Perverse Incentives: the Conflict of Interest implicit in Alternative Investment Management Fees

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Abstract

Institutional fund managers, fund of fund managers, high net-worth individuals and others invest billions with alternative asset managers. These managers charge investors fees to manage their money. These fees should align the interests of managers and investors. We argue that the current fees fail in this regard. In particular, we find that by growing their assets under management, managers increase their overall revenue via their management fees but, due to capacity constraints, decrease the returns to their investors. We suggest increasing contracting flexibility to resolve this conflict of interest.

JEL:G23

Introduction

Alternative investment managers invest capital in search of yield, unfettered, across the global financial system. As such, these managers represent the paradigm of modern fund management and in a sense a test of their efficacy is a test of the efficacy of modern finance itself.

Ideally, such managers are required to deliver persistent, absolute, and large returns to their investors. To generate these returns takes rare skill and consequently investors provide managers lucrative fees for this service[1].

Are these manager's fees deserved? We believe that they are not[2]. For example, if Warren Buffet had charged typical hedge fund fees, rather than the negligible fees he does charge, he would have kept for himself $57 billion of the total $62 billion his company made for investors over 42 years[3].

In particular, we shall critique the role of management fees, which are charged in proportion to assets under management, and argue that they permit managers to focus on their own wealth maximization at the expense of their investor's. So, we believe a revision is warranted and make some suggestions[4].

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[1] Warren Buffet has commented in the Berkshire Hathaway annual general meeting (2004) that "hedge funds are distinguished not by [their manager's] abilities but by their ability to charge high fees." http://jvbruni.com/berkshire.htm

[2] Using Arnold's (1987) ethical framework we find that the fee structure creates a misalignment between the investor and the manager's interests; there is a lack of 'fit' between the fees that may be generated for managers and the rewards to investors; luck can play a role in generating fees for managers; and negative fees are not incurred by managers.

[3] John Kay, "Just Think the fees you could charge Buffet", Financial Times 11/3/2008.

[4] From the 2006 Berkshire Hathaway Annual report, http://www.berkshirehathaway.com/letters/2006ltr.pdf : "It's a lopsided system whereby 2% of your *principal* is paid each year to the manager even if he accomplishes nothing – or, for that matter, loses you a bundle....".

Managed futures, the focus of this study, are classed as alternative investments and have a similar fee structure to hedge funds: their revenue is generated from a combination of management fees, and incentive fees[5].

One might assume that to maximize revenue a manager must maximize both fee revenue streams. However, a tension exists between the two. Whilst management fees increase as a fund's assets under management (AUM) increases, capacity constraints, which erode trading profits, mean that it becomes more difficult to generate incentive fees[6]. Therefore, it is unclear if total manager revenue is a monotonically increasing function of assets under management or, if instead, there is an optimal AUM which maximizes it.

We show empirically that the former is true: as a fund's assets under management increases the combined fee revenue continues to increase too, albeit at a reduced rate. This means that, for large funds, a conflict of interest occurs, since it is easier for large managers to focus on maximising revenue for themselves by generating asset growth rather than generating large returns for their investors[7].

In this context, we re-consider the fee structure on behalf of the investor. We argue that managers of differing sizes should have different mixes of management and incentive fees. In particular, we conclude that small funds need higher management fees, because they tend to be new and need 'start-up' money; medium sized funds

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[5] Typically, 2% of the notional value of the funds under management represents the management fees and 20% of the profits (above a high water mark) represent the incentive fee.

[6]For example, see Naik et al (2007) and literature review (below).

[7] The Renaissance Medallion Fund has been suggested as a counter example to our thesis. Over a number of years it repaid all of its investors and closed the fund to external investors. Our response is to refer to a 2008 performance report http://www.mmexecutive.com/news/188874-1.html.
Whilst the Medallion fund did well (80%), Renaissance's other funds did poorly. How is this possible? Is this any coincidence given that the medallion fund has no external money? Why is Renaissance willing to forgo the management fee for its poorly performing funds in 2009? So that they may increase their AUM and charge management fees for them later? The example of closing the fund to external investors is reminiscent of Long Term Capital Management (LTCM) just prior to them getting into trouble.

should have lower management fees than small funds, but higher incentive fees. They deserve higher incentive fees because they are not capacity constrained and should be incentivized to provide good performance. They deserve some management fees too, because they allocate a portion of their limited capacity to investors. The largest funds should have no management fees and should be compensated on performance exclusively. They have virtually no capacity remaining, and therefore should no longer require management fees to entice capacity take-up. Most importantly, with no management fees they will no longer focus on increasing their revenue from management fees at the expense of returns to their investors[8].

Literature Review

To maximise a fund's revenue over time, it must maximise returns, survival and AUM (Lajbcygier, 2008). Maximizing returns and survival has been shown to be difficult (Brown et al (2001))[9]. Instead, focusing on AUM growth may be the key to revenue maximization (Lajbcygier, 2008).

However, prior literature suggests that successful funds may be reluctant to readily accept new assets, as the cost of growing could dramatically reduce future performance (Goetzmann, Ingersoll, and Ross, 2003; Ammann and Moerth, 2005).

Studies that consider decreasing returns to scale in the hedge fund / managed

[8] We need to qualify this statement: large AUM provides a multiplier effect for incentive fee revenue. The larger the AUM the larger the revenue generated from the incentive fee ceteris paribus.

[9] Brown, Goetzmann, and Park (2001) find evidence to suggest that older funds decrease their variance strategies substantially. Their study presents evidence that older managers do not utilise the asymmetric option-like payoff of the performance contract. Rather, these managers favour a lower variance strategy to enhance chances of survival, and arguably maximise the value of their managed futures business.[9] An old fund with less volatility in its strategies does not necessarily imply that total revenue decreases with fund age; revenue can be 'boosted' from management rather than incentive fees. The focus on fund age in the present context stems from the likely correlation with fund size and fund age. A reduced variance rationale may provide an alternative explanation to the capacity constraints argument: 'oldest' funds with reduced variance strategies are likely to have a degradation in incentive fees per dollar invested, just as capacity constrained firms might expect.

futures universe evidence a negative relation between managed assets and percentage returns (Harri and Brorsen, 2004; Herzberg and Mozes, 2003). Herzberg and Mozes (2003) find that smaller funds tend to out-perform large funds in terms of returns, and especially on a Sharpe ratio basis.

Following the argument presented in Goetzmann, Ingersoll, and Ross (2003), under a successful incentive scheme there should be limited incentive for 'established' managers to accept new money, due to capacity constraints[10]. This would imply that the worth of the contract for managers lies in the handsome reward provided for generating absolute returns; in other words, with the incentive fees, an idyllic alignment of interests between managers and clients occurs. Indeed they find that managers do not take on new money when they do well and that larger funds do not continue to take on new funds.

A more contemporary view of the alternative investment industry, in which widespread diminishing alphas are considered (see Naik et al (2007)), would suggest that the marginal worth of incentive fees for managers has decreased vis-à-vis management fees.

Since there is no evidence of large returns persistence in the long term, on average (Agarwal and Naik, 2000; Harri and Brorsen, 2004), and a high attrition rate among funds (i.e. low survival), growth in AUM is in reality the key fund value generator for two reasons: management fee revenue and the 'multiplier' effect on incentive fees when they are earned.

Logically large, persistent, returns should attract assets over the long run since this means investors are being rewarded. The problem with this argument is that the

[10] Capacity constraints mean that the cost of trading increase with trading volume, eroding trading profits.

existing literature provides no evidence of large, persistent returns on average (Brown et al., 1999; Agarwal and Naik, 2000).

This quandary is known as the 'asset accumulation paradox': How may we attribute long term fund growth to long-term, persistent, absolute performance when such performance does not exist? The rationality of investors who place money with managers despite their inability to outperform has been questioned (p.1270, Berk and Green (2004)).

What else may be responsible for AUM growth? Perhaps performance characteristics other than absolute returns are responsible. If relative performance drives the allocation decision, can managers generate long-term business growth by increasing managed assets as long as relative performance is maintained?

Lajbcygier (2008) finds that relative performance (with risk and a few other characteristics) is indeed vital for explaining managed futures AUM growth. This result is consistent with the view that asset growth and revenue from the management fee is the dominant value generator for managed futures not absolute return performance and incentive fee revenue.

This result is very important: it appears that the incentives embedded in the performance contract to ensure persistent, large, absolute returns for clients do not work; managers do not take full advantage of the designed incentives in the contracts, and what follows is that asset allocators do not necessarily judge managers rationally[11].

Thus the question beckons: do large managers derive more value for their fund by increasing their AUM, given that on average, the incentive fee may not be persistent or even existent over the long term? Furthermore, if managers do benefit in

[11] Often fees are paid to asset allocators by investors based on the amount of their money they 'place' with managers.

a total revenue sense by increasing AUM, is there a decrease in efficiency per dollar invested for the largest funds due to capacity constraints? If so, is there a decrease in the total revenue per dollar invested due to incentive fees declining per dollar invested?

This paper empirically examines the benefits of large asset bases to managers in terms of total fund revenue; it also attempts to gain insight into possible fee reform solutions for the industry by considering the break-down of total revenue into incentive fee revenue and management fee revenue as a function of AUM.

Hypotheses

From the extensive discussion in the literature review (above), it is unclear if revenue is a monotonically increasing function of assets under management or, if instead, there is an optimal AUM which maximizes total revenue.

