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An empirical examination of the performance of real estate mutual funds 1990–2008

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Abstract

Empirical support for the evidence of over- or under-performance in real estate mutual funds is mixed. Using a sample covering the period 1990–2008, we provide a thorough investigation of the performance of real estate fund managers, including an examination of the impact of the down-market of 2007–2008. Our initial results show no over-performance for the overall period of 1990–2008; however, after accounting for the down-market period of 2007–2008, fund managers significantly out-perform the market for the 1990–2006 period. Thus, our results show that mutual fund investors can earn superior returns by investing in real estate mutual funds. Further, our cross-sectional results show that investors can earn higher returns by investing in funds that are large in size and rebalanced more frequently. © 2012 Academy of Financial Services. All rights reserved.

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1. Introduction

According to the Investment Company Institute, mutual funds in the United States managed roughly $11.1 trillion assets by the end of the year 2009, making them the largest mutual fund industry in the world. Moreover, the combined assets under management for the year 2009 increased by approximately $1.5 trillion or 15% over the previous year. Real Estate Mutual Funds (REMFs hereafter) were one of the largest drivers of this growth. According to the National Association for Real Estate Investment Trusts (NAREIT), the

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market capitalization of the REIT Equity Index in the year 2009 increased by roughly $72 billion or 41% over the previous year. In a recent study, Hartzell, Muhlhofer, and Titman (2010) report that REMFs experienced an annual growth rate of 40% per year over the period 1994–2005. This explosive growth in actively managed REMFs shows that fund investors not only believe in this sector, they also believe that active management provides superior returns when compared with passively managed real estate ETFs or a diversified portfolio with a significant exposure to REITs. The tremendous growth of these funds over the last decade warrants an in-depth analysis of their performance. Our study uses a variety of models to analyze the performance of REMFs for the period 1990–2008.

In a recent practitioner oriented study, Joseph Harvey, the President and CIO of Cohen and Steers[1] reports that investment in funds that target REITs can deliver superior returns. His study indicates that REITs have out-performed diversified core funds by as much as 5.60% annually over the last 10 years.[2] While the academic research on diversified mutual funds, in general, finds that such funds under-perform their relative benchmarks, empirical support on the evidence of over- or under-performance for real estate funds is mixed. Lin and Yung (2007) show that investors could benefit from selecting specific classes within REMFs. Their findings suggest that the growth category REMFs can deliver as much as 2.30% more return than value funds within REMFs universe and suggest the benefits of using active fund management for REMF investors. On the other hand, Derwall et al. (2009) show that momentum plays a major role in the over-performance of these funds. Their study suggests that REMF managers may be getting more credit than perhaps deserved because most of their returns can be mimicked by simply following cheap momentum strategies. The authors suggest that uninformed investors can earn higher returns (by saving on fees) by turning to indexation; that is, by investing in REIT ETFs.

These conflicting results may be in part because of the small sample size and limited sample periods of previous articles. Our motivation, in this article, is to provide a detailed examination of REMF performance for the period 1990–2008. Our sample of REMFs is one of the largest to be used, and we use varied models, including conditional and unconditional models in our investigation of fund performance. We also provide an analysis of the impact of the 2007–2008 market downturn on REMFs. While the real estate market has experienced ups and downs previously, the recent downturn is said to be the worst since the end of the Great Depression. We, therefore, parse our sample to investigate how the 2007–2008 market downturn affects REMF fund performance.

While the impact of the U.S. real estate market has been discussed extensively in the business press, our article provides empirical evidence on the extent of this free-fall on real estate fund performance. The decline in real estate began in 2007, with the residential market especially hard hit; the Case-Shiller 10-city and 20-city index showed an annual decline of 19.1% and 18% in October of 2008 (S&P/Case-Shiller Year in Review, 2008). The sub-prime crisis along with the stalling of the credit markets propelled the United States into a major recession in December of 2007. While real estate funds have little direct exposure to residential real estate or mortgages because they mainly invest in REITs, the overall return for these funds was impacted by investor perception that commercial real estate would be the next victim, and thus REIT stocks lost value during this period. Added to this was investor perception that the credit crunch would put an end to the takeovers and takeover speculations

that were inflating REIT stocks in recent years (Morningstar Research, 2008). Thus, it would seem reasonable to expect the performance of real estate mutual funds to decline for this period.

On the other hand, there is some evidence (Kosowski, 2006; Moskowitz, 2000; and Edwards and Caglayan, 2001) that the performance of diversified mutual funds is worse in expansions when compared with recessions. Research for the real estate funds shows that this may be true for this sector as well. Kallberg, Liu, and Trzcinka (2000) examine the performance of REIT mutual funds to document that REIT mutual funds do better in times of lower real estate returns, showing better performance during market downturns. Thus, our article seeks to add to the literature on fund performance by examining the 2007–2008 down-market period.

