

Hedge Funds and the US Real Estate Bubble: Evidence from NYSE Real Estate Companies

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The recent US Real Estate Bubble had consequences not only for the real economy but for the stock market as well. Real Estate Investment Trusts' (REITs) prices reached levels which could not be supported by their fundamentals until mid-2007. Using this observation as a starting point we assume that hedge fund managers are rational investors and we examine their holdings behavior in the REITs sector of the NYSE. Our working assumption is based on the DeLong et al [12] and Abreu & Brunnermeier [1] argument that rational investors under certain conditions may not always short a bubble but instead ride it so as to gain from the price rise. Using data on hedge fund managers holdings from the 13f Filing Database provided by Thomson Financial we find that hedge funds were overloaded with REITs stocks prior to the price peak of the sector but their positions were placed in such a way that they gained from this strategy. Moreover, non-specialized hedge fund managers outperformed specialized ones.

JEL Classification: G14, G15, G18

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The recent US Real Estate Bubble had consequences not only for the real economy but for the stock market as well. Real Estate Investment Trusts' (REITs) prices reached levels which could not be supported by their fundamentals until mid-2007. Using this observation as a starting point we assume that hedge fund managers are rational investors and we examine their holdings behavior in the REITs sector of the NYSE. Our working assumption is based on the DeLong et al [12] and Abreu & Brunnermeier [1] argument that rational investors under certain conditions may not always short a bubble but instead ride it so as to gain from the price rise. Using data on hedge fund managers holdings from the 13f Filing Database provided by Thomson Financial we find that hedge funds were overloaded with REITs stocks prior to the price peak of the sector but their positions were placed in such a way that they gained from this strategy. Moreover, non-specialized hedge fund managers outperformed specialized ones.

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Introduction

The recent US Real Estate Bubble had consequences not only for the real economy but for the stock market as well. Real Estate Investment Trusts' (REITs) prices reached levels which could not be supported by their fundamentals until mid-2007. Using this observation as a starting point we assume that hedge fund managers are rational investors and we examine their holdings behavior in the REITs sector of the NYSE. Our working assumption is based on the DeLong et al [12] and Abreu & Brunnermeier [1] argument that rational investors under certain conditions may not always short a bubble but instead ride it so as to gain from the price rise.

We use a sample of 111 NYSE traded REITs and analyze the behavior of the hedge fund managers holdings. The REITs' PE ratios – for the 2002–2007 sample period – reached levels that could not be supported by their fundamentals and thus strongly pointing to a bubble episode. We obtain hedge fund managers' holdings from the 13f Filing database. In our empirical analysis, we examine if hedge fund managers were overloaded with REITs holdings for the sample period and if they were timing their REITs trades properly to profit from the peak of the bubble. Our purpose is not to

draw any conclusion about the hedge fund industry in general. Our REITs sample and the sample hedge fund managers are too small for such a venture. Instead we consider that our approach is fruitful because it adds another piece to the puzzle of the behavior of rational investors in bubble environments. Moreover it is interesting by itself to examine if such a behavior can happen again after a similar event in the REITs market that took place back in 70s and after the Abreu & Brunnermeier [1] and Brunnermeier & Nagel [7] papers that highlighted the behavior of rational investors in bubble episodes. Nevertheless, our results are supportive of the case that hedge funds were acting as rational investors in the DeLong et al [12] and Abreu & Brunnermeier [1] sense. They ride the bubble as long as it was rising and this behavior was profitable.

In the reminder of the paper, Section 1 provides a review of the literature, Section 2 gives a short description of the real estate bubble and identify the segment of real estate stocks to be examined. Section 3 presents the sample more formally and gives details on the use of the 13f holding data and the construction of the list of hedge funds that will be used in what follows. Moreover it gives a summary statistics for the stock holdings of these hedge funds and presents the hypotheses to be tested. Section 4 and Section 5 provide the empirical analysis of the paper. A brief conclusion ends the paper.

1 Literature Review

It is interesting that back in the '70s the REITs sector was again in the center of a bubble episode. Institutional investors played a significant role in creating the bubble and also made profits from it as it is pointed out by Soros [24]. This event does not necessary preclude a bubble from happening again and in addition places the REITs market in a series of markets that experienced bubble episodes in the last centuries. Kindleberger & Aliber [17] analyze such a series of bubbles. The first bubble episode occurred in the 17th century Netherlands (the Tulip Bulb Bubble, 1636), the second and third occurred in France and England in the 18th century (the Mississippi and South Sea Bubbles respectively) and so on until the 1920s US stock price bubble and more recently the 2000 DotCom bubble. Even though it is old, a quote from Adam Smith can describe the investors behavior during such an episode. *...the conduct of almost all the unfortunate...have arisen from their not knowing when they were well, when it was proper for them to sit still and be contented.*

Despite the evidence from the financial history the Efficient Markets Hypothesis does not cope well with the occurrence of bubbles. A fully rational¹ investor will anticipate a bubble and so she will play against it. In such a way under symmetric

¹Rationality here is perceived as choosing in accordance with a preference ordering that is complete and transitive subject to perfect and costless acquired information (Blaug [2]). Brunnermeier([3], [4]) provides an excellent review on bubbles.

information and finite time a bubble cannot take place. Using the fact that after the end of the game the price will be zero and backwards induction we can prove that the price of the asset today is just the sum of the discounted dividends. Under infinite time the imposition of the transversality condition precludes a bubble from occurring. These two results are enough for the standard rational result on the no existence of bubbles. Nevertheless, this view contradicts with financial history and reality - the real estate bubble is still unfolding.

The question that arises here is if there is an alternative approach in analyzing the behavior of investors around bubble episodes. An answer exists and has two main branches. Both are more or less related with behavioral finance. Under the first branch Adam Smith's *great unfortunate* can not anticipate where she is well enough so as to exit from the market. This is due mainly to behavioral biases and learning problems. But despite these problems, rational investors cannot profit from irrational ones and drive the latter out of the market ². It may be the case that certain aspects of rational investors behavior will prevent them from playing against the bubble. So irrational investors will ride the bubble, rationals will play along, the bubble will rise, burst and so on. Under DeLong et al. [12] rational and irrational traders coexist in the market. The former are risk averse and this prevents them from playing against the bubble. So they push the price up as good news are announced so as to cause more buying from the irrational – feedback traders ³. Rational investors risk aversion prevents them from playing against the bubble. The main result of such a behavior is profits for the rational traders that come from the expropriation of the feedback traders.

The second branch of the literature – even though strongly related with the first – gives more active role to rational investors. In Abreu & Brunnermeier [1] rational investors anticipate that a bubble exists exogenously in the market. The causes of the bubble are not central in the analysis anymore. It might be attributed to irrational investors, overconfidence, feedback traders, etc. The focus is on the behavior of rational investors. These are small in the competitive sense (i.e. each of them alone cannot play effectively against the bubble) and they enter the market sequentially. So at each moment only a fraction of them enters the market. Until this fraction become enough large so as to form the critical mass that will burst the bubble rational investors will never play against it.

Abreu & Brunnermeier's [1] work is not based on risk aversion that prevents rational investors to short the bubble like in the DeLong et al [11] and DeLong et al [12] papers. Rational investors' risk neutrality permits them to short the bubble but they do not have enough power to be effective against it because they are competitive and they face synchronization risk. As long as a mass of them is formed, everything goes

²M. Friedman [14] pointed out that rational investors will drive the irrational traders out of the market.

³Feedback traders are those that buy when prices rise and sell when prices fall (DeLong et al. [12])

back to a Friedman's [14] world where rational investors stabilize prices by pushing out of the market the irrational ones. Both approaches above deviate from the standard rational approach. In the in between period – that starts from the point where rational investors anticipate the bubble and ends when the critical mass is formed to burst it – rational investors ride the bubble along with the irrational ones. This is due to their (rational) incentive to gain from the price rise that the bubble causes as long as they can not play against it. This causes the bubble to rise more. The behavior of the rational investors during the in between period will be the main objective of the paper.

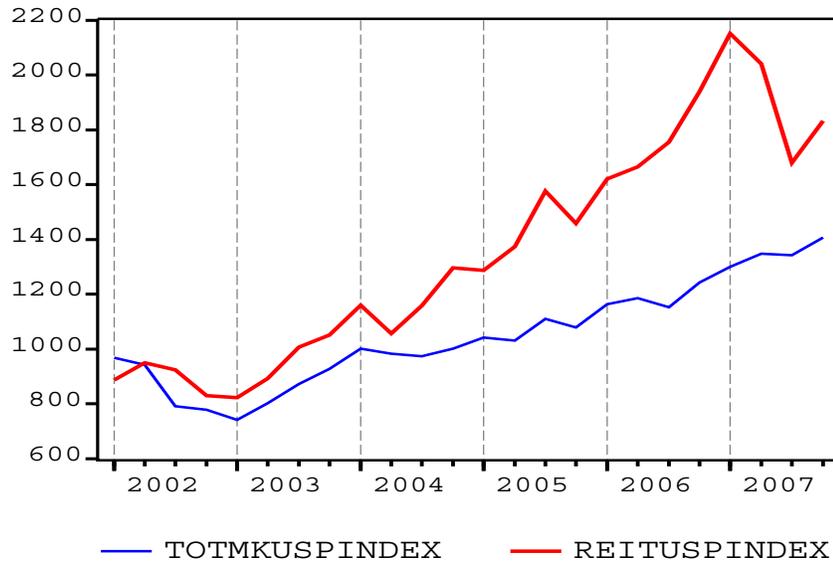
Empirical work on the subject is scant. Brunnermeier & Nagel [7] using 13f holdings for the 1998-2000 period identify a list of hedge funds and closely examine their behavior as the 2000 DotCom bubble unfolded. Their main result was that hedge funds managers placed their holdings in a way to profit from the bubble. The main drawback of their analysis was the absence of direct information in the short side of hedge funds managers holdings. As a result they view their approach not as the one that will give evidence against the rational approach to bubbles but rather as a clinical study of the behavior of a group of rational investors during the DotCom bubble.

The use of 13f filing database places our paper in a – short – line of papers that examine the behavior of institutional investors or sub categories of them. Gompers & Metrick [15] using 13f filing data to analyze institutional investors' demand for stocks find that the level of institutional ownership in a stock can help to forecast its future return. Sias [22] uses 13f filing data to examine herding among institutional investors. Herding is decomposed in two parts. The first consists of institutional investors that follow their own lagged trades while the second consists of institutional investors that follow each others trades. His results are in favor of the latter definition. More recently, Campbell et al. [8] use 13f filing data to extrapolate institutional investors daily stock holdings. According to their analysis institutional investor trades generate short term losses but longer term profits.

