The investor's choice between active and index funds[1]

La elección del inversor entre fondos activos y fondos índice

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1. INTRODUCTION

The significant growth of the mutual fund industry has attracted the interest of both professionals and academics, giving rise to a large body of financial literature analyzing the results and performance of mutual funds. The first studies on this topic were Treynor (1965), Sharpe (1966), and Jensen (1968). The development of this literature has in general been driven by contributions on asset valuation models. Since the contributions of Sharpe (1992), Fama and French (1993), and Carhart (1997), it has been common practice to apply multifactorial models in evaluating mutual funds. These models adjust the funds' returns to their reference portfolios or market risk factors, as shown in Cremers and Petajisto (2009), Busse, Goyal and Wahal (2010), and Fama and French (2010), among others. The basic question is whether investors could achieve higher risk-adjusted returns by investing in mutual funds rather than directly investing in the market, which implies comparing the results obtained by active management with those obtained by passive management. Previous mutual fund literature has reached inconclusive findings on the relationship between active management and value added by fund managers. On the one hand, Kacperczyk, Sialm and Zheng (2005) find that, on average, mutual funds perform better when they deviate from their benchmarks and concentrate their investments in sectors where they have information advantages. Along the same lines, Cremers and Petajisto (2009) find evidence of how funds outperform their benchmarks when they deviate from them in their holdings. Measuring the level of active management based on unsystematic risk, Amihud and Goyenko (2013) show that the most

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EXECUTIVE SUMMARY

This study compares the performance of actively-managed mutual funds and index funds. For a large sample of US domestic equity share-class funds, we analyze the relation between portfolio turnover and fund risk-adjusted return. Using gross returns, results indicate that before (after) the onset of the recent financial crisis, low-turnover active funds reach higher (similar) results than those obtained by index funds, whilst high-turnover active funds have similar (worse) returns to index funds. The same evidence is found when net returns are considered, but index funds perform comparatively better due to their lower costs. From an investors' perspective, investing in previous high-turnover funds could lead to lower overall risk-adjusted returns.

RESUMEN DEL ARTÍCULO

Este estudio compara el rendimiento de los fondos de inversión gestionados activamente y los fondos que replican a índice de referencia. Para una amplia muestra de fondos estadounidenses que invierten en acciones de EE. UU., se analiza la relación entre la rotación de la cartera y el rendimiento ajustado al riesgo de los fondos considerados. En términos de rentabilidades brutas, se muestra que antes (después) del inicio de la reciente crisis financiera, los fondos activos que presentan una baja rotación alcanzan resultados más altos (similares) que los obtenidos por fondos índice, mientras que los fondos activos de alta rotación tienen rendimientos similares o incluso peores. La misma evidencia se encuentra al considerar rendimientos netos, aunque los fondos índice tienen un desempeño comparativamente mejor debido a los menores gastos asociados que soportan. Desde la perspectiva de los inversores, invertir en fondos previos de alta rotación podría conducir, en promedio, a peores resultados financieros.

active funds achieve higher performance. Huij and Derwall (2011) also show how mutual funds concentrated in some asset classes and with higher specific risk perform better than other more diversified funds. On the other hand, Huang, Sialm and Zhang (2011) find that the worst performance of funds is driven by increased investment concentration and higher specific risk. Moreover, Sharpe (1991) shows that, on average, it is not possible for active management to beat the market because the mutual fund industry itself is a relevant part of the market. Most of the results in the literature seem to confirm this hypothesis. For example, Fama and French (2010) find that only 2% of the 3,156 active mutual funds added significant value for investors. They also show that index funds perform similarly to the 3% highest-performing active mutual funds, mainly due to their low costs. In other words, their performance is better than the remaining 97% of active funds. Therefore, index funds seem to be an interesting alternative diversified investment for fund investors, implying lower costs.

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In this study, we ask whether fund investors might easily perceive the level of active management in the fund portfolio. Some measures of active management are not easily observable, and investors need information on the portfolio's holdings in order to construct them. In contrast, mutual funds report the information on the portfolio turnover in the fund prospectus each year. This measure refers to the level of purchases and sales in the fund portfolio, so investors can differentiate between funds managed with high and low relative levels of trading.

Previous studies addressing the relation between portfolio turnover and fund performance reach opposite conclusions. Elton *et al.* (1993) and Chow *et al.* (2011), among others, show that the turnover ratio has a negative effect on the fund's results, whereas Wermers (2000) conclude that high-turnover funds are able to obtain better returns. Along these lines, Pástor *et al.* (2016) explain that there is a common component in the portfolio turnover of mutual funds, suggesting that mutual funds exploit time-varying opportunities.

In this context, it is worth noting that the managers of actively-managed mutual funds modify their portfolio's holdings when they detect market opportunities, thus enhancing their expected return despite higher trading costs. Active funds can therefore have very different levels of portfolio turnover, depending on the managers' buy and sell decisions. In contrast, index funds tend to report low turnover

ratios since they simply follow their benchmark and, as a result, their managers do not deliberately modify the portfolio's holdings.

The main objective of this study is to compare the performance of actively-managed mutual funds with that of index funds. Instead of employing a multifactor model to observe the added value provided by fund managers, we aim to assess the overall results experienced by fund investors. Hence, we employ several ratios that are usually taken into consideration by professionals and individuals in order to make their investment decisions, mainly due to the simplicity of their structure. These ratios are related to the funds' risk-adjusted returns: the Sharpe ratio, the Treynor ratio, and the Jensen's alpha. While the funds' net return refers to the final return experienced by an investor without considering back-end loads, redemption fees and other similar fees, the Sharpe and the Treynor ratios measure the funds' efficiency, considering the risk borne in the funds' portfolio. Specifically, the Sharpe and the Treynor ratios consider in their estimation the total risk of the portfolio (i.e., the volatility of the fund returns) or the risk related to market (beta), respectively. Finally, the funds' alpha refers to the actual performance experienced by funds in excess of their expected results, given a level of risk measured by their beta.

In this study, a large sample of US domestic equity mutual funds is considered. However, because of the fact that a high turnover ratio in the portfolio management implies higher trading commissions regardless of the context analyzed, and given the evidence about similarities in the fund performance across countries reported in several studies (such as Bauer *et al.*, 2005) or in studies analyzing international mutual funds (e.g., Droms and Walker, 2001), we should expect that the same conclusions would be reached in other countries or international industries.

