Does Concurrent Management of Mutual Funds and Pension Plans Create Conflicts of Interest?*

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Abstract
The purpose of this paper is to compare the performance of mutual funds —pension plans— whose managers simultaneously manage the assets belonging to pension plans —mutual funds— with that achieved by mutual funds —pension plans— whose managers only manage the assets belonging to mutual funds —pension plans—. To do this, we present a sample consisting of data corresponding to 115 Spanish equity pension plans and 336 Spanish equity mutual funds in relation to such aspects as risk-adjusted return, management and custodial fees, asset size, creation date, number of participants, name of the asset management companies for the period between February 2007 and June 2011. On this data, we propose a model using the bootstrap technique. The results obtained show no significant relationship between side-by-side management and financial performance in the mutual fund and pension plan industries. Therefore, we do not find evidence that pension plan investors are being exploited.

Keywords: pension plans; mutual funds; side-by-side; Jensen's Alpha; multi-index model; Spanish market.

JEL: G23; G11; J32; M21.

¿Puede la gestión conjunta de planes de pensiones y fondos de inversión generar un conflicto de interés?

Resumen
El objetivo del presente trabajo es comparar el resultado financiero de los fondos de inversión —planes de pensiones— cuyos gestores manejan simultáneamente el patrimonio perteneciente a planes de pensiones —fondos de inversión— con aquel alcanzado por los fondos de inversión —planes de pensiones— y están especializados en gestionar el patrimonio de un tipo de institución de inversión colectiva. Para ello, se dispone de datos correspondientes a 115 planes de pensiones y 336 fondos de inversión que invierten en renta variable y están domiciliados en España relativos a rentabilidad ajustada al riesgo, comisiones de gestión y depósito,

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patrimonio, fecha de creación, número de participantes, entidad gestora desde febrero de 2007 hasta junio de 2011. Sobre estos datos se aplica la técnica *bootstrap*. Los resultados obtenidos indican que no hay una relación significativa entre la gestión conjunta y resultado financiero en las industrias de los fondos de inversión y los planes de pensiones. Por tanto, no se encontró evidencia de que los partícipes de planes de pensiones estén siendo explotados.

Palabras clave: planes de pensiones; fondos de inversión; alfa de Jensen; gestión conjunta; modelo multiíndice; mercado español.

JEL: G23; G11; J32; M21.

Introduction

Seeking a diversified portfolio of assets managed by professionals, investors[1] place their savings in mutual funds and pension funds,[2] thereby increasing their wealth. To achieve this objective, managers channel pension fund and/or mutual fund assets into the stock and bond market, using similar management strategies as evidenced by Freeman & Brown (2001) and Myers (2004). For this reason, some pension fund and mutual fund management companies belonging to the same financial group might come to a side-by-side agreement to manage both mutual and pension funds. This arrangement would allow mutual and pension funds to share infrastructure —such as offices in the same building and technology, etc.— and administrative assistants in order to perform back-office functions, and/or managers who concurrently manage the asset of mutual and pension funds, thereby allowing them to hold large blocks of stock or to serve on company boards in which mutual and pension funds invest and to benefit from economies of scope and/or scale derived from management expenses and transaction costs (Annaert et al., 2003; Chen & Chen, 2009).

However, the concurrent management of mutual and pension fund assets could lead to agency problems resulting from the existence of a conflict of interest between management companies —agents, who invest in stock markets on behalf of mutual and pension funds—, and pension plan investors —principal 1, who own pension fund shares—, taking into account that Mehran & Stulz (2007) define a conflict of interest as "a situation in which a party can potentially benefit from a transaction by taking actions that adversely affect its counterparty". The interest of pension plan investors and mutual fund investors is to maximize their wealth through an efficient management of funds by managers. Managers are interested in maximizing their profits by charging a management fee both to mutual funds and to pension plan funds. These management fees could reach a maximum of 2% of assets under management in the Spanish pension plan industry, while management fees may reach a maximum of 2.25% of assets under management and/or may be associated with financial performance attained in the Spanish mutual fund industry. Given that managers may receive greater compensation from

1 People who own mutual or pension fund shares, termed "participants".

2 Pension plans are long-term savings products for retirement whose participants' monetary contributions are accumulated in pension funds.

mutual rather than pension fund yields and that Spanish pension plan investors do not punish managers, whose pension plans reach lower short-term risk-adjusted returns (Martí-Ballester, 2014; 2015a), most likely because these are invested on a long-term basis, we could expect concurrent managers of pension and mutual fund portfolios to work more assiduously for their mutual fund clients than for their pension fund clients, transferring wealth from pension plans to mutual funds, which could consequently result in an underperformance compared to otherwise similar pension plans whose managers only manage pension plans' assets (Nohel, Wang & Zheng, 2010). This could cause a conflict of interest between concurrent managers —agent— who increase their profits by working more assiduously for their mutual fund clients —principal 2— than for their pension plan clients —principal 1—; the latter group may perform more poorly than their mutual fund peers or pension plan peers, whose assets are managed by management companies specialising in the pension fund industry.

Conflicts of interest in the delegated asset management industry have previously been analysed by authors who have focused on distinct aspects (Agarwal & Ma, 2012): 1) the window-dressing behaviour amongst portfolio managers (Agarwal et al., 2015), 2) strategic risk-shifting (Chevalier & Ellison, 1997; Huang, Sialm & Zhang, 2011), 3) different incentives (Cohen & Schmidt, 2009) and 4) side-by-side management (Chen & Chen, 2009; Cici et al., 2010; Nohel et al., 2010). Specifically, Cici, Gibson & Moussawi (2010) state that mutual funds that are concurrently managed with hedge funds, which offer higher financial benefits, underperformed those of mutual funds that were not associated with hedge funds. Nevertheless, Chen & Chen (2009) indicate that this only happens when a hedge fund manager starts a mutual fund, and not in the opposite case.

In order to overcome the abovementioned conflicts of interest between managers and shareholders, said literature has proposed several mechanisms. While Fama & Jensen (1983) argue that improving product competition may be a possible solution to reduce a conflict of interest between an agent and client by achieving an increased transparency and market discipline (Walter, 2004), Jensen & Meckling (1976) and Cremers et al. (2009) recommend imposing incentive compensations, which according to Kouwenberg & Ziemba (2007) would not resolve conflicts of interest. Opposing this favouritism hypothesis (Cici, Gibson & Moussawi, 2010), Nohel, Wang & Zheng (2010) propose the superior talent hypothesis (Cici, Gibson & Moussawi, 2010), stating that concurrent management could actually lead to a win-win situation, which would therefore imply a benefit for the mutual fund and pension plan investors. Regarding this matter, mutual funds have less constraint on composing their portfolios and their managers receive higher financial rewards (Agarwal & Ma, 2012) compared to pension plans. This may incentivize pension plan managers to manage mutual funds concurrently —in order to obtain increased income—, which would benefit pension plan complexes that might retain talented human capital and target different sets of clients. This puts traditional pension plan management companies at a disadvantage compared to those that concurrently manage mutual funds (Cici, Gibson & Moussawi, 2010).

On the other hand, pension plans accumulate a large and captive capital flow. Mutual fund managers that manage pension plans concurrently increase the current and future managed asset size as their employees continue to save money (Cohen & Schmidt, 2009), and consequently their income, which enables mutual fund complexes to retain talented human capital and target different sets of clientele. This puts traditional mutual fund management companies at a disadvantage compared to those that are concurrently managing pension plans (Cici, Gibson & Moussawi, 2010). Therefore, concurrent management enables mutual fund and pension plan complexes to attract talented managers, consequently increasing its revenue and its reputational capital. According to Chen & Chen (2009) and Fang (2005) the firm's reputation could reduce information asymmetry problems and a potential conflict of interest by inducing managers to manage all funds with the client's interest in mind (Chen & Chen, 2009).

Following this line of research, our paper contributes to the academic literature on agency conflicts by focusing on a previously unexplored segment of the money management industry: the effect of side-by-side management on the performance of Spanish mutual funds and pension plans, taking the work of Nohel, Wang & Zheng (2010) as reference. The results obtained show that managers who simultaneously manage mutual funds and pension plans in the Spanish market generate similar performance to that of their peers in the respective aforementioned industries. Therefore, managers do not strategically allocate returns to the detriment of pension plan investors, which is likely to be because management companies take steps to ensure that the potential conflicts of interest are not exploited.

