A Systematic Study of Real Estate Core Funds: Herd Behavior and Performance Attribution Analysis

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ABSTRACT

The returns and portfolio characteristics of core funds were tested for evidence of herd behavior and performance relative to the NCREIF Property Index (NPI), using a proprietary database that included data from 1985 to 2004. Tests performed include descriptive statistics, regression analysis, and attribution analysis.

Results indicate that herd behavior tends to be somewhat correlated with the NPI return. Through our disaggregate (fund specific) analysis, we find that herd behavior, where managers base investment decisions on the collective actions of the market rather than their individual beliefs, may be present in the core fund industry. Regression analysis suggests that herding appears to be positively correlated with fund size and negatively correlated to leverage, fees, and persistence from the one-year lag of the deviation from the mean.

Performance analysis results indicate that although fund leverage has increased significantly over time, the use of debt has produced little or no additional return to investors. We found that across funds, net returns to real estate fall short of the NPI, and that across time, there is a negative correlation between the performance of the index and fund performance relative to the index. Attribution analysis revealed that property selection returns have produced the greatest amount of return deviation from the NPI over time, and that selection and strategy returns are negatively correlated. Regression analysis suggests there is persistence in fund performance in the short term, that a fund's fee is positively correlated with gross returns, although that does not necessarily translate into higher returns to the investor, and that larger funds are negatively correlated with performance.

Thesis Supervisor: David M. Geltner
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I. Introduction

The real estate private equity industry has grown tremendously over the last decade as a result of both regulatory and market changes. As real estate has gained favor as an asset class, comprising a larger portion of and occupying a more permanent place in a balanced portfolio, real estate core funds have become a popular investment vehicle. This relatively recent interest in core funds has brought into focus a number of issues in this segment of the real estate industry with regard to reporting practices, transparency of results and, perhaps most importantly, individual manager performance.

From a cursory review of the data available, returns of core funds appear tightly bunched over the long term, and fall relatively close to the National Council of Real Estate Investment Fiduciaries (NCREIF) benchmark index, suggesting that core funds are something of a commodity; but do these casual observations stand up to rigorous analysis? In an attempt to answer this question, our study focuses on two issues: i) characterizing herd behavior in the core real estate fund industry and ii) determining whether there is an advantage to investing in one particular core fund over another.

We begin our analysis with herd behavior, examining both the aggregate and disaggregate dispersion in total returns and testing for possible correlates, including fund size, leverage, fee, and age. We then analyze the performance of core funds by comparing the subject group to the NCREIF Property Index (NPI), examining both gross-of-fee and net-of-fee returns on an aggregate and disaggregate basis. Lastly, we investigate the individual investment selection and allocation strategy performance of each fund to help identify the reasons for over- or under-performance.

II. Overview of Core Funds

With the disastrous effects of the 2000 to 2002 bear market in publicly-traded equities, institutional investors are making increasingly greater commitments to real estate in search for stability, higher cash income and the potential for significant total return.[1] As a result, almost all general investment consultants are gearing up their search activity and ability to deal in private real estate, an asset class that many had ignored in the 1990's.[2] In a recently reported 2005 Pension Real Estate Association (PREA) Plan Sponsor Survey, just over one-third of the plans report they have a target allocation to real estate of 10% or more. Although these allocation targets are high relative to historical standards, actual investment falls below the mark. Only 12.3% of plans surveyed actually hold 10% or more of their total assets in real estate.[3]

In an effort to define investor objectives, and to direct advisors' efforts in acquisitions and asset management, a consensus has emerged around the terms "core," "enhanced core or core-plus," "value-added" and "opportunistic." "Core" comprises the bulk of most investors' real estate portfolios, and has traditionally involved investments in well leased, multi-tenanted properties in major metropolitan areas, owned with little or no mortgage debt and made up of mainstream, income-producing office, industrial, retail and multi-family assets. As reported in the 2005 PREA Plan Sponsor Survey, investments classified as core constitute 70.4%, or $73 billion of the $104 billion currently invested in institutional quality real estate.[4]

Generally speaking, core properties are viewed as the least risky, commensurately producing the lowest returns. Some consultants use absolute return targets to help define the difference in investment types, with core returning 8-10%, core-plus delivering 10-12%, value-added stepping-up another 200 basis points to 12-14%, and opportunistic investments yielding 14% or higher. Others simply use a relative yardstick, such as the NPI return plus 100, 200 or 400 basis points.[5]

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[1] Ronald W. Kaiser, "Investment Styles and Style Bosex in Equity Real Estate: Can the Emerging Model Succeed in Classifying Real Estate Alternatives?," *Journal of Real Estate Portfolio Management*, vol. 11, no. 1 (Jan-Apr 2005), p. 5
[2] *Ibid.,* p. 6
[3] "2005 Plan Sponsor Research Report," *Pension Real Estate Association,* 2005, p. 6
[4] *Ibid.,* p. 11
[5] Ronald W. Kaiser, "Investment Styles and Style Bosex in Equity Real Estate: Can the Emerging Model Succeed in Classifying Real Estate Alternatives?," *Journal of Real Estate Portfolio Management*, vol. 11, no. 1 (Jan-Apr 2005), p. 10

Distribution of Private Real Estate Investments by Strategy

	All Plans		% of Private Real Estate Equity by Size and Type				
	$ Millions	% of Private RE Equity	Assets > $25B	Assets < $25B	Public	Corporate	Other
Core	73,401	70.4	72.0	66.3	72.2	58.9	72.7
Value-Added	18,134	17.4	16.2	20.5	17.4	15.5	18.6
Opportunistic	12,684	12.2	11.8	13.1	10.4	25.6	8.7
Total	104,219	100.0	100.0	100.0	100.0	100.0	100.0

Source: Pension Real Estate Association
Note: Totals may not add due to rounding.

Figure 1: Real Estate Assets By Investment Class and Fund Size

III. Literature Review

Herd Behavior

Literature on herd behavior has mainly focused on the financial stock markets. Although real estate core funds have been part of the institutional investment sector since the 1990's, there has not been a thorough investigation of potential herd behavior between these funds and NCREIF. This is likely due to the fact that, unlike information on publicly traded companies, data on core funds is not publicly available.

Christie and Huang (1995) provide this description of Herd Behavior: "In a market setting, herds are characterized by individuals who suppress their own beliefs and base their investment decisions solely on the collective actions of the market, even when they disagree with its predictions."[6] Their objective was to test for the presence of herd behavior when herds are most likely to form in financial markets. They believed that because individuals are more likely to suppress their own beliefs in favor of the market consensus during periods of unusual market movements, herd behavior would most likely emerge during periods of market stress. Natural candidates for these periods are those trading intervals characterized by large swings in average prices. Additionally, they believed that firms herd around the returns of firms that share common characteristics. For example in our study, core real estate funds herding around similar core real estate funds. Results of their study indicated that dispersions increase much more dramatically during up markets relative to down markets. They also found that the dispersions were found to increase significantly during periods of large average price changes, implying individual returns do not cluster around either the market or industry returns during periods of market stress.

Christie and Huang also tested for herding within industries, using data from both NYSE and AMEX firms for a period extending from July 1962 and December 1988. Daily and monthly returns were equally weighted. The following table provides the average level of dispersions, its associated standard deviation, and the average number of firms used to compute the statistics for the entire sample and by industry. For the daily returns, the average level of

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[6] William G. Christie and Roger D. Huang, "Following the Pied Piper: Do Individual Returns Herd around the Market?," *Financial Analysts Journal,* vol. 51, no. 4 (July-August 1995), p. 31

dispersion is 2.90% a day across all stocks, with a standard deviation of .59%. Across industries, the level of dispersion ranges from a low of 1.60% for utilities to 3.24% for petroleum. The average level of dispersion for monthly returns is 9.77% with a standard deviation of 5.22%. Instead of Christie and Huang's daily and monthly returns, our dispersion analysis uses annualized returns.

Industry	Average Return Dispersion	Standard Deviation of Dispersion	Average Number of Firms
Daily Data			
All industries	2.90%	0.59%	2,292
Petroleum	3.24	1.22	119
Finance and real estate	2.94	0.90	265
Consumer durables	3.17	0.74	370
Basic industries	2.78	0.69	319
Food and tobacco	2.37	0.65	143
Construction	2.77	0.88	86
Capital goods	2.84	0.68	309
Transportation	2.78	0.86	75
Utilities	1.60	0.45	174
Textile and trade	2.92	0.85	241
Services	3.15	1.01	95
Leisure	3.01	1.00	96
Monthly Data			
All industries	9.77%	5.22%	890
Petroleum	8.45	4.80	49
Consumer durables	9.89	5.05	151
Basic industries	9.41	5.46	190
Food and tobacco	8.66	5.64	96
Capital goods	9.07	4.42	132
Transportation	10.96	7.48	69
Utilities	6.63	4.93	100
Textile and trade	9.37	5.41	103

Source: Christie and Huang 1995

Figure 2: Return Dispersion By Industry

Bikhchandani and Sharma (2001) describe herding a result from an obvious intent by investors to copy the behavior of other investors.[7] If a manager is uncertain, they follow the "noise" of the market. The paper also describes compensation-based herding where, if an investment manager's compensation depends on how the performance compares with other professionals, this may lead to herd behavior.[8] Additionally, Scharfstein and Stein (1990) find that under certain circumstances, managers simply mimic the investment decisions of other managers, ignoring substantive private information. Herd behavior by money managers could

[7] Sushil Bikhchandani and Sunil Sharma, "Herd Behavior in Financial Markets," *International Monetary Fund Staff Papers,"* vol. 47, no. 3 (2001) p. 281
[8] *Ibid.,* p. 292

provide a partial explanation for excessive stock market volatility. By mimicking the behavior of others rather than responding to their private information, members of a herd will tend to amplify exogenous stock price shocks.[9]

Real Estate Fund Performance

Most of the existing literature on real estate performance focuses on publicly-traded REITS and mutual funds. Our research found no published articles specifically addressing return performance within the core fund industry, again, likely due to the proprietary nature of the information.

Gallo, Lockwood and Rutherford (2000) examined the performance of real estate mutual funds from January 1991 to December 1997 and found that their sample of funds outperformed the Wilshire Real Estate Securities Index on a risk-adjusted basis by more than 5% annually. They attribute this superior performance to funds' over-weighting outperforming property types (specifically health care and apartments) relative to the index, concluding that the funds employed superior allocation strategies among asset classes during the study period, but that selection within a property type had no effect on returns.

Damodaran and Liu (1993) and Kallberg, Liu and Trzcinka (2000) suggest that investment managers in real estate can produce positive abnormal returns because of their specific appraisal skills and information about real estate investment targets, while acknowledging that existing studies on professionally managed real estate investments have not found evidence of positive abnormal performance.

On the other hand, O'Neal and Page (2000) examined the performance of twenty-eight real estate mutual funds over a three-year period from 1996 to 1998, concluding that they did not produce positive abnormal returns.

Lin and Yung (2004) corroborate that finding, concluding that mutual fund performance is primarily determined by the performance of the real estate sector as a whole. Their study also found that fund performance persists in the short term, and that risk adjusted real estate fund returns are positively affected by fund size, but are unrelated to expense ratio, management tenure and turnover.

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[9] David S. Scharfstein and Jeremy C. Stein, "Herd Behavior and Investment," *The American Economic Review,"* vol. 80, no. 3 (June 1990) p. 477

Myer and Webb (1993) regressed quarterly holding period returns of professionally managed private real estate portfolios onto the NPI for a period of 29 quarters. In the 47 portfolios they examined, they found only 16 (or 34%) whose returns exceeded the NPI with statistical significance.

In a later study, Myer, Webb and He (1997) expanded their research to include the effect of a fund's asset management fee on return and to test for persistence. They conclude that the ranking of funds does not seem to depend on whether gross or net returns are used, suggesting that funds with superior performance do not charge fees that are higher, on average, than those charged by poorly performing funds. They also found that a far larger percentage of funds outperform NCREIF when a Jensen alpha measure (a risk-adjusted return metric) is used compared to a cumulative return measure. The evidence for persistence of performance also differs by performance measure. The cumulative return showed some evidence of persistence, but the Jensen alpha measure did not.

It is important to keep in mind that these conclusions were reached studying funds that invested in publicly traded real estate securities and not individual property investments. In principle, real estate investment managers who buy property directly might be able to produce persistently superior selection effect returns (gross-of-fees, anyway) without violating market efficiency assumptions due to: (i) the private nature of the asset market, which might enable some managers to gain "inside" access to the best deals (known in the venture capital investment industry as "deal flow access" – i.e., they get to see the best deals first, presumably because of a track record of reliable and speedy execution of the deal), and (ii) the ability of the investment manager to exercise operational control over the investment assets (unlike in the case of stock mutual fund managers), which could enable managers with non-replicatable property value-enhancing operational management skills to perform better than average.[10]

Portfolio-Level Attribution Analysis

Geltner and Miller (2001) describe selection and allocation as the two major functions of a portfolio manager, and consequently, portfolio level performance attribution seeks to parse the

[10] That said, these micro-level effects would be more difficult to produce for the commodity-like investments of core funds than for the more entrepreneurial investments of opportunity funds. It would seem more likely that core managers might have superior macro-level research that could enable persistently superior sector allocation strategy to effect performance.

total return performance relative to the benchmark into two components relating to these two functions. Selection is defined as the micro-level decision of which particular assets are picked by the manager to include in the portfolio, and allocation refers to the chosen segment weights in a portfolio, which in the case of our study is property type. We employ standard industry methodology, the mechanics of which are outlined in the next section, to quantify performance attributes and evaluate the performance of our study group of funds relative to the NPI.

IV. Data

Data used in this study was provided by Pension Consulting Alliance, Inc. (PCA), a consultancy organization which, in addition to providing advisory services for pension funds, conducts research and reporting on investment topics.[11] Data was gathered from core fund general partners through questionnaires and annual reports since their respective inception to year-end 2004. Only commingled, open-ended funds are included in our study, as defined by Pension Real Estate Association (PREA):

> *Commingled fund*: a term applied to all open-end and closed-end pooled investment vehicles designed for institutional tax-exempt investors. A commingled fund may be organized as a group trust, a partnership, a corporation, an insurance company separate account, or another multiple ownership entity.[12]
>
> *Open-end fund*: a commingled fund with no finite life that allows continuous entry and exit of investors and typically engages in ongoing investment purchase and sale activities. [13]

A total of thirteen firms representing nineteen open-ended funds participated in the initial survey.

