The Value of Active Management in the Commercial Real Estate Market: Evidence from Holdings and Trades

Draft for the
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April 2013

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Abstract

We investigate the aggregate value to active investment fund management in the commercial real estate market. We utilize the fraction of square footage held by institutional investors as a proxy for the industry's consensus opinion on a particular property class, and examine subsequent returns to these property classes to assess the industry's aggregate ability to select outperforming assets. We find that the most widely held submarkets *underperform* the submarkets least held by institutions, particularly private entities, suggesting that markets which are widely held by institutions may exhibit some degree of overcrowding. In contrast, we find that the submarkets most bought by REIT managers outperform the least-bought (or most sold submarkets), suggesting that REIT portfolio managers do in fact create value through active trading via early movement into markets that will exhibit superior performance.

1 Introduction

The Real Estate Market represents a significant sum of capital, in particular actively managed capital held in portfolios by investment managers. Portfolio managers of Commingled Real Estate Funds that report to the National Council of Real Estate Investment Fiduciaries (NCREIF) currently manage a property portfolio valued in excess of $247 billion, and the total market capitalization of Real Estate Investment Trusts (REITs) is over $389 billion. Several billion dollars per year are expended by these portfolio managers in pursuit of underpriced properties. Presumably, these managers are expected to yield returns in excess of what would be earned through a passive portfolio strategy.

Although investors largely appear to trust the ability of portfolio managers to invest their capital, the academic literature has repeatedly questioned the ability of active managers to systematically pick underpriced investments. Beginning with Jensen (1968), a large literature has explored the ability of mutual fund managers to systematically pick stocks and time their investments so as to generate abnormal performance and justify the fees and expenses of active money management. Despite the volume of articles in this vein, evidence on the systematic ability of mutual fund portfolio managers to generate abnormal profits has yielded results that are mixed at best, and generally has concluded that managers exhibit little to negative ability to generate abnormal returns. These findings are often ascribed to the fact that the stock market is overall generally considered to be highly informationally efficient.

In contrast to the mutual fund setting, where markets are believed to be highly efficient, real estate investment portfolios provide us with a laboratory for exploring active management utilizing an alternative asset class that is traded in a less efficient market than that for common equities,[1] and in which abnormal profits by informed investors are therefore considered to be more common. While many alternative asset classes are traded in private markets, many of these markets suffer from a lack of data availability, particularly as regards trading and returns data. The real estate market is an exception in this respect, and therefore provides an ideal laboratory for constructing a systematic view of whether and how informed institutional-level investors can generate abnormal profits through active trading.

In this paper, we explore the aggregate performance of properties widely held and traded by public and private real estate portfolio managers. Our goal is to shed light on the value of active management in this asset class and on the aggregate abilities of portfolio managers to select better-performing assets. Examining the aggregate performance of property held and traded by real estate portfolio managers focuses on the issue of whether the consensus opinion of the entire real estate portfolio management community about a particular property class (location and type) represents superior information about the value of that property class. We expect active property trades to represent a stronger portfolio manager opinion about the value of that property class than the passive decision of holding an existing position, since the latter may be driven by non-performance related reasons such as concerns over transaction costs, capital gains taxes, or long-term strategic asset allocation. We would therefore expect any evidence of property

[1]In the real estate literature, many studies have documented the predictability of property markets (mainly to make a statement about their efficiency), for example Liu and Mei (1992, 1994), Barkham and Geltner (1995), Case and Shiller (1990), Case and Quigley (1991),and especially Geltner and Mei (1995) and Mühlhofer (2009) who use technical trading strategies to illustrate that market timing profits can be made in the property market.

selection ability to be more discernible by examining trades rather than holdings.

We find that the most widely held submarkets actually *underperform* the submarkets least held by institutions. This result is strongest for private entities and only exists to a very small extent for REITs. This suggests that markets which are widely held by institutions may exhibit some degree of overcrowding, with excessive demand for space raising prices and eliminating future returns. For trading, on the other hand, we find that the most bought submarkets outperform the least-bought (or most sold submarkets). This result is very strong for REITs, when measuring trading as well as subsequent performance over long horizons. This suggests that REITs do in fact create value through active trading and supports a hypothesis that these firms further are *early movers* into markets that will exhibit superior performance. This trade-returns relationship appears to be concentrated primarily in the Office sector. The trading effects observed for REITs are small to non-existent for private entities in the full sample. Using a post-1995 sample (to mirror the REIT sample time period) for private managers, yields the same result for these portfolios as for the entire sample.

We further attempt to distinguish between trades buying into a market that are due to growth in that submarket segement, versus genuine value creation through reallocation decisions that are due to positive selection ability. Institutional trading on the part of the institutional class as a whole may be motivated more by stock availability in certain markets, rather than by an effort or an ability to find market segments that truly outperform. Such behavior may be motivated by the necessity to invest newly-raised funds into commercial property by a certain deadline (often the end of a tax year), in order to avoid this money being withdrawn again by end investors. A situation such as this one would lead managers to simply choose markets which offer an easy entrance, due to large amounts of stock availability, rather than because they believe those markets will outperform in the future. When we horserace stock growth and forward returns, we find that private managers buy into markets that are characterized by recent growth in underlying stock, whereas REIT managers buy into markets that are characterized by high furture returns, suggesting that REIT managers are able to generate outperformance through selection ability.

Our analysis is related to a number of significant finance and economics research literatures. Abnormal profits (or the lack thereof) for mutual funds in the stock market have been studied extensively in the literature (see e.g. Jensen (1968, 1969), Brown and Goetzmann (1995), Gruber (1996), Carhart (1997), and for mutual funds of REITs (Kallberg, Liu and Trzcinka (2000), Hartzell, Mühlhofer and Titman (2010). Daniel, Grinblatt, Titman and Wermers (1997), distinguish between *timing* and *selectivity*[2]) The common theme that emerges from these studies is that true risk-adjusted abnormal profits are rare in stock portfolios held by mutual funds and when found, such profits lack persistence.

Other studies have attempted to generate a systematic view of how potential trading profits are made in alternative asset markets such as private equity or venture capital. Of note here are studies such as Cochrane (2005), Kaplan and Schoar (2005), Ljungqvist and Richardson (2003), as well as Gompers, Kovner, Lerner and Scharfstein (2008). Such studies, while generating some useful inferences about these markets, suffer from problems with data availability (for example

[2]Hochberg and Mühlhofer (2011) explore such a decomposition of returns for real estate portfolio managers.

by being able to observe only venture-capital financed firms that went public, having to rely on voluntarily reported investment returns, or by being forced to use other indirect public-market related measures to infer information about the more inefficient private market). In our study, on the other hand, we make use of a complete dataset of property trades by institutional-grade REITs and private property managers covered by NCREIF, thus providing both complete trading information and eliminating selection bias. The use of real estate transaction data thus affords us a laboratory for testing whether informed institutional investors are able to exploit market inefficiencies to generate abnormal trading profits.

The remainder of the paper is organized as follows. Section 2 discusses the data used in our analysis. Section 3 presents and discusses our study methodology. Section 4 presents our empirical results. Section 5 discusses and concludes.

2 Data

Property transaction data for REIT portfolio managers are obtained from SNL Financial, which aggregates data from 10-K and 10-Q reports of a large sample of institutional-grade publicly traded REITs. The SNL Financial DataSource dataset provides comprehensive coverage of corporate, market, and financial data on publicly traded REITs and selected privately held REITs and REOCs (Real Estate Operating Companies). One part of the data contains accounting variables for each firm, and the other contains a listing of properties held in each firm's portfolio, which we use for this study. For each property, the dataset lists a variety of property characteristics, as well as which REIT bought and sold the property and the dates for these transactions. By aggregating across these properties on a firm-by-firm basis in any particular time period, we can compute a REIT's fractional exposure to particular sets of characteristics such as property type and geographic segment.