2 The US Real Estate Bubble and the NYSE Sample Stocks

In recent years (after 2002) there was a sharp rise in US Real Estate (RE) asset prices that led to what is today identified as the "US RE Bubble". Brunnermeier and Julliard(2007) provide a review of the literature on housing bubbles and an interesting explanation for their existence. To make a long story short, the movement of investment funds from the stock market to the real estate sector of the economy started just after the DotCom Bubble of 2000. The main factors that led to the latter were the historical low interest rates, the aversion of the stock market due to the DotCom bubble, the invention of new financial products that focused in real

Figure 1: Total US Market Index versus REITs Index



estate (for example mortgage backed loans, the creation of the Subprime market⁴). But all these did not leave the stock market unaffected. From 2002 onwards funds were directed to firms that were directly or indirectly related with the real estate market. In order to observe the behavior of real estate stocks we use a sample of 111 Real Estate Investment Trusts⁵ traded in the NYSE for the period 2001:Q1 to 2007:Q4⁶. The choice of the specific market segment was made not only in terms of their price behavior but also because these stocks are the closest substitute for real estate in the stock market⁷. Figure 1.1 below presents the total US market index and compares it with a weighted (by market value) index of the 111 REITs (RE stocks from now on) of our sample. Indexes data and stock prices data were obtained from Thomson's Financial DataStream.

Observe that from 2002 onwards there was an appreciation in REITs that accelerated by the end of 2005, reached a peak in 2007:Q1 and moved downwards thereafter.

Figure 1.2 shows the P/E ratio for RE stocks from the first quarter of 2002 to the first quarter of 2008 and again compares it with the respective P/E ratio of an

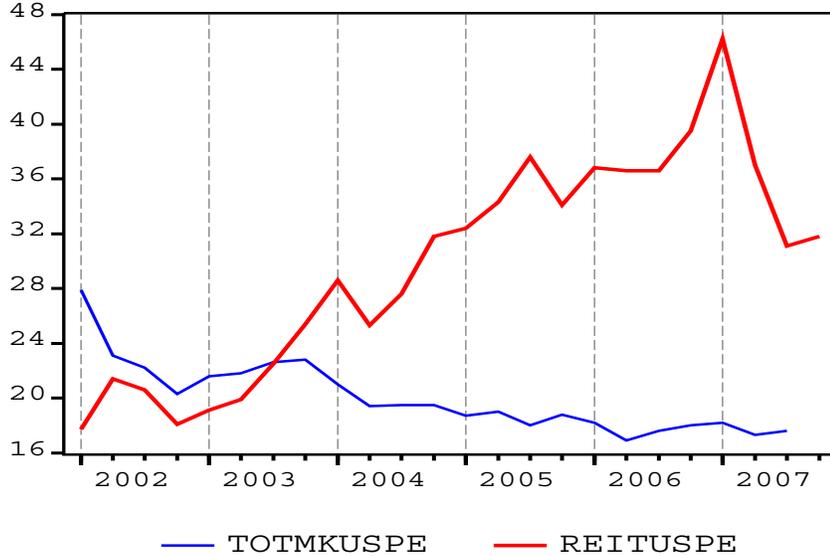
⁴Gorton [16] provides an excellent review of the Subprime markets and the respective panic etc.

⁵For more details on the sample selection process as well as the names of the REITs and their summary statistics refer to Appendix.

⁶The website <http://www.nareit.com/about/2007FAQ.pdf> provides a detailed description of the nature of a REIT, the size of the REITs industry etc.

⁷The analysis was performed using other RE stocks (for example construction firms and firms related directly or indirectly with real estate). Nevertheless results were similar.

Figure 2: Total US Market Index Price Earnings Ratio versus REITs Index Price Earnings Ratio



index that includes all the US traded stocks. P/E ratios for the RE stocks more than doubled from 2002 to the end of 2006 but all this gains vanished from from mid 2007. Clearly there is an argument here for an extreme mispricing in the RE sector. This mispricing becomes more evident if we compare the P/E ratio of the RE sector with the P/E ratio of the total US market. The latter almost lost half of its value during the specific period.

So as to have a better view on the mispricing we follow Ofek & Richardson [20] that build on Modigliani & Miller's [18] seminal paper. Their approach is based on the relation of the P/E ratio of a firm that has supernormal profits (r^*) for a number of T periods and for a fraction κ of earnings invested in the supernormal project and the P/E ratio of the firm for the period it reverts back to normal return and earnings. This relation is:

$$\left(\frac{P}{E}\right)^{Super\ Normal} = \left(\frac{1+r^*}{1+r}\right)^T \left(\frac{P}{E}\right)^{Normal} \quad (1)$$

with $\left(\frac{P}{E}\right)^{Super\ Normal}$, $\left(\frac{P}{E}\right)^{Normal}$ being the P/E ratios for the supernormal and normal periods respectively⁸. Table 1.1 below presents the relative supernormal returns needed so as to equate the P/E ratios at the peak of the bubble with various levels of historical P/E ratios.

⁸The derivation of the above formula is presented in the Appendix

Table 1: Required Supernormal Returns

Required Returns			
Historical P/E Ratios			
Years	15	20	25
5	0.25	0.18	0.13
10	0.12	0.09	0.06
15	0.08	0.06	0.04

The table presents the required supernormal returns needed so as to equate the P/E ratios at the peak of the bubble with historical P/E ratios of 15, 20 and 25% respectively.

The supernormal returns are computed as a solution $\frac{1+r^*}{1+r} - 1$ of equation (1.1) above (*i.e.* $(\frac{P}{E})^{Super\ Normal} = (\frac{1+r^*}{1+r})^T (\frac{P}{E})^{Normal}$)

Even though the relative supernormal returns needed do not seem quite high one has to observe that one of the basic assumptions of equation (1) above is that all earnings are retained within the firm. But by definition REITs pay as dividends more than 95% of their earnings each year. This supports the argument that the supernormal returns from Table 1.1 above cannot exist for a long time - giving a clear warning for the existence of a mispricing in the RE market.

Payne & Waters [21] examine the existence of rational bubbles in REITs market. Under a rational bubble environment an investor recognizes the overvaluation but rides the bubble because he is compensated with excess positive returns for the risk of a bubble collapsing. Their sample consists of the period 1972:Q1 – 2005:Q3. Their results are mixed. Even though they cannot detect periodically collapsing bubbles for the sub-period 1975-1994 they detect evidence of such bubbles for specific REITs categories and for the period 1994-2005.

3 The Sample and the Conjectures to be Tested

We obtained hedge funds stock holdings using the 13f filing data provided by Thomson Financial. It is worth spending some time here explaining the details of the 13f filing data. Under Section 13f of the Securities Exchange Act of 1934 every institutional investment manager with more than \$100 million under discretionary management are required to disclose their holdings in "Section 13(f) Securities". The latter include:

- Exchange traded quoted stocks (traded in NYSE, AMEX or NASDAQ)
- Equity options and warrants
- Shares of closed-end investment companies

- Certain convertible debt securities

Institutional investment managers now include banks, insurance companies, brokers/dealers, investment advisors who manage private accounts, mutual fund assets, pension plan assets and hedge fund assets. Only the long positions of a manager are included in his 13f filing and this is a drawback for the empirical analysis. There is no direct way for obtaining information on the short position of the manager.

The 13f filing data are crucial to our analysis of rational investors behavior because it is the sole source of information for the behavior of hedge funds. This is because the latter are not regulated by the Securities and Exchange Commission or any other similar institution. Beware that the 13f filings data are organized at the firm level. So a firm that operates more than one hedge funds will disclose the equity holdings of all the hedge funds it operates under its name. This is the reason we refer in hedge fund managers and not in hedge funds in what follows.

The process for selecting the hedge funds to be included in the analysis is as follows:

- We obtained the files with the 13f filings for each quarter of the sample period (2001:Q1-2007:Q4) for the sample 111 REITs. Each file contains the list of institutional investors (firm level) that hold the 111 REITs, their 13f categorization, the value of each investor's holdings in REITs, the number of REITs shares he owns, the number of securities held in his portfolio and the total value of his stock portfolio. For example in 2007:Q4, 1st Global Advisors Inc., an investment advisor with 15 securities in his portfolio which had total value of \$ 141.51 million, owned \$ 0.22 millions of the AMB Property Corp REIT (3,803 of AMB Property Group shares).
- From 2001:Q1 to 2001:Q4 we identified the Institutional investors categorized as "Hedge Funds" or "Hedge Funds / Investment Advisors" and filtered these results using information from the SEC (Form ADV) and Thomson Financial. These are the HF's mngrs investing in REITs prior to 2002:Q1. 283 hedge fund managers were identified in this way. This identification process is needed because we do not want our sample to be biased by "latecomers".
- Using the above list we examined which of them still invested (i.e. existed in the 13f Filing file of the respective quarter) as the "bubble" unfolded (period 2002:Q1-2007:Q4). we obtained the value of their holdings in the 111 sample REITs, the number of REITs shares they owned, the number of securities they held in their portfolio and its total value for each quarter.

The hedge fund managers identified for each quarter as described above will consist our sample hedge fund managers from now on⁹. Table 1.2 below presents summary

⁹A more detailed description of the construction of the sample hedge fund managers list as well as the list can be found in the Appendix.

statistics for the sample hedge funds managers. Since this is the first summary statistics for RE stocks - and the second in the hedge fund literature after the Brunnermeier & Nagel [7] one - we will give some details on it.

The first column presents the number of hedge funds that were investing in RE stocks each quarter. Observe that the number is not constant over time. This is due to the fact that some of the hedge funds that were in the initial 2001 list had equity holdings that did not cross the \$100 million threshold required by the 13f Form listing requirements.

The second set of columns shows the stock holdings per manager. Interestingly enough the mean value is \$8,9 billion which is far away from the respective \$1 billion of Brunnermeier & Nagel [7]. But again the mean, median and semi inter quantile range (s.i.q.r) indicate that the distribution of holdings is skewed with only a small number of hedge funds controlling the largest part of equity stock holdings.

The third set of columns shows the number of stocks held by hedge funds in our sample. The average number of stocks held by our sample hedge funds is around 10 with the median and the s.i.q.r. indicating that the distribution of the stocks held by the hedge fund managers is skewed. Such an observation is not strange for Hedge Funds which are focused on specialized strategies (and not diversification).