The study makes three contributions to the literature. Firstly, and in line with other studies (Elton *et al.*, 1993; Wermers, 2000) we differentiate among actively-managed mutual funds according to their level of portfolio turnover, since this ratio can be used as an indicator of the level of trading in mutual fund management. However, we also differentiate among index funds with different levels of turnover ratio. This approach allows us to compare active and index funds' performance in-depth. Secondly, we perform the analysis before and after the onset of the recent financial crisis, since the business cycles could imply differences in the active and index funds' results. Thirdly,

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we explore whether a fund investor, taking the past level of portfolio turnover into consideration, could obtain better risk-adjusted returns by investing in some actively-managed mutual funds rather than holding index funds with similar relative levels of turnover.

The rest of this study is organized as follows: Section 2 describes the methodology and the sample considered. Section 3 reports the results of the analysis. Finally, the main conclusions are presented in Section 4.

2. PERFORMANCE METHODOLOGY AND DATA

Our main objective in this study is to compare the performance of different mutual funds. To address this issue, we apply several measures that are usually taken into consideration by professionals and individuals when they make their investment decisions. Specifically, we are interested in estimating three different ratios that reflect the overall risk-adjusted return experienced in a portfolio: the Sharpe ratio, the Treynor ratio and the Jensen's alpha.

The first one (i.e., the Sharpe ratio) is a measure that reflects the overall fund return in excess of the risk-free asset, divided by the total risk borne in the portfolio. Mathematically:

$$SR_p = \frac{\overline{R_p} - \overline{R_f}}{\sigma_p}$$

Where SR_p is the Sharpe ratio of portfolio 'p' during a period, $\overline{R_p}$ and $\overline{R_f}$ are the average returns of portfolio 'p' and the risk-free asset during this period, respectively, and σ_p reflects the volatility (measured as the standard deviation of the returns) borne in portfolio 'p' during the same period.

Similar to the SR, we also estimate the Treynor ratio. Instead of considering the total risk borne in the portfolio, this measure adjusts the mean return achieved by a fund to the risk related to the market factor (i.e., the beta). In other words:

$$TR_p = \frac{\overline{R_p} - \overline{R_f}}{\hat{\beta}_p}$$

Where TR_p is the Treynor ratio of portfolio 'p' during a period, and $\hat{\beta}_p$ reflects the market beta estimate of portfolio 'p' during the same period.

Finally, we also assess the Jensen's alpha ($\hat{\alpha}_p$) for each portfolio. This alpha reflects, on average, the actual return experienced by a portfolio in excess of the return that we should expect, given both the market return and the portfolio's beta:

$$\hat{\alpha}_p = \overline{R_p} - \hat{\beta}_p \overline{R_m}$$

All the aforementioned ratios aim to calculate the risk-adjusted returns experienced by investors holding a portfolio during a period. Logically, the higher these ratios are, the better the overall performance the portfolio achieves.

Up to now, it should be noticed that the portfolio's beta is measured through both the portfolio's returns and the market returns. Given the importance of the election of a proper market (or benchmark) in the analysis, and regarding the large sample of US mutual funds considered in this study, we therefore employ a wide US market factor that includes all the firms listed on the NYSE (the New York Stock Exchange), the AMEX (the American Stock Exchange) and the NASDAQ. This market factor has been commonly employed in other performance evalutation models (such as the Fama and French (1993) or the Carhart (1997) risk-factor models).

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Data on monthly returns for the US market factor and for the risk-free asset (namely, the one-month Treasury Bill rate) correspond to the Professor Kenneth R. French's database, while funds' monthly returns (both in gross and in net terms) are obtained from the Morningstar database.

Additionally, we obtained data on fund characteristics such as the total amount of assets managed by each fund (or *TNA, Total Net Assets*), their annual expenses and turnover ratio. Turnover ratio is measured as the lesser of purchases and sales of the mutual fund over a year, as a percentage of the average monthly net assets managed by the fund. Thus, a turnover ratio equal to 100% implies that the fund portfolio was completely modified during the year. In contrast, a turnover ratio of 200% implies that the portfolio changed completely in a six-month period.

Therefore, a higher level of turnover is a consequence of more buy and sell decisions taken by fund managers in their portfolio. It should be noted that this measure is not affected by investors' inflows or outflows, since a high level of inflows (outflows) would imply a high

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level of purchases (sales) of assets in the portfolio management, but if they are not accompanied by a high level of sales (purchases) due to the manager's decision, they would not have any impact on the turnover ratio. We can therefore assume that a higher level of turnover is a consequence of a higher level of trading in managing the mutual fund.

Data on fund characteristics were obtained from Morningstar. The sample period runs from January 1999 to December 2016, and is split into two sub-periods to observe any differences in the analysis results when different periods are considered. The first sub-period covers the period prior to the recent financial crisis (January 1999 - December 2007), while the second sub-period lasts from January 2008 to December 2016.

Our sample comprises 17,767 US domestic equity share-class funds. However, some of these share-classes belong to the same portfolio and, therefore, have the same investment objectives. To address this matter, we grouped these different share-classes into the same fund, obtaining a final sample of 4,913 actively-managed mutual funds, and 341 index funds. These index funds are trying to replicate the behavior of their benchmark, so by nature they should be mainly passive in their investments, and should experience low levels of portfolio turnover.

Table 1 shows the main descriptive statistics of the sample for the period and both sub-periods. Panel A and Panel B show the mean, median and standard deviation for some characteristics of the actively-managed funds and index funds, respectively. Panel C presents the same statistics for the market factor and the risk-free asset returns.

On average, active funds' managed assets grew in the more recent period (1,095.26 million dollars in assets during the second sub-period compared to 460.95 million during the first sub-period). Index funds also grew remarkably, reaching an average of 4,352.67 million dollars during the second sub-period. Then, it seems that index funds hold on average more than three times the assets under active funds' management during the period considered, despite having a much higher number of active funds in our sample. This is consistent with the idea of rational investors aiming to improve their financial results through index funds rather than investing in active funds (Fama and French, 2010).