Background and hypothesis development

According to agency theory (Dalton et al., 2007; Jensen & Meckling, 1976), an agency problem could occur in collective investment industry when the actions of managers —agents— diverge from the interests of pension plan and mutual fund participants —principals— as indicated by Connelly et al. (2010). The interests of pension plan participants differ from those of mutual fund participants in their behaviour and incentives as mentioned by Del Guercio & Tack (2002) and Martí-Ballester (2015a) because the investment time horizon is different for both of them (Neubaum & Zahra, 2006). Therefore, management companies —agent— could manage the assets belonging to principals with heterogeneous interests and disparate abilities to influence managers in order to comply with those interests, which could create an "Agency Problem II" described by Villalonga & Amit (2006).

In that sense, the objective of pension plan investors is to reach long-term high risk-adjusted returns while mutual fund investors look for high risk-adjusted returns in the short-term from a modern portfolio theory perspective (Markowitz, 1952). This could lead pension plan investors to have a weaker reaction than mutual fund investors to decrease annual risk-adjusted returns in the short term. Thus, the disposition effect, produced when investors keep their assets in poorly performing funds, is more important in the pension fund industry than in the

mutual fund industry in the short-term time horizon based on the theory of investor cognitive dissonance (Goetzmann & Peles, 1997). This could incentivize managers, who simultaneously manage mutual funds and pension plans, to favour their mutual fund clients over their pension plan clients (Nohel, Wang & Zheng, 2010), in order to attract assets belonging to new mutual fund investors while retaining cautious pension plan investors, allowing managers to increase the assets under management and their associated management fees —in absolute terms—. Therefore, we hypothesize that:

H1: Pension plans —mutual funds— involved in side-by-side arrangements significantly underperform —outperform— their peers in the pension plan —mutual fund— industry.

Management companies that simultaneously manage mutual funds and pension plans could accumulate much larger assets and number of participants than those of their peers specialized in the management of pension plans or mutual funds (Nohel, Wang & Zheng, 2010). Their investors could benefit from 1) the existence of economies of scale derived from management and transaction costs and 2) the existence of economies of scope derived from sharing material and/or human infrastructure, which allows managers to reduce their operating costs (Annaert et al., 2003; Chen & Chen, 2009) and to transfer this saving into their clients. Therefore, we hypothesize that:

H2: Pension plans and mutual funds managed by large management companies outperform those managed by small management companies.

H3: Pension plans and mutual funds managed by management companies controlling large assets belonging to a small number of participants outperform those that control small assets belonging to a large number of participants.

Management companies could be interested in the concurrent management of large mutual funds and pension plans because they may enjoy economies of scale. This would allow them to charge lower management fees and reach better risk-adjusted return which would attract new flows in proportion to their size (Del Guercio & Tkac, 2002) increasing the fees earned by managers. However, when the asset accumulated by pension plans or mutual funds exceeds the optimal size, its financial performance could be eroded due to the existence of diseconomies of scale associated with trading costs (Chen & Lai, 2010) which may deteriorate the reputation of mutual fund and pension plan managers. To prevent this, managers could charge higher fees that discourage the entry of new pension plan and mutual fund investors (Chen et al., 2004). Therefore, we hypothesize that:

H4: Large pension plans and mutual funds outperform small pension plans and mutual funds.

Large pension plans and mutual funds are more visible than small pension plans and mutual funds (Barber, Odean & Zheng, 2005). This could favour a large number of participants investing their small amounts of money and benefiting from lower information costs (Shu, Yeh &

Yamada, 2002), while being charged higher fees and commissions (Rakowski & Wang, 2009) due to small participants being less sensitive to high fees paid to managers (Martí-Ballester, 2015a). Consequently, pension plans and mutual funds reduce their risk-adjusted return while managers increase their profits. Therefore, we hypothesize that:

H5: Pension plans and mutual funds controlling large amounts of money belonging to a small number of investors outperform those that accumulate small amounts of money belonging to a large number of investors.

Large pension plans and mutual funds could be older than pension plans and mutual funds that have lower asset volume. This could reduce their financial performance given that when the asset under management increases too much decreasing economies of scale are generated (Berk & Green, 2004). Additionally, older mutual funds and pension plans could be charged higher custodial fees than their recently created counterparts in order to promote younger pension plans and mutual funds and attract new investors (Goriaev, Nijman & Werker, 2008) which, in turn, affects their financial performance. Therefore, we hypothesize that:

H6: Younger pension plans and mutual funds outperform their older counterparts.

Pension plans and mutual funds pay different percentages of fees for investment management and distribution services to management and custodian companies respectively which affect their financial performance (Chen & Lai, 2010; Khorana, Servaes & Tufano, 2008). For example, Spanish mutual funds offer higher financial rewards due to 1) performance-based fees being as a maximum equal to 18% —9%— of realized capital gains and capital appreciation and/or 2) higher management fees being as a maximum equal to 2.25% —1.35%— of assets under management, while pension plans only pay a maximum 2% of the amount of assets under management, irrespective of performance reached, which does not incentivize managers to improve their management of pension plans. Conversely, the performance-based fee could 1) incentivize managers to improve the financial performance obtained by mutual funds and 2) tempt an opportunistic concurrent manager to strategically shift returns to the benefit of mutual fund investors and the detriment of pension plan investors (Nohel, Wang & Zheng, 2010). Therefore, we hypothesize that:

H7: Pension plans and mutual funds that set high management fees underperform those that set low management fees.

H8: Pension plans and mutual funds that set high custodial fees underperform those that set low custodial fees.

H9: Mutual funds that set high performance-based fees outperform those that set low performance-based fees.

The fees and commissions charges, supported by mutual funds and pension plans, could be different depending on whether the management and custodian company belong to the same financial group. On the one hand, management and custodian companies belonging to same group could benefit from lower transaction costs due to economies of scope and scale at the financial group level. But on the other, management and custodian companies belonging to same group could charge higher asset under management costs due to the existence of conflicts of interest (Anolli & Del Giudice, 2008). To avoid the occurrence of the latter, Spanish mutual fund and pension plan laws bind management and custodian companies belonging to the same financial group to comply with an internal code of conduct that prevents conflicts of interest. Therefore, we hypothesize that:

H10: Pension plans and mutual funds managed by a management and custodian company belonging to the same financial group reach the same financial performance as pension plans and mutual funds managed by independent management companies.

Research method

Sample and data collection

To analyse the effect of side-by-side management on the performance of Spanish mutual funds and pension plans, we took monthly assets, number of participants and liquidating values corresponding to 115 and 336 individual equity[3] pension plans and equity mutual funds, respectively. The period studied was 28 February 2007 to 30 June 2011. In 2007 economic growth begins to slow, ushering in a financial crisis in Spain that lasted until 2014 (Banco de España, 2017). This financial crisis led to a sharp reduction in the number of financial groups due to mergers and acquisitions, mainly during the 2010-2011 period (Banco de España, 2017). In turn, this reduction caused mergers, liquidations, and money transfers among pension plans and among mutual funds, principally from 2011 onwards. As of June 30, 2011, the accumulated capital of the pension plans and mutual funds that are included in our sample represents 68.83% and 94.50% of the assets managed by equity pension plans and equity mutual funds, respectively. From this data, provided by the Spanish Association of Collective Investment and Pension Funds —INVERCO—, we calculated the plans' and funds' monthly returns according to the standard procedure in the literature. Additionally, we used the monthly return of the Ibex-35 index, the AFI Treasury bond index, the one-day AFI Repos index, the AFI Treasury bills with one-year maturity and the Morgan Stanley Capital International style indexes for the Spanish stock market, the International Financial Analysts —AFI— and the Morgan Stanley Capital International —MSCI—, respectively.

3 The Spanish Association of Investment and Pension Plans —INVERCO— defines equity pension plans and equity mutual funds as those whose portfolio is made up by over of 75% equity funds. However, INVERCO allows managers to temporarily increase the portion of fixed income in their portfolios —in special situations such as a stock exchange crash or financial crises— without modifying the pension plan category.

The Directorate-General for Insurance and Pension Funds —DGSFP— and the Spanish Securities and Investments Board —CNMV— also provided data for pension plans and mutual funds, respectively, in the original sample including the creation date, the name of the asset management companies, quarterly management, custodial and performance-based fees for each pension plan and mutual fund and quarterly assets managed by mutual fund management companies for the aforesaid period. Quarterly assets managed by pension fund management companies were obtained from INVERCO while the names of the managers of each pension plan and mutual fund were obtained from the Morningstar database, which enabled us to identify simultaneous managers of pension plans and mutual funds.