The first hypothesis directly tests this:

H_1: Total revenue increases with fund size, albeit at a decreasing rate

From the discussion of manager variance reduction with age for the purposes of increasing survival (literature review and Brown et al (2001)) it is important to test:

H_2: Total revenue increases with fund age, albeit at a decreasing rate

Since dollar incentive fees and management fees are calculated as a function of AUM, a larger asset base would imply proportional increases in both incentive and management fees, ceteris paribus. The AUM acts as a revenue multiplier for both incentive and management fees. For a capacity constrained fund however, dollar incentive fees should not increase proportionally with fund size, if at all. A larger asset base will undoubtedly reduce profitability, but not necessarily eliminate dollar incentive fees. The third hypothesis tests whether dollar incentive fees increase proportionally with fund size or whether there is degradation in the rate at which incentive fees increase; consistent with a capacity argument. In other words, is the rate of increase in incentive fees per dollar invested lower for 'capacity constrained' funds?

H_3: The rate of increase in incentive fees per dollar invested is lower for larger funds compared with smaller funds

If Hypothesis 3 is validated, and management fees do indeed increase at a constant rate across the sample, then it seems logical that the proportion of total revenue due to management fees will increase with fund size. This hypothesis needs to be explicitly tested:

H_4: Proportion of total revenue due to management fees increases with fund size

Data

The Barclay Group[12], an alternative investments resources group, provides the data for this study. Each program (fund) contains important information for this study's purposes: self-reported style; specific management and incentive fees charged (typically 2% p.a. and 20%, respectively); and monthly data, including the rate of return and the AUM. Importantly, the Barclay Group provides data on surviving and non-surviving funds during our sample period; this limits the extent of any survivorship bias (see Brown et al, 2001), although does not completely eliminate it.[13] Notably, the TASS database was one of the first databases to recognise the

[12] http://www.barclaygrp.com
[13] Arguably, a fund manager will only voluntarily report his data if he expects to survive. Hence, any data in the alternative investments universe has some survivorship bias; furthermore, funds are typically brought into databases with a history (Park, 1995). Both these concepts are linked with the self-selection bias apparent in hedge fund and CTA data.

importance of maintaining defunct funds in their database, given the high attrition rate in the alternative investments industry; many data providers have since followed suit.

The present study focuses only on one style of managed futures, namely the 'systematic diversified' style, since it is the most common style in the Barclay database[14]. Indeed over their entire database history, approximately one third of all funds are systematic diversified funds.

The data used in the present study warrants several important caveats. As mentioned above, as a result of the relaxed regulatory environment that surrounds these private investment vehicles, many hedge fund and managed futures databases are not free from potential conditioning. Park's (1995) analysis of the MAR[15] data suggests that funds are typically brought into the database with a history; it is inferred that data brought into the Barclay database is likely to be similar. This conditioning has two separate implications, namely a self-selection bias[16] and survivorship bias[17]. Each bias is discussed in turn.

The survivorship bias in the final sample used in this study is further minimised by the sampling procedure outlined below. Regardless, Ackermann et al.

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[14] More broadly, the data are limited to one style. Different CTA styles have different capacity limits and difference margin requirements; the hypotheses are tested using only this one style-specific dataset. Also, due to the diverse and flexible investment options employed by CTAs, any classification into a particular 'style' is in itself spurious. Further note that certain strategies within a style may have differing capacity limits and different requirements for margin maintenance. Therefore any inferences made from the style-specific analysis to the broader CTA industry would need to be substantiated in further studies. Nevertheless, these limitations are largely unavoidable.

[15] Managed Account Reports, a competitor to both TASS and The Barclay Group

[16] Self-selection bias is created by the freedom of managers to exercise discretion as to whether they report their returns performance or not. Arguably managers may choose to only be forthcoming with their performance data when they have a good track record to reveal. As a consequence this bias is inherent in all hedge fund and CTA studies; the present study is no exception.

[17] A survivorship bias is imparted into hedge fund and CTA data if there is a requirement of history before being brought into a database. For instance, like Park (1995) notes, a survival bias is imparted if a track record is required as it implies that the fund has survived for the required track record length, while others with similar characteristics have failed. Despite The Barclay Group retaining data on live and dead funds, which reduces the survivorship bias, this alone does not entirely eliminate it, for reasons discussed above.

(1999) argue that the survival bias is de minimis and does not condition analysis substantially. However, recent findings (Fung and Hsieh, 2000 and Liang, 2000) argue that these results may be an artefact of the particular database used by Ackerman et al. (1999).

Furthermore, descriptive fund data has limitations and complications attached. Barclay's database provides percentage fee level information (e.g. 2% p.a. management fee; 20% incentive fee) for each fund. There is no guarantee that these figures are accurate and/or applied equally to accounts managed. Moreover, varying policies on high-water marks, fee allocation mechanisms, the treatment of new and existing investors, and hurdle rates complicate the incentive fee and indeed total revenue estimation process and subsequent analyses.

Despite The Barclay Group providing a 30-year history of monthly data from 1 January 1975 to 1 March 2005, very few funds are alive throughout this entire period. Thus to improve the quality of the analyses, the data are restricted; yearly individual fund fees are calculated for the most recent five-year window, from 1 January 2000 to 1 January 2005. Creating a common five-year window controls for time-varying exogenous factors that may affect strategic rate of return. Furthermore, since the majority of funds are new, most funds exist in this latest time period.

The sampling procedure used eliminates as much bias in the dataset as possible. The final sample is constructed using three sampling methodologies, primarily to eliminate any sort of survivorship bias: firstly, funds that have complete data for the entire sample period (1 Jan 2000 – 1 Jan 2005); secondly, funds that have data from 1 Jan 2000, but subsequently die before 1 Jan 2005; finally, any funds that come into existence after 1 Jan 2000, and have at least 13 months of complete data are included in the final sample. At least 13 months of data are required for each fund so that at least 1 full year of revenue can be estimated using the technique outlined in the research method.

It is important to include these last two sorting techniques, given the high attrition rate in managed futures data. If the final sample only included funds that survive the entire 5-year sample period, the sample would be severely biased. Specifically, a survival bias would be inherent in any findings or conclusions drawn from the subsequent analysis, a common problem in hedge fund studies given the lack of regulation in the industry.

Specific managed futures data are collected: monthly performance data for each managed futures included the sample period; amount of AUM each month; a proxy for fund age; and specific percentage fees charged by each fund.

Furthermore, in order to differentiate between more established and less established funds, two proxies are calculated:

ave_aum ~ average funds under management during the year of revenue calculation

month_id[18] ~ age of the fund data in the database;

The treatment of outliers in the present study is approached very conservatively. Since each yearly estimate corresponds to genuine managed futures data in the Barclay database, it is spurious to use an automatic method of screening outliers, e.g. 'windsoring' the dataset. Fee estimates are eliminated under one exception: where the average AUM of a fund over the year estimated is equal to zero. This highlights an erroneous record by the manager or the database itself. The manager has presumably been forthcoming with returns figures but not with amount

[18] The metric month_id is used as a proxy for fund age. To calculate this variable it is assumed that the first piece of returns data for a particular fund in the entire dataset is its first month of operation. For instance, if a given fund's first returns data are reported on 01/01/1996, then at the start of the sample period (i.e. 01/01/2000) this fund will have a month_id of 49.

of managed assets. Over the entire 5-year sample period, 19 out of 1261 fund-years are eliminated from the sample due to zero average AUM.

Although it is tempting to improve the specification of the regressions by deleting funds with dollar fees equal to zero (whether it be total revenue, incentive fees, or management fees), the intention of the paper is such that any policy argument for fee reform would be weakened if these genuine fee estimates were excluded from analysis. A plausible criticism would be that by eliminating these yearly fee estimates for some funds, the analysis would be conducted only on the most profitable funds. It is important for these estimates to remain in the final sample as it is genuinely possible for a fund to accrue zero total revenue over a period of a year; this does however mean that the fixed management fee must be 0% p.a. and the fund must not provide any returns over the previous high water mark.

Research Method

Some simplifying assumptions are inevitable to estimate management and incentive fees for each fund. Firstly, it is assumed that each program (fund) represents one trading account; unlike hedge funds that pool investments, each managed futures program likely manages a large number of accounts, all with different realised returns and asset bases. Installing the fundamental assumption that each fund represents one trading account allows for estimation of dollar revenues for each fund. This estimation is possible with the available data, namely management fees, incentive fees, monthly returns data and monthly net-of-fees AUM data.

Furthermore, the returns data reported by managers is an average return across all accounts managed by the fund. Given the nature of these vehicles[19], some accounts within a single fund will be more profitable than others, depending on when their

[19] CTA set heavily leveraged positions using a variety of derivatives contracts.

relative positions in derivatives markets are set and what positions are held. Although minor, note also that fees payable on nominal equity are used since the actual dollars used (and leverage multiplier) is not available[20].

Lastly, the analysis is couched in terms of yearly fees due to the significant lockup periods that exist in the managed futures universe. Highly sought after managers are likely to require investment for at least 12 months, thus it makes most sense to offer yearly analyses. Additionally, the analysis is strengthened, particular for incentive fee inferences; using yearly fees (rather than quarterly) there is significantly less zero dollar estimates, essentially reducing the noise in the estimates.

The management agreement provides for a monthly management fee to be paid from the client's account regardless of whether the account is profitable. From the outset, it is important to consider several important points: AUM data are reported as a net-of-fees figure (i.e. it is the sum of each accounts' net asset value after the management fee and incentive fee, if applicable, have been deducted); AUM data are reported on the 1st of each month; furthermore, it is rounded up to the nearest $100,000; finally the monthly management fee for any fund is equal to 1/12th of the specified yearly management fee (e.g. .02/12).

