# *The Performance of the Spanish Mutual Funds with Incentive Fees*

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**ABSTRACT**

This paper analyses the performance-expenses relationship in mutual funds which charge management fees total or partially on returns (*mixed* funds) and in those which charge management fees totally on assets (*asse*t funds). We apply our study to a sample of Spanish mutual funds, from 1999 to 2009. In particular, we find that *mixed* funds perform significantly better than the rest of risky funds considered. Moreover, we have found a strong positive performance-expenses relationship for *mixed* funds and negative for *asset* funds. Thus, *asset* funds which incur in relatively high expenses perform relatively bad and mixed funds relatively good, once the effect of volatility, age and size is considered. This result seems to point to a more efficiency of mixed funds, according to the Grossman and Stiglitz's efficiency criterion.

## 1. INTRODUCTION

Since the seminal paper by Jensen (1968), literature on mutual fund performance evaluation generally concludes that equity mutual funds, on average, underperform the appropriate benchmark return. One of the more recurrent arguments is the high level of fees charged; in fact, when before-expenses returns are considered fund performance is not significantly negative. In particular, Grinblatt and Titman (1989), Malkiel (1995), Droms and Walker (1996), Gruber (1996) and Cesari and Panetta (2002), among others, find that mutual funds do not underperform the market when raw returns (before-expenses) are considered. A similar result is found by Martínez (2003) for the Spanish market. Therefore, the amount of expenses charged to investors appears to be a key element in mutual fund performance evaluation.

Being that so, the aim of this paper is to analyse whether also the way that expenses are charged to investors is relevant regarding mutual fund performance evaluation and performance-expenses relationship.

Annual operating expenses include management fees, which investors have to pay to managers for portfolio supervision services; custody fee, paid for asset administration and custody, and other distribution, legal and administrative costs. The main component of expenses is management fees, usually accounting for 90-95% of them. Mutual fund management fees are generally charged to investors as a percentage of total assets under management (*asset-based fee*); thus, asset growth, instead of returns, appears to be a desirable objective from a fund managers' perspective. Additionally, current worldwide mutual fund regulation usually allows management fees to be charged total o partially on returns obtained or performance (*performance-based fee*). In fact, all the country members of the International Organization of Securities Commissions, IOSCO, except United Kingdom, allow this type of fee, although only a minority of mutual funds uses it.

Mutual funds which choose to charge management fees on returns are in fact linking the manager's remuneration to his/her effort and to the performance obtained. So, according to agency theory literature, it should be understood as a commitment to the interest of investors.

Many academic articles have theoretically analysed the optimality of this fee structure. Grinblatt and Titman (1989), Golec (1992), Roll (1992), Das and Sundaram (1998a, b and 2002), Palomino and Prat (2003) and, recently, Li and Tiwari (2009) are

some of the most significant. The prevailing conclusion is that performance-based fees seem to be more appropriate. Thus, Das and Sundaram (1998b) conclude that if risk aversion is assumed in the preferences of investors and managers, the optimal contract has to be linear, and must include a base fee for the amount of assets managed and additional remuneration depending on returns above those of a reference portfolio. The reason put forward is that this type of fee best aligns the interests of managers and investors, with managers encouraged to obtain high returns because their remuneration depends on them.

Therefore, this type of mutual funds appears as a very interesting subgroup which deserves separate analysis from the aggregate mutual fund industry. Unfortunately, mainly motivated by its low quantitative relevance (both in number of funds and asset managed) financial literature has devoted little attention to these funds.

Regarding performance issues, Volkman (1999), Elton *et al* (2003) and Giambona and Golec (2007) agree to show that U.S. mutual funds with performance-based fees perform relatively better than other actively managed funds.

Some other articles focus on the risk-taking behaviour of the managers paid on performance. For instance, Brown *et al* (1996), Chevalier and Ellison (1997), Elton *et al* (2003), Golec and Starks (2004), and Low (2006) conclude that performance-based fees may encourage risk-taking by managers as increases in stock return volatility make for bigger fees. However, since they can increase the sensitivity of the manager's portfolio to firm stock price movements, little risk can be assumed (Carpenter (2000); Ross, (2004)).

In a related article, Massa and Patgiri (2009) analyse the impact of the incentives in the manager's remuneration on the risk and performance obtained for the US mutual funds. Instead of a performance-based management fee, they consider the shape of the asset-based fee structure as the incentive component, with the percentage of fee being usually diminished as the asset volume managed increase. In our opinion, the existence of a performance-based fee may be able to capture in a more direct way the incentive to the fund manager than the shape in the asset-based fee.

This paper focuses on this small but promising group of mutual funds. In particular, the aim of the paper is to investigate the efficiency of these funds mainly through the analysis of the performance-expenses relationship.

Relevant contributions

From the efficiency point of view, higher expenses should be linked to better performance and/or services (Grossman and Stiglitz (1980)). Thus, in the absence of market frictions, equilibrium in the market for mutual funds requires that expenses adjust to make all net (after-expenses) risk-adjusted returns equal to zero. Alternatively, equilibrium requires raw (before-fee) risk-adjusted returns and expenses to be positively and linearly related. Further, the slope of the linear relation has to be one.

In the presence of market frictions, such as short-selling or borrowing constraints, trading costs, or costly search, there might be small and transitory deviations from previous condition, with some funds offering small and negative net adjusted-returns and others offering small and positive net adjusted-returns. As long as these deviations are not correlated with fund expenses, raw risk-adjusted performance and expenses will be linearly related and with a unitary slope.

Recently, Gil-Bazo and Ruiz-Verdú (2009) has found a robust negative relation between raw risk-adjusted performance and expenses in a comprehensive sample of U.S. equity mutual funds. However, that seems not to be the case for the best-governed funds, which appear to charge fees more in line with performance.

We apply our study to a sample of Spanish mutual funds, from 1999 to 2009. The typical management fee in the Spanish mutual fund industry is a fixed percentage of assets managed, with no explicit performance component. Only 7.6% of mutual funds use performance-based management fees.[1]

Comment some of the most relevant findings.

The rest of this paper is organized as follows. Section 2 describes the data and variables employed in the analysis. is presented in Section 3 presents the econometric methodology and discusses the results of the empirical model estimating the performance-expenses relationship, separately for funds using asset-based and performance-based management fees. Alternative estimation methodologies are checked in section 4, in order to evaluate the robustness of the findings, and finally, Section 5 concludes and summarizes the main findings of the paper.

## 2. DATA AND VARIABLES

[1] In a related paper, Díaz-Mendoza and Martínez (2009) analyse the attributes of a sample of mutual funds that determine the choice of a performance-based fee as opposed to an asset-based fee.

The Spanish mutual fund industry has shown a rapid increase in volume of asset managed during the last two decades. According to the Spanish Asset Management Association (*Asociación de Instituciones de Inversión Colectiva y Fondos de Pensiones,* INVERCO (2010)), the volume of assets managed by mutual funds at year-end 2009 was equivalent to 18.8% of total Spanish family savings, compared to 0.4% in 1985. Despite the massive figures of redemptions in the fund industry worldwide in 2007 and, especially, in 2008, the Spanish industry managed 0.17 trillion (compared with just 0.0017 trillion Euros in 1985), equivalent to 19.0% of GDP. This made Spain the sixth biggest European country in terms of assets managed.

In accordance with current Spanish legislation, management fees can be charged on the basis of the total volume of assets managed, the returns obtained or a combination of the two. Given the main objective of the paper, funds are classified into two groups according to the type of management fee charged. We will use the term "*asset funds*" for those that establish the management fee exclusively on volume of assets; funds that tie management fees partial or exclusively to returns are referred to as "*mixed funds*". Similar to others countries, only a minority of Spanish mutual funds tie the remuneration of managers on returns; moreover, almost all mixed funds combine the two types of fee by charging a base fee proportional to the assets managed plus an additional fee dependent on performance.

However, since November 2006 Spanish legislation has required the application of a so-called high-water mark, under which managers only receive performance fees for returns not previously achieved.

The dataset was obtained from Comisión Nacional del Mercado de Valores (CNMV), the body that supervises and inspects Spanish stock markets, and therefore mutual funds. It initially comprised monthly information regarding all the Spanish open-end funds that existed during the ten-year period from June 1999 to June 2009. The proportion of mixed funds in the Spanish fund industry is limited: only an average 7.6% of the open-end funds charge management fees on performance, accounting for a reduced 4.7% of the volume of assets.