Mutual funds and pension plans created after 28 February 2007, those dissolved during the period, those classified in other pension plan and mutual fund categories —fixed income, mixed equity, guaranteed funds— during the period or those with missing data for any of the months considered were omitted. Thus, survival bias may appear as a result of excluding dissolved portfolios from the sample, or omitting, for methodological reasons, certain funds that existed in the period (Brown, Draper & McKenzie, 1997; Carhart, 1997). The survivorship bias overestimates the mutual funds' and pension plans' performance, as the predominant reason for excluding one fund in the sample is its extinction because of inferior or worse performance with respect to its counterparts (Rohleder, Scholz & Wilkens, 2010). However, Ferruz, Vargas & Vicente (2008) demonstrate that non-surviving Spanish mutual funds under a specific management style do not significantly underperform compared with Spanish surviving funds, finding that a significant number of non-surviving Spanish mutual funds are excluded from databases because they change the portfolio's composition and therefore they are classified in other categories such as mixed income or mixed equity categories. In the pension plans industry, Andreu, Sarto & Vicente-Gimeno (2009) report no significant changes in their inferences regarding the Spanish pension plan market by using samples that are free of survival bias, probably due to pension plans classified in a specific style switching to other categories during the period analysed. Both (Ferruz, Vargas & Vicente, 2008; Andreu Sarto & Vicente-Gimeno, 2009) use the same data sources as this paper.

Dependent variable

Our dependent variable is mutual fund and pension plan performance. To evaluate mutual fund and pension plan performance, we use the multi-index model, based on an extension of Jensen's Alpha model (1968) in a similar way to Gruber (1996), Mittelstaedt & Olsen (2003) and Blake, Lehmann & Timmerman (2002). Jensen's Alpha model (Jensen, 1968) is based on the traditional capital asset pricing model —CAPM—. This traditional model is a single-index model (Jensen, 1968) expressed in Equation [1] as follows:

$$R_{it} = \alpha_i + \beta_i r_{bt} + \mu_{it} \qquad [1]$$

Where α_i is Jensen's Alpha interpreted as a measure of outperformance or underperformance relative to a market proxy; R_{it} is the excess return of fund i at moment t over the risk-free asset; r_{bt} represents the excess return of equity index at moment t over the risk-free asset, μ_{it} is an error term. In our case, we use the monthly one-day AFI Repos index as a risk-free asset and the Ibex35 index as the equity benchmark. Said equation [1] is estimated by using the heteroskedasticity and autocorrelation consistent covariance matrix estimator proposed by Newey & West (1987) as in Martí-Ballester (2019), Nofsinger & Varma (2014) and Silva & Cortez (2016).

This traditional Jensen's Alpha model assumes that the only benchmark used by the manager is efficient; the violation of this assumption or the omission of benchmarks generates biased estimators (Ferson & Schadt, 1996). Given that the Spanish Securities and Investments Board —CNMV— allows pension plan and mutual fund managers to increase the percentage of fixed income and exceed the established limit of 25% during the time frame analysed in the present paper due to stock market falls, the use of models that only evaluate equity —such as Jensen's model, Carhart's (1997) factor model and Fama & French's (1993) factor model— and do not consider the part of the portfolio accounting for fixed income, would produce biases in the measurement results.

To overcome the bias generated by the omission of benchmarks (Ferson & Schadt, 1996; Sharpe, 1992) in the measurement of Spanish pension plan and mutual fund performance we propose a multi-index model which enables us to analyse portfolios consisting of several types of assets —with 75 to 100 per cent accounting for equities and 0 to 25 per cent consisting of fixed income— in which Spanish equity pension plans could invest.

Thus, abnormal returns are measured based on Equation [2] in a similar way to Gruber (1996), Martí-Ballester (2015b) and Mittelstaedt & Olsen (2003):

$$R_{it}= \alpha_p + \beta_m r_{mt} + \beta_d r_{dt} + \beta_l r_{lt} + \beta_s r_{st} + \beta_g r_{gt} + \beta_v r_{vt} + \beta_w r_{wt} + \mu_{pt} \quad [2]$$

Where R_{it} is the excess performance of fund i at moment t over the risk-free asset. The benchmarks used are as follows. In the first place, we include the Ibex-35 index as a proxy for investment in the Spanish stock market (m). The AFI index (d) and (l) represents the excess performance of the portfolio made up of Treasury bonds and debentures, as well as the return of a portfolio made up of Treasury bills with one-year maturity over the risk-free asset. We extend the number of benchmarks using the Morgan Stanley Capital International —MSCI— style indexes for the Spanish market: the small-cap index (s), the growth index (g) the value index (v) and the world index (w). The Ibex-35 index (m) causes multicollinearity problems resulting from the small-cap index (s), the growth index (g) and the value index (v) variables. In order to overcome this problem, the Ibex-35 index variable is regressed against the small-cap index (s), the growth index (g) and the value index (v) variables. The residual value of this regression is substituted by the original Ibex-35 index variable in model [2] in a similar way to Martí-Ballester (2014). The correlation between the independent variables

is subsequently analysed in order to determine the existence of significant multicollinearity problems.[4] To work out the monthly excess return for the plans, mutual funds and for the benchmarks, we use the monthly one-day AFI Repos index as a risk-free asset. Said equation [2] is estimated by using the heteroskedasticity and autocorrelation consistent covariance estimator proposed by Newey & West (1987).

Our multi-index model also presents advantages over another traditional risk-adjusted performance measure, the Sharpe ratio (1966). The Sharpe ratio, is based on mean-variance theory, being expressed as follows in equation [3]:

$$Sharpe\ ratio = \frac{\overline{r_{it}}}{\sigma_{r_{it}}} \qquad [3]$$

Where r_{it} is the average yearly excess return of fund *i* at moment t over the risk-free asset and σ_{rit} is the standard deviation of excess returns of fund *i* at moment t over the risk-free asset. This measure determines reward per unit of total risk and requires normal distribution in the investment returns, generating invalid results during periods of negative excess returns such as those where the stock market falls (Israelsen, 2005).

Independent variable

Our independent variable, SBS dummy, is set equal to one if the mutual fund —pension plan— is managed by management company that also manages at least on pension plan —mutual fund—, and zero otherwise. If a large number of management companies that manage both pension plans and mutual funds strategically transfer returns of a significant magnitude, then simultaneously managed pension plans and mutual funds, on average, underperform or outperform their counterparts as mentioned by Cici, Gibson & Moussawi (2010).

Control variables

The control variables have been selected considering previous findings in the literature. Thus, we use as control variables the size of the management company, the size of the mutual fund and pension plan, the age of the pension plan and mutual fund, the fees charged by custodian and management companies and the type of management company.

Management company size is measured as the natural log of the quarterly assets of each management company during the period analysed —LASSETMC— and as the natural log of the

4 Said findings are provided upon request.

quarterly assets of each management company minus the natural log of the quarterly number of participants in the management company —LINVESTMC—. The size of the mutual fund and pension plan is measured as the natural log of the monthly assets of each fund or plan —LASSET— and as the natural log of the monthly assets of each fund or plan minus the natural log of the monthly number of participants in the fund or plan —LINVEST—. The age of the pension plan and mutual fund is measured as the natural log of the number of years since the pension plan and mutual fund were set up —LAGE—.

The custodial fees are measured as a percentage over assets —CUSTFEE—, management fees are measured as a percentage over assets —MANFEE— and performance-based fees are measured as a percentage over realized capital gains —PERFEE—. The type of management company is measured as a dummy variable that takes a value of 1(0) for independent —banking— managed plans and funds —INDMC—.

Methodology

To analyse the effect of concurrent management on the performance of mutual funds and pension plans, we implement univariate analysis and multivariate analysis.

Univariate analysis

We perform univariate analysis on the relationship between financial performance and concurrent management of mutual funds and pension plans. First, we rank the pension plans —and mutual funds— in two groups: the pension plans —mutual funds— whose management companies manage both pension plans and mutual funds —SBS group— and the pension plans —mutual funds— whose management companies are specialized in managing pension plans —mutual funds—. Second, we compare the financial performance reached in these two groups in the pension plan and mutual fund industries, and perform the parametric test of differences in means —t-test— and non-parametric test —bootstrap test— for equality of medians to examine whether the concurrent funds outperform or underperform their peers managed by management companies specialized in managing mutual funds or pension plans.