Table 1 also shows that index funds seem to obtain higher net returns during the second sub-period (8.59%, in annual terms) than during the first sub-period (5.45%). As we could expect, these returns are

very similar to those experienced by the market factor. In contrast, the average active fund experienced different returns than the market. Their returns are higher during the first sub-period (6.95%) but they fail to provide investors with greater overall returns than the market (7.33%) during the second sub-period, which seems to be more volatile.

In addition, the overall expenses and portfolio turnover represent, on average, higher percentages for active funds (1.33% and 86.58%, respectively) than for index funds (0.64% and 73.20%, respectively). The same evidence remains in observing the median, a measure of central tendency. In short, actively-managed mutual funds generally have higher levels of expenses and their portfolios are modified to a greater extent.

Next, we aim to differentiate among funds with different levels of port-folio turnover. Then, we sort active funds and index funds according to their turnover ratio, and divide each group into five quintiles. That is, the 20% of the funds with the lowest portfolio turnover are grouped into quintile 1, while the 20% of the funds with the highest levels of turnover are grouped into quintile 5. This process is repeated each year until the end of the period. Following this method, we are able to compare active and index funds with similar relative levels of portfolio turnover.

Table 2 shows the average turnover ratio for the group of active and index funds belonging to each quintile, as well as their return and risk. As we can observe, active funds have very different levels of portfolio turnover. The group of funds in quintile 1 reaches an average turnover of 16.92%, while the highest-turnover funds modify their portfolio much more, reaching an average turnover ratio of 218.53%. Regarding Panel B, we observe that index funds also experience different levels of turnover. This motivates us to split their sample into quintiles in order to compare properly active and index funds with similar relative levels of portfolio turnover.

Table 2 also shows differences in the return and risk of active funds. High-turnover active funds seem to achieve higher annualized returns (8.65%) during the first sub-period, but lower returns (6.41%) during the second sub-period. Low-turnover active funds, in contrast, seem to obtain better returns (7.62%) during the latter sub-period. Nonetheless, note that high turnover funds also seem to be riskier. They experience higher levels of risk during the main period (17.74% per year, on average, for active funds) than low-turnover funds

Table 1. **Descriptive statistics of the sample**

PANEL A. CHARACTERISTICS OF ACTIVELY-MANAGED MUTUAL FUNDS									
	January 1999 – December 2016			January 1999 – December 2007			January 2008 – December 2016		
	Mean	Median	S.D.	Mean	Median	S.D.	Mean	Median	S.D.
TNA (millions)	996.88	192.18	3,842.24	460.95	93.65	1,432.22	1,095.26	183.66	4,499.75
Annualized Return (%)	7.14	12.98	15.94	6.95	12.87	14.66	7.33	13.39	17.19
Turnover (%)	86.58	62.00	143.50	91.94	70.00	114.18	77.70	57.00	103.22
Net Expense Ratio (%)	1.33	1.30	0.74	1.42	1.40	0.73	1.25	1.24	0.73
PANEL B. CHARACTERISTICS OF INDEX FUNDS									
	January 1999 – December 2016			January 1999 – December 2007			January 2008 – December 2016		
	Mean	Median	S.D.	Mean	Median	S.D.	Mean	Median	S.D.
TNA (millions)	3,125.22	522.48	13,473.30	1,347.79	182.82	4,912.04	4,352.67	540.36	20,007.92
Annualized Return (%)	7.02	12.58	15.89	5.45	11.66	14.53	8.59	14.05	17.20
Turnover (%)	73.20	15.00	241.04	74.27	15.00	310.84	72.50	15.00	186.71
Net Expense Ratio (%)	0.64	0.50	0.56	0.66	0.51	0.56	0.63	0.50	0.63
PANEL C. ANNUALIZED RETURNS FOR THE RISK-FREE ASSET AND FOR THE MARKET FACTOR									
	January 1999 – December 2016			January 1999 – December 2007			January 2008 – December 2016		
	Mean	Median	S.D.	Mean	Median	S.D.	Mean	Median	S.D.
R_f (%)	1.79	0.96	0.58	3.35	3.72	0.50	0.23	0.00	0.16
R_M (%)	6.96	14.28	15.32	5.37	13.80	14.41	8.55	14.88	16.22

This Table reports the main descriptive statistics (mean, median and standard deviation (S.D.)) of the characteristics of the sample during the main period and both sub-periods. Panel A shows the overall characteristics of 4,913 US actively-managed mutual funds, while Panel B reports analogous characteristics for 341 US index funds. Specifically, the fund size (measured as the Total Net Assets (or TNA) under management, in million dollars), the net return (in %) annualized from a monthly basis, the annual turnover ratio (in %) and the net expense ratio (in %) related to the fund portfolio are considered as fund characteristics. Additionally, the same descriptive statistics for the annualized returns on the risk-free asset (the one-month Treasury Bill rate, or Rf) and on the market factor (RM) are reported in Panel C.

