,000
	Sigma	0,890	0,058	15,456	0,000
	Sharpe Ratio	0,477	0,089	5,356	0,000
Fixed Income (#obs = 438)	Return	0,2556	0,021	12,461	0,000
	Sigma	0,677	0,023	29,352	0,000
	Sharpe Ratio	-0,039	0,020	-2,018	0,044

Table 4. Results of T-tests on the difference of mean returns, sigma and Sharpe ratio between PPP and Benchmarks

Sample	Variable	Mean	Standard Error	T-Statistics	P-Value
Total PPP (#obs = 501)	$R_{PPP} - R_{Benchmark}$	-0,050	0,003	-15,124	0,000
	MM	0,010	0,004	2,533	0,016
Securities Investment Funds (#obs = 176)	$R_{PPP} - R_{Benchmark}$	-0,020	0,005	-4,104	0,000
	MM	0,005	0,008	0,530	0,346
Pension Funds (#obs = 325)	$R_{PPP} - R_{Benchmark}$	-0,068	0,004	-16,607	0,000
	MM	0,013	0,004	3,174	0,003
Equity (#obs = 63)	$R_{PPP} - R_{Benchmark}$	-0,024	0,008	-2,850	0,008
	MM	0,025	0,021	1,217	0,189
Fixed Income (#obs = 438)	$R_{PPP} - R_{Benchmark}$	-0,055	0,004	-15,436	0,000
	MM	0,033	0,007	4,951	0,000

Table 5. Results of T-tests of mean difference in returns and Modigliani-Modigliani measure

5. Conclusions

The purpose of this work was to analyze the performance of personal pension plans in the form of funds in Portugal, making a comparison with some benchmarks defined by the pension providers.

Pension plans were created with the purpose of encouraging people to save for their retirement, since life quality is expected to decrease during this period, due to a reduction in household's wealth.

These plans are long-term investments that depend on the performance of other assets, making them very volatile to market conditions. Since these are long-term investments whose purpose is to guarantee an income during the retirement period, the government established restrictions regarding asset allocation and the market structure with the purpose of protecting funds against negative economic events. On average, the performance is very similar across funds and this might be caused by the restrictions defined by the government concerning asset allocation. This homogeneity prevents the investor to choose the fund that better suits his profile, regarding wealth, age and risk aversion.

It was found evidence that, in Portugal, personal pension plans in the form of funds underperform, on average, their benchmarks both in raw and risk-adjusted terms. Benchmarks are essentially indexes that include dozens of stocks or bonds, however pension funds do not invest in all of them. It can also happen that private pension schemes invest in different assets that are not included on the presented benchmarks.

In general, personal pension schemes in the form of funds are not a risky investment, however, on average, their returns are not significantly different from zero. This result suggests that these plans might not be a good complement to pensions provided by social security systems in guaranteeing the same life quality once the individual retires. These results also may suggest that plans in the form of funds do not have higher returns than PPPs in the form of insurance, and they present a higher risk as they do not have a return guaranteed.

5.1. Limitations and future research

The study of personal pension plans in Portugal is scarce. All the information regarding their performance, risk and asset allocation is provided by the institutions responsible for

each fund and by ASF and APFIPP. ASF just has information at a cross-sectional level. And the APFIPP website is not user friendly, due to the time it takes to collect all the data needed.

It can be interesting to make a deeply investigation work regarding these plans, studying what motivates individuals to invest a portion of their wealth in these plans; how does age, wealth, career path and risk aversion affect the individual's choice when choosing the plan; it can also be interesting to analyze the impact of these plans on household's saving and if the investment in these financial products is worthy.

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Appendix

Appendix A – Decreto-Lei n.º 205/89

2446

DIÁRIO DA REPÚBLICA — I SÉRIE

N.º 145 — 27-6-1989

MINISTÉRIO DAS FINANÇAS

Decreto-Lei n.º 205/89

de 27 de Junho

A constituição de planos individuais de reforma permite incentivar a poupança de longo prazo completando os esquemas de segurança social proporcionados pelo Estado e os que têm natureza privada, como os derivados de fundos de pensões.

Trata-se, aliás, de uma orientação estratégica nas políticas macroeconómicas e da Segurança Social que consiste em criar todo um conjunto de esquemas diversificados complementares do sistema geral de segurança social.

A relevância da poupança na economia portuguesa justifica que, em determinadas condições, os planos individuais de poupança-reforma beneficiem de um regime fiscal que, por um lado, facilite a capitalização na fase de poupança e, por outro, não seja penalizante aquando dos reembolsos para os fins sociais que se pretende alcançar. Todavia, não assentam em isenção fiscal mas apenas no diferimento da tributação. Isto é, e dentro de limites determinados, as contribuições para o fundo não estão sujeitas a IRS, mas os reembolsos, que incluem o capital e rendimentos acumulados, estão sujeitos a imposto, em condições aliás favoráveis, segundo o regime previsto para as pensões e com uma regra especial para atenuar o efeito da progressividade no caso de resgate, parcial ou total, de uma só vez.

Dado o importante papel que se reconhece aos «planos poupança-reforma» (PPR) como fomentadores da poupança e como esquemas complementares de reforma com vista a uma maior justiça social, para além da necessidade de se evitarem situações de dupla tributação para os participantes, ficam isentos do IRC os rendimentos dos fundos de poupança-reforma (FPR). De igual modo, são considerados como custos ou perdas de exercício, nos termos do regime previsto no n.º 2 do artigo 38.º do Código do IRC, os gastos suportados pelas pessoas colectivas com a subscrição de certificados FPR em nome e a favor dos seus empregados. O referido regime fiscal é o constante do estatuto dos benefícios fiscais.

A gestão destes planos, pela sua configuração e natureza, é atribuída a entidades especializadas, como são as sociedades gestoras de fundos de investimento e de fundos de pensões e as companhias de seguro do ramo vida. Pretende-se, também, incentivar a concorrência nesta matéria, a fim de serem oferecidas alternativas diferentes aos cidadãos sem pôr em risco a segurança das aplicações, razão pela qual tais planos deverão ser constituídos por um mínimo de 50 % em títulos da dívida pública.

Assim:

No uso da autorização legislativa concedida pela alínea g) do artigo 4.º da Lei n.º 8/89, de 22 de Abril, e nos termos da alínea b) do n.º 1 do artigo 201.º da Constituição, o Governo decreta o seguinte:

Artigo 1.º

Noção

1 — Os «planos poupança-reforma» (PPR) são constituídos por certificados nominativos de um fundo de poupança-reforma (FPR), que terá a forma de fundo

de investimento, de fundo de pensões ou outros equiparados.

2 — Os certificados de FPR podem ser subscritos por pessoas singulares ou por pessoas colectivas a favor e em nome dos seus trabalhadores.

3 — Os certificados de FPR podem representar diversas unidades de participação do FPR, inteiras ou fraccionadas, as quais podem ser ou não desmaterializadas.

4 — São enquadráveis no regime dos PPR os seguros individuais de poupança-reforma e outros congéneres, desde que, cumulativamente:

- Cumpram os requisitos estabelecidos no presente diploma;
- As respectivas reservas matemáticas evidenciem a observância do disposto no artigo 3.º;
- Aditem à respectiva denominação a sigla PPR.

