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ROBUST ESTIMATION OF HEDGE FUND PERFORMANCE

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Robust Estimation of Hedge Fund Performance

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Abstract: Returns of hedge funds generally exhibit non-normality. It is well documented that if asset returns have systematic skewness, expected returns should include rewards for accepting this risk. This skewness risk premium should be controlled for in any estimate of performance. To investigate this issue we specify the Residual Augmented Least Squares (RALS) estimator, designed to exploit non-normality in a time series' distribution. Specifying a linear factor model, we provide robust estimates of hedge fund performance, demonstrating the increase in efficiency of RALS relative to OLS estimation. Our evidence suggests that measuring performance using OLS alphas is inefficient, understating the performance of some hedge funds and overstating the performance of others. We then examine the source of the OLS mispricing. We find that the level of mispricing is positively related to estimates of skewness in the historical fund returns. We conclude that when estimated by OLS the performance of managers who pursue a strategy exhibiting positive skewness is understated and those whose strategy exhibits negative skewness is overstated. Estimation by RALS overcomes this. Our findings are robust to the biases in hedge fund databases.

Keywords: Hedge funds, Skewness, RALS, Factor models

1. Introduction

Given that it is well documented that hedge fund returns exhibit skewness and investors have skewness preferences, is OLS the most appropriate estimation technique for assessing performance? If not, how large are the OLS performance estimate errors, are they systematic, and can they be overcome? These questions are particularly relevant for institutional and retail investors in hedge funds, as they strive, in volatile markets, to identify which are the best and worst performing funds. Our paper addresses each of these questions by specifying a new robust econometric technique on a large sample of hedge funds.

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It is generally accepted that investors have a preference for positively skewed returns if they have utility functions that exhibit decreasing absolute risk aversion (Markowitz (1952) and Arrow (1971)). There is empirical evidence that investors have a preference for positive skewness both in studies of mutual funds (Levy and Sarnat (1972)) and portfolio choice (Polkovnichenko (2005)). Likewise, the behavioural finance literature suggests that investors may have a preference for positively skewed returns Barberis and Huang (2008). Preference for positive skewness has also been shown to generate a risk premium on negatively skewed assets (Harvey and Siddique (2000)).

In this paper, we revisit investment fund performance in light of this skewness risk premium, for a large sample of hedge funds. We specify Im and Schmidt (2008) Residual Augmented Least Squares (RALS) estimator to robustly estimate performance. The RALS estimator is particularly practical as it provides robust coefficient estimates without imposing any restriction on the distribution of returns, and is easily estimated using two step least squares. Given the complex dynamic trading strategies this approach is very relevant for hedge funds. We are then able to compare the robust performance estimates with OLS estimates.

Our empirical results are clear. Although in aggregate the OLS estimates are similar to the RALS performance estimates, when we examine performance deciles there is a non-trivial error in performance measures (both alpha and t-statistic of alpha) when estimated by OLS. We further find that this error is principally due to the skewness in a funds distribution. This finding is across all fund categories and is robust to the known biases in hedge fund databases – backfill, incubation and smoothing. These results have important implications for hedge fund performance measurement. Collectively, the results suggest that for the bottom 10% of funds sorted on historical skewness, OLS overestimates performance by 2.4% per annum. For the top 10% of funds sorted on historical skewness, OLS underestimates performance by over 6% per annum. The distribution of performance estimates has fatter tails when estimated by RALS. These findings are replicated when we repeat the analysis for t-statistic of alpha (akin to the information ratio, Kosowski, Naik and Teo (2007)). Within strategy groupings we find that these results are most acute for Managed Futures funds where the bottom (top) 10% of funds sorted on historical skewness have

OLS alpha errors of 6% (-12%) per annum. The grouping where the error is least is fund of funds, where the errors are 1.7% and -1.9%, respectively.

These results confirm that OLS estimates of performance are biased for funds exhibiting non-normality, these biases are related to skewness in a funds distribution and estimating performance using a robust estimation technique overcomes this bias. In doing so we build on several related themes.

Considerable recent research in the sources of systematic risk has focused on negative skewness in individual stocks and the stock market as a whole. Several of these studies have demonstrated how preference for positive skewness can generate a risk premium on negatively skewed assets (e.g. Kraus and Litzenberger (1976) and Harvey and Siddique (2000)). Our study builds on this pioneering work and demonstrates that due to this preference for positive skewness a risk premium exists for hedge funds pursuing strategies exhibiting skewness and performance estimation by RALS captures this premium.