The study is focus on the funds investing mainly on risky assets: Equity funds (EFunds) and Global funds (GFunds).[2] Equity funds include funds which invest more than 30% in equities; Global funds contain those funds whose investment policy is not

[2] Bond funds (BFunds), which invest more than 70% in fixed income assets), Guaranteed funds (GUARANT), and others funds (OTHERS) were excluded from the analysis.

precisely defined and which do not belong to any other category. This sample selection accounts for an average 40% of the number of Spanish open-end funds, but only for a 21.7% of the total asset managed in the industry. However, regarding the mixed fund group, the sample represents an average 80.4% and 81.5% of the number of funds and assets managed, respectively. So, the sample chosen can be considered as very representative of the group of funds charging management fees total or partially on performance, yielding a total of 127,257 fund-month observations.

For each mutual fund in the sample, the dataset includes the net (after expenses) asset value, total volume of assets managed, investment objective, performance-based and asset-based management fee charged, and total annual expenses.

Net asset values allow us to compute the net fund returns (NRET), which is the figure usually displayed to investors; raw (before expenses) fund returns (GRET) are obtained adding monthly expenses to the net fund returns.[3] Additionally, given the empirical evidence that incentives affect fund returns and risk-taking, we construct alternative risk-adjusted performance measures.

In order to estimate the risk-adjusted fund excess returns, (Jensen's alpha) CAPM, Fama and French (1993) and Carhart (1997) multifactor models are used. So, we need to construct the market, size (SMB), book to market (HML) and momentum (WML) factors. We use the Factset-JCF database to extract, for the period June 1999-June 2009 the following information for the Spanish Stock Market: i) monthly returns (adjusted for dividends, capital increases, splits and reverse splits), ii) the average return of the three-month interest rate of government bonds as the proxy for the return of the risk-free asset, iii) the Book-to-Market ratio is calculated by dividing the book value of the equity per share by the closing stock price, iv) the market value we consider is the product of the closing stock price and the number of shares. The alpha from CAPM is termed $\alpha_{CAPM}$, the corresponding to the three-factor Fama and French model is $\alpha_{FF}$, and, finally, the alpha for the four-factor model of Carhart is denoted as $\alpha_{FFM}$. In order to gain robustness in results, all the risk-adjusted returns are estimated separately both with net returns (after expenses, $\alpha^{N}_{CAPM}$, $\alpha^{N}_{FF}$ and $\alpha^{N}_{FFM}$) and gross returns (before-expenses, $\alpha^{G}_{CAPM}$, $\alpha^{G}_{FF}$ and $\alpha^{G}_{FFM}$).

[3] Monthly expenses are computed just dividing annual expenses (EXPENSES) by 12

Thus, we estimate the alphas of the mutual funds of the excess returns on the risk-free rate with respect to the factors. Therefore, the following evaluation models are estimated in a rolling time series regression:

$$MODEL\ 1:\ R_{pt} - r_{ft} = \alpha_{pCAPM} + \left(R_{mt} - r_{ft}\right)\beta_{mp} + u_{pt}$$

$$MODEL\ 2:\ R_{pt} - r_{ft} = \alpha_{pFF} + \left(R_{mt} - r_{ft}\right)\beta_{mp} + SMB_t\beta_{SMBp} + HML_t\beta_{HMLp} + \varepsilon_{pt}$$

$$MODEL\ 3:\ R_{pt} - r_{ft} = \alpha_{pFFM} + \left(R_{mt} - r_{ft}\right)\beta_{mp} + SMB_t\beta_{SMBp} + HML_t\beta_{HMLp} + WML_t\beta_{WMLp} + \pi_{pt}$$

where $R_{pt}$ is the return on fund $p$ in month $t$; $r_{ft}$ is the return on the risk-free asset in month *t*; $R_{mt}$ is the return on the value-weighted market portfolio proxy in $t$; $SMB_t$ and $HML_t$ are the Fama-French factors to capture the effects of size and Book-to-Market, respectively; $WML_t$ is the price momentum in *t*, calculated as the difference in month *t* between the returns on the portfolios of winners and losers. The portfolio of winners (losers) is the equally weighted portfolio containing the 30% of the stocks with the highest (lowest) returns in the previous period beginning in month *t*-12 and ending in *t*-2[4]. The constant term, the so-called Jensen alpha, measures the monthly risk-adjusted fund return.

The first alphas are estimated with a set of 36 observations, corresponding to our first 36 months and it is assigned to May 2002 for the subsequent cross-section estimation. Next the alphas corresponding to June 2002 are estimated with the first 37 observations of the sample. We continue successively up to a total of 60 months. From here, the set of observations for the alpha and betas estimation remains constant, incorporating an additional observation as it eliminates the first one. In the end, we have for each fund a series of 86 alphas relative to the four alternative models which refer to every month from May 2002 to June 2009. These risk-adjusted fund returns will be used to separately assess the performance of the "*asset funds*" versus of the "*mixed funds*" ones.

We then describe the set of fund attributes considered as control variables in the empirical model. All of them are variables likely related with the fund return, and whose effect should be considered in order to clearly identify the performance-expenses relationship.

[4] See Fama and French (1993) for details regarding the construction of the SMB and HML factors, and Jegadeesh and Titman (1993) for the construction of the momentum factor.

Firstly, we consider the number of years from the registration of the fund (AGE). The volatility of performance (VOLAT) is measured by the standard deviation of the twelve previous monthly returns of the fund, in percentage terms. Fund size is proxied by the total volume of assets managed in thousands of Euros (ASSETS).[5] Total expenses borne by the fund includes the management fee, custody fee, and other operating costs; and is computed as a percentage of the average volume of assets during the year. This annual variable is termed EXPENSES.

### 2.1.Descriptive analysis of the data

Table 1, reports the number of funds (Panel A) and the relative asset volume managed (Panel B) according to the fund investment objective (Equity, Global, Bond, Guarantee and Others funds) and the type of management charged (asset and mixed funds), at year-end of the sample period, from June 1999 to June 2009.

As mentioned before, the average number of mixed funds is 7.6% of total, going from a 4.6% in 1999 to a maximum 10.6% in 2006. Regarding the market share, mixed funds account for an average 4.7% of the assets managed, being the year 2002 the minimum (1.5%) and achieving a maximum 9.1% in 2006. It can be observed a considerable increase in the presence of mixed funds in the Spanish mutual fund industry, reaching its highest relevance in the period 2005-2007. The last two years of the sample seem to show a decrease in both the number and assets managed by mixed funds.

According to the fund investment objective, Table 1 shows that Equity and Global funds include the most part of mixed funds, in number and asset managed. It should be also highlighted the outstanding role of Global funds in this group; being they a relatively small type of funds, the number and size of mixed funds with such investment objective is very significant.

Table 2 reports summary statistics of the relevant variables for the selected sample, separately for asset and mixed funds. As can be deduced from the table, economically significant differences over the ten-year period are observed in almost all the attributes, for the two types of funds. In comparison with *asset* funds, *mixed* funds managed on average during our sample period a significant higher volume of assets, and were less volatile. These surprising findings are mainly due to the last two years of the

[5] In the empirical analysis in Section 3 this variable is measured as its neperian logarithm.

sample, where a substantial increase in size and a noteworthy reduction in the risk-taking behaviour of the mixed funds took place.[6] As expected, mixed funds are younger than asset funs, and have been slightly more expensive than asset funds, according to the total annual expense ratio.

It is remarkable the negative performance obtained for the Spanish equity *asset* funds, independently of the measure considered. All the before-expenses measures of performance are on average negative, except when the four-factor Carhart model is used. For instance, the monthly mean raw risk-adjusted return (when the CAPM model is used) reaches the negative figure of -0.02%. This is consistent with the findings of the literature on Spanish mutual fund evaluation.[7]

However, the performance evaluation of the Spanish equity funds which charge management fee on returns is not so negative; in fact, only one of the measures of raw performance is negative. For comparison, the monthly mean raw risk-adjusted return (when the CAPM model is used) is +0.03 for the *mixed* funds. Such a statistically significant difference in performance is robust across the alternative measures considered. Note also the readers that all the maximum (minimum) values of the alternatives risk-adjusted returns are higher (lower) for the mixed funds than for the asset ones.

Although next section will analyse more in depth this issue, these findings seem to put forward a different behaviour between *asset* and *mixed* funds in terms of asset management and performance evaluation.