Artigo 2.º

Gestão dos FPR

1 — São competentes para gerir os FPR as seguintes entidades:

- Sociedades gestoras de fundos de investimento, autorizadas nos termos do Decreto-Lei n.º 229-C/88, de 4 de Julho;
- Sociedades gestoras de fundos de pensões, autorizadas nos termos do Decreto-Lei n.º 396/86, de 25 de Novembro;
- Companhias de seguros que explorem legalmente em Portugal o ramo «Vida».

2 — Cada entidade gestora poderá gerir um ou mais FPR.

Artigo 3.º

Composição do fundo

1 — As regras a que deve obedecer a composição do património do fundo são as aplicáveis aos fundos de investimento, aos fundos de pensões ou às reservas matemáticas dos seguros de vida, conforme os casos, com a ressalva do disposto no número seguinte.

2 — Em relação ao património do fundo deverão ser observadas as seguintes relações:

- O FPR deverá ser constituído, no mínimo de 2 %, por numerário, depósitos bancários, bilhetes do Tesouro ou aplicações nos mercados interbancários;
- O FPR será constituído, no mínimo de 50 %, por títulos de dívida pública emitidos por prazo superior a um ano;
- O FPR poderá ser constituído, no máximo de 20 %, por documentos representativos de empréstimos hipotecários.

Artigo 4.º

Reembolso dos certificados

1 — Os participantes só podem exigir o reembolso do valor capitalizado dos certificados nos seguintes casos:

- Reforma por velhice;
- Desemprego de longa duração;
- Incapacidade permanente para o trabalho qualquer que seja a sua causa;
- Doença grave;

e) A partir dos 60 anos de idade, desde que a subscrição se tenha iniciado há pelo menos cinco anos.

2 — No caso de morte do participante o reembolso poderá ser exigido pelos herdeiros.

3 — O regime relativo à descrição objectiva dos casos previstos no n.º 1, bem como à sua confirmação, constará de regulamento a aprovar por portaria conjunta dos Ministros das Finanças e do Emprego e da Segurança Social.

Artigo 5.º

Cálculo da unidade de participação

O valor da unidade de participação é calculado pelo menos uma vez por mês, em dias a fixar no regulamento de gestão.

Artigo 6.º

Resultados do fundo

Os resultados obtidos pelo FPR são objecto de capitalização.

Artigo 7.º

Forma de reembolso

1 — Nos casos previstos no n.º 1 do artigo 4.º os participantes, ou os seus herdeiros, poderão optar por:

- a) Reembolso da totalidade ou de parte dos certificados de forma periódica ou não;
- b) Pensão vitalícia mensal;
- c) Qualquer composição das duas modalidades anteriores.

2 — As modalidades previstas nas alíneas b) e c) do número anterior deverão ser aprovadas pelo Instituto de Seguros de Portugal.

Artigo 8.º

Regime fiscal

1 — Os rendimentos dos FPR ficam isentos de IRC.

2 — A disciplina do n.º 2 do artigo 38.º do Código do IRC é também aplicável quando os beneficiários forem fundos de poupança-reforma.

3 — Para efeitos de IRS é dedutível ao rendimento colectável, e até à concorrência deste, o valor aplicado no respectivo ano em PPR, com o limite máximo do menor dos valores seguintes: 20 % do rendimento total bruto englobado e 500 contos.

4 — O reembolso dos certificados de FPR estão sujeitos a IRS nos seguintes termos:

- a) De acordo com as regras aplicáveis aos rendimentos da categoria H do Código do IRS, quando a sua percepção ocorra sob a forma de rendas;
- b) Pela taxa correspondente a um quinto do seu valor, em caso de resgate pela totalidade;
- c) De acordo com as regras estabelecidas nas alíneas anteriores quanto à respectiva parte dos rendimentos, nos casos em que se verificarem, simultaneamente, as modalidades nelas referidas.

Artigo 9.º

Fiscalização

Os FPR e as respectivas entidades gestoras ficarão sujeitos à fiscalização do Banco de Portugal ou do Instituto de Seguros de Portugal, consoante a sua natureza.

Artigo 10.º

Contas

1 — A entidade gestora deverá publicar, com periodicidade mensal, no boletim de uma das bolsas de valores, a composição discriminada dos valores que integram o património do fundo e o número de unidades de participação em circulação.

2 — A contabilidade dos fundos é organizada de harmonia com as normas e instruções emitidas pelo Banco de Portugal e pelo Instituto de Seguros de Portugal.

Artigo 11.º

Legislação aplicável

Aplica-se aos PPR e FPR a legislação dos fundos de investimento, fundos de pensões ou actividade seguradora, conforme os casos, com as especificidades referidas neste diploma.

Visto e aprovado em Conselho de Ministros de 18 de Maio de 1989. — *Antbal António Cavaco Silva* — *Miguel José Ribeiro Cadilhe* — *José Albino da Silva Peneda*.

Promulgado em 16 de Junho de 1989.

Publique-se.

O Presidente da República, MARIO SOARES.

Referendado em 20 de Junho de 1989.

O Primeiro-Ministro, *Antbal António Cavaco Silva*.

MINISTÉRIO DOS NEGÓCIOS ESTRANGEIROS

Decreto n.º 26/89

de 27 de Junho

Nos termos da alínea c) do n.º 1 do artigo 200.º da Constituição, o Governo decreta o seguinte:

Artigo único. São aprovados, para ratificação, os Actos Finais da Conferência Administrativa Regional para a Planificação da Radiodifusão Sonora em Ondas Métricas, respeitante à região 1 e a parte da região 3, que constituem o Acordo de Genebra de 1984, assinados em 1984 e 1985, respectivamente, cujos textos originais em francês e a respectiva tradução para português vão anexos ao presente decreto.

Visto e aprovado em Conselho de Ministros de 23 de Março de 1989. — *Antbal António Cavaco Silva* — *João de Deus Rogado Salvador Pinheiro* — *João Maria Leitão de Oliveira Martins* — *António Fernando Couto dos Santos*.

Ratificado em 14 de Abril de 1989.

Publique-se.

O Presidente da República, MARIO SOARES.

Referendado em 14 de Abril de 1989.

O Primeiro-Ministro, *Antbal António Cavaco Silva*.