Table 2. **Annualized portfolio return and risk of active funds**

PANEL A. ACTIVELY-MANAGED FUNDS, QUINTILES SORTED BY TURNOVER												
	January 1999 – December 2016			January 1999 – December 2007			January 2008 – December 2016			Differences between sub-periods			
	Turnover (%)	Return (%)	Risk (%)	Turnover (%)	Return (%)	Risk (%)	Turnover (%)	Return (%)	Risk (%)	Turnover (%)	T-stat	Return (%)	T-stat
Quintile 1 (low)	16.92	7.12	14.93	18.86	6.61	13.11	15.70	7.62	16.61	-3.16***	(-6.93)	1.01	(0.14)
Quintile 2	40.00	7.36	15.40	44.35	7.10	13.60	36.34	7.62	17.08	-8.01***	(-9.52)	0.53	(0.07)
Quintile 3	63.78	7.23	15.75	70.17	6.78	14.20	57.67	7.69	17.22	-12.50***	(-11.17)	0.91	(0.12)
Quintile 4	97.07	7.49	16.67	105.72	7.45	15.73	87.49	7.53	17.64	-18.23***	(-11.54)	0.08	(0.01)
Quintile 5 (high)	218.53	7.53	17.74	222.78	8.65	18.00	189.99	6.41	17.56	-32.79***	(-10.28)	-2.23	(-0.27)
PANEL B. INDEX FUNDS, QUINTILES SORTED BY TURNOVER												
	January 1999 – December 2016			January 1999 – December 2007			January 2008 – December 2016			Differences between sub-periods			
	Turnover (%)	Return (%)	Risk (%)	Turnover (%)	Return (%)	Risk (%)	Turnover (%)	Return (%)	Risk (%)	Turnover (%)	T-stat	Return (%)	T-stat
Quintile 1 (low)	3.70	5.95	14.96	3.73	3.96	14.09	3.68	7.94	15.82	-0.05	(-0.58)	3.97	(0.56)
Quintile 2	8.55	6.34	15.18	8.48	4.26	14.04	8.62	8.41	16.29	0.14	(1.34)	4.15	(0.58)
Quintile 3	16.07	7.64	16.46	16.52	6.07	14.91	15.63	9.22	17.94	-0.89***	(-2.81)	3.15	(0.41)
Quintile 4	28.48	8.31	16.46	30.31	7.48	14.84	26.65	9.15	18.00	-3.66***	(-5.66)	1.68	(0.22)
Quintile 5 (high)	295.05	7.45	17.24	271.71	6.44	15.87	318.40	8.45	18.57	46.69***	(2.96)	2.02	(0.25)

This table reports the average turnover ratio (in %) for active funds (Panel A) and index funds (Panel B) in each quintile, sorting by their portfolio turnover. The overall funds' net return in each quintile and their risk (i.e., the standard deviation of the returns) are also reported. The last columns of each Panel shows the differences of the mean coefficients among sub-periods, as well as their significance (t-statistics, in parentheses) between the funds belonging to the highest and the lowest quintile. '***' denotes significance at the 1% level.

(14.93%). These differences remain in the sub-periods considered. Therefore, it seems that funds with low levels of turnover ratio bear lower levels of risk than high-turnover funds. In the next section, we look for differences in the risk-adjusted return for funds with different levels of portfolio turnover.

3. RESULTS

3.1. Results using gross returns

In this section, we analyze whether there are differences between the risk-adjusted returns of active funds and index funds, before deducting their management expenses. In other words, we study whether fund managers increase the expected return of their portfolios by detecting market opportunities and making buy and sell decisions which modify their portfolio's holdings.

Therefore, an investor could think that a manager detecting more market opportunities would increase their turnover ratio. However, this increase in the portfolio variation would imply higher trading costs, reducing the fund's net return, although the fund return before considering expenses (i.e., gross return) should not be affected. Thus, when gross returns are considered, funds with higher levels of portfolio turnover are expected to achieve better performance than the rest of the funds.

Similar to the previous analysis, we split the sample of active funds into quintiles, according to their turnover ratio. This process is repeated each year. Next, we create five portfolios that yearly invest in all the funds in each quintile. So, the monthly return of each portfolio equals the average return of the funds they invest in. In addition, we also employ the same methodology to analyze the sample of index funds. Finally, we create two additional portfolios ('*All*' portfolios) that invest in all the active funds ('Active') or in the entire sample of index funds ('Index'), without differentiating by their turnover ratio. After obtaining the monthly returns of these twelve portfolios, we estimate their risk-adjusted return employing the Sharpe ratio and the Jensen's alpha measures[3]. The results of this analysis are presented in **Table 3**.

Panel A shows the results of the analysis for the main period. With the aim of analyzing whether active and index funds perform differently, we also include the main differences among the overall risk-adjusted

Table 3. **Performance results using gross returns. Sorting on fund turnover ratio**

		Portfolio 1	Portfolio 2	Portfolio 3	Portfolio 4	Portfolio 5	All
PANEL A. JANUARY 1999 - DECEMBER 2016 PERIOD.							
Annualized Sharpe ratio (in %)	Active funds	0.441 *	0.445	0.429 *	0.421 *	0.404 *	0.419 *
		(1.86)	(1.88)	(1.82)	(1.78)	(1.71)	(1.77)
	Index funds	0.319	0.341	0.398 *	0.434 *	0.369	0.370
		(1.35)	(1.44)	(1.68)	(1.84)	(1.56)	(1.56)
	Active − Index	0.122 **	0.104	0.032	-0.012	0.036	0.049 *
		(2.45)	(2.20)	(1.00)	(-0.33)	(0.62)	(1.68)
Annualized Jensen's alpha (in %)	Active funds	1.618 ***	1.747 ***	1.539 **	1.541 *	1.491	1.395 **
		(2.67)	(2.65)	(2.32)	(1.80)	(1.14)	(2.08)
	Index funds	-0.235	0.110	1.101	1.748 *	0.688	0.552
		(-0.50)	(0.21)	(1.45)	(1.89)	(0.75)	(1.26)
	Active − Index	1.853 **	1.636 **	0.438	-0.207	0.803	0.844 *
		(2.48)	(2.25)	(0.85)	(-0.33)	(0.79)	(1.79)
PANEL B. JANUARY 1999 - DECEMBER 2007 SUB-PERIOD.							
		Portfolio 1	Portfolio 2	Portfolio 3	Portfolio 4	Portfolio 5	All
Annualized Sharpe ratio (in %)	Active funds	0.344	0.370	0.334	0.345	0.374	0.336
		(1.03)	(1.11)	(1.00)	(1.03)	(1.12)	(1.01)
	Index funds	0.087	0.110	0.229	0.320	0.239	0.189
		(0.26)	(0.33)	(0.69)	(0.96)	(0.71)	(0.57)
	Active − Index	0.257 ***	0.260 ***	0.105 *	0.026	0.135	0.147 ***
		(3.06)	(3.03)	(1.86)	(0.39)	(1.45)	(2.75)
Annualized Jensen's alpha (in %)	Active funds	2.722 ***	3.175 ***	2.808 ***	3.309 **	4.407 *	2.930 ***
		(2.85)	(3.16)	(2.74)	(2.30)	(1.89)	(2.74)
	Index funds	-0.714	-0.373	1.375	2.763 *	1.646	0.734
		(-0.82)	(-0.37)	(1.30)	(1.82)	(1.15)	(1.13)
	Active − Index	3.436 ***	3.549 ***	1.433 *	0.546	2.761	2.195 ***
		(3.01)	(2.98)	(1.73)	(0.54)	(1.64)	(2.80)
PANEL C. JANUARY 2008 - DECEMBER 2016 SUB-PERIOD.							
		Portfolio 1	Portfolio 2	Portfolio 3	Portfolio 4	Portfolio 5	All
Annualized Sharpe ratio (in %)	Active funds	0.520	0.508	0.510	0.489	0.433	0.491
		(1.56)	(1.52)	(1.53)	(1.46)	(1.30)	(1.47)
	Index funds	0.525	0.541	0.540	0.530	0.480	0.523
		(1.57)	(1.62)	(1.62)	(1.59)	(1.44)	(1.57)
	Active − Index	-0.005	-0.033	-0.030	-0.041	-0.047	-0.033
		(-0.10)	(-0.74)	(-0.90)	(-1.07)	(-0.87)	(-1.17)