The next to the last column reports portfolio turnover. Following Chen, Jegadeesh, & Wermers [9] portfolio turnover is define as:

$$Portfolio\ Turnover_{i,t} = \frac{\min(Buys_{i,t}, Sells_{i,t})}{Total\ Net\ Assets_{i,t}}$$

where $Buys_{i,t}(Sells_{i,t})$ is the minimum absolute total value of stock purchases (sales) during quarter t by fund i and $Total\ Net\ Assets_{i,t}$ is the value of total stock assets of fund i for quarter t. This measure is commonly used in the literature because it captures the funds trading that is unrelated to investor inflows or outflows. Here our quarterly data were used and the turnover is annualized. Turnover is used because it shows how quickly a hedge fund trades in stocks. If turnover is high then the hedge fund under question buys and sells stocks very quickly and our quarterly equity holdings cannot capture such a behavior. For our quarterly data to be of any use we need a low turnover which means that a large portion of equity holdings survives in the hedge fund portfolio from one quarter to the other. The average turnover for our sample hedge funds is well bellow 100% indicating that a large portion of our hedge funds holdings survive between successive quarters. Such a fact will permit us to draw credible conclusions below by observing the behavior of hedge fund holdings. In the opposite case – with average turnover more than 100% – the quarterly frequency and hence the 13f holdings are inadequate for making results about hedge funds behavior.

Finally – observe from the last column – that mean hedge fund managers' is around 1,494,526.6. This number compared with the total capitalization of the US market

Table 2: Hedge Funds' Holdings Summary Statistics

		Summary Statistics									
		Number of Managers		Stock Holdings per Manager		Number of Stocks per Manager		Turnover		Aggregate Assets	
		Mean	Med	s.i.q.r	Mean	Med	s.i.q.r	Mean	Med	s.i.q.r	
2002	Q1	210	7719.6	610.6	1644.9	10	3	3.63			1621115.0
	Q2	212	7777.2	636.3	1713.7	10	3	3.88			1648757.0
	Q3	201	8121.6	704.0	1807.8	10	3	4.25			1632438.0
	Q4	200	8172.0	682.0	1815.4	10	3	4.25			1634407.0
2003	Q1	198	8248.5	743.4	1802.1	10	4	3.63			1633193.0
	Q2	186	8690.4	682.0	2005.4	11	4	4.50			1616412.0
	Q3	189	8553.7	660.0	1804.0	11	4	4.63			1616647.0
	Q4	187	8600.6	639.4	1796.2	11	4	4.88			1608314.0
2004	Q1	189	8650.5	660.0	1800.9	13	5	5.50			1634942.0
	Q2	188	8691.3	722.3	1794.2	14	5	6.50			1633971.0
	Q3	184	8879.5	746.8	1907.9	15	6	7.25			1633835.0
	Q4	188	8717.2	725.0	1880.8	15	5	8.25			1638839.0
2005	Q1	187	8759.6	746.1	1932.7	16	5	8.75			1638047.0
	Q2	186	8761.0	648.3	1799.4	16	6	9.50			1629552.0
	Q3	189	8645.6	657.1	1843.6	17	6	9.13			1634013.0
	Q4	193	8478.3	639.4	1795.3	17	6	9.00			1636317.0
2006	Q1	194	8514.3	648.3	1797.0	19	8	10.00			1651772.0
	Q2	191	8645.6	660.0	1802.0	19	7	10.88			1651302.0
	Q3	195	8509.8	660.0	1802.2	20	8	11.00			1659404.0
	Q4	195	8554.8	747.5	1812.6	20	8	11.00			1668190.0
2007	Q1	192	8577.3	733.6	1803.8	21	7	11.50			1646836.0
	Q2	193	8543.8	756.3	1795.2	18	6	10.00			1648944.0
	Q3	193	8539.8	747.5	1857.6	18	6	10.00			1648185.0
	Q4	194	8506.1	751.9	1824.0	18	6	9.63			1650177.0

Summary Statistics for the sample hedge fund managers are presented.

For Stock Holdings Per Manager and Number of Stocks Per Manager s.i.q.r. indicates the semi inter-quantile range.

Turnover is defined as the minimum of buys or sells in a given quarter divided by total net assets (*i.e.* $Portfolio\ Turnover_{i,t} = \frac{\min(Buys_{i,t}, Sells_{i,t})}{Total\ Net\ Assets_{i,t}}$)

(15 \$ trl for 2007, Source: Thomson Financial DataStream) shows that our hedge fund managers holdings represent only 6% of the total capitalization. In other words our sample hedge fund managers are price takers and cannot change the aggregate behavior in the REITs market on their own.

After examining the hedge fund managers sample its time to state explicitly the conjectures the validity of which we will test in the following analysis. The critical point of the analysis is the question if rational investors (hedge funds) ride the bubble or not. For our managers to ride the bubble in our case we will expect them to be overweighted in the stocks of our sample (*Conjecture 1*). Moreover we will expect them to gain from the bubble i.e. place their trades in such a way they will make profits. So hedge fund managers anticipated the bubble and placed their holdings accordingly (*Conjecture 2*).

4 Hedge Fund Portfolio Weights

An answer to *Conjecture 1* first require an assessment on hedge fund holdings during the sample period. We use the 13f data on RE holdings for the hedge funds identified above in order to calculate the following ratios:

$$HF\ Load = \frac{Market\ Value\ of\ Hedge\ Fund\ RE\ Holdings}{Market\ Value\ of\ Total\ Hedge\ Fund\ Holdings}$$

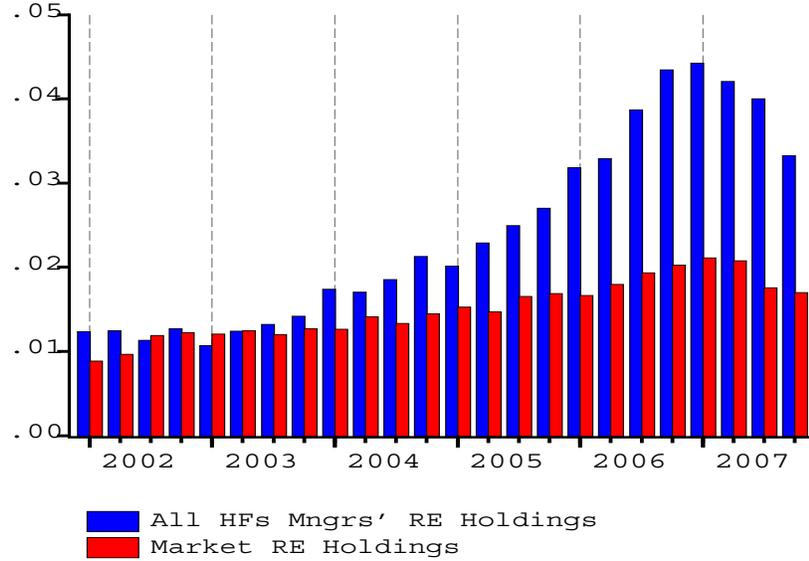
So as to have a benchmark loading we calculate the following ratio also:

$$Market\ Load = \frac{Market\ Value\ of\ RE\ Stocks}{Market\ Value\ of\ All\ Stocks\ in\ NYSE}$$

For the numerator of the first ratio the total holdings of Hedge Funds RE holdings are used and for the denominator the total hedge funds stock holdings for each quarter. The numerator of the second ratio is the total market value of RE stocks and the denominator is the total market value of all the NYSE stocks for each quarter. Note here that relative price movements change portfolio weights over time. So the hedge fund managers portfolio weights should be compared with the respective market REITs holdings within a quarter and not from quarter to quarter.

From Figure 1.3 observe that hedge fund managers were overloaded relative to the market benchmark for most of the period. The market REITs holdings vary around 1% for most of the period while the hedge fund managers holdings quadrupled reaching 4.3% for the quarters prior to the REITs sector peak in 2007:Q1. Observe that overweighting in REITs increases sharply after 2005:Q4 and decreased after the peak of 2007:Q1 relative to the respective market benchmarks. It has to be noted here that the loadings we observe are not biased upwards by IPOs during the end of our sample period because we selected our sample REITs in a way to avoid such a problem.

Figure 3: All Hedge Fund RE Holdings versus Market RE Holdings



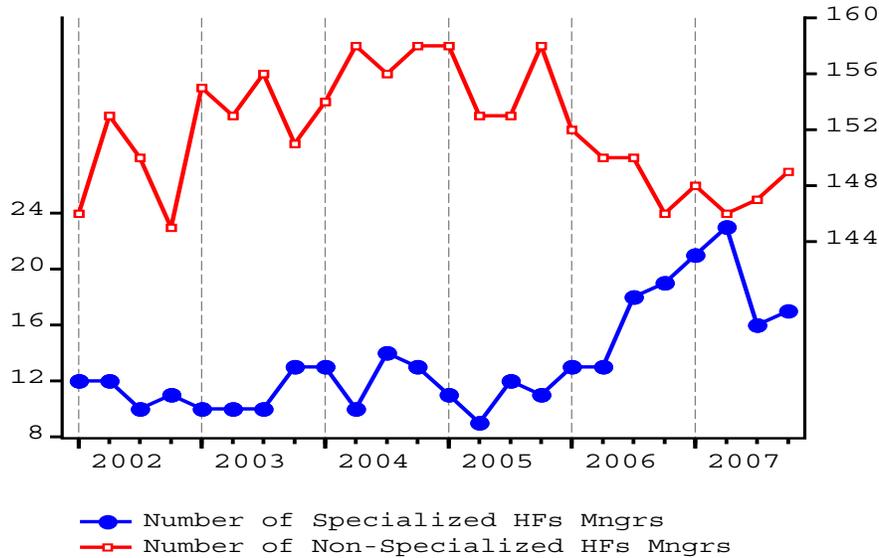
As a result we cannot reject *Conjecture 1* (i.e. that hedge funds were overweighted in REITs as the bubble was unfolding). One might argue here that at the same time hedge fund managers may had short positions in REITs. We will postpone for a while the answer to such a question and first examine in heterogeneity in managers size played a role in the determination of their behavior during the bubble period.

4.1 Heterogeneity Among Hedge Funds - Specialization in RE plays a role?

The distribution of holdings among the hedge funds of our sample is important for various reasons. First of all the REITs market and the RE market in general is small and so it expected to have only a small number of investors that regularly invest in it. Second results based on the RE holding presented above might be misleading if these holdings come from a small number of hedge funds that invest heavily in RE and a large number of hedge funds that invest only a very small portion of their assets in RE.