Appendix B – Personal Pension Plans’ Taxation

DEDUÇÕES À COLETA	NÃO CASADOS	CASADOS	
		TRIBUTAÇÃO SEPARADA (3) (um sujeito passivo)	TRIBUTAÇÃO CONJUNTA (dois sujeitos passivos)
DEDUÇÕES INSCRITAS PELO CONTRIBUINTE NO ANEXO H DA MODELO 3			
Encargos suportados pelo proprietário relacionados com a recuperação ou com ações de reabilitação de imóveis: -Localizados em áreas de reabilitação urbana, ou -Arrendados passíveis de atualização ao abrigo do NRAU (4) (5) (Art.º 71.º, n.º 4 do EBF)	30% dos encargos suportados, pelo proprietário, com o limite de € 500,00.	30% dos encargos suportados pelo proprietário, no caso de sujeito passivo, com o limite de € 500,00. 15% dos encargos suportados pelo proprietário dependente com o limite de € 250,00.	30% dos encargos suportados, pelo proprietário, com o limite de € 500,00.
Regime público de capitalização (5) (Art.º 17.º do EBF)	20% do valor aplicado com o limite de € 350,00.	20% do valor aplicado com o limite de € 350,00.	20% do valor aplicado, por sujeito passivo, com o limite de € 350,00.
PPR - Inferior a 35 anos (5)	20% do valor aplicado com o limite de € 400,00.	20% do valor aplicado com o limite de € 400,00.	20% do valor aplicado, por sujeito passivo, com o limite de € 400,00.
PPR - De 35 a 50 anos (5)	20% do valor aplicado com o limite de € 350,00.	20% do valor aplicado com o limite de € 350,00.	20% do valor aplicado, por sujeito passivo, com o limite de € 350,00.
PPR - Superior a 50 anos (5) (Art.º 21.º do EBF)	20% do valor aplicado com o limite de € 300,00.	20% do valor aplicado com o limite de € 300,00.	20% do valor aplicado, por sujeito passivo, com o limite de € 300,00.
Não são dedutíveis as importâncias relativas às aplicações efetuadas após a data da passagem à reforma			
Donativos ao Estado em dinheiro (4) (5)	25% das importâncias doadas pelos membros do agregado familiar.	25% das importâncias doadas pelo sujeito passivo.	25% das importâncias doadas pelos membros do agregado familiar.
Donativos em dinheiro a outras entidades (4) (5) (Art.º 63.º do EBF)	25% das importâncias doadas pelos membros do agregado familiar, até ao limite de 15% da coleta.	12,5% das importâncias doadas pelos dependentes do agregado familiar. 25% das importâncias doadas pelo sujeito passivo, até ao limite de 15% da coleta. 12,5% das importâncias doadas pelos dependentes do agregado familiar, até ao limite de 15% da coleta.	25% das importâncias doadas pelos membros do agregado familiar, até ao limite de 15% da coleta.

Source: Portal das Finanças, Portugal, 2017

Appendix C – Performance indicators

- Difference in Returns – it is simply the difference between the PPP’s return and the benchmark’s return. Formula: $\bar{R} = \bar{R}_{PPP} - \bar{R}_{PPB}$
- Sharpe Ratio – it is a measure for calculating risk-adjusted return. It is the average return earned in excess of the risk-free rate per unit of volatility. Formula: $SR = \frac{\bar{R}_P - R_F}{\sigma_P}$, where \bar{R}_P is the expected return of a portfolio, R_F is the risk-free rate and σ_P is the portfolio volatility.
- Modigliani risk-adjusted performance – or the M^2 measure, is very similar to Sharpe ratio, but easier to interpret, especially when it presents a negative value, since it can be presented in percentage. It measures the returns of a portfolio

adjusted for the risk of the portfolio relative to that of some benchmark. Formula:

$$M^2 = \frac{\bar{R}_P - R_F}{\sigma_P} * \sigma_B + R_F, \text{ where } \sigma_B \text{ is the benchmark's annualized volatility.}$$

Appendix D – Benchmarks' description

- Bloomberg Barclays EuroAgg Treasury Total Return Index consists of fixed-rate, investment grade public obligations of the sovereign countries participating in the European Monetary Index. This Index currently contains euro-denominated issues from 13 countries (source: Bloomberg).
- Bloomberg Barclays Euro Aggregate Corporate Total Return Index is a rules based benchmark measuring investment grade, euro-denominated, fixed rate, and corporate only. Only bonds with a maturity of 1 year and above are eligible (source Bloomberg).
- FTSE 100 Index – is a capitalization-weighted index of the 100 most highly capitalized companies traded on the London Stock Exchange (source: Bloomberg).
- Dow Jones Industrial Average is a price-weighted average of 30 blue-chip stocks that are generally the leaders in their industry (source: Bloomberg).
- Euro Stoxx 50 Index is the Europe's leading blue-chip index for the Eurozone, provides a blue-chip representation of super sector leaders in the Eurozone. It covers 50 stocks from 12 Eurozone countries (source: Bloomberg).
- MSCI Europe UCITS ETF is a fund whose purpose is to track the performance of the MSCI Europe Total Return (Net) Index. It captures large and mid-cap representation across 15 Developed Markets countries in Europe (source: Bloomberg and MSCI).

- MSCI World UCITS ETF is a fund whose purpose is to track the performance of the MSCI World Total Return (Net) Index. It captures large and mid-cap representation across 23 Developed Markets countries (source: Bloomberg and MSCI).
- Euribor is the rate at which Euro interbank term deposits are offered by one prime bank to another prime bank within the EMU zone (source: EMMI, European Money Markets Institute).

Appendix E – T-Statistic

A t-statistic is any statistical hypothesis test in which the test statistic follows a Student's t-distribution under the null hypothesis. This statistic is commonly used to compare average returns from different portfolios and tests how significant these differences are. $T = \frac{\bar{X} - \mu}{\frac{\sigma}{\sqrt{n}}} \sim t(n - 1)$, where

\bar{X} is the sample mean,

μ is the hypothesized value,

σ is the sample standard deviation and

n is the number of observations.

The p-value is the associated probability of a result to be observed. If the p-value is below 5% (in this particular case), the null hypothesis is rejected.