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Annualized Jensen's alpha (in %)	Active funds	0.171	-0.015	0.029	-0.312	-1.243	-0.304
		(0.30)	(-0.02)	(0.04)	(-0.34)	(-1.15)	(-0.40)
	Index funds	0.217	0.467 *	0.630	0.430	-0.447	0.225
		(0.62)	(1.73)	(0.59)	(0.44)	(-0.40)	(0.40)
	Active – Index	-0.046	-0.482	-0.601	-0.743	-0.796	-0.529
		(-0.05)	(-0.63)	(-0.99)	(-1.07)	(-0.80)	(-1.08)

This Table presents the overall risk-adjusted gross returns (the Sharpe ratio and the Jensen's alpha) for the quintile-portfolios during the main period and both sub-periods. Each year, funds are sorted into quintiles, according to their level of turnover ratio. Each portfolio invests yearly and equally-weighted in all the funds in each quintile (e.g., Portfolio 1 invests each year in the lowest-turnover funds, while Portfolio 5 invests yearly in the highest-turnover funds). The differences and their significance (t-statistic, in parentheses) between active and index funds with similar relative levels of turnover ratio (Active – Index) are reported in the last rows of each Panel. '*', '**', and '***' denote significance at 10%, 5%, and 1% levels, respectively.

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returns of funds experiencing similar relative levels of turnover ratio ('Active – Index' row), as well as their significance (t-statistic).

Regarding the last column, active funds seem to perform, in gross terms, significantly better than index funds. For instance, the average active fund obtains an annualized alpha of 0.844% higher. Therefore, active funds obtain, on average, abnormal returns of 0.844% more than index funds, after adjusting for their market risks. Nonetheless, only the portfolios investing in low-turnover active funds ('Portfolio 1' and 'Portfolio 2') obtain significantly greater risk-adjusted gross returns than their index counterparts, achieving annualized gross alphas of 1.853% and 1.636% significantly higher than the risk-adjusted returns experienced by index funds with similar relative levels of portfolio turnover. The same evidence is found in employing the Sharpe ratio as a measure of the funds' risk-adjusted returns. In contrast, portfolios investing in high-turnover active funds ('Portfolio 4' and 'Portfolio 5') do not seem to perform greater than index funds over the entire sample period.

Panel B and Panel C present the results of the analysis for the first and second sub-periods, respectively.

While the performance differences during the second sub-period (Panel C) are not significant, it should be noticed that only portfolios investing in low-turnover active funds achieve better and statistically significant alphas (an annualized 3.5%, approximately) during the first sub-period (Panel B), implying that their risk-adjusted returns are higher than those reported by the portfolios investing in index funds

with relatively low turnover ratios (-0.714%). Regarding the Sharpe ratio, it is also significantly higher for low-turnover active funds (in an annual 0.26%, approximately) than for low-turnover index funds during the first sub-period. Instead, the portfolios investing in high-turnover active and index funds do not seem to perform significantly different in gross terms.

Thus, results in **Table 3** show that, using gross returns, funds with lower levels of portfolio turnover obtained better (first sub-period) or similar (second sub-period) risk-adjusted return, compared to the overall performance of index funds. In contrast, and contrary to what we expected, high-turnover funds did not achieve, on aggregate, better performances than index funds with similar relative levels of turnover ratio, before deducting their management expenses during the period analyzed.

3.2. Results using net returns

The evidence in the previous section is not enough to assume that an investor could obtain better risk-adjusted returns by investing in low-turnover funds. This is because fund investors obtain net returns, once the fund expenses have been deducted.

Accordingly, we repeat the performance analysis using funds' net rather than gross returns. Performance is again estimated by applying the Sharpe ratio and the Jensen's alpha for estimating the risk-adjusted returns experienced by fund investors. Results are reported in **Table 4**.

Table 4 shows the performance results for the main period (Panel A), for the sub-period 1999-2007 (Panel B) and from 2008 to the end of the sample period (Panel C). The evidence is very similar to that reported in Table 3, but the risk-adjusted net returns reported for each portfolio are, logically, smaller. Considering net returns, none of the portfolios that invest in active funds experiences a performance significantly different from zero; neither do they seem to obtain risk-adjusted returns significantly different from those achieved by the portfolios investing in similar index funds.

However, the two sub-periods reveal interesting performance results. On the one hand, although almost none of the portfolios in the first sub-period (Panel B) obtains neither statistically significant alphas nor Sharpe ratios, the risk-adjusted returns on 'Portfolio 1' and 'Portfolio 2' (those investing in funds belonging to quintiles 1 and 2, respectively) are significantly greater (2.793% and 2.897% for annualized alphas;

and 0.205% and 0.210% for Sharpe ratios, respectively) than those of the portfolio investing in index funds with similar levels of turnover ratio. In contrast, portfolios investing in high-turnover funds ('Portfolio 4' and 'Portfolio 5') do not obtain significantly different risk-adjusted returns from their index counterparts during this sub-period.