A number of alternative robust estimation techniques have been specified to more efficiently model non-normal data. These include M-estimators, L-estimators and R-estimators. Bloomfield and Steiger (1983) demonstrate that Bassett and Koenker (1978) Least Absolute Deviations (LAD) estimator, from the L-estimator class has particularly useful properties in time series regression models and LAD is often specified as an alternative to least squares when the disturbances exhibit excess kurtosis. Phillips, McFarland and McMahon (1996) and Phillips and McFarland (1997) specify FM-LAD, a non-stationary form of the LAD regression procedure, due to Phillips (1995), to model the relationship between daily forward exchange rates and future daily spot prices. Our study is complimentary to this research specifying RALS to model hedge fund returns, where the returns exhibit both kurtosis and skewness.

Our study builds upon existing research which successfully addresses performance estimates and the distribution of hedge funds. One strand of this research successfully specifies contingent claims as risk factors in a linear factor model specification. The idea being that by replicating the payoff of the strategy the non-linearity will be captured in the contingent claim risk factor coefficient. Agarwal and Naik (2004) and Mitchell and Pulvino (2001) incorporate short positions in put options, while Fung and Hsieh (2001) use positions in look-back straddles as risk factors. The alternate approach, which is more

closely related to the present paper, is the non-parametric bootstrap methodology which has been applied to mutual funds (Kosowski, Timmermann, Wermers and White (2005)) and hedge funds (Kosowski, Naik and Teo (2007)). Our study adds to this emerging literature presenting new evidence on hedge fund performance for funds with differing distributional characteristics. While Kosowski, Naik and Teo (2007) examine funds at different levels of performance, in this study our focus is on differences in statistical characteristics.

The remainder of the paper is organised as follows. Section 2 outlines the theoretical framework for expected higher moment preferences. Section 3 provides a review of the data. Section 4 describes the risk factor model and the methodology. Section 5 presents results. Finally, Section 6 provides a conclusion.

2. Theoretical framework

In this section, drawing on Kraus and Litzenberger (1976) we outline the theoretical framework for an expectation of skewness preference. In the following analysis we ignore terms of the fourth and higher order, assuming that the investor's expected utility is definable over the first three central moments of the probability distribution of end of period wealth. While it is trivial to extend this model to incorporate any number of higher moments, there is no reason to do so from the perspective of a positive theory of valuation. Aversion to standard deviation and preference for positive skewness are general characteristics of all investors having utility functions displaying the desirable behavioristic attributes, namely (i) positive marginal utility for wealth, (ii) decreasing marginal utility for wealth, i.e., risk aversion, and (iii) non-increasing absolute risk aversion, i.e., risk assets are not inferior goods Arrow (1971). We are not aware of comparable behavioristic arguments for general investor attitudes toward the fourth and higher moments.

Included in the set of utility functions displaying the desired attributes are logarithmic, power, and negative exponential utility functions. These non- polynomials may be expanded as Taylor series and

the investor's expected utility of end of period wealth, E[$U(\bar{W})$], ignoring terms of the fourth and higher moments may be expressed as:

$$U(\bar{W}) + \left[\frac{U''(\bar{W})}{2!}\right]\sigma_w^2 + \left[\frac{U'''(\bar{W})}{3!}\right]m_w^3 \tag{1}$$

where

$$\bar{W} = \mathrm{E(W)},\ \sigma_w^2 = E(W-\bar{W})^2,\ m_w^3 = E(W-\bar{W})^3 \tag{2}$$

and

$$m_w^n = E(W-\bar{W})^n \tag{3}$$

While convergence of the series is assured for the negative exponential utility function, Kraus and Litzenberger (1976) show that logarithmic and power utility functions require $\left|\widetilde{W}-\bar{W}\right| \leq \bar{W}$, with probability one.

Condition (b), decreasing marginal utility of wealth,

$$U''(\bar{W}) < 0 \tag{4}$$

implies aversion to variance.