Property transactions data for private real estate portfolio managers are obtained from the National Council of Real Estate Investment Fiduciaries (NCREIF), which collects transaction-level data for private entities (primarily pension funds). Having one's properties be part of NCREIF's portfolio is generally considered highly desirable for a private pension fund, in that this gives the fund prestige. Because NCREIF's policy is to only report data on high-grade institutional-quality commercial real estate (which it uses for its flagship industry index, the NPI) being part of NCREIF's database confirms a level of quality on the part of the investor. It is not possible for an investor to report performance only in certain quarters and not in others, as some times happens with private equity; NCREIF membership constitutes a long-term commitment. Further, data reported by NCREIF members is treated by the organization under a strict non-disclosure agreement.[3] Thus, manipulating performance numbers would be ineffective because this could not help the investor signal quality. Because NCREIF members are both willing and able to fully and confidentially report this data to NCREIF, this arrangement gives us the opportunity to examine trades in a large private asset market, in a more complete and unbiased way than the data used in past studies on other alternative asset classes. This data source thus helps us overcome issues such as selection- and survivorship bias, which plague much of the private-equity, hedge-fund, and

[3] As academic researchers, we are given access to NCREIF's raw data under the same non-disclosure agreement.

venture-capital literature.

Aggregate square footage data is obtained from CBRE Econometric Advisors (formerly Torto-Wheaton Research). This firm conducts estimates of available commercial stock, by submarket. The estimates produced by this firm are highly regarded in institutional circles for observing trends throughout urban markets across the United States.

Table 1 shows summary statistics for our data. We have 198 submarkets, which we track over a 1980 to 2011 time window, at a quarterly frequency.[4] These summary statistics are computed across the entire panel of submarkets and quarters.

The average submarket contains 227 million square feet of space, with the median at 162 million and the third quartile at 275 million. The difference between the mean and the median (and the mean's proximity to the third quartile) indicates that there are a few markets at the top of the distribution that are extremely large, with then a large number of small markets making up the rest of the distribution. This situation is well known in the Urban Economics literature, which models city sizes as following approximately an exponential decay, by rank within a large region (e.g. Zipf's Law).

The average private institution in our sample holds 6.6 million square feet per submarket, while the average REIT holds about two thirds of this (4.6 million). Interestingly enough, despite this difference in actual square footage held, the two types of institutions hold, on average, very similar fractions of available space in a given submarket (4.0% and 4.4% respectively), which would indicate that, on average, REITs are present in smaller markets at least to a larger extent than

[4]As limited by our stock data, many submarkets start later. All REIT data starts in 1995.

private investors. On average, private institutions turn over (i.e. buy or sell) 469,000 square feet per quarter, while REITs turn over 363,000 square feet per quarter. For both types of institutions, this constitutes approximately seven to eight percent of their holdings in the average market.

For all distributions reported here, the means are well above the medians, and especially for trading activity these are close to the third quartile. This indicates that for all these measures, a high degree of positive skewness exists, with a few very large markets at the top, which also have a much higher degree of institutional presence as well as institutional trading activity. As with total stock available, this should be consistent with evidence of *Urban Giants* from the Urban Economics literature, as well as with industry concepts such as *Gateway Cities* which dominate other markets, as well as anecdotal evidence (e.g. New York City or Los Angeles).

3 Methodology

To assess whether managers of institutional portfolios in aggregate generate value through active management, we adapt the methodology of Chen, Jegadeesh and Wermers (2000) (henceforth CJW). Specifically, we assess whether the choice to allocate capital to specific submarkets and away from others by the institutional class generates positive value-added.

In line with CJW, we begin by classifying submarkets according to their level of fractional institutional ownership, as well as according to the extent to which the asset is traded by institutions. We then rank submarkets based on these measures and sort into portfolios on these two dimensions. Finally, returns over various time horizons for each of these portfolios are computed and reported. If submarkets with high fractional holdings or a high level of positive trading (i.e. buying) by institutions generate higher returns than submarkets with low fractional holding or a high level of negative trading (i.e. selling) by institutions, then the institutional class as a whole has made good capital allocation decisions and therefore created value.

The classification according to fractional holdings is achieved through the following measure:

$$FracHolding_{i,t} = \frac{Sqf\ Held_{i,t}}{Total\ Stock_{i,t}} \quad (1)$$

In this expression, $Sqf\ Held_{i,t}$ is the number of square feet of space held in submarket i in all institutional portfolios in the data at time t, while $Total\ Stock_{i,t}$ is the total square footage of stock that exists in submarket i at that time. For example, consider the sub-market of Chicago office properties. In this case, the $FracHolding_{i,t}$ measure indicates the proportion of Chicago office space that is held by all institutional investors in our sample combined, as a fraction of total Chicago office space available. Intuitively, if markets with high (low) *FracHolding* at time t, subsequently generate high (low) returns, institutional portfolio managers in aggregate have created value, by being heavily invested in rising markets and out of falling markets. The (presumably) less sophisticated set of non-institutional investors would, by implication, be pursuing the opposite strategies and thereby not generate value through active trading.

As a stronger measure of institutional interest, we follow CJW in developing a measure that shows how much a submarket is traded by institutions, defined as follows:

$$Trade_{i,t} \quad = \quad FracHolding_{i,t} - FracHolding_{i,t-1} \tag{2}$$

The measure is thus defined as a first difference between fractional holdings at two subsequent time periods. Intuitively, a positive measure here shows an increase in the fraction of total available square footage which is held by the institutional investors in our sample (i.e. institutional investors *buying into the market* in net terms), while a negative measure shows a decrease in this fraction (i.e. institutional investors *selling out of the market* in net terms). If a sub-market with a strongly positive (negative) *Trades* measure at time t, subsequently generates high (low) returns, then institutional investors in aggregate will have generated value. As stated above, active trading behavior should indicate more strongly held opinions by the industry about a particular market, and so we may very well find different results by examining active trading behavior, rather than passive holdings snapshots.

Our datasets contain a list of properties traded by REITs as well as commingled Real Estate funds (NCREIF members). For each property, the datasets list a variety of property characteristics (such as size, type, and location), as well as which entity bought and sold the property and the dates for these transactions. We aggregate across trades, to determine overall exposure to a particular sub-market by all institutional investors in our dataset. The returns to a particular sub-market are taken from NCREIF's flagship National Property Index (NPI), which exists at various levels of aggregation by geography and property type. At this stage of the investigation, we conduct this procedure for REITs and NCREIF members separately and we use data aggregated at the level of Core-Based Statistical Area (CBSA) interacted with property type. The example of Chicago Office property, given above, is in line with this. Given that we have separate data for holdings by portfolio managers of publicly traded as well as private entities, we thus examine right away whether these two types of managers differ in their value-added capacity.

To avoid drawing inferences that might be driven by the commercial property's slow transaction speed or (relatively) low volatility, we consider multiple time horizons, both for the computation of our measures, as well as for the measurement of subsequent returns. In a first run, we compute $FracHolding$ for each submarket (i) over just one quarter (t). Based on these measures, we sort markets into deciles by $FracHolding_{i,t}$ and then compute returns for the subsequent year (i.e. we aggregate the returns for quarters $t+1$ through $t+4$) for each market, and report distributional statistics for the returns to all markets that at in any quarter t end up in either the bottom or top decile of $FracHolding$. We then also report hypothesis tests, testing whether these distributions of returns differ from each other. Having done this, we then keep the same sort, and instead report distributions and hypothesis tests for two-year forward returns (i.e. an aggregation of the returns for quarters $t+1$ through $t+8$), three-year forward returns (i.e. an aggregation of the returns for quarters $t+1$ through $t+12$) and four-year forward returns (i.e. an aggregation of the returns for quarters $t+1$ through $t+16$). Following this, we proceed analogously, by sorting on $Trade$ over the previous quarter, instead of $FracHolding$.