So as to unveil the distinction distribution of hedge fund holdings in each quarter we split our sample hedge funds between those that specialize in RE and those that do not. The group construction is based solely on the proportion of RE holdings in their total portfolio. In other words we split the hedge fund holdings in two groups. The first – the specialized hedge funds – have holdings greater or equal 10% and the second includes the rest. The choice of the 10% was based purely on the data but

Figure 4: Number of Specialized Hedge Funds

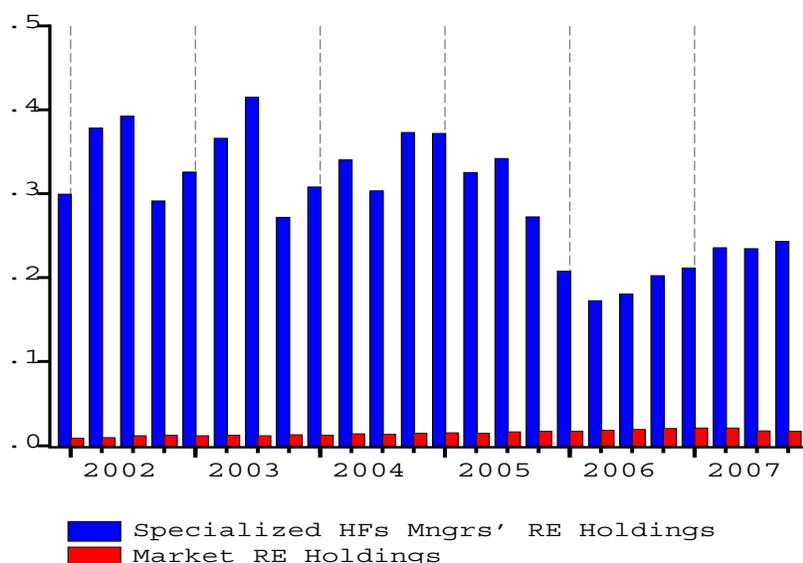


it also has some empirical backing from the real estate literature. More specifically, Chun, Jarjisly and Shilling [10] estimate that the exposure of an institutional investor who faces no consumption risk is around $3\frac{1}{2}\%$ while the respective percentage rises to 15% and more when the institutional investor is exposed to consumption risk¹⁰. Figure 1.4 presents the distinction between specialized and non-specialized funds. For most of the period the number of the specialized hedge funds remains stable with mean around 20. There is an exception on the 2005:Q4-2007:Q1 period where there is an increase of almost 50% in the number of specialized funds. But as the price followed a decreasing pattern after 2007:Q1 participation of specialized funds falls too. There are 20 specialized hedge fund managers in the REITs sector on 2007:Q4, the same number with 2004:Q4.

The number of non specialized hedge fund managers has a mean of 170 for most of the period. It increases before the 2004:Q1 and 2005:Q3 price peaks and decreases shortly after. Observe that the number of non-specialized hedge fund managers decreased prior to 2007:Q1 – from 2005:Q3 to 2006:Q4 with the exception of the 2006:Q3 where an increase was observed. More importantly this number increased after the price collapsed indicating that a number of non-specialized hedge fund

¹⁰Chun, Jarjisly and Shilling [10]in an asset allocation approach examine the existence of the so-called "underinvestment puzzle" in real estate. Their results are not in favor of the existence of the "underinvestment puzzle" Only investors who are exposed to consumption risk invest more than 15% in real estate while all the others invest around $3\frac{1}{2}\%$ of their portfolio. As consumption risk they define the possibility of poor performance of an institutional investor's portfolio when consumption growth opportunities are low.

Figure 5: Specialized Hedge Funds Mean RE Holdings



managers entered the market too late to profit from the price peak.

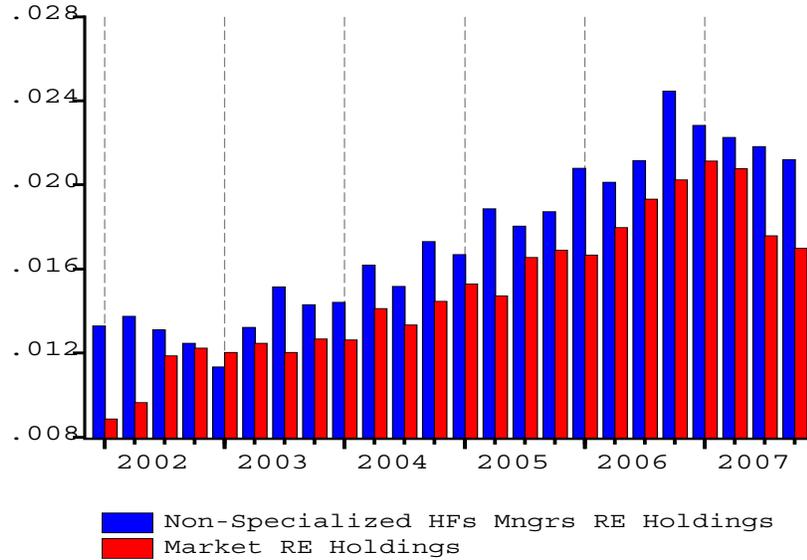
The question that arises here is if this behavior is verified by the hedge fund holdings. Again we use the ratios presented above but instead of the total RE holdings of each group we present the mean RE holdings for each group. The reason for doing this is to observe the difference in the average holding behavior between the two groups.

Figure 1.5 presents the holdings of the specialized funds. Again the ratios presented above were used but instead of the total holdings (%) compared with the benchmark market ratio (as in Figure 3) mean holdings were used. The main reason for doing this is to observe the difference in the average holding behavior of the two groups.

By construction specialized hedge fund holdings are more than 10% and reached 43% percent before the 2004:Q1 price peak. The behavior of their holdings is consistent with the anticipation of the price peaks in 2004:Q1 and 2005:Q3. They started building up their positions a year before the price peak and started unloading two or three quarters before it. But this is not the case for the 2007:Q1 price peak. Specialized hedge funds reduced their positions in the REITs sector after the 2005:Q3 peak and started to upload positions after 2006:Q2 and continued doing so until the end of the sample period.

This behavior is strange enough in part of the specialized hedge funds since it indicates an early exit from the market and then a late entry – when it was late to profit from the price rise. It has to be mentioned here that 2005 was a tough period for

Figure 6: Non Specialized Hedge Funds Mean RE Holdings



REITs institutional investors. Reports¹¹ from the market pointed out that the three year run up of REITs prices could not cope with the rising interest rates (Federal Fund Rates rose from 1% to 3,75% for the first five months of 2005). Moreover the decreasing US growth and the peak in the US real estate market in 2006:Q1 is an indication that our Specialized hedge fund managers placed their positions so as to gain from the real estate market peak. Sushko & Stamatiou [23] show that even though the Case-Shiller Housing Value Index peaked in 2006:Q1 the REITs index (see Figure 1.1 above) continued to move upwards. So it was a close call for the Specialized hedge fund managers and they started to enter the REITs market again. Figure 1.6 presents the holdings of the non-specialized hedge funds managers. Even though the threshold for dividing between the two groups was 10% the mean holdings of non specialized hedge funds managers are well below that. Observe that for most of the period – from 2002:Q1 to 2007:Q4 – mean holdings are above the market threshold. Non-specialized hedge fund managers were overweighted in REITs stocks. Observe that their loadings in REITs reached a peak – compared with the respective market benchmark holdings – in 2006:Q4 and from then on this loadings started to decrease following the behavior of the market benchmark. Nevertheless this decrease was slow since in the last quarters of 2007 hedge fund managers holdings in REITs are above their market benchmarks. Nevertheless this not the end of the story. There are questions to be answered yet. Below we will examine hedge funds short positions and in the next section their returns during the sample period.

¹¹There is a list of links to such reports and news in the Appendix.

4.2 What About Going Short?

Because of the 13f data nature we have no information on the hedge funds short positions. To address this problem we will use an indirect approach similar with that of Brunnermeier & Nagel [7]. Starting from the benchmark RE market ratio above we have that:

$$m_{RE} = \frac{RE_{mv}}{TM_{mv}} \quad (2)$$

with RE_{mv}, TM_{mv} being the RE sector and total market value respectively. Assume that a hedge fund allocates a fraction b of its total portfolio to the market portfolio and then allocates a fraction g of the total portfolio value from the total portfolio value to the RE sector. Then the return of this hedge fund is:

$$r_t = (b - g)r_M + gr_{RE} + e_t \quad (3)$$

with r_M, r_{RE} being the market and RE sector returns respectively and e_t is the idiosyncratic return. On the other hand, the return of the market portfolio can be written as the sum of the weighted (by market value) returns of the various market sectors:

$$r_M = r_{s1}w_{s1} + r_{s2}w_{s2} + \dots + r_{sn}w_{sn}$$

with r_{si} and w_{si} the returns and weights of sector $i = 1, 2, \dots, n$. For our analysis we indicate with A the sum of all the other sectors except the RE sector and so we have:

$$r_M = A + r_{RE}m_{RE} \quad (4)$$

From equations (2), (3), (4) we have:

$$r_t = (b - g)A + (b - g)m_{RE}r_{RE} + gr_{RE} + e_t \quad (5)$$

Using (5) we can observe that the net investment in RE stocks is $W_{RE} = (b - g)m_{RE} + g$ and therefore the net investment in RE stocks as a proportion of the total hedge fund portfolio invested in stocks b is:

$$\begin{aligned} w_{RE} &= \frac{W_{RE}}{b} = \\ &= \frac{b - g}{b}m_{RE} + g \end{aligned}$$

and finally:

$$w_{RE} = m_{RE} + \frac{g}{b}(1 - m_{RE}) \quad (6)$$

Table 3: HFR Style Indices

HFR Style Indices
Equity Hedge
Equity Nonhedge
Equity Market Neutral
Market Timing
Macro
Short Shelling
Real Estate

These are the various hedge fund styles that HFR uses for distinguishing between the various hedge fund strategies.

So as to calculate (2) we can estimate b and g using the following OLS regression:

$$r_t = \alpha + \beta r_M + \gamma(r_{RE} - r_M) + \epsilon_t$$

The lack of specific hedge fund returns from our sample is circumvented partially by using data from Hedge Fund Research (HFR). These data consist of the various HFR style indexes.

So we estimate the above regression seven times - one for each style index. For the hedge fund return r_t we use the returns of the respective HFR index. For the return of the RE sector we use a value weighted index of our sample stocks and for the market return the total US market index (TOTMKUS) obtained from Thomson Financial.

The behavior of market betas is almost as expected. Positive for most of the cases and significant. Moreover it is close to zero for the market neutral case and negative as expected for the short specialist case. Observe that the γ coefficient is positive only for the real estate index. And using the relation for w_{RE} the net investment in Real Estate relative to the HF's portfolio is 0.64. A close look to the Figure of specialized HFs holdings reveals that the mean is around 0.25. This difference is attributed to the fact that our sample HFs only overlap with the HFR dataset.

The absence of negative γ loadings is an indication that hedge funds short positions in the RE market were not of a significant size or at least of a size to be a serious drawback for our analysis.