As mentioned earlier, academic research on the performance of REMFs documents mixed results. Kallberg, Liu, and Trzcinka (2000) examine 68 REIT mutual funds for the period 1987–1998 to document that these funds earn a superior return, net of expenses. On the other hand, O'Neal and Page's (2000) investigation of 28 real estate funds for the period 1996–1998 shows no over-performance of the funds, relative to their benchmarks. However, Gallo, Rutherford, and Lockwood (2000) find support for over-performance of as much as five percentage points annually in their analysis of 24 funds for the period 1991–1997. Lin and Yung (2004) analyze 83 REMFs for the period 1993–2001 and also fail to find any evidence in support of over-performance.

More recent research also does not document any significant support for over-performance for REMFs. Using Monte Carlo simulations techniques, Chiang et al., (2008) investigate 55 fund of funds for 1982–2003 to find that the funds do not out-perform their benchmarks. Examining 132 REIT mutual funds for 1994–2005, Hartzell, Muhlhofer, and Titman (2010) document evidence of over-performance in a single-index context. However, they find that their sample of funds show no evidence of over-performance when examined in a multi-index model and net of fees. Similarly, Bond and Mitchell (2010) ask if fund managers can systematically and persistently deliver superior risk-adjusted returns. Using a unique dataset of 280 commercial real estate funds in the United Kingdom for the period 1981–2006, they fail to support any evidence of over- or under-performance for United Kingdom real estate funds.

Summing up, given the lack of agreement on REMF performance, our motivation is to shed an additional layer of understanding on fund performance. Our sample size and time period is larger than the previous research; therefore, we can study fund performance over a period of almost two decades. Our sample period is 1990–2008, and we include an investigation of fund performance over the down-market of 2007–2008.[3] Using the Center for Research in Security Prices (CRSP) survivor bias-free mutual fund database, our sample comprises 184 real estate sector funds (an average of 85 funds per year) that existed at some point in time over the entire 19 year period, with the highest number of funds existing in 2005 (166 funds) and the lowest in 1990 (3 funds). Finally, our article also examines the impact of fund characteristics on fund performance. We analyze the cross-sectional determinants to explain the factors explaining fund performance. We also ask if the results for diversified mutual funds also hold true for the real estate sector.

Our sample of real estate funds grows tremendously, from 3 funds in 1990 to 149 funds

in 2008. Our investigation into fund performance shows that, for the overall period of 1990–2008, real estate mutual fund managers do not demonstrate any selectivity and do not out-perform the industry index. However, after accounting for the down-market period of 2007–2008, we find a marked change in fund performance; fund managers are able to significantly out-perform the market for the 1990–2006 period. Moreover, the coefficient for the dummy variable for 2007–2008 is negative and significant. Thus, our results are quite different from those of Kosowski (2006) and Kallberg, Liu, and Trzcinka (2000), who report that funds out-perform during down-market conditions. We suggest this difference stems from the severity of the "Great Recession" experienced in the last two years of our sample period, where market conditions across all sectors were dismal and investor confidence was at historical lows.

The remainder of the article is as follows. Section 2 describes the data and methodology. We provide the empirical results and discussion in Section 3, while Section 4 concludes the article.

2. Data and methodology

2.1. Data

We obtain our sample of real estate mutual funds for the period 1990–2008 from the Center for Research in Security Prices (CRSP) survivorship bias-free mutual fund database. We use the Lipper Objective Code, the Wiesenberger Fund Objective Code, the Strategic Insight Objective code, and the Thompson Reuters Objective Code to identify the initial sample of REMFs. The sample comprises of only domestic equity funds that are identified as RLE by the Wiesenberger Fund Objective Code or the Strategic Insight Objective Code, or the Thomson Reuters Objective Code or as RE by the Lipper Objective Code. We also ensure that the final sample of REMFs includes only those funds with at least 36 monthly observations. Data on fund characteristics such as fund expense ratios, turnover ratio, total net assets (fund size), 12b-1 fees, and percentage invested in stock and cash are obtained from the CRSP database. All the fund specific variables are reported annually by the CRSP database except for monthly total net assets. Following standard procedure in mutual fund research, we divide the variables by 12 to estimate monthly values. Monthly returns for the U.S. REIT Index are from the *Morningstar Direct database* and data on T-bill returns, and the Fama-French factor-mimicking portfolios for size (SMB), book-to-market (HML), and momentum (MOM) are from Wharton Research Data Services (WRDS). Monthly data on BAA and AAA rated corporate bonds and 10 year Treasury bond and three month Treasury bill returns are obtained from the Federal Reserve Web site. We provide a description of the sample of REMFs in Table 1.

The funds in our sample grow at an astounding rate, from 6 funds in 1990 to 149 funds in 2008.[4] O'Neal and Page (2000) find that real estate funds increased from 7 in 1991 to 113 in 1998, about a 16-fold increase. The maximum number of real estate funds are found in 2005 (166), and the average number of funds in our sample period is 85. Total net assets increased from $34.18 million in year 1990 to $183.59 million by the end of the year 2008.