Performance of Personal Pension Plans in Portugal

PPP	Company	Inception date	Class
F.P. PPR 5 Estrelas	Futuro SGFP	23/11/1989	Fundo de Pensões
F.I.M. Santander Poupança Valorização FPR	Santander Asset Management	23/11/1989	Fundo de Investimento Mobiliário
Victoria Valor Vantagem - Duplo Valor PPR	Victoria Seguros	04/12/1989	Fundo de Pensões
F.P. PPR Praemium S	Ocidental Pensões	13/12/1989	Fundo de Pensões
F.P. PPR Praemium V	Ocidental Pensões	13/12/1989	Fundo de Pensões
F.P. PPR BNU Vanguarda	Ocidental Pensões	02/11/1990	Fundo de Pensões
F.I.M. NB PPR	GNB SGFP	22/11/1991	Fundo de Investimento Mobiliário
F.I.M. BPI Reforma Segura PPR	BPI Gestão de Ativos	28/11/1991	Fundo de Investimento Mobiliário
F.I.M. BPI Reforma Investim. PPR	BPI Gestão de Ativos	02/12/1991	Fundo de Investimento Mobiliário
F.P. BBVA Equilibrado PPR	BBVA	08/10/1992	Fundo de Pensões
F.P. CVI PPR	BBVA	23/11/1993	Fundo de Pensões
F.P. PPR Vintage (+)	GNB SGFP	30/10/1995	Fundo de Pensões
F.P. Vanguarda PPR	Ocidental Pensões	09/01/1996	Fundo de Pensões
F.P. BPI Vida - PPR	BPI Vida e Pensões	31/10/1996	Fundo de Pensões
F.P. PPR Garantia de Futuro (+)	Futuro SGFP	05/12/1996	Fundo de Pensões
F.P. PPR Europa	Ocidental Pensões	27/10/1997	Fundo de Pensões
F.P. PPR Platinum	Futuro SGFP	29/12/1997	Fundo de Pensões
F.I.M. Bankinter PPR Obrigações	Bankinter Gestão de Ativos	18/11/1999	Fundo de Investimento Mobiliário
VIVA PPR XXI	Groupama Vida	06/12/1999	Ramo Vida
PPR Património Reforma Prudente	SGF SGFP	26/05/2000	Fundo de Pensões
BPI Reforma Garantida 5 anos PPR	BPI Vida e Pensões	14/05/2001	Ramo Vida
F.I.M. Santander Poupança Prudente FPR	Santander Asset Management	21/05/2001	Fundo de Investimento Mobiliário
F.P. BBVA Prudente PPR	BBVA	11/11/2002	Fundo de Pensões
PPR Património Reforma Equilibrado	SGF SGFP	06/12/2002	Fundo de Pensões
PPR Património Reforma Conservador	SGF SGFP	06/12/2002	Fundo de Pensões
F.I.M. IMGA Poupança PPR	IM Gestão de Ativos	05/05/2003	Fundo de Investimento Mobiliário
PPR Património Reforma Ações	SGF SGFP	23/04/2004	Fundo de Pensões
BPI Reforma Aforro PPR	BPI Vida e Pensões	07/04/2005	Ramo Vida
F.I.M. BPI Reforma Ações PPR	BPI Gestão de Ativos	22/06/2005	Fundo de Investimento Mobiliário
F.I.M. IMGA Investimento PPR Ações	IM Gestão de Ativos	11/01/2006	Fundo de Investimento Mobiliário
Caixa PPR Capital Mais	Fidelidade	02/05/2006	Ramo Vida
PPR Plano Reforma Capital Garantido	Santander Totta Vida	29/05/2006	Ramo Vida
F.I.M. Bankinter PPR 20	Bankinter Gestão de Ativos	04/10/2006	Fundo de Investimento Mobiliário
F.I.M. Bankinter PPR Ações 55	Bankinter Gestão de Ativos	04/10/2006	Fundo de Investimento Mobiliário
Allianz PPR Activo	Allianz	22/11/2006	Ramo Vida
Solução PPR Zurich	Zurich Vida	01/01/2007	Ramo Vida
Leve DUO (PPR)	Fidelidade	08/04/2007	Ramo Vida
Capital Diferido CD BA PPR	España, S.A.	01/01/2008	Ramo Vida
Misto BA PPR	España, S.A.	01/01/2008	Ramo Vida
Leve II (PPR)	Fidelidade	03/03/2008	Ramo Vida
F.P. PPR Geração Activa	Futuro SGFP	11/06/2008	Fundo de Pensões
F.I.M. Optimize Capital Reforma PPR Ações	Optimize Investment Partners	25/09/2008	Fundo de Investimento Mobiliário
F.I.M. Optimize Capital Reforma PPR Equilibrado	Optimize Investment Partners	25/09/2008	Fundo de Investimento Mobiliário
BPI Reforma Garantida 1 ano PPR	BPI Vida e Pensões	23/10/2008	Ramo Vida
Liberty PPR Mais	Liberty	06/11/2008	Ramo Vida
PPR SGF Garantido	SGF SGFP	12/12/2008	Fundo de Pensões
BPI Reforma Garantida 3 anos PPR	BPI Vida e Pensões	27/04/2009	Ramo Vida
BPI Reforma Garantida 8 anos PPR	BPI Vida e Pensões	27/04/2009	Ramo Vida
PPR SGF Ações Dinâmico	SGF SGFP	18/09/2009	Fundo de Pensões
F.P. BBVA Dinâmico PPR	BBVA	12/11/2009	Fundo de Pensões
PPR Transfer (Transferências)	Fidelidade	21/12/2009	Ramo Vida
PPR Transfer	Fidelidade	21/12/2009	Ramo Vida
PLANO POUPANÇA REFORMA - PSN	P.S.N. - Mutua de Seguros	01/02/2010	Ramo Vida
F.I.M. Optimize Capital Reforma PPR Moderado	Optimize Investment Partners	19/08/2010	Fundo de Investimento Mobiliário
Vida PPR Rendimento Garantido 03	Bankinter Seguros de Vida	03/09/2010	Ramo Vida
Generali PPR + Seguro (Prémios Únicos)	Generali Vida	01/11/2010	Ramo Vida
Generali PPR + Seguro (Prémios Periódicos)	Generali Vida	01/11/2010	Ramo Vida
PPR Plano A	Mapfre Seguros de Vida	19/11/2011	Ramo Vida
BPI Reforma Garantida 2 anos PPR	BPI Vida e Pensões	23/07/2012	Ramo Vida
F.P. PPR BIG Ações Alpha	Futuro SGFP	29/10/2012	Fundo de Pensões
F.P. PPR BIG Taxa Plus	Futuro SGFP	29/10/2012	Fundo de Pensões
Lusitania Poupança Reforma PPR (71D5)	Lusitania-Vida	01/02/2015	Ramo Vida
PPR Rendimento Total (71E5)	Lusitania-Vida	02/02/2015	Ramo Vida
CA PPR [Capital]	CA Vida	16/03/2015	Ramo Vida
Reforma Programada PPR Empresas	Ocidental Vida	08/04/2015	Ramo Vida
Reforma Programada PPR	Ocidental Vida	08/04/2015	Ramo Vida
Leve PPR Uni - 2ª série	Fidelidade	20/04/2015	Ramo Vida
Real PPR	Real Vida	01/05/2015	Ramo Vida
PPR Garantido Finibanco 2015 - PPR	Finibanco Vida	01/06/2015	Ramo Vida
Prévoir PPR PU (TT 0%)	Prévoir Vie	01/11/2015	Ramo Vida
Prévoir PPR PP (TT 0%)	Prévoir Vie	01/11/2015	Ramo Vida
Real PPR R	Real Vida	01/12/2015	Ramo Vida
Postal PPR Rendimento Garantido	Fidelidade	04/12/2015	Ramo Vida
PPR+	Ageas Vida	04/01/2016	Ramo Vida
PPR SGF Stoik Ações	SGF SGFP	15/02/2016	Fundo de Pensões
PPR Poupança Futuro Transfer	Fidelidade	07/03/2016	Ramo Vida
NB PPR Aforro Seguro	GNB Seguros Vida	07/07/2016	Ramo Vida
PPR Garantido	Mapfre Seguros de Vida	01/09/2016	Ramo Vida
GNB PPR Aforro Seguro	GNB Seguros Vida	26/09/2016	Ramo Vida
F.I.M. Bankinter PPR 35	Bankinter Gestão de Ativos	07/11/2016	Fundo de Investimento Mobiliário
NB PPR Renda Mensal II	GNB Seguros Vida	03/04/2017	Ramo Vida
NB PPR Renda Mensal IV	GNB Seguros Vida	03/04/2017	Ramo Vida
NB PPR Renda Mensal I	GNB Seguros Vida	03/04/2017	Ramo Vida
NB PPR Renda Mensal III	GNB Seguros Vida	03/04/2017	Ramo Vida
F.P. Caixa PPR Rendimento Mais	CGD Pensões	10/07/2017	Fundo de Pensões

Table 1. List of PPP (name, provider, inception date, class)