Lastly, we conduct this set of tests by sorting on annualized versions of $FracHolding$

and $Trade$. For the former, we use the four-quarter moving average (i.e. average $FracHolding$ over quarters $t-3$ through t), and for $Trade$ we use the four-quarter trailing sum (i.e. the sum of $Trade$ over quarters $t-3$ through t). We conduct the same decile sort and report the same forward returns for the bottom and top decile of submarkets.

4 Results

Table 2 shows the first set of results from our main test. First, the table shows distributional statistics for the bottom decile and top decile markets sorted by one-quarter $FracHolding$ or $Trade$, in this case for private managers. We further show t-tests of the hypothesis that the two means are equal to each other, against the two-sided alternative. We structure the tests, such that the difference tested is $Top - Bottom$, i.e. a positive t-statistic indicates that the top decile would be outperforming the bottom, while a negative t-statistic indicates the opposite.

We further show results from a Kolmogorov-Smirnov (KS) test, testing the null hypothesis that the two distributions or returns are the same. This test has the advantage over a t-test of means, that it considers differences in the entire distribution, even away from the center (i.e. the mean). Given that we are facing such skewed data, the results from this test constitute an important source for making statistical inferences about the relationships we observe. When conducting a KS-test against the two-sided alternative which rejects, the D statistic does not allow an inference for which direction the two distributions are likely to differ in reality (unlike, for example in a t-test, where the sign of the statistic itself indicates this). Therefore, we conduct KS test against the one-sided alternative that is suggested by the outcome of the t-test. It should be noted that the alternative hypotheses on a KS test concern the positions of the cumulative distribution functions (CDF) in relation to each other. Therefore, the *positive* alternative, on the KS tests in this case, states that the CDF of the top-decile returns lies *above* that of the bottom-decile returns, which indicates that the top-decile returns have a statistical tendency to be *lower* than the bottom. The negative alternative states the opposite.

The first panel of Table 2, which shows results from a sort based on fractional holdings and distributions of one-year returns shows that, on average, the least held decile actually has a return of 8% per year, a *higher* return than the most held decile, which only shows a return of 6% per year. Similar relationships can be observed for all quartiles reported, as well, with the most-held decile of markets always underperforming the least-held. The gap seems to narrow, when approaching the upper part of the distribution, with the first quartiles differing by about four percentage points, while the third quartiles differ by only about ten basis points. Both the t-test and the KS test strongly reject a hypothesis of these two sets of returns being the same, in favor of the alternative that the least-held decile outperforms the most-held. The next section of the panel, which shows two-year returns for the same sort, tells a similar story: the most widely held markets significantly underperform the least widely held for this type of investor. This effect becomes stronger, in magnitude and significance, when we repeat the exercise with three-year and four-year forward returns in the bottom part of the panel.

These results directly contradict a hypothesis of institutions' creating value by having especially strong concentrations in markets that will generate especially high performance. Perhaps an alternative effect could be taking place here, which might be one of over-crowding. Perhaps markets that are widely held by institutions tend to be somewhat overbought, which causes excessive demand, drives up prices and thus reduces returns. If institutions were holding a portfolio that is approximately value-weighted (as dictated by finance theory), this could lead to such a result, with large markets showing these signs of overbuying.

The second panel of the table shows distributions of decile-portfolio returns when sorted by trades. Over a one-year horizon, we find that the two sets of return distributions are statistically indistinguishable from each other. This indicates that these investors do not have a strong tendency to either buy into markets that will perform very strongly, nor out of markets that will perform poorly. When examining a two-year return horizon, we find that the KS test weakly rejects the hypothesis of the two distributions being the same (at the 10% level), in favor of the negative alternative, i.e. that the most bought decile does, in fact outperform the least-bougt (or most sold). This would constitute weak evidence that over a longer return horizon, these investors generate some value added through their trades, although the lack of rejection of the t test would indicate that this is happening away from the center of the distribution, meaning that this would be somewhat infrequent. In the center of the distribution, trading behavior here seems to look more like pure liquidity trading that would be associated with making only trades for portfolio rebalancing, without generating profits. The same pattern persists for three-year and four-year forward returns, and is similar in magnitude though losing its statistical significance.

Table 3 shows similar results to those described for private managers for REITs, except that these are somewhat weakened. In the top two portions of the table, we still find some evidence that the most widely held markets by REITs underperform the least held markets. However, this difference is smaller (only around one percentage point per quarter, or about half that observed for private entities). In fact this is small enough and seems to be irregular enough in the central portions of the distributions, that t-tests fail to reject a hypothesis of the means of the two distributions being the same. However, the KS tests do reject at a five-percent level, in favor of the positive alternative (which states the the top decile *underperforms* the bottom, in that the former's CDF lies above that of the latter). For sorts based on trades, we find no difference in the returns distributions among the top and bottom deciles, which would indicate a pattern of liquidity trades only, when looking at REITs over this return horizon. The patterns become stronger in significance for three-year and four-year ahead returns.

To allow for the slow trades and low volatility of the commercial property market, we repeat the same set of tests, using annualized versions of the $FracHolding$ and $Trade$ measures to conduct the submarket sort. The results for private entities for this test are reported in Table 4. This table paints a similar picture to Table 2, in that the least-held markets strongly and significantly outperform the most-held markets, again supporting an over-crowding hypothesis. Similarly, on trading, we find weak evidence of the most-bought markets outperforming the least-bought (this time on a one-year return horizon), with a 10%-level rejection by the KS test for the one-and two-year forward returns.

Conducting the same test for REITs, in Table 5, we find a slightly different picture from Table 3. The negative holding effects are somewhat weakened, with gaps shrinking to about a half percentage points and KS tests rejecting only at the 10%-level for one- and two-year forward returns, at the 5%-level for three-year forward returns and at the 1%-level for four-year forward returns. However, on trades, here we find very strong results, especially with two-year return horizons. In this case, the most bought submarket decile generates an average return of 20.21% over these two years, while the most sold decile shows only 16.57%; this is a difference of almost four percentage points. When examining the quartile statistics, one can see that this outperformance is consistently visible throughout the distribution and this gap actually grows as one moves toward the top. Both the t-test and the KS test strongly reject (at the 5% level and 1% level respectively) the hypothesis of identical performance, in favor of positive outperformance of the most-bought decile. These results are similar in magnitude and stronger in statistical significance for the three- and four-year forward returns.

The picture that forms, thus, is that when measuring trades and performance over longer horizons, REITs seem to generate significant value through their trading activity. A hypothesis of REITs' being early movers into markets that will generate especially good performance could explain why these results are the most prominent at the longest time horizons, as in that case it would take some time for this outperformance to be visible. Private managers seem to add much less value along this dimension.

In Table 6, we break the above analysis down by property type (Apartment, Hotel, Industrial, Office and Retail), for private managers in the NCREIF sample. The table shows distributional statistics for the returns to the bottom-decile submarkets and top-decile submarkets, by holdings and trades subdivided by property type. Decile sorts are undertaken at the end of each quarter t, for the preceding year (quarters $t-3$ through t). For fractional holdings, we sort on the one-year moving average, while for trades we sort on the one-year moving sum. Returns are reported two years going forward (quarters $t+1$ through $t+8$). The table then reports distributions across the entire panel of quarters and submarkets. As before, we report a t-statistic testing the null that the means of the two distributions are the same against the two-sided alternative. Positive t-statistics indicate that the mean for the top decile returns is greater than that for the bottom. We also report a Kolmogorov-Smirnov test, testing the null that the two distributions are the same, against the alternative indicated by the point estimate of the difference of means. The *Positive Alternative* states that the CDF of the top-decile returns lies above that of the CDF for the bottom-decile returns, which means that the overall distribution of top decile returns is less than that of bottom decile returns. The *Negative Alternative states the opposite.* As can be easily seen from the table, the negative holdings-return relationship documented above for private managers appears to be driven primarily by the Office and Apartment sectors, with little significant differences in the other sectors. There are no significant patterns evident in Panel B, where we examine the relationship between trades and forward returns.