Table 1 Descriptive statistics

Year	EXP	COM	CASH	TURN	TNA (in millions of dollars)	12b-1	*N*
1990	1.03%	95.37%	3.63%	50.74%	34.18*	0.00%	3
1991	1.03%	91.73%	4.59%	54.49%	43.91	0.00%	4
1992	1.04%	88.75%	4.02%	56.45%	64.71	0.00%	4
1993	1.05%	94.55%	2.77%	49.74%	188.02	0.01%	6
1994	1.28%	92.23%	3.39%	44.19%	96.64	0.21%	17
1995	1.58%	91.70%	6.67%	57.69%	59.92	0.40%	34
1996	1.66%	88.14%	8.76%	59.89%	74.34	0.44%	45
1997	1.62%	91.09%	8.22%	52.97%	159.55	0.42%	61
1998	1.69%	90.09%	7.79%	51.89%	114.80	0.45%	86
1999	1.74%	91.27%	6.30%	65.01%	71.72	0.47%	103
2000	1.76%	91.69%	5.82%	92.47%	66.98	0.49%	107
2001	1.75%	89.50%	6.03%	81.68%	76.03	0.49%	116
2002	1.74%	87.99%	5.77%	84.41%	92.66	0.51%	123
2003	1.74%	86.97%	5.16%	87.78%	106.36	0.55%	143
2004	1.78%	85.09%	4.49%	128.59%	146.42	0.57%	153
2005	1.78%	85.94%	4.21%	130.80%	182.59	0.57%	166
2006	1.74%	86.04%	3.91%	127.66%	242.32	0.57%	154
2007	1.74%	88.05%	3.82%	129.69%	262.31	0.56%	149
2008	1.74%	87.38%	4.21%	136.39%	183.59	0.56%	149
Average	1.55%	89.66%	5.24%	81.19%	124.05	0.38%	85

Notes: The table reports values for the expense ratio, percent invested in common stocks, percent invested in cash, turnover ratio, total net assets, and 12b-1 fee over the January 1990 through December 2008 period. All variables are reported on an annual basis. EXP is the expense ratio and is defined as expenses investors pay as percentage of total net assets that includes 12b-1 fee, COM (CASH) is the percentage of total funds invested in common stock (cash), TURN is the turnover ratio, TNA is the average monthly total net assets under management, 12b-1 is the operating fee charged by mutual funds, and *N* represents the total number of funds in each period. Average is the mean value of each variable over the entire January 1990 through December 2008 period.

*Year end (December) total net assets. CRSP started reporting monthly net assets in 1991.

The highest amount of total net assets under management, approximately $262 million, is observed in 2007, and the average amount of total net assets over the entire 19 year period is $124.05 million. The average expense ratio of the funds is 1.55% per year over our sample period of 1990–2008. O'Neal and Page (2000) report a mean expense ratio of 1.38% for their sample period of 1991–1998 and Lin and Yung (2004) report a mean expense ratio of 1.55% over the period 1993–2001. Thus, it appears that expenses charged by real estate funds are increasing over time. The average turnover ratio for the funds in our sample is 81.19%, higher than the mean turnover of 58.6% reported by Lin and Yung (2004). We conjecture that the inclusion of the "hot" real estate markets of the early to mid-2000s contributes to the higher turnover ratios in our sample. We find that our funds charge, on average, 0.38% in 12b-1 fees. The mean holding in common stock is 89.66% and 5.24% in cash.

2.2. Methodology

2.2.1. Real estate fund performance

We begin our analysis by an examination of the performance of real estate mutual funds. Our model first examines excess return against the single-index model:

$$r_{it} - r_{ft} = \alpha_i + \beta_i * INDRF_t + \varepsilon_{i,t} \quad (1)$$

where:

$r_{it} - r_{ft}$	is the excess monthly return on fund i over the Treasury bill rate,
α_i	is the measure of the portfolio's performance (fund alpha),
$INDRF_t$	is the excess monthly return on the Wilshire U.S. REIT index
β_i	is the unconditional measure of risk

Over-performance, relative to the benchmark, is indicated by a significantly positive alpha, thereby providing support for superior stock picking abilities or fund manager selectivity. Research shows the importance of benchmark selection in performance measurement. Blake, Elton, and Gruber (1992) and Dellva, DeMaskey, and Smith (2001), for example, discuss the significance of using the appropriate benchmark when estimating fund alphas. Similarly, Costas and Jakob (2011) examine index suitability for funds that use the S&P 500 index as the relevant benchmark. They find that using an appropriate growth or value index dramatically changes the abnormal performance reported by the fund. Therefore, we use a real estate specific index in our estimations. Our first model uses the Wilshire U.S. REIT index as the market index in the single-index context.