The results obtained using these univariate analyses should be viewed with caution, as the performance obtained by mutual fund and pension plan management companies may be influenced by the characteristics of the industry, as suggested by Annaert et al (2003), Blake, Lehmann & Timmerman (2002), Carhart (1997) and Otten & Bams (2002).

Multivariate analysis

The above-mentioned univariate analysis does not take into account the effects of fund size, fund age, fees and type of management company on the relationship between a fund's financial performance and concurrent management. To overcome this, the effect of concurrent management on the performance of mutual funds and pension plans is set out in Equation [4]:

$$\alpha_i = constant_i + \beta_1 SBS_i + \beta_2 LASSETMC_i + \beta_3 LINVESTMC_i + \beta_4 LASSET_i + \beta_5 LINVEST_i + \beta_6 LAGE_i + \beta_7 MANFEE_i + \beta_8 CUSTFEE_i + \beta_9 PERFEE_i + \beta_{10} INDMC_i + \varepsilon_i \quad [4]$$

In order to estimate this model, we implement a bootstrap estimator. While the OLS estimator assumes homoscedasticity and normality in the error term providing biased estimators —which is attained in model 1, table 5— when these assumptions are violated, the bootstrap technique provides efficient estimators in presence of heteroscedasticity and non-normality, which are present in the error term. To detect any form of heteroscedasticity in the error term we adopt the Breusch-Pagan/Cook-Weisberg tests whose results reject the null hypothesis of homoscedasticity as shown in table 4. To check the existence of non-normality in the error term we adopt the Jarque-Bera tests whose results do not allow us to accept the null hypothesis of normality in the error term as shown in table 4. Taking these findings into account, we implement the bootstrap technique using 1000 replications. As explained by Guan (2003), this technique is a nonparametric Monte Carlo statistical test that draws 1000 hazard estimates, repeatedly replacing the sample data in order to calculate standard errors across results for these 1000 replications. This large number of replications allow us to attain the true sampling distributions, providing efficient and consistent estimators in the presence of heteroscedasticity and non-normality in the error term.

Results

Descriptive statistics

Table 1 summarizes the results obtained using a multi-index evaluation model and sets out the performance as an annualized percentage. The statistics showing the performance distribution amongst the different industries analysed show, on average, a positive risk-adjusted net —gross— return in equity pension plans and equity mutual funds, with an annualized value that ranges from 0.53% —2.55%— in pension plans without side-by-side management to 4.07% —6.60%— in mutual funds with side-by-side management.

Table 1. Pension plan and mutual fund performance

Panel A: Equity Pension Plan Performance								
Return	**Type of Management**	**No. Plans**	**Performance[a]**				**Bootstrap test (S_{115})**	**T-test**
			Min	**Max**	**Mean**	**Median**		
Net of fees	SBS Management	34	-5.9112	15.0864	1.5968	1.0296	-1.068	-1.462
	WSBS Management	81	-5.5692	19.3692	0.5288	0.0698		
Gross of fees	SBS Management	34	-3.8316	16.9764	3.3373	2.5092	-0.7841	-1.080
	WSBS Management	81	-3.3696	21.5184	2.5533	2.2608		
Panel B: Mutual Fund Performance								
Return	**Type of Management**	**No. Funds**	**Performance[a]**				**Bootstrap test (S_{336})**	**T-test**
			Min	**Max**	**Mean**	**Median**		
Net of fees	SBS Management	174	-32.1720	29.7480	4.0677	1.9974	-1.6215**	-1.803*
	WSBS Management	162	-9.9984	28.6452	2.4462	1.0680		
Gross of fees	SBS Management	174	-30.0720	37.3056	6.6080	4.3020	-1.8889**	-2.019**
	WSBS Management	162	-7.9128	36.3504	4.7191	3.2982		

Note: SBS Management: side-by-side management; WSBS Management: without side-by-side management. Statistical significance of 1%, 5% and 10% is indicated by ***, **, and *, respectively. [a] the performance is presented as an annualized percentage.

Source: Own elaboration.

Additionally, table 2 sets out the descriptive statistics of control variables and shows that the size of equity mutual funds, using the average assets —ASSET— or the average investment by participant —INVEST— variable as a proxy, is higher than that of equity pension plans, with the range of assets being greater in the case of the former. This could be due to the fact that contributions to pension plans are limited by the regulatory law, whereas mutual fund participants can invest unlimited amounts. The average age —AGE— of equity mutual funds is also higher than that of equity pension plans. Furthermore, the size —ASSETMC and INVESTMC— of mutual fund management companies is greater than that of pension plan management companies, with the former charging higher —lower— management fees —custodial fees—. We can verify that no multicollinearity problems are obtained between the abovementioned variables when implementing a correlation matrix (Sharma & James, 1981) and applying a variance inflation factor —VIF— whose results are summarized in table 3.

Table 2. Descriptive statistics for variables of equity pension plans and equity mutual funds

Variables	Management industry	Mean	Median	Standard Deviations	Maximum	Minimum
ASSETMC	**PP**	5 793 249 162.79	2 955 022 857.14	8 347 847 423.22	42 406 837 937.71	14 138 187.50
	MF	9 340 690 525.88	2 916 249 588.57	13 260 246 687.93	42 794 990 941.67	16 173 012.35
INVESTMC	**PP**	11 636.98	7713.31	9377.66	62 675.13	1944.24
	MF	30 243.12	21 689.79	33 307.97	317 140.71	7343.20
ASSET	**PP**	24 878 887.91	11 145 773.58	40 738 768.90	220 345 547.17	17 132.08
	MF	41 919 807.09	16 810 150.94	94 272 160.14	997 834 471.70	1 116 037.74
INVEST	**PP**	6540.05	5334.48	4616.44	30 517.40	342.06
	MF	29 145.99	15 351.17	66 579.13	963 344.83	1205.66
AGE	**PP**	10.36	10.74	3.02	22.47	4.51
	MF	12.47	12.25	4.04	25.25	4.25
MANFEE	**PP**	1.72	2.00	0.43	2.00	0.10
	MF	1.81	1.90	0.43	2.25	0.00
CUSTFEE	**PP**	0.22	0.15	0.16	0.50	0.00
	MF	0.13	0.11	0.06	0.20	0.00
PERFEE	**PP**	-	-	-	-	-
	MF	0.84	0.00	2.60	9.00	0.00

Note: PP: equity pension plans; MF: equity mutual funds.

Source: Own elaboration.

Table 3. Correlation matrix for regression variables

	VIF	SBS	LASSETMC	LINVESTMC	LASSET	LINVEST	LAGE	MANFEE	CUSTFEE	PERFEE	INDMC
SBS		1									
LASSETMC	1.45	0.2162	1								
LINVESTMC	1.89	0.0659	-0.0127	1							
LASSET	1.42	0.2201	0.3396	0.3158	1						
LINVEST	2.07	0.1992	0.0426	0.6343	0.3032	1					
LAGE	1.15	0.0181	-0.0008	0.1516	0.2720	0.2330	1				
MANFEE	1.29	0.0461	0.0848	-0.1231	0.1335	0.0447	0.1875	1			
CUSTFEE	1.25	0.0607	0.0289	-0.2553	-0.0196	-0.4030	-0.0254	0.0595	1		
PERFEE	1.23	0.0949	0.0684	0.1380	0.0338	0.1523	-0.0239	-0.3669	-0.0761	1	
INDMC	1.36	0.1505	-0.4197	0.2247	-0.0135	0.1036	0.0658	-0.0975	-0.1818	0.1158	1

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Note: VIF: Variance Inflation Factor.