The data set for herd behavior analysis consists of ten firms with thirteen funds reporting from 1985 through 2004. A total of six funds were eliminated for the following reasons: three were recently formed in the second or third quarter of 2004 and had not yet accumulated a full year's worth of performance data, another two specialized in only one property type, and one exhibited characteristics more similar to opportunistic funds than core real estate.

The data set for the performance analysis consists of nine firms with eleven funds reporting both fund characteristics and performance results from 1985 to 2004. In addition to the above mentioned funds that were eliminated from the data set, another two were removed because of higher yield targets and investment styles more indicative of "value-add" funds than "core" funds.

The firms provided the following information:

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[11] Pension Consulting Alliance website: http://www.pensionconsulting.com
[12] "2005 Plan Sponsor Research Report," *Pension Real Estate Association,* 2005, p. 31
[13] *Ibid,* p. 31

- Quarterly income, appreciation and total returns- both gross and net of all management fees, other fees and expenses for each quarter since inception
- Quarterly Gross and Net Asset Value for each quarter since inception
- Year-end disaggregation of the value of property holdings (based on GAV) by the five major property types (i.e.: Office, Apartment, Retail, Industrial and Hotel) and the four major geographic regions (East, West, South, Midwest) for each year since inception
- Year-end total number of properties held in the fund broken down into the five major property types and four major geographic regions for each year since inception

The study also includes data from NCREIF as a benchmark for core funds. Nearly all plan sponsors surveyed in the 2005 PREA survey benchmark their real estate investments using NCREIF's data.

	Number	Percentage
NCREIF	46	92.0
NAREIT	12	42.0
Wilshire REIT	7	14.0
Morgan Stanley REIT	6	12.0
IPD	4	8.0

Source: Pension Real Estate Association

Figure 3: NCREIF is Benchmark of Choice for Pension Funds

The study specifically utilized NCREIF's newest performance product, the NCREIF Fund Index-Open-End Diversified Core Equity or NFI-ODCE. The NFI-ODCE is an index of investment returns reporting on both a historical and current basis the results of 26 open-end commingled funds pursuing a core investment strategy, some of which have performance histories dating back to the 1970's.

V. Herd Behavior

Methodology

We first investigated herd behavior at the aggregate level (across all of the funds) within each year, to observe how herd behavior has been varying over time. Then we go down to the disaggregate level where we model the herd behavior of individual funds, also over time. Our quantitative measure of herd behavior is labeled as "D(t)" for the disaggregate measure for fund i in year t. We use the label "D" to stand for *dispersion* or *deviation,* the amount of difference among funds from the mean performance of all the funds (in a given year). Thus, "D(t)" is actually a measure of the inverse of herd behavior. The larger "D(t)" is, the less "herd behavior" there is, as "D(t)" is actually a measure of "deviation from the herd", where "herd" is defined as the mean performance of all of the funds.

"D(t)" is defined in two alternative ways, both measuring the *absolute* (unsigned) difference from the mean across all funds in each year. Thus, our measure of deviation is not sensitive to whether a fund deviates from the mean by performing better than the mean or worse than the mean. (The signed or algebraic difference would measure the relative *quality* of performance, which is a different topic than herding, and is studied in the other part of this thesis using different measures.) The two definitions of "D" that we use are based on, respectively, the absolute deviation and the squared deviation from the mean fund performance each year. For aggregate level analysis, we use the average of these measures across the funds available each year.

- The mean absolute deviation (MAD) is the difference each period between the total return performance of each fund and the unweighted mean total return performance of all the funds, averaged across all the funds:

$$D(t)=\sum \frac{|(r(i,t)-r(m,t))|}{n(t)} \quad \textit{(Equation 1)}$$

where r(i,t) is the total return to fund i in year t, r(m,t) is the mean total return to all of the funds in year t, and n(t) is the number of funds available in year t. The sum is across funds within each year.

- The mean squared deviation (MSD) is similar, but only takes the square rather than the absolute value of the deviations, across the funds, within each year:

$$D(t) = \sum \frac{((r(i,t)-r(m,t))^2}{(n(t)-1)} \quad \textit{(Equation 2)}$$

As noted, we also analyze the disaggregate (fund specific) herd behavior over time. This is calculated based on a disaggregated measure of fund deviation from the mean fund each year "D(i,t)":

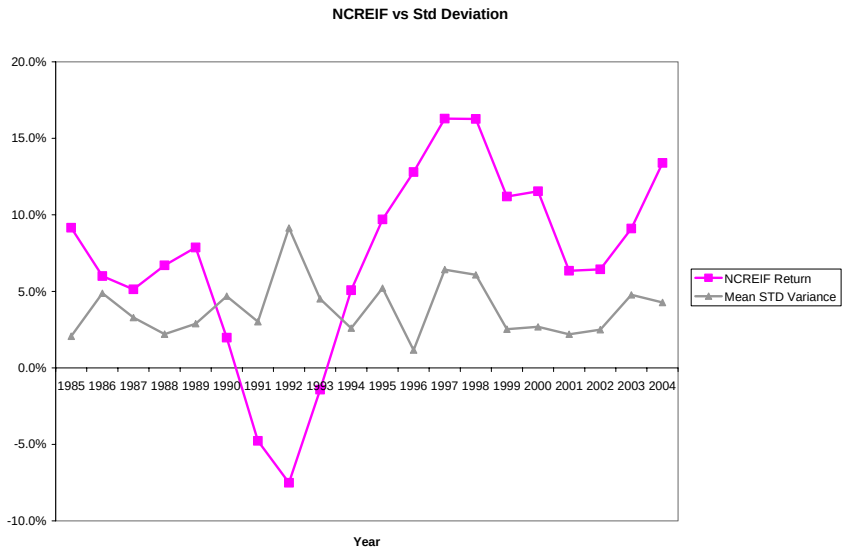
$$D(i,t) = (r(i,t) - r(m,t))^2 \quad \textit{(Equation 3)}$$

The equation shows the magnitude of the dispersion between funds, across time.

Lastly, the study also uses a regression analysis on the pooled (panel) data, regressing our disaggregate measure of dispersion, "D(i,t)" on to several different combinations of "explanatory" variables, to test some hypotheses about what might be causing or correlated to herd behavior. These regressions are across both time and funds where both "i" and "t" will be varying in the data.

Results and Analysis

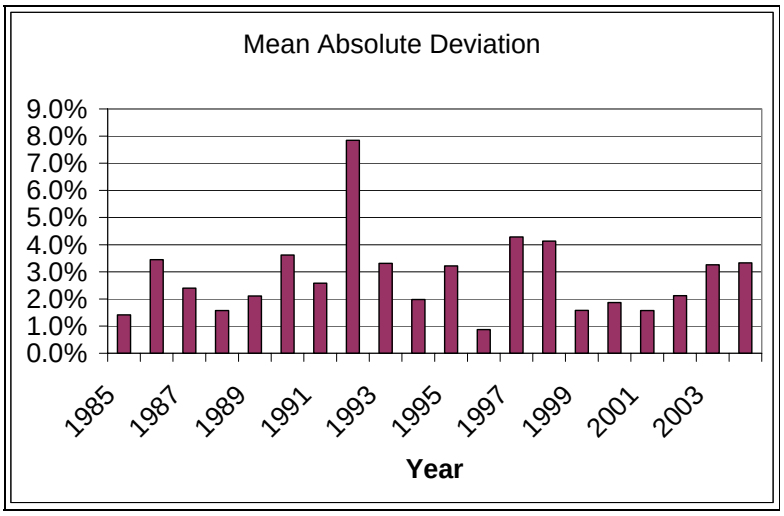
We begin our characterization of herd behavior at the aggregate level with an analysis of performance dispersion, across all funds within each year. Graph 1 plots the square root of the MSD (i.e., the "standard deviation" of the funds' performance) in each year in our sample history, to show how herd behavior has been changing over time.



Graph 1: NCREIF vs. Standard Deviation of the Mean (across all funds)

Looking at the above graph, D(t) ranges from 1% in 1996 to 9% in 1992, with most years ranging from 2%-3%. Other than the outlier year of 1992, we found that herd behavior tended to be somewhat correlated with the NCREIF return. When NCREIF was in an upmarket, there was less herding across funds. Whereas in a down-market, herding was more apparent. 1992 was a somewhat anomalous year when private real estate markets bottomed, the turning point when companies initiated the REIT boom, the CMBS market was just forming, and allegations that some funds were overvalued.

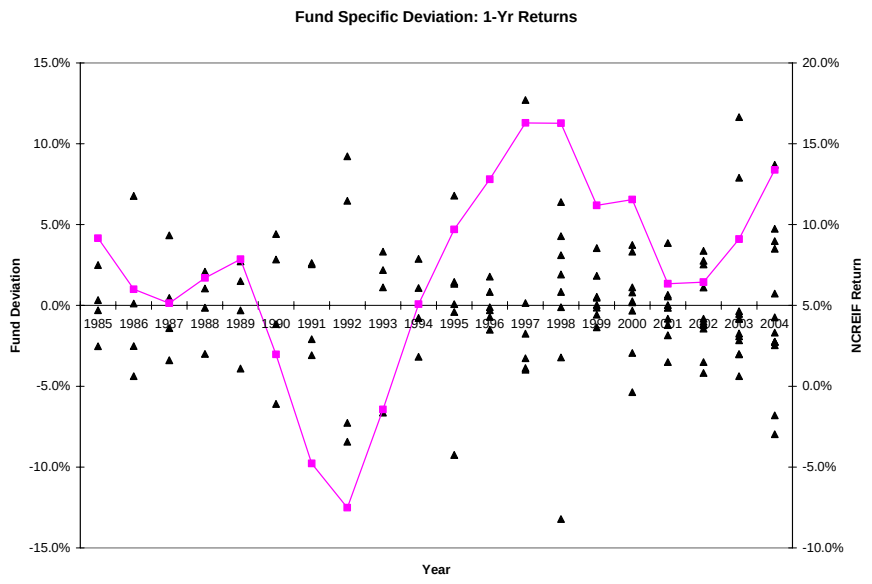
Graph 2 is like Graph 1 only it uses the MAD rather than the MSD to portray the average fund return performance deviation from the mean by year.



Graph 2:Mean Absolute Deviation

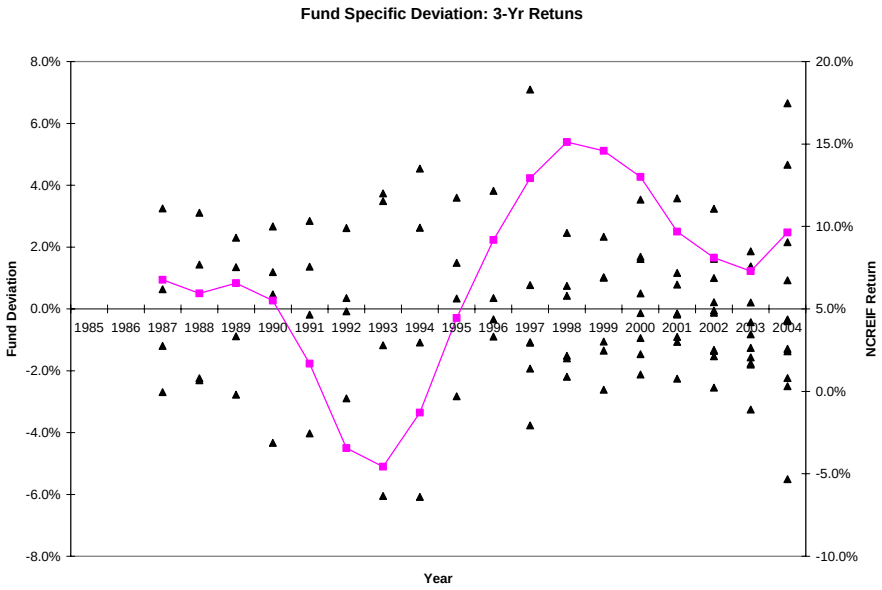
Graph 2 shows a very similar picture to Graph 1 except that the deviation range is slightly smaller, from 1% in 1996 and nearly 8% in 1992, with most of the years ranging from 1.5%-3%.

Next we turn to our disaggregate analysis. To begin, let us look at scatterplots of the individual fund returns relative to the mean return each year. Each "dot" (triangle) in the scatterplots presented in Graphs 3-5 represent one fund's performance relative to the mean during this year indicated on the horizontal axis: (r(i,t)-r(m,t)). Graphs 3, 4, and 5 show, respectively, the deviation for 1-yr, and for trailing annualized average 3-year and 5-year returns. The solid line is the corresponding (trailing average) NCREIF return, to illustrate the prevailing institutional real estate market condition. Funds are masked for anonymity.



