Efficiency in Pension Funds Management in a QE Environment: The Case of Spain

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ABSTRACT

This study analyzes the efficiency in the management of pension funds in Spain through a representative portfolio of core values where pension fund managers invest in. Through econometric techniques and using a model rooted in the tradition of mean-variance models, the existence of inefficient management and portfolio composition is observed, at a time of profound changes in European pension systems.

Keywords: Funds management, Quantitative Finance, Pensions, Efficiency, Monetary Policy.

Eficiencia en la gestión de los fondos de pensiones en un entorno de QE: El caso de España

RESUMEN

El presente estudio analiza la eficiencia en la gestión de los fondos de pensiones en España a través de una cartera representativa de los principales valores donde invierten los gestores de fondos de pensiones. A través de técnicas econométricas y mediante un modelo de media-varianza, se observa la existencia de ineficiencia en la gestión y composición de las carteras, en un momento de profundos cambios en los sistemas de pensiones europeos.

Palabras clave: Gestión, Finanzas Cuantitativas, pensiones, eficiencia, política monetaria.

Clasificación JEL: G14, G22, J32

1. INTRODUCTION. THE ACTUAL SYSTEM AND ITS DYNAMICS

Financing consumer expenditure at the hour of retirement is one of the key elements in the economic research in recent years. Until two decades ago, pensions in Spain were out of the economic discussion, based on the principles that founded the first public pension system driven by Otto von Bismarck in the re-unified Germany in the late nineteenth century (Kolmar, 2007).

However, population dynamics and the evolution of the most important macroeconomic variables make pensions a key element by two sides: on the one hand, the sustainability of the pension system as it was implemented and the sufficiency of benefits when workers finish their working life. As it is noted by M. Boldrin (Boldrin et al, 1999) and J. F Jimeno (Jimeno, 2002), demographic change by the form of aging (the elevation of both life expectancy and the average age of the population) affects all the key variables of the economic system, condensed into the following expression.

$$\frac{\text{Pension expense}}{\text{GDP}} = \frac{\text{Pensions}}{\text{Population}>65\text{yr}} \times \frac{\text{Population}>65\text{yr}}{\text{Population [16-64]}} \times \frac{1}{\text{Employment}} \times \frac{\text{Average pension}}{\text{Average productivity}} \quad (1)$$

Under the latest projections made by the European Commission (*The 2015 Ageing Report*) and the changes introduced in the last reform of the pension system in 2013 and others (see, for example, Sánchez, 2014), pension expenditure to GDP (under a scenario of no further reforms) will be situated in 18 per cent of GDP in 2050. The factors that determine this estimation are, on the one hand, the increase in the number of pensions (16.5 million by 2050) and, on the other hand, the increase in the population over 65 years (around 15 million people).

Successive reforms of the Spanish pension system (it is a well-defined contribution system) are characterized by two essential questions: the first one, they have a parametric nature through changes in parameters such as the age of retirement, the period of computation for calculating the pension base regulatory or modification of the maximum pension.

The last one, successive governments have chosen the gradual exclusion of certain expenses that were financed against the Social Security Budget during decades and now they are funded via the State Budget. This is the case of health spending (up to the 1994 reform), non-contributory pensions and probably for 2017, pensions for widows and orphans (Díaz-Saavedra, 2005).

Taking this scenario, different alternatives can be implemented in order to establish a complimentary private pension system (see, for example, Caminada and Goudswaard, 2005). Fundamentally, this new system is based on the accumulation of savings over time in a particular type of investment vehicles called "pension funds" so that the recipient can receive a complement to public

pension upon retirement.

Pension funds started in Spain from Act 8/1987 of 8th June of Plans and Pension Funds. These particular investment vehicles were boosting through the "Toledo Pact" in 1995: an agreement between political parties, businessmen organizations and unions. In this sense, this agreement published one of the most important documents that have conditioned the management of the Social Security system in the last years called "Report of the presentation for the analysis of the structural problems of the Social Security system and major reforms to be undertaken". In it, one of the main recommendations is the stimulation of private savings through pension funds encouraged with tax benefits.