Source: Own elaboration

Univariate analysis

To analyse the effect of concurrent management on the performance of mutual funds and pension plans, we compare the net fees and gross fees risk-adjusted performance of side-by-side pension plans —mutual funds— with their peer pension plans —mutual funds— without side-by-side management, using the bootstrap test to detect differences in two mean functions, thus making error distributions arbitrary and unequal, as indicated by Hall & Hart (1990). Table 1 summarizes the results obtained showing that mutual funds managed side-by-side outperform, on average, their peer mutual funds —bootstrap test (S_{336})= -1.6215, p-value<0.05; bootstrap test (S_{336})= -1.8889, p-value<0.05— while pension plans managed simultaneously with mutual funds obtain similar risk-adjusted returns, on average, to their peer pension plans —bootstrap test (S_{115})= -1.068, p-value>0.10; bootstrap test (S_{115})= -0.7841, p-value>0.10—. Similar results can be reached by implementing the T-test. These findings should be viewed with caution given that the fees charged by management and custodian companies, and the age and the size of mutual funds and pension plans could influence their financial performance (Annaert et al., 2003; Blake, Lehmann & Timmerman, 2002; Carhart, 1997; Otten & Bams, 2002).

Multivariate analysis

Table 4 presents the coefficient estimates for the regression in Equation [3]. The result undermines our earlier finding that side-by-side mutual fund managers outperform their peers (β_{1A} =0.7141, p-value>0.10; β_{1B} =0.7030, p-value>0.10). Conversely, for the pension plan industry, our results support our earlier finding that side-by-side pension plan managers perform in the same way as their peers (β_{1C} =-1.1881, p-value>0.10; β_{1D} =-1.1881, p-value>0.10). This would indicate that management companies that simultaneously manage mutual funds and pension plans take steps to ensure that potential conflicts of interest are not exploited.

In the pension plan and mutual fund industries, we find that the LASSETMC variable does not significantly influence the alpha of the equity mutual fund and pension plan industries (β2A= -0.4944, p-value>0.10; β2B=-0.4911, p-value>0.10; β2C=-0.3047, p-value>0.10; β2D=-0.3047, p-value>0.10). This could indicate 1) the inexistence of economies of scope or 2) the benefits from the existence of economies of scope are not being transferred to pension plan and mutual fund participants. This result is congruent with those obtained by Martí-Ballester (2015b).

In the case of the pension plan industry, we find a positive and significant relationship between the LINVMC variable and risk-adjusted return (β_{3C}=2.1462, p-value<0.10; β_{3D}=2.1461, p-value<0.10). This indicates that management companies controlling large assets belonging to a small number of participants have lower operating costs than those that manage a large number of pension plan accounts with a low amount of accumulated assets, as mentioned by Martí-Ballester (2015b). This relationship is not the same in the case of the equity mutual fund industry, probably due to the fact that the operating costs associated with participants are different depending on the type of industry.

Table 4. Performance of side-by-side mutual funds and pension plans: regression approach using multi-index alpha as a dependent variable

Variables	Mutual Funds		Pension Plans	
	Gross Return Multi-index Alpha (Model A)	Net Return Multi-index Alpha (Model B)	Gross Return Multi-index Alpha (Model C)	Net Return Multi-index Alpha (Model D)
SBS	0.7141	0.7030	-1.1881	-1.1881
	(0.9583)	(0.9679)	(1.3156)	(1.3923)
LASSETMC	-0.4944	-0.4911	-0.3047	-0.3047
	(0.3205)	(0.3265)	(0.2653)	(0.2674)
LINVESTMC	-0.9509	-0.9142	2.1462 *	2.1461 *
	(0.7946)	(0.7761)	(1.1896)	(1.2262)
LASSET	1.6252 ***	1.5840 ***	0.6164 *	0.6164 *
	(0.4972)	(0.4545)	(0.3631)	(0.3384)
LINVEST	-0.4342	-0.4220	4.8098	4.8101
	(0.5991)	(0.5474)	(3.5628)	(3.3471)
LAGE	-4.8147 ***	-4.8319 ***	-1.4850	-1.4849
	(1.3582)	(1.3091)	(0.9697)	(0.9281)
MANFEE	1.3414	0.3316	0.3995	-0.6006
	(1.2138)	(1.2683)	(0.7895)	(0.7712)
CUSTFEE	-6.9263	-8.2848	2.6928	1.6926
	(8.1123)	(7.5383)	(1.8774)	(1.8661)
PERFEE	1.3530 ***	0.8045 ***		
	(0.2249)	(0.2195)		
INDMC	0.9529	0.9660	0.4338	0.4339
	(1.3134)	(1.3561)	(1.4256)	(1.3917)
CONSTANT	11.7368	11.9694	-21.5811 *	-21.5806 *
	(11.5233)	(12.1270)	(12.5384)	(12.5952)
R-Squared	0.2125	0.1349	0.1831	0.2007
Jarque-Bera test	52.43 ***	54.47 ***	52.04 ***	53.77 ***
Breusch-Pagan test	19.15 ***	14.25 ***	10.70 ***	8.93 ***
N Observations	336	336	115	115

Note: The standard errors are reported in the parentheses, estimated using bootstrap technique —1000 replicates—. Statistical significance of 1%, 5% and 10% is indicated by ***, **, and *, respectively.

Source: Own elaboration.

The coefficient on size indicates that larger funds and plans have significantly higher alphas (β_{4A}=1.6252, p-value<0.01; β_{4B}=1.5840, p-value<0.01; β_{4C}=0.6164, p-value<0.10; β_{4D}=0.6164, p-value<0.10), suggesting the existence of scale economies associated with trading commissions and fees. This is largely consistent with the literature on pension and mutual fund performance (Capelle-Balncard & Monjon, 2014).

The LINVEST variable does not significantly influence pension plan and mutual fund risk-adjusted return (β_{5A}=-0.4342, p-value>0.10; β_{5B}=-0.4220, p-value>0.10; β_{5C}=4.8098, p-value>0.10; β_{5D}=4.8101, p-value>0.10). Therefore, pension plans and mutual funds that accumulate large assets belonging to a small number of participants perform similarly to pension plans and mutual

funds that accumulate small assets belonging to a large number of participants. This could be due to the differences between operating costs associated with the number of participants being small. However, when a management company manages a lot of pension plans whose assets belong to a large number of participants contributing small amounts of money to their pension plans, the full operating costs become significantly higher than those assumed by management companies controlling large assets belonging to a small number of participants.

An important factor that significantly and negatively affects the performance of mutual funds is their age (β_{6A}=-4.8147, p-value<0.01; β_{6B}=-4.8319, p-value<0.01). Thus, mutual funds set up earlier underperform those that have only recently been commercialized. This could be due to the fact that the older funds of our sample can accumulate higher amounts of assets than the younger ones, with the former exceeding the efficient asset size and consequently causing scale diseconomies to decrease their financial performance. This finding is congruent with those obtained by Otten & Bams (2002). On the contrary, we do not find a significant relationship between the performance of LAGE variable and pension plans (β_{6C}=-1.4850, p-value>0.10; β_{6D}=-1.4849, p-value>0.10), probably due to the fact that older pension plans can regularly pay pension benefits, consequently reducing their asset size to one similar to that of other younger pension plans in which the number of participants is greater than that of the beneficiaries (Martí-Ballester, 2014; 2015b).

As Ippolito (1989), we find that gross —before fees— and net —after fees— risk-adjusted returns are unrelated to management (β_{7A}=1.3414, p-value>0.10; β_{7B}=0.3316, p-value>0.10; β_{7C}=0.3995, p-value>0.10; β_{7D}=-0.6006, p-value>0.10) and custodial (β_{8A}=-6.9263, p-value>0.10; β_{8B}= -8.2848, p-value>0.10; β_{8C}=2.6928, p-value>0.10; β_{8D}=1.6926, p-value>0.10) fees in equity mutual fund and pension plan industries, which could result from the fact that mutual fund and pension fund managers charge similar fees to that of their peers, thus reducing the degree of competitiveness in the mutual fund and pension plan markets. On the other hand, Gil-Bazo & Ruiz-Verdu (2009) state that US equity mutual funds with worse gross performance charge significantly higher fees than those with better gross performance, this being a strategy set by mutual funds in the presence of investors with a low degree of sensitivity to performance. Similar results are reached by Otten & Bams (2002) in the German, UK and Dutch mutual fund markets.

On the other hand, the performance-based fee is positively related to the alpha of the equity mutual fund industry (β_{9A}=1.3530, p-value<0.01; β_{9B}=0.8045, p-value<0.01), indicating that a more efficient management is generated in performance-based fee funds. Thus, linking agents' pay to their performance is effective as a remedy for agency problems (Jensen & Meckling, 1976). This finding is congruent with those obtained by Díaz-Mendoza, López-Espinosa & Martínez-Sedano (2014) and Nohel, Wang & Zheng (2010).