In Table 3, the coefficients of correlation between all the variables considered are presented, separately for *asset* and *mixed* funds. Regarding the differences between both types of funds, two issues of interest appear. Firstly, the correlation between the performance measures with and without risk adjusts, seems to be consistent but moderately higher for mixed than for asset funds. This seems to point to a likely distinct role played by the fund volatility. Secondly and more important, expenses correlate negatively with all measures of asset funds performance (even for the before-expenses ones), but positive and quite largely for the mixed ones. Thus, for the raw risk-adjusted returns based on the CAPM, FF three-factor, and Carhart four-factor models, the

[6] The year by year statistics of the sample are not shown in the tables, but are available to readers upon request.

[7] For the Spanish market, most of the empirical studies conclude that mutual funds, on average, underperform the appropriate benchmark return. See, for instance, Rubio (1993), Martínez (2003).

correlations with the annual expenses become 0.29, 0.14 and 0.23, respectively, for the mixed funds; whereas that for the asset funds the figures are -0.07, -0.10 and-0.06. We will go back to this relevant issue in the empirical section of the paper.

Additionally, in order to analyze in depth the statistic differences between *mixed* funds and *asset* funds, we use the simple matching estimator methodology of Abadie and Imbens (2006).[8] This methodology provides a systematic procedure to find matches when matching is done on several variables simultaneously. In the simple methodology used, only one matched fund is considered. So, each *mixed* fund is matched to one *asset* fund with similar values of one or more matching variables (size, age, expenses, and the investment objective). The difference between *mixed* and *asset* funds is estimated by averaging the differences between each mixed fund and the corresponding matched asset fund. A positive coefficient indicates that the value of the performance variable is higher for *mixed* funds than for *asset* funds.

In table 4, we analyse the annual performance, computed as the sum of the twelve monthly ones. Panel A reports the average of the differences in the annual performance measures between *mixed* and *asset* funds, and the *t*-statistic for 5% significance in these differences. Panel B shows the matching estimator (and *t*-statistic) for differences between the *mixed* and the matched *asset* funds, using individually size, age and expenses as matching variables. In Panel C we use simultaneously the matching variables simultaneously.

Panel A corroborates the negative performance obtained for the Spanish equity *asset* funds, and the significantly better behaviour of the *mixed* funds, also in annual terms. As such differences could be motivated by attributes others than the way the management fee is charged, Panels B and C compares the performance of *mixed* and *asset* funds with similar attributes, the matching variables. Thus, for instance, the first value in Panel B indicates that *mixed* funds on average obtain an annual net return 2.88% higher than the one earned by matched *asset* funds, with a similar asset volume (as the matching variable is size, ASSETS). Although not all the values are statistically different from cero, it should be pointed out that all the estimators are positive, independently of the performance measure and the matching variables considered. It allows us to conclude that *mixed* funds performed on average better than *asset* ones with similar size, age and expenses. The economic significance of such an improvement is

[8] See Abadie *et al*. (2004) for the implementation of the matching estimator in Stata, and Gil-Bazo, Ruiz-Verdú and Santos (2009) for an application in the US fund industry.

(as expected) higher for the raw performance measures, accounting for a 3.53% in the gross annual returns. This difference is substantial, considering that the average raw return for *mixed* funds is -0.23 %. Regarding the risk-adjusted measures, the estimators go from 0.06% to 0.24%.

## 3. METHODOLOGY

This section deals with the efficiency of the Spanish risky mutual funds. As mentioned before, the focus is to analyse the differences between the funds which charge the management fee exclusively on asset volume (asset funds) and the ones which tie the management fee total o partially on the performance. Our hypothesis is that *mixed* funds are more efficient than *asset* funds. If that is the case, it could be concluded that the commitment with investors that the performance-based fee implies, works in the correct way, increasing the returns to investors. Thus, mixed funds should be considered as an exceptional type of funds, in spite of its limited presence in the fund industry worldwide.

The analysis of the fund efficiency will be carried out through two complementary strategies. The first one is to analyse the alternative risk-adjusted estimations. We will evaluate the differences between the two groups of mutual funds performance just reporting the proportion of estimations (significantly) positive and negative, for the alternatives measures considered. Our hypothesis is that the proportion of significantly positive fund-month observations is higher in the *mixed* funds than in the *asset* funds. Secondly, we will examine the performance-expenses relationship. According to the Grossman and Stiglitz's efficiency criterion, a positive cross- sectional relationship should be found between the before-expenses fund performance and the expenses charged. We will expect a significant difference in the estimated slope of that linear relation for both groups of funds, being bigger for the *mixed* funds than for the *asset* ones. This will allow us to confirm a higher efficiency of the Spanish *mixed* funds.

### 3.1.- Performance evaluation

In order to assess the differences in performance shown in table 2, we report in Table 5 the distribution of the fund-month performance measures observations in our sample according to its quantity, separately for the two groups considered. Panel A

details the percentage of positive values for the net (NRET) and gross returns (GRET), and for the alternatives estimations of risk-adjusted returns ($\alpha^{N}_{CAPM}$, $\alpha^{N}_{FF}$ , $\alpha^{N}_{FFM}$, $\alpha^{G}_{CAPM}$, $\alpha^{G}_{FF}$ and $\alpha^{G}_{FFM}$). Panels B and C report the percentage of statistically significant (at the 5% of significance) positive and negative estimations, respectively.

As expected from Table 2, less than one half of the risk-adjusted estimations for the asset funds are positive. Attending to the raw risk-adjusted measures, the figures go from 36% for the three-factor model to 48% for the CAPM and the four-factor ones. The estimations for the mixed funds are significantly better, suggesting a better performance of these funds. When we look at the risk-adjusted estimations after expenses (the net ones), no relevant differences are found, except $\alpha^{N}_{CAPM}$; this confirm that mixed funds have been more expensive than asset funds in our sample period.

Panel B, corroborate previous results. *Mixed* funds obtained significantly positive risk-adjusted more often than *asset* funds, especially before expenses. The percentage of such a fund-month observations are in the range of 7%-11%, depending on the model considered; whereas that for the asset funds the range is 4%-8%.

Regarding the percentage of significantly negative risk-adjusted estimations, Panel C reveals that, surprisingly, they occur more often in mixed funds than in asset funds. However, these percentages are smaller than the ones in Panel B.

To sum up, Table 5 reports evidence that for our sample and period considered mixed funds perform better that asset funds, although the bad mixed funds seems to be worst than the bad asset funds. Elton *et al* (2003) find similar evidence for the US fund market.

### 3.2.- Performance-expenses relationship

Once evaluated the performance of "*asset funds*" and "*mixed funds*", next we try to analyze whether there is a relationship between the ability to generate abnormal returns and the fund expenses.

In a well-functioning market, expenses would adjust to ensure that, in equilibrium, net (after-expenses) performance is equalized across funds. Therefore, in equilibrium, differences in expenses would equal differences in raw (before-fee) performance, so the slope of a regression of raw performance on fees would be one. If expenses adjusted only partially to differences in performance, that slope would be positive but less than one. In contrast to this prediction, Gil-Bazo and Ruíz-Verdú

(2009) found a puzzling negative relation between raw performance and expenses in a sample of diversified U.S. equity mutual funds: funds with worse raw performance charge higher expenses. In a cited article, Gruber (1996) drew attention to the puzzle that investors buy actively managed funds even though, on average, they provide lower net risk-adjusted returns than index funds. Their results uncover yet another puzzling fact about the industry of actively managed mutual funds. Since this evidence of apparently anomalous negative expenses-performance relation is at odds with economic intuition and the predictions of a benchmark competitive model they subject it to a battery of robustness tests, and they found that it survives all of them. Finally, they show that this relation may be explained as the outcome of strategic fee setting by mutual funds in the presence of investors with different degrees of sensitivity to performance.