Pension funds are, in fact, collective investment institutions (CII) with financial nature since the 1982 Act. In this sense, these funds have all the characteristics of a CII as well as some aspects from their origin in the insurance market. For example, the management and legal conditions come from actuarial techniques, with an obvious bias towards safety and long-term investment.

By contrast with investment funds, the government exercises an exhaustive control of the pension funds management companies and insurance companies. Supervisory competence lies in the Ministry of Economy with a General Direction dedicated to Insurance and Pension Funds, rather than do it the National Securities Commission (in Spanish, CNMV) which imposes a series of conditions to management portfolios in order to protect investors.

Figure 1
Number of participants in pension plans in Spain
*(in millions)*
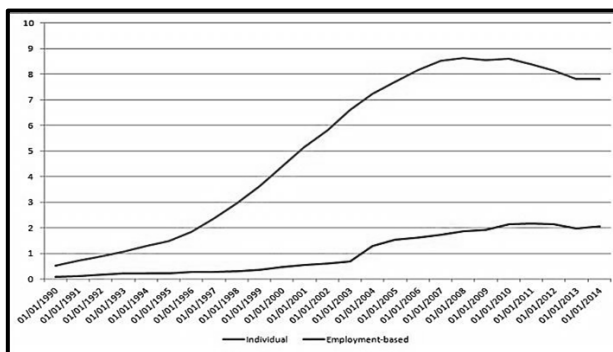
Source: Inverco.

Since 1982, pension plans, assets under management and the number of participants, have grown significantly thanks in part to the tax benefits that have been implemented over time. Both the pension fund is endowed with personal

contributions or the employer puts money on behalf of his employee, the tax law recognizes a tax benefit in the form of reduction of net income in the case of pension plans with enterprise promotion or as a reduction in the overall tax base in other pension funds up to a limit.

Figure 2
Total wealth of pension funds in Spain
(in billions)
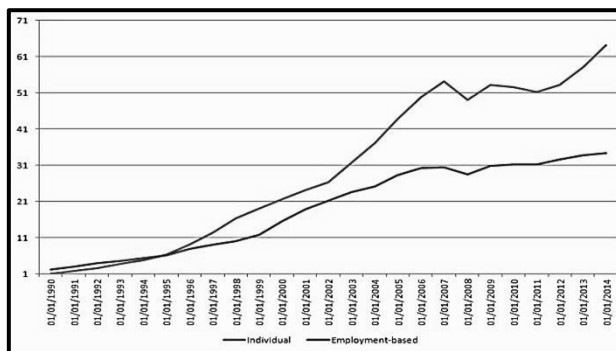
Source: Inverco.

Certainly, tax benefits have prompted many participants to subscribe pension funds, leaving aside other decision variables such as management fees, changes in expected inflation, the fiscal treatment of reimbursements in retirement (this is considered as a "salary" income and therefore it increases the probability of stepping up in a progressive tax system as it is now the personal income tax) or the historical performance of the pension plans.

The variable "return" is relegated, in the light of this evidence, to a non-important role when actually it is essential to assess the conservation of savings over time. The yield curve by each maturity –short-run and long-run fixed-income and variable income– is affected both by the movement of interest rates and by the management of the different types of managers.

As well as historical performance is considered, management fees can be considered as a proxy measure to evaluate the results of pension funds management. Although it is not possible to establish a causal relationship *ex ante* between fees and management efficiency, there is a partial correlation between higher fees and lower results in terms of annual returns of pension funds (Fernandez et al, 2015).

Taking a sample of 1,530 pension plans in 2014, the most common maximum annual fee is 1.5 per cent (all fees are charged over the accumulated wealth) while the most common maximum annual administration fee is 0.1 per cent. So, the most frequent maximum expenditure for a contributor of a pension

plan is at 1.6 per cent annually.