In contrast, we find a non-statistically significant effect of management company type on pension plan and mutual fund risk-adjusted return (β_{10A}=0.9529, p-value>0.10; β_{10B}=0.9660, p-value>0.10; β_{10C}=0.4338, p-value>0.10; β_{10D}=0.4339, p-value>0.10). Therefore, management companies belonging to financial groups do not benefit from this, probably because they have an internal code of conduct to avoid conflicts of interest in compliance with the pension fund and mutual fund law.

For robustness, we employ two alternative traditional financial performance measures as dependent variables in equation [4]: 1) Jensen's Alpha and 2) Sharpe ratio. In the results reported in Tables 5 and 6 we continue to find an insignificant relationship between financial performance and concurrent management of mutual funds and pension plans. Thus, the biased results obtained using the traditional Jensen's Alpha[5] —which has omitted benchmark problems— and Sharpe ratio —whose results in our sample are almost all negative values[6]— do not affect its relation with the side-by-side —SBS— management variable. However, it does affect its relationship with other variables as shown in tables 5 and 6. Therefore the use of these measures should be employed with caution.

Table 5. Performance of side-by-side mutual funds and pension plans: regression approach using the Sharpe ratio as a dependent variable

Variables	Mutual Funds		Pension Plans	
	Gross Return Sharpe Ratio (1)	Net Return Sharpe Ratio (1)	Gross Return Sharpe Ratio (2)	Net Return Sharpe Ratio (2)
SBS	0.0079	0.0075	-2.9422	-2.9422
	0.0136	0.0139	2.8139	2.7685
LASSETMC	-0.0065	-0.0063	0.2046	0.2046
	0.0052	0.0053	0.4796	0.4607
LINVESTMC	-0.0044	-0.0069	2.5097	2.5097
	0.0135	0.0138	2.9249	2.6615
LASSET	0.0215 **	0.0232 ***	0.9430	0.9430
	0.0071	0.0073	0.9199	0.8500
LINVEST	-0.0040	-0.0038	15.9216	15.9216
	0.0093	0.0094	11.2243	10.4557
LAGE	-0.0221	-0.0262	-4.9908	-4.9908
	0.0185	0.0189	3.1836	3.1048
MANFEE	-0.0096	-0.0324 *	0.4531	-0.5469
	0.0169	0.0173	1.9317	1.9242
CUSTFEE	-0.0429	-0.0661	6.3577	5.3577
	0.1082	0.1104	4.4123	4.2556
PERFEE	0.0163 ***	0.0059 **		
	0.0027	0.0028		
INDMC	0.0053	0.0040	4.8380	4.8380
	0.0201	0.0206	2.9875	3.1976
CONSTANT	-0.1326	-0.1369	-57.0138 **	-57.0138 **
	0.1679	0.1714	22.5151	21.9876
R-Squared	0.1703	0.0866	0.1879	0.2040
Jarque-Bera test	4.361	3.704	2.052 ***	2.052 ***
Breusch-Pagan test	1.20	2.24	18.86 ***	18.43 ***
N Observations	336	336	115	115

Note: 1) The standard errors are reported in the parentheses, estimated using OLS technique. 2) The standard errors are reported in the parentheses, estimated using bootstrap technique —1000 replicates—. Statistical significance of 1%, 5% and 10% is indicated by ***, **, and *, respectively.

Source: Own elaboration.

5 Said findings are provided upon request.

6 Said findings are provided upon request.

Table 6. Performance of side-by-side mutual funds and pension plans: regression approach using Jensen's alpha as a dependent variable

Variables	Mutual Funds		Pension Plans	
	Gross Return Alpha	Net Return Alpha	Gross Return Alpha	Net Return Alpha
SBS	-0.0539	-0.0327	-1.1668	-1.1668
	0.5679	0.5595	0.9845	1.0134
LASSETMC	-0.3108	-0.3055	0.0107	0.0107
	0.2092	0.1981	0.1655	0.1603
LINVESTMC	-0.5462	-0.5325	1.1288	1.1287
	0.4850	0.4810	0.9073	0.9757
LASSET	1.1285 ***	1.1365 ***	0.3511	0.3510 *
	0.3039	0.3050	0.2244	0.2106
LINVEST	0.2505	0.2452	4.4097 **	4.4096 **
	0.3852	0.3788	1.9803	1.9469
LAGE	-0.6792	-0.7198	-1.7196 **	-1.7197 **
	0.8422	0.8309	0.6921	0.7249
MANFEE	-0.9258	0.0629	0.5502	-0.4498
	0.8794	0.8328	0.5360	0.5428
CUSTFEE	-2.9715	-1.9241	3.0127 **	2.0124
	5.0792	4.9910	1.4716	1.4710
PERFEE	0.2928 **	-0.1414		
	0.1270	0.1290		
INDMC	-0.0752	-0.0704	1.2734	1.2733
	0.8194	0.8555	0.9965	1.0142
CONSTANT	-5.5909	-5.8251	-15.8278 **	-15.8270 *
	6.7447	6.6218	8.0308	8.3592
R-Squared	0.0582	0.0087	0.2132	0.2584
Jarque-Bera test	11.13 ***	10.42 ***	12.25 ***	12.25 ***
Breusch-Pagan test	12.24 ***	7.23 ***	5.76 **	5.68 **
N Observations	336	336	115	115

Note: The standard errors are reported in the parentheses, estimated using bootstrap technique —1000 replicates—. Statistical significance of 1%, 5% and 10% is indicated by ***, **, and *, respectively.

Source: Own elaboration.

Conclusions

Spanish pension fund and mutual fund management companies sharing material and/or human infrastructure to perform back-office functions could benefit from economies of scope and/or scale derived from management expenses and transaction costs (Annaert et al., 2003; Chen & Chen, 2009). However, the concurrent management system could cause agency problems associated with a conflict of interest between the pension fund and/or mutual fund clients and

their managers in a similar way as that mentioned by Chen & Chen (2009) and Cici, Gibson & Moussawi (2010), who examined the mutual fund and hedge fund industries.

Based on the favouritism hypothesis (Cici, Gibson & Moussawi 2010), the interests obtained by pension plan investors could be affected by the financial benefits achieved by mutual fund investors, as the latter pay higher financial rewards. However, based on the superior talent hypothesis, concurrent management enables management complexes to attract talented managers who improve their reputation. This reputational capital serves as a corrective device that reduces agency problems associated with conflicts of interest. Therefore, concurrent management could benefit pension plan and mutual fund investors compared to traditional management.

Whereas previous studies have mainly been focused on evaluating concurrent management between mutual funds and hedge funds, we propose examining concurrent management between mutual funds and pension plans. In order to do this, we have implemented the bootstrap test, the traditional t-test and analysis regression to analyse data corresponding to 115 pension plans and 336 mutual funds.

Our empirical research implies that pension plans and mutual funds simultaneously managed by the same companies obtain similar results to those of their peer pension plans and mutual funds without side-by-side management despite the existence of incentives to benefit mutual fund investors. This could indicate that management companies take steps to ensure that potential conflicts of interest are not exploited. These control measures are based on dividing the simultaneously managed mutual fund and pension plan portfolios into as many portfolios as pension plans and mutual funds that have hired their services. Each portfolio is built considering legal and regulatory guidelines (Evans & Fahlenbrach, 2012). The legal and regulatory requirements for mutual funds and pension funds are different in relation to 1) the investment restrictions in their portfolios, for example pension funds must invest at least 70% of their assets in financial instruments and derivatives traded on regulated markets, banking deposits, among others, while mutual funds invest their assets in securities and financial instruments admitted to trading in certain stock exchanges, other markets or organized trading systems described in the Collective Investment Schemes Law and to 2) maximum legal management and custodial fees, for example, the Spanish pension fund law imposes a maximum annual management fee of 2% of assets under management while the Spanish mutual fund law establishes a 2.25% maximum annual management fee on assets under management or 18% maximum annual management fee on the performance obtained or 1.35% of assets under management and 9% on performance. We also find that the adoption of a performance-based-fee is an incentive to improve mutual fund performance.