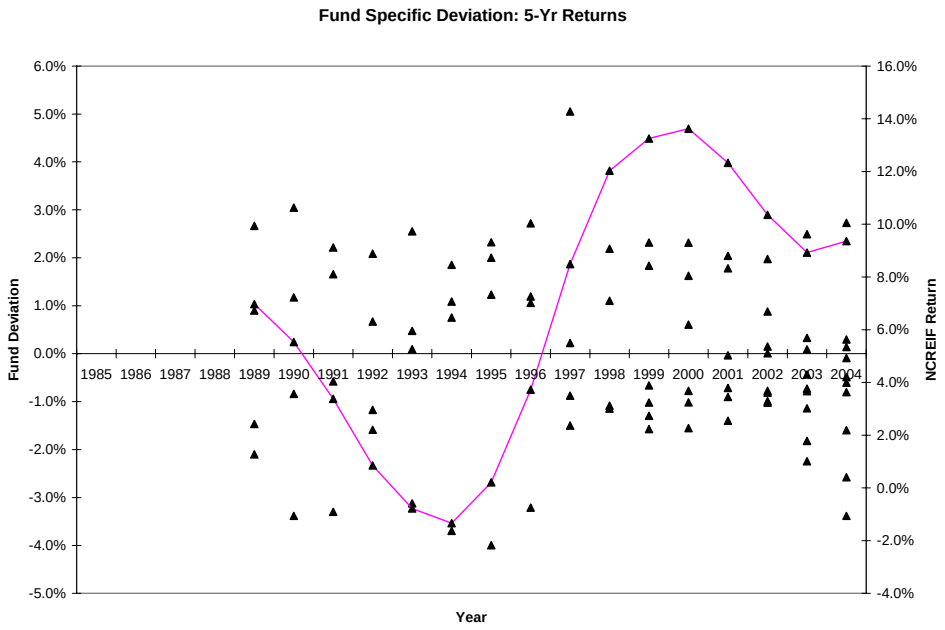
Graph 3: Fund Specific Deviation: 1-Year Returns

Graph 3 does not strike one visually as indicating much herding behavior at the annual frequency. This is in some contrast to Graph 4 and 5, which show much less dispersion (note the change in vertical axis scales). The reduction in dispersion between the 1-year and the 3 and 5-year returns is mostly the effect of annualizing the multiple year returns.



Graph 4: Fund Specific Deviation: 3-Year Returns

At the 3-year frequency shown above, the dispersion ranges from -6% to 7%, with the majority of funds hovering between the +/- 2% mark. It worth noting that in the recent years, the funds have been increasingly herding toward the mean.



Graph 5: Fund Specific Deviation: 5-Year Returns

The 5-year return deviation chart above further suggests herding behavior. The deviations are now more closely bunched together, especially from 2001 to the year-end 2004. They range from -4% to +5%, with the majority clustering between the -2% to +1% range, which is more tightly bunched than the 3-year deviations. In summary, the scatterplots suggest herding once the returns are averaged over multiple years.

Structural Analysis of Herding Behavior

A regression analysis was performed to see if we could gain an understanding of the determinates or correlates of herd behavior. The study regressed our squared deviation disaggregate dispersion measure "D(i,t)" onto several different combinations of fund characteristics available in our data and that could serve as "explanatory" variables for fund dispersion from the mean.

The formula being estimated takes the form:

$$D(i,t) = \alpha + ß1SIZE(i,t) + ß2AGE(i,t) + ß3LEVERAGE(i,t) + ß4FEE(i,t) + ß5UPMKT(i,t) + ß6DWNMKT(i,t) + ß7\ D(i,t-1) \quad \textit{(Equation 4)}$$

The variable "SIZE" represents the fund's size (in dollars) or Gross Asset Value. A larger size of fund may have a greater number of real estate assets in its portfolio which limits the fund from trying to make strategic decisions to beat the benchmark. In other words, as the fund increases in size, it is more difficult to make an impact on total return of the fund that beats the benchmark. Therefore, we might be able to expect a negative relationship between the "SIZE" and our measure of dispersion.

The variable "AGE" represents the number of years since the inception of the fund. The older the fund is may result in management expertise that has identified a strategy, through trial and error, that can exceed the benchmark. So we might expect a positive relationship between "AGE" and our measure of dispersion.

The variable "LEVERAGE" represents the Loan-to-Value ratio of the fund; the percent debt calculated at year end: GAV-NAV/GAV. A larger leverage percentage might reflect a strategy that the fund may achiever higher return as they increase the amount of debt in their portfolio. Therefore, we may be able to expect a positive relationship between "LEVERAGE" and our measure of dispersion.

The variable "FEE" equals the difference between fund gross and net returns. A larger fee might reflect greater resources available to the fund to conduct research and strategy, to attempt to beat the benchmark by differentiating its strategy from the benchmark. So we might expect a positive relationship between the "FEE" and our measure of dispersion.

The variable "UPMKT" represents the time dummies for the growth in NCREIF's market condition. Inferring from the Christie and Huang article that stocks usually tend to increase dispersions during up markets, we might expect a positive relationship between "UPMKT" and our measure of dispersion.

The variable "DWNMKT," on the other hand, represents the time dummies for the drop in NCREIF's market condition. Again inferring from the Christie and Huang article that stocks herd behavior would most likely emerge during periods of market stress, we might expect a negative relationship between "DWNMKT "and our measure of dispersion.

The variable "D(i,t-1)" is the one year lag of "D(i,t)." Looking at NCREIF's historical returns, there seems to be positive momentum from the previous year. Since the mean of our sample is similar to the NCREIF returns, we can also probably expect a positive relationship between "D(i,t-1)" and our measure of dispersion.

Table 1 presents the regression results when all of the possible explanatory variables available in our data are used. Regressing equation 4, the analysis came up with the following statistics:

Regression Statistics			
R2	0.126837		
Adjusted R2	0.075475		
	Coefficient	**t-stat**	**p-stat**
Intercept	-.0000490	-0.037909	0.969824
Fund Size	-.0000003	-1.781861	0.077322
Fund Age	.0000247	0.814416	0.417033
Fund Leverage	.0048516	1.772797	0.078821
Fee	.0307060	0.302626	0.762703
NCREIF upmkt	.0004158	0.738867	0.461443
NCREIF dwnmkt	.0003090	1.184375	0.238625
D(i,t-1)	.2008032	2.187770	0.030641

Table 1: Regression Statistics

The first thing we note in Table 1 is that this regression has a fairly low R-square measure of goodness of fit. In other words, the set of structural explanatory variables tested here do not explain much of the variation in herd behavior. However, it is not too surprising that we would get a rather small R-square in this type of model, because, there is relatively little range in these funds' characteristics, our explanatory variables. It is difficult for the regression model to predict fund dispersion when the predictors do not change much across funds or across time.[14]

In other words, the funds are executing almost identical strategies which cause herding, and, as a result, tend to deviate from the mean by similar amounts.

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[14] The mean and standard deviation were calculated across the explanatory variables to give us an indication if the predictors do or do not change much across funds and time. Although "SIZE" (mean: $2,021mm, stdev: $1,857mm) has a lower standard deviation than the mean, there is still some predictive power in this specific variable. "AGE" (mean: 15 years, stdev: 9 years), also has a lower standard deviation than the mean which explains the low predictive power of this variable. "LEVERAGE" (mean 14.5%, stdev: 12.2%) has a lower standard deviation than the mean, however, there is still some predictive power in this variable. "FEE" (mean 1.2%, stdev: 0.3%) has a standard deviation, which is lower than the mean, that indicates that the data sample is closely bunched together in term of "FEE." "D(i,t-1)" (mean: 0.1%, stdev: 0.3%) has a standard deviation, which is higher than the mean, that indicates that the variable has some predictive power.

Even though the R-squared is low, the regression analysis does find some predictive power in a few of the explanatory variables. The most significant predictors of fund dispersion from the mean are Fund Size, Fund Leverage, and the one-yr lag of the deviation.

Table 1 reveals that the variable "SIZE" is significantly related to herding behavior. This negative relationship is consistent to what we had expected; as the fund increases in size, the less the fund deviates from the mean performance of all the funds.

Table 1 also reveals that the variable "AGE" is not significantly related to herd behavior. Even though an older fund may have more experience in the core fund industry, we do not find any evidence that this can lead a fund to deviate more from the mean performance of all the funds.

It also reveals that the variable "LEVERAGE" is significantly related to herd behavior. This validates our expectation of a positive relationship between "LEVERAGE" and our measure of dispersion. We find evidence that as funds increase their debt percentage, the more the funds deviate from the mean performance of all the funds.

Additionally, Table I reveals that "FEE" is not significantly related to herding behavior. Whatever higher fees are used for, we do not find any evidence that they lead a fund to deviate more from the mean performance of all the funds.

The table also revealed that "UPMKT" is not significantly related to herding behavior. We do not find that the positive NCREIF market condition leads to a fund to deviate more from the mean performance of all the funds.

It also revealed that "DWNMKT" is not significantly related to herding behavior. We do not find that the negative NCREIF market condition leads to a fund to deviate more from the mean performance of all the funds.

Lastly, Table 1 reveals that "D(i,t-1)" is significantly related to herding behavior. The one-year lag of dispersion exhibits positive momentum or persistence for a fund's dispersion from the mean.

A more parsimonious regression that only had the significant "explanatory" variables was also performed. We regressed the squared deviation disaggregate dispersion measure "D(i,t)" onto "SIZE," "LEVERAGE," and "D(i,t-1)." Table 2 presents the regression results when all the significant explanatory variables in our data are used:

Regression Statistics			

R2	0.110824066		
Adjusted R2	0.089136848		
	Coefficient	**t-stat**	**p-stat**
Intercept	0.000992092	2.288618948	0.023807695
Fund Size (GAV)	-2.39251E-07	-1.747939996	0.082969728
Fund Leverage	0.004449131	2.110436338	0.036846341
D(i,t-1)	0.223605094	2.510460411	0.013355282

Table 2: Regression Statistics-significant explanatory variables

The first thing we note in Table 2 is that the regression has an even lower R-square measure of goodness of fit than Table 1. However the parsimonious model has a higher adjusted R-square, and each of the explanatory variables increased in their predictive power.

Fixed Effect Model

While a purely structural model as discussed above presents an important perspective, additional insight may be gained by adding so-called "fixed effects" to the model. Here we include dummy variables for fund identity and for the year of performance. These dummy variables control for effects that are "residual" in each firm or in each year, leaving the coefficients on the structural variables to reflect only more fundamental and abiding effects of these underlying characteristics beyond what is conveyed by differences in firms or time. One can also view the fixed effects regression as capturing the effect of omitted structural variables that differ between funds or across time.

To perform the fixed effects regression, dummy variables were created for each fund which is called "fund fixed effect." Dummy variables were also created for each year which is called "time fixed effect." The original structural variables were also included (Equation 4), only with the constant dropped as it is duplicated by the fixed effects. The fixed effects regression was run with both fixed effects, only the time effects, and only the firm effects.

Regression Statistics			
R2	0.5427		
Adjusted R2	0.3547		
	Coefficient	**t-stat**	**p-stat**
Fund Size	1.52 e-07	0.42	0.676
Fund Age	-.0000339	-0.31	0.754
Fund Leverage	.0021678	0.45	0.654

Fee	.2755184	1.54	0.126
NCREIF upmkt	-.0023384	-0.85	0.397
NCREIF dwnmkt	-.0003472	-0.85	0.400
D(i,t-1)	.1303059	1.23	0.223

Table 3: Regression Statistics-Firm and Time Fixed Effects

Regression Statistics			
R2	0.4880		
Adjusted R2	0.3562		
	Coefficient	**t-stat**	**p-stat**
Fund Size	-1.74 e-07	-1.14	0.257
Fund Age	.0000182	0.62	0.536
Fund Leverage	.0049037	1.43	0.155
Fee	.0980096	0.86	0.389
NCREIF upmkt	-.0011071	-0.58	0.562
NCREIF dwnmkt	-.0003982	-1.02	0.312
D(i,t-1)	.2572132	2.65	0.009

Table 4: Regression Statistics-Time Fixed Effects

Regression Statistics			
R2	0.3898		
Adjusted R2	0.2757		
	Coefficient	**t-stat**	**p-stat**
Fund Size	-1.31 e-07	-0.43	0.668
Fund Age	-.0000279	-0.39	0.694
Fund Leverage	.0013891	0.29	0.772
Fee	.2875926	1.62	0.109
NCREIF upmkt	.0004112	0.74	0.463
NCREIF dwnmkt	.0004164	1.54	0.126
D(i,t-1)	.0720821	0.74	0.459

Table 5: Regression Statistics-Firm Fixed Effects

Not surprisingly, including fixed effects greatly improves the fit of the regression (R-square). More interestingly, the explanatory variable FEE now seems to have a more significant impact, and in the positive direction. In other words, once we control for firm-specific and time fixed effects, there is some evidence (albeit admittedly rather weak) that fund fees are positively related to a tendency of the fund to depart farther from the mean. Perhaps there is a deeper relationship between fees and fund performance in which funds that charge higher fees behave more independently than funds that do not (apart from firm-specific effects).

VI. Fund Performance

Methodology

In general, our performance analysis focuses on comparing our subject group of eleven core funds' performance to the NCREIF Property Index (NPI) as a benchmark. In particular, we examine the differences between the funds' mean total gross and net returns each year and the NPI over time.

Investment managers are often compared both to their peer universe and to a passive index that is broadly representative of his or her asset class. The general consensus is that a comparison to a passive index is better in principal, since in the public securities markets, passive indices are replicable by both the manager and the client, and the investor can choose to buy the index as opposed to hiring the manager.[15]

However, "buying the index" is not possible in the real estate industry. Real estate portfolio managers can only buy assets that are for sale, and can generally only buy all or nothing with respect to a particular asset. It would be rare for more than one manager to be able to invest in the same asset at the same time or to buy a partial interest[16]. Also, real estate transaction costs are high, necessitating longer holding periods. Perhaps the most important difference between direct real estate investment versus securities fund management, however, is that the real estate investment manager is responsible for the operational management of the asset he or she selects.

The result is that there does not exist in the direct private real estate asset class the same kind of passive index or passive investment funds as are common in securities investments, and a peer universe index such as the NPI is therefore considered quite acceptable as a relevant benchmark for appropriate style investment managers, in particular, core funds serving institutional clients (such as our sample of 11 funds). Using the NPI as the "benchmark" for defining our measure of fund performance also makes sense: i) because the properties that comprise the index are similar in location, type and quality to those held by core funds, and ii) because the funds themselves often directly compare their performance to the NPI in both offering memoranda and in reports to their investors.

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[15] D. Geltner and N. Miller, Commercial Real Estate Analysis and Investments, (Ohio: South-Western Publishing, 2001), p.729

[16] other than owning a joint venture interest with an operating partner

Nevertheless, the differences between private real estate investing and securities investing described above make asset selection performance more complex in the real estate industry. This has implications that need to be considered in making comparisons to a peer group index like the NPI, for example, to what degree selection performance effects are due to finding "under-priced" assets (as is the case in securities markets) versus more property operational level skills such as deal execution and property operational management ability.[17]

As previously stated, comparisons of gross-of-fees (hereafter, simply "gross") and net-of-fees (hereafter, "net") annual fund returns to the NPI are often made by the core fund industry. However, since every fund in our study contains a component of cash and debt in addition to its real estate assets, the effect of these two components must be removed in order to make an "apples to apples" comparison to the NPI, which is a pure property level index (with no debt or cash). To do this, we first compute a de-levered return to real estate for each fund each year, referred to as r(RE), and then define a measure of the property level performance of each fund "i" during each year "t" relative to the NPI in that year, labeled P(i,t).