Given a necessary condition for

$$d\left[-\frac{U''}{U'}\right]dW = \frac{\left[-U'U''+(U'')^2\right]}{(U')^2} \leq 0 \tag{5}$$

is

$$U''' \geq (U'')^2/U' > 0, \tag{6}$$

condition (c), non-increasing absolute risk aversion

$$d\left[-\frac{U''}{U'}\right]dW \leq 0 \tag{7}$$

leads to

$$U''' > 0 \tag{8}$$

implying preference for positive skewness.

Having established a theoretical framework for skewness preference, in the following section we discuss the data used to investigate whether skewness is priced for hedge funds when performance is estimated by OLS.

3. Data

We evaluate the performance of hedge funds using monthly net-of-fee returns of live and dead hedge funds in the Lipper/TASS database up to October 2007 - a period that covers several market crises, including the LTCM collapse in 1998, the dot-com crash in 2002 and the credit crisis in 2007. At the final quarter of 2007, the TASS database contains 5,845 live and 4,415 dead funds, including fund of funds.

Hedge fund returns are self reported to TASS and it is well known that this leads to backfill and incubation biases in the database (Fung and Hsieh (2000)). Backfill bias is where funds report prior performance to the data vendor. Funds will only be motivated to provide these historical returns in the case of good performance so the backfilling of these returns induces bias. Likewise, incubation bias is where a fund is set up initially using manager money to establish a track record. Following good performance the returns of this incubated fund are then submitted to the data vendor, who adds them to the database. In the case of poor performance the manager will not add this fund to the database. This leads to upward bias in the database. To control for backfill and incubation bias in this paper we repeat all analysis omitting the first twelve months of data for each fund.

In addition to self selection biases, TASS do not keep information on funds that died before December 1993. This leads to survivorship bias. Controlling for this bias we specify a sample of fund returns from January 1994 to October 2007.

For estimation purposes we delete funds with less than two years of returns data. We also delete funds which report only gross returns and/or do not report monthly returns. We group funds according to the TASS classifications, Convertible Arbitrage (CA), Event Driven (ED), Equity Market Neutral (EMN), Emerging Markets (EM), Fixed Income Arbitrage (FIA), Fund of Funds (FoF), Global Macro (GM),

Long Short Equity Hedge (LSEH), Managed Futures (MF) and Multi Strategy (MS). [1] We delete funds which do not provide investment style information. Our final sample consists of 4,537 live hedge funds and 3,323 dead hedge funds. Finally, several studies identify serial correlation in the returns of hedge funds. To mitigate this bias, in robustness checks we repeat all analysis using unsmoothed hedge fund returns Getmansky, Lo and Makarov (2004).

[Insert Table 1 here please]

Table 1 contains summary statistics of the TASS funds in the sample. For each fund type, the table lists the number of funds and the equally weighted cross sectional mean of each fund's mean monthly return, standard deviation, Sharpe ratio, skewness and kurtosis. Based on Jacque Bera tests (5% significance level) funds are categorised as being either dead normally distributed (1,495 funds), dead non-normally distributed (1,828 funds), live normally distributed (2,208 funds) or live non-normally distributed (2,329 funds). Across all categories (with the exception of normally distributed Multi-Strategy) live funds feature substantially higher Sharpe ratios. For example, the mean Sharpe ratio of both normal and non-normal Managed Futures funds is more than double that for the corresponding dead funds. Dead funds are also generally more volatile than live funds with the exception of normally distributed Fixed Income Arbitrage and Managed Futures funds and non-normal Convertible Arbitrage and Global Macro funds.

Comparing funds classified as normal and non-normal the Sharpe ratios are similar (0.29 and 0.29 for dead funds and 0.46 and 0.45 for live funds). Despite this, amongst dead funds the returns of non-normal funds are generally higher and more volatile. For example, Long Short Equity Hedge normal funds have a mean monthly return of 1.08 and a standard deviation of 5.39 versus a mean of 0.75 and standard deviation of 4.14 for non-normal funds. The return distribution of all non-normal categories feature substantial excess kurtosis ranging from 2.97 to 14.05. Likewise the return distribution of non-normal dead funds are generally more negatively skewed, whereas for live non-normal funds this is not

[1] As there are only 39 funds we do not break out results for the Dedicated Short Bias style. They are included in the full sample results.

the case and, comparing the different categories, live non-normal funds are about as equally likely to be more positively skewed than the corresponding normally distributed funds.