Importantly, since the monthly management fee in dollar terms is estimated at the end of the month, payable quarterly, the net-of-fees AUM data for the following month is required in the estimation procedure, due to the reporting date. Management fees are estimated for each month in the sample period, excluding 01/01/2005, using the following equation:

$$mgt_t = [fum_{t+1} / (1- mf)] - fum_{t+1} \qquad (1)$$

where,

[20] This shortcoming is common to all datasets, not just the Barclay Group database.

mf is the monthly management fee charged by the particular fund, e.g. 2%/12

mgt_t is the dollar management fee estimate for that period

fum_{t+1} is the following monthly net-of-fees aum, reported on the first of that month

The yearly dollar management fees used in testing the hypotheses is simply the sum of the 12 estimates over that period for that fund.

The management agreement provides for a quarterly performance/incentive fee to be paid on the 'new' trading profits of the client's nominal account value during each calendar quarter. Importantly, The calculation takes place on the 1st of January, April, July, and October, using the following equation:

$$fum_t + mgt_{t-1} + inc_{t-1} = [fum_t / (1- (mf/12))] + [if \times max(0,cr_t-max(cr_{t-n})) \times fum_t] \quad (2)$$

where,

$[fum_t / (1- (mf/12))]$ is the net-of-fees AUM plus the management fee

if is the percentage incentive fee, e.g. 20%

cr_t is the current level of cumulative return of the account

cr_{t-n} is the prior cumulative returns levels recorded at quarterly intervals; n must be a multiple of 3 (due to quarterly 'high water marking')

$max(0,cr_t-max(cr_{t-n}))$ determines whether there are any realised trading profits over any prior maximum cumulative return levels of the account[21]

The quarterly incentive fee is calculated by $[if \times max(0,cr_t-max(cr_{t-n})) \times fum_t]$. For instance, 20% x 0.3 trading profit per dollar invested x amount of AUM. The yearly incentive fee is the sum of the incentive fees payable over the four quarterly periods.

[21] In other words, this determines whether an incentive fee is payable over the quarter or not.

Prior returns-based studies use piecewise linear regression methods to greatly reduce the error of simple linear regression and improve the analyses. It is particularly useful in regards to managed futures, as typically the scalability of trading technologies differs depends on how many commodities contracts are being traded, for instance. It is not uncommon to believe a variable x predicts a variable y differently over certain ranges of x. It is proposed in this study that more established funds use invested capital of clients differently than other funds; it is plausible that they set lower variance strategies and that they operate under capacity constraints within their own strategies and in the broader marketplace.

As such, the relation between fees and fund size or fund age is expected to differ for these ‘established’ funds. A piecewise OLS regression approach is taken to test the hypotheses of the study. To test the hypotheses, two adjoined lines are fitted to the data: one line defines the relationship of y and x for $x > c$ (i.e. established funds sorted on size or age) and the other line defines the relationship for $x \leq c$ (i.e. the remaining sample).

Hypothesis 1 is tested by regressing the yearly total revenues (rev_i) on a constant and the average amount of AUM for that fund-year (ave_aum_i). For the sake of robustness, two regressions are always estimated. The first divides the data into quintiles by AUM and compares Q5 with Q1-4; the second divide about the median AUM.

$$rev_i = \alpha + \beta \; ave\_aum_i + \varepsilon_i \qquad (3)$$

For the hypothesis to hold under a capacity constraint rationale the coefficient on fund size (β) should be positive and statistically significantly different to zero for both piecewise regressions. Furthermore, the coefficient of the upper partitioned x values should be significantly lower than the coefficient of the regression on the lower partitioned x values, consistent with a capacity rationale.

Hypothesis 2 is tested similarly, by regressing yearly total rev (rev_i) on a constant and the month_id of the fund. Like hypothesis 1, two regressions are estimated in each instance. Note that for robustness, the regressions are estimated over each year in the 5-year sample period, as well as in aggregate, and results compared.

$$rev_i = \alpha + \beta \; month\_id_i + \varepsilon_i \qquad (4)$$

For the hypothesis to be confirmed, the coefficient (β) on fund age should be positive and statistically significantly different to zero for both piecewise regressions. Furthermore, the coefficient of the upper partitioned x values should be significantly lower than the coefficient of the regression on the lower partitioned x values to isolate the effects of lower variance strategies on profitability.

The third hypothesis is tested in a similar way as hypothesis 1, changing only the dependent variable in the piecewise regressions to indicate incentive fee revenue. It is designed to isolate any decrease in total revenue per dollar invested to the incentive fee portion of revenue. If confirmed that any decreased rate of total revenue is principally driven by a decreasing rate of incentive fees, this would suggest that large funds derive a relatively larger portion of their total revenue from fixed management fees (hypothesis 4). Furthermore, it would be evidence that these funds utilize capital invested differently to smaller funds, and as such ought to be engaged under more flexible performance contracts that align investor interests with managerial incentives more closely.

The conjecture that fund size has different effects on fund performance motivates several studies to consider the relation between fund returns and AUM. The crucial idea of the estimation method utilised in this study is that considering dollar fees payable to managers will offer greater insight into managerial motivation/incentives than purely returns-based studies[22].

Results and Discussion

Table 1 provides the descriptive statistics for fund size, fund age, and the percentage and dollar fees of the 'systematic diversified' funds examined in aggregate. The aggregate sample is split into quintiles and summary statistics provided for each quintile; the characteristics of the percentage management fees and percentage incentive fees across the sample are of particular interest.

TABLE 1 – *Descriptive Statistics (extract)*

	Q1	Q2	Q3	Q4	Q5
mgt fee (%)					
Mean	2.489	2.533	2.496	2.542	2.313
Median	2	2	2	2	2
Std Dev	0.935	1.090	1.076	1.107	0.923
perf fee (%)					
Mean	20.396	20.472	20.413	21.042	20.889
Median	20	20	20	20	20
Std Dev	3.126	2.354	4.112	2.611	2.318
ave_aum ($000)					
Mean	646.451	3092.599	12070.897	43089.600	337510.560
Median	516.667	2856.751	11495	42223.750	220394.581
Std Dev	435.522	1130.884	4679.696	15670.134	353983.403

There appears to be a uniform application of percentage incentive fees across the industry, regardless of quintile. For instance, the incentive fee (%) charged by managers across the sample has a median and mean very close to 20 percent in each quintile, as well as a relatively small standard deviation of approximately 3. This

[22] Importantly, the vast majority of papers study this relation based on simple linear or piecewise linear regression methods, with other related factors as control variables when considering a cross-section of strategies. In contrast, the present study principally considers the relation between fund size with dollar total revenue for one strategy of commodity trading advisor. The control variables utilised in prior studies add little to the style-specific analyses in this instance.

suggests that regardless of the size of fund, clients tend to pay the same percentage of realised profits to the managers. This is consistent with prior studies (Kat, 2003; Lee, Lwi, and Phoon, 2004; Goetzmann et al, 2003) that imply little contracting flexibility within the alternative investments industry[23].

Furthermore, the percentage management fees applied across the sample have a consistent median across quintiles of 2 percent. Unlike incentive fees, however, the mean management fees (%) in each quintile suggest a greater degree of flexibility. Particularly, there appears to be a lower management fee (%) charged for the upper and lower most quintiles; in the context of this thesis, this suggests some recognition by managers and investors alike that the benefits of investing in managed futures in these quintiles may not justify a high regular fee level, if any. This flexibility in the contracting process could potentially be explained by want of a track record for 'small' funds and the possibility of capacity constraints for 'large' funds.

An important feature of the data is the exponential growth in average assets under management across AUM quintiles. For instance, the mean ave_aum ($000) of Q5 is substantially larger than Q4; Figure 1 illustrates this exponential relation.

[23] There is a concern that any fee flexibility may signal manager quality to investors. Whilst true, there is an element of fee flexibility in the system to-day which are not published. For example, often clients will want a management fee waiver.

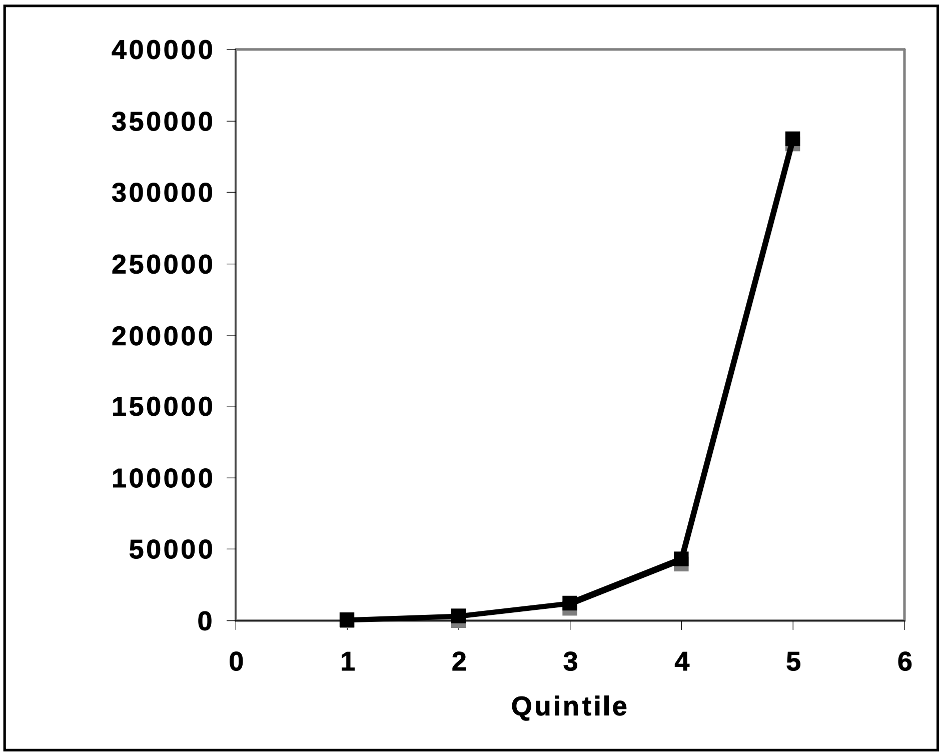

Figure 1: Mean of the average assets under management ($000) for each quintile

Figure 1 highlights that Q5 funds on average are substantially bigger than the other four quintiles. In the context of this study, these funds are much more likely to be capacity constrained. Indeed the nature of the capacity constraint from Figure 1 would suggest a non-linear step function, whereby small firms are not affected at all, whilst the largest firms are severely affected by capacity constraints. Consistent with this point of view, the subsequent analysis principally compares Q5 funds with Q1-4 funds in an attempt to capture the effects of the likely capacity constraints.