Our next model for fund performances uses the Carhart (1997) model, as previous research (Fama and French, 1993; Carhart, 1997) shows the need to add additional factors when estimating fund alpha. The Carhart (1997) model adds size, book to market, and momentum to allow more explanatory power to fund alpha estimations. There is some evidence (Chen et al., 1998) that the cross-section of REIT returns are more related to the Fama-French factors such as size and book to market than to macroeconomic variables. Other articles on real estate funds such as Kallberg, Liu, and Trzcinka (2000) and Hartzell, Muhlhofer, and Titman (2010) also use multifactor models to provide a better explanation of fund alpha. Thus, our second model is the following four-factor model:

$$r_{it} - r_{ft} = \alpha_i + \beta_{1i} * INDRF_t + \beta_{2i} * SMB_t + \beta_{3i} * HML_t + \beta_{4i} * MOM_t + \varepsilon_{i,t} \quad (2)$$

where:

$INDRF_t$	is the excess monthly return on Wilshire U.S. REIT index,
SMB_t	is the difference in returns between small and large capitalization stocks
HML_t	is the difference in returns between high and low book-to-market stocks
MOM_t	is the difference in returns between stocks with high and low past returns

The alpha intercept from the four-factor model examines fund's performance over the risk premium related to the industry, size, book-to-market, and momentum factors. As REMFs are generally small-cap funds, the Fama-French factors may be especially appropriate. Real estate funds could also be significantly impacted by the momentum factor, as it is generally related to industry effects (Moskowitz and Grinblatt, 1999; O'Neal and Page, 2000). For both the single-index and four-factor model, we first compute fund alpha using model above for the entire 1990–2008 period. Given the recent market events of 2007–2008, especially in the

real estate sector, we are interested in studying the impact of the severe market collapse experienced during the last two years in our sample period. Therefore, we use a dummy variable to indicate the market downturn period and re-estimate alpha as described earlier. This will allow us to draw inferences on how the down-market impacts the performance of the funds in our sample.

Given that we use overlapping observations, our results could exhibit a serial dependence bias. Therefore, we use Newey-West heteroscedasticity and autocorrelation adjusted standard errors to correct for the serial dependence of the standard error of the mean (Newey and West, 1987). Following standard procedure in mutual fund research, we restrict our sample to those funds with at least 36 monthly observations (Chen et al., 2004; Elton, Gruber, and Green, 2007).

2.2.2. *Conditional alphas and fund performance*

The conditional model examines the impact of publicly available information on fund alpha and includes lagged market variables in the regression estimations. According to Ferson and Schadt (1996), conditional models are better measures of fund alpha as they provide a more accurate account for time-varying model parameters and expected market returns. The authors argue that the conventional unconditional models assume publicly available information is not used by investors when they form expectations of future returns. This could imply that fund managers may not possess superior stock picking abilities if they rely merely on public information when making investment decisions. Ferson and Schadt (1996) and Edelen (1999) suggest adding public information such as the dividend yield, the default spread, and the Treasury spread to examine if fund managers have selectivity skills. If fund managers possess superior information other than publicly available information, they should be able to out-perform the benchmarks after controlling for these variables. The authors state that in cases where an unconditional model shows under-performance, the conditional model may show it moving to a more neutral or even a positive performance area.

We believe that because of the narrow, industry sector specific focus, the real estate funds in our sample could be more sensitive to the market indicators described in the Ferson and Schadt (1996) model. Therefore, we estimate the conditional model as a robustness check, following these authors and others such as Huij and Verbeek (2009) and Barras, Scaillet, and Wermers (2010):

$$r_{it} - r_{ft} = \alpha_i + \beta_{1i} INDRF_t + \beta_{2i} SMB_t + \beta_{3i} HML_t + \beta_{4i} MOM_t + \gamma_i (Q_{t-1} * INDRF_t) + \varepsilon_{i,t} \quad (3)$$

In the model above, the coefficients γ_i (γ_{1i} and γ_{2i}) represents the fund manager abilities to change beta in the presence of publicly known information; and Q_{t-1} is the vector of one period lagged values of the market indicators: the default spread (DS) between Moody's BAA and AAA rated bonds, and the Treasury spread (TS) between the 10 year T-bond yield and the three-month T-bill yield. As in the previous estimations, we evaluate REMF performance using the conditional model for the entire 1990–2008 period, and then re-estimate it using a dummy variable to indicate the down-market of 2007–2008.

2.2.3. Cross-sectional determinants of real estate fund performance

We next investigate the cross-sectional determinants of fund alpha. Research on diversified mutual funds shows mixed results for the cross-sectional impact of fund characteristics. While Carhart (1997) reports that fund performance, as measured by alpha, is negatively related to fund expense and turnover ratios, Ippolito (1989) does not document any relation between alpha and fund turnover or management fees. Grinblatt and Titman (1994) report that while fund alphas are positively related to fund turnover, there is no significant relation between alpha and either fund size or expense ratios. Chordia (1996) and Nanda, Narayanan, and Warther (2000) posit that fund performance is improved by expenses such as load fees and 12b-1 fees. They state that such fees act as screens for short-term investors and enhance fund performance because of reduced transaction costs. Edelen (1999) and Ferson and Warther (1996) report that sudden increases in fund flow have a significant negative effect on fund returns, as managers increase their cash holdings instead of investing in stock. On the other hand, Wermers (2000) and Grinblatt and Titman (1989) show that fund liquidity reduces expenses and thus positively impacts fund performance.