Figure 3
Distribution of management fees in the Spanish pension funds
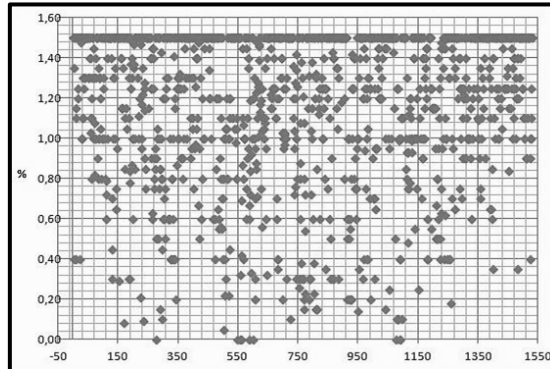
Source: Inverco.

The evidence discussed above opens many questions: are pension plans adequate vehicles in order to accumulate saving across time? Is pension funds management efficient? This second question is developed in the next section.

2. REPRESENTATIVE PORTFOLIO OF PENSION FUNDS AND THE "EFFICIENT FRONTIER"

Most pension funds in Spain are, on the one hand, based on European fixed income while, in the other hand, a small portion of them is based on variable income (Inverco, 2015). Given this evidence, a representative portfolio is built with the following European securities, characterized by the rate of return and, at the same time, it is defined by its sample mean (expected return) and its sample variance (risk).

    a. German ten-year bond

    b. Spanish ten-year bond

    c. French ten-year bond

In addition, a benchmark constructed from yields of the different bonds that are part of the European Monetary Union is defined. It can be understood as an European ten-year bond.

The return of the portfolio and its variability are defined as follows: Let $E_t(r_g)$, $E_t(r_s)$ and $E_t(r_f)$ be the expected value at time t of the annual return rates of the German, Spanish and French bonds, respectively, and let $E_t(r_c)$ be the annual return on the portfolio composed by these European securities. Also, let

$a_{g,t}$, $a_{s,t}$ and $a_{f,t}$ be the respective weights of the German, Spanish and French bonds in the representative portfolio.

Finally, let $var_t(r_g)$, $var_t(r_s)$ and $var_t(r_f)$ the variances of the rate return of German, Spanish and French bonds, respectively, which are used as a measure of the specific risk (leaving aside the classic definition of null risk in sovereign debt). Also, let $var_t(r_c)$ the average risk of the representative portfolio.

$$E_t(r_c) = a_{g,t}E_t(r_g) + a_{s,t}E_t(r_s) + a_{f,t}E_t(r_f) \tag{2}$$

$$\begin{aligned} var_t(r_c) = a_{g,t}^2 var_t(r_g) + a_{s,t}^2 var_t(r_s) + a_{f,t}^2 var_t(r_f) - 2a_{g,t}a_{s,t}cov_t(r_g,r_s) \\ -2a_{s,t}a_{f,t}cov_t(r_s,r_f) - 2a_{g,t}a_{f,t}cov_t(a_g,a_f) \end{aligned} \tag{3}$$

In a partial optimal scenario, the manager minimizes the risk of the portfolio subject to its composition in terms of the expected value of the rate returns and the different weights of the assets in the portfolio.

$$\min_{a_{g,t},a_{s,t},a_{f,t}} var_t(r_c) \tag{4}$$

$$\min_{a_{g,t},a_{s,t},a_{f,t}} a_{g,t}^2 var_t(r_g) + a_{s,t}^2 var_t(r_s) + a_{f,t}^2 var_t(r_f) - 2a_{g,t}a_{s,t}cov_t(r_g,r_s)$$
$$- 2a_{s,t}a_{f,t}cov_t(r_s,r_f) - 2a_{g,t}a_{f,t}cov_t(r_g,r_f)$$

$$s.t \; E_t(r_c) = a_{g,t}E_t(r_g) + a_{s,t}E_t(r_s) + a_{f,t}E_t(r_f)$$
$$a_{g,t} + a_{s,t} + a_{f,t} = 1$$

By each time period "t", the manager constructs an efficient portfolio, taking all the information until this moment. Taking a monthly series ranged from 1997 to 2014, the specific risk is minimized towards a non-linear optimization program.