The key question that we attempt to answer here is: if we consider total revenue as a function of AUM, will total revenue always grow as assets grow or will there be some maximum AUM after which revenue will diminish due to either capacity constraints, variance reduction strategies or some other cause?

Capacity constraints mean that a manager's total revenue is reduced as AUM increases (beyond some threshold). This is because large trading volume associated with large AUM adversely impacts market prices and erodes trading profits. The regression estimates of Equation (3) in Table 2, Panel A reveal evidence to reconcile the seemingly conflicting statements above; the uppermost quintile funds (i.e. those most likely to be capacity constrained) generate larger total revenue but at a diminished rate per dollar invested than the remaining smaller funds. This suggests that for large funds, management fee increases dominate incentive fee decreases and thus total revenue still grows (albeit at a slower rate per dollar invested).

Figure 2 illustrates the rate of change of total revenue per dollar invested with the upper quintile partitioned. These results validate Hypothesis 1 and at least appears consistent with prior literature; the largest firms are most likely going to feel a reduction in returns (and hence the incentive fees portion of total revenue payable) due to capacity constraints.

At first instance it may seem that these findings are to be expected, given that both management fees and incentive fees are calculated as functions of AUM. That is, AUM magnifies both fees. However, the relevant literature often posits that managers have a strong incentive to resist growth in fear of future performance reduction; however, we must note that future performance only affects incentive fees, not necessarily the total revenue of the fund. Ultimately all that a manager cares about is maximising her total revenue.

Table 3, Panel A presents piecewise linear regression estimates utilising Equation (3) for each year of the sample period and in aggregate across the entire sample, funds partitioned about the median. The results show unequivocally that a fund with a larger asset base has larger total revenue, with positive coefficients (β) for ave_aum in each instance that are statistically significantly different to zero at the 1% level. Of course, an important point of issue is where the data are partitioned; in other words, how large (or how old, see below) must a fund be to be classified as a fund most likely susceptible to capacity constraints. We noted in Figure 1 that the Q5 AUM was substantially larger than Q1-Q4. Table 3, Panel A demonstrates that the above result is robust when each cross-section is partitioned about the median, as opposed to partitioning the upper most quintile (Table 2, panel A).

Furthermore, the rate (β) at which revenue increases per dollar invested for the large funds is significantly lower to the rate of increase for relatively smaller funds. This suggests that large funds are significantly less efficient in generating revenue per dollar invested; consistent with hypothesis 1. This result is robust across each year in the sample, excluding 2003. Indeed in aggregate across all years in the sample, the rate of increase is also lower for large funds, significant at the 1% level using one-tailed t-tests.[24]

A tentative conclusion may be drawn that large funds experience a decline in the rate of incentive fees (perhaps due to capacity constraints) but maintain a constant rate of change for management fees, which explains the lower, although still persisting positive gradient in the uppermost quintile, shown in Figure 2. In other words, the decreased rate (of revenue per dollar of AUM) is due to incentive fee degradation. Following this argument, one might infer the proportion of total revenue due to management fees is higher for large funds. It is necessary to test this conclusion explicitly, as it is at least plausible that larger funds charge low or even zero management fees so as to attract more AUM to their funds. Thus the diminished rate of change we observe may occur due to a combination of reduced dollar management fees and reduced incentive fees. The inference that there is greater

[24] The null for these t-tests are that the rate at which revenue increases per dollar invested is the same across large and small firms.

reliance on the fixed management fee as a revenue generator for large managers vis-à-vis small managers must be substantiated.

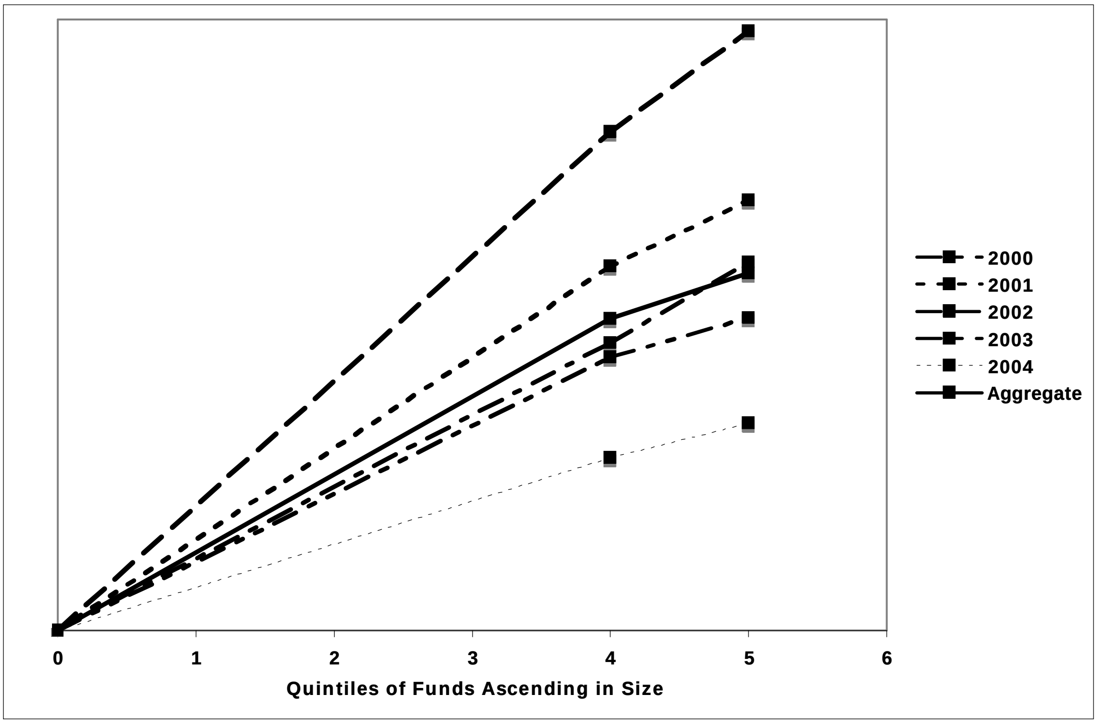

Figure 2: Rate of change in total revenue per dollar invested when comparing Q1-4 and Q5 funds separately

Subsequent analyses aside, the positive coefficients attached to the independent variable in each instance are important findings and have substantial implications. Principally, the result suggests that even for established managers facing ever-growing capacity concerns; on average, larger funds generate larger dollar revenues. This result lends support to the idea that the amount of AUM is the key fund value generator for the manager, not absolute return generation; it adds intuitive strength to his model for asset growth. Taking these results at face value would suggest a strong incentive for entrepreneurial managers to increase AUM despite degradation in incentive fee revenue due to the return degradation caused by capacity constraints.

TABLE 2

Piecewise Regression (Total Revenue), Upper Quintile Funds Partitioned

Panel A: Proxy for establishment, average assets under management for a fund in a year (ave_aum)

	2000		2001		2002		2003		2004		Aggregate	
	Q1-Q4	Q5	Q1-Q4	Q5	Q1-Q4	Q5	Q1-Q4	Q5	Q1-Q4	Q5	Q1-Q4	Q5
intercept	38.558	2395.42**	-51.554	1601.203	-53.996	-419.900	192.246	-2224.060	211.195	1951.888	71.605	4571.621***
	(0.648)	(2.217)	(-0.663)	(1.024)	(-0.260)	(-0.1122)	(1.196)	(-0.5671)	(1.010)	(0.640)	(1.059)	(13.938)
ave_aum	0.057***	0.033***	0.076***	0.055***	0.104***	0.084***	0.060***	0.067***	0.036***	0.029***	0.065***	0.038***
	(14.122)	(5.591)	(16.404)	(8.514)	(10.020)	(6.7831)	(11.731)	(8.8427)	(10.827)	(8.768)	(22.806)	(12.938)
t-statistic	-4.11***		-3.176***		-1.641*		0.967		-2.239**		-9.683***	
no. of obs	202	50	197	50	210	53	211	52	169	42	989	247
R^2 (%)	49.93	39.44	57.98	60.16	32.56	47.43	39.70	61.00	41.25	65.78	34.51	44.23

Table 2, Panel A reports piecewise regression results of Eq (3) where the dependant variable is estimated total revenue calculated over a year. The independent variable is average assets under management for that year. Funds are classified into quintiles on the basis of ascending ave_aum of the fund. The t-stats in parentheses test whether Ho:$\beta_i = 0$ versus H1$\beta_i \neq 0$. The t-statistic between Q1-4 funds and Q5 funds is a 1-sided test, testing Ho:$\beta_{Q5} \geq \beta_{Q1\text{-}4\ Q5}$ versus H1:$\beta_{Q5} < \beta_{Q1\text{-}4.}$ *,**,*** indicate rejection of Ho at the 10%, 5%, and 1% significance levels, respectively.