Haslem, Baker, and Smith (2008) examine the performance and characteristics of actively managed equity funds with diverse expense ratios. They find superior performance occurs, on average for large funds with low expense ratios, low trading activity, and no or low front-end loads. They also find that 12b-1 fees do not impact fund performance. In their examination of real estate funds, Kallberg, Liu, and Trzcinka (2000) find that larger funds and funds with higher turnover ratios have significantly better performance. They find that alpha is not significantly related to fund expense ratios. Lin and Yung (2004) also report a positive relation between alpha and fund size for their sample of REIT mutual funds, and show that fund expense ratio does not significantly impact fund performance.

We model the cross-sectional determinants of fund performance as follows:

$$\alpha_{it} = \beta_0 + \beta_1\, Expense\ Ratio_{it} + \beta_2\, Turnover_{it} + \beta_3\, Size_{it} + \beta_4\, 12b\text{-}1_{it} + \beta_5\, Cash_{it} + \varepsilon_{it} \quad (6)$$

where:

α_{it}	is the monthly abnormal performance for each fund obtained from the four factor model estimated over a 36 month rolling window.
Expense ratio	is the management, administrative expense, net of 12b-1 fees as percentage of total net assets
Turnover	is the minimum of aggregated sales or aggregated purchases of securities divided by the average 12-month total net assets of the fund
Size	is the log of total net assets
12b-1	is the monthly operating fee charged by the fund
Cash	is the percentage of total funds invested in cash

Based on the literature, we hypothesize the fund alpha is positively related to fund size and 12b-1 fees, and negatively related to total expense ratio, fund turnover ratio, and cash holdings. We use percentage of cash as a liquidity measure. Similar to Carhart (1997), we estimate Fama and Macbeth (1973) monthly cross-sectional regressions and then average

Table 2 Abnormal performance of real estate funds using the single-index market model

Variable	Estimate	*t* value	*p*-value
Panel A			
alpha	0.000402	1.09	0.2755
INDRF	0.902813	50.66	0.0000
Number of funds	184		
Fund month observations	18,248		
Panel B			
alpha	0.001149	3.93	0.0001
INDRF	0.897041	48.53	0.0000
Down dummy	−0.004289	−5.21	0.0000
Number of funds	184		
Fund month observations	18,248		

Notes: The table reports the asset-weighted performance and asset-weighted betas of the portfolio of real estate sector funds over period January 1990 to December 2008. INDRF is the excess monthly return of the Wilshire U.S. REIT index over the one month T-bill rate. The dependent variable is the individual fund's monthly excess return over the corresponding one month T-bill rate. *N* represents the number of monthly observations over the period January 1990 to December 2008. Results are based on Newey-West heteroscedasticity and autocorrelation adjusted standard errors. Only those funds with at least 36 monthly observations are included in the final analysis.

Panel A: Reports regression estimates and corresponding *t* statistics for the single factor model where the explanatory variable is INDRF. Panel B: The U.S. real estate market experienced a severe downturn beginning in 2007. To capture the impact of "downturn" we create a *down dummy* variable that takes a value of 1 if the period is between January 2007 and December 2008. Panel B reports the regression estimates and corresponding *t* statistics and *p*-values of the single-index model with the *down dummy* variable.

Model: $r_{it} - r_{ft} = \alpha_i + \beta_i * INDRFt + \varepsilon_{i,t}$.

these coefficient estimates across the entire sample period to evaluate the impact of real estate mutual fund characteristics on fund performance.

3. Empirical results

3.1. Performance based on unconditional and conditional models

We begin our analysis with an analysis of performance through the single index model. Table 2 reports the asset-weighted performance and asset-weighted betas of the portfolio of real estate funds for the period 1990–2008. Results are based on Newey-West heteroscedasticity and autocorrelation adjusted standard errors for funds that have at least 36 monthly observations.

Panel A of Table 2 shows that when compared to the Wilshire U.S. REIT index, asset-weighted average portfolio alpha is statistically insignificant, indicating the fund managers are unable to beat their relative index. This result differs from the findings of Gallo, Lockwood, and Rutherford (2000) and Kallberg, Liu, and Trzcinka (2000) who find that real estate mutual funds provide superior performance relative to the Wilshire Real Estate Index in a single-index context.