Table 7 similarly breaks down the analysis by property type for REIT managers. Here, in contrast to the private managers, we see that the positive holdings-returns relationship and trades-returns relationship documented above for the pooled set of property types is concentrated primarily in the Office sector. The positive trades-returns relationship in the office sector is quite strong. We note that there are a number of possible explanations for why the relationships appear to be concentrated in the Office sector. Importantly, it is likely that the match between holdings and stock data in our analysis is best for the Office sector (as compared to retail, where the CBRE stock data may exclude malls).

In Table 8, we repeat the analysis for the private manager (NCREIF) sample, but restrict the sample period to the time period after 1995. This matches the time period for which the REIT data is available, so as to rule out differences in the documented patterns being caused solely by differences in the sample periods for the two sets of managers. When we restrict the NCREIF sample to this period, we observe similar negative holdings-return relationships across the different lengths of forward-return periods, and no significant trade-return relationships, as observed for private managers across the entire sample.

In line with the results found so far, we next test the hypothesis that institutional trading may be motivated more by stock availability in certain markets, rather than by an effort or an ability to find market segments that truly outperform, on the part of the institutional class as a whole. Such behavior may be motivated by the necessity to invest newly-raised funds into commercial property by a certain deadline (often the end of a tax year), in order to avoid this money being withdrawn again by end investors.[5] A situation such as this one would lead managers to simply choose markets which offer an easy entrance, due to large amounts of stock availability.

In order to test this hypothesis, and differentiate it from the alternative of

[5]At least anecdotal evidence for such situations exists.

genuine value creation by institutional managers who are able to identify outperforming markets ex-ante, we run the following regression:

$$trade_{t,t+1,i} = \alpha + \beta_1 2.yr.return_{t+1,t+3} + \beta_2 stock.growth_{t-1,t} + \epsilon_{t,i} \quad (3)$$

In the above notation, t is in years. This regression associates current trade, with stock growth the year before, and two-year returns following the trade action. Under the hypothesis of value creation, we should find a positive relationship between trade and return, implying that managers will buy into markets that will generate high returns and sell out of markets that will generate low returns. On the other hand, if trades are driven by stock growth, we should find a positive relationship between stock growth and subsequent trades. Of course, this setup would allow for both mechanisms to coexist, if that were the case.

Table 9 presents the results of this analysis. The table highlights an important difference in the patterns for private managers and REITs. In panel A, we present the estimates of the regressions for private institutions, and in Panel B, the estimates from regressions using the REIT manager sample. For the private manager (NCREIF sample), we observe no significant relationship between future high returns and trading activity. However, we observe a positive and significant relationship between stock growth and trading activity, suggesting that private managers buy into markets that are growing in stock, rather than predicting future appreciation in the market. In the REIT sample, however, we observe the opposite: there is no statistically significant relationship between trades and stock availability, but there is a strong positive association between trades into a market and future returns in that market. This suggest that for REIT managers, the choice to buy into a market may be motivated by a prediction of future appreciation in that market, rather than by due to growth in stock in that market. The regression models for the REIT manager sample have much greater explanatory power than the models for private managers, with a R^2 of 7.8% versus 0.1% for the private manager models.

5 Conclusion

Despite a large literature on the value-added of active portfolio managers, evidence on the systematic ability of portfolio managers to generate abnormal profits has yielded results that are mixed at best, and generally has concluded that managers exhibit little to negative ability to generate abnormal returns. These findings, which primarily come from analysis of the mututal fund literature, are often ascribed to the fact that the public equities market is overall generally considered to be highly informationally efficient. In contrast to the mutual fund setting, where markets are believed to be highly efficient, real estate investment portfolios provide us with a laboratory for exploring active management utilizing an alternative asset class that is traded in a less efficient market than that for common equities and where the scope for informational advantages and value-added may be larger.

In this paper, we investigate the aggregate value to active investment fund management in the commercial real estate market. We utilize the fraction of square footage held by institutional investors as a proxy for the industry's consensus opinion on a particular property class, and examine subsequent returns to these property classes to assess the industry's aggregate ability to select outperforming assets.

We find negative performance for highly held markets, which may indicate that for institutional holdings, overcrowding of markets may dominate any value-added provided by institutional allocation decisions along this dimension. For trading, on the other hand, we do find positive value created by REIT managers, in that the markets that are heavily bought by these firms tend to outperform those that are least bought. This relationship appears to be concentrated primarily in the office sector, and trades into a market by REIT managers appear to be associated with high future returns in those markets.

References

Barkham, R. and Geltner, D.: 1995, Price discovery in american and british property markets, *Real Estate Economics* **23**(1), 21–44.

Brown, S. J. and Goetzmann, W. N.: 1995, Performance persistence, *Journal of Finance* **50**, 679–698.

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

Case, B. and Quigley, J.: 1991, Dynamics of real-estate prices, *Review of Economics and Statistics* **73**(1), 50–58.

Case, K. and Shiller, R.: 1990, Forecasting prices and excess returns in the housing market, *AREUEA Journal* **18**(3), 253–273.

Chen, H., Jegadeesh, N. and Wermers, R.: 2000, The value of active mutual fund management: An examination of the stockholdings and trades of fund managers, *Journal of Financial and Quantitative Analysis* **35**(03), 343–368.

Cochrane, J. H.: 2005, The risk and return of venture capital, *Journal of Financial Economics* **75**, 3–52.

Daniel, K., Grinblatt, M., Titman, S. and Wermers, R.: 1997, Measuring mutual fund performance with characteristic-based benchmarks, *Journal of Finance* **52**(3), 1035–1058.

Geltner, D. and Mei, J.: 1995, The present value model with time-varying discount rates: Implications for commercial property valuation and investment decisions, *Journal of Real Estate Finance and Economics* **11**(2), 119–135.

Gompers, P., Kovner, A., Lerner, J. and Scharfstein, D.: 2008, Venture capital investment cycles: The impact of public markets, *Journal of Financial Economics* **87**.

Gruber, M. J.: 1996, Another puzzle: The growth in actively managed mutual funds, *Journal of Finance* **51**, 783–810.

Hartzell, J., Mühlhofer, T. and Titman, S.: 2010, Alternative benchmarks for evaluating reit mutual fund performance, *Real Estate Economics* **38**(1), 121–154.

Hochberg, Y. V. and Mühlhofer, T.: 2011, Market timing and investment selection: Evidence from real estate investors. Working paper, available at: http://tobias.muhlhofer.com.

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

Jensen, M.: 1969, Risk, the pricing of capital assets, and the evaluation of investment portfolios, *Journal of Business* **42**, 167–247.

Kallberg, J. G., Liu, C. L. and Trzcinka, C.: 2000, The value added from investment managers: An examination of funds of reits, *Journal of Financial and Quantitative Analysis* **35**, 387–408.

Kaplan, S. N. and Schoar, A.: 2005, Private equity performance: Returns persistence and capital, *Journal of Finance* **60**, 1791–1823.

Liu, C. H. and Mei, J.: 1992, The predictability of returns on equity reits and their comovement with other assets, *Journal of Real Estate Finance and Economics* **5**(4), 401–418.

Liu, C. H. and Mei, J.: 1994, An analysis of real estate risk using the present value model, *Journal of Real Estate Finance and Economics* **8**, 5–20.