5 Hedge Funds Returns

Until now we focused on the overloading of hedge funds with RE stocks during the sample period. This by itself only partially can answer the question if hedge

Table 4: Regression Coefficients

Factor Loadings				
	coef. b	coef. g	Rsqr.	factor loadings
eq.1	0.4892	0.0184	0.5187	0.0105
	0.00	0.67		
eq.2	0.9441	0.0247	0.6797	0.0105
	0.00	0.68		
eq.3	0.0845	0.0199	0.1347	0.0105
	0.00	0.29		
eq.4	0.5743	0.0388	0.4951	0.0105
	0.00	0.47		
eq.5	0.2794	0.0298	0.1694	0.0105
	0.00	0.58		
eq.6	-0.8062	-0.0535	0.6397	0.0105
	0.00	0.35		
eq.7	0.4203	0.2712	0.6166	0.6490
	0.00	0.00		

The table presents the results of the following regression $r_t = \alpha + \beta r_M + \gamma(r_{RE} - r_M) + \epsilon_t$ for the sample period 2002-2007 (monthly data). The depended variables are returns of the seven HFR indexes (i.e. Equity Hedge, Equity Nonhedge, Equity Market Neutral, Market Timing, Macro Short Selling, Real Estate). The first column presents the coefficient β , the second column the coefficient γ and the third column presents the R^2 for each regression. The fourth column presents the factor loadings (i.e. the total investment in REITs stocks) given by the following formula: $w_{RE} = m_{RE} + \frac{\gamma}{b}(1 - m_{RE})$.

funds were rational investors or not. But *Conjecture 2* asks if hedge fund managers anticipated the bubble and placed their holdings accordingly. To get a more complete answer we have to examine directly the hedge fund portfolios during the sample periods. This will be done in two steps.

In the first step we will examine hedge funds behavior in the quarters before and after the RE bubble. The second step will be to have a more direct look at the actual composition of the hedge fund RE portfolios during the sample period.

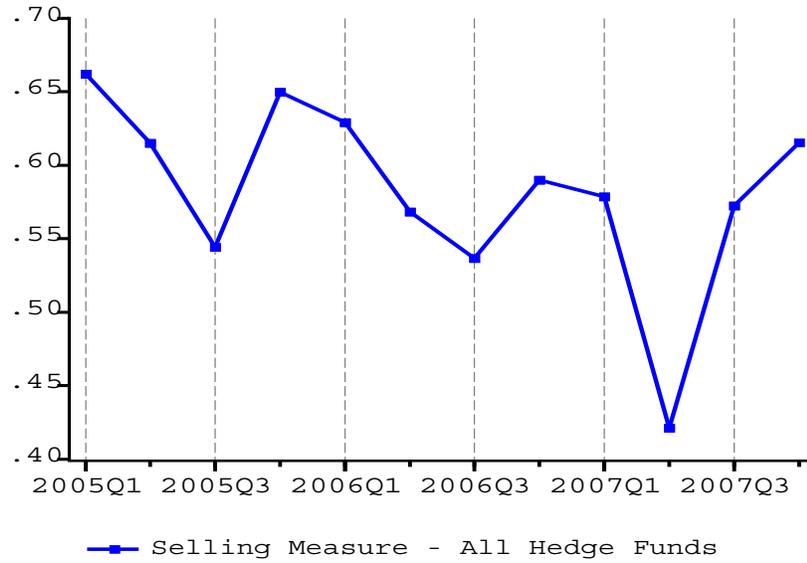
5.1 Hedge Funds Anticipated the Bubble?

In order to observe the behavior of the hedge funds around the peak of the bubble we will examine their behavior in the REITs market. So as to accomplish this we will use the following measure:

$$\Delta_{k,t} = \frac{\#Hedge\ Funds\ Selling_{k,t}}{\#Hedge\ Funds\ Buying_{k,t} + \#Hedge\ Funds\ Selling_{k,t}} \quad (7)$$

The above measure – the selling measure in what follows – shows the number of

Figure 7: Selling Measure - All Hedge Funds

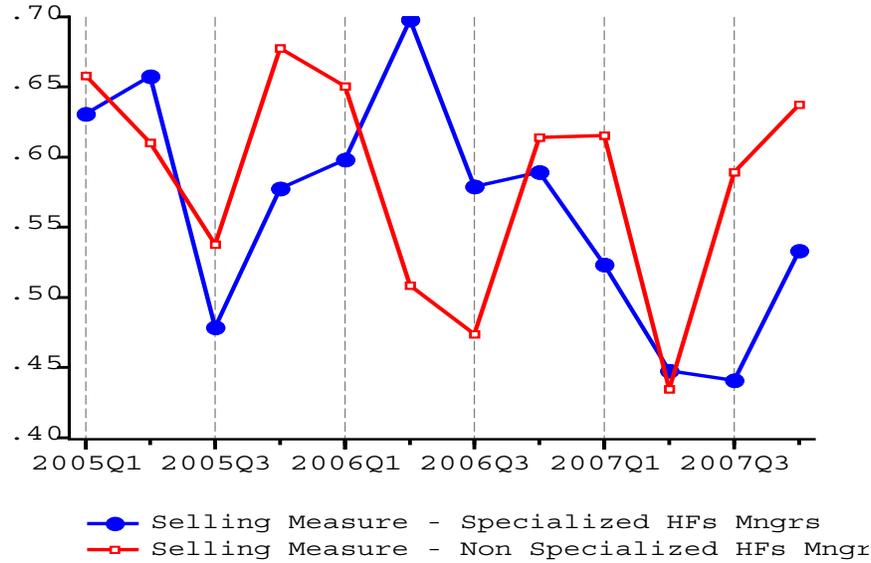


hedge funds that sell RE stocks in a specific quarter in relation with the total number of hedge funds that buy or sell stocks in that quarter. The selling measure is a modified version of Sias [22] herding measure. The difference is that in the latter the number of institutional investors that bought stocks in each quarter was used in the nominator instead of the number of investors selling stocks as in our measure. End of quarter holdings data were used for the period 2005:Q1 – 2007:Q4 for all hedge funds of our sample as well as for the breakdown of Specialized and Non Specialized Hedge Funds. If end of quarters holdings of a hedge fund manager for a REIT are bigger than the respective holdings of the previous quarter then we classify the hedge fund manager in the buying side and the opposite holds for the selling side of the previous relation. We conjecture here that the selling measure will increase the quarters before the price peak. In other words, hedge fund managers knew that a bubble existed and started to exit before the rice peak.

From Figure 1.7 observe that for the case of all hedge funds there is little – even though increasing – variation in the selling measure in the quarters prior to the price peak of the RE market (2007:Q1). The increase in the selling measure is not so obvious so as to give support to the argument that hedge funds anticipated the bubble and so they placed their positions accordingly in the quarters before the bubble.

Figure 1.8 presents the breakdown of hedge funds in Specialized and Non Specialized ones. Observe the change in the picture. There is a decrease in the selling measure for the Specialized hedge funds for the 2005:Q2 to 2006:Q2 period. They did not

Figure 8: Selling Measure - Specialized versus Non Specialized Hedge Funds



start to unload their positions until the quarters prior to the peak –from 2006:Q2 to 2006:Q4. It is interesting here to mention that Sushko & Stamatiou [23] find that institutional investors started to unloading their positions from 2006:Q2 and afterwards. The selling measure for the Non-Specialized hedge fund managers shows a different behavior. It increases in the quarters prior to the bubble and until the end of the sample period – with the exception of 2007:Q2.

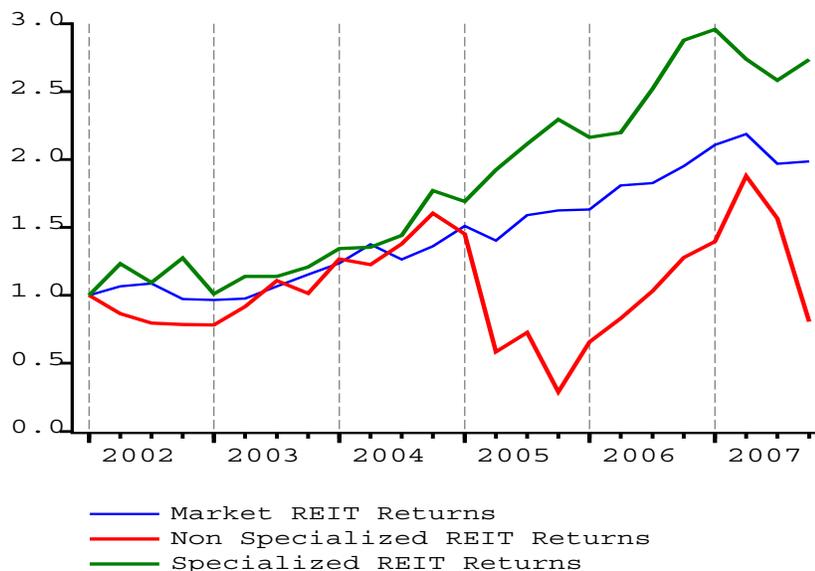
So the argument that hedge funds anticipated the RE bubble and placed their positions accordingly cannot be rejected yet. But still one crucial step remains. To examine if hedge funds profited from their behavior in the RE stock market.

5.2 Hedge Funds Portfolio Performance

Our main purpose in what follows is to observe the relations of hedge funds for the sample period so as to give a clear answer to the argument that hedge funds anticipated the bubble (or not). In order to achieve this we build copycat portfolios that mimic hedge fund behavior in the market and compare it with a portfolio that consists of the RE stocks of our sample.

So as to achieve this we obtain for the 13f filings files for each quarter the number of stocks that each hedge fund manager holds and calculate its total return for each quarter using the returns of the stock he owns. We use the end of quarter REITs prices for these returns as by definition 13f filings holdings refer to end of quarter prices. We do this for Specialized and Non Specialized Hedge Funds as well as for a

Figure 9: Copycat Portfolios - Growth of 1\$ for the Sample Period (2002-2007)



(value weighted) portfolio that consists of our sample RE stocks. Figure 1.9 below presents the growth of an investment of 1\$ in each one of the three portfolios for the sample period.

The portfolio that copies the REITs Market is out performed for most of the period by the portfolio of the Non-Specialized hedge fund managers but this is not the case for the Specialized managers portfolio. Observe that this outperformance in relation to the REITs market copycat portfolio becomes more clear during 2005-2006. Non-specialized managers during the period did not buy a copy of the REITs market portfolio but instead they invested in stocks that were still making profits as the peak of the bubble closed. This is evidence - in part of Non Specialized hedge fund managers - of stock picking ability. Specialized Hedge fund managers had also that stock picking ability after 2005:Q3 but their early exit from the market had consequences for the total return performance. The return of the 1\$ goes to zero after 2005:Q2 and starts to rise after 2005:Q3 and until the peak of the REITs market (2007:Q1) and decreases thereafter.

Table 1.5 presents a more formal investigation of the performance of each one of our Copycat portfolios. The first line of each panel presents the mean quarterly return for each year, the second line presents its standard deviation, the third line the Annual Sharpe Ratio. The fifth line presents the growth of 1\$ invested in 2002:Q1. For Sharpe ratio's risk free asset the US 3-month Treasury Bill was used.