Life Expectancy at Birth

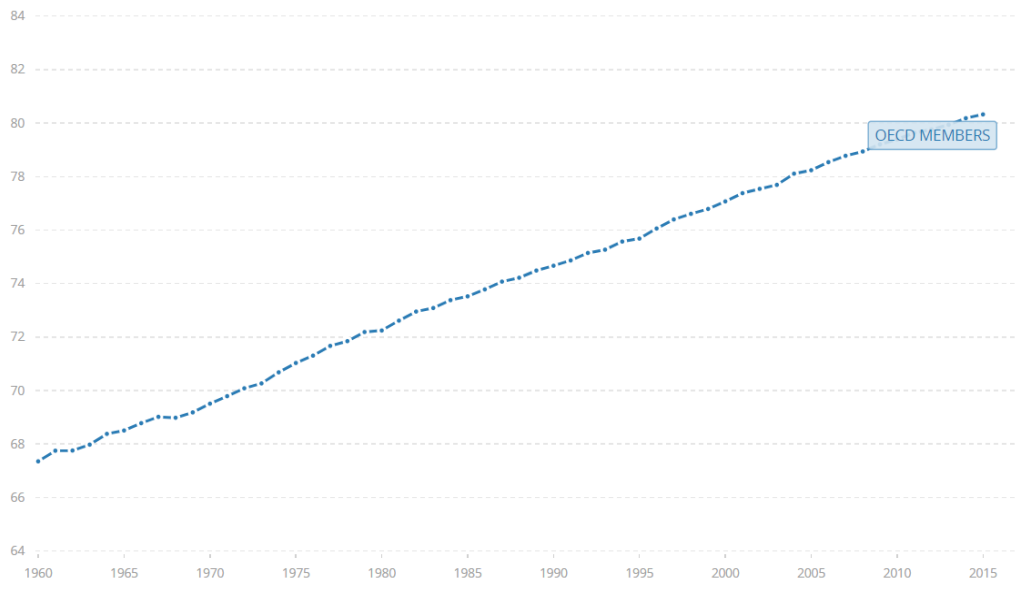


Figure 1. Life Expectancy at Birth in OECD Countries (World Bank, 1960-2015)

Fertility Rate

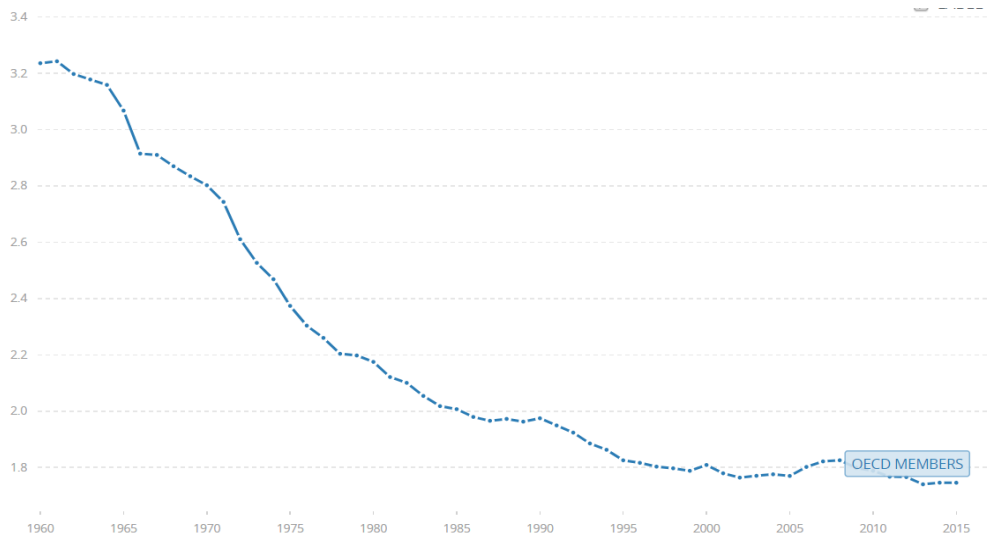


Figure 2. Fertility Rate in OECD Countries (World Bank, 1960-2015)

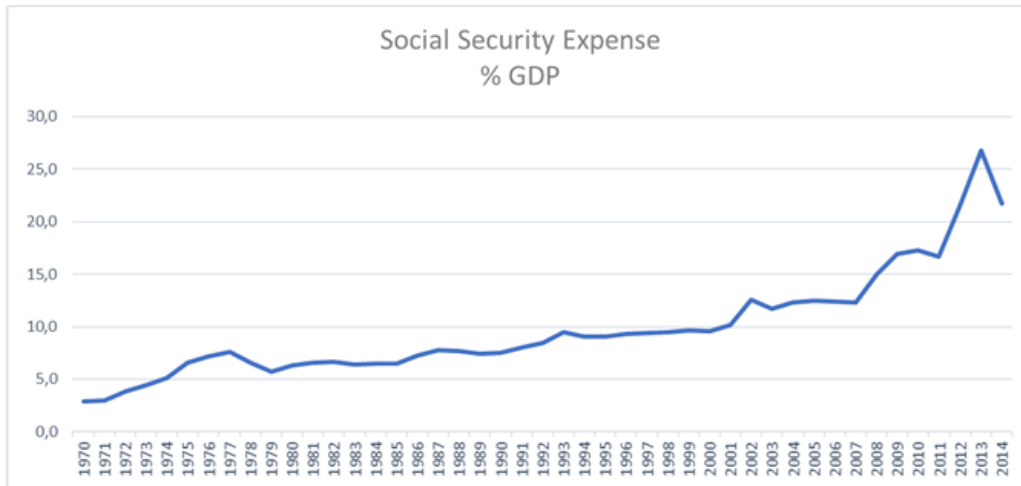


Figure 3. Social Security Expense in % of GDP in Portugal (Pordata, 1970-2014)

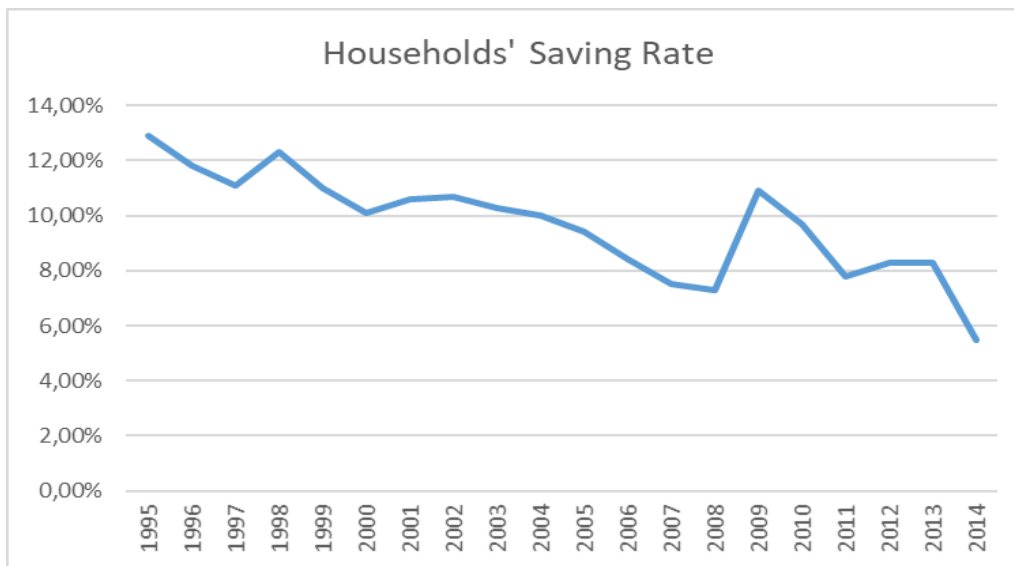


Figure 4. Households' Saving Rate in Portugal (Pordata, 1995-2014)