4. Methodology

We benchmark the performance of our hedge fund sample to the Fung and Hsieh (2004) seven-factor model.[2] We estimate this model both with OLS and the RALS estimator. The details of the Fung and Hsieh (2004) model are reviewed in Section 3.1 and an overview of the RALS estimator is provided in Section 3.2. Finally in Section 3.3 we discuss the methodology specified to identify the source of the OLS mispricing.

4.1 Factor benchmarks

The Fung and Hsieh (2004) model specifies three Trend-Following Risk Factors, specifically Bond (*PTFSBD*), Currency (*PTFSFX*) and Commodity (*PTFSCOM*) Trend-Following Factors augmented with two equity-oriented Risk Factors: *SNPRF*, the excess total return on the Standard & Poors 500 index, and *SCMLC*, the Size Spread Factor (Wilshire Small Cap 1750 - Wilshire Large Cap 750 monthly return) and two Bond-orientated risk factors: *BD10RET*, the monthly change in the 10-year treasury constant maturity yield (month end-to-month end), and *BAAMTSY*, a credit spread factor (the monthly change in the Moody's Baa yield less 10-year treasury constant maturity yield (month end-to-month end)).[3]

$$r_{it} = \hat{\alpha}_i + \sum_{k=1}^{K} \hat{\beta}_k^i F_{k,t} + \hat{\varepsilon}_t^i \qquad (9)$$

where r_{it} is the net-of-fees excess return on hedge fund *i* at time *t,* $\hat{\alpha}_i$ is the estimated abnormal performance of the hedge fund, $\hat{\beta}_k^i$ is the estimated risk factor loading of hedge fund i for risk factor *k*, $F_{k,t}$ is the return of factor *k* for month *t* and $\hat{\varepsilon}_t^i$ is the estimated residual.

[2] We specify this model as it has been shown to explain much of the variation in hedge fund returns (Fung and Hsieh, 2004).
[3] For details on the construction of the trend following factors see Fung and Hsieh (2001).

[Insert Table 2 here please]

Table 2 Panel A contains summary statistics of the Fung and Hsieh (2004) factors we use. The *PTFSBD*, *PTFSFX* and *PTFSCOM* return series are obtained from David Hsieh's website. Data to construct *BD10RET* and *BAAMTSY* come from the US Federal Reserve website and *SNPRF* and *SCMLC* are obtained from DataStream. With the exception of *SNPRF* the mean monthly returns of the various factors are less than or equal to zero. Comparing the Sharpe ratios with those reported for the different equally weighted hedge fund categories in Table 1 only dead Managed Futures and dead non-normal Event Driven funds have lower Sharpe ratios that the *SNPRF* risk factor.

To provide an indication of the substitutability of the various factors Table 2 Panel B contains a correlation matrix. Generally, the factors have low correlation with each other, with the exception of the two bond related factors, *BD10RET* and *BAAMTSY*, -0.89. While high correlation amongst explanatory variables can give rise to spurious univariate significance levels, our focus in this paper in on the estimated intercepts, rather than the factor coefficients, and hence is unaffected by multicollinearity.

4.2. Residual Augmented Least Squares

Our challenge in this paper is to determine whether, due to the skewness in a funds return distribution, OLS misprices hedge fund performance. This section reviews the RALS estimator, proposed by Im and Schmidt (2008), which we can implement to provide robust estimates of hedge fund performance.

Given a multivariate linear regression model

$$y_t = \beta' z_t + u_t \tag{10}$$

where $z_t = (1, x_t')'$, x'_t is a $(k-1)$ x 1 vector of time series observed at time t, while $\beta' = (\alpha\beta')$ where α is the intercept and β' is the $(k-1)$ x 1 vector of coefficients on x_t. Assuming the following moment conditions hold:

$$E[x'(y - x'\beta)] = 0 \tag{11}$$

$$E\{(x\otimes[h(y-x'\beta)-K]\}=0 \tag{12}$$

where (11) is the least squares moment condition which asserts that *x* and *u* are uncorrelated and (12) refers to some additional moment conditions that some function of *u* is uncorrelated with *x*. *h(.)* is a *J x 1* vector of differentiable functions and *K* is a *J x 1* vector of constants. Therefore, there are *kJ* additional moment conditions.