Therefore, this study tries to contrast if the results obtained by the literature are driven by asset-based fee funds. Taking into account that the vast majority of funds belong to this type, the results could be explained by the high proportion of asset-based fee funds. This study will analyze the relation risk-adjusted performance-expenses in both groups of funds, asset funds and mixed funds (performance-based fees funds), separately. We hope that this relation is not so negative, at least in group of funds with performance-based fees. This would mean that m*ixed* funds are more efficient than asset funds. Therefore, the following models are estimated with a cross-sectional regression for each of the 80 months from May 2002 until December 2008[9]:

$$MODEL\ \ 7:\ \ \alpha_{pCAPMt} = \lambda_0 + \lambda_1 \exp enses_{pt} + u_{pt}$$
$$MODEL\ \ 8:\ \ \alpha_{pFFt} = \lambda_0 + \lambda_1 \exp enses_{pt} + \varepsilon_{pt}$$
$$MODEL\ \ 9:\ \ \alpha_{pFFMt} = \lambda_0 + \lambda_1 \exp enses_{pt} + \pi_{pt}$$

where $\alpha_{pCAPMt}$ is the alpha from CAPM for investment fund $p$ in month $t$; $\alpha_{pFFt}$ is the alpha from Fama and French (1993) model for investment fund $p$ in month $t$; $\alpha_{pFFMt}$ is the alpha from Carhart (1997) model for investment fund $p$ in month $t$ and $\exp enses_{pt}$ is the monthly expense, computed as annual expenses borne by the fund (adding in the

[9] We run 80 cross-sectional regressions and not 86 because the annual expense of funds for 2009 it is not available.

management fee, custody fees, and other operating costs) as percentage of the average volume of assets during the year divided by 12.

Results in Table 6 show the time average of the coefficients in previous models, including volatility, age and size (measured as the neperian logarithm of the asset volume) as control variables. Once again we report separately the results for the asset funds and the mixed ones. We will focus mainly on the coefficient of the expenses variable.

The results are very revealing. For the total sample, the performance-expenses relationship is clearly negative, even for the before-expenses case. Similar to Gil-Bazo and Ruiz-Verdú (2009) for the US market, we find that the Spanish risky funds with relatively bad performance do not charge the lowest management fees or expenses. On the contrary, they seem to charge higher than the average expenses. That is, in a cross-sectional analysis funds which incur in relatively high (low) expenses perform relatively bad (good), contrary to the efficient principle.

Going separately to the *mixed* and *asset* funds, we find exceptionally significant differences. For the *asset* funds, the slope of the performance-expenses estimation is significantly negative, irrespective of the performance measure considered, as for the total sample. The cross-sectional effect of fund expenses on the risk-adjusted performance is very close to minus one for the raw measures and average -1.5 for the after-expenses ones. However, the group of *mixed* funds seems to conduct in a remarkably contrasting way. Irrespective of the performance measure, fund expenses vary cross-sectionally in the same direction than performance; better (worse) funds incur in higher (lower) expenses. Thus, it seems there be a positive relationship between returns offered to the investors and the cost they have to pay for them, for these funds.

Regarding the no risk-adjusted returns, the average coefficient of the cross-section performance-expenses estimation is 6.4 for the gross returns, but (obviously lower) even 5.4 for the after-expenses ones. So, on average, *mixed* funds charging 1% of asset volume as annual expenses obtained 0.53% less raw monthly returns than funds charging 2% as expenses.[10] For the net risk-adjusted performance, the coefficients are bigger than 1.5, and very close to 2, for the before-expenses measures.

[10] For the *asset* funds, the same increase in expenses will reduce raw monthly returns 0.028%.

It is also interesting to note that the performance of mixed funds is to some extent better estimated (in terms of the explained variance) in the models of Table 6 than the asset ones.

## 4.- ROBUSTNESS ANALYSIS

Several additional analyses have been performed to analyze the robustness of the results. These and the results obtained are as follows.

1. We use the novel multi-way clustering econometric methodology outlined by Petersen (2009) –in a Finance context- and by Gow *et al.* (2009) –in Accounting- in order to control for cross-sectional and time-series dependence. We use as clusters the investment fund and the date to correct for cross-sectional and time-series dependence simultaneously. Also we develop a SAS program to estimate three-way cluster-robust standard errors, following the theoretical derivation in Cameron *et al.* (2009). This allows us to simultaneously correct for within-date (time-series) dependence, within-investment funds (cross-sectional) dependence and within-investment style (cross-sectional) dependence. The results clearly show a negative relation between before-fee performance and fees for asset-based funds but this is not the case for performance-based ones. The R-square of these pooled time-series cross-sectional (models 7, 8 and 9) regressions are lower than those obtained with cross-sectional regressions.[11]
2. Net and raw no risk-adjusted fund returns (NRET and GRET, respectively) are available form June 1999 to June 2009. We have estimated models 7-9 with these data and results maintain unaltered.
3.

## 5. CONCLUDING REMARKS

The efficiency of Spanish funds which charge management fees total or partially on returns (*mixed* funds) is analysed in detail. Both, the percentage of risk-adjusted performance measures and the matching estimators allow us to conclude that *mixed* funds perform significantly better than the rest of risky funds considered.

[11] All results and/or SAS program to estimate three-way cluster-robust standard errors are available upon request.

Moreover, we have found strong cross-section evidence that for *mixed* funds, expenses affect performance positively, once the effect of volatility, age and size is considered; whereas that this effect is negative for the rest of funds. This result seems to point to a more efficiency of mixed funds, according to the Grossman and Stiglitz's efficiency criterion.

To be completed

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# TABLES

Table 1. Distribution of the Spanish fund industry

Panel A shows the distribution of the Spanish fund industry at year-end from 1999 to 2009 period, grouped according to the type of management fee charged. *Asset* funds charge management fees on the basis exclusively of the total assets managed, and *mixed* funds total or partially on the returns obtained. Funds are classified depending on their investment objectives: equities, EFunds; fixed-income assets, BFunds; global, GFunds, Guaranteed, GUARAN, and others. The number of funds of each type is reported. Panel B reports the relative percentage of asset managed for each type of mutual fund.

Panel A

| | | 1999 | 2000 | 2001 | 2002 | 2003 | 2004 | 2005 | 2006 | 2007 | 2008 | 2009 | total |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **EFunds** | ***Asset*** | 558 | 722 | 848 | 833 | 716 | 696 | 687 | 700 | 724 | 711 | 585 | 7780 |
| | ***Mixed*** | 68 | 81 | 84 | 87 | 97 | 89 | 106 | 107 | 87 | 58 | 60 | 924 |
| | ***Total*** | 626 | 803 | 932 | 920 | 813 | 785 | 793 | 807 | 811 | 769 | 645 | 8704 |
| **BFunds** | ***Asset*** | 884 | 897 | 849 | 828 | 862 | 833 | 813 | 779 | 774 | 789 | 767 | 9075 |
| | ***Mixed*** | 22 | 31 | 23 | 26 | 28 | 25 | 28 | 39 | 30 | 35 | 35 | 322 |
| | ***Total*** | 906 | 928 | 872 | 854 | 890 | 858 | 841 | 818 | 804 | 824 | 802 | 9397 |
| **GFunds** | ***Asset*** | 43 | 98 | 93 | 100 | 144 | 196 | 229 | 267 | 311 | 335 | 145 | 1961 |
| | ***Mixed*** | 9 | 16 | 21 | 32 | 52 | 90 | 117 | 151 | 159 | 134 | 56 | 837 |
| | ***Total*** | 52 | 114 | 114 | 132 | 196 | 286 | 346 | 418 | 470 | 469 | 201 | 2798 |
| **GUARANT** | ***Asset*** | 582 | 605 | 637 | 597 | 620 | 664 | 724 | 780 | 837 | 846 | 841 | 7733 |
| | ***Mixed*** | 1 | 1 | 2 | 5 | 4 | 1 | 1 | 2 | 4 | 4 | 21 | 46 |
| | ***Total*** | 583 | 606 | 639 | 602 | 624 | 665 | 725 | 782 | 841 | 850 | 862 | 7779 |
| **OTHERS** | ***Asset*** | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 165 | 165 |
| | ***Mixed*** | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 60 | 60 |
| | ***Total*** | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 225 | 225 |
| **total** | ***Asset*** | 2067 | 2322 | 2427 | 2358 | 2342 | 2389 | 2453 | 2526 | 2646 | 2681 | 2503 | 26714 |
| | ***Mixed*** | 100 | 129 | 130 | 150 | 181 | 205 | 252 | 299 | 280 | 231 | 232 | 2189 |
| | ***Total*** | 2167 | 2451 | 2557 | 2508 | 2523 | 2594 | 2705 | 2825 | 2926 | 2912 | 2735 | 28903 |