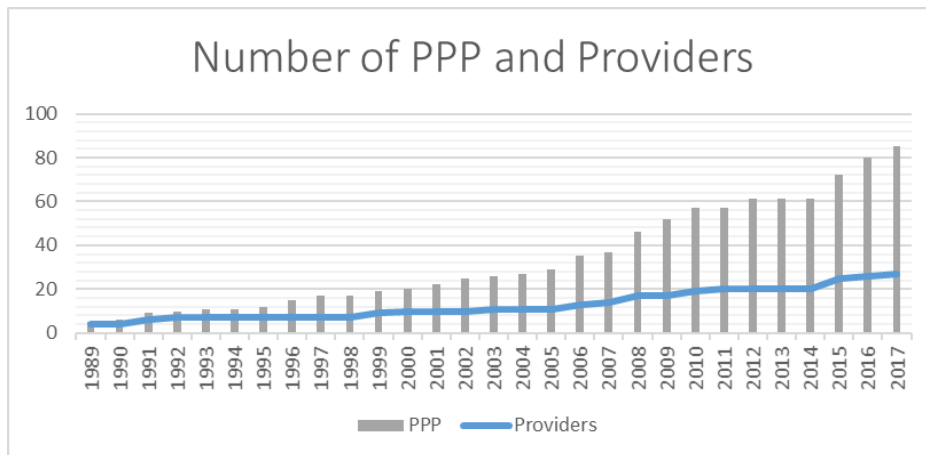


Figure 5. Evolution of personal pension plans and pension providers (own calculations based on APFIPP data)

Estrutura dos fundos de pensões (1.º trimestre 2017)

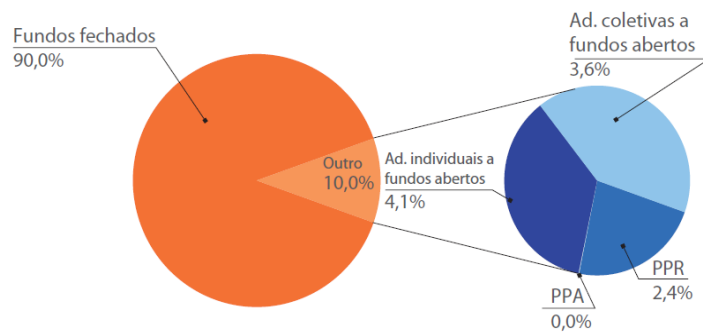


Figure 6. The Pension Funds Market in Portugal (ASF, 2017)

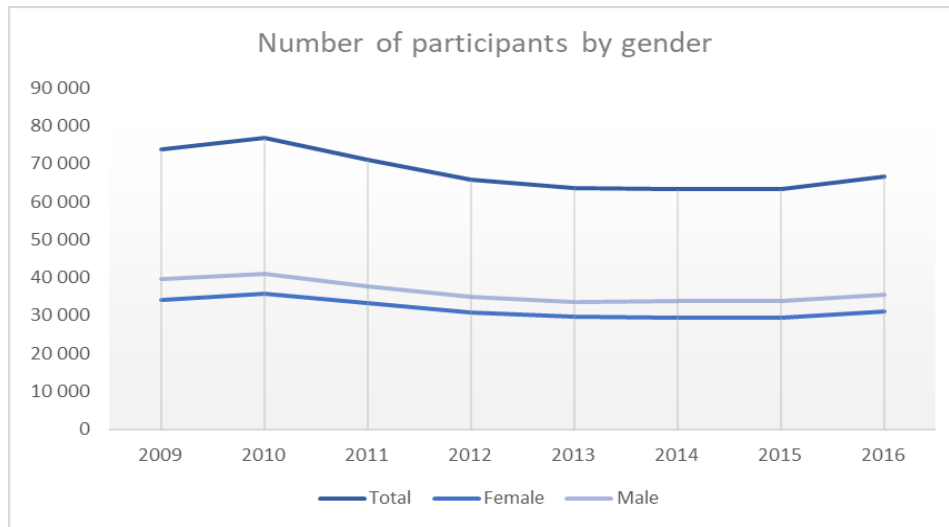


Figure 9. Number of Participants by gender (ASF reports: *Estatísticas de Fundos de Pensões*, 2011-2016)

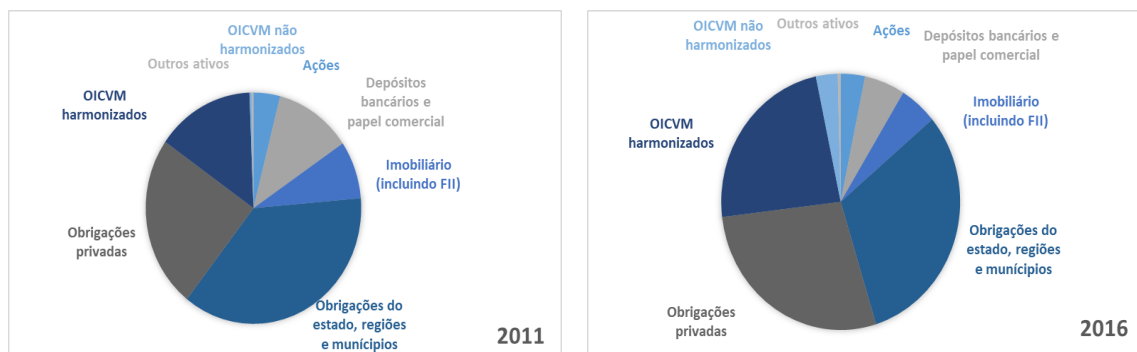


Figure 11. PPPs' investment structure (ASF reports: *Estatísticas de Fundos de Pensões*, 2011-2016)

Performance of Personal Pension Plans in Portugal

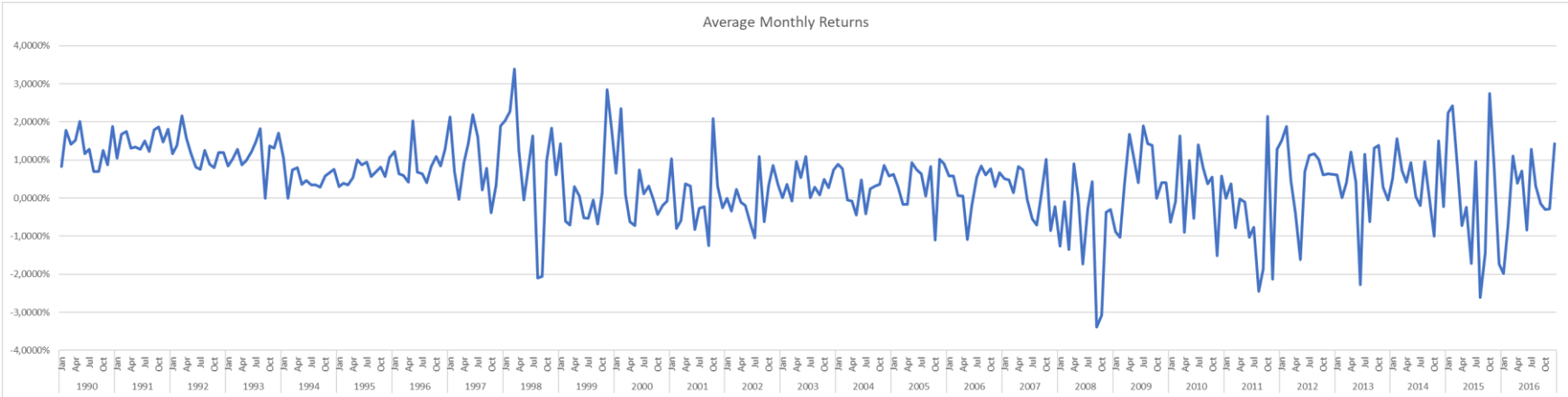


Figure 12. Average PPP’s monthly returns (own calculations based on APFIPP information)