Excess kurtosis in the residual implies that the standardized fourth central moment of the series exceeds three, so that:

$$E(u_t^4-3\sigma^4)=E[u_t(u_t^3-3\sigma^2u_t)]\neq 0 \tag{13}$$

implying that $u_t^3 - 3\sigma^2 u_t$ is correlated with u_t but not with the regressors since x_t and u_t are by assumption independent. Similarly when errors are skewed the standardised third central moment is non-zero so that:

$$E(u_t^3-\sigma^3)=E[u_t(u_t^2-\sigma^2)]\neq 0 \tag{14}$$

which implies that $u_t^2 - \sigma^2$ is correlated with u_t but not with the regressors (again since x_t and u_t are by assumption independent.)

Im and Schmidt (2008) suggest a two step estimator that can be simply computed from OLS applied by equation (10) augmented with the term (15).

$$\widehat{w}_t=[(\hat{u}_t^3-3\hat{\sigma}^2\hat{u}_t)(\hat{u}_t^2-\hat{\sigma}^2)]' \tag{15}$$

where $\hat{u}_t$ denotes the residual and $\hat{\sigma}_t$ denotes the standard residual variance estimate obtained from OLS applied to equation (10). The resulting estimator is the RALS estimator of β, β^*. When both the regressor and the regressand are stationary, β^* has an asymptotic distribution given by

$$\sqrt{T}(\beta*-\beta)\rightarrow N[0,\sigma_A^2 Var(x_t)^{-1}] \tag{16}$$

Im and Schmidt (2008) derive a measure of the asymptotic efficiency gain from employing RALS as opposed to OLS through the statistic ρ^* constructed as σ_A^2/σ^2 where σ^2 is the asymptotic variance of the OLS estimation of β and σ_A^2 is the asymptotic variance of the RALS estimator:

$$\sigma_A^2=\sigma^2-\frac{\mu_3^2(\mu_6-6\mu_4\sigma^2+9\sigma^6-\mu_3^2)-2\mu_3(\mu_4-3\sigma^4)(\mu_5-4\mu_3\sigma^2)+(\mu_4-3\sigma^4)^2(\mu_4-\sigma^4)}{(\mu_4-\sigma^4)(\mu_6-6\mu_4\sigma^2+9\sigma^6-\mu_3^2)-(\mu_5-4\mu_3\sigma^2)^2} \tag{17}$$

where μ_i denotes the *i*-th central moment of u_t. ρ^* is small for large efficiency gains. The inclusion of the RALS estimators is useful in obtaining a more efficient model estimate if the distribution of the error term is non-normal. For the normal distribution, OLS is efficient and this ratio equals one. This statistic shows that this gain can be substantial for a range of alternative non normal error distributions.

σ_A^2 can be consistently estimated by replacing the μ_i with the corresponding sample moments, using ordinary least squares residuals, yielding $\hat{\sigma}_A^2$. The covariance matrix for β^* can then be estimated consistently as

$$V(\beta^*) = \hat{\sigma}_A^2(\hat{X}' M_{\widetilde{W}} \tilde{X})^{-1} \tag{18}$$

where the idempotent matrix $M_{\widetilde{W}}$ is given by

$$M_{\widetilde{W}} = I_t - \widetilde{W}'\left(\widetilde{W}'\widetilde{W}\right)^{-1} \tag{19}$$

where I_t is the $T \times T$ identity matrix and $\tilde{V} = (\tilde{v}_1 \tilde{v}_2 \ldots \tilde{v}_T)', \tilde{v}_t = v_t - T^{-1}\sum v_t$ for $(V, v) = (X, x), (W, w)$.

The quantification of the efficiency gain and the ability to achieve it using the RALS estimation technique depends on the homoskedastic assumption that the third and fourth conditional moments do not depend on the regressors.

4.3 Source of mispricing

Following the identification of mispricing our second key challenge is to identify whether this mispricing is systematically related to the distribution of fund returns. In section 2.0 we outlined a theoretical framework which indicated that skewness preference should be priced when assessing hedge fund performance.