Let $t_i \epsilon T$, where $T = \{t_1, t_2, ..., t_n\}$ is the set of periods of the sample: $\{t_1 = 1997, t_2 = 1998, ..., t_{17} = 2014\}$. In this sense, for each time instant "i", the specific risk is minimized constructing the Lagrangian function ($\mathcal{L}_t$) in order to obtain the first-order conditions.

$$\mathcal{L}_t(a_{g,t}, a_{s,t}, a_{f,t}, \lambda_t, \mu_t) = a_{g,t}^2 var_t(r_g) + a_{s,t}^2 var_t(r_s) + a_{f,t}^2 var_t(r_f) -$$

$$2a_{g,t}a_{s,t}cov_t(r_g,r_s) - 2a_{s,t}a_{f,t}cov_t(r_s,r_f) - 2a_{g,t}a_{f,t}cov_t(r_g,r_f) - \lambda_t\left(a_{g,t}E_t(r_g) + \right.$$

$$\left. a_{s,t}E_t(r_s) + a_{f,t}E_t(r_f) - E_t(r_c)\right) - \mu_t(a_{g,t} + a_{s,t} + a_{f,t} - 1) \tag{5}$$

$$
\begin{cases}
\dfrac{\partial \mathcal{L}_t}{\partial a_{g,t}} = 2a_{g,t}var_t(r_g) - 2a_{s,t}cov_t(r_g, r_s) - 2a_{f,t}cov_t(r_g, r_f) - \lambda_t E_t(r_g) - \mu_t \\[2mm]
\dfrac{\partial \mathcal{L}_t}{\partial a_{s,t}} = 2a_{s,t}var_t(r_s) - 2a_{g,t}cov_t(r_g, r_s) - 2a_{f,t}cov_t(r_s, r_f) - \lambda_t E_t(r_s) - \mu_t \\[2mm]
\dfrac{\partial \mathcal{L}_t}{\partial a_{f,t}} = 2a_{f,t}var_t(r_f) - 2a_{s,t}cov_t(r_s, r_f) - 2a_{g,t}cov_t(r_g, r_f) - \lambda_t E_t(r_f) - \mu_t \\[2mm]
\qquad \dfrac{\partial \mathcal{L}_t}{\partial \lambda_t} = -\left(a_{g,t}E_t(r_g) + a_{s,t}E_t(r_s) + a_{f,t}E_t(r_f) - E_t(r_c)\right) \\[2mm]
\qquad\quad \dfrac{\partial \mathcal{L}_t}{\partial \mu_t} = -\left(a_{g,t} + a_{s,t} + a_{f,t} - 1\right)
\end{cases}
$$

$$
F.O.C \qquad \nabla\left(\frac{\partial \mathcal{L}_t}{\partial a_{g,t}}, \frac{\partial \mathcal{L}_t}{\partial a_{s,t}}, \frac{\partial \mathcal{L}_t}{\partial a_f}, \frac{\partial \mathcal{L}_t}{\partial \lambda_t}, \frac{\partial \mathcal{L}_t}{\partial \mu_t}\right) = (0,0,0,0,0)
$$

$$
\begin{cases}
0 = 2a_{g,t}var_t(r_g) - 2a_{s,t}cov_t(r_g, r_s) - 2a_{f,t}cov_t(r_g, r_f) - \lambda_t E_t(r_g) - \mu_t \\
0 = 2a_{s,t}var_t(r_s) - 2a_{g,t}cov_t(r_g, r_s) - 2a_{f,t}cov_t(r_s, r_f) - \lambda_t E_t(r_s) - \mu_t \\
0 = 2a_{f,t}var_t(r_f) - 2a_{s,t}cov_t(r_s, r_f) - 2a_{g,t}cov_t(r_g, r_f) - \lambda_t E_t(r_f) - \mu_t \\
0 = -\left(a_{g,t}E_t(r_g) + a_{s,t}E_t(r_s) + a_{f,t}E_t(r_f) - E_t(r_c)\right) \\
0 = -\left(a_{g,t} + a_{s,t} + a_{f,t} - 1\right)
\end{cases}
$$

Now, taking the values at time t of the expected value and sample variance of the rate returns of the assets and the covariance between pears, we obtain the values of the optimal weights across time, solving this system of equations for each year of the sample.