Our findings could be of interest to mutual fund and pension plan management companies, investors and regulators. Mutual fund and pension plan management companies could share material and/or human infrastructure in order to perform back-office functions that would enable them to decrease their operational costs —which they do not transfer to investors— and increase the size of managed assets, consequently increasing their own benefits. Mutual fund

investors and pension plan participants could invest in mutual funds and pension plans that are managed concurrently without reducing their own financial benefits. Regulators are able to confirm that Spanish regulations have been sufficient to mitigate or prevent the existence of agency problems associated with conflicts of interest. However, given that performance-based fees are efficient in improving mutual fund performance, regulators have proposed their use in the pension fund industry. However, this type of management fee linked to financial performance is being adopted by a small number of management companies in the mutual fund and pension fund industry. Regulators should promote their use as it could increase competitiveness in the mutual and pension fund industry. Furthermore, management companies who concurrently manage mutual and pension fund assets should increase their transparency, clearly explaining —in the financial reports provided to participants— the criteria used for distributing operational costs charged to mutual funds and pension funds.

References

[1] Agarwal, V., & Ma, L. (2012, May 23). *Managerial Multitasking in Mutual Fund Industry*. Paper presented at the Fifth Singapore International Conference on Finance, Singapore. https://doi.org/10.2139/ssrn.1741282

[2] Agarwal, V., Mullally, K., Tang, Y., & Yang, B. (2015). Mandatory Portfolio Disclosure, Stock Liquidity, and Mutual Fund Performance. *Journal of Finance*, *70*(6), 2733-2776. https://doi.org/10.1111/jofi.12245

[3] Andreu, L., Sarto, J. L., & Vicente-Gimeno, L. (2009). Evaluating the Style Portfolio Performance of Spanish Equity Pension Plans. *Revista Española de Financiación y Contabilidad*, *38*(144), 545-578. https://doi.org/10.1080/02102412.2009.10779674

[4] Annaert, J., Van den Broeck, J., & Vander Vennet, R. (2003). Determinants of Mutual Fund Underperformance: A Bayesian Stochastic Frontier Approach. *European Journal of Operational Research*, *151*(3), 617-632. https://doi.org/10.1016/S0377-2217(02)00603-3

[5] Anolli, M., & Del Giudice, A. (2008). *Italian Open End Mutual Fund Costs* (MPRA Paper No. 8111). Retrieved from Munich Personal RePEc Archive website. https://mpra.ub.uni-muenchen.de/id/eprint/8111

[6] Banco de España. (2017). *Informe sobre la crisis financiera y bancaria en España, 2008-2014*. Retrieved from https://www.bde.es/f/webbde/Secciones/Publicaciones/OtrasPublicaciones/Fich/InformeCrisis_Completo_web.pdf

[7] Barber, B., Odean, T., & Zheng, L. (2005). Out of Sight, Out of Mind: The Effects of Expenses on Mutual Fund Flows. *Journal of Business*, *78*(6), 2095-2120. https://doi.org/10.1086/497042

[8] Berk, J. B., & Green, R. C. (2004). Mutual Fund Flows and Performance in Rational Markets. *Journal of Political Economy*, *112*(6), 1269-1296. https://doi.org/10.1086/424739

[9] Blake, D., Lehmann, B. N., & Timmerman, A. (2002). Performance Clustering and Incentives in the UK Pension Fund Industry. *Journal of Asset Management*, 3, 173-194. https://doi.org/10.1057/palgrave.jam.2240073

[10] Brown, S. J., Draper, G. P., & McKenzie, E. (1997). Consistency of UK Pension Fund Performance. *Journal of Business Finance & Accounting*, *24*(2), 155-178. https://doi.org/10.1111/1468-5957.00100

[11] Capelle-Blancard, G., & Monjon, S. (2014). The Performance of Socially Responsible Funds: Does the Screening Process Matter? *European Financial Management*, *20*(3), 494-520. https://doi.org/10.1111/j.1468-036X.2012.00643.x

[12] Carhart, M. (1997). On Persistence in Mutual Fund Performance. *Journal of Finance*, *52*(1), 57-82. https://doi.org/10.1111/j.1540-6261.1997.tb03808.x

[13] Chen, L. W., & Chen, F. (2009). Does Concurrent Management of Mutual and Hedge Funds Create Conflicts of Interest? *Journal of Banking and Finance*, *33*(8), 1423-1433. https://doi.org/10.1016/j.jbankfin.2009.02.006

[14] Chen, H. C., & Lai, C. W. (2010). Reputation Stretching in Mutual Fund Starts. *Journal of Banking & Finance*, *34*(1), 193-207. https://doi.org/10.1016/j.jbankfin.2009.07.013

[15] Chen, J., Hong, H., Huang, M., & Kubik, J. D. (2004). Does Fund Size Erode Mutual Fund Performance? The Role of Liquidity and Organization. *American Economic Review*, *94*(5), 1276-1302. https://doi.org/10.1257/0002828043052277

[16] Chevalier, J. A., & Ellison, G. (1997). Risk Taking by Mutual Funds as a Response to Incentives. *Journal of Political Economy*, *105*(6), 1167–1200. https://doi.org/10.1086/516389

[17] Cici, G., Gibson, S., & Moussawi, R. (2010). Mutual Fund Performance When Parent Firms Simultaneously Manage Hedge Funds. *Journal of Financial Intermediation*, *19*(2), 169-187. https://doi.org/10.1016/j.jfi.2009.04.002

[18] Cohen, L., & Schmidt, B. (2009). Attracting Flows by Attracting Big Clients. *Journal of Finance*, *64*(5), 2125–2151. https://doi.org/10.1111/j.1540-6261.2009.01496.x

[19] Connelly, B. L., Tihanyi, L., Certo, S. T., & Hitt, M. A. (2010). Marching to the Beat of Different Drummers: The Influence of Institutional Owners on Competitive Actions. *Academy of Management Journal*, *53*(4), 723-742. https://doi.org/10.5465/amj.2010.5 2814589

[20] Cremers, M., Driessen, J., Maenhout, P., & Weinbaum, D. (2009). Does Skin in The Game Matter? Director Incentives and Governance in the Mutual Fund Industry. *Journal of Financial and Quantitative Analysis*, *44*(6), 1345-1373. https://doi.org/10.1017/S0022109009990408

[21] Dalton, D. R., Hitt, M. A., Certo, S. T., & Dalton, C. M. (2007). The Fundamental Agency Problem and its Mitigation: Independence, Equity, and The Market for Corporate Control. *The Academy of Management Annals*, *1*(1), 1–64. https://doi.org/10.1080/078559806

[22] Del Guercio, D., & Tkac, P. (2002). The Determinants of the Flow of Funds of Managed Portfolios: Mutual Funds Versus Pension Funds. *Journal of Financial and Quantitative Analysis*, *37*(4), 523-557. https://doi.org/10.2307/3595011

[23] Díaz-Mendoza, A. C., López-Espinosa, G., & Martínez-Sedano, M. A. (2014). The Efficiency of Performance-Based-Fee Funds. *European Financial Management*, *20*(4), 825-855. https://doi.org/10.1111/j.1468-036X.2012.00654.x

[24] Evans, R. B., & Fahlenbrach, R. (2012). Institutional Investors and Mutual Fund Governance: Evidence from Retail-Institutional Fund Twins. *Review of Financial Studies*, *25*(12), 3530-3571. https://doi.org/10.1093/rfs/hhs105

[25] Fama, E., & French, K. (1993). Common Risk Factors in the Returns on Stocks and Bonds. *Journal of Financial Economics*, *33*(1), 3-56. https://doi.org/10.1016/0304-405X(93)90023-5

[26] Fama, E., & Jensen, M. (1983). Agency Problems and Residual Claims. *Journal of Law and Economics*, *26*(2), 327–349. https://doi.org/10.1086/467038

[27] Fang, L. H. (2005). Investment Bank Reputation and the Price and Quality of Underwriting Services. *Journal of Finance*, *60*(6), 2729–2761. https://doi.org/10.1111/j.1540-6261.2005.00815.x

[28] Ferruz, L., Vargas, M., & Vicente, L. (2008). *Size and Experience Effects on Global Funds Performance.* Paper presented at the European Financial Management Association Meeting, Athens, Greece. Retrieved from https://www.academia.edu/1812314/Size_and_experience_effects_on_global_fund_performance

[29] Ferson, W. E., & Schadt, W. (1996). Measuring Fund Strategy and Performance in Changing Economic Conditions. *The Journal of Finance*, *51*(2), 425-461. https://doi.org/10.1111/j.1540-6261.1996.tb02690.x

[30] Freeman, J. P., & Brown, S. L. (2001). Mutual Fund Advisory Fees: The Cost of Conflicts of Interest. *Journal of Corporation Law*, 26, 610-673.