De-Levered Fund Performance Relative to the NPI, or P(i,t)

Fund returns for each year are de-levered using a weighted average cost of capital (WACC) model, quantifying cash returns each year as the T-bill yield, and debt returns as the Baa-rated corporate bond average yield to maturity. So, for any given fund in any given year:

$$(RE/A)r(RE) + (C/A)r(C) = (D/A)r(D) + (E/A)r(E),$$

where:
(RE/A) = real estate investments as a percentage of a fund's total assets;
(C/A) = cash holdings as a percentage of a fund's total assets;
(D/A) = leverage ratio or debt outstanding as percentage of fund's total assets;
(E/A) = 1 - (D/A) = equity as a residual percentage of a fund's total assets (Assets = Liabilities + Equity);
r(RE) = total return to a funds' real estate investments (unlevered);
r(C) = total return to cash (assumed equal to T-Bill yield);

[17] D. Geltner and N. Miller, Commercial Real Estate Analysis and Investments, p.722

r(D) = total return to the fund's debt (assumed equal to corporate Baa-rated yield to maturity)
r(E) = total return to the fund's equity (i.e., the gross-of-fees return reported by the fund to its investors);

and where:
Real Estate + Cash = Total Assets = A = D + E = Total Liabilities + Owners' Equity.
Solving the above equation for r(RE), we get:

$$r(RE) = [(D/A)r(D) + (E/A)r(E) - (C/A)r(C)] / (RE/A)$$
$$= (D/RE)r(D) + (E/RE)r(E) - (C/RE)r(C).$$

This de-levered r(RE) measure (with the cash return component also removed) can now be directly compared to the NCREIF Property Index total return, which represents a return to unlevered property. In addition to comparing de-levered returns with the NPI, however, we compare r(RE) to r(E). This difference tells us the effect of core funds' leverage and cash holding strategy. We can examine these performance differentials both for the core funds as a group over time (averaging across funds within each year), and across individual funds (averaging across time for the available history of each fund).

As noted, the difference between our delevered r(RE) performance measure and the NPI each period is our measure of property level relative performance, P(i,t):

$$P(i,t) = r(RE,i,t) - NPI(t),$$

where:
r(RE,i,t) = fund i's total unlevered return to real estate in year t (adjusted for cash), and
NPI(t) = the NPI total return in year t.

We begin our P(i,t) comparisons with a scatter-plot across years, similar to the deviations scatterplot used to describe herd behavior, where the vertical axis is P(i,t), the horizontal axis is

years, and each fund has a point in each year.[18] We then examine the funds' mean P(i,t) across time and the individual mean P(i,t) achieved by each fund.

The Components of P(i,t): Selection and Strategy

To obtain greater insight into the structure of fund performance differentials vis a vis NCREIF, it is useful to attribute total de-levered return performance differential into two additive components that we will label "Selection" (SEL) and "Strategy" (STR), such that:

$$P(i,t) = SEL(i,t) + STR(i,t).$$

First, we construct for each fund (each year) its "alter-ego", labeled A(i,t). The alter-ego of fund "i" is created using fund i's allocation among property sectors, but with the NPI's total return performance within each property sector for each year "t". The alter-ego return will then be simulated each year, again using a WACC model:

$$A(i,t) = SUM(w(i,j,t)*NPI(j,t)),$$

where:
w(i,j,t) = the weight of fund i in asset class j in year t,
NPI(j,t) = the NPI return to asset class j in year t,

and where the summation is across asset classes j = office, industrial, residential, retail, hotels, and other, and the sum (over j) across all the w(i,j,t) weights is one: SUM(w(i,j,t)) = 1, for every i and t.

As a result, the alter-ego fund represents what each fund's total return performance would have been (each year, gross of fees) if it had achieved the same property returns within each property sector as the NCREIF Index. The alter-ego thus mimics the fund except for the fund's *property*

[18] The difference between our Graph 4 here in the performance analysis and our previous Graph 3 in the herding behavior section is that here the returns are property level (adjusted for leverage and cash, as noted above), and the performance indicated here is relative to the NPI benchmark, rather than relative to the mean performance of just the 11 core funds in our study.

selection performance relative to NCREIF. The alter-ego has fund i's allocation among property types, but NCREIF's return performance within each sector.[19] This is A(i,t). Now we define:[20]

$$SEL(i,t) = r(RE,i,t) - A(i,t);$$

$$STR(i,t) = A(i,t) - NPI(t).$$

Defining our previous total return performance measure based on gross-of-fees total return, we now have:

$$P(i,t) = SEL(i,t) + STR(i,t) = r(RE,i,t) - A(i,t) + A(i,t) - NPI(t) = r(RE,i,t) - NPI(i,t).$$

As noted, the SEL(i,t) component represents fund i's selection performance, the component of its gross-of-fees performance (in year t, relative to the NPI benchmark) that is due to its ability to pick (and manage and harvest) individual properties within each sector that the fund may or may not choose to operate in. This is the classical "bottom-up" source of real estate fund investment performance; the largely decentralized ability to find good property deals and execute them and manage them well at the property level.

The STR(i,t) component represents fund i's "strategy" performance, the component of its gross-of-fees performance (in year t, relative to the NPI benchmark) that is due to its fund-level strategic policy choice of how to allocate real estate investments across the property market segments. This is the classical "top-down" source of real estate fund investment performance; the largely centralized ability to conduct macro-level property market research and make successful fund-level strategic and tactical decisions about what property sectors to invest in, and when.

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[19] To be strictly correct, therefore, we must acknowledge that A(i,t) depends not only on the difference between fund i's versus NCREIF's property-level performance within each sector, but also (by the weights used) on the difference between fund i's and NCREIF's sector allocation weights (the w(i,j,t) values in the equation). Thus, our STR(i,t) measure is, strictly speaking, a combination of property selection and sector allocation effects. However, this is a measure of sector strategy (or "allocation") effect often used in the industry, and has the advantage of combining with our SEL(i,t) measure to add up exactly to the total property level performance differential P(i,t) (avoiding any "interaction effect"). (See Geltner & Miller pp.726-727.)

[20] Note that STR(i,t) is what is often termed the fund's "Allocation Effect", the measure that is (somewhat confusingly for us here) labeled *"A_s"* in Geltner-Miller.

Having constructed two variables that break out the nature of core fund performance into these two components, we examine some summary and descriptive analysis of how the funds have performed over time within each of these two components of performance.

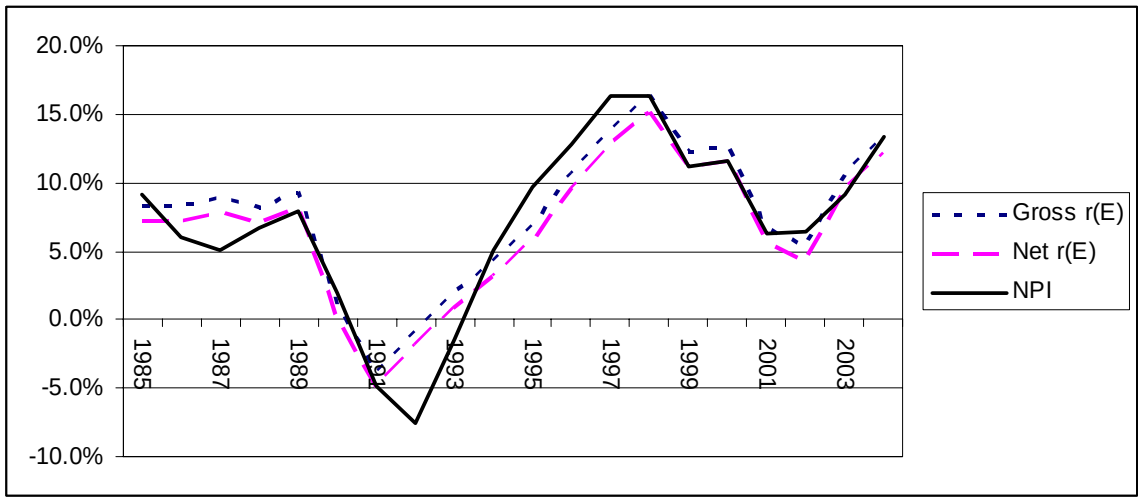
Structural Analysis of Funds' Relative Performance

Finally, using pooled (time series/cross-sectional) data, we run regression analyses (regressing across both "i" and "t") to explore hypotheses about the determinants and correlates of P(i,t) and each of its two components, SEL and STR, as with the earlier analysis of herding behavior.

Results and Analysis

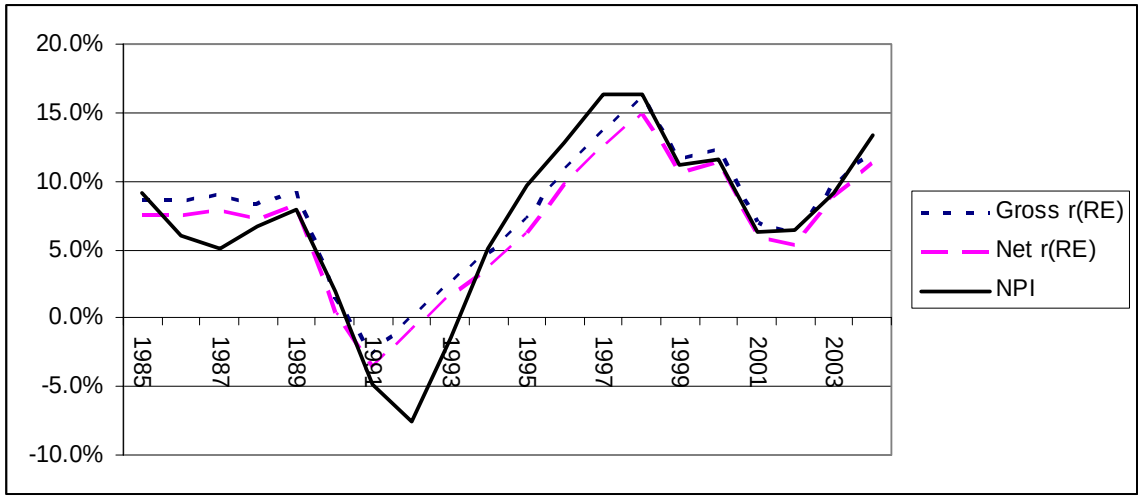
Leveraged vs. Unleveraged Returns

Comparing both total gross and net mean returns each year to the NPI, it appears that the group of core funds effectively mirrors the NCREIF index with a couple of exceptions: i) during the down-market of the early 90's, funds fared better than the index, and ii) fund performance lagged the index in time, but not in ultimate return, during the high-growth period of 1994 to 1998.



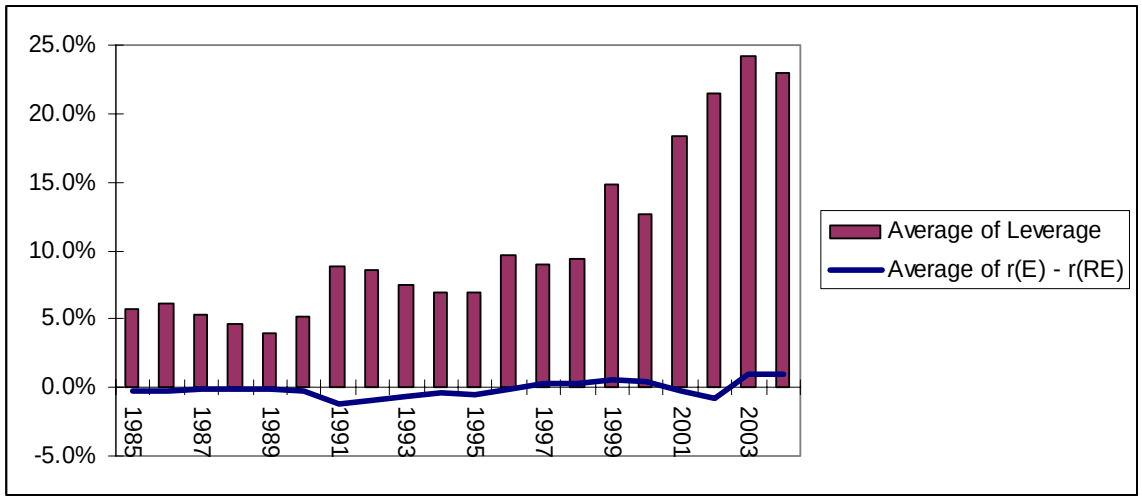
Graph 6: Average Annual r(E)

After de-levering the returns and adjusting for cash to produce a return to real estate that is more directly comparable to the NPI, for each fund each year, the relationships remain largely unchanged, with only minor differences in returns beginning to appear in 1998, due primarily to the negligible use of leverage prior to that time.



Graph 7: Average Annual r(RE)

Debt as a percentage of fund assets has risen dramatically since 1998, increasing from 9.4% to 23.0% by the end of 2004. This change in financial policy has resulted in higher risk for investors, but even with historically low interest rates and rapidly rising real estate values, produced very little additional return, as seen in Graph 8.