Figure 4
Optimal weights across time
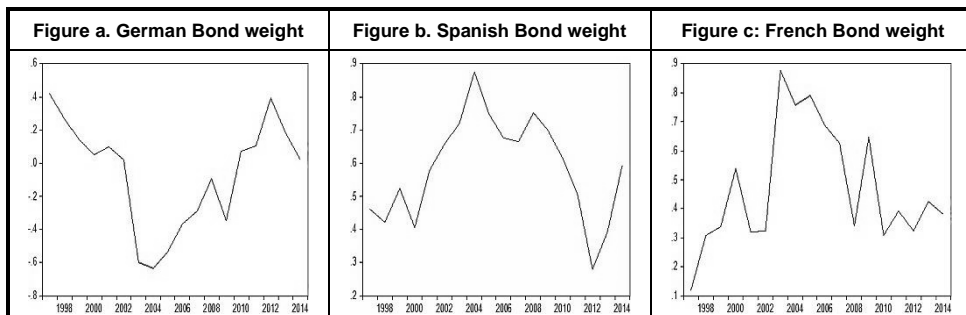
Source: Own elaboration.

Optimal weights in this optimal model have a direct relationship with the business cycle and periods of confidence crisis. That is the case of the German bond, used as a "safe haven" by investors who look for stability when markets

are wary of the economic policies and the ability of the governments to repay the debt.

The demand for a pension fund portfolio of German bonds, as it is seen in the figure before, grows in periods of volatility and lack of confidence (i.e the European Sovereign Debt crisis between 2010 and 2012). By contrast, it decreases with economic growth and financial stability. In this sense, there is key question: the optimal management guide obtained before, indicates that the portfolio manager must be "short" in German bonds in some situations.

This fact contrasts with the management strategy of pensions funds in Spain, in which the majority of portfolio managers operate only in the buy-side ("long only"). Managers usually take long positions and seldom put themselves short. The identification of short positions with risk stops the possibility of using other tools in order to do an "active" management.

Precisely, the actual perspectives for the next two years indicate that the weight of German bonds in the representative portfolio is going to shrink while the probability of being below zero grows. So, managers could be short in German bonds in the next years following the optimal management guide in the representative portfolio.

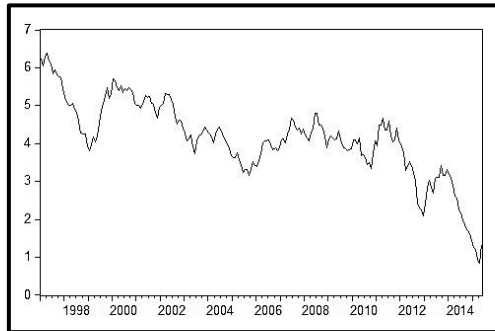**Figure 5**
German bonds weight forecast 2015-2016
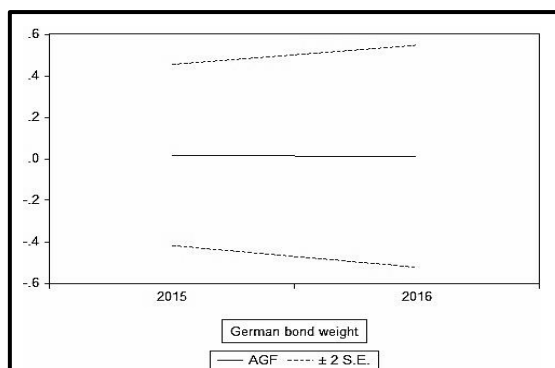
Source: Own elaboration.