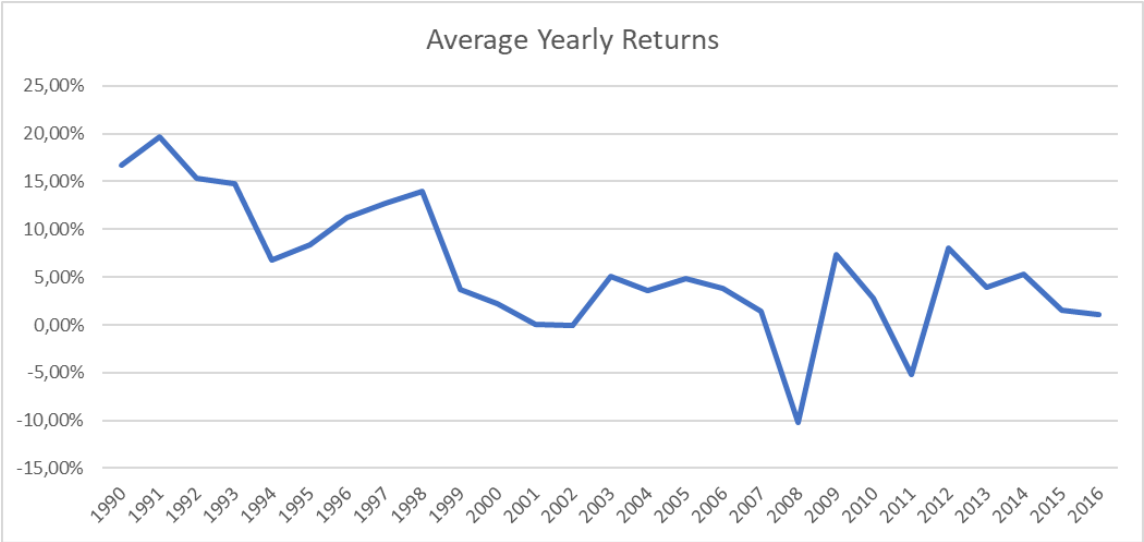


Figure 13. Average PPP’s yearly returns (own calculations based on APIPP information)

Performance of Personal Pension Plans in Portugal

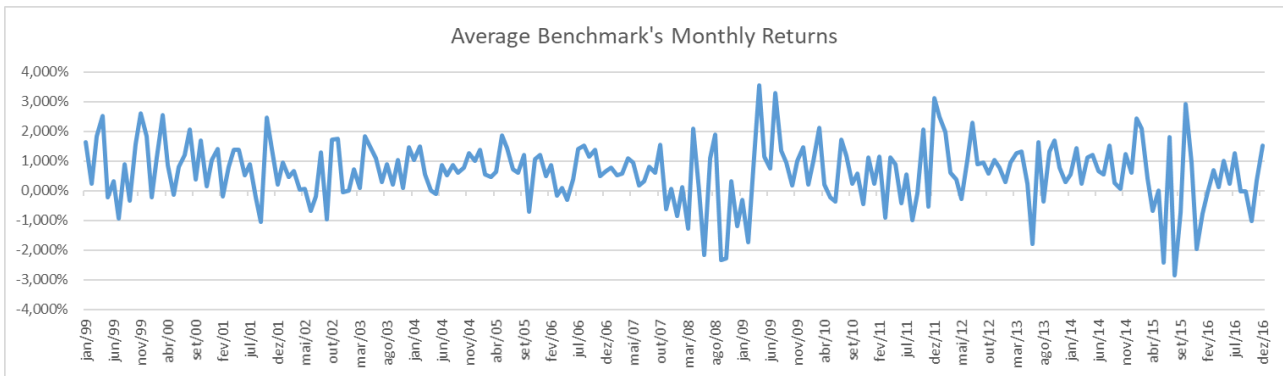


Figure 14. Average benchmark's monthly returns (own calculations based on Bloomberg's database)

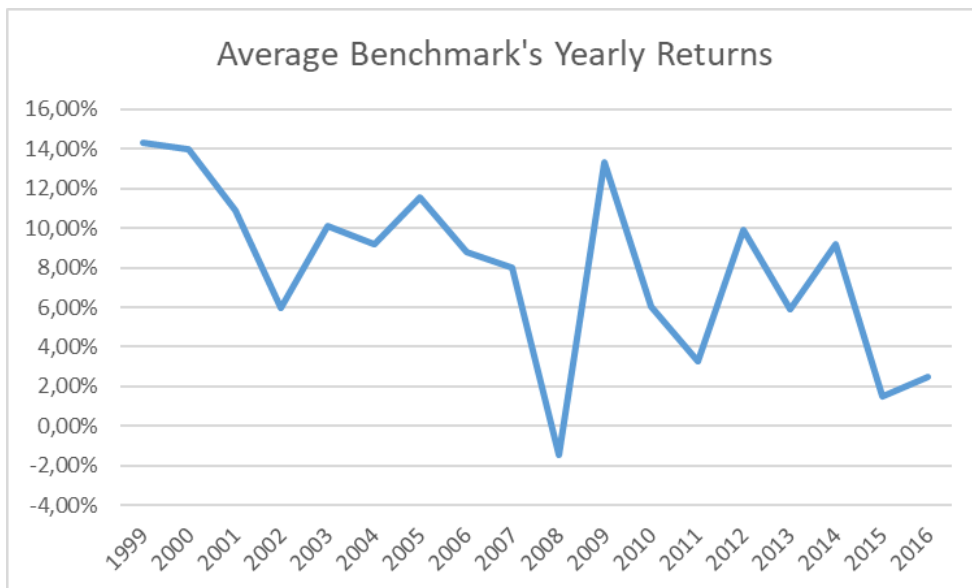


Figure 15. Average benchmark's yearly returns (own calculations based on Bloomberg's database)