For 2006 – the year before the peak of the bubble – Specialized hedge funds managers

Table 5: Performance Summary for the Copycat Portfolios

Performance Summary						
Panel A: All Hedge Funds Portfolio						
	2002	2003	2004	2005	2006	2007
Mean	0.01	0.02	0.10	-0.06	0.12	0.00
St. Deviation	0.10	0.12	0.09	0.14	0.05	0.13
Annual Sharpe Ratio	0.14	0.26	2.31	-1.02	4.46	-0.17
Growth of 1\$	1.02	1.08	1.58	1.18	1.83	1.54
Panel B: Specialized Hedge Funds Portfolio						
Mean	-0.08	0.06	0.11	-0.43	0.37	-0.05
St. Deviation	0.06	0.13	0.11	0.58	0.30	0.39
Annual Sharpe Ratio	-2.64	0.93	2.05	-1.51	2.39	-0.31
Growth of 1\$	0.77	0.97	1.47	0.01	0.04	0.01
Panel C: Non Specialized Hedge Funds Portfolio						
Mean	0.08	-0.01	0.10	0.06	0.08	0.02
St. Deviation	0.18	0.15	0.08	0.08	0.10	0.09
Annual Sharpe Ratio	0.88	-0.21	2.18	1.46	0.93	0.13
Growth of 1\$	1.23	1.12	1.60	2.04	2.51	2.37
Panel D: Market Portfolio of Sample REITs						
Mean	-0.01	0.04	0.05	0.05	0.05	0.02
St. Deviation	0.09	0.05	0.09	0.09	0.05	0.07
Annual Sharpe Ratio	-0.50	1.40	0.71	0.32	0.00	-0.66
Growth of 1\$	0.97	1.15	1.36	1.62	1.95	1.99

The table presents the performance summary for the Copycat portfolios. Each portfolio was constructed using the 13f filings data (*i.e.* the end of quarter number of stocks that each hedge fund manager holds) and the respective end of quarter prices. Performance is summarized using annual means, standard deviations, Sharpe ratios and the growth of 1\$ invested at the start of 2002. In Panel A the results for the portfolio of all hedge fund managers are presented. In Panels B and C the results for the breakdown in Specialized and Non-Specialized hedge fund managers portfolios are presented. In Panel D the performance summary for a value weighted REITs market portfolio is presented.

copycat portfolio returns are the highest. Nevertheless this return did not help in improving their poor performance caused by their 2005 early exit behavior. For the rest of the portfolios it is obvious that Non-Specialized hedge funds managers copycat portfolio outperforms the REITs market copycat portfolio. Mean returns, Sharpe Ratios and Cumulative returns are higher for Non-Specialized hedge funds managers copycat than the REITs market portfolio. The values of the Sharpe ratios for the year 2006 are of interest. The respective values are 2.39 , 0.93 and 0.00 for the Specialized, Non Specialized and REITs Market portfolios respectively. Such behavior is in favor of the stock picking ability of the hedge fund managers. In both cases they ensured highest mean returns with less risk than an investment in the REITs Market portfolio.

All of the above are in favor of the argument that hedge fund managers placed their holdings in such a way so as to profit from the bubble in the REITs market in

2007:Q1 (*Conjecture 2*).

Conclusion

The main purpose of this study was to examine the behavior of a sample of hedge fund managers in the REITs sector of the NYSE for the period 2002:Q1 to 2007:Q4. The REITs market segment followed the upwards move of the US Real Estate sector and more interestingly continued to move upwards even after the peak in the US Real Estate sector in 2006:Q1. A subset of the REITs sector (containing more than 90% of the NYSE REITs) was constructed and two conjectures were examined. *Conjecture 1* states that the sample hedge fund managers were overweighted in REITs stocks during the sample period while *Conjecture 2* stated that hedge fund managers anticipated the bubble and placed their holdings accordingly. Using 13f filing data on institutional ownership we identified a sample of hedge fund managers that invested in the sample REITs for the period 2002-2007.

Our sample hedge fund managers for most of the period were overloaded with REITs stocks but placed their holdings in such a way that gained from the bubble. More interestingly non specialized hedge fund managers outperformed specialized hedge fund managers during the sample period. The former choose to exit of the REITs market early in 2005 and this behavior had consequences for their overall performance. Nevertheless both types of hedge fund managers in the period before the bubble performed in such a way that shows their ability to gain from a bubble environment.

These results are in accordance with the theory work of DeLong et al [12] and Abreu & Brunnermeier [1] and the empirical results of Brunnermeier & Nagel [7]. Hedge fund managers anticipated the REITs bubble and ride it – instead of playing against it as standard theory predicts – so as to gain from the price rise. It have to be mentioned though that we cannot draw general results for the hedge fund industry from our small sample of hedge fund managers

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A The Sample Stocks

Before we proceed with the sample stocks we think that is useful to give some details on the nature of a Real Estate Investment Trust, its legal structure and the size of the REIT industry. So according to the National Association of Real Estate Investment Trusts[19] a REIT is a company that mainly owns and in most cases also operates income-producing real estate such as apartments, shopping centers, offices, hotels and warehouses. Some REITS also engage in financing real estate. Moreover, REITS can be classified in exchange traded around 170 REITS by the end of 2007 mostly traded in the NYSE) and non-exchange traded¹²

The basic characteristic of a REIT is that it has most of its assets and income in real estate and must distribute each year at least 90% of its taxable income to its shareholders.

The Sample stocks are Real Estate Investment Trusts (REITS) included in the respective market sector of the NYSE. We did not include all the REITS that were traded in the NYSE but followed a more indirect process. We used a list of REITS that was published in Imperiale [13] – a textbook on the REITS industry. We excluded the REITS that were subjects of takeover and so did not survive until the end of the sample period. Moreover using Thomson’s Financial Datastream we included in our list the REITS that entered the NYSE until 2005:Q1. The main reason for this was to avoid IPO problems during the final quarters of our sample that will increase our holdings for reasons other than those described in the main part of the paper. A complete list of the 111 REITS is presented below in Table A.1.

B The Modigliani–Miller Formula

According to Modigliani & Miller’s [18] approach and for a firm (named in what follows *Super Normal*) that for a period T years has supernormal returns r^* (relative to normal returns r) and with a fraction κ of the earnings invested the following formula holds for its $\frac{P}{E}$ ratio:

$$\left(\frac{P}{E}\right)^{\text{Super Normal}} = \frac{1}{r} \left\{ 1 + \frac{\kappa(r^* - r)}{r - \kappa r^*} \left[1 - \left(\frac{1 + \kappa r^*}{1 + r} \right)^T \right] \right\}$$

Assuming that $\kappa = 1$ (*i.e.* all the earnings are retained within the firm) we have that:

¹²the following textitforbes.com article provides an interesting introduction to REITs:http://www.forbes.com/2005/02/14/cz_sf_0214reits.html.

Table 6: List of the 111 Sample REITS

Sample Stocks			
AMB Property Corp	AMB-N	Host Hotels & Resorts Inc	HST-N
Acadia Realty Trust	AKR-N	Inland Real Estate Corp	IRC-N
Agree Realty Corp	ADC-N	Kilroy Realty Corp	KRC-N
Alexanders Inc	ALX-N	Kimco Realty Corp	KIM-N
Alexandria Real Estate Equities Inc	ARE-N	Kite Realty Group Trust	KRG-N
American Campus Communities Inc	ACC-N	LTC Properties Inc	LTC-N
Annaly Capital Management Inc	NLY-N	Lasalle Hotel Properties	LHO-N
Anthracite Capital Inc	AHR-N	Lexington Realty Trust	LXP-N
Anworth Mortgage Asset Corp	ANH-N	Liberty Property Trust	LRY-N
Apartment Investment & Management Co	AIV-N	MFA Financial Inc	MFA-N
Ashford Hospitality Trust Inc	AHT-N	Macerich Co	MAC-N
Associated Estates Realty Corp	AEC-N	Mack Cali Realty Corp	CLI-N
AvalonBay Communities Inc	AVB-N	Maguire Properties Inc	MPG-N
BRE Properties Inc	BRE-N	Medical Properties Trust Inc	MPW-N
BRT Realty Trust	BRT-N	Mid-America Apartment Communities Inc	MAA-N
BioMed Realty Trust Inc	BMR-N	National Health Investors Inc	NHI-N
Boston Properties Inc	BXP-N	National Retail Properties Inc	NNN-N
Brandywine Realty Trust	BDN-N	Nationwide Health Properties Inc	NHP-N
CBL & Associates Properties Inc	CBL-N	Newcastle Investment Corp	NCT-N
Camden Property Trust	CPT-N	NorthStar Realty Finance Corp	NRF-N
Capital Trust Inc MD	CT-N	Omega Healthcare Investors Inc	OHI-N
CapitalSource Inc	CSE-N	One Liberty Properties Inc	OLP-N
Caplease Inc	LSE-N	Parkway Properties Inc	PKY-N
Capstead Mortgage Corp	CMO-N	Pennsylvania Real Estate Investment Trust	PEI-N
Cedar Shopping Centers Inc	CDR-N	Plum Creek Timber Co Inc	PCL-N
Cogdell Spencer Inc	CSA-N	Post Properties Inc	PPS-N
Colonial Properties Trust	CLP-N	Potlatch Corp New	PCH-N
Corporate Office Properties Trust Inc	OFC-N	Prime Group Realty Trust	PGE.B-N
Cousins Properties Inc	CUZ-N	ProLogis Trust	PLD-N
Deerfield Capital Corp	DFR-A	Public Storage	PSA.E-N
Developers Diversified Realty Corp	DDR-N	RAIT Financial Trust	RAS-N
Diamonrock Hospitality Co	DRH-N	Ramco-Gershenson Properties Trust	RPT-N
Digital Realty Trust Inc	DLR-N	Rayonier Inc	RYN-N
Duke Realty Corp	DRE-N	Realty Income Corp	O-N
Dynex Capital Inc	DX-N	Redwood Trust Inc	RWT-N
EastGroup Properties Inc	EGP-N	Regency Centers Corp	REG-N
Education Realty Trust Inc	EDR-N	SL Green Realty Corp	SLG-N
Entertainment Properties Trust	EPR-N	Saul Centers Inc	BFS-N
Equity Lifestyle Properties Inc	ELS-N	Senior Housing Properties Trust	SNH-N
Equity One	EQY-N	Simon Property Group Inc	SPG-N
Equity Residential	EQR-N	Sovran Self Storage Inc	SSS-N
Essex Property Trust	ESS-N	Strategic Hotels & Resorts Inc	BEE-N
Extra Space Storage Inc	EXR-N	Sun Communities Inc	SUI-N
Federal Realty Investment Trust Inc	FRT-N	Sunstone Hotel Investors Inc	SHO-N
Felcor Lodging Trust Inc	FCH-N	Tanger Factory Outlet Centers Inc	SKT-N
First Industrial Realty Trust Inc	FR-N	Taubman Centers Inc	TCO-N
First Potomac Realty Trust	FPO-N	U Store It Trust	YSI-N
Getty Realty Corp New	GTY-N	UDR Inc	UDR-N
Glimcher Realty Trust	GRT-N	Universal Health Realty Income Trust	UHT-N
HCP Inc	HCP-N	Ventas Inc	VTR-N
HRPT Properties Trust	HRP-N	Vornado Realty Trust	VNO-N
Health Care REIT Inc	HCN-N	Washington Real Estate Investment Trust	WRE-N
Healthcare Realty Trust Inc	HR-N	Weingarten Realty Investors	WRI-N
Highwoods Properties Inc	HIW-N	Winthrop Realty Trust Inc	FUR-N
Home Properties Inc	HME-N	iStar Financial Inc	SFI-N
Hospitality Properties Trust	HPT-N		