3. EMPIRICAL EVIDENCE OF PENSION FUNDS MANAGEMENT IN SPAIN

The model based on the tradition of mean-variance evaluation of financial investment, shows a conservative strategy to preserve value across time. In this sense, it is possible to evaluate the performance of this portfolio and compare it with the average historical returns of the pension funds collected by Fernández et al (2015).

The figure below shows the performance of the representative portfolio between 1997 and 2014, given by the annual rate return in percentage. Its behavior is conditioned by some important events: the "Great Recession" from 2009 and 2011 and the beginning of the European Monetary Union. The financial integration process started in the final years of the 20th century has made possible an effective reduction of risk premium between countries and a progressive decreasing of bond coupons. However, the financial crisis that started in 2008 broke this process and provoked a new financial fragmentation that affects the management of portfolios biased to fixed income.

Figure 6
Rate return of the representative portfolio

Source: Own elaboration.

How did pensions funds managers react to these circumstances? Taking the figures released by Inverco (2015) or analyzed by Fernández et al (2015), the average results in the pension funds industry in Spain seem very poor with respect to the representative portfolio return at the optimum. From a population of 313 pension funds in Spain with 15 years of track record, the average return before taxes between 1999 and 2014 has been 1.2 per cent, while the optimal average return of the representative portfolio is 4.0075 per cent.

Thus, an investor who put 1,000 Euros in 1999 in a typical fund of the 313 funds contemplated in this study and the same investor who put 1,000 Euros in 1999 but in a fund that follow an optimal guidance in the representative portfolio, in 2014 could have recovered a totally different amount (net of management and deposit fees and before taxes) taking into account the average fees in Section 2[1] and the performance of the inflation rate.

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[1] In real terms applying an inflation rate of 2 per cent (the inflation target for the ECB).

Figure 7
Performance of EUR 1,000 between management strategies
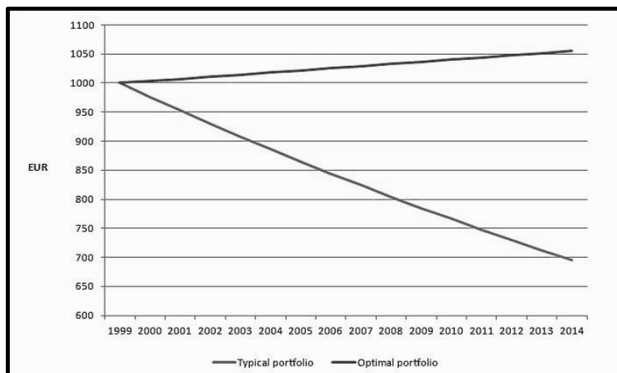
4. EFFICIENCY GAINS WITH RESPECT TO OPTIMAL GUIDANCE

Given the empirical evidence about results in pension funds management, there exists the possibility of improve the management techniques in order to obtain better results. In this sense, the expected ways of improvement for strict fixed-income pension fund managers are the following.

a) More active management through the "sell-side" (short positions) combined with a more diversified portfolio (a major grade of rotation in assets).

b) A new utilization of benchmarks with mixed portfolios. More exposition to variable income does not necessarily imply more risk thorough the time and it stimulates competitiveness between funds companies.

c) Different management fees structure, putting them linked to results directly. It introduces the incentive for pension funds managers to attract more investors.

The implementation of these changes also depends on the market circumstances, especially with the European fixed-income assets that are suffering a strong pressure from the monetary policy measures taken by the European Central Bank (ECB). In the next section it is seen the effects of Quantitative Easing program over the optimal portfolio.

## 5. PENSION FUNDS MANAGEMENT IN A QE ENVIRONMENT

The management of investment vehicles based on fixed-income assets, has become more complex thanks to the monetary intervention of Central Banks. Since 2010, in the European Monetary Union the majority of market operations

have been made through the purchase of sovereign bonds and a small share of private paper such as ABS (asset-backed securities). The purchase of public securities from banks (the ECB cannot subscribe directly public bonds from national Treasuries) became the most important action in monetary policy in 2012 in order to avoid a further market fragmentation and as a vehicle to bail-out some Euro members with serious problems of credibility.