To investigate whether the RALS estimator has captured this skewness risk premium we estimate the following cross sectional regression model.

$$z_i = \gamma_0 + \gamma_1 skew_i + \gamma_2 kurt_i + \epsilon \tag{20}$$

Where, depending on the choice of performance measure, $z_i = \hat{a}_i^{RALS} - \hat{a}_i^{OLS}$ or $z_i = t\hat{a}_i^{RALS} - t\hat{a}_i^{OLS}$. $\hat{a}_i^{RALS}$ is the intercept of the RALS estimated time-series regression of fund *i*'s returns against the Fung and Hsieh benchmark factors. $\hat{a}_i^{OLS}$ is the intercept of the OLS estimated time-series regression of fund *i*'s returns against the Fung and Hsieh benchmark factors. $t\hat{a}_i^{RALS}$ and $t\hat{a}_i^{OLS}$ are the corresponding intercept t-statistics. *Skew* and *kurt* are the estimates of skewness and kurtosis for fund *i*.

$$z_i = \gamma_0 + \gamma_1 skew_i + \gamma_2 kurt_i + \sum_{j=1}^{J} \beta_j C_{ji} + \epsilon \quad (21)$$

To ensure our results are robust to alternate sources of pricing error we also in (21) specify a set of control variables, C_{ji}, which Aragon (2007) specifies to explain hedge fund performance. The variables are *dlock*, *notice*, *min*, $notice^2$, min^2 and *dlock.notice*. The variables *dlock*, *notice*, and *min* correspond to the lockup indicator, redemption notice period (in 30-day units), and minimum investment size (in millions of dollars). The variables $notice^2$ and min^2 allow for non-linearity in the return and share restriction relation. The last variable, *dlock.notice* allows for interaction between the lockup and notice period restrictions.

In unreported tests we also estimate a cross sectional model augmented with control variables specified by Liang (1999), to explain average fund returns, to ensure our results are robust to the choice of control variables.[4] The fund characteristics specified are incentive fee (in percent), management fee (in percent), natural logarithm of fund assets, lockup period (in days) and number of months since fund inception.

5. Results

We present robust estimates of hedge fund performance in section 4.1, identify the source of the OLS mispricing in section 4.2 and provide robustness checks in section 4.3.

5.1 Robust estimates of hedge fund performance

[4] These results are available from the authors on request.

Summary statistics and statistical characteristics of our sample hedge fund residuals are reported in Table 3.

[Insert Table 3 here please]

Several inferences can be drawn from this table. OLS alpha for the entire sample of funds is approximately 5% per annum. The worst performing styles are Fund of Funds, Global Macro and Managed Futures. Jarque and Bera (1987) statistics reject normality for greater than half of estimated hedge fund residuals. Within style groupings, Convertible Arbitrage, Event Driven and Fixed Income Arbitrage funds have the most rejection of normality. Estimated residuals exhibit negative skewness for four fund styles: Convertible Arbitrage, Fixed Income Arbitrage, Fund of Funds and Multi Strategy. The RALS alpha estimates for the entire sample are equivalent to the OLS estimates with the largest difference being for Emerging Markets funds (16 basis points per month). The mean efficiency gain, ρ^*, from RALS estimation is 0.69, with the largest (smallest) gain for Multi-Strategy (Fund of Funds). Most striking is that when estimated by RALS, though the mean efficiency gain is large the differences in mean alpha are relatively small.

[Insert Figure 1 here please]

To examine the distributions of both OLS and RALS performance estimates for the full sample we plot the kernel density estimate of both the OLS and RALS estimated alpha distributions in Figure 1. It is clear from this plot that the RALS alpha distributions have fatter tails than the OLS estimates.

[Insert Figure 2 here please]

We also examine the kernel density estimate of the distribution of OLS and RALS t-statistic of alpha in Figure 2. Again the RALS performance estimate distribution has fatter tails than the corresponding OLS distribution. Both of these figures suggest that while the difference between the mean OLS and RALS performance estimates is relatively small the difference will be larger at extremes.

To gauge whether the results vary for funds which are either live or dead, normal or non-normal we report the average fund results within strategy categories from estimating performance, as measured

by alpha and t-statistic of alpha (t-alpha), estimated by OLS and RALS for the differing fund classifications in Table 4. We also report ρ^* the efficiency gain from estimating by RALS.