As mentioned earlier in the article, we want to investigate the impact of the real estate

market downturn of 2007–2008 on fund alpha. We also want to determine the impact of this period on the results for our overall period. To determine the impact of these two years in our overall results, we insert a dummy variable for the down years and re-estimate fund alpha. These results are presented in Panel B of Table 2. As can be seen in Panel B, the effect of the down period on REMF performance results is remarkable, and on average, asset-weighted portfolio alpha weighted by individual fund's monthly total net assets is now positive and highly significant for the period 1990–2006; the abnormal performance for the REMFs is approximately 1.2% annually. Furthermore, the coefficient of the dummy is negative and highly significant as well, demonstrating the extreme impact of the 2007–2008 period on real estate mutual fund returns. Thus, in the single-index context, it seems that the down-period is a significant driver in the results found in Panel A of Table 1, where we see no evidence of under- or over-performance over the 1990–2008 period. We find that when the down-market of 2007–2008 is excluded from the time period being evaluated, REMF managers are able to significantly out-perform the Wilshire U.S. REIT index. In the same token, the dummy for the downturn period shows that during this time, these funds significantly under-perform the real estate index.

We next examine individual fund alpha and average asset-weighted portfolio alpha in a multi-index framework, using the Carhart (1997) four-factor model. Asset-weighted performance and asset-weighted betas of our sample of real estate funds are presented in Table 3. Our first regression measures the overall period; as reported in Panel A of Table 3, portfolio alpha is once again insignificant as measured by the four-factor Carhart model for the period 1990–2008. Our results differ from those of Kallberg, Liu, and Trzcinka (2000), who find that REIT mutual fund managers are able to out-perform the market in a multi-index framework. Once again, we want to verify the impact of the last two years of our sample period on the overall results. We present the portfolio alpha results with the dummy variable for 2007–2008 in Panel B of Table 3. Similar to the results reported in the single-index model, we find that asset-weighted average alpha is positive and very significant for the period 1990–2006, while the coefficient for the dummy variable for period 2007–2008 is negative and highly significant as well.

As a robustness check of our previous models, we next provide the asset weighted performance and asset weighted betas of real estate sector funds using the Ferson and Schadt (1996) conditional model. We re-estimate our four-factor model after controlling for lagged default spread and Treasury spread in interaction terms as illustrated in Model 3 in the methodology section. If the fund manager possesses superior selectivity skills after controlling for these publicly available variables, fund performance should improve with this model. Ferson and Schadt (1996) report better performance results for the average mutual fund in their study when the conditional model is used. However, our estimations as reported in Panel A of Table 4 show that alpha remains insignificant even in the Ferson and Schadt (1996) model. As in the previous estimations, Panel B of Table 3 provides the results for the period 1990–2006, with a dummy variable for the market downturn of 2007–2008. Again our previous findings as reported in Tables 2 and 3 are verified; we find that the alpha for the period 1990–2006 is positive and highly significant. In addition, as in the earlier models, the coefficient for the downturn dummy for 2007–2000 is negative and highly significant. Thus, the more stringent Ferson and Schadt (1996) model confirms our previous results.

Table 3 Abnormal performance of real estate sector funds using multi factor models

Variable	Estimate	*t* value	*p*-value
Panel A			
alpha	0.00034	0.94636	0.34521
INDRF	0.90841	45.79543	0.00000
SMB	−0.00556	−0.82341	0.41135
HML	−0.01265	−1.44273	0.15081
MOM	0.01546	2.07566	0.03932
Number of funds	184		
Fund month observations	18,248		
Panel B			
alpha	0.001114	3.948123	0.000112
INDRF	0.903479	44.826651	0.000000
SMB	−0.006459	−0.966344	0.335148
HML	−0.019002	−2.562351	0.011202
MOM	0.016548	2.272938	0.024192
Down dummy	−0.004362	−5.470334	0.000000
Number of funds	184		
Fund month observations	18,248		

Notes: This table reports the asset-weighted performance and asset-weighted betas of the portfolio of real estate sector funds over the period January 1990 to December 2008. INDRF is the excess monthly return of the Wilshire U.S. REIT index over one month T-bill rate; SMB, HML, and MOM are monthly returns of size (the difference in returns between small and large cap stocks), book to market (the difference in returns between high and low book-to-market stocks), and momentum (the difference in returns between stocks with high and low past returns) portfolios, respectively. The dependent variable is the individual fund's monthly excess return over the corresponding one month T-bill rate. *N* represents the number of funds over the period January 1990 to December 2008. Results are based on Newey-West heteroscedasticity and autocorrelation adjusted standard errors. Only those funds with at least 36 monthly observations are included in the final analysis.

Panel A: Reports regression estimates and corresponding *t* statistics and *p*-values of four-factor model where INDRF is a proxy for the market. Panel B: The U.S. real estate market experienced a severe downturn beginning in 2007. To capture the impact of "downturn" we create a *down dummy* variable that takes a value of 1 if the period is between January 2007 and December 2008. Panel B reports the regression estimates and corresponding *t* statistics and *p*-values of the five-factor model where the *down dummy* is the 5th variable.