$$\begin{aligned}
\left(\frac{P}{E}\right)^{\text{Super Normal}} &= \frac{1}{r} \left\{ 1 + \frac{(r^* - r)}{r - r^*} \left[1 - \left(\frac{1 + r^*}{1 + r}\right)^T \right] \right\} \Rightarrow \\
\left(\frac{P}{E}\right)^{\text{Super Normal}} &= \frac{1}{r} \left\{ 1 - \frac{(r - r^*)}{r - r^*} \left[1 - \left(\frac{1 + r^*}{1 + r}\right)^T \right] \right\} \Rightarrow \\
\left(\frac{P}{E}\right)^{\text{Super Normal}} &= \frac{1}{r} \left\{ 1 - 1 + \left[\frac{1 + r^*}{1 + r}\right]^T \right\} \Rightarrow \\
\left(\frac{P}{E}\right)^{\text{Super Normal}} &= \frac{1}{r} \left(\frac{1 + r^*}{1 + r}\right)^T \tag{8}
\end{aligned}$$

Moreover for a firm with no supernormal profit (named in what follows *Normal*) opportunities we know that the following formula holds for the $\frac{P}{E}$:

$$\left(\frac{P}{E}\right)^{\text{Normal}} = \frac{1}{r} \tag{9}$$

(i.e. the price of the firm is equal with the discounted earnings $P^{\text{Normal}} = \frac{E^{\text{Normal}}}{r} \Rightarrow \left(\frac{P}{E}\right)^{\text{Normal}} = \frac{1}{r}$)

Combining equations (8) and (9) we have that:

$$\left(\frac{P}{E}\right)^{\text{Super Normal}} = \left(\frac{1 + r^*}{1 + r}\right)^T \left(\frac{P}{E}\right)^{\text{Normal}}$$

C The Distribution of 13f Holdings Among Institutional Investors

In Table A.2 below the distribution of 13f Filings holdings data among the various types of institutional investors that are obliged to disclose their positions in the sample stocks. Data were obtained from Thomson Financial's 13f – Ownership utility. Panel A presents the number of institutional investors that are in the market at the last quarter of each year in our sample. Panel B presents the total value of the portfolio of each type of institutional investor for the same time span. Panel C presents the total value of the REITS each type of institutional investor has in his portfolio. Finally Panel D presents the number of institutional investors that hold each stock. The table is similar with the respective tables presented in Gompers & Metrick [15].

From Panel A above observe that the number of all institutional investors reached its highest point at 2006:Q4 and the same is true for the total value of institutional investors' REITS portfolio in Panel C.

Table 7: Distribution of 13f Holdings Among Institutional Investors

Descriptive Statistics						
	Dec 02	Dec 03	Dec 04	Dec 05	Dec 06	Dec 07
Panel A: Number of Institutional Investors						
Bank and Trusts	101	111	124	123	125	115
Hedge Funds	349	403	455	504	586	562
Insurance Companies	22	21	18	18	20	19
Investment Advisors	784	824	867	903	1046	1007
Pension Funds	47	46	42	45	49	47
All Others	205	264	888	1072	1260	1210
Total Number of Inst.Inv.	1508	1669	2394	2665	3086	2960
Panel B: Total Portfolio Capitalization in Millions (\$)						
Bank and Trusts	279353.2	282189.8	291367.1	298808.3	292880.3	300612.3
Hedge Funds	1746690.0	1882660.0	1965653.0	1947031.0	1971660.0	2040728.0
Insurance Companies	58701.1	66618.4	55257.7	55927.6	57446.3	57592.8
Investment Advisors	5100468.0	5308982.0	5302486.0	5703678.0	5871000.0	6457841.0
Pension Funds	470058.1	466757.4	423874.1	492771.0	496904.7	513424.3
All Others	212456.4	253331.6	332152.2	351425.0	360841.5	364000.3
Total Capitalization	7867726.8	8260539.2	8370790.1	8849640.9	9050732.8	9734198.7
Panel C: REITS Portfolio Capitalization in Millions (\$)						
Bank and Trusts	767.8	1504.0	1839.1	1207.3	2169.6	2264.8
Hedge Funds	19092.8	23977.9	36842.1	45358.8	74497.2	62568.8
Insurance Companies	1389.4	1596.1	1273.4	1676.3	2149.0	1518.2
Investment Advisors	43198.7	67092.0	99417.3	112776.9	181706.3	159077.1
Pension Funds	7693.1	9629.1	12716.4	15509.6	21691.4	20545.3
All Others	8750.8	10318.6	13293.9	15957.6	23794.0	21145.5
Total Capitalization	80892.6	114117.7	165382.2	192486.5	306007.4	267119.7
Panel D: Number of REITS with:						
> 1 trader	82	88	105	111	111	111
> 20 traders	79	86	99	103	109	109
> 50 traders	72	80	94	100	107	108
> 100 traders	51	67	76	86	99	103
Total Number of REITS	82	88	105	111	111	111

The table presents the distribution of 13f holdings among the various types of institutional investors. The types of institutional investors are: Bank and Trusts, Hedge Funds, Insurance Companies, Investment Advisors, Pension Funds and All Others (including Endowments, Research Firms, Other Firms, etc.). Panel A presents the number of institutional investors with holdings in the sample REITs for each year from 2002 to 2007. Panel B presents the total portfolio capitalization in Millions (\$) for each year from 2002 to 2007. Panel C presents the total REITs holdings capitalization in Millions (\$) for each year from 2002 to 2007. Panel D presents the breakdown of REITs based on the number of institutional investors that trade in each year from 2002 to 2007.

D The Sample Hedge Fund Managers

Below the construction of the sample Hedge Fund Managers is described. The main part of the construction is described in the paper but below we repeat it and clarify some details as well as presenting the table with the names of the sample hedge fund managers.

We obtained the files with the 13f filings for each quarter of the sample period (2001:Q1-2007:Q4) for the sample 111 REITS. Each file contains the list of institutional investors (firm level) that hold the 111 REITS, their 13f categorization, the value of each investor's holdings in REITS, the number of REITS shares he owns, the number of securities held in his portfolio and the total value of his stock portfolio. For example in 2007:Q4, 1st Global Advisors Inc., an investment advisor with 15 securities in his portfolio which had total value of \$ 141.51 million, owned \$ 0.22 millions of the AMB Property Corp REIT (3,803 of AMB Property Group shares). From 2001:Q1 to 2001:Q4 we identified the Institutional investors categorized as "Hedge Funds" or "Hedge Funds / Investment Advisors" and filtered these results using information from the SEC (Form ADV) and Thomson Financial. There is a difference between the "Hedge Funds" and "Hedge Funds / Investment Advisors" 13f Filing categorization. "Hedge Funds / Investment Advisors" are operating firms that not only own hedge funds but also mutual funds. Because the 13f Filing reporting is done at the firm level the equity holdings that appear in the 13f file for a "Hedge Fund / Investment Advisor" include all the holdings of the firm irrespectively of their source (if they come from the hedge fund or mutual fund branch of the firm). In order to distinguish between the firms whose income comes mainly from hedge funds (and not mutual funds) we use SEC's Form AVD.

These are the hedge fund managers investing in REITS prior to 2002:Q1. 283 hedge fund managers were identified in this way. This identification process is needed because we do not want my sample to be biased by "latecomers".

Using the above list we examined which of them still invested (i.e. existed in the 13f Filing file of the respective quarter) as the "bubble" unfolded (period 2002:Q1-2007:Q4). We obtained the value of their holdings in the 111 sample REITS, the number of REITS shares they owned, the number of securities they held in their portfolio and its total value for each quarter. Tables A.3 and A.4 provide the list of the hedge fund managers of our sample.

E Reports on the US REITS sector during 2005

Below we present links to news and reports about the situation of the REITS sector in 2005. The list is only indicative of the end of 2005 condition in the market. Thousands of similar reports are still out there.

http://www.forbes.com/2006/01/27/reits-vornado-camden-in_ps_0130adviserqa_inl.html

http://www.forbes.com/2005/11/22/reits-slatin-in_ps_1122soapbox_inl.html
http://www.forbes.com/2005/07/13/reit-investing-insider-cz_sf_0713reits2.html
http://www.forbes.com/2006/01/27/reits-vornado-camden-in_ps_0130adviserqa_inl.html
<http://nreionline.com/news/REITs/>
http://www.forwardua.com/pdf/FlashReport_2005_12.pdf
<http://home.flash.net/~factoids/fact4/r0503c.htm>
<http://www.ml.com/media/67216.pdf>