Ljungqvist, A. and Richardson, M. P.: 2003, The cash flow, return and risk characteristics of private equity. Unpublished Working Paper, New York University.

Mühlhofer, T.: 2009, They would if they could: Assessing the bindingness of the property holding constraint for reits. Working paper, available at: http://tobias.muhlhofer.com.

R Development Core Team: 2008, *R: A Language and Environment for Statistical Computing*, R Foundation for Statistical Computing, Vienna, Austria. ISBN 3-900051-07-0.
URL: *http://www.R-project.org*

Table 1: Summary Statistics

This table presents summary statistics for total stock, as well as square-footage held and turned over by both private institutions (NCREIF Members) and REITs. The distributional statistics presented are for the entire panel of submarkets (interaction of CBSA and property type) and calendar quarters. *Net Square-Footage Turned Over* is defined as the absolute value of purchases minus sales.

	Mean	**Stand. Dev.**	**1st Quartile**	**Median**	**3rd Quartile**
Stock (1000s of sqf)	227,649	251,733	84,862	162,921	275,452
Square-Footage Held by Private Institutions (1000s of sqf)	6,609	7,683	2,127	4,009	7,919
Square-Footage Held by REITs (1000s of sqf)	4,600	6,299	945	2,425	5,155
Fraction of Space Held by Private Institutions	0.0402	0.0431	0.0132	0.0274	0.0529
Fraction of Space Held by REITs	0.0442	0.06	0.0072	0.0197	0.056
Net Square-Footage Turned Over by Private Institutions, in each Submarket-Quarter (1000s of sqf)	469.11	1,387.51	19.66	164.71	478.44
Net Square-Footage Turned Over by REITs, in each Submarket-Quarter (1000s of sqf)	363.38	878.56	8.54	76.26	334.99
Total Number of Submarkets: 198					

Table 2: Decile Returns Tests, Private Institutions, Quarterly Sorts

This table shows distributional statistics for the returns to the bottom-decile submarkets and top-decile submarkets, by holdings and trades, for private institutions (NCREIF members). Decile sorts are undertaken at the end of each quarter t, and returns are reported for one year going forward (quarters $t+1$ through $t+4$) two years (quarters $t+1$ through $t+8$), three years, and four years. The table then reports distributions across the entire panel of quarters and submarkets. Further, below each set of distributional statistics, we report a t-statistic testing the null that the means of the two distributions are the same against the two-sided alternative. Positive t-statistics indicate that the mean for the top decile returns is greater than that for the bottom. We also report a Kolmogorov-Smirnov test, testing the null that the two distributions are the same, against the alternative indicated by the point estimate of the difference of means. The *Positive Alternative* states that the CDF of the top-decile returns lies above that of the CDF for the bottom-decile returns, which means that the overall distribution of top decile returns is *less* than that of bottom decile returns. The *Negative Alternative* states the opposite.

Panel A: Private Institutions (NCREIF Members), Quarterly Fractional Holdings

	Mean	**Stand. Dev.**	**1st Quartile**	**Median**	**3rd Quartile**
One-Year Returns					
Bottom Decile	0.0804	0.1143	0.0373	0.0936	0.1453
Top Decile	0.0634	0.1327	−0.0121	0.0749	0.1445
t-test, $Top - Bot$	-2.94^{**}				
KS-test, Positive Altern.	0.12^{***}				
Two-Year Returns					
Bottom Decile	0.1857	0.1964	0.0877	0.2051	0.3141
Top Decile	0.1593	0.2345	0.0026	0.1559	0.3007
t-test, $Top - Bot$	-2.49^{*}				
KS-test, Positive Altern.	0.15^{***}				
Three-Year Returns					
Bottom Decile	0.322	0.264	0.1653	0.3281	0.5163
Top Decile	0.2749	0.3129	0.0633	0.2453	0.4694
t-test, $Top - Bot$	-3.17^{**}				
KS-test, Positive Altern.	0.17^{***}				
Four-Year Returns					
Bottom Decile	0.4757	0.326	0.2604	0.4859	0.7262
Top Decile	0.395	0.3884	0.1463	0.3497	0.6048
t-test, $Top - Bot$	-4.16^{***}				
KS-test, Positive Altern.	0.18^{***}				

$^{***}: p < .001$, $^{**}: p < .01$, $^{*}: p < .05$, $^{\circ}: p < .1$.

Panel B: Private Institutions (NCREIF Members), Quarterly Trades

	Mean	**Stand. Dev.**	**1st Quartile**	**Median**	**3rd Quartile**
One-Year Returns					
Bottom Decile	0.0682	0.1222	0.0044	0.0836	0.1418
Top Decile	0.0743	0.1229	0.0191	0.0884	0.1492
t-test, $Top - Bot$	1.06				
KS-test, Negative Altern.	0.04				
Two-Year Returns					
Bottom Decile	0.1635	0.2134	0.0273	0.1761	0.3015
Top Decile	0.1779	0.2189	0.0541	0.1957	0.3222
t-test, $Top - Bot$	1.35				
KS-test, Negative Altern.	0.06°				
Three-Year Returns					
Bottom Decile	0.2845	0.2829	0.0875	0.2885	0.4699
Top Decile	0.3035	0.2948	0.0883	0.305	0.5064
t-test, $Top - Bot$	1.28				
KS-test, Negative Altern.	0.05				
Four-Year Returns					
Bottom Decile	0.4177	0.348	0.1635	0.4229	0.6504
Top Decile	0.438	0.3621	0.1754	0.4249	0.6639
t-test, $Top - Bot$	1.06				
KS-test, Negative Altern.	0.05				

$^{***}: p < .001$, $^{**}: p < .01$, $^{*}: p < .05$, $^{\circ}: p < .1$.

Table 3: Decile Returns Tests, REITs, Quarterly Sorts

This table shows distributional statistics for the returns to the bottom-decile submarkets and top-decile submarkets, by holdings and trades, for REITs. Decile sorts are undertaken at the end of each quarter t, and returns are reported for one year going forward (quarters $t+1$ through $t+4$) or two years (quarters $t+1$ through $t+8$), three years, and four years. The table then reports distributions across the entire panel of quarters and submarkets. Further, below each set of distributional statistics, we report a t-statistic testing the null that the means of the two distributions are the same against the two-sided alternative. Positive t-statistics indicate that the mean for the top decile returns is greater than that for the bottom. We also report a Kolmogorov-Smirnov test, testing the null that the two distributions are the same, against the alternative indicated by the point estimate of the difference of means. The *Positive Alternative* states that the CDF of the top-decile returns lies above that of the CDF for the bottom-decile returns, which means that the overall distribution of top decile returns is *less* than that of bottom decile returns. The *Negative Alternative* states the opposite.

Panel A: REITs, Quarterly Fractional Holdings

	Mean	Stand. Dev.	1st Quartile	Median	3rd Quartile
One-Year Returns					
Bottom Decile	0.1057	0.12	0.065	0.1223	0.1782
Top Decile	0.1004	0.1259	0.047	0.1149	0.173
t-test, $Top - Bot$	-0.63				
KS-test, Positive Altern.	0.09^{*}				
Two-Year Returns					
Bottom Decile	0.2293	0.2223	0.1344	0.2754	0.3674
Top Decile	0.2174	0.2286	0.09	0.2473	0.377
t-test, $Top - Bot$	-0.75				
KS-test, Positive Altern.	0.09^{*}				
Three-Year Returns					
Bottom Decile	0.3879	0.2925	0.2188	0.4408	0.5639
Top Decile	0.3618	0.301	0.1367	0.3709	0.5784
t-test, $Top - Bot$	-1.18				
KS-test, Positive Altern.	0.11^{**}				
Four-Year Returns					
Bottom Decile	0.5531	0.3512	0.3217	0.564	0.7402
Top Decile	0.4942	0.3603	0.2033	0.4534	0.7352
t-test, $Top - Bot$	-2.09^{*}				
KS-test, Positive Altern.	0.16^{***}				

$^{***}: p < .001$, $^{**}: p < .01$, $^{*}: p < .05$, $^{\circ}: p < .1$.