Taken together, our single-index, multi-index, and conditional models all provide similar results. When examining performance for the period of 1990–2008, we are not able to show any evidence of over- or under-performance. We then parse our sample to allow for the severe market downturn of 2007–2008. When removing this period from our estimations by introducing a market downturn dummy variable, our results change dramatically. We now show that the REMFs in our sample over-perform regardless of benchmark or model specification for the period 1990–2006. Moreover, the same funds drastically under-perform the benchmarks for the down-market period of 2007–2008. We provide a summary of the performance results in Table 5.

A perusal of the table demonstrates the difference in the number of funds that report significantly positive performance in the estimations with the down-market dummy. For the single-index model, this number improves from 12 to 19 funds, for the four-factor unconditional model, it improves from 7 to 20 funds and from 5 to 10 funds for the conditional model. Similarly, the number of significantly negative alphas decreases in the estimations with the down-market dummy.

Table 4 Conditional model and abnormal performance of real estate sector funds

Variable	Estimate	*t* value	*p*-value
Panel A			
alpha	0.00029	0.82220	0.41203
INDRF	0.89619	22.76623	0.00000
SMB	−0.00506	−0.77609	0.43870
HML	−0.01442	−1.88330	0.06125
MOM	0.01614	2.32624	0.02110
$INDRF_t * DS_{t-1}$	0.37164	0.19153	0.84832
$INDRF_t * TS_{t-1}$	1.26334	1.58730	0.11417
Number of funds	184		
Fund month observations	18,248		
Panel B			
alpha	0.00111	3.80548	0.00019
INDRF	0.88610	21.67271	0.00000
SMB	−0.00628	−0.98126	0.32776
HML	−0.02201	−3.55481	0.00048
MOM	0.01783	2.65733	0.00857
$INDRF_t * DS_{t-1}$	0.64236	0.32832	0.74304
$INDRF_t * TS_{t-1}$	1.31131	1.64394	0.10191
Down dummy	−0.00465	−4.65024	0.00001
Number of funds	184		
Fund month observations	18,248		

Notes: This table reports the asset-weighted performance and asset-weighted betas of the portfolio of real estate sector funds over the period January 1990 to December 2008. INDRF is the excess monthly return of Wilshire U.S. REIT index over the one month T-bill rate; SMB, HML, and MOM are monthly returns of size (the difference in returns between small and large cap stocks), book to market (the difference in returns between high and low book-to-market stocks), and momentum (the difference in returns between stocks with high and low past returns) portfolios, respectively. Coefficients γi capture the response of the manager's beta to the public information embedded in the two traditional market predictors; where Q_{t-1} is a vector of lagged values of the market predictors: the default spread (DS) is the difference between Moody's BAA and AAA rated bonds lagged one period and Treasury spread (TS) is the difference between the 10 year Treasury bond yield and the three month Treasury bill yield. The dependent variable is the individual fund's monthly excess return over the corresponding one month T-bill rate. *N* represents number of funds over the period January 1990 to December 2008. Results are based on Newey-West heteroscedasticity and autocorrelation adjusted standard errors. Only those funds with at least 36 monthly observations are included in the final analysis.

Panel A: Reports regression estimates and corresponding *t* statistics and *p*-values of four-factor model where INDRF is a proxy for the market. Panel B: The U.S. real estate market in the U.S. suffered a severe downturn starting in 2007. To capture the impact of the "downturn" we create a *down dummy* variable that takes a value of 1 if the period is between January 2007 and December 2008. Panel B shows the regression estimates and corresponding *t* statistics and *p*-values of five-factor model where *down dummy* is the 5th variable.

MODEL: $r_{it} - r_{ft} = \alpha_i + \beta_{1i} INDRF_t + \beta_{2i} SMB_t + \beta_{3i} HML_t + \beta_{4i} MOM_t + \gamma_i (Q_{t-1} * INDRF_t) + \varepsilon_{i,t}$.

3.2. Cross-sectional analysis

In Table 6, we estimate Fama and Macbeth (1973) monthly cross-sectional regressions and then average these coefficient estimates across the entire sample period to evaluate the impact of the flow of funds and turnover on abnormal performance. We use a rolling 36 month window of returns to estimate the beta loadings of the four-factor model to then calculate alphas for each month (Carhart, 1997; Brown, Harlow, and Starks, 1996). This estimation model allows beta to change over time, and time-varying alphas incorporate this effect.