Table 8: The List of the Sample Hedge Fund Managers

Sample Hedge Fund Managers	
Zweig-Di Menna Associates Inc.	Oak Brook Investments LLC
Zimmer Lucis Partners L.L.C.	North American Management Corp.
York Management & Research Inc.	Neuberger Berman LLC (Oscar Capital Mgmt.)
York Capital Management	Neptune Capital Management L.L.C.
Wyper Capital Management L.P.	Munder Capital Management
Wynfield Capital Inc.	Morgens Waterfall Vintidals & Co Inc.
William Jones & Associates LLC	Morgan Stanley Investment Management Inc. (US)
Westfield Capital Management Company LP	Morgan Stanley Investment Management (MAS)
Westchester Capital Management Inc.	Moore Capita IManagement Inc.
West Highland Capital Inc.	Monatair Investments LLC
Wells Capital Management (Strong)	Metropolitan Capital Advisors Inc.
Weld & Forbes LLC	McKinley Capital Management LLC
Warfield Associates Inc.	Maverick Capital Ltd.
Wall Street Associates LLC	Mastrapasqua Asset Management Inc.
Wadra Investment Advisory Group Inc.	Maringale Asset Management L.P.
Vinik Asset Management L.P.	Martin Currie Investment Management Ltd.
Van Eck Associates Corporation	Mark Asset Management Corp
Tyndall Management L.L.C.	Mainstream Investment Advisors LLC
Twin Capital Management Inc.	Magten Asset Management Corp.
Twedy Browne Company LLC	Mackay Shields LLC
Turner Investment Partners Inc.	MAI Wealth Advisors LLC
Tudor Investment Corporation	MD. Sessinvestors Services Inc.
Titan Capital Management L.L.C. (NJ)	M&R Capital Management Inc.
Timnucan Asset Management Inc.	M&I Investment Management Corp.
Tilley Private Wealth Management	Luther King Capital Management Corp.
Third Point L.L.C.	Los Angeles Capital Management And Equity Rese
Third Avenue Management LLC	Loomis Sayles & Company L.P.
The Dreyfus Corporation	Lope Pine Capital L.L.C.
The Boston Company Asset Management LLC	Loeb Partners Corp.
The Baupost Group L.L.C.	Lazard Asset Management L.L.C.
Talon Asset Management Inc.	Kingdon Capital Management L.L.C.
T.Rowe Price Associates Inc.	Keefe Managers L.L.C.
Symphony Asset Management LLC	James Investment Research Inc.
Summit Capital Management L.L.C.	Jacobs Levy Equity Management Inc.
Strone Investment Management L.P.	JP Morgan Asset Management U.K. Limited
Straus Capital Management L.L.C.	JMG Capital Management LLC
State Street Global Advisors (UK) Ltd.	JL Advisors LLC
Standard Pacific Capital LLC	JF Asset Management (HK) Ltd.
Southeastern Asset Management Inc.	Ingalls & Stryder LLC (Asset Management)
Soros Fund Management L.L.C.	Independence Investments LLC
Smith Asset Management Group LP	Ignis Asset Management Limited
Smith & Williamson Investment Management Limited	INTECH Investment Management LLC
Seneca Capital Advisors L.L.C.	ING Investment Management Co. (NY)
Segall Bryant & Haniff Investment Counsel	ING Investment Management Co.
Section H Partners L.P.	ING Clarion Real Estate Securities L.P.
Schwerin Boyle Capital Management Inc.	ICM Asset Management Inc.
Schwartz Investment Counsel Inc.	Hofer & Arnett Capital Management Inc.
Schroder Investment Management Ltd. (SIM)	
Schneider Investment Management (Japan) Ltd.	
Schneider Capital Management Corporation	
Schaefer Gullen Capital Management Inc.	
Sand Hill Advisors Inc.	
San Francisco Sentry Investment Group	
SSI Investment Management Inc.	
SFO Partners & Co.	
SCM Advisors LLC	
S.A.C. Capital Advisors LP	
Rydex Investments	
Royce & Associates LLC	
Roxbury Capital Management L.L.C.	
Rockview Management LLC	
Rochdale Investment Management LLC	
Robeco Investment Management Inc.	
Robeco Investment Management Inc. (WPG)	
River Source Investments LLC	
Rice Hall James & Associates LLC	
Renaissance Technologies Corp.	
Reich & Tang Asset Management L.L.C.	
RH Capital Associates L.L.C.	
RCM Capital Management LLC	
Prospector Partners LLC	
Pronark Investment Advisors Inc.	
Private Capital Management LP	
Porter Orfin L.L.C.	
Pioneer Investment Management Ltd.	
Pin Oak Investment Advisors Inc.	
Peterson Flynn & Dinanore Inc.	
Performance Capital L.L.C.	
Pequot Capital Management Inc.	
Paradigm Asset Management Company LLC	
Para Advisors LLC	
Paloma Partners Management Company	
Palisade Capital Management LLC	
PNC Capital Advisors Inc.	
PEA Capital LLC	
PAR Capital Management Inc.	
Osterweis Capital Management LLC	
Oracle Investment Management Inc.	
Oppenheimer Funds Inc.	
Oppenheimer Capital L.L.C.	
Omega Advisors Inc.	
Och-Ziff Capital Management L.P.	
Oaktree Capital Management L.P.	
Oakmont Corporation	

Table 9: The List of the Sample Hedge Fund Managers

Sample Hedge Fund Managers	
Highland Capital Management L.P.	Eagle Asset Management Inc.
Highfields Capital Management L.P.	EOS Partners L.P.
Highbridge Capital Management LLC	EGS Partners L.L.C.
Hermes Fund Managers Limited	EBF & Associates L.P.
Henderson Global Investors Ltd.	E.S. Barr & Company
Hellman Jordan Management Company Inc.	Double Alpha Group Inc.
Heartland Advisors Inc.	Dickstein Partners Inc.
Harvest Management LLC	Dexia Asset Management Belgium S.A.
Handelsbanken Asset Management	Deutsche Asset Management Americas
Halbis Capital Management (UK) Limited	Deltec Asset Management L.L.C.
HHH Asset Management LLC	Delta Asset Management LLC
Gruber & McBaune Capital Management L.L.C.	Dawson-Herman Capital Management Inc.
GrissantiBrowna&Partners LLC	Davidson Kempner Capital Management L.L.C.
Greenlight Capital Inc.	Dalton Greiner Hartman Maher & Co LLC
Granum Capital Management L.L.C.	DSI International Management Inc.
Grantham Mayo Van Otterloo & Co L.L.C.	DIAM Co Ltd.
Granite Capital International Group L.P.	D. E. Shaw & Co L.P.
Goodman & Company Investment Counsel	Cypress Tree Investment Management LLP
Gilder Gagnon Howe & Co. LLC	Credit Suisse Asset Management LLC (US)
George Weiss Associates Inc.	Grauer Rosenthal McHugh LLC
Gateway Investment Advisers L.L.C.	Cooper Neff Alternative Managers
Garimore Investment Management Limited	Commons Investor Services Inc.
Gardner Russo & Gardner	Columbus Circle Investors
Gabriel Capital L.P.	Columbia Partners L.L.C. Investment Management
GE Asset Management Inc.	Cohen & Steers Capital Management Inc.
Fuller & Thaler Asset Management Inc.	Cobalt Capital Management Inc.
Friedman Billings Ramsey Investment Management	Citadel Investment Group L.L.C.
Franklin Templeton Investment Management Ltd	Chilton Investment Company LLC
Franklin Street Advisors Inc.	Chartwell Investment Partners L.P.
Franklin Mutual Advisors LLC	Charter Oak Partners
Franklin Advisers Inc.	Cerberus Capital Management L.P.
Foster Dykema Cabot & Collic.	Centurion Investment Group L.P.
Fortis Investments France	Centurion Counsel Inc.
Fortis Investments (Nederland)	Cedar Hill Associates Inc.
Formula Growth Ltd.	Cazenove Capital Management Limited
First State Investments (UK) Ltd.	Caxton Associates L.L.C.
First Quadrant L.P.	Catalyst Investment Management Co L.L.C.
First Pacific Advisors LLC	Carlson Capital L.P.
Fiduciary Asset Management LLC	Capital Partnership
Falcon Point Capital LLC	Capital Counsel LLC
Falcon Fund Management Ltd.	Caupon Capital Advisors LLC
Fairview Capital Investment Management L.L.C.	Cambiar Investors LLC
FSI Group Inc.	Calamos Advisors LLC
F&C Asset Management plc	CIInvestments Inc.
Essex Investment Management Company LLC	Buckingham Capital Management Inc.
Elliott International Capital Advisors Inc.	Buchanan Parker Asset Management
Edgewood Management LLC	Britcoleur Capital Management L.L.C.
Brahman Capital Corp.	Brahman Capital Corp.
Bowman Capital Management L.L.C.	Bowman Capital Management L.L.C.
Boston Provident L.P.	Boston Provident L.P.
Black Rock Investment Management (UK) Ltd.	Black Rock Investment Management (UK) Ltd.
Black Rock HPB Management L.L.C.	Black Rock HPB Management L.L.C.
Black Rock Financial Management (Value)	Black Rock Financial Management (Value)
Bhivni Associates Inc.	Bhivni Associates Inc.
Bentley Capital Management Inc.	Bentley Capital Management Inc.
Benchmark Capital Advisors Inc.	Benchmark Capital Advisors Inc.
Bel Air Investment Advisors LLC	Bel Air Investment Advisors LLC
Bedford Oak Advisors L.L.C.	Bedford Oak Advisors L.L.C.
Bear Stearns Asset Management Inc.	Bear Stearns Asset Management Inc.
Beach Investment Counsel Inc.	Beach Investment Counsel Inc.
Batterymarch Financial Management Inc.	Batterymarch Financial Management Inc.
Basswood Partners L.L.C.	Basswood Partners L.L.C.
Baring Asset Management Asia Ltd.	Baring Asset Management Asia Ltd.
Baldwin Brothers Inc.	Baldwin Brothers Inc.
Baker Nye Advisors Inc.	Baker Nye Advisors Inc.
Balson Capital Management LLC	Balson Capital Management LLC
BKF Asset Management Inc.	BKF Asset Management Inc.
Aviva Investors Global Services Limited	Aviva Investors Global Services Limited
Avery Capital Management LLC	Avery Capital Management LLC
Atticus Capital L.P.	Atticus Capital L.P.
Atlantic Trust Private Wealth Management	Atlantic Trust Private Wealth Management
Atalanta Sosnoff Capital LLC	Atalanta Sosnoff Capital LLC
Ashford Capital Management Inc.	Ashford Capital Management Inc.
Ashburton (Jersey) Ltd.	Ashburton (Jersey) Ltd.
Arvson + Johnson + Ortiz L.P.	Arvson + Johnson + Ortiz L.P.
Arnhold& S. Bleichroeder Advisers LLC	Arnhold& S. Bleichroeder Advisers LLC
Ardsley Partners	Ardsley Partners
Appaloosa Management L.P.	Appaloosa Management L.P.
Apollo Investment Management L.P.	Apollo Investment Management L.P.
Apex Capital LLC	Apex Capital LLC
Angelo Gordon & Co L.P.	Angelo Gordon & Co L.P.
Analytic Investors LLC	Analytic Investors LLC
Alliance Bernstein L.P.	Alliance Bernstein L.P.
Alex. Brown Investment Management	Alex. Brown Investment Management
Albion Financial Group	Albion Financial Group
Advisory Research Inc.	Advisory Research Inc.
Alpern Herman & Brock Asset Management	Alpern Herman & Brock Asset Management
AXA Rosenber Investment Management LLC	AXA Rosenber Investment Management LLC
AXA Investment Managers UK Ltd.	AXA Investment Managers UK Ltd.
AXA Investment Managers Paris	AXA Investment Managers Paris
AXA Framlington Investment Management Ltd.	AXA Framlington Investment Management Ltd.
AR.AssetManagementInc.	AR.AssetManagementInc.
AG Asset Management LLC	AG Asset Management LLC
AEW Capital Management L.P.	AEW Capital Management L.P.