Panel B: REITs, Quarterly Trades

	Mean	Stand. Dev.	1st Quartile	Median	3rd Quartile
One-Year Returns					
Bottom Decile	0.0899	0.1147	0.0498	0.1021	0.1513
Top Decile	0.0918	0.1207	0.0465	0.1021	0.156
t-test, $Top - Bot$	0.24				
KS-test, Negative Altern.	0.04				
Two-Year Returns					
Bottom Decile	0.1885	0.1999	0.0907	0.2124	0.3049
Top Decile	0.2013	0.2115	0.0947	0.2182	0.337
t-test, $Top - Bot$	0.87				
KS-test, Negative Altern.	0.08				
Three-Year Returns					
Bottom Decile	0.3097	0.2635	0.1529	0.3084	0.4634
Top Decile	0.344	0.2769	0.1455	0.3431	0.5044
t-test, $Top - Bot$	1.69°				
KS-test, Negative Altern.	0.08				
Four-Year Returns					
Bottom Decile	0.4357	0.3094	0.2451	0.417	0.5942
Top Decile	0.4844	0.3367	0.225	0.4381	0.6911
t-test, $Top - Bot$	1.89°				
KS-test, Negative Altern.	0.08				

$^{***}: p < .001$, $^{**}: p < .01$, $^{*}: p < .05$, $^{\circ}: p < .1$.

Table 4: Decile Returns Tests, Private Institutions, One-Year Sorts

This table shows distributional statistics for the returns to the bottom-decile submarkets and top-decile submarkets, by holdings and trades, for private institutions (NCREIF members). Decile sorts are undertaken at the end of each quarter t, in this case for the preceding year (quarters $t-3$ through t). For fractional holdings, we sort on the one-year moving average, while for trades we sort on the one-year moving sum. Returns are reported for one year going forward (quarters $t+1$ through $t+4$) or two years (quarters $t+1$ through $t+8$), three years, and four years. The table then reports distributions across the entire panel of quarters and submarkets. Further, below each set of distributional statistics, we report a t-statistic testing the null that the means of the two distributions are the same against the two-sided alternative. Positive t-statistics indicate that the mean for the top decile returns is greater than that for the bottom. We also report a Kolmogorov-Smirnov test, testing the null that the two distributions are the same, against the alternative indicated by the point estimate of the difference of means. The *Positive Alternative* states that the CDF of the top-decile returns lies above that of the CDF for the bottom-decile returns, which means that the overall distribution of top decile returns is *less* than that of bottom decile returns. The *Negative Alternative* states the opposite.

Panel A: Private Institutions (NCREIF Members), Annual Fractional Holdings

	Mean	**Stand. Dev.**	**1st Quartile**	**Median**	**3rd Quartile**
One-Year Returns					
Bottom Decile	0.0764	0.1121	0.0308	0.0944	0.1426
Top Decile	0.0626	0.1347	−0.0135	0.0711	0.1421
t-test, $Top - Bot$	-2.29^{*}				
KS-test, Positive Altern.	0.12^{***}				
Two-Year Returns					
Bottom Decile	0.1821	0.1962	0.079	0.2059	0.3113
Top Decile	0.1556	0.2346	$-5e-04$	0.1558	0.2973
t-test, $Top - Bot$	-2.41^{*}				
KS-test, Positive Altern.	0.16^{***}				
Three-Year Returns					
Bottom Decile	0.3192	0.2614	0.1604	0.3338	0.5108
Top Decile	0.271	0.3114	0.0649	0.254	0.453
t-test, $Top - Bot$	-3.14^{**}				
KS-test, Positive Altern.	0.17^{***}				
Four-Year Returns					
Bottom Decile	0.4774	0.3146	0.2715	0.5015	0.7247
Top Decile	0.3953	0.3825	0.1555	0.3562	0.6036
t-test, $Top - Bot$	-4.17^{***}				
KS-test, Positive Altern.	0.19^{***}				

$^{***}: p < .001$, $^{**}: p < .01$, $^{*}: p < .05$, $^{\circ}: p < .1$.

Panel B: Private Institutions (NCREIF Members), Annual Trades

	Mean	Stand. Dev.	1st Quartile	Median	3rd Quartile
One-Year Returns					
Bottom Decile	0.066	0.1242	0.0054	0.0801	0.139
Top Decile	0.068	0.1211	0.0067	0.0882	0.1445
t-test, $Top - Bot$	0.33				
KS-test, Negative Altern.	0.06°				
Two-Year Returns					
Bottom Decile	0.1663	0.2228	0.0271	0.1799	0.3061
Top Decile	0.1678	0.2141	0.0327	0.1891	0.3086
t-test, $Top - Bot$	0.13				
KS-test, Negative Altern.	0.03				
Three-Year Returns					
Bottom Decile	0.2931	0.2855	0.094	0.3139	0.4755
Top Decile	0.2928	0.2957	0.0767	0.2833	0.4957
t-test, $Top - Bot$	−0.02				
KS-test, Negative Altern.	0.04				
Four-Year Returns					
Bottom Decile	0.44	0.3458	0.1853	0.4515	0.6704
Top Decile	0.429	0.3623	0.1728	0.3961	0.6549
t-test, $Top - Bot$	−0.55				
KS-test, Negative Altern.	0.04				

$^{***}: p < .001$, $^{**}: p < .01$, $^{*}: p < .05$, $^{\circ}: p < .1$.

Table 5: Decile Returns Tests, REITs, One-Year Sorts

This table shows distributional statistics for the returns to the bottom-decile submarkets and top-decile submarkets, by holdings and trades, for REITs. Decile sorts are undertaken at the end of each quarter t, in this case for the preceding year (quarters $t-3$ through t). For fractional holdings, we sort on the one-year moving average, while for trades we sort on the one-year moving sum. Returns are reported for one year going forward (quarters $t+1$ through $t+4$) or two years (quarters $t+1$ through $t+8$), three years, and four years. The table then reports distributions across the entire panel of quarters and submarkets. Further, below each set of distributional statistics, we report a t-statistic testing the null that the means of the two distributions are the same against the two-sided alternative. Positive t-statistics indicate that the mean for the top decile returns is greater than that for the bottom. We also report a Kolmogorov-Smirnov test, testing the null that the two distributions are the same, against the alternative indicated by the point estimate of the difference of means. The *Positive Alternative* states that the CDF of the top-decile returns lies above that of the CDF for the bottom-decile returns, which means that the overall distribution of top decile returns is *less* than that of bottom decile returns. The *Negative Alternative* states the opposite.

Panel A: REITs, Annual Fractional Holdings

	Mean	**Stand. Dev.**	**1st Quartile**	**Median**	**3rd Quartile**
One-Year Returns					
Bottom Decile	0.1009	0.1232	0.0563	0.1251	0.1797
Top Decile	0.0946	0.1282	0.0418	0.1106	0.1715
t-test, $Top - Bot$	-0.71				
KS-test, Positive Altern.	0.08°				
Two-Year Returns					
Bottom Decile	0.2191	0.2293	0.1134	0.2689	0.3663
Top Decile	0.2013	0.2318	0.0668	0.2369	0.3547
t-test, $Top - Bot$	-1.05				
KS-test, Positive Altern.	0.09°				
Three-Year Returns					
Bottom Decile	0.373	0.2951	0.2003	0.3988	0.5542
Top Decile	0.3336	0.2922	0.1161	0.351	0.5173
t-test, $Top - Bot$	-1.72°				
KS-test, Positive Altern.	0.12^{**}				
Four-Year Returns					
Bottom Decile	0.5397	0.3636	0.315	0.5261	0.7356
Top Decile	0.4638	0.3415	0.1981	0.4126	0.6887
t-test, $Top - Bot$	-2.59^{**}				
KS-test, Positive Altern.	0.17^{***}				

$^{***}: p < .001$, $^{**}: p < .01$, $^{*}: p < .05$, $^{\circ}: p < .1$.