[31] Gil-Bazo, J., & Ruiz-Verdú, P. (2009). The Relation between Price and Performance in the Mutual Fund Industry. *Journal of Finance*, *64*(5), 2153-2183. https://doi.org/10.1111/j.1540-6261.2009.01497.x

[32] Goetzmann, W., & Peles, N. (1997). Cognitive Dissonance and Mutual Fund Investors. *Journal of Financial Research*, *20*(2), 145-158. https://doi.org/10.1111/j.1475-6803.1997.tb00241.x

[33] Goriaev, A., Nijman, T., & Werker, B. (2008). Performance Information Dis-Semination in the Mutual Fund Industry. *Journal of Financial Markets*, *11*(2), 144-159. https://doi.org/10.1016/j.finmar.2007.10.003

[34] Gruber, M. J. (1996). Another Puzzle: The Growth in Actively Managed Mutual Fund. *The Journal of Finance*, *51*(3), 783-810. https://doi.org/10.1111/j.1540-6261.1996.tb02707.x

[35] Guan, W. (2003). From the Help Desk: Bootstrapped Standard Errors. *The Stata Journal*, *3*(1), 71-80. https://doi.org/10.1177/1536867X0300300105

[36] Hall, P., & Hart, J. D. (1990). Bootstrap Test for Difference Between Means in Nonparametric Regression. *Journal of the American Statistical Association*, *85*(412), 1039-1049. https://doi.org/10.2307/2289600

[37] Huang, J., Sialm, C., & Zhang, H. (2011). Risk Shifting and Mutual Fund Performance. *Review of Financial Studies*, *24*(8), 2575–2616. https://doi.org/10.1093/rfs/hhr001

[38] Ippolito, R. A. (1989). Efficiency with Costly Information: A Study of Mutual Fund Performance, 1965-1984. *The Quarterly Journal of Economics*, *104*(1), 1-23. https://doi.org/10.2307/2937832

[39] Israelsen, C. L. (2005). A Refinement to the Sharpe Ratio and Information Ratio. *Journal of Asset Management*, *5*(6), 423-427. https://doi.org/10.1057/palgrave.jam.2240158

[40] Jensen, M. C. (1968). The Performance of Mutual Funds in the Period 1945-1964. *Journal of Finance*, *23*(2), 389-415. https://doi.org/10.1111/j.1540-6261.1968.tb00815.x

[41] Jensen, M. C., & Meckling, W. H. (1976). The Theory of the Firm: Managerial Behavior, Agency Costs and Ownership Structure. *Journal of Financial Economics*, *3*(4), 305-360. https://doi.org/10.1016/0304-405X(76)90026-X

[42] Khorana, A., Servaes, H., & Tufano, P. (2008). Mutual Fund Fees Around the World. *The Review of Financial Studies*, *22*(3), 1279-1310. https://doi.org/10.1093/rfs/hhn042

[43] Kouwenberg, R., & Ziemba, W. (2007). Incentives and Risk-Taking in Hedge Funds. *Journal of Banking & Finance*, *31*(11), 3291–3310. https://doi.org/10.1016/j.jbankfin.2007.04.003

[44] Markowitz, H. (1952). Portfolio Selection. *The Journal of Finance*, *7*(1), 77-91. https://doi.org/10.1111/j.1540-6261.1952.tb01525.x

[45] Martí-Ballester, C. P. (2014). Determinants of Equity Pension Plan Flows. *Estudios de Economía*, *41*(1), 125-148. https://doi.org/10419/146719

[46] Martí-Ballester, C. P. (2015a). Investor Reactions to Socially Responsible Investment. *Management Decision*, *53*(3), 571-604. https://doi.org/10.1108/MD-04-2014-0207

[47] Martí-Ballester, C. P. (2015b). Can Socially Responsible Investment for Cleaner Production Improve the Financial Performance of Spanish Pension Plans? *Journal of Cleaner Production*, 106, 466-477. https://doi.org/10.1016/j.jclepro.2014.06.058

[48] Martí-Ballester, C. P. (2019). The Role of Mutual Funds in the Sustainable Energy Sector. *Business Strategy and the Environment*, *28*(6), 1107-1120. https://doi.org/10.1002/bse.2305

[49] Mehran, H., & Stulz, R. M. (2007). The Economics of Conflicts of Interest in Financial Institutions. *Journal of Financial Economics*, *85*(2), 267-296. https://doi.org/10.1016/j.jfineco.2006.11.001

[50] Mittelstaedt, H. F., & Olsen, J. C. (2003). An Empirical Analysis of the Investment Performance of the Chilean Pension System. *Journal of Pension Economics and Finance*, *2*(1), 7-24. https://doi.org/10.1017/S1474747202001208

[51] Myers, D. H. (2004). *The Reaction of Asset Flows to Performance in Pension Account Returns*. Retrieved from Northern Finance Association.

[52] Neubaum, D. O., & Zahra, S. A. (2006). Institutional Ownership and Corporate Social Performance: The Moderating Effects of Investment Horizon, Activism, and Coordination. *Journal of Management*, *32*(1), 108-131. https://doi.org/10.1177/0149206305277797

[53] Newey, W. K., & West, K. D. (1987). Hypothesis Testing with Efficient Method of Moments Estimation. *International Economic Review*, *28*(3), 777-787. https://doi.org/10.2307/2526578

[54] Nofsinger, J., & Varma, A. (2014). Socially Responsible Funds and Market Crises. *Journal of Banking & Finance*, *48*, 180-193. https://doi.org/10.1016/j.jbankfin.2013.12.016

[55] Nohel, T., Wang, Z. J., & Zheng, L. (2010). Side-by-Side Management of Hedge Funds and Mutual Funds. *The Review of Financial Studies*, *23*(6), 2342-2373. https://doi.org/10.1093/rfs/hhq008

[56] Otten, R., & Bams, D. (2002). European Mutual Fund Performance. *European Financial Management*, *8*(1), 75-101. https://doi.org/10.1111/1468-036X.00177

[57] Rakowski, D., & Wang, X. (2009). The Dynamics of Short-Term Mutual Fund Flows and Returns: A Time-Series and Cross-Sectional Investigation. *Journal of Banking & Finance*, *33*(11), 2102-2109. https://doi.org/10.1016/j.jbankfin.2009.05.001

[58] Rohleder, M., Scholz, H., & Wilkens, M. (2010). Survivorship Bias and Mutual Fund Performance: Relevance, Significance, and Methodical Differences. *Review of Finance*, *15*(2), 441-474. https://doi.org/10.1093/rof/rfq023

[59] Silva, F., & Cortez, M. C. (2016). The Performance of US and European Green Funds in Different Market Conditions. *Journal of Cleaner Production*, *135*, 558-566. https://doi.org/10.1016/j.jclepro.2016.06.112

[60] Sharma, S., & James, W. L. (1981). Latent Root Regression: An Alternate Procedure for Estimating Parameters in the Presence of Multicollinearity. *Journal of Marketing Research*, *18*(2), 154-161. https://doi.org/10.1177/002224378101800203

[61] Sharpe, W. F. (1966). Mutual Fund Performance. *The Journal of Business*, *39*(1), 119-138. Retrieved from https://www.jstor.org/stable/2351741

[62] Sharpe, W. F. (1992). Asset Allocation: Management Style and Performance Measurement. *The Journal of Portfolio Management*, *18*(2), 7-19. https://doi.org/10.3905/jpm.1992.409394

[63] Shu, P. G., Yeh, Y. H., & Yamada, T. (2002). The Behavior of Taiwan Mutual Fund Investors-Performance and Fund Flows. *Pacific-Basin Finance Journal*, *10*(5), 583-600. https://doi.org/10.1016/S0927-538X(02)00070-7

[64] Villalonga, B., & Amit, R. (2006). How Do Family Ownership, Control and Management Affect Firm Value? *Journal of financial Economics*, *80*(2), 385-417. https://doi.org/10.1016/j.jfineco.2004.12.005

[65] Walter, I. (2004). Conflicts of Interest and Market Discipline Among Financial Service Firms. *European Management Journal*, *22*(4), 361-376. https://doi.org/10.1016/j.emj.2004.06.004