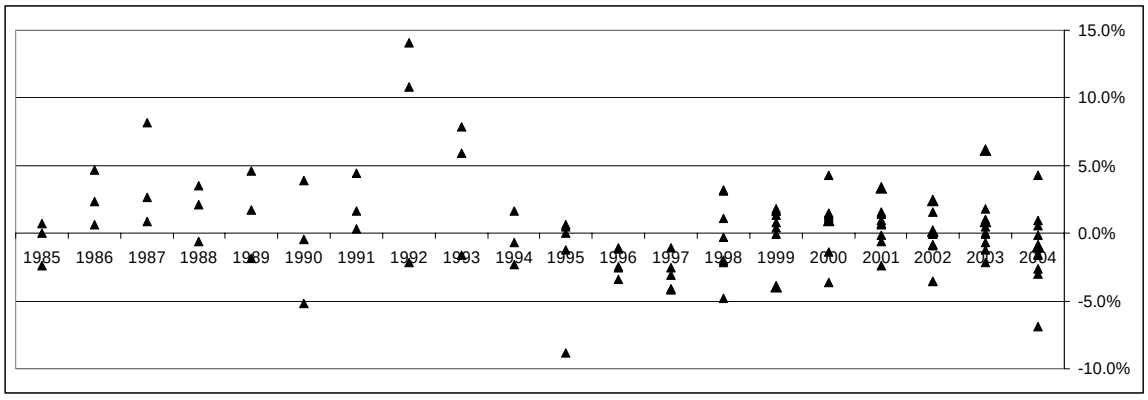
Graph 8: Leverage Increases Over Time With Little Effect on Return

This raises the question of whether core funds should use leverage at all, given that: i) return spreads between debt and real estate have historically been tight, and ii) investors can create leveraged portfolios on their own. In the past twenty years, the difference in the mean levered and unlevered return for our group of funds has been positive only six times, with the spread in returns ranging from approximately -1% to 1%.

With the nine funds in our study that have a track record of more than three years, the mean spread between levered and unlevered returns for the individual funds ranges from -.4% to .6%. Given that the average fund size in 2004 was nearly $3.3 billion, it seems unlikely that fund managers need to use debt to fund acquisitions, but are instead using leverage to enhance returns to equity with little success.[21]

Fund Returns vs. the NCREIF Property Index

Next, as noted, we subtracted the NPI return from each fund's r(RE) each year to generate a performance measure referred to as P(i,t). In any given year, almost all of the funds fall within a range of +/-5% of the NPI return for that year.

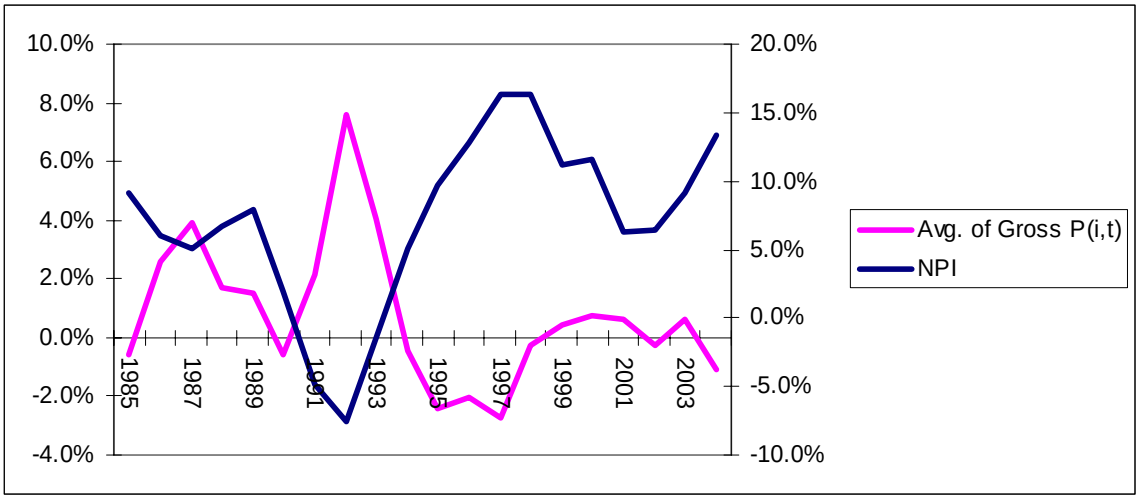


Graph 9: Scatterplot of P(i,t) Over Time Showing Dispersion[22]

Turning to Graph 10, averaging P(i,t) across years, it appears that core fund returns as compared to the NPI are negatively correlated; funds outperform the NPI in bad years and perform relatively poorly in good years. The group performed exceptionally well in 1992, with returns outpacing the NPI by 7.6%. However, returns relative to the NPI drop off significantly after 1994; the mean return has not exceeded the index by more than .7% since that time. This decrease in the dispersion of returns over time may indicate a maturation of the market for institutional quality assets.

[21] Another possibility for the growing use of leverage, at least in part, may be an increase in the number of joint ventures with partners who are not tax-exempt and use debt to increase after-tax returns. However, it is impossible to tell from the data collected what the magnitude of this effect may be, if any.

[22] As opposed to the scatterplots for herd behavior which illustrate return deviation from the mean return in a given year, this plot shows fund performance relative to the NPI.

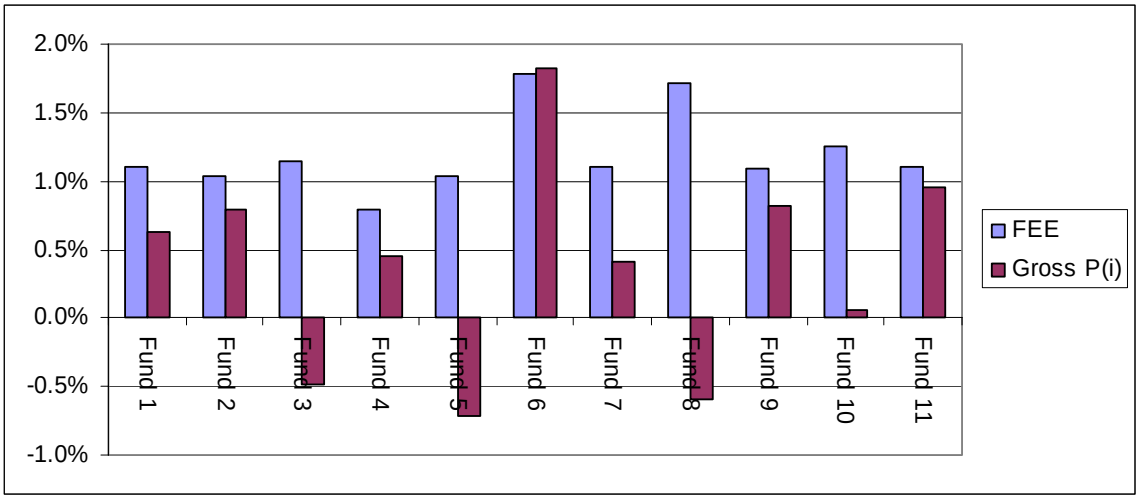


Graph 10: Negative Correlation Between Gross P(i,t) and the NPI

It is possible that this negative correlation exists, at least in part, due to differences in the nature of appraised values of assets held by core funds and the properties that compose the NCREIF index. In fact, in the early 1990's, one of the subject funds conducted an independent investigation to determine if appraised values were being systematically over-stated in response to allegations that fund managers were placing undue pressure on appraisers.

If fund asset values were indeed overstated relative to assets in the index, it would explain both the over-performance in 1992 and 1993 and the lag in return relative to the index from 1994 to 1998. Properties that weren't written-down as significantly in a falling market would likely be written-up more slowly as market values recover. However, since it is impossible to know for certain if there is or has been differential treatment of assets during the appraisal process within our subject group of funds, we assume for the purposes of our study that all assets are appraised similarly.

Although most funds marginally outperform the NPI on average, over time, on a gross basis, the average fees charged by the fund (as measured by the difference between the gross and net returns) are greater than the amount of excess return, resulting in a net return that falls below the benchmark. For funds in our subject group with a track record of three years or more, the average difference between the net return and the NPI over the study period ranged from -.2% to -1.8%.



Graph 11: Average Fee and average Gross P(i) over each fund's available history

This shortfall in net returns relative to the benchmark is not entirely unexpected (Lin and Yung (2004) found that real estate mutual fund managers do not produce enough return to pay for their expenses) and is not meant to be an indictment of the core fund industry. Since the NPI is not an index that investors can buy and sell, such as the S&P 500 or the Russell 2000, these funds provide institutional investors with the valuable service of assembling a well diversified portfolio that can be invested in to obtain (something close to) the NPI return; a service that investors should expect to pay for. The question for investors then becomes which manager or managers can most effectively reproduce the results of the NPI with the lowest tracking risk (least leverage) and lowest fee expenses.

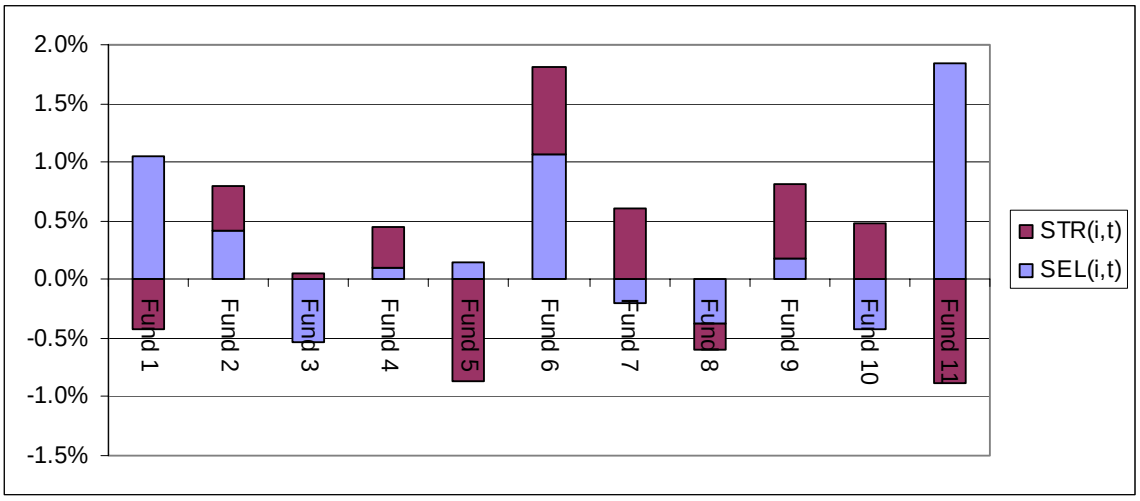
With this in mind, the next part of our analysis suggests that, while the need for skilled management teams to effectively execute the acquisition, management and disposition functions necessary to maintain an active portfolio is indisputable, there is some question about how much value has apparently been added by macro-level research and financial policy decisions.

Component Analysis of P(i,t): SEL and STR

As noted, to better understand the nature of the difference between the funds' unlevered returns to real estate and the NPI, we conducted a performance attribution analysis, parsing P(i,t) into two parts: i) property selection, SEL(i,t), and ii) allocation strategy among property types, STR(i,t).

Only four of the eleven funds were able to produce a positive result for both average SEL and STR. Six of the funds produced positive returns in one component that were offset by

negative returns in the other, and one fund produced negative returns in both components. A negative correlation between selection and strategy returns is also observed in the results of our regression analyses, which will be discussed later.



Graph 12: Average SEL and STR by Fund

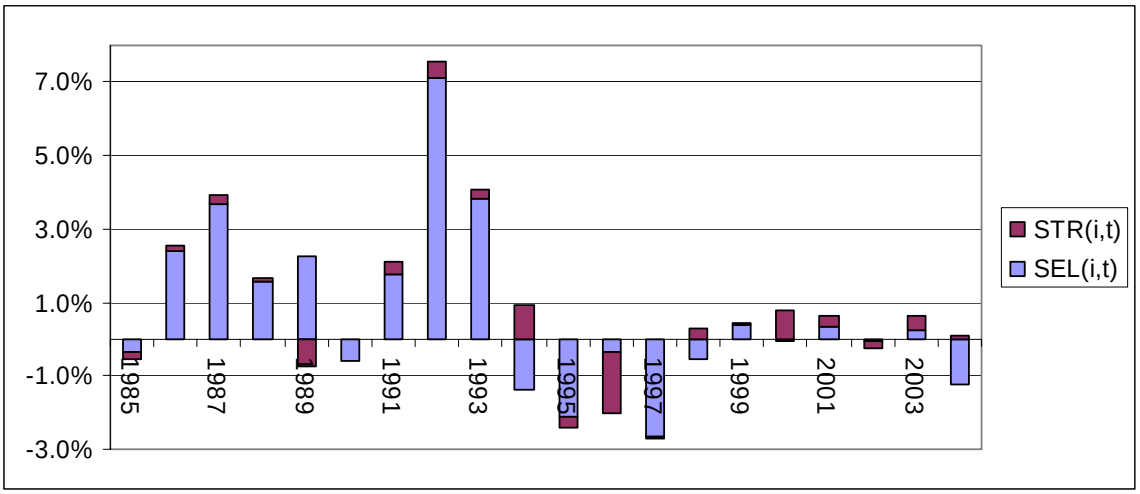
Examining average SEL and STR across funds over time in Graph 13, we discover that in years where the group of funds either outperformed or underperformed the NPI significantly, the difference was almost solely attributable to property selection within a sector, rather than to a difference in sector allocations. This finding stands in contrast with Gallo, Lockwood and Rutherford's (2000) conclusion that allocation among asset classes was responsible for the superior performance of REIT mutual funds relative to the Wilshire Real Estate Index from 1991 to 1997. These results are not necessarily contradictory, however, due to the very different nature of investing in public companies that own real estate versus direct property investment, and the use of different benchmark indexes.

The positive selection component returns exhibited prior to 1994 may suggest a more inefficient market existed during that period that allowed managers to buy bargains; however, since core funds were buying little (if anything) through the lean years of 1991 to 1993, it is likely that some portion of that return differential is attributable to existing portfolios of high-quality, core assets outperforming their peers during a market downturn.[23]

It is also interesting to note that property selection, while creating significant value for investors prior to 1994, has been negative or neutral ever since. This would seem to contradict

[23] The nature of this over-performance (at least in the early '90s) may again be due to the appraisal issue discussed earlier, but it is impossible to tell from the data collected.

the findings of Damodaran and Liu (1993) and Kallberg, Liu and Trzcinka (2000), who concluded that investment managers in real estate can produce positive abnormal returns because of superior skills and information about investment targets (although, again, those studies were of REIT mutual funds).