Panel B: REITs, Annual Trades

	Mean	Stand. Dev.	1st Quartile	Median	3rd Quartile
One-Year Returns					
Bottom Decile	0.0803	0.1133	0.0362	0.0968	0.1435
Top Decile	0.0905	0.1243	0.0516	0.098	0.1623
t-test, $Top - Bot$	1.2				
KS-test, Negative Altern.	0.08°				
Two-Year Returns					
Bottom Decile	0.1657	0.2053	0.0702	0.1883	0.2957
Top Decile	0.2021	0.2235	0.0882	0.2236	0.3549
t-test, $Top - Bot$	2.29^{*}				
KS-test, Negative Altern.	0.14^{**}				
Three-Year Returns					
Bottom Decile	0.274	0.2642	0.1284	0.2714	0.4375
Top Decile	0.3463	0.286	0.1262	0.3449	0.5314
t-test, $Top - Bot$	3.34^{***}				
KS-test, Positive Altern.	0.15^{***}				
Four-Year Returns					
Bottom Decile	0.4068	0.3111	0.1829	0.3806	0.5965
Top Decile	0.4873	0.3401	0.2045	0.4717	0.7313
t-test, $Top - Bot$	2.94^{**}				
KS-test, Positive Altern.	0.12^{*}				

$^{***}: p < .001$, $^{**}: p < .01$, $^{*}: p < .05$, $^{\circ}: p < .1$.

Table 6: Decile Returns Tests, Private Institutions, by Property Type, One-Year Sorts, Two-Year Returns

This table shows distributional statistics for the returns to the bottom-decile submarkets and top-decile submarkets, by holdings and trades, for private institutions (NCREIF members), subdivided by property type. Decile sorts are undertaken at the end of each quarter t, for the preceding year (quarters $t-3$ through t). For fractional holdings, we sort on the one-year moving average, while for trades we sort on the one-year moving sum. Returns are reported two years going forward (quarters $t+1$ through $t+8$). The table then reports distributions across the entire panel of quarters and submarkets. Further, below each set of distributional statistics, we report a t-statistic testing the null that the means of the two distributions are the same against the two-sided alternative. Positive t-statistics indicate that the mean for the top decile returns is greater than that for the bottom. We also report a Kolmogorov-Smirnov test, testing the null that the two distributions are the same, against the alternative indicated by the point estimate of the difference of means. The *Positive Alternative* states that the CDF of the top-decile returns lies above that of the CDF for the bottom-decile returns, which means that the overall distribution of top decile returns is *less* than that of bottom decile returns. The *Negative Alternative* states the opposite.

Panel A: Private Institutions (NCREIF Members), Annual Fractional Holdings, Two-Year Returns

	Mean	**Stand. Dev.**	**1st Quartile**	**Median**	**3rd Quartile**
Apartment					
Bottom Decile	0.2129	0.1971	0.1409	0.2616	0.3419
Top Decile	0.1755	0.1996	0.0631	0.1859	0.2728
t-test, $Top - Bot$	-1.95°				
KS-test, Positive Altern.	0.24^{***}				
Hotel					
Bottom Decile	0.1583	0.3648	−0.2	0.22	0.4293
Top Decile	0.3064	0.3339	−0.0457	0.3757	0.6226
t-test, $Top - Bot$	1.2				
KS-test, Negative Altern.	0.31				
Industrial					
Bottom Decile	0.1894	0.2011	0.0915	0.196	0.3023
Top Decile	0.1777	0.2011	0.0769	0.1961	0.2752
t-test, $Top - Bot$	−0.7				
KS-test, Positive Altern.	0.1^{*}				
Office					
Bottom Decile	0.1846	0.2103	0.0443	0.2171	0.3156
Top Decile	0.1407	0.226	−0.0461	0.1703	0.3115
t-test, $Top - Bot$	-2.34^{*}				
KS-test, Positive Altern.	0.14^{**}				
Retail					
Bottom Decile	0.0661	0.2015	−0.113	0.0409	0.2645
Top Decile	0.0741	0.2286	−0.1158	0.0803	0.2947
t-test, $Top - Bot$	0.2				
KS-test, Negative Altern.	0.12				

$^{***}: p < .001$, $^{**}: p < .01$, $^{*}: p < .05$, $^{\circ}: p < .1$.

Panel B: Private Institutions (NCREIF Members), Annual Trades, Two-Year Returns

	Mean	Stand. Dev.	1st Quartile	Median	3rd Quartile
Apartment					
Bottom Decile	0.177	0.1956	0.0889	0.1967	0.2681
Top Decile	0.1787	0.1852	0.0839	0.2043	0.2974
t-test, $Top - Bot$	0.09				
KS-test, Negative Altern.	0.04				
Hotel					
Bottom Decile	0.2407	0.3616	−0.1137	0.3357	0.555
Top Decile	0.1952	0.3901	−0.1284	0.2164	0.5917
t-test, $Top - Bot$	−0.34				
KS-test, Positive Altern.	0.19				
Industrial					
Bottom Decile	0.1895	0.1881	0.0804	0.2126	0.3037
Top Decile	0.1793	0.1805	0.0845	0.2079	0.2946
t-test, $Top - Bot$	−0.67				
KS-test, Positive Altern.	0.09				
Office					
Bottom Decile	0.1508	0.2228	0.0028	0.1618	0.305
Top Decile	0.1615	0.2253	0.0021	0.1773	0.2999
t-test, $Top - Bot$	0.55				
KS-test, Negative Altern.	0.05				
Retail					
Bottom Decile	0.0422	0.2072	−0.0951	−0.0516	0.2653
Top Decile	0.0485	0.212	−0.1673	0.0803	0.2419
t-test, $Top - Bot$	0.15				
KS-test, Negative Altern.	0.15				

$^{***}: p < .001$, $^{**}: p < .01$, $^{*}: p < .05$, $^{\circ}: p < .1$.

Table 7: Decile Returns Tests, REITs, by Property Type, One-Year Sorts, Two-Year Returns

This table shows distributional statistics for the returns to the bottom-decile submarkets and top-decile submarkets, by holdings and trades, for REITs, subdivided by property type. Decile sorts are undertaken at the end of each quarter t, for the preceding year (quarters $t-3$ through t). For fractional holdings, we sort on the one-year moving average, while for trades we sort on the one-year moving sum. Returns are reported two years going forward (quarters $t+1$ through $t+8$). The table then reports distributions across the entire panel of quarters and submarkets. Further, below each set of distributional statistics, we report a t-statistic testing the null that the means of the two distributions are the same against the two-sided alternative. Positive t-statistics indicate that the mean for the top decile returns is greater than that for the bottom. We also report a Kolmogorov-Smirnov test, testing the null that the two distributions are the same, against the alternative indicated by the point estimate of the difference of means. The *Positive Alternative* states that the CDF of the top-decile returns lies above that of the CDF for the bottom-decile returns, which means that the overall distribution of top decile returns is *less* than that of bottom decile returns. The *Negative Alternative* states the opposite.