TABLE 3

Piecewise Regression (Total Revenue), Above Median Funds Partitioned

Panel A: Proxy for establishment, average assets under management for a fund in a year (ave_aum)

	2000		2001		2002		2003		2004		Aggregate	
	Small	Large	Small	Large	Small	Large	Small	Large	Small	Large	Small	Large
intercept	12.420	897.777***	-33.274	-252.661	-40.482	303.348	-40.874	-292.925	64.919	1098.044	-18.040	1922.497***
	(0.844)	(2.638)	(-1.584)	(-0.576)	(-1.193)	(0.253)	(-0.437)	(-0.248)	(0.319)	(1.206)	(-0.988)	(4.177)
ave_aum	0.045***	0.039***	0.076***	0.071***	0.104***	0.082***	0.087***	0.064***	0.045***	0.030***	0.073***	0.042***
	(8.898)	(13.447)	(11.262)	(21.949)	(9.933)	(13.297)	(5.420)	(17.818)	(2.647)	(19.237)	(16.882)	(28.103)
t-stat	-1.947**		-1.545*		-3.651***		-6.320***		-9.874***		-20.936***	
no. of obs	126	126	124	123	132	131	132	131	106	105	618	618
R^2 (%)	38.97	59.32	50.97	79.93	43.15	57.81	18.43	71.10	6.31	78.23	31.63	56.18

Table 3, Panel A reports piecewise regression results of Eq (3) where the dependant variable is estimated total revenue calculated over a year. The independent variable is average assets under management for that year. Funds are classified as large if the ave_aum of the fund is above the median ave_aum of the sample.The t-stats in parentheses test whether Ho:$\beta_i = 0$ versus H1$\beta_i \neq 0$. The t-statistic between 'Small' funds and 'Large' funds is a 1-sided test, testing Ho:$\beta_{Small} \geq \beta_{Large}$ versus H1:$\beta_{Small} < \beta_{Large}$ *,**,*** indicate rejection of Ho at the 10%, 5%, and 1% significance levels, respectively.

Brown, Goetzmann, and Park (2001) find evidence to suggest that older funds decrease their variance strategies substantially. They note that managers do not utilise the asymmetric option-like payoff of the performance contract, instead favouring a lower variance strategy to enhance chances of survival and optimize management fee revenue so as to maximise the value of their managed futures business.[25]

An old fund with less volatility in its returns does not necessarily imply that total revenue decreases with fund age. The larger AUM of older funds may act as a revenue 'multiplier', generating larger incentive and/or management fee revenue. Table 2, Panel B presents piecewise regression estimates for Equation (4), which reveals in each instance a positive coefficient attached to the age variable (i.e. month_id). Thus, although the 'oldest' funds may have reduced variance strategies, their total revenue may be larger compared with relatively 'younger' funds.

There appears to be a reduction in the rate of revenue increase when the sample is sorted on fund age in aggregate but not on a yearly basis; 4 of the 5 yearly estimates of gradient in the piece-wise linear regressions (see Table 2, Panel B) are either not significantly lower for the oldest quintile, or only significantly lower at the 10% level using a 1-sided t-test. In aggregate, we can reject Ho:$\beta_{Q5} \geq \beta_{Q1\text{-}4}$ at the 1% level for the uppermost quintile estimate; consistent with hypothesis 2. This aggregate result is robust against median partitioning of the data by age.[26]

The interpretation of the effects of fund age on total revenue is not as clear as those by fund size; nor does it offer a superior specification; Equation (4) regressions do not have nearly as much explanatory power as Equation (3) regression estimates.[27]

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[25] Analytically, an option contract can be shown to increases in relative value with increased volatility.
[26] See Table 3, Panel B.
[27] R^2 values are consistently lower for regression using month_id to explain fees, rather than ave_aum. In other words, regressions based on equation (3) consistently trump regressions based on equation (4) in terms of explanatory power.

Given this result, the specific dollar management and incentive fee analysis below considers fund size exclusively. Although fund age is considered in the literature by Brown et al. (2001), fund size is arguably a better way to couch the analysis, both statistically speaking and logically, given the direct link to the calculation of fees payable to managers.

It is important to determine the source of the decreased rate of revenue increase for the larger funds (i.e. the lower positive gradient illustrated in the last quintile in Figure 2 and shown with statistically lower Q5 βs in Tables 2 and 3). We attempt to explore this decreased rate of revenue by focusing on revenue generated from incentive fees rather than total revenue.

Table 4, Panel A and Table 5, Panel A presents regression estimates for dollar incentive fees (instead of total fees) against average AUM. The estimates in Table 4 are for Q5 funds versus Q1-4 funds (ordered by AUM), whereas Table 5 presents estimates for funds partitioned about the median average AUM. In aggregate, the results across both tables are consistent with Hypothesis 1. In each instance there is evidence of a reduction in β at the 1% significance level in the rate at which incentive fees increase per dollar invested. Partitioning about the median offers more robust results, with evidence of a rate reduction at the 1% significance level for each year in the sample between 'large' and 'small' funds. We note that the interpretation is clearer for the median split (Table 5, Panel A) than for the quintile split (Table 4, Panel A). For Q5 in Table 4, Panel A we can reject the null hypothesis at 1% significance level for only two out of five years. However, for the median partitioning of funds we can reject the null hypothesis for all five years (Table 5, Panel A). This result contradicts our intuition that the largest AUM funds are most severely capacity constrained. We have no simple explanation.

TABLE 2 - *continued*

Piecewise Regression (Total Revenue), Upper Quintile Funds Partitioned

Panel B: Proxy for establishment, age of fund in months (month_id)

	2000		2001		2002		2003		2004		Aggregate	
	Q1-Q4	Q5	Q1-Q4	Q5	Q1-Q4	Q5	Q1-Q4	Q5	Q1-Q4	Q5	Q1-Q4	Q5
intercept	27.790	584.093	422.148	4867.872	-71.583	4470.513	-103.576	10754.036	1337.125	3365.187	101.641	5008.913
	(0.072)	(0.190)	(0.553)	(0.949)	(-0.044)	(0.601)	(-0.061)	(0.924)	(0.741)	(0.351)	(0.168)	(1.394)
month_id	29.381***	18.984	37.105***	2.688	82.935***	18.891	87.970***	8.158	57.461**	25.103	62.337***	15.556
	(4.227)	(17.613)	(2.854)	(0.096)	(2.996)	(0.484)	(3.187)	(0.137)	(2.554)	(0.572)	(6.376)	(0.836)
t-stat	-2.072**		-1.233		-1.641*		-1.343*		-0.738		-2.513***	
no. of obs	202	50	197	50	210	53	211	52	169	42	989	247
R^2 (%)	8.20	2.36	3.99	0.02	4.14	0.46	4.64	0.04	3.76	0.81	3.96	0.28

Table 2, Panel B reports piecewise regression results of Eq (4) where the dependant variable is estimated total revenue calculated over a year. The independent variable is fund age (month_id). Funds are classified into quintiles on the basis of ascending month_id of the fund. The t-stats in parentheses test whether Ho:$\beta_i = 0$ versus H1$\beta_i \neq 0$. The t-statistic between Q1-4 funds and Q5 funds is a 1-sided test, testing Ho:$\beta_{Q5} \geq \beta_{Q1\text{-}4}$ versus H1:$\beta_{Q5} < \beta_{Q1\text{-}4.}$ *,**,*** indicate rejection of Ho at the 10%, 5%, and 1% significance levels, respectively.

TABLE 3 - *continued*

Piecewise Regression (Total Revenue), Above Median Funds Partitioned

Panel B: Proxy for establishment, age of fund in months (month_id)

	2000		2001		2002		2003		2004		Aggregate	
	Young	Old	Young	Old	Young	Old	Young	Old	Young	Old	Young	Old
intercept	59.162	1262.530	-535.686	2534.372	-1890.789	4306.046*	818.991	6565.040	-419.450	7172.910*	-284.797	4362.721***
	(0.194)	(1.241)	(-0.581)	(1.470)	(-0.728)	(1.752)	(0.847)	(1.570)	(-0.218)	(1.847)	(-0.440)	(3.275)
month_id	25.061**	15.267*	68.511**	14.085	156.873*	21.449	41.557	26.834	95.014**	7.332	69.246***	18.346*
	(2.551)	(1.902)	(2.509)	(1.093)	(1.962)	(1.202)	(1.497)	(0.908)	(2.449)	(0.310)	(3.745)	(1.938)
t-stat	-1.768**		-4.222***		-7.587***		-0.498		-3.708***		-5.378***	
no. of obs	126	126	124	123	132	131	132	131	106	105	618	618
R^2 (%)	4.99	2.84	4.91		2.90	1.10	1.70	0.63	5.45	0.09	2.23	6.06

Table 2, Panel B reports piecewise regression results of Eq (4) where the dependant variable is estimated total revenue calculated over a year. The independent variable is fund age (month_id). Funds are classified as old where the month_id of the fund is above the median month_id in the corresponding year. The t-stats in parentheses test whether Ho:$\beta_i = 0$ versus H1$\beta_i \neq 0$. The t-statistic between Old and Young funds is a 1-sided test, testing Ho:$\beta_{Old} \geq \beta_{Young}$ versus H1:$\beta_{Old} < \beta_{Young.}$ *,**,*** indicate rejection of Ho at the 10%, 5%, and 1% significance levels, respectively.

Note the similarities of these incentive fee revenue estimates to the total revenue estimates; each coefficient remains positive and statistically significantly different to zero, meaning that actual dollar incentive fees continue to increase with fund size, albeit at a decreased rate[28]. This is consistent with a capacity argument.[29]

Given this evidence, the reduction in the total revenue rate per dollar invested, for large funds observed in Table 2 and 3, can at least partly be explained by a reduction in dollar incentive fees per AUM dollar invested. Notably, although this evidence is consistent with a capacity constraint argument, it is also consistent with literature that suggests that larger funds set lower variance strategies, to maximise survival in the industry (Brown et al. 1999; Brown et al., 2001). Under this rationale, large funds effectively reduce the chance of large returns, in favour of consistent returns, in order to increase the odds of survival in this high attrition industry.[30] In either instance, the capital is used less effectively in larger funds, and motivates fee level reform.