Panel B

| | | 1999 | 2000 | 2001 | 2002 | 2003 | 2004 | 2005 | 2006 | 2007 | 2008 | 2009 | total |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **EFunds** | ***Asset*** | 19.60 | 25.01 | 19.68 | 14.19 | 13.16 | 12.43 | 13.96 | 15.02 | 13.99 | 7.65 | 7.03 | 14.73 |
| | ***Mixed*** | 1.11 | 1.46 | 1.00 | 0.71 | 0.78 | 1.13 | 1.57 | 1.76 | 1.46 | 0.39 | 0.48 | 1.14 |
| | ***Total*** | 20.71 | 26.47 | 20.68 | 14.90 | 13.94 | 13.56 | 15.53 | 16.78 | 15.44 | 8.04 | 7.51 | 15.87 |
| **BFunds** | ***Asset*** | 55.41 | 48.55 | 54.24 | 61.54 | 58.79 | 55.71 | 52.37 | 47.48 | 48.29 | 54.85 | 53.76 | 53.36 |
| | ***Mixed*** | 0.57 | 0.61 | 0.24 | 0.20 | 0.28 | 0.32 | 0.46 | 1.27 | 1.21 | 1.23 | 1.35 | 0.71 |
| | ***Total*** | 55.99 | 49.16 | 54.48 | 61.74 | 59.07 | 56.02 | 52.83 | 48.75 | 49.50 | 56.07 | 55.11 | 54.07 |
| **GFunds** | ***Asset*** | 0.41 | 0.84 | 1.09 | 0.93 | 2.59 | 3.48 | 4.30 | 6.51 | 6.35 | 4.49 | 1.36 | 3.22 |
| | ***Mixed*** | 0.31 | 0.37 | 0.43 | 0.54 | 0.91 | 4.29 | 4.74 | 6.04 | 5.29 | 1.81 | 0.60 | 2.65 |
| | ***Total*** | 0.73 | 1.22 | 1.52 | 1.46 | 3.50 | 7.77 | 9.03 | 12.55 | 11.64 | 6.30 | 1.96 | 5.87 |
| **GUARANT** | ***Asset*** | 22.58 | 23.10 | 23.32 | 21.83 | 23.47 | 22.63 | 22.59 | 21.89 | 23.36 | 29.43 | 29.94 | 23.76 |
| | ***Mixed*** | 0.01 | 0.06 | 0.01 | 0.08 | 0.01 | 0.01 | 0.02 | 0.03 | 0.06 | 0.15 | 0.44 | 0.07 |
| | ***Total*** | 22.58 | 23.16 | 23.33 | 21.90 | 23.48 | 22.64 | 22.61 | 21.92 | 23.41 | 29.58 | 30.38 | 23.83 |
| **OTHERS** | ***Asset*** | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 3.88 | 0.28 |
| | ***Mixed*** | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 1.15 | 0.08 |
| | ***Total*** | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 5.04 | 0.36 |
| **total** | ***Asset*** | 98.00 | 97.51 | 98.33 | 98.48 | 98.01 | 94.25 | 93.21 | 90.91 | 91.99 | 96.42 | 95.97 | 95.35 |
| | ***Mixed*** | 2.00 | 2.49 | 1.67 | 1.52 | 1.99 | 5.75 | 6.79 | 9.09 | 8.01 | 3.58 | 4.03 | 4.65 |
| | ***Total*** | 100.00 | 100.00 | 100.00 | 100.00 | 100.00 | 100.00 | 100.00 | 100.00 | 100.00 | 100.00 | 100.00 | 100.00 |

Table 2: Descriptive statistics for the sample considered

The Table shows the descriptive statistics for age (AGE), volatility (VOLAT), assets managed in thousands of Euros (ASSETS), total expenses over assets (EXPENSES), and alternatives measures of performance: net return (NRET), gross return (GRET), and the estimations of the risk-adjusted fund excess returns, (Jensen's alpha), according to the CAPM ($\alpha_{CAPM}$), the Fama and French (1993) ($\alpha_{FF}$) and the Carhart (1997) ($\alpha_{FFM}$) multifactor models, both with net and raw returns. The asterisk stands for 5% significance in the differences in averages test between *asset* funds and *mixed* funds.

| | | Obs | Mean | Std. Dev. | Min | Max | t |
|---|---|---|---|---|---|---|---|
| **ASSETS** | ***Asset*** | 107229 | 45346.52 | 103791.00 | 1.00 | 2278357.00 | |
| | ***Mixed*** | 20028 | 54500.47 | 165513.70 | 1.00 | 2975930.00 | |
| | ***Total*** | 127257 | 46787.19 | 115756.30 | 1.00 | 2975930.00 | -10.28 |
| **VOLAT** | ***Asset*** | 106969 | 3.80 | 2.78 | 0.00 | 65.15 | |
| | ***Mixed*** | 19995 | 3.09 | 2.74 | 0.00 | 46.18 | |
| | ***Total*** | 126964 | 3.69 | 2.79 | 0.00 | 65.15 | 33.19 |
| **EXPENSES** | ***Asset*** | 8968 | 1.78 | 0.81 | 0.00 | 17.74 | |
| | ***Mixed*** | 1624 | 1.82 | 1.10 | 0.00 | 19.26 | |
| | ***Total*** | 10592 | 1.79 | 0.86 | 0.00 | 19.26 | -1.70 |
| **AGE** | ***Asset*** | 107178 | 6.24 | 4.46 | 0.00 | 22.64 | |
| | ***Mixed*** | 19988 | 4.76 | 3.93 | 0.00 | 22.10 | |
| | ***Total*** | 127166 | 6.01 | 4.41 | 0.00 | 22.64 | 44.02 |
| **NRET** | ***Asset*** | 106531 | -0.18 | 4.86 | -98.92 | 102.61 | |
| | ***Mixed*** | 19837 | -0.08 | 4.41 | -96.79 | 74.83 | |
| | ***Total*** | 126368 | -0.16 | 4.79 | -98.92 | 102.61 | -2.60 |
| **GRET** | ***Asset*** | 98492 | -0.05 | 4.63 | -68.48 | 92.50 | |
| | ***Mixed*** | 18314 | 0.02 | 4.28 | -90.64 | 74.95 | |
| | ***Total*** | 116806 | -0.04 | 4.58 | -90.64 | 92.50 | -1.72 |
| $\alpha^{N}_{CAPM}$ | ***Asset*** | 44354 | -0.19 | 0.66 | -3.20 | 2.72 | |
| | ***Mixed*** | 6170 | -0.17 | 0.69 | -2.46 | 3.16 | |
| | ***Total*** | 50524 | -0.19 | 0.67 | -3.20 | 3.16 | -1.89 |
| $\alpha^{G}_{CAPM}$ | ***Asset*** | 38758 | -0.02 | 0.68 | -2.98 | 2.81 | |
| | ***Mixed*** | 5203 | 0.03 | 0.72 | -2.14 | 3.25 | |
| | ***Total*** | 43961 | -0.01 | 0.69 | -2.98 | 3.25 | -5.00 |
| $\alpha^{N}_{FF}$ | ***Asset*** | 44354 | -0.38 | 0.66 | -3.48 | 2.56 | |
| | ***Mixed*** | 6170 | -0.33 | 0.69 | -2.85 | 3.54 | |
| | ***Total*** | 50524 | -0.37 | 0.66 | -3.48 | 3.54 | -5.60 |
| $\alpha^{G}_{FF}$ | ***Asset*** | 38758 | -0.23 | 0.67 | -3.26 | 2.63 | |
| | ***Mixed*** | 5203 | -0.14 | 0.73 | -2.71 | 3.62 | |
| | ***Total*** | 43961 | -0.22 | 0.68 | -3.26 | 3.62 | -8.29 |
| $\alpha^{N}_{FFM}$ | ***Asset*** | 44354 | -0.15 | 0.57 | -2.90 | 3.03 | |
| | ***Mixed*** | 6170 | -0.12 | 0.62 | -2.58 | 3.70 | |
| | ***Total*** | 50524 | -0.15 | 0.57 | -2.90 | 3.70 | -4.17 |
| $\alpha^{G}_{FFM}$ | ***Asset*** | 38758 | 0.02 | 0.58 | -2.72 | 3.10 | |
| | ***Mixed*** | 5203 | 0.07 | 0.66 | -2.44 | 3.78 | |
| | ***Total*** | 43961 | 0.02 | 0.59 | -2.72 | 3.78 | -5.74 |

Table 3: Correlation matrix

This table shows the correlation coefficients between the assets managed in thousands of Euros (ASSETS), volatility (VOLAT), annual total expense ratio (EXPENSES), number of years from inscription (AGE), net return (NRET), gross return (GRET), and the net and raw risk-adjusted returns, according to the CAPM, three-factor FF and four-factor Carhart models ($\alpha^{N}_{CAPM}$, $\alpha^{N}_{FF}$ , $\alpha^{N}_{FFM}$, $\alpha^{G}_{CAPM}$, $\alpha^{G}_{FF}$ and $\alpha^{G}_{FFM}$). Panel A is for the total sample, and Panel B and C are for the *asset* funds and *mixed* ones, respectively.