Panel A: REITs, Annual Fractional Holdings, Two-Year Returns

	Mean	**Stand. Dev.**	**1st Quartile**	**Median**	**3rd Quartile**
Apartment					
Bottom Decile	0.2574	0.2113	0.2593	0.3272	0.3793
Top Decile	0.2041	0.1797	0.106	0.2249	0.2692
t-test, $Top - Bot$	-2.12^{*}				
KS-test, Positive Altern.	0.52^{***}				
Industrial					
Bottom Decile	0.2057	0.1843	0.1323	0.2329	0.3223
Top Decile	0.177	0.1679	0.1255	0.1915	0.2779
t-test, $Top - Bot$	-1.39				
KS-test, Positive Altern.	0.2^{**}				
Office					
Bottom Decile	0.1741	0.193	0.1105	0.1906	0.2877
Top Decile	0.2115	0.2498	0.0124	0.2769	0.4208
t-test, $Top - Bot$	1.42				
KS-test, Negative Altern.	0.24^{***}				
Retail					
Bottom Decile	0.0853	0.2028	-0.124	0.1163	0.2715
Top Decile	0.0624	0.2242	-0.1315	0.0032	0.3006
t-test, $Top - Bot$	-0.47				
KS-test, Positive Altern.	0.18				

$^{***}: p < .001$, $^{**}: p < .01$, $^{*}: p < .05$, $^{\circ}: p < .1$.

Panel B: Private Institutions (NCREIF Members), Annual Trades, Two-Year Returns

	Mean	Stand. Dev.	1st Quartile	Median	3rd Quartile
Apartment					
Bottom Decile	0.2091	0.2029	0.1305	0.2072	0.282
Top Decile	0.1689	0.1668	0.1252	0.1962	0.2585
t-test, $Top - Bot$	-1.68°				
KS-test, Positive Altern.	0.11				
Industrial					
Bottom Decile	0.1894	0.1576	0.1361	0.2121	0.2887
Top Decile	0.1809	0.1884	0.1038	0.1931	0.3121
t-test, $Top - Bot$	-0.41				
KS-test, Positive Altern.	0.14°				
Office					
Bottom Decile	0.1513	0.2108	0.0635	0.1754	0.2843
Top Decile	0.2257	0.2423	0.0893	0.2298	0.4113
t-test, $Top - Bot$	2.76^{**}				
KS-test, Negative Altern.	0.25^{***}				
Retail					
Bottom Decile	0.0357	0.2228	-0.1871	-0.0344	0.2768
Top Decile	0.0441	0.2111	-0.1288	0.0505	0.2207
t-test, $Top - Bot$	0.16				
KS-test, Negative Altern.	0.17				

$^{***}: p < .001$, $^{**}: p < .01$, $^{*}: p < .05$, $^{\circ}: p < .1$.

Table 8: Decile Returns Tests, Private Institutions, One-Year Sorts, from 1995

This table shows distributional statistics for the returns to the bottom-decile submarkets and top-decile submarkets, by holdings and trades, for private institutions (NCREIF members), starting at Q1, 1995 (the start of the REIT sample). Decile sorts are undertaken at the end of each quarter t, in this case for the preceding year (quarters $t-3$ through t). For fractional holdings, we sort on the one-year moving average, while for trades we sort on the one-year moving sum. Returns are reported for one year going forward (quarters $t+1$ through $t+4$) or two years (quarters $t+1$ through $t+8$), three years, and four years. The table then reports distributions across the entire panel of quarters and submarkets. Further, below each set of distributional statistics, we report a t-statistic testing the null that the means of the two distributions are the same against the two-sided alternative. Positive t-statistics indicate that the mean for the top decile returns is greater than that for the bottom. We also report a Kolmogorov-Smirnov test, testing the null that the two distributions are the same, against the alternative indicated by the point estimate of the difference of means. The *Positive Alternative* states that the CDF of the top-decile returns lies above that of the CDF for the bottom-decile returns, which means that the overall distribution of top decile returns is *less* than that of bottom decile returns. The *Negative Alternative* states the opposite.

Panel A: Private Institutions (NCREIF Members), Annual Fractional Holdings, from 1995

	Mean	Stand. Dev.	1st Quartile	Median	3rd Quartile
One-Year Returns					
Bottom Decile	0.0857	0.1146	0.0535	0.1045	0.1501
Top Decile	0.077	0.1371	0.0225	0.0874	0.152
t-test, $Top - Bot$	-1.29				
KS-test, Positive Altern.	0.12^{***}				
Two-Year Returns					
Bottom Decile	0.2035	0.1989	0.1302	0.2242	0.3267
Top Decile	0.1905	0.2326	0.0696	0.193	0.3302
t-test, $Top - Bot$	-1.07				
KS-test, Positive Altern.	0.16^{***}				
Three-Year Returns					
Bottom Decile	0.3543	0.259	0.2255	0.3745	0.5516
Top Decile	0.3259	0.2956	0.1344	0.2994	0.4881
t-test, $Top - Bot$	-1.73°				
KS-test, Positive Altern.	0.16^{***}				
Four-Year Returns					
Bottom Decile	0.5208	0.3049	0.3403	0.5384	0.7509
Top Decile	0.4589	0.3473	0.2126	0.3902	0.6569
t-test, $Top - Bot$	-3^{**}				
KS-test, Positive Altern.	0.21^{***}				

$^{***}: p < .001$, $^{**}: p < .01$, $^{*}: p < .05$, $^{\circ}: p < .1$.

Panel B: Private Institutions (NCREIF Members), Annual Trades, from 1995

	Mean	**Stand. Dev.**	**1st Quartile**	**Median**	**3rd Quartile**
One-Year Returns					
Bottom Decile	0.0761	0.1274	0.0256	0.09	0.1523
Top Decile	0.0797	0.122	0.0374	0.0988	0.1501
t-test, $Top - Bot$	0.55				
KS-test, Negative Altern.	0.06°				
Two-Year Returns					
Bottom Decile	0.1923	0.2241	0.0747	0.2177	0.3314
Top Decile	0.1954	0.2113	0.0864	0.217	0.3306
t-test, $Top - Bot$	0.26				
KS-test, Negative Altern.	0.05				
Three-Year Returns					
Bottom Decile	0.3323	0.2767	0.1479	0.3508	0.5062
Top Decile	0.3408	0.283	0.1476	0.3258	0.5307
t-test, $Top - Bot$	0.51				
KS-test, Negative Altern.	0.05				
Four-Year Returns					
Bottom Decile	0.4848	0.3193	0.2479	0.4864	0.7045
Top Decile	0.4921	0.3428	0.2331	0.447	0.7015
t-test, $Top - Bot$	0.34				
KS-test, Negative Altern.	0.05				

$^{***}: p < .001$, $^{**}: p < .01$, $^{*}: p < .05$, $^{\circ}: p < .1$.

Table 9: Regression Results for Stock-Trade Relationships

Dependent variable: $trade_{t,t+1}$. This table shows regression results, testing whether trades are associated with stock availability or future high returns. The dependent variable is trade for the year starting t and ending $t+1$, while the independent variables are stock growth the previous year ($t-1$ to t) and two-year returns, starting the year after the trade (from $t+1$ to $t+3$).

Panel A: Private Institutions (NCREIF Members)

	Coefficient	**t-statistic**
$(Intercept)$	0.0022	8.64^{***}
$2.yr.return_{t+1,t+3}$	-0.0008	-0.95
$stock.growth_{t-1,t}$	0.0134	2.74^{**}
N	6465	
$\overline{R^2}$	0.001	
F	4.528	

Panel B: REITs

	Coefficient	**t-statistic**
$(Intercept)$	-0.0110	-11.36^{***}
$2.yr.return_{t+1,t+3}$	0.0411	16.01^{***}
$stock.growth_{t-1,t}$	0.0304	1.28
N	2992	
$\overline{R^2}$	0.078	
F	128.122	

$^{***}: p < .001$, $^{**}: p < .01$, $^{*}: p < .05$, $^{\circ}: p < .1$.