Graph 13: Average SEL and STR by Year

When comparing average SEL and STR across funds (as shown in Graph 12) and across time (as shown in Graph 13), one should note the difference in the scale of the y-axis. The effect of the comparatively large positive selection return variances in the late 1980's and early 1990's is diminished when eleven subsequent years of neutral or negative selection returns are averaged in. As a result, the scale of the y-axis in Graph 12 is compressed to a range of only -1.5% to 2%, and the relatively small strategy components in Graph 13 appear to make up a larger component of total P(i,t) than one might expect after looking at the breakdown of the two components over time. Also, it is important to recognize that the results by funds shown in Graph 12 refer to only to the available history for each fund, and so the sample of time covered differs across funds. Similarly, the results shown by year in Graph 13 refer only to the funds in existence in each year, and so the sample of funds included differs across years.

Structural Analysis of Relative Performance

To dig deeper than the aggregate level analysis reported above, we used regression analysis to explore relative performance at the disaggregate level, that is, where the observations in the data are individual fund performance differentials in each year. We regress P(i,t) and its component

parts, SEL(i,t) and STR(i,t) onto a group of structural variables that characterize the funds and/or other possible determinants or correlates of fund performance.

Overall Return Relative to the Index, or P(i,t)

The initial model for gross P(i,t), a so-called "kitchen sink" regression that includes all of the possible "explanatory" variables in the equation, explained approximately 27.5% of the factors affecting return relative to the index. The equation for the model is as follows:

$$P(i,t) = \alpha + ß1\text{logSIZE} + ß2\text{AGE} + ß3\text{FEE} + ß4\text{HIRF} + ß5\text{LEVG} + ß6\text{DWNMKT} + ß7\text{NTRLMKT} + ß8P(i,t-1) + ß9\text{GRO} + ß10\text{INVSIZE}$$

where:

logSIZE = the natural log of the size of the fund (Gross Asset Value, or GAV) as of year-end. The log of GAV was used to change the linear relationship of the dependent and independent variable, allowing for a diminishing effect on return as size increased.

AGE = number of years since the inception of the fund. In the absence of information about particular fund managers' expertise and tenure, we use the age of the fund (and to a certain extent, a fund's fee) as a proxy for "institutional wisdom". It is plausible that funds with a longer track record have accumulated some expertise in successfully acquiring, managing and disposing of positive-NPV assets.

FEE = the difference between a fund's gross and net return. Funds that charge higher fees may devote more resources to research or hire more experienced managers, and consequently produce higher returns.

HIRF= a Hirfendahl index was calculated for each observation (i,t) as a measure of diversification. While this measure will not differentiate a fund that over-weights office from another which may over-weight retail, it does give an indication of how evenly distributed a fund's assets are across sectors.[24] We expect funds with a higher index to be positively

[24] A Hirfendahl index is calculated by squaring the percentage of assets in each sector and adding the results together, producing a result in our study of between .1667 and 1. For example, a fund that invested 16.67% of its GAV in each of the six sectors (office, industrial, retail, apartment, hotel and other) would be perfectly diversified with an index of .1667 (1/n sectors). A fund that was invested solely in office, on the other hand, would have an index of 1.

correlated with performance, assuming that managers are making a sector bet based superior market knowledge or asset management skill in a given property type.

LEVG = percentage debt calculated at year-end.[25] If it were not for the relationship between debt and performance discussed earlier in this study, we would expect a positive correlation between the two. It is plausible that managers who employ higher levels of debt do so because they are attempting to increase returns to equity from assets they believe will produce positive leverage.

DWNMKT = dummy variable to indicate a year in which the NPI showed a negative return

NTRLMKT = dummy variable to indicate a year in which the NPI was flat[26]

P(i,t-1) = last year's unlevered return to real estate relative to the NPI. Including last year's performance measure in the regression allows us to test for persistence in the short-term.

GRO = growth in fund assets over the past three years. Growth in GAV could be an indication that investors believe a fund will outperform its peers or the NPI, evidenced by the "votes" they cast with their investment dollars.

INVSIZE = the average size of a fund's individual investments[27]

[25] (GAV-NAV)/GAV

[26] By creating dummy variables for both down and neutral markets, we are allowing the effect of an up market to be reflected in the coefficient. When the neutral market variable is replaced with an up market dummy, we find that UPMKT is negatively correlated with fund performance (although it is not significant at the 95% level) and DOWNMKT, while still positively correlated, is no longer statistically significant.

[27] GAV/Number of Investments

Regression Statistics	
Multiple R	0.524473543
R Square	0.275072497
Adjusted R Square	0.198764339
Standard Error	0.028838678
Observations	106

	Coefficients	*Standard Error*	*t Stat*	*P-value*
Intercept	-0.003750351	0.034878094	-0.107527	0.914597
logSIZE	-0.015058318	0.009784493	-1.538998	0.127129
AGE	0.000510363	0.000499379	1.021995	0.309379
FEE	2.503203004	1.612751715	1.552132	0.123956
HIRF	0.019161665	0.042648031	0.449298	0.65424
LEVG	-0.042517908	0.035949238	-1.182721	0.239871
DWNMKT	0.01981451	0.007261121	2.72885	0.007573
NTRLMKT	0.009365014	0.007433067	1.259912	0.210787
P(i,t-1)	0.380537994	0.09095944	4.183601	6.4E-05
GRO	-0.00243263	0.004280417	-0.568316	0.571161
INVSIZE	0.000291696	0.000226379	1.288525	0.200693

Table 6: Initial Regression Results for P(i,t)

The constant, the age of a fund, a fund's Hirfendahl index (measure of diversification among different property sectors), leverage, a neutral market, growth in gross asset value during the past three years, and average investment size produced the lowest t-statistics, indicating a lack of causality or correlation, and were removed before running a second, more parsimonious regression with the remaining variables that seem most significant. The fact that these variables had little explanatory power is an interesting observation by itself; however, in that the expected relationships discussed above either do not exist or have only a minor effect on performance.

Our second analysis still explained 23.3% of the variation in disaggregate level fund return relative to the NPI, using only four variables.

Regression Statistics	
Multiple R	0.483197354
R Square	0.233479683
Adjusted R Square	0.201131046
Standard Error	0.028618813
Observations	106

	Coefficients	*Standard Error*	*t Stat*	*P-value*
logSIZE	-0.00619286	0.003365502	-1.840099823	0.068661
FEE	1.406174123	0.911559397	1.542602849	0.126024
DWNMKT	0.016806029	0.005771967	2.911664026	0.004416
P(i,t-1)	0.371695841	0.086742313	4.285057976	4.15E-05

Table 7: Parsimonious Regression Results for P(i,t)

Both DWNMKT and P(i,t-1) were statistically significant at the 95% confidence level and both showed positive coefficients, suggesting higher returns relative to the index if either: i) it was a down year for the index, or ii) the fund performed well the previous year relative to the NPI. Although not significant at the 95% confidence level, a fund's fee was positively correlated with gross P(i,t), while its size showed negative correlation.

One reason for the positive correlation between fee and gross return may be the incentive compensation structure common to most core funds. In addition to a base fee, which is usually calculated as a percentage of assets under management, managers are often paid an incentive bonus once certain base return hurdles are met. This fee structure is designed to motivate managers to produce higher returns, and will necessarily result in higher fees paid to managers in years when their fund performs well. It is possible that managers who produce superior returns are able to charge higher fees, or that those with an incentive fee structure work harder, and therefore achieve better results. However, keep in mind that our regression model only tells us that a fund's fee and its gross return are *positively correlated*; it cannot tell us whether the higher fee *resulted in* the higher return (i.e., direction of causality is not implied by the empirical correlation that is found).

It is also worth noting that when the same regression is run using *net* P(i,t), the t-stat on FEE drops from 1.54 to 1.04, and the coefficient falls from 1.41 to .94. The fact that a fund's fee is less significant in explaining differences in net returns suggests that the value of any increase in returns is captured to a significant degree by the fund's management, and is not passed on to the investor. This finding is supported by Lin and Yung (2004) and Myer, Webb and He (1997), who observed that real estate mutual fund performance on a net basis was unrelated to the fund's fee or expense ratio. On the other hand, our finding that the coefficient for net-of-fee performance still remains positive (even if smaller and less significant) does suggest that some benefit of the superior gross-of-fee performance related to higher fees may indeed be passed on to investors.

Contrary to the conclusion of Lin and Yung, we find that larger funds were negatively correlated with relative performance in our regression analysis. As a fund's assets under management grow, it may become more difficult for managers to effectively identify and place sufficient capital in positive or zero NPV investments that will perform as well as the index.

This, combined with the negative return correlation with leverage demonstrated in the initial regression, further questions the value of core funds use of debt financing.

To examine the magnitude or importance of each of these variables, we calculated a mean impact on return (the variable's coefficient multiplied by the mean of that variable) to quantify the magnitude of the effect, and multiplied each variable's coefficient by its standard deviation to measure the range of each variable's expected effect on P(i,t) within our data (here labeled "Dispersion").

Variable	Magnitude (Const. * Avg.)	Dispersion (Const. * Std. Dev.)	Expected Range of Effect Low	High
logSIZE	-1.91%	0.33%	-2.24%	-1.58%
FEE	1.59%	0.35%	1.24%	1.95%
DWNMKT	0.55%	0.79%	-0.24%	1.35%
P(i,t-1)	0.15%	1.20%	-1.05%	1.34%

Table 8: Measures of Magnitude and Dispersion for Selected Coefficients

In other words, the first row and first column in Table 3 suggests that the effect of the (log) size of the average sized fund on the fund's net-of-fee relative performance is negative 1.91%. That is, the fund's performance is 1.91% below what it would be for a hypothetical "zero-sized" fund. Based on the 1-standard-deviation range in the (log) size of funds across the (pooled) database, the effect of size in the actual data causes net-of-fee relative returns to range between 1.58% and 2.24% below what they would be if there were no size effect. Similar reasoning is applied to each of the other three significant determinants or correlates of fund performance indicated in the table. Given that the average net P(i,t) across funds is -.6%, each of these variables could have a significant effect on return relative to the index.

Investment Selection

After searching for correlates of overall performance relative to the NPI, we ran regressions for both investment selection and strategy. The model for investment selection explained approximately 24.4% of the factors affecting performance. The equation for the model is as follows:

$$SEL(i,t) = \alpha + ß1logSIZE + ß2AGE + ß3FEE + ß4HIRF + ß5LEVG + ß6DWNMKT + ß7NTRLMKT + ß8SEL(i,t-1) + ß9STR(i,t) + ß10GRO + ß11INVSIZE$$

where all of the variables have the same definitions as before, except we now include:

SEL(i,t-1) = last year's selection return component, and

STR(i,t) = this year's strategy return component.

Regression Statistics	
Multiple R	0.49396547
R Square	0.244001886
Adjusted R Square	0.155534021
Standard Error	0.028751668
Observations	106

	Coefficients	*Standard Error*	*t Stat*	*P-value*
Intercept	-0.012423936	0.036002571	-0.345085	0.730802
logSIZE	-0.012839173	0.010320713	-1.24402	0.216585
AGE	0.00050246	0.00050012	1.00468	0.31763
FEE	2.398548573	1.607607449	1.491999	0.139048
HIRF	0.029643739	0.042982216	0.689675	0.492098
LEVG	-0.037277616	0.035956106	-1.036753	0.30251
DWNMKT	0.019917577	0.007329198	2.717566	0.00783
NTRLMKT	0.007762248	0.007583068	1.023629	0.308638
SEL(i,t-1)	0.360690813	0.092927989	3.881401	0.000193
STR(i,t)	-0.555120352	0.301744231	-1.839705	0.068968
GRO	-0.001703071	0.004329227	-0.393389	0.694923
INVSIZE	0.00025494	0.000233666	1.09104	0.278044

Table 9: Regression Results for SEL

Only the one-year lagged variable, SEL(i,t-1), and DWNMKT were statistically significant at the 95% confidence level, and both showed positive coefficients.

Other dependent variables were significant, but not at the 95% confidence level. Larger funds were negatively correlated with selection return, as was a fund's strategy performance in that year. A fund's fee was again positively correlated with selection return.

In both this regression and the next, selection and strategy returns are negatively correlated, suggesting that managers perform well at either buying, managing and selling assets or allocating funds across property types, but not both. Looking back to Graph 8, we see that, over time, skillful property selection has produced returns significantly above the index far more often than superior asset allocation strategies. If we assume for a minute that the institutional property market has not become more efficient, and consequently, that positive property selection returns are still possible, is there a case to be made for hiring managers specializing in a single property type who should theoretically possess an investment selection advantage over managers who must divide their attention among all asset classes?

Investment Strategy

The model for investment strategy explained approximately 24.3% of the factors affecting performance. The equation for the model is as follows:

$$STR(i,t) = \alpha + ß1logSIZE + ß2AGE + ß3FEE + ß4DWNMKT + ß5NTRLMKT + ß6SEL(i,t) + ß7STR(i,t-1) + ß8GRO + ß9INVSIZE$$

where all of the variables have the same definitions as before, except we now include:
SEL(i,t) = this year's selection return component, and
STR(i,t-1) = last year's strategy return component.

Regression Statistics	
Multiple R	0.492853128
R Square	0.242904206
Adjusted R Square	0.171926475
Standard Error	0.009683169
Observations	106

	Coefficients	*Standard Error*	*t Stat*	*P-value*
Intercept	0.023409601	0.008057865	2.905186	0.004556
logSIZE	-0.009348013	0.003209061	-2.913005	0.004453
AGE	0.000117389	0.000166051	0.706949	0.481311
FEE	-0.153124837	0.446598642	-0.342869	0.732447
DWNMKT	0.002143391	0.002505805	0.85537	0.394476
NTRLMKT	0.003856471	0.002475702	1.557728	0.122588
SEL(i,t)	-0.037468505	0.031820806	-1.177484	0.241913
STR(i,t-1)	0.205886488	0.100109798	2.056607	0.042437
GRO	0.000879115	0.001504746	0.584228	0.560437
INVSIZE	0.000152444	6.73543E-05	2.26331	0.025869

Table 10: Regression Results for STR

In this regression, logSIZE, STR(i,t-1) and INVSIZE were all statistically significant at the 95% confidence level. Both STR(i,t-1) and INVSIZE showed positive coefficients, but, as in the other regressions, logSIZE was negatively correlated with strategy return. It is interesting that the average investment size was significant with regard to allocation strategy return, but not to selection or overall P(i,t). However, with such a small coefficient, the mean effect on return is only four basis points.