Stated previously, it is at least plausible that ‘large’ funds may charge smaller management fees, say 1% p.a. compared with 2% p.a. in order to attract client money to their arguably ‘constrained’ and ‘less volatile’ strategies.

We have considered how AUM affects incentives fees, but we haven’t done the same for management fees. Tables 6 & 7, Panel A provides this management fee information. Table 7, Panel A, highlights that the rate at which management fees grow per AUM dollar invested is constant (i.e. static) when the sample is partitioned about median asset under managements; the coefficient attached to the size variable for ‘large’ funds is not significantly lower than that of ‘small’ funds (apart from

[28] We can reject Ho:β=0, at 1% significance for all years apart from 2003 (Table 4, Panel A).
[29] See Gregoriou and Rouah, 2001.
[30] See Literature review

2004). This means that reduced management fees cannot be responsible for reduced revenue by large funds.

However, an unexpected result found in Table 6, Panel A is that there is a significant decline in management fees between the first four quintiles and the last. In other words, the uppermost funds by assets under management charge a lower fixed management fee on average (i.e. an average of 2.3% p.a. for largest quintile funds compared with 2.5% p.a. for remaining funds in the sample). This is an important finding, as it shows that the rate of change in total revenue for large funds is due partly to a decreased rate of management fees per AUM dollar invested along with the aforementioned decreased rate of incentive fees per AUM dollar invested. The fact that larger funds charge a lower fixed management fee per dollar invested suggests that the industry is self-regulating; clients are demanding marginally smaller fixed regular fees if a fund manages an amount of assets which is likely to disadvantage the fund's, and hence, clients' returns performance.

TABLE 4

Piecewise Regression (Dollar Incentive fee), Upper Quintile Funds Partitioned

Panel A: Proxy for establishment, average assets under management for a fund in a year (ave_aum)

	2000		2001		2002		2003		2004		Aggregate	
	Q1-Q4	Q5	Q1-Q4	Q5	Q1-Q4	Q5	Q1-Q4	Q5	Q1-Q4	Q5	Q1-Q4	Q5
intercept	62.799	1953.775*	10.194	-1533.928	-26.158	-449.724	201.948	-2168.872	235.287	2474.514	97.053	4726.482***
	(1.044)	(1.940)	(0.134)	(-1.147)	(-0.129)	(-0.125)	(1.297)	(-0.560)	(1.193)	(0.766)	(1.471)	(3.550)
ave_aum	0.0323***	0.013**	0.045***	0.0533***	0.078***	0.061***	0.037	0.045	0.013***	0.005	0.040***	0.015***
	(7.852)	(2.309)	(10.204)	(8.441)	(7.694)	(5.150)	(7.500)	(5.972)	(4.030)	(1.426)	(12.295)	(5.444)
t-stat	-3.542***		-		-1.442*		-		-2.224**		-9.064***	
no. of obs	202	50	198	49	210	53	211	52	169	42	989	247
R^2 (%)	23.56	10.00	34.70	60.25	22.16	34.20	21.21	41.64	8.86	48.39	17.15	10.79

Table 4, Panel A reports piecewise regression results of Eq (3) where the dependant variable is estimated dollar incentive fees calculated over a year. The independent variable is average assets under management for that year. Funds are classified into quintiles on the basis of ascending ave_aum of the fund. The t-stats in parentheses test whether Ho:$\beta_i = 0$ versus H1$\beta_i \neq 0$. The t-statistic between Q1-4 funds and Q5 funds is a 1-sided test, testing Ho:$\beta_{Q5} \geq \beta_{Q1\text{-}4\ Q5}$ versus H1:$\beta_{Q5} < \beta_{Q1\text{-}4.}$ *,**,*** indicate rejection of Ho at the 10%, 5%, and 1% significance levels, respectively.

TABLE 5

Piecewise Regression (Dollar Incentive fee), Above Median Funds Partitioned

Panel A: Proxy for establishment, average assets under management for a fund in a year (ave_aum)

	2000		2001		2002		2003		2004		Aggregate	
	Small	Large	Small	Large	Small	Large	Small	Large	Small	Large	Small	Large
intercept	16.153	784.433**	-32.302	-351.679	-31.333	268.241	-30.225	-293.880	101.051	1250.835	-13.109	1942.472***
	(1.143)	(2.475)	(-1.606)	(-0.854)	(-0.952)	(0.232)	(-0.345)	(-0.252)	(0.499)	(1.313)	(-0.761)	(4.235)
ave_aum	0.025***	0.018***	0.058***	0.049***	0.082***	0.059***	0.065***	0.042***	0.045	0.006***	0.052***	0.019***
	(5.070)	(6.450)	(8.978)	(16.103)	(8.020)	(10.005)	(4.301)	(11.794)	(1.039)	(3.738)	(12.859)	(12.565)
t-stat	-2.596***		-2.989***		-3.772***		-6.369***		-7.125***		-22.822***	
no. of obs	126	126	124	123	132	131	132	131	106	105	618	618
R^2 (%)	17.17	25.12	39.79	68.18	33.10	43.69	12.45	51.88	1.03	11.94	21.16	20.40

Table 5, Panel A reports piecewise regression results of Eq (3) where the dependant variable is estimated dollar incentive fees calculated over a year. The independent variable is average assets under management for that year. Funds are classified as large if the ave_aum of the fund is above the median ave_aum of the sample. The t-stats in parentheses test whether Ho:$\beta_i = 0$ versus H1$\beta_i \neq 0$. The t-statistic between Small funds and Large funds is a 1-sided test, testing Ho:$\beta_{Large} \geq \beta_{Small}$ versus H1:$\beta_{Large} < \beta_{Small.}$ *,**,*** indicate rejection of Ho at the 10%, 5%, and 1% significance levels, respectively.

On balance, we must conclude that these results suggest that most of the diminishing rate of total revenue per dollar invested is due to diminishing incentive fees and not diminishing management fees. In other words, under median partitioning, it is accurate to infer that 'large' funds rely more heavily on the management fees for revenue and this represents a greater proportion of their total revenue than those funds below median size; consistent with hypothesis 4. Figure 3 illustrates that in aggregate across the sample, 'small'[31] firms derive 28% of total yearly revenue from management fees, whereby 'large' firms derive 43% on average.

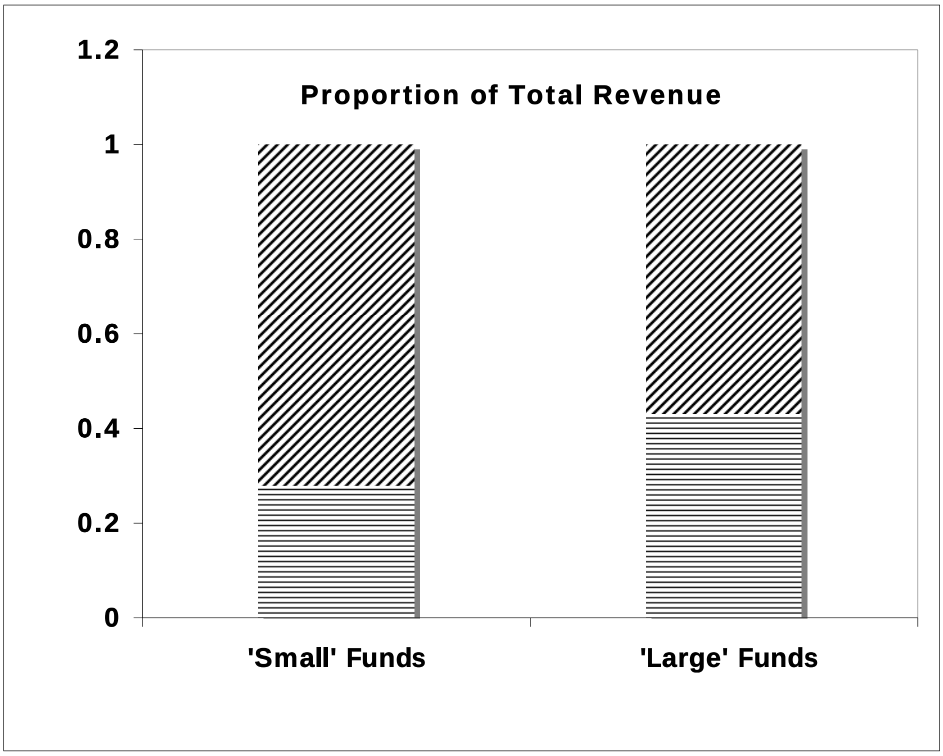

Figure 3: Proportion of total revenue due to management fees (horizontal line) and incentive fees (diagonal line) for 'small' and 'large' Funds

[31] Partitioned about the median assets under management.