Panel A

| | **ASSETS** | **VOLAT** | **EXPENSES** | **AGE** | **NRET** | **GRET** | $\alpha^{G}_{CAPM}$ | $\alpha^{N}_{CAPM}$ | $\alpha^{G}_{FF}$ | $\alpha^{N}_{FF}$ | $\alpha^{G}_{FFM}$ | $\alpha^{N}_{FFM}$ |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **ASSETS** | 1 | | | | | | | | | | | |
| **VOLAT** | -0.0428 | 1 | | | | | | | | | | |
| **EXPENSES** | 0.0147 | 0.1648 | 1 | | | | | | | | | |
| **AGE** | 0.1880 | -0.0070 | 0.1133 | 1 | | | | | | | | |
| **NRET** | 0.0522 | -0.4430 | 0.0480 | 0.0009 | 1 | | | | | | | |
| **GRET** | 0.0524 | -0.4400 | 0.0637 | 0.0027 | 0.9999 | 1 | | | | | | |
| $\alpha^{G}_{CAPM}$ | 0.1024 | -0.2341 | -0.0046 | 0.0071 | 0.2911 | 0.2907 | 1 | | | | | |
| $\alpha^{N}_{CAPM}$ | 0.1021 | -0.2498 | -0.0700 | -0.0043 | 0.2898 | 0.2884 | 0.9969 | 1 | | | | |
| $\alpha^{G}_{FF}$ | 0.0662 | -0.1613 | -0.0575 | 0.0053 | 0.1337 | 0.1327 | 0.9535 | 0.9538 | 1 | | | |
| $\alpha^{N}_{FF}$ | 0.0656 | -0.1756 | -0.1202 | -0.0058 | 0.1316 | 0.1296 | 0.9474 | 0.9536 | 0.9972 | 1 | | |
| $\alpha^{G}_{FFM}$ | 0.1072 | -0.0327 | -0.0044 | 0.0360 | 0.0389 | 0.0388 | 0.9154 | 0.9125 | 0.9330 | 0.9273 | 1 | |
| $\alpha^{N}_{FFM}$ | 0.1068 | -0.0492 | -0.0768 | 0.0233 | 0.0361 | 0.0349 | 0.9107 | 0.9147 | 0.9322 | 0.9332 | 0.9962 | 1 |

Panel B

| | ASSETS | VOLAT | EXPENSES | AGE | NRET | GRET | $\alpha^{G}_{CAPM}$ | $\alpha^{N}_{CAPM}$ | $\alpha^{G}_{FF}$ | $\alpha^{N}_{FF}$ | $\alpha^{G}_{FFM}$ | $\alpha^{N}_{FFM}$ |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **ASSETS** | 1 | | | | | | | | | | | |
| **VOLAT** | -0.0304 | 1 | | | | | | | | | | |
| **EXPENSES** | 0.0194 | 0.1811 | 1 | | | | | | | | | |
| **AGE** | 0.2004 | -0.0119 | 0.1400 | 1 | | | | | | | | |
| **NRET** | 0.0515 | -0.4466 | -0.0172 | 0.0175 | 1 | | | | | | | |
| **GRET** | 0.0518 | -0.4439 | -0.0023 | 0.0196 | 0.9999 | 1 | | | | | | |
| $\alpha^{G}_{CAPM}$ | 0.1030 | -0.2614 | -0.0662 | 0.0238 | 0.2888 | 0.2879 | 1 | | | | | |
| $\alpha^{N}_{CAPM}$ | 0.1018 | -0.2737 | -0.1354 | 0.0103 | 0.2872 | 0.2852 | 0.9969 | 1 | | | | |
| $\alpha^{G}_{FF}$ | 0.0634 | -0.1815 | -0.1004 | 0.0203 | 0.1291 | 0.1276 | 0.9521 | 0.9521 | 1 | | | |
| $\alpha^{N}_{FF}$ | 0.0621 | -0.1930 | -0.1667 | 0.0072 | 0.1274 | 0.1249 | 0.9466 | 0.9525 | 0.9972 | 1 | | |
| $\alpha^{G}_{FFM}$ | 0.1101 | -0.0583 | -0.0571 | 0.0502 | 0.0347 | 0.0338 | 0.9135 | 0.9112 | 0.9320 | 0.9272 | 1 | |
| $\alpha^{N}_{FFM}$ | 0.1086 | -0.0722 | -0.1346 | 0.0350 | 0.0328 | 0.0308 | 0.9091 | 0.9137 | 0.9310 | 0.9328 | 0.9961 | 1 |

Panel C

| | ASSETS | VOLAT | EXPENSES | AGE | NRET | GRET | $\alpha^{G}_{CAPM}$ | $\alpha^{N}_{CAPM}$ | $\alpha^{G}_{FF}$ | $\alpha^{N}_{FF}$ | $\alpha^{G}_{FFM}$ | $\alpha^{N}_{FFM}$ |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **ASSETS** | 1 | | | | | | | | | | | |
| **VOLAT** | -0.1590 | 1 | | | | | | | | | | |
| **EXPENSES** | -0.0051 | 0.1045 | 1 | | | | | | | | | |
| **AGE** | 0.0651 | 0.0044 | 0.0041 | 1 | | | | | | | | |
| **NRET** | 0.0625 | -0.4215 | 0.3997 | -0.1204 | 1 | | | | | | | |
| **GRET** | 0.0618 | -0.4155 | 0.4177 | -0.1193 | 0.9998 | 1 | | | | | | |
| $\alpha^{G}_{CAPM}$ | 0.1090 | -0.0555 | 0.2889 | -0.0912 | 0.3069 | 0.3104 | 1 | | | | | |
| $\alpha^{N}_{CAPM}$ | 0.1155 | -0.0872 | 0.2514 | -0.0937 | 0.3080 | 0.3107 | 0.9976 | 1 | | | | |
| $\alpha^{G}_{FF}$ | 0.1034 | -0.0249 | 0.1377 | -0.0761 | 0.1652 | 0.1667 | 0.9625 | 0.9661 | 1 | | | |
| $\alpha^{N}_{FF}$ | 0.1090 | -0.0537 | 0.0969 | -0.0775 | 0.1608 | 0.1615 | 0.9526 | 0.9609 | 0.9976 | 1 | | |
| $\alpha^{G}_{FFM}$ | 0.0988 | 0.1279 | 0.2273 | -0.0357 | 0.0654 | 0.0697 | 0.9280 | 0.9249 | 0.9394 | 0.9306 | 1 | |
| $\alpha^{N}_{FFM}$ | 0.1053 | 0.1010 | 0.1865 | -0.0362 | 0.0570 | 0.0605 | 0.9203 | 0.9224 | 0.9397 | 0.9360 | 0.9972 | 1 |

Table 4: Matching estimators

The table shows if the differences in averages between *asset* funds and *mixed* funds are significant for the annual alternatives measures of performance: net return (NRET), gross return (GRET), and the estimations of the risk-adjusted fund excess returns, (the Jensen alpha), according to the CAPM ($\alpha_{CAPM}$), the Fama and French (1993) ($\alpha_{FF}$) and the Carhart (1997) ($\alpha_{FFM}$) multifactor models, both with net and raw returns. Panel A reports the average and t-statistic for differences between mixed asset funds.
Panel B reports the estimator matching coefficient and t-statistic for differences between mixed and matched asset funds. In this panel, we use the matching variables individually include size, age, expenses, and the investment objective. In Panel C we use the matching variables simultaneously.