Other dependent variables were significant, but not at the 95% confidence level. Selection return in the current year was negatively correlated with a fund's strategy return component, while a sideways year for the index showed positive correlation.

VII. Conclusion

The results of our study suggest that herd behavior, where managers base investment decisions on the collective actions of the market rather than their individual beliefs, may or may not be present in the core fund industry, depending on how we define 'herding'. After performing an aggregate analysis of performance dispersion across all funds and within each year, we found that herd behavior tended to be somewhat correlated with the NCREIF return. Through the disaggregate analysis (the individual fund returns relative to the mean return each year), the funds were more tightly bunched in the 3 and 5-year return deviations. Without an industry-specific herd behavior percentage measure, the average mean absolute deviation (MAD) across all funds and time of 2.8%, may or may not indicate herd behavior.

We also performed a regression analysis to gain an understanding of the determinates or correlates of herd behavior. Although the set of structural explanatory variables tested does not explain much of the variation in herd behavior (R-square), the analysis does find some predictive power in a few of the explanatory variables. Herding appears to be positively related to fund size, negatively related to fund leverage and exhibits positive momentum or persistence from the previous year. Adding "fixed effects" of time and fund to the regression model greatly improves the fit of the regression (R-square). There is some evidence that fund fees are positively related to a tendency of the fund to depart farther from the mean.

As for our performance analysis, by comparing returns to equity with delevered returns to real estate, we find that although fund leverage has increased significantly over time, from 9.4% in 1998 to 23.0% by the end of 2004, the use of debt has produced little or no additional return to investors. The average spread between levered and unlevered returns for the nine funds in our study that have a track record of more than three years ranges from -.4% to .6%.

We also conclude that, across funds, average unlevered net returns for core funds fall short of the NPI index. For funds in our subject group with a track record of three years or more, the average difference between the net return and the NPI over the study period ranged from -.2% to -1.8%. This shortfall is consistent with studies of real estate mutual fund returns and is to be expected when comparing net returns with an index that does not reflect any cost of management.

Across time, there is a negative correlation between the performance of the index and fund performance relative to the index, with the largest departure from the NPI occurring during the down market of the early 90's. Returns relative to the NPI decrease significantly after 1994; the mean return has not exceeded the index by more than .7% since that time.

Portfolio-level attribution analysis reveals that property selection returns have produced the greatest amount of return deviation from the NPI over time, and that across funds, selection and strategy returns are negatively correlated. Four of eleven funds in our study were able to create value relative to the index through both successful property selection and allocation strategy. Six produced positive returns in one component that were offset by negative returns in the other, and one produced negative returns in both components. These results raise some question about how much value can be added through macro-level research and financial policy decisions.

Regression analysis suggests that there is persistence in the short term for P(i,t) and its components. A fund's fee is positively correlated with gross returns; however at least part of the benefit of the higher return is captured at the fund level, as the correlation weakens when the same regressions are run using net returns. Larger funds are negatively correlated with performance in each of our regressions, suggesting that effectively placing capital in positive NPV investments becomes more difficult as fund size increases.

VIII. Appendix

Regression Output: Herd Behavior Deviation on fund size, age, leverage, fee, NCREIF markets, and the one-yr lag of fund deviation (1985-2004) –across time and funds

Independent Variable: Fund specific GAV

Independent Variable: Fund Age

Independent Variable: Fund Leverage

Independent Variable: Fund Fee (Gross minus Net Return)

Independent Variable: NCREIF up market

Independent Variable: NCREIF down market

Independent Variable: 1-yr lag of herd deviation

Dependent Variable: Fund Deviation from the Average 1985-2004

D(i,t) = -0.000049 - .00000027SIZE + .000025Age + .00485Leverage + .0307Fee + .000416NCREIFupmkt + .00031NCREIFdwnmkt + .2008D(i,t-1)

SUMMARY OUTPUT

Regression Statistics	
Multiple R	0.356142021
R Square	0.126837139
Adjusted R Squar	0.075474618
Standard Error	0.002740477
Observations	127

ANOVA

	df	*SS*	*MS*	*F*	*Significance F*
Regression	7	0.000129823	1.85461E-05	2.46944925	0.021125428
Residual	119	0.000893715	7.51021E-06		
Total	126	0.001023538			

	Coefficients	*Standard Error*	*t Stat*	*P-value*	*Lower 95%*	*Upper 95%*	*Lower 95.0%*	*Upper 95.0%*
Intercept	-4.90382E-05	0.001293581	-0.03790892	0.96982383	-0.002610457	0.002512381	-0.002610457	0.002512381
Fund Size (GAV)	-2.72006E-07	1.52653E-07	-1.78186113	0.07732242	-5.74274E-07	3.02617E-08	-5.74274E-07	3.02617E-08
Fund Age	2.46567E-05	3.02753E-05	0.814416596	0.41703313	-3.52914E-05	8.46047E-05	-3.52914E-05	8.46047E-05
Fund Leverage	0.00485159	0.002736687	1.772796758	0.078821	-0.000567324	0.010270503	-0.000567324	0.010270503
Fee	0.030705983	0.101465131	0.302625966	0.76270327	-0.170205108	0.231617075	-0.170205108	0.231617075
NCREIF up	0.000415751	0.000562688	0.738866934	0.46144265	-0.000698426	0.001529929	-0.000698426	0.001529929
NCREIF falling	0.000309003	0.0002609	1.184375314	0.23862471	-0.000207605	0.000825611	-0.000207605	0.000825611
Di, t-1 var	0.200803248	0.091784433	2.187770215	0.03064076	0.019060906	0.382545589	0.019060906	0.382545589

Regression Output: Herd Behavior Deviation on fund size, leverage, and the one-yr lag of fund deviation (1985-2004) –across time and funds

Independent Variable: Fund specific SIZE

Independent Variable: Fund Leverage

Independent Variable: 1-yr lag of herd deviation

Dependent Variable: Fund Deviation from the Average 1985-2004

D(i,t) = -0.000992 - .00000024SIZE + .00444Leverage + .2236D(i,t-1)

SUMMARY OUTPUT

Regression Statistics	
Multiple R	0.332902488
R Square	0.110824066
Adjusted R Square	0.089136848
Standard Error	0.002720153
Observations	127

ANOVA

	df	*SS*	*MS*	*F*	*Significance F*
Regression	3	0.000113433	3.78109E-05	5.110109869	0.002291862
Residual	123	0.000910105	7.39923E-06		
Total	126	0.001023538			

	Coefficients	*Standard Error*	*t Stat*	*P-value*	*Lower 95%*	*Upper 95%*	*Lower 95.0%*	*Upper 95.0%*
Intercept	0.000992092	0.000433489	2.288618948	0.023807695	0.000134026	0.001850157	0.000134026	0.001850157
Fund Size (GAV)	-2.39251E-07	1.36876E-07	-1.747939996	0.082969728	-5.10188E-07	3.16866E-08	-5.10188E-07	3.16866E-08
Fund Leverage	0.004449131	0.002108157	2.110436338	0.036846341	0.000276164	0.008622099	0.000276164	0.008622099
Di, t-1 var	0.223605094	0.089069357	2.510460411	0.013355282	0.047297766	0.399912423	0.047297766	0.399912423

Regression Output: Herd Behavior Deviation on Fund size, age, leverage, fee, NCREIF markets, the one-yr lag of fund deviation (1985-2004), firm and time fixed effects –across time and funds

D(i,t) =.00000015SIZE - .000034Age + .00217Leverage + .2755Fee - .002338NCREIFupmkt - .00035NCREIFdwnmkt + .1303D(i,t-1)

Source	SS	df	MS	Number of obs	=	127
				F(37, 90)	=	2.89
Model	0.0006979	37	1.886E-05	Prob > F	=	0
Residual	0.0005881	90	6.53E-06	R-squared	=	0.5427
				Adj R-squared	=	0.3547
Total	0.001286	127	1.013E-05	Root MSE	=	0.00256

ditsqrd	Coef.	Std. Err.	t	P>t	[95% Conf.	Interval]
fundsizegav	1.52E-07	3.62E-07	0.42	0.676	-5.67E-07	8.71E-07
fundage	-3.39E-05	0.000108	-0.31	0.754	-0.0002484	0.0001806
fundleverage	0.0021678	0.0048232	0.45	0.654	-0.0074143	0.0117498
fee	0.2755184	0.1783305	1.54	0.126	-0.0787663	0.6298031
ncreifup	-0.002338	0.0027455	-0.85	0.397	-0.0077929	0.003116
ncreiffall~g	-0.000347	0.0004106	-0.85	0.4	-0.001163	0.0004686
dit1var	0.1303059	0.1061333	1.23	0.223	-0.0805464	0.3411581
americarei~i	-0.000282	0.0025509	-0.11	0.912	-0.0053494	0.004786
americanst~d	(dropped)					
guggenheim~s	-0.000704	0.0039692	-0.18	0.86	-0.008589	0.0071821
lionproper~d	-0.000503	0.002695	-0.19	0.852	-0.005857	0.0048513
mept	-0.000953	0.0013386	-0.71	0.479	-0.0036121	0.0017068
primeprope~y	(dropped)					
prisai	-0.000182	0.0011598	-0.16	0.876	-0.0024862	0.002122
prisaii	0.0017054	0.00123	1.39	0.169	-0.0007383	0.0041491
specialsit~d	-0.00318	0.0031144	-1.02	0.31	-0.0093667	0.0030078
strategicp~d	-0.002323	0.003743	-0.62	0.536	-0.0097592	0.005113
towerfund	-6.69E-05	0.0011774	-0.06	0.955	-0.002406	0.0022721
usincomegr~h	0.0008165	0.0036053	0.23	0.821	-0.0063461	0.0079792
usproperty~t	-0.000207	0.0012296	-0.17	0.867	-0.0026494	0.0022364
y2004	0.0000938	0.0021817	0.04	0.966	-0.0042405	0.0044281
y2003	0.0009396	0.0022961	0.41	0.683	-0.0036221	0.0055013
y2002	-0.002563	0.003144	-0.82	0.417	-0.008809	0.0036833
y2001	-0.00197	0.0031874	-0.62	0.538	-0.0083028	0.0043621
y2000	-0.001976	0.0031187	-0.63	0.528	-0.0081722	0.0042194
y1999	-0.001782	0.0029583	-0.6	0.549	-0.0076587	0.0040956
y1998	0.0020126	0.0032462	0.62	0.537	-0.0044366	0.0084617
y1997	0.0032011	0.0020972	1.53	0.13	-0.0009654	0.0073676
y1996	-0.00045	0.0020612	-0.22	0.828	-0.0045453	0.0036447
y1995	0.001975	0.0020289	0.97	0.333	-0.0020558	0.0060057
y1994	-0.000178	0.0020911	-0.09	0.932	-0.0043325	0.0039762
y1993	0.0001747	0.002119	0.08	0.934	-0.004035	0.0043844
y1992	0.003596	0.0028192	1.28	0.205	-0.0020047	0.0091967
y1991	-0.002172	0.0027527	-0.79	0.432	-0.0076408	0.0032966
y1990	-0.001017	0.0027686	-0.37	0.714	-0.0065169	0.0044837
y1989	0.0005747	0.0020922	0.27	0.784	-0.0035818	0.0047313
y1988	(dropped)					
y1987	-0.001251	0.0027401	-0.46	0.649	-0.0066949	0.0041924
y1986	-0.001515	0.002714	-0.56	0.578	-0.0069066	0.0038771
y1985	-0.00216	0.002705	-0.8	0.427	-0.0075338	0.003214

Regression Output: Herd Behavior Deviation on fund size, age, leverage, fee, NCREIF markets, the one-yr lag of fund deviation (1985-2004), firm fixed effects –across time and funds

D(i,t) = - .00000013SIZE - .000028Age + .00147Leverage + .2875Fee + .000411NCREIFupmkt + .00042NCREIFdwnmkt + .0720D(i,t-1)

Source	SS	df	MS	Number of obs	=	127
				F(20, 107)	=	3.42
Model	0.0005013	20	2.506E-05	Prob > F	=	0
Residual	0.0007847	107	7.33E-06	R-squared	=	0.3898
				Adj R-squared	=	0.2757
Total	0.001286	127	1.013E-05	Root MSE	=	0.00271

ditsqrd	Coef.	Std. Err.	t	P>t	[95% Conf.	Interval]
fundsizegav	-1.31E-07	3.05E-07	-0.43	0.668	-7.35E-07	4.73E-07
fundage	-2.79E-05	0.0000708	-0.39	0.694	-0.0001683	0.0001124
fundleverage	0.0013891	0.0047716	0.29	0.772	-0.00807	0.0108483
fee	0.2875926	0.1777721	1.62	0.109	-0.0648198	0.640005
ncreifup	0.0004112	0.0005578	0.74	0.463	-0.0006945	0.001517
ncreiffall~g	0.0004164	0.0002699	1.54	0.126	-0.0001185	0.0009514
dit1var	0.0720821	0.0970701	0.74	0.459	-0.1203481	0.2645123
americarei~i	-0.002136	0.0020325	-1.05	0.296	-0.0061647	0.0018937
americanst~d	-0.002675	0.0032316	-0.83	0.41	-0.0090808	0.0037319
guggenheim~s	-0.002618	0.0042708	-0.61	0.541	-0.0110841	0.0058488
lionproper~d	-0.002659	0.0020871	-1.27	0.205	-0.0067964	0.0014784
mept	-0.002008	0.0023989	-0.84	0.404	-0.0067636	0.0027476
primeprope~y	-0.000942	0.0025916	-0.36	0.717	-0.0060797	0.0041955
prisai	-0.001135	0.0024502	-0.46	0.644	-0.0059923	0.0037221
prisaii	0.0005638	0.0020783	0.27	0.787	-0.0035561	0.0046838
specialsit~d	-0.00478	0.0031626	-1.51	0.134	-0.0110494	0.0014896
strategicp~d	-0.00255	0.0028195	-0.9	0.368	-0.0081394	0.0030394
towerfund	-0.001966	0.002084	-0.94	0.348	-0.0060968	0.0021657
usincomegr~h	-0.000967	0.0034392	-0.28	0.779	-0.007785	0.0058507
usproperty~t	-0.002096	0.0020223	-1.04	0.302	-0.0061046	0.0019132