TABLE 6

Piecewise Regression (Dollar Management Fee), Upper Quintile Funds Partitioned

Panel A: Proxy for establishment, ave_aum

	2000		2001		2002		2003		2004		Aggregate	
	Q1-Q4	Q5	Q1-Q4	Q5	Q1-Q4	Q5	Q1-Q4	Q5	Q1-Q4	Q5	Q1-Q4	Q5
intercept	-24.241	441.645	-45.347*	237.000	-27.837	29.824	-9.702	-55.188	-24.092	-522.626	-25.448**	-154.861
	(-1.623)	(1.520)	(-1.936)	(0.733)	(-1.153)	(0.082)	(-0.346)	(-0.090)	(-0.360)	(-0.352)	(-2.213)	(-0.621)
ave_aum	0.025***	0.020***	0.028***	0.022***	0.026***	0.023***	0.228***	0.022***	0.024***	0.024***	0.025***	0.023***
	(24.654)	(12.787)	(20.561)	(14.062)	(21.277)	(18.787)	(25.615)	(18.847	(21.993)	(14.914)	(52.005)	(45.592)
t-stat	-3.024***		-4.307***		-2.609***		-0.347		-		-3.489***	
no. of obs	202	50	198	49	210	53	211	52	169	42	989	247
R^2 (%)	75.24	77.31	68.32	80.80	68.52	87.38	75.84	87.66	74.34	84.76	73.26	89.46

Table 6, Panel A reports piecewise regression results of Eq (3) where the dependant variable is dollar management fees calculated over a year. The independent variable is average assets under management for that year. Funds are classified into quintiles on the basis of ascending ave_aum of the fund. The t-stats in parentheses test whether Ho:$\beta_i = 0$ versus H1$\beta_i \neq 0$. The t-statistic between Q1-4 funds and Q5 funds is a 1-sided test, testing Ho:$\beta_{Q5} \geq \beta_{Q1\text{-}4\ Q5}$ versus H1:$\beta_{Q5} < \beta_{Q1\text{-}4.}$ *,**,*** indicate rejection of Ho at the 10%, 5%, and 1% significance levels, respectively.

TABLE 7

Piecewise Regression (Dollar Management Fee), Above Median Funds Partitioned

Panel A: Proxy for establishment, average assets under management for a fund in a year (ave_aum)

	2000		2001		2002		2003		2004		Aggregate	
	Small	Large	Small	Large	Small	Large	Small	Large	Small	Large	Small	Large
intercept	-3.733	113.344	-0.972	99.018	-9.149	35.108	-10.649	0.956	-36.133	-152.791	-4.931*	-19.975
	(-0.843)	(1.251)	(-0.186)	0.968	(-1.679)	(0.296)	(-1.291)	(0.005)	(-1.403)	(-0.352)	(-1.663)	(-0.236)
ave_aum	0.020***	0.022***	0.018***	0.022***	0.023***	0.023***	0.022***	0.022***	0.027***	0.024***	0.020***	0.023***
	(13.389)	(27.959)	(10.750)	(29.274)	(13.430)	(36.996)	(15.794)	(39.370)	(12.760)	(32.154)	(29.189)	(84.555)
t-stat	-		-		-		-		-5.076***		-	
no. of obs	126	126	124	123	132	131	132	131	106	105	618	618
R^2 (%)	59.11	86.31	48.64	87.63	58.12	91.38	65.74	92.32	61.02	90.94	58.04	92.07

Table 7, Panel A reports piecewise regression results of Eq (3) where the dependant variable is dollar management fees calculated over a year. The independent variable is average assets under management for that year. Funds are classified as 'large' if above the median ave_aum of the sample. The t-stats in parentheses test whether Ho:$\beta_i = 0$ versus H1$\beta_i \neq 0$. The t-statistic between Small funds and Large funds is a 1-sided test, testing Ho:$\beta_{Large} \geq \beta_{Small}$ versus H1:$\beta_{Large} < \beta_{Small.}$ *,**,*** indicate rejection of Ho at the 10%, 5%, and 1% significance levels, respectively.

The above finding in itself represents a strong policy argument for clients to demand lower management fees when investing with large funds; substantiating these fees as necessary for administration purposes holds little truth for large established funds that undoubtedly experience considerable economies of scale.[32] Also, arguing that management fees should be paid to large funds as economic 'rent' for allocating some of their capacity to investors does not make sense either, since large funds are severely capacity constrained. Figure 4 further demonstrates this phenomenon graphically using the regression slopes estimated in aggregate, across the entire sample period.

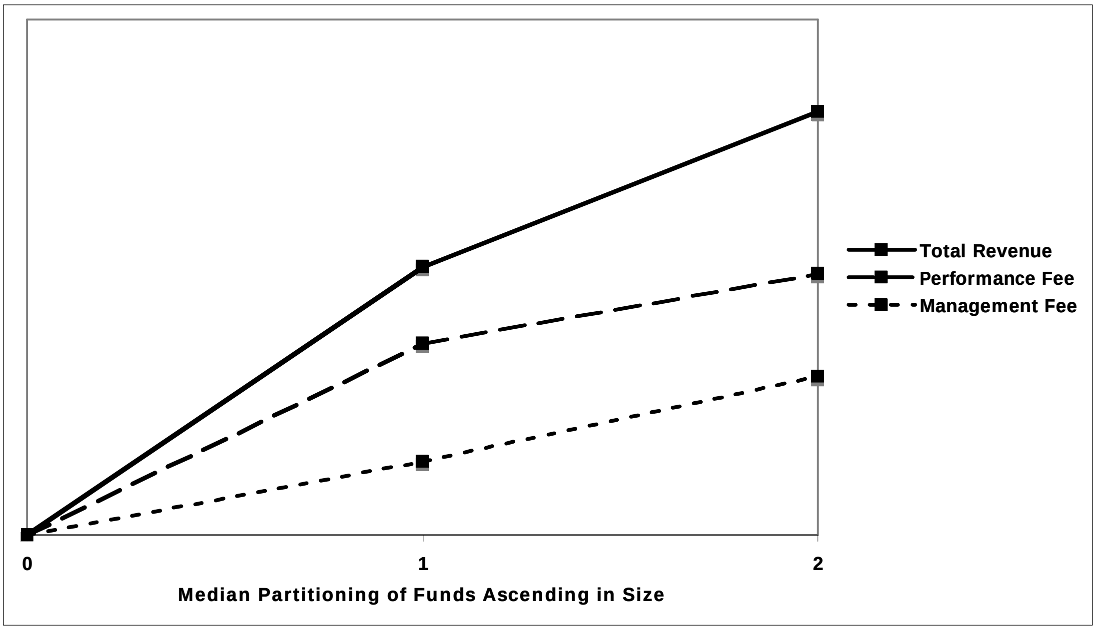

Figure 4: Aggregate piecewise fee regression slopes for median partitioning of assets under management

These findings are consistent with Hypothesis 3 and 4 and as discussed previously, lend themselves nicely to a policy argument for fee reform among large, and likely capacity constrained, funds. Ideally, there should be no incentive for

[32] CTAs arguably experience huge economies of scale relative to other industries; administrative costs do undoubtedly rise (once large, funds tend to employ staff to execute orders personally, as opposed to relying on brokers). Nevertheless, the admin costs of CTAs increase at a substantially lower rate than the rate at which management fees increase with dollars invested.

managers to grow assets beyond their optimal exposure (i.e. to a point where the returns to investors are compromised). From the perspective of a client, a reduced rate of return per dollar invested is unacceptable. The results, on the other hand, suggest that there is always an incentive to grow AUM for a manager even though incentive fees indicate return degradation for larger funds; crucially the fact that they are able to derive incentive fees means these managers still continue to deliver positive albeit smaller returns to investors, due to capacity constraints or lower variance strategies. Colloquially put, clients seem to get more ‘bang for their buck’ in smaller funds than larger funds; note though, clients do still receive some positive returns with large funds.

The funds in the largest quintile may be severely capacity constrained (Figure 1). Figure 5 illustrates that in aggregate, when the largest quintile funds are partitioned, there is a significant decrease in the rate of incentive fees per dollar invested at the 1% level, although it is still positive.[33]

[33] See Table 4, Panel A.

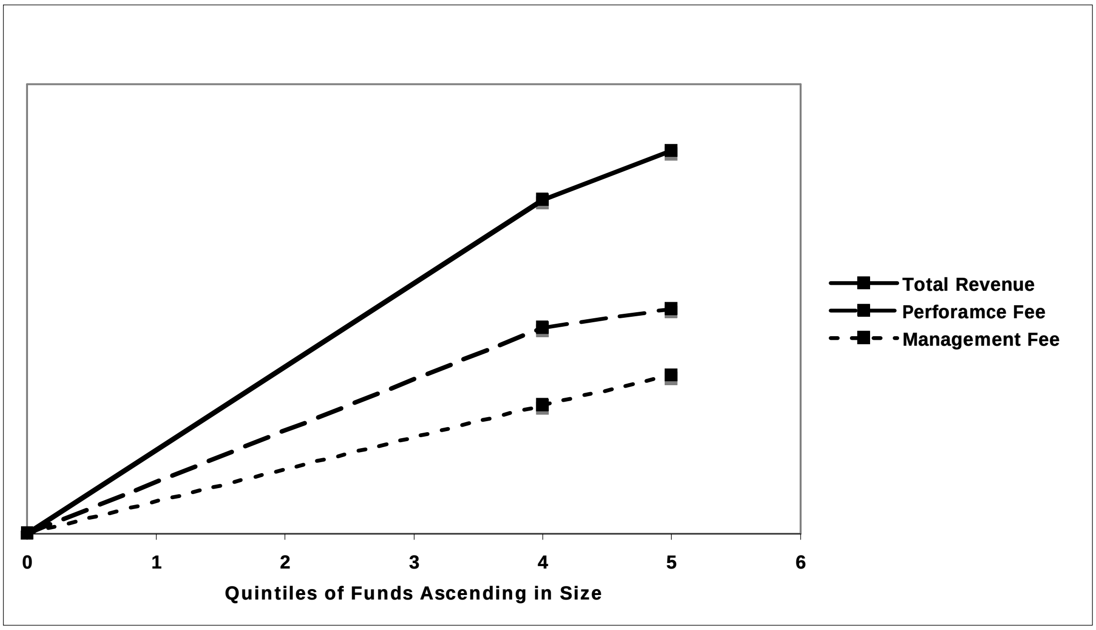

Figure 5: Aggregate piecewise fee regression slopes with the largest quintile by assets under management partitioned

An obvious argument for a client of a large fund would be to reduce the fixed management fee, given a large fund is more established, less volatile, experiences large economies of scale, and presumably can continue to operate with periods 'under water'[34] without relying on new management fees.