Table 5 Comparison of abnormal performance across various models

Model	Number of funds	Positive	Negative	Significant	Insignificant	Positive and significant	Negative and significant
Single factor model alpha	184	62	122	50	134	12	38
Single factor model with downturn dummy alpha	184	93	91	47	137	19	28
Four-factor model unconditional model alpha	184	56	128	48	136	7	41
Four-factor unconditional model with downturn dummy alpha	184	85	99	50	134	20	30
Four-factor model conditional model alpha	184	51	133	45	139	5	40
Four-factor conditional model with downturn dummy alpha	184	69	115	37	147	10	27

Notes: This table shows the comparison of the abnormal performance of the individual funds across six different models. Abnormal performance (alpha) is estimated by using single factor market model, single factor market model with the downturn dummy, Carhart four-factor model, Carhart four-factor model with the downturn dummy, Carhart four-factor conditional model, and the Carhart four-factor conditional model with the downturn dummy. The table also divides performance based on significant, insignificant, positive, negative, positive and significant, and negative and significant alphas.

Based on the literature on diversified and real estate mutual funds, we had hypothesized that fund alpha is positively related to fund size and 12b-1 fees. We find that fund alpha is

Table 6 Cross-sectional analysis

Variable	Estimate	*t* statistics
Alpha	−0.001	−1.48
MEXP	−0.492*	−1.74
MTURN	0.0128**	2.44
Size	0.0002***	4.32
M12B-1	0.3005	0.57
MCASH	0.0012	0.44
Adj. R^2	0.238	
N	7,790	

Notes: This table summarizes the multivariate Fama and MacBeth (1973) cross-sectional regressions for each month from December 1992 to December 2008. The dependent variable is the monthly intercept calculated using four- factor beta loadings on the prior three years of monthly returns. The independent variables are: *MEXP* is the monthly expense ratio net of 12b-1 fees, *MTURN* is the monthly minimum of aggregated sales or aggregated purchases of securities divided by the average 12-month total net assets of the fund, *Size* is the log (monthly total net assets), *M12B-1* is the monthly operating fee charged by mutual funds, and *MCASH* is the monthly percentage of total funds invested in cash. The reported estimates are time-series averages of monthly cross-sectional regression slope estimates as in Fama and MacBeth (1973). *N* refers to the number of fund month observations used in the regression.

$\alpha_{it} = \beta_0 + \beta_1\ Expense\ Ratio_{it} + \beta_2\ Turnover_{it} + \beta_3\ Size_{it} + \beta_4\ 12B1_{it} + \beta_5\ Cash_{it} + \varepsilon_{it}$.

***, **, and * represent the statistical significance at 1%, 5%, and 10% level, respectively.

indeed very strongly related to fund size but not related to management fees in the way of 12b-1 fees. We also hypothesized that fund alpha is negatively related to the expense ratio, turnover ratio, and cash holdings. However, we find that fund alpha is positively impacted by fund turnover ratio at the 5% significance level; for every hundred basis point increase in turnover ratio, fund alpha increases by 1 basis point. Thus, our results confirm those of Kallberg, Liu, and Trzcinka (2000) who document positive alphas for larger funds with higher turnover ratios. While these above-mentioned authors do not find any relation between performance and expense ratios, we find that fund alpha is negatively related (at the 10% level) to fund expense ratio. Similar to Tiwari and Vijh (2004), we do not document any relation between alpha and cash holdings.

4. Conclusion

Our study provides a comprehensive analysis of the performance of REMFs for the period 1990–2008. Previous studies on real estate fund performance find mixed results on the evidence of over- or under-performance. Using one of the largest sample size and sample periods to date, our article provides an extensive examination of manager skill and selectivity. We also add to the literature on REMF performance by investigating the impact of the downturn of 2007–2008 on fund performance.

The performance results for the single-index, four-factor, and conditional models all tell the same story. Fund performance is positive but insignificant over the entire sample period of 1990–2008. However, once we account for the down-market conditions of 2007–2008, we note a drastic change in our results. Fund performance is positive and significant for the 1990–2006 period, while the coefficient for the downturn dummy variable is negative and highly significant. It appears that fund managers are able to out-perform their industry benchmark in all periods except for the last two years of one of the most severe downturns experienced in modern times. To this extent, our results on fund performance are consistent with prior studies such as Kallberg, Liu, and Trzcinka (2000) that report that real estate fund managers are able to beat their relative benchmarks.

Notes

1 Cohen and Steers is a multibillion dollar mutual fund with emphasis on global real estate and infrastructure, among other asset classes. This fund's net asset value is roughly $45 billion by the end of year 2011.
2 For more details, please refer to *The Truth About Real Estate Allocations* by Joseph Harvey (Harvey, 2010).
3 While Derwall et al. (2009) study 282 REIT mutual funds for 1980 through July 2008, they do not examine down-market impact on fund performance, but investigate the impact of REIT momentum on REIT mutual fund performance.
4 Our sample comprises the entire universe of real estate mutual funds available on the CRSP survivor bias-free database and thus differs from the sample described in

Kallberg, Liu, and Trzcinka (2000). While our initial sample size is similar to that documented by O'Neal and Page (2000) and Derwall et al (2009), our final sample differs because we restrict our funds to those with at least 36 monthly observations.

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