Regression Output: Herd Behavior Deviation on fund size, age, leverage, fee, NCREIF markets, the one-yr lag of fund deviation (1985-2004), time fixed effects –across time and funds

D(i,t) =-000000173SIZE +.000018Age + .00490Leverage + .0980Fee - .001107NCREIFupmkt - .00040NCREIFdwnmkt + .2572D(i,t-1)

Source	SS	df	MS	Number of obs	=	127
				F(26, 101)	=	3.7
Model	0.0006276	26	2.414E-05	Prob > F	=	0
Residual	0.0006584	101	6.52E-06	R-squared	=	0.488
				Adj R-squared	=	0.3562
Total	0.001286	127	1.013E-05	Root MSE	=	0.00255

ditsqrd	Coef.	Std. Err.	t	P>t	[95% Conf.	Interval]
fundsizegav	-1.74E-07	1.53E-07	-1.14	0.257	-4.77E-07	1.29E-07
fundage	0.0000182	0.0000292	0.62	0.536	-0.0000398	0.0000762
fundleverage	0.0049037	0.0034233	1.43	0.155	-0.0018872	0.0116947
fee	0.0980096	0.1134024	0.86	0.389	-0.1269502	0.3229695
ncreifup	-0.001107	0.001905	-0.58	0.562	-0.0048861	0.0026719
ncreiffall~g	-0.000398	0.0003921	-1.02	0.312	-0.001176	0.0003796
dit1var	0.2572132	0.097004	2.65	0.009	0.0647834	0.449643
y2004	0.0000855	0.0017277	0.05	0.961	-0.0033418	0.0035128
y2003	0.0007063	0.0017619	0.4	0.689	-0.0027889	0.0042015
y2002	-0.001668	0.0014786	-1.13	0.262	-0.0046016	0.0012648
y2001	-0.00116	0.0015804	-0.73	0.465	-0.0042951	0.0019749
y2000	-0.001091	0.00152	-0.72	0.474	-0.0041065	0.0019241
y1999	-0.001412	0.0015157	-0.93	0.354	-0.0044187	0.0015946
y1998	0.0025436	0.0021121	1.2	0.231	-0.0016463	0.0067335
y1997	0.0030539	0.0018337	1.67	0.099	-0.0005837	0.0066915
y1996	-0.000906	0.0018304	-0.49	0.622	-0.0045368	0.0027254
y1995	0.001795	0.0018279	0.98	0.328	-0.0018311	0.005421
y1994	-0.00027	0.0019642	-0.14	0.891	-0.0041668	0.0036261
y1993	-0.00051	0.0020149	-0.25	0.801	-0.0045072	0.0034868
y1992	0.0049431	0.001791	2.76	0.007	0.0013903	0.0084959
y1991	-0.00084	0.0017841	-0.47	0.639	-0.004379	0.0026993
y1990	0.0006575	0.0018244	0.36	0.719	-0.0029616	0.0042767
y1989	0.0006409	0.0020862	0.31	0.759	-0.0034976	0.0047795
y1988	(dropped)					
y1987	0.0001483	0.0019652	0.08	0.94	-0.0037501	0.0040467
y1986	0.0000513	0.0019498	0.03	0.979	-0.0038165	0.0039192
y1985	-0.000466	0.0019528	-0.24	0.812	-0.0043402	0.003407

Regression Output: Performance Analysis- P(i,t)

Dependent Variable: Annual Gross Return Relative to the NPI, or P(i,t)

Independent Variable: Log of Fund GAV

Independent Variable: Fund Age

Independent Variable: Fund Fee (Gross - Net Return)

Independent Variable: Hirfendahl Index

Independent Variable: Fund Leverage

Independent Variable: NPI Down Market Dummy

Independent Variable: NPI Neutral Market Dummy

Independent Variable: 1-Year Lag of Performance

Independent Variable: Growth in GAV Over Past 3 Years

Independent Variable: Average Investment Size

P(i,t) = -0.00375 - 0.01506logSIZE + 0.00005AGE + 2.50320FEE + 0.01916HIRF - 0.04252LVG + 0.01981DWNMKT + 0.00937NTRLMKT + 0.38054P(i,t-1) – 0.00243GRO + 0.00029INVSIZE

SUMMARY OUTPUT

Regression Statistics	
Multiple R	0.524473543
R Square	0.275072497
Adjusted R Square	0.198764339
Standard Error	0.028838678
Observations	106

ANOVA

	df	*SS*	*MS*	*F*	*Significance F*
Regression	10	0.029979674	0.002998	3.6047587	0.000432477
Residual	95	0.079008591	0.000832		
Total	105	0.108988265			

	Coefficients	*Standard Error*	*t Stat*	*P-value*	*Lower 95%*	*Upper 95%*	*Lower 95.0%*	*Upper 95.0%*
Intercept	-0.003750351	0.034878094	-0.107527	0.9145974	-0.072992072	0.065491371	-0.072992072	0.065491371
logSIZE	-0.015058318	0.009784493	-1.538998	0.127129	-0.034482978	0.004366343	-0.034482978	0.004366343
AGE	0.000510363	0.000499379	1.021995	0.3093787	-0.000481029	0.001501756	-0.000481029	0.001501756
FEE	2.503203004	1.612751715	1.552132	0.1239559	-0.698511666	5.704917673	-0.698511666	5.704917673
HIRF	0.019161665	0.042648031	0.449298	0.6542402	-0.065505321	0.10382865	-0.065505321	0.10382865
LEVG	-0.042517908	0.035949238	-1.182721	0.2398714	-0.113886118	0.028850303	-0.113886118	0.028850303
DWNMKT	0.01981451	0.007261121	2.72885	0.0075729	0.005399372	0.034229648	0.005399372	0.034229648
NTRLMKT	0.009365014	0.007433067	1.259912	0.2107872	-0.00539148	0.024121507	-0.00539148	0.024121507
P(i,t-1)	0.380537994	0.09095944	4.183601	6.397E-05	0.199960803	0.561115185	0.199960803	0.561115185
GRO	-0.00243263	0.004280417	-0.568316	0.5711613	-0.010930327	0.006065067	-0.010930327	0.006065067
INVSIZE	0.000291696	0.000226379	1.288525	0.2006925	-0.000157724	0.000741115	-0.000157724	0.000741115

Regression Output: Performance Analysis- P(i,t)

Dependent Variable: Annual Gross Return Relative to the NPI, or P(i,t)

Independent Variable: Log of Fund GAV

Independent Variable: Fund Fee (Gross - Net Return)

Independent Variable: NPI Down Market Dummy

Independent Variable: 1-Year Lag of Performance

P(i,t) = -0.00619logSIZE + 1.40617FEE + 0.01680DWNMKT + 0.37170P(i,t-1)

SUMMARY OUTPUT

Regression Statistics	
Multiple R	0.483197354
R Square	0.233479683
Adjusted R Square	0.201131046
Standard Error	0.028618813
Observations	106

ANOVA

	df	*SS*	*MS*	*F*	*Significance F*
Regression	4	0.025446545	0.006361636	7.76722	1.68935E-05
Residual	102	0.083541719	0.000819036		
Total	106	0.108988265			

	Coefficients	*Standard Error*	*t Stat*	*P-value*	*Lower 95%*	*Upper 95%*	*Lower 95.0%*	*Upper 95.0%*
logSIZE	-0.00619286	0.003365502	-1.840099823	0.068661	-0.012868315	0.000482594	-0.012868315	0.000482594
FEE	1.406174123	0.911559397	1.542602849	0.126024	-0.401898706	3.214246953	-0.401898706	3.214246953
DWNMKT	0.016806029	0.005771967	2.911664026	0.004416	0.005357365	0.028254693	0.005357365	0.028254693
P(i,t-1)	0.371695841	0.086742313	4.285057976	4.15E-05	0.199642961	0.543748721	0.199642961	0.543748721

Regression Output: Performance Analysis- Selection Return

Dependent Variable: Annual Selection Component of P(i,t)

Independent Variable: Log of Fund GAV

Independent Variable: Fund Age

Independent Variable: Fund Fee (Gross - Net Return)

Independent Variable: Hirfendahl Index

Independent Variable: Fund Leverage

Independent Variable: NPI Down Market Dummy

Independent Variable: NPI Neutral Market Dummy

Independent Variable: 1-Year Lag of Selection Performance

Independent Variable: Current Year Strategy Performance

Independent Variable: Growth in GAV Over Past 3 Years

Independent Variable: Average Investment Size

SEL(i,t) = -0.01242 - 0.01284logSIZE + 0.00005AGE + 2.39850FEE + 0.02964HIRF - 0.03728LVG + 0.01992DWNMKT + 0.00776NTRLMKT + 0.36070SEL(i,t-1) – 0.55512STR(i,t) – 0.00170GRO + 0.00025INVSIZE

SUMMARY OUTPUT

Regression Statistics	
Multiple R	0.49396547
R Square	0.244001886
Adjusted R Square	0.155534021
Standard Error	0.028751668
Observations	106

ANOVA

	df	*SS*	*MS*	*F*	*Significance F*
Regression	11	0.025079935	0.00228	2.758085	0.003847324
Residual	94	0.077705889	0.000827		
Total	105	0.102785824			

	Coefficients	*Standard Error*	*t Stat*	*P-value*	*Lower 95%*	*Upper 95%*	*Lower 95.0%*	*Upper 95.0%*
Intercept	-0.012423936	0.036002571	-0.345085	0.730802	-0.083907848	0.059059975	-0.083907848	0.059059975
logSIZE	-0.012839173	0.010320713	-1.24402	0.216585	-0.03333118	0.007652833	-0.03333118	0.007652833
AGE	0.00050246	0.00050012	1.00468	0.31763	-0.000490539	0.001495459	-0.000490539	0.001495459
FEE	2.398548573	1.607607449	1.491999	0.139048	-0.793392078	5.590489223	-0.793392078	5.590489223
HIRF	0.029643739	0.042982216	0.689675	0.492098	-0.055698416	0.114985894	-0.055698416	0.114985894
LEVG	-0.037277616	0.035956106	-1.036753	0.30251	-0.108669271	0.034114039	-0.108669271	0.034114039
DWNMKT	0.019917577	0.007329198	2.717566	0.00783	0.005365291	0.034469863	0.005365291	0.034469863
NTRLMKT	0.007762248	0.007583068	1.023629	0.308638	-0.007294103	0.022818599	-0.007294103	0.022818599
SEL(i,t-1)	0.360690813	0.092927989	3.881401	0.000193	0.176180207	0.545201419	0.176180207	0.545201419
STR(i,t)	-0.555120352	0.301744231	-1.839705	0.068968	-1.15424029	0.043999586	-1.15424029	0.043999586
GRO	-0.001703071	0.004329227	-0.393389	0.694923	-0.010298848	0.006892705	-0.010298848	0.006892705
INVSIZE	0.00025494	0.000233666	1.09104	0.278044	-0.000209011	0.00071889	-0.000209011	0.00071889

Regression Output: Performance Analysis- Strategy Return

Dependent Variable: Annual Strategy Component of P(i,t)

Independent Variable: Log of Fund GAV

Independent Variable: Fund Age

Independent Variable: Fund Fee (Gross - Net Return)

Independent Variable: NPI Down Market Dummy

Independent Variable: NPI Neutral Market Dummy

Independent Variable: Current Year Selection Performance

Independent Variable: 1-Year Lag of Strategy Performance

Independent Variable: Growth in GAV Over Past 3 Years

Independent Variable: Average Investment Size

STR(i,t) = 0.02340 - 0.00934logSIZE + 0.00012AGE - 0.15312FEE + 0.00214DWNMKT + 0.00386NTRLMKT - 0.37469SEL(i,t) + 0.20589STR(i,t-1) + 0.00088GRO + 0.00015INVSIZE

SUMMARY OUTPUT

Regression Statistics	
Multiple R	0.492853128
R Square	0.242904206
Adjusted R Square	0.171926475
Standard Error	0.009683169
Observations	106

ANOVA

	df	*SS*	*MS*	*F*	*Significance F*
Regression	9	0.002887955	0.000321	3.422259	0.001088654
Residual	96	0.00900132	9.38E-05		
Total	105	0.011889275			

	Coefficients	*Standard Error*	*t Stat*	*P-value*	*Lower 95%*	*Upper 95%*	*Lower 95.0%*	*Upper 95.0%*
Intercept	0.023409601	0.008057865	2.905186	0.004556	0.007414852	0.039404349	0.007414852	0.039404349
logSIZE	-0.009348013	0.003209061	-2.913005	0.004453	-0.015717953	-0.002978072	-0.015717953	-0.002978072
AGE	0.000117389	0.000166051	0.706949	0.481311	-0.000212219	0.000446998	-0.000212219	0.000446998
FEE	-0.153124837	0.446598642	-0.342869	0.732447	-1.039616812	0.733367137	-1.039616812	0.733367137
DWNMKT	0.002143391	0.002505805	0.85537	0.394476	-0.002830596	0.007117378	-0.002830596	0.007117378
NTRLMKT	0.003856471	0.002475702	1.557728	0.122588	-0.001057762	0.008770704	-0.001057762	0.008770704
SEL(i,t)	-0.037468505	0.031820806	-1.177484	0.241913	-0.100632354	0.025695344	-0.100632354	0.025695344
STR(i,t-1)	0.205886488	0.100109798	2.056607	0.042437	0.007169957	0.404603018	0.007169957	0.404603018
GRO	0.000879115	0.001504746	0.584228	0.560437	-0.002107785	0.003866015	-0.002107785	0.003866015
INVSIZE	0.000152444	6.73543E-05	2.26331	0.025869	1.87463E-05	0.000286141	1.87463E-05	0.000286141

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