Thus, the ECB is playing now the role of "lender of last resort", being the largest buyer of sovereign bonds. In this sense, the Frankfurt-based monetary institution has a great influence on the determination of market bond prices and, of course, on yields. The demand of bonds by the ECB has let European Treasures issue debt with the lowest interest rates. Even, some maturities in the yield curve of countries such as Germany, Belgium, France or Spain are in negative.

A large set of consequences can be stated. But in the field of fixed-income management, it can be seen the most direct one: a persistent decline in bond returns, combined to the disappearance of risk premia and price stability (zero inflation). In reality, fixed-income managers are dealing with products that have been impulse by an "artificial hand". Although the bond returns slowdown can be justified by fundamentals (the real economic growth is larger than the cost of debt in real terms), European countries are very indebted (debt is growing faster) and their sustainability depends on the decisions of the ECB.

Figure 8
Impulse responses in a 1 per cent reduction in German bond return
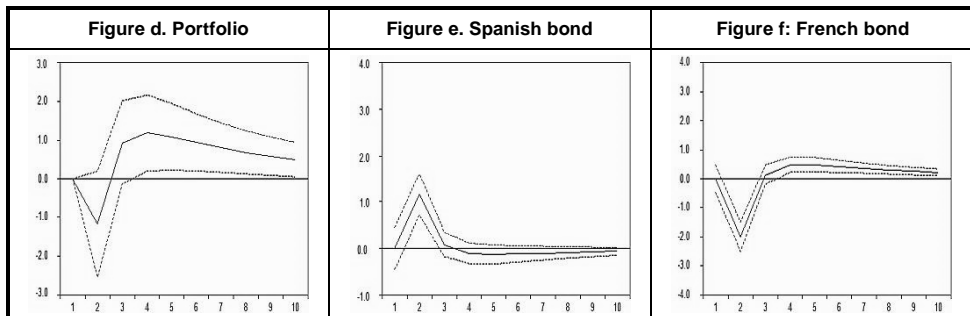
Source: Own elaboration.

Going back to fixed-income management, pension funds strategies are affected by lower interest rates in all maturities. The possibility of making carry-trade between bonds with different maturities is over while returns are getting themselves very closer. Therefore, the optimal strategies based on the representative portfolio presented before, change dramatically.

The next figures show the expected impact of a reduction of 1 per cent of the rate return of the German bond over the optimal portfolio in ten periods. Note that the largest impact is over the profitability of the representative portfolio with a strong reaction in the first periods.

The model predicts the change of correlation between German and Spanish 10-year notes will continue more time with a strong reaction at the beginning of the impulse. In spite of the fact that the risk premium is converging to zero, the performance of the Spanish debt will be rather different than the German one.

These estimations change the optimal composition of the portfolio. As it is shown before, the weight of German bonds in the representative portfolio will decrease period-by-period. However, this downtrend is accelerated thanks to the monetary measures taken by the ECB. Pension funds managers are looking for alternative assets in the fixed-income market in order to beat inflation in the long-run.

6. CONCLUSIONS

Pensions are now in the centre of the economic debate, especially in the case of the economic policy. The Spanish state spends around 12.5 percentage points of GDP in different types of retirement payments. At the same time, private pensions industry has grown faster in the last two decades but, actually, this is too small by comparison to other countries like Germany, the UK or the USA -the rate of savings in private pension funds in Spain is 8.4 per cent of GDP-.

In this sense, an improvement of the efficiency in pension funds management would be a good form to become pension funds more attractive for investors who are planning their retirement. Fees (management and administration) and inflation are the worst enemy for a saver in each moment of time, but it is even more important with fund managers that do not take the opportunity of maximizing profitability for their fund-holders.

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