Panel A

| | **NRET** | **GRET** | $\alpha^{N}_{CAPM}$ | $\alpha^{G}_{CAPM}$ | $\alpha^{N}_{FF}$ | $\alpha^{G}_{FF}$ | $\alpha^{N}_{FFM}$ | $\alpha^{G}_{FFM}$ |
|---|---|---|---|---|---|---|---|---|
| ***Asset*** | -2.51 | -0.90 | -0.79 | -0.08 | -1.70 | -0.97 | -0.62 | 0.07 |
| ***Mixed*** | -1.51 | -0.23 | -0.52 | 0.11 | -1.09 | -0.45 | -0.33 | 0.24 |
| ***Total*** | -2.35 | -0.79 | -0.75 | -0.05 | -1.60 | -0.89 | -0.58 | 0.10 |
| ***t*** | -6.22 | -4.31 | -2.21 | -1.59 | -4.68 | -4.34 | -2.81 | -1.60 |

Panel B

| | **NRET** | | **GRET** | | $\alpha^{N}_{CAPM}$ | | $\alpha^{G}_{CAPM}$ | | $\alpha^{N}_{FF}$ | | $\alpha^{G}_{FF}$ | | $\alpha^{N}_{FFM}$ | | $\alpha^{G}_{FFM}$ | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| matching variables | coef | t | coef | t | coef | t | coef | t | coef | t | coef | t | coef | t | coef | t |
| ASSETS | 2.88 | 4.67 | 2.54 | 4.07 | 0.15 | 1.02 | 0.06 | 0.41 | 0.46 | 3.08 | 0.37 | 2.67 | 0.17 | 1.37 | 0.04 | 0.30 |
| AGE | 1.98 | 2.18 | 1.70 | 1.88 | 0.37 | 1.90 | 0.26 | 1.38 | 0.75 | 3.73 | 0.64 | 3.34 | 0.36 | 2.13 | 0.23 | 1.35 |
| EXPENSES | 3.32 | 4.28 | 3.33 | 4.29 | 0.18 | 0.92 | 0.24 | 1.27 | 0.38 | 1.94 | 0.44 | 2.41 | 0.22 | 1.35 | 0.21 | 1.28 |

Panel C

| | **NRET** | | **GRET** | | $\alpha^{N}_{CAPM}$ | | $\alpha^{G}_{CAPM}$ | | $\alpha^{N}_{FF}$ | | $\alpha^{G}_{FF}$ | | $\alpha^{N}_{FFM}$ | | $\alpha^{G}_{FFM}$ | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| matching variables | coef | t | coef | t | coef | t | coef | t | coef | t | coef | t | coef | t | coef | t |
| ASSETS AGE | 2.35 | 3.87 | 2.15 | 3.54 | 0.27 | 1.84 | 0.33 | 2.29 | 0.40 | 2.74 | 0.46 | 3.26 | 0.27 | 2.10 | 0.29 | 2.33 |
| ASSETS AGE EXPENSES | 3.51 | 4.97 | 3.53 | 5.00 | 0.06 | 0.33 | 0.20 | 1.18 | 0.10 | 0.59 | 0.24 | 1.41 | 0.13 | 0.87 | 0.23 | 1.53 |
| ASSETS AGE EXPENSES INVESTMENT OBJECTIVE | 2.34 | 2.91 | 2.37 | 2.94 | 0.09 | 0.52 | 0.26 | 1.47 | 0.15 | 0.82 | 0.31 | 1.79 | 0.21 | 1.37 | 0.31 | 2.01 |

Table 5: Performance measures distribution

The Table shows the distribution of the fund-month performance measures observations in our sample according to its quantity, separately for the two groups considered, asset and mixed funds. Panel A details the percentage of positive values for the net (NRET) and gross returns (GRET), and for the alternatives estimations of risk-adjusted returns ($\alpha^{N}_{CAPM}$, $\alpha^{N}_{FF}$ , $\alpha^{N}_{FFM}$, $\alpha^{G}_{CAPM}$, $\alpha^{G}_{FF}$ and $\alpha^{G}_{FFM}$). Panels B and C report the percentage of statistically significant (at the 5% of significance) positive and negative estimations, respectively.

Panel A

| | **NRET** | **GRET** | $\alpha^{N}_{CAPM}$ | $\alpha^{G}_{CAPM}$ | $\alpha^{N}_{FF}$ | $\alpha^{G}_{FF}$ | $\alpha^{N}_{FFM}$ | $\alpha^{G}_{FFM}$ |
|---|---|---|---|---|---|---|---|---|
| ***Asset*** | 0.54 | 0.56 | 0.34 | 0.48 | 0.25 | 0.36 | 0.32 | 0.48 |
| ***Mixed*** | 0.58 | 0.61 | 0.33 | 0.50 | 0.25 | 0.40 | 0.33 | 0.53 |
| ***difference*** | -0.04 | -0.05 | 0.02 | -0.02 | 0.00 | -0.03 | -0.01 | -0.05 |
| ***t*** | -10.60 | -11.98 | 2.39 | -2.64 | 0.15 | -4.56 | -1.05 | -6.27 |

Panel B

| | $\alpha^{N}_{CAPM}$ | $\alpha^{G}_{CAPM}$ | $\alpha^{N}_{FF}$ | $\alpha^{G}_{FF}$ | $\alpha^{N}_{FFM}$ | $\alpha^{G}_{FFM}$ |
|---|---|---|---|---|---|---|
| ***Asset*** | 0.04 | 0.08 | 0.02 | 0.04 | 0.03 | 0.06 |
| ***Mixed*** | 0.05 | 0.11 | 0.03 | 0.07 | 0.03 | 0.08 |
| ***difference*** | -0.01 | -0.03 | -0.01 | -0.02 | -0.01 | -0.02 |
| ***t*** | -2.23 | -7.78 | -4.09 | -7.41 | -2.39 | -4.62 |

Panel C

| | $\alpha^{N}_{CAPM}$ | $\alpha^{G}_{CAPM}$ | $\alpha^{N}_{FF}$ | $\alpha^{G}_{FF}$ | $\alpha^{N}_{FFM}$ | $\alpha^{G}_{FFM}$ |
|---|---|---|---|---|---|---|
| ***Asset*** | 0.03 | 0.01 | 0.07 | 0.03 | 0.04 | 0.01 |
| ***Mixed*** | 0.05 | 0.02 | 0.08 | 0.04 | 0.05 | 0.02 |
| ***difference*** | -0.02 | -0.01 | -0.01 | -0.01 | -0.01 | -0.01 |
| ***t*** | -8.15 | -6.55 | -3.24 | -4.93 | -4.00 | -4.83 |

Table 6: Fund performance-expenses relationship

The Panel A of the table shows the time average of the cross-section estimates for each of the 80 months from May 2002 until December 2008:

$$MODEL\ \ 7:\ \ \alpha_{pCAPMt} = \lambda_0 + \lambda_1 \exp enses_{pt} + u_{pt}$$

$$MODEL\ \ 8:\ \ \alpha_{pFFt} = \lambda_0 + \lambda_1 \exp enses_{pt} + \varepsilon_{pt}$$

$$MODEL\ \ 9:\ \ \alpha_{pFFMt} = \lambda_0 + \lambda_1 \exp enses_{pt} + \pi_{pt}$$

where $\alpha_{pCAPMt}$ is the alpha from CAPM for investment fund $p$ in month $t$; $\alpha_{pFFt}$ is the alpha from Fama and French (1993) model for investment fund $p$ in month $t$; $\alpha_{pFFMt}$ is the alpha from Carhart (1997) model for investment fund $p$ in month $t$ and $\exp enses_{pt}$ is the monthly expense.; both with net and raw returns.

Panel B table shows return-expenses relationship from May 2002 until December 2008 and Panel C from June 1999 until June 2008