Table 4. **Performance results using net returns. Sorting on fund turnover ratio**

PANEL A. JANUARY 1999 - DECEMBER 2016 PERIOD.			Portfolio 1	Portfolio 2	Portfolio 3	Portfolio 4	Portfolio 5	All
Annualized Sharpe ratio (in %)	Active funds		0.357	0.362	0.346	0.342	0.324	0.336
			(1.51)	(1.53)	(1.46)	(1.45)	(1.37)	(1.42)
	Index funds		0.278	0.299	0.356	0.396	0.328	0.329
			(1.18)	(1.27)	(1.50)	(1.68)	(1.39)	(1.39)
	Active − Index		0.079	0.062	-0.010	-0.055	-0.005	0.007
			(1.59)	(1.32)	(-0.31)	(-1.45)	(-0.08)	(0.22)
Annualized Jensen's alpha (in %)	Active funds		0.367	0.463	0.219	0.211	0.062	0.065
			(0.60)	(0.70)	(0.33)	(0.25)	(0.05)	(0.10)
	Index funds		-0.843 *	-0.522	0.404	1.135	-0.008	-0.093
			(-1.79)	(-0.98)	(0.53)	(1.23)	(-0.01)	(-0.21)
	Active − Index		1.211	0.985	-0.185	-0.923	0.070	0.158
			(1.62)	(1.35)	(-0.36)	(-1.46)	(0.07)	(0.34)
PANEL B. JANUARY 1999 - DECEMBER 2007 SUB-PERIOD.			Portfolio 1	Portfolio 2	Portfolio 3	Portfolio 4	Portfolio 5	All
Annualized Sharpe ratio (in %)	Active funds		0.249	0.276	0.241	0.261	0.294	0.246
			(0.75)	(0.83)	(0.72)	(0.78)	(0.88)	(0.74)
	Index funds		0.044	0.065	0.182	0.278	0.195	0.145
			(0.13)	(0.20)	(0.55)	(0.83)	(0.58)	(0.43)
	Active − Index		0.205 **	0.210 **	0.059	-0.018	0.100	0.101 *
			(2.44)	(2.45)	(1.04)	(-0.27)	(1.07)	(1.88)
Annualized Jensen's alpha (in %)	Active funds		1.471	1.891 *	1.488	1.980	2.978	1.599
			(1.54)	(1.88)	(1.45)	(1.38)	(1.28)	(1.49)
	Index funds		-1.322	-1.005	0.678	2.150	0.949	0.090
			(-1.51)	(-1.00)	(0.64)	(1.42)	(0.66)	(0.14)
	Active − Index		2.793 **	2.897 **	0.810	-0.170	2.028	1.509 *
			(2.44)	(2.43)	(0.98)	(-0.17)	(1.21)	(1.92)

PANEL C. JANUARY 2008 - DECEMBER 2016 SUB-PERIOD.							
		Portfolio 1	Portfolio 2	Portfolio 3	Portfolio 4	Portfolio 5	All
Annualized Sharpe ratio (in %)	Active funds	0.445	0.433	0.433	0.413	0.352	0.413
		(1.33)	(1.30)	(1.30)	(1.24)	(1.05)	(1.24)
	Index funds	0.487	0.502	0.501	0.496	0.443	0.486
		(1.46)	(1.50)	(1.50)	(1.48)	(1.33)	(1.45)
	Active − Index	-0.042	-0.069	-0.068 **	-0.082 **	-0.091 *	-0.073 ***
		(-0.82)	(-1.56)	(-2.03)	(-2.16)	(-1.68)	(-2.59)
Annualized Jensen's alpha (in %)	Active funds	-1.080 *	-1.299 *	-1.292 *	-1.642 *	-2.672 **	-1.634 **
		(-1.88)	(-1.84)	(-1.67)	(-1.80)	(-2.47)	(-2.15)
	Index funds	-0.391	-0.165	-0.067	-0.183	-1.143	-0.419
		(-1.12)	(-0.61)	(-0.06)	(-0.19)	(-1.02)	(-0.75)
	Active − Index	-0.689	-1.134	-1.225 **	-1.459 **	-1.529	-1.215 **
		(-0.81)	(-1.49)	(-2.01)	(-2.11)	(-1.54)	(-2.49)

This Table presents the overall risk-adjusted net returns (the Sharpe ratio and the Jensen's alpha) for the quintile-portfolios during the main period and both sub-periods. Each year, funds are sorted into quintiles, according to their level of turnover ratio. Each portfolio invests yearly and equally-weighted in all the funds in each quintile (e.g., Portfolio 1 invests each year in the lowest-turnover funds, while Portfolio 5 invests yearly in the highest-turnover funds). The differences and their significance (t-statistic, in parentheses) between active and index funds with similar relative levels of turnover ratio (Active − Index) are reported in the last rows of each Panel. '*', '**', and '***' denote significance at 10%, 5%, and 1% levels, respectively.

On the other hand, in the second sub-period (Panel C), active funds, on aggregate (as shown in the last column), report a lower performance (an annual alpha of -1.634%) than the average index fund (-0.419%), a difference that is statistically significant (t-statistic of -2.49). In other words, index funds seem to perform better than actively-managed mutual funds during the second sub-period. However, the alphas of the portfolios investing in low-turnover funds are not significantly different from the performance of index funds, and the overall underperformance of active funds seems to be driven by the poor results of the high-turnover funds (e.g., 'Portfolio 5' has a negative alpha of -2.672% per year). In fact, the differences in performance between some portfolios that invest in high-turnover active funds and the portfolios investing in similar index funds (-1.459% per year) are statistically significant (t-statistic of -2.11). Similar conclusions are reached from the results obtained by considering the Sharpe ratio as a measure of the risk-adjusted net return experienced by fund investors.

In summary, the above evidence shows that in general, low-turnover funds obtain better (sub-period 1) or similar (sub-period 2) performances than index funds with similar relative levels of turnover ratio, while high-turnover funds obtain similar (sub-period 1) or worse (sub-period 2) risk-adjusted returns than their index peers. When the results in this section are compared with those from the previous section (that is, using gross returns), mutual fund performance deteriorates, especially for active funds, because the expenses involved are higher than index fund fees (as shown in **Table 1**).

3.3. Results using net returns and considering the previous fund portfolio turnover

The previous sections show that, in general, low-turnover active funds can provide investors with better or similar risk-adjusted returns than index funds which replicate a benchmark. In contrast, investing in high-turnover funds could lead investors to worse risk-adjusted return, depending on the sub-period considered.