A management fee reduction would go some way to re-aligning the interests of clients and managers in large funds; importantly such a reduction does not completely eliminate the incentive for managers to seek growth in assets under management. This is because the AUM acts as an incentive fee revenue 'multiplier'.

This point is illustrated nicely by simulating a zero management fee environment in the present sample; essentially, dollar incentive fees become the total revenue of the fund when management fees are set equal to zero.

Figure 6 illustrates the rate of change of the simulated total revenue (without management fees) per dollar invested for each year and in aggregate; the uppermost quintile is partitioned in each instance. In aggregate, across all years, there is a

[34] I.e. below the previous high water mark, meaning no incentive fees are payable for that quarter.

reduction for upper quintile funds in the rate of change in total revenue per dollar managed. Two possible sources for this exist: a decline in percentage incentive fees charged (e.g. 20% to 10% of realised profits) or a decrease in the size of cumulative return. Descriptive statistics suggest that percentage incentive fees are static across quintiles[35]; therefore the declining rate of change per dollar invested can be explained by a diminishing cumulative return delivered by large funds, consistent with a capacity constraint argument.

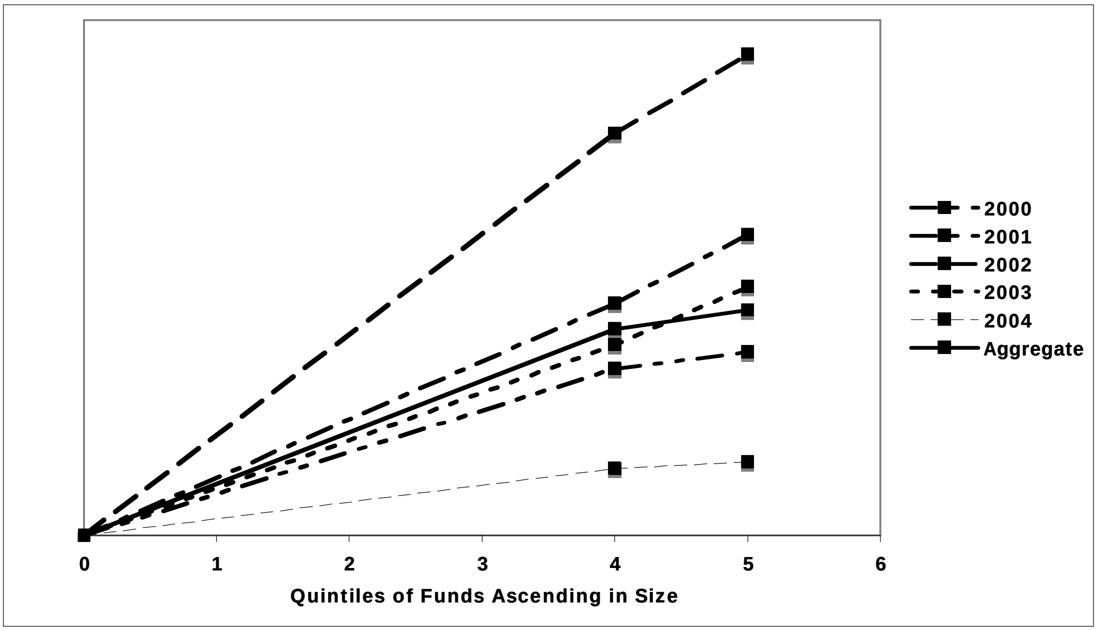

Figure 6: Change in total revenue per dollar invested when management fees are set to zero.

Discussed earlier, Table 4, Panel A presents the regression analyses of dollar incentive fees (for present purposes, total revenue) against average assets under management. As Figure 6 illustrates, dollar incentive fees tend to increase (positive coefficients) but at a decreased rate per dollar invested for the uppermost quintile funds compared with the remaining (lower quintile) funds; importantly, the coefficient for uppermost quintile funds is still positive and significantly different to zero.

[35] See Table 1, Panel A.

Thus, if zero management fees for large funds became the norm, the only fee clients would pay is when they receive a cumulative return above the high water mark. Interestingly, this is reminiscent of Jones' original hedge fund. Such a fee structure reduces the incentive to embrace growth in assets under management as a value generator for managers but does not entirely eliminate it, as coefficients are still positive in upper quintile funds.

Although up to this point we have mainly focused on management fees, our analysis can also answer some questions about incentive fees too. An important question that needs to be addressed is: for every dollar made by a manager, how much should go to the manager as an incentive fee and how much should go to the investor, the provider of the investment capital?

Apart from historical arguments, or arguments about what the market will bear, this issue hasn't been addressed in the hedge fund literature. It appears that essentially a philosophical argument needs to be considered: how should the trading profits be divided between manager and investor? Ultimately the answer to this question must hinge on an ethical consideration of what amount of profits are deserved (Arnold, 1987) by an entrepreneurial fund manager.

Here we answer this question by focusing on how the fund manager can best serve the investor in terms of 'efficiency per dollar invested' (not in total revenue generated for the manager[36]). Table 8, Panel A highlights that the most efficient users of invested capital are the quintile 3 funds; this result is robust in 4 of the 5 years considered (see author). In other words, these funds have the largest rate of change in incentive fees per dollar invested. Figure 7 illustrates the above results.

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[36] This focus is in no small part responsible for the 2008 crisis and is ethically tantamount to 'institutionalised' stealing.

TABLE 8

Results from Aggregate Piecewise Regressions of Incentive fees, Quintile Partitioning

Panel A: Proxy for establishment, average assets under management (ave_aum)

	Q1	Q2	Q3	Q4	Q5
intercept	18.941	50.809	147.316	515.657	4726.482***
	(1.396)	(1.280)	(0.532)	(0.968)	(3.550)
ave_aum	0.025	0.024**	0.050**	0.030**	0.015***
	(1.439)	(2.002)	(2.324)	(2.583)	(5.444)
no. of obs	247	248	247	247	247
R^2 (%)	8.38	1.60	2.16	2.65	10.79

Table 8, Panel A reports piecewise regression results of Eq (3) where the dependant variable is dollar incentive fees calculated over a year. The independent variable is average assets under management for that year. Funds are split into quintiles on the basis of size. *,**,*** indicate significance at the 10%, 5%, and 1% levels, respectively

Prima facie the result suggests that money invested with a quintile 3 fund is utilised most efficiently and should demand the highest share of the profits, relatively speaking[37]; in other words, clients may be willing to enter contracts that offer these managers more of the realised profits as an incentive to perform well when capacity constraints are not prohibitive. In contrast, for young/small managers, clients may be willing to offer a lower proportion of realised profits for want of a track record. Similarly, a reasonable argument for a client of an old/large fund is that, since these funds tend to set relatively lower variance strategies to ensure survival (Brown et al., 2001), their incentive fees should be more conservative than the 20% industry benchmark.

[37] The coefficient attached to ave_aum is largest for Q3 funds and statistically different to zero at the 5% level. This suggests the relation between ave_aum and incentive fees is steepest for Q3 funds.

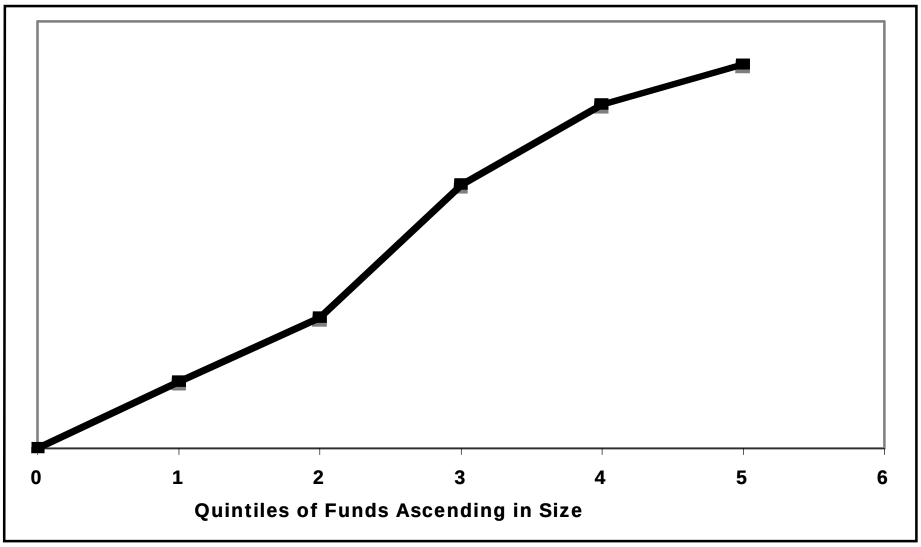

Figure 7: Rate of change in incentive fees per dollar invested across each quintile in aggregate

Conclusion

This study presents novel findings for the alternative investments literature. Importantly, the study highlights a misalignment in incentives under the current contracting convention. The management fee for large AUM funds is perverse: it leads to a misalignment of interests between managers and investors.

These results have several important implications for future contracting arrangements between investor and manager within the managed futures industry. Principally, they identify different efficiencies in use of capital amongst managed futures. Institutional fund allocators, fund-of-fund managers, and high net worth individuals can utilize this work to further understand the issues that should rationally underpin fee structure negotiations within this industry.

Further work will consider long term ‘claw back’ provision in fee structures for managed futures as a mechanism for introducing negative fees and benchmarking for incentive fees of large AUM funds to reduce the effect of luck on fee entitlement.

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