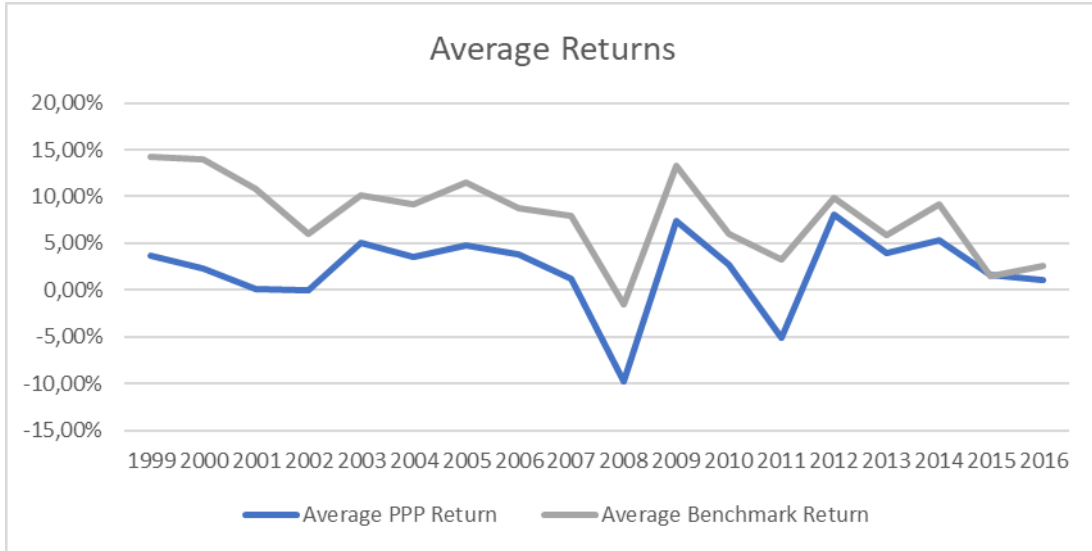


Figure 16. Average PPP Return Vs Average Benchmark Return

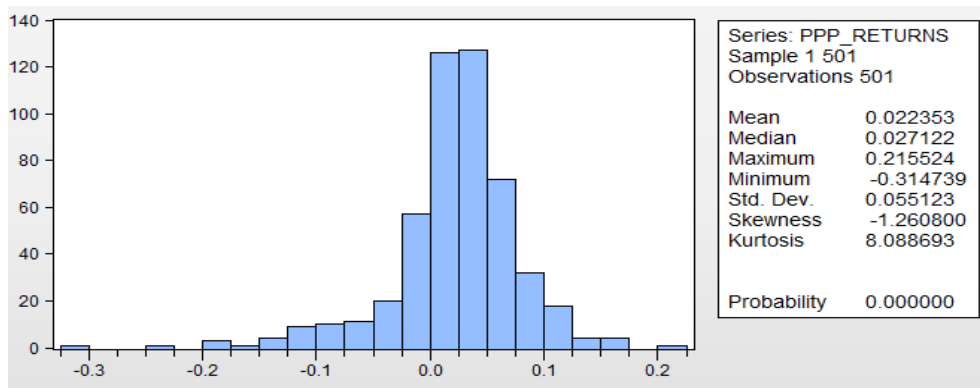


Figure 17. Histogram of total personal pension plan's average return

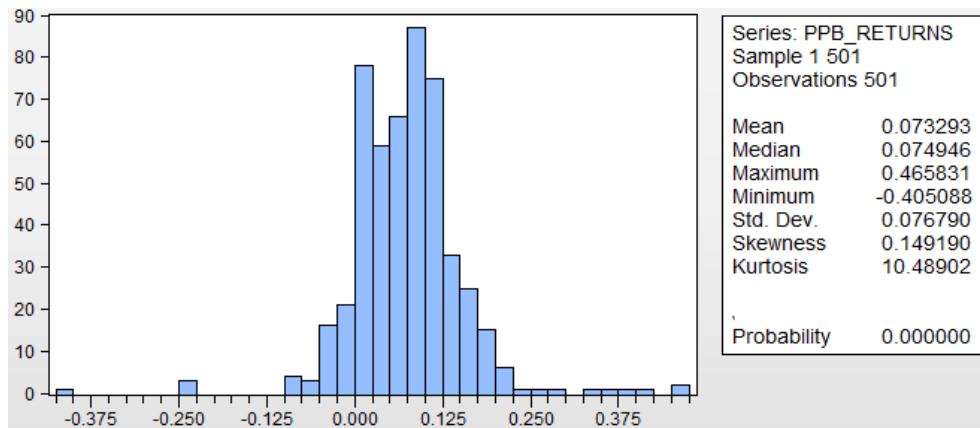


Figure 18. Histogram of total benchmark's average return

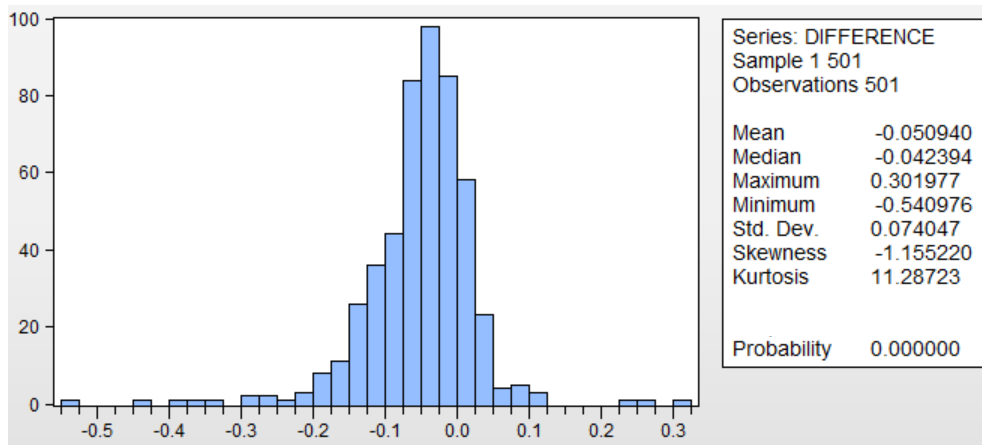


Figure 19. Histogram of the difference in returns

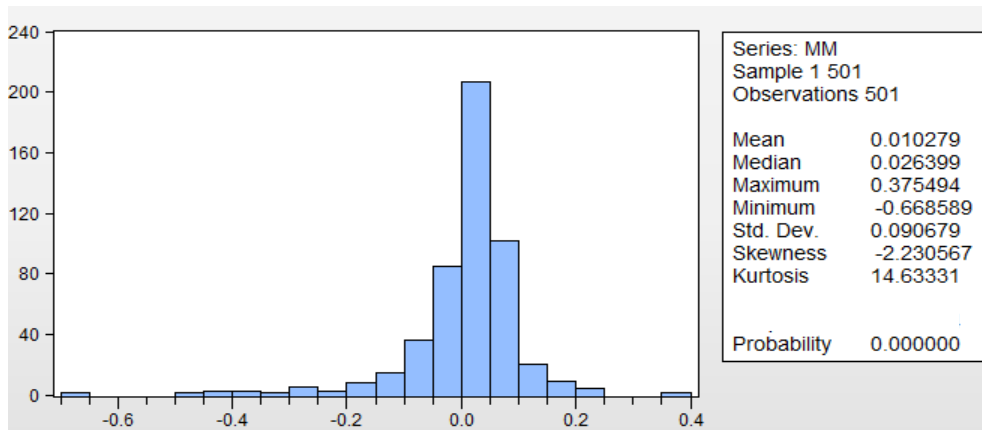


Figure 20. Histogram of the Modigliani-Modigliani Risk Adjusted Return