Fund investors can easily see the portfolio's turnover ratio in the fund prospectus. However, the ratio reported refers to the portfolio turnover for the fund during the previous period. Accordingly, we analyze whether an investor, aware of the level of portfolio turnover in the fund during the previous period, can make fund investment decisions that lead to higher or worse risk-adjusted returns. In other words, we develop different investment strategies based on the past level of portfolio turnover achieved by active funds.

To address this issue, we run a similar analysis to the one in the previous sections. We, however, yearly split each sample of funds (active and index funds) into quintiles, according to the level of turnover ratio reached by each fund during the previous period. Next, we repeat the same process used in the previous section and create twelve different portfolios that invest in the funds in each group (six portfolios investing in active funds, and six portfolios investing in index funds). Again, the return of each portfolio would be equal to the average net return of the funds in which each portfolio invests. Finally, we estimate the performance of these twelve portfolios by computing their Sharpe ratio and their Jensen's alpha.

Results are reported in **Table 5**. Panel A shows the results for the period running from January 2000 to December 2016, while Panel B and Panel C present the results for the sub-periods January 2000 to December 2007, and January 2008 to December 2016, respectively.

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Table 5. **Performance results using net returns. Sorting on previous fund turnover ratio**

PANEL A. JANUARY 2000 - DECEMBER 2016 PERIOD.							
		Portfolio 1	Portfolio 2	Portfolio 3	Portfolio 4	Portfolio 5	All
Annualized Sharpe ratio (in %)	Active funds	0.304	0.317	0.305	0.272	0.239	0.283
		(1.25)	(1.30)	(1.25)	(1.12)	(0.98)	(1.16)
	Index funds	0.237	0.254	0.327	0.390	0.290	0.291
		(0.97)	(1.04)	(1.34)	(1.60)	(1.19)	(1.19)
	Active − Index	0.067	0.063	-0.022	-0.118 ***	-0.052	-0.008
		(1.46)	(1.27)	(-0.60)	(-3.43)	(-0.87)	(-0.28)
Annualized Jensen's alpha (in %)	Active funds	0.369	0.592	0.423	-0.083	-0.543	0.064
		(0.62)	(0.95)	(0.63)	(-0.10)	(-0.41)	(0.10)
	Index funds	-0.667	-0.388	0.809	1.903 **	0.239	0.150
		(-1.30)	(-0.68)	(1.03)	(2.04)	(0.27)	(0.35)
	Active − Index	1.036	0.980	-0.387	-1.986 ***	-0.782	-0.086
		(1.47)	(1.28)	(-0.66)	(-3.45)	(-0.74)	(-0.19)
PANEL B. JANUARY 2000 - DECEMBER 2007 SUB-PERIOD.							
		Portfolio 1	Portfolio 2	Portfolio 3	Portfolio 4	Portfolio 5	All
Annualized Sharpe ratio (in %)	Active funds	0.115	0.161	0.141	0.107	0.092	0.112
		(0.32)	(0.45)	(0.40)	(0.30)	(0.26)	(0.32)
	Index funds	-0.060	-0.058	0.066	0.240	0.093	0.035
		(-0.17)	(-0.16)	(0.19)	(0.68)	(0.26)	(0.10)
	Active − Index	0.175 **	0.218 **	0.075	-0.133 **	0.000	0.077
		(2.27)	(2.29)	(1.09)	(-2.46)	(0.00)	(1.43)
Annualized Jensen's alpha (in %)	Active funds	1.634 *	2.305 **	2.120 **	1.775	1.762	1.755
		(1.67)	(2.39)	(2.04)	(1.21)	(0.71)	(1.61)
	Index funds	-0.743	-0.696	1.081	3.688 **	1.584	0.623
		(-0.73)	(-0.60)	(0.94)	(2.33)	(1.15)	(0.96)
	Active − Index	2.376 **	3.001 **	1.039	-1.913 **	0.178	1.133
		(2.23)	(2.26)	(1.03)	(-2.35)	(0.09)	(1.43)
PANEL C. JANUARY 2008 - DECEMBER 2016 SUB-PERIOD.							
		Portfolio 1	Portfolio 2	Portfolio 3	Portfolio 4	Portfolio 5	All
Annualized Sharpe ratio (in %)	Active funds	0.440	0.431	0.427	0.401	0.369	0.413
		(1.32)	(1.29)	(1.28)	(1.20)	(1.10)	(1.24)
	Index funds	0.471	0.493	0.518	0.501	0.441	0.486
		(1.41)	(1.48)	(1.55)	(1.50)	(1.32)	(1.45)
	Active − Index	-0.032	-0.062	-0.092 ***	-0.101 **	-0.073	-0.073 ***
		(-0.63)	(-1.36)	(-2.58)	(-2.36)	(-1.42)	(-2.59)

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Annualized Jensen's alpha (in %)	Active funds	-1.173 **	-1.330 *	-1.404 *	-1.856 **	-2.381 **	-1.634 **
		(-2.06)	(-1.92)	(-1.79)	(-1.99)	(-2.20)	(-2.15)
	Index funds	-0.640 *	-0.307	0.243	-0.077	-1.157	-0.419
		(-1.75)	(-1.03)	(0.23)	(-0.08)	(-1.02)	(-0.75)
	Active – Index	-0.534	-1.023	-1.647 **	-1.779 **	-1.224	-1.215 **
		(-0.63)	(-1.31)	(-2.55)	(-2.30)	(-1.30)	(-2.49)

This Table presents the overall risk-adjusted net returns (the Sharpe ratio and the Jensen's alpha) for the quintile-portfolios during the main period and both sub-periods. Each year, funds are sorted into quintiles, according to their previous level of turnover ratio. Each portfolio invests yearly and equally-weighted in all the funds in each quintile (e.g., Portfolio 1 invests each year in the previous low-turnover funds, while Portfolio 5 invests yearly in the previous high-turnover funds). The differences and their significance (t-statistic, in parentheses) between active and index funds with similar relative levels of turnover ratio (Active – Index) are reported in the last rows of each Panel. '*', '**', and '***' denote significance at 10%, 5%, and 1% levels, respectively.