Panel A

| | | TOTAL | | | ASSET | | | MIXED | | |
|---|---|---|---|---|---|---|---|---|---|---|
| | | Mean | t Value | Std Error | Mean | t Value | Std Error | Mean | t Value | Std Error |
| $\alpha^{G}_{CAPM}$ | Intercept | -0.858 | -25.720 | 0.033 | -0.815 | -20.830 | 0.039 | -1.069 | -15.130 | 0.071 |
| | EXPENSES | -0.260 | -6.040 | 0.043 | -0.824 | -10.560 | 0.078 | 1.958 | 17.280 | 0.113 |
| | VOLAT | 0.049 | 2.890 | 0.017 | 0.051 | 2.980 | 0.017 | 0.030 | 1.890 | 0.016 |
| | AGE | 0.009 | 5.930 | 0.002 | 0.012 | 6.880 | 0.002 | -0.002 | -1.010 | 0.002 |
| | lnASSETS | 0.060 | 20.100 | 0.003 | 0.060 | 16.380 | 0.004 | 0.070 | 13.620 | 0.005 |
| | $R^2$ | 0.231 | | | 0.248 | | | 0.324 | | |
| $\alpha^{N}_{CAPM}$ | Intercept | -0.934 | -24.580 | 0.038 | -0.888 | -20.360 | 0.044 | -1.054 | -19.130 | 0.055 |
| | EXPENSES | -0.706 | -13.940 | 0.051 | -1.419 | -18.270 | 0.078 | 1.754 | 16.080 | 0.109 |
| | VOLAT | 0.046 | 2.730 | 0.017 | 0.048 | 2.820 | 0.017 | 0.025 | 1.690 | 0.015 |
| | AGE | 0.007 | 4.410 | 0.002 | 0.010 | 5.630 | 0.002 | -0.001 | -0.350 | 0.002 |
| | lnASSETS | 0.060 | 18.460 | 0.003 | 0.061 | 16.230 | 0.004 | 0.054 | 17.040 | 0.003 |
| | $R^2$ | 0.226 | | | 0.253 | | | 0.271 | | |
| $\alpha^{G}_{FF}$ | Intercept | -0.866 | -25.150 | 0.034 | -0.821 | -20.120 | 0.041 | -1.086 | -14.940 | 0.073 |
| | EXPENSES | -0.407 | -8.250 | 0.049 | -0.997 | -10.870 | 0.092 | 1.730 | 14.220 | 0.122 |
| | VOLAT | 0.009 | 0.550 | 0.016 | 0.009 | 0.580 | 0.016 | -0.002 | -0.150 | 0.014 |
| | AGE | 0.009 | 5.850 | 0.002 | 0.013 | 6.900 | 0.002 | -0.004 | -2.340 | 0.002 |
| | lnASSETS | 0.054 | 16.800 | 0.003 | 0.053 | 13.800 | 0.004 | 0.069 | 12.390 | 0.006 |
| | $R^2$ | 0.205 | | | 0.229 | | | 0.271 | | |
| $\alpha^{N}_{FF}$ | Intercept | -0.944 | -24.060 | 0.039 | -0.896 | -19.780 | 0.045 | -1.075 | -18.720 | 0.057 |
| | EXPENSES | -0.845 | -14.860 | 0.057 | -1.581 | -17.480 | 0.090 | 1.544 | 13.300 | 0.116 |
| | VOLAT | 0.005 | 0.320 | 0.015 | 0.006 | 0.380 | 0.016 | -0.007 | -0.520 | 0.013 |
| | AGE | 0.007 | 4.300 | 0.002 | 0.010 | 5.660 | 0.002 | -0.003 | -1.540 | 0.002 |
| | lnASSETS | 0.054 | 16.270 | 0.003 | 0.055 | 14.270 | 0.004 | 0.053 | 14.920 | 0.004 |
| | $R^2$ | 0.203 | | | 0.236 | | | 0.223 | | |
| $\alpha^{G}_{FFM}$ | Intercept | -0.784 | -22.660 | 0.035 | -0.729 | -16.780 | 0.043 | -1.065 | -13.900 | 0.077 |
| | EXPENSES | -0.310 | -6.030 | 0.051 | -0.921 | -12.540 | 0.073 | 1.938 | 16.100 | 0.120 |
| | VOLAT | 0.058 | 4.190 | 0.014 | 0.059 | 4.310 | 0.014 | 0.048 | 3.750 | 0.013 |
| | AGE | 0.011 | 8.740 | 0.001 | 0.015 | 10.160 | 0.001 | 0.001 | 0.340 | 0.002 |
| | lnASSETS | 0.054 | 17.840 | 0.003 | 0.053 | 14.000 | 0.004 | 0.069 | 11.800 | 0.006 |
| | $R^2$ | 0.172 | | | 0.192 | | | 0.287 | | |
| $\alpha^{N}_{FFM}$ | Intercept | -0.856 | -21.530 | 0.040 | -0.802 | -16.630 | 0.048 | -1.015 | -17.970 | 0.057 |
| | EXPENSES | -0.751 | -12.400 | 0.061 | -1.510 | -20.240 | 0.075 | 1.666 | 12.600 | 0.132 |
| | VOLAT | 0.055 | 4.020 | 0.014 | 0.056 | 4.110 | 0.014 | 0.044 | 3.640 | 0.012 |
| | AGE | 0.009 | 6.830 | 0.001 | 0.012 | 8.520 | 0.001 | 0.002 | 1.010 | 0.002 |
| | lnASSETS | 0.054 | 16.110 | 0.003 | 0.055 | 13.830 | 0.004 | 0.050 | 15.660 | 0.003 |
| | $R^2$ | 0.167 | | | 0.199 | | | 0.231 | | |

Panel B

| | | TOTAL | | | ASSET | | | MIXED | | |
|---|---|---|---|---|---|---|---|---|---|---|
| | | Mean | t Value | Std Error | Mean | t Value | Std Error | Mean | t Value | Std Error |
| **GRET** | **Intercept** | -0.209 | -1.650 | 0.127 | -0.161 | -1.280 | 0.126 | -0.664 | -3.480 | 0.191 |
| | **EXPENSES** | 0.821 | 2.460 | 0.333 | -0.338 | -1.030 | 0.330 | 6.402 | 7.910 | 0.809 |
| | **VOLAT** | 0.043 | 0.450 | 0.097 | 0.094 | 0.930 | 0.100 | -0.119 | -1.220 | 0.097 |
| | **AGE** | 0.012 | 2.640 | 0.005 | 0.014 | 3.140 | 0.004 | 0.005 | 0.720 | 0.006 |
| | **lnASSETS** | 0.030 | 2.610 | 0.011 | 0.030 | 2.590 | 0.012 | 0.025 | 1.430 | 0.017 |
| | **$R^2$** | 0.320 | | | 0.328 | | | 0.397 | | |
| **NRET** | **Intercept** | -0.209 | -1.650 | 0.127 | -0.161 | -1.280 | 0.126 | -0.664 | -3.480 | 0.191 |
| | **EXPENSES** | -0.179 | -0.540 | 0.333 | -1.338 | -4.060 | 0.330 | 5.402 | 6.680 | 0.809 |
| | **VOLAT** | 0.043 | 0.450 | 0.097 | 0.094 | 0.930 | 0.100 | -0.119 | -1.220 | 0.097 |
| | **AGE** | 0.012 | 2.640 | 0.005 | 0.014 | 3.140 | 0.004 | 0.005 | 0.720 | 0.006 |
| | **lnASSETS** | 0.030 | 2.610 | 0.011 | 0.030 | 2.590 | 0.012 | 0.025 | 1.430 | 0.017 |
| | **$R^2$** | 0.318 | | | 0.328 | | | 0.387 | | |

Panel B

| | | Mean | t Value | Std Error | Mean | t Value | Std Error | Mean | t Value | Std Error |
|---|---|---|---|---|---|---|---|---|---|---|
| **GRET** | **Intercept** | -0.292 | -1.620 | 0.181 | -0.155 | -0.850 | 0.181 | -0.694 | -2.660 | 0.261 |
| | **EXPENSES** | 1.308 | 3.990 | 0.328 | -0.118 | -0.370 | 0.319 | 7.160 | 8.330 | 0.859 |
| | **VOLAT** | 0.011 | 0.130 | 0.083 | 0.048 | 0.560 | 0.085 | -0.095 | -1.140 | 0.083 |
| | **AGE** | 0.002 | 0.260 | 0.009 | 0.005 | 0.500 | 0.010 | 0.007 | 0.830 | 0.008 |
| | **lnASSETS** | 0.037 | 2.200 | 0.017 | 0.031 | 1.820 | 0.017 | 0.038 | 1.840 | 0.021 |
| | **$R^2$** | 0.323 | | | 0.327 | | | 0.399 | | |
| **NRET** | **Intercept** | -0.367 | -2.030 | 0.181 | -0.228 | -1.250 | 0.182 | -0.793 | -3.060 | 0.260 |
| | **EXPENSES** | 0.446 | 1.360 | 0.327 | -0.946 | -2.970 | 0.319 | 6.251 | 7.270 | 0.860 |
| | **VOLAT** | 0.010 | 0.120 | 0.083 | 0.046 | 0.550 | 0.085 | -0.097 | -1.160 | 0.083 |
| | **AGE** | 0.002 | 0.210 | 0.009 | 0.004 | 0.440 | 0.010 | 0.007 | 0.820 | 0.008 |
| | **lnASSETS** | 0.040 | 2.350 | 0.017 | 0.033 | 1.930 | 0.017 | 0.043 | 2.110 | 0.020 |
| | **$R^2$** | 0.321 | | | 0.326 | | | 0.393 | | |