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Panel A and Panel B show that only the portfolio that invests in some of the previous high-turnover active funds ('Portfolio 4') underperform index funds with similar relative levels of turnover ratio. This evidence is statistically significant and remains in considering both the Sharpe ratio and the Jensen's alpha as a measure of the risk-adjusted return experienced by investors.

Furthermore, and despite of the negative alphas achieved by all the portfolios investing in active funds, Panel C shows that only the previous high-turnover active funds experience overall risk-adjusted returns significantly worse than the performance provided by the portfolios investing in index funds with high turnover ratios.

Therefore, the evidence in **Table 5** shows that investing in high-turnover funds led, in general terms, to similar or lower risk-adjusted net returns than investing in similar index funds, depending on the sub-period considered. In contrast, investing in low-turnover index funds led to similar or even better performances than their index counterparts.

4. CONCLUSIONS

This study compares the performances of active and index mutual funds, the latter usually being passively managed. The fund performance is measured through two widely-applied measures (namely, the Sharpe ratio and the Jensen's alpha) in the investment decision-making process for both professionals and individual investors.

Active funds vary greatly in portfolio turnover, with some cases reporting a turnover ratio of more than one thousand per cent. In other words, some fund managers replace their portfolio's holdings more than ten times in a year. They are assumed to modify their portfolio's holdings when they detect market opportunities, thus enhancing their expected return despite assuming higher trading costs. In contrast, index funds are supposed to report low turnover ratios since they simply follow their benchmark and their managers do not deliberately modify the portfolio's holdings. Since the turnover ratio is reported in the fund prospectus, fund investors have ready access to this information and can decide to invest in a fund with a low or high level of portfolio turnover. Accordingly, we divided the sample of active funds into five different groups depending on the level of portfolio turnover achieved. With the aim of performing a consistent comparison, we also consider five different groups of index funds according to their annual turnover ratio. The main objective, therefore, was to observe whether an investor could obtain higher risk-adjusted returns by investing in index funds or active funds with similar levels of portfolio turnover.Results indicate that active funds with low levels of portfolio turnover achieve better or similar results than index funds. However, investing in high-turnover active funds leads to similar or even worse results than investing in index funds. This underperformance is especially relevant in a highly volatile market context.

In this study, we employed a large sample of US domestic equity mutual funds, so our results are directly related to the US market. However, because of the fact that a high turnover ratio in the portfolio management implies higher trading commissions that can deteriorate the investors' risk-adjusted returns, and given the evidence about similarities in the fund performance across countries reported in several studies or in studies analyzing international mutual funds, we should expect the same evidence to remain in other countries or international industries.

Therefore, rational investors willing to enhance their performance should consider the turnover ratio as a proxy for the trading commissions experienced in the fund portfolio and, consequently, for the potential worsening of their risk-adjusted returns. Furthermore, trading to a greater extent (as shown in a high turnover ratio) could lead to bearing higher risks that also deteriorates the investors' performance.

REFERENCES

Amihud, Y., and Goyenko, R. (2013). Mutual fund's R2 as predictor of performance, *Review of Financial Studies*, 26(3), 667–694.

Bauer, R., Koedijk, K., & Otten, R. (2005). International evidence on ethical mutual fund performance and investment style. *Journal of Banking & Finance*, 29(7), 1751-1767.

Busse, J. A., Goyal, A., and Wahal, S. (2010). Performance and persistence in institutional investment management, *Journal of Finance*, 65(2), 765–790.

Carhart, M. M. (1997). On persistence in mutual fund performance, *Journal of Finance*, 52(1), 57–82.

Chow, E. H., Lin, H. M., Lin, Y. M., and Weng, Y. C. (2011). The performance of overconfident fund managers. *Emerging Markets Finance and Trade*, 47, 21-30.

Cremers, M., and Petajisto, A. (2009). How active is your fund manager? A new measure that predicts performance, *Review of Financial Studies*, 22(9), 3329–3365.

Droms, W. G., & Walker, D. A. (2001). Performance persistence of international mutual funds. *Global Finance Journal*, 12(2), 237-248.

Elton, E. J., Gruber, M. J., Das, S., and Hlavka, M. (1993). Efficiency with costly information: A reinterpretation of evidence from managed portfolios. *Review of Financial Studies*, 6, 1-22.

Fama, E. F., and French, K. R. (1993). Common risk factors in the returns on stocks and bonds, *Journal of Financial Economics*, 33(1), 3–56.

Fama, E. F., and French, K. R. (2010). Luck versus skill in the cross-section of mutual fund returns, *Journal of Finance*, 65(5), 1915–1947.

Huang, J., Sialm, C., and Zhang, H. (2011). Risk shifting and mutual fund performance, *Review of Financial Studies*, 24(8), 2575–2616.

Huij, J., and Derwall, J. (2011). Global equity fund performance, portfolio concentration, and the fundamental law of active management, *Journal of Banking and Finance*, 35(1), 155–165.

Jensen, M. (1968). The performance of mutual funds in the period 1945-1964, *Journal of Finance*, 23(2), 389–416.

Kacperczyk, M., Sialm, C., and Zheng, L. (2005). On the industry concentration of actively managed equity mutual funds, *Journal of Finance*, 60(4), 1983–2011.

Pástor, L., Stambaugh, R. F., and Taylor, L. A. (2016). Do funds make more when they trade more? *Journal of Finance*, forthcoming. Available at SSRN: https://ssrn.com/abstract=2524397.

Sharpe, W. (1966). Mutual fund performance, *Journal of Business*, 39(1), 119–138.

Sharpe, W. (1991). The arithmetic of active management, *Financial Analysts Journal*, 47(1), 7–9.

Sharpe, W. (1992). Asset allocation: Management style and performance measurement, *Journal of Portfolio Management*, 18(1), 7–19.

Treynor, J. (1965). How to rate management investment funds, *Harvard Business Review*, 43(1), 63–75.

Wermers, R. (2000). Mutual fund performance: An empirical decomposition into stock-picking talent, style, transaction costs, and expense. *Journal of Finance*, 55, 1655-1695.

NOTES

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3. We also employ the Treynor ratio as an estimate of the risk-adjusted returns and get very similar conclusions. Results are therefore not reported for the sake of brevity and because of the similarity of this estimate and the Sharpe ratio. Nevertheless, they are available from the authors upon request.

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