[Insert Table 4 here please]

First, comparing normally distributed live and dead funds, unsurprisingly the performance estimates are quite similar. For the All Funds category the estimated OLS (RALS) alphas are 0.55 (0.55) for live funds and 0.15 (0.17) for dead funds. Within individual fund categories there is some variability in performance estimates. For example dead Event Driven funds mean estimated alpha ranges from -0.17 to +0.07 and live Managed Futures funds mean estimated alpha ranges from 0.59 to 0.71.

Next, carrying out a similar analysis on non-normally distributed live and dead funds the results are less consistent. Looking at live All Funds the performance estimates are quite similar for OLS (RALS) 0.51 (0.54) but there is more variability in the dead All Funds category 0.33 (0.47). A possible explanation for this inconsistency is the source of the normality. Looking back at Table 1 dead non-normal funds exhibited excess kurtosis and generally negative skewness. On the other hand live non-normal funds exhibited excess kurtosis but were equally likely to exhibit positive and negative skewness. Event Driven is a category with a large difference in mean performance estimates amongst dead funds, with alphas ranging from 0.04 to 0.27. This category had a mean skewness of -0.74. Other categories with relatively large differences in performance, as measured by alpha, would be Emerging Markets and Long Short Equity Hedge, which also exhibit negative skewness.

To further illustrate the difference between OLS and RALS performance estimates for both normal and non-normal funds we compare the alpha estimates in Figure 3.

[Insert Figure 3 here please]

Figure 3A plots OLS against RALS performance estimates for All funds. To quantify this relationship we regress the OLS alpha against the RALS alpha. The slope is highly significant but has an estimate of just 0.5, and the adjusted R^2 of the regression is only 9%. Figure 3B repeats the analysis, but the time only for normally distributed funds. For these normally distributed funds the slope from regressing the OLS alpha against the RALS alpha has a larger estmate, 0.7, and the adjusted R^2 of the

regression is much larger, 78%. Finally in Figure 3C we compare the performance estimates for non-normally distributed funds. The slope is lower, 0.4, though still highly significant and the Adjusted R^2 drops to 5%.

Next, in Panel A of Table 5 we report the magnitude and statistical significance of fund performance for all funds, based on performance rankings. All funds are ranked into deciles based upon their estimated alphas. The results suggest that the performance of the best funds is understated and the performance of the worst funds is overstated. For example, decile 1, the worst performing funds have OLS (RALS) alpha estimates of -0.83 (-0.91) a statistically significant difference of 0.09% per month. At the other end of the performance spectrum the best performing funds in decile 10 have OLS (RALS) alpha estimates of 2.02 (2.51) with OLS understating performance by -0.49% per month.

[Insert Table 5 here please]

To examine potential variability in performance measures between style groups we report the statistical significance of performance measures and the difference between performance measures by investment objective in Panels B to K. Convertible Arbitrage funds performance is significantly positive (10% level) for half of funds. Only the top deciles performance is understated. Deciles 3 and 4 have overstated performance. For Event Driven and Emerging markets the top two deciles are understated but unusually for emerging markets decile 2 performance estimated by OLS is also understated. For Equity market neutral, Multi-Strategy and Fixed Income Arbitrage the bottom and top deciles are over and under stated. Unusually in Fixed Income Arbitrage decile 8 is also understated. For Global Macro and Managed Futures only the top decile is understated. Long short equity hedge the top three deciles are understated respectively. The results of Fund of funds are unusual. The performance of almost all categories is overstated by OLS. Only the performance of the top decile is understated.

These results generally show that the performance of the best (worst) funds is under (over) stated by OLS. However, there are exceptions. Anomalous results occur for Emerging Markets, Fixed Income Arbitrage and most obviously for fund of funds.

[Insert Table 6 here please]

Next in Table 6 we repeat this analysis using t-alpha as the performance measure. There are some exceptions, particularly fund of funds, but the results are generally consistent with the preceding analysis with the performance of the best funds being understated and the worst being overstated.

These results indicate that there is considerable mispricing for hedge funds when performance is estimated using OLS, particularly for non-normal funds. This is consistent with previous research on hedge funds Kosowski, Naik and Teo (2007). In the next section we investigate the source of the mispricing.

5.2 Source of OLS mispricing

The results in the previous section suggest that standard OLS fund alpha estimates may not be robust to non-normality in a funds return series distribution. There can be quite large differences when comparing the performance of funds, when the model is estimated by OLS and RALS. In this section, we examine the source of the mispricing. As discussed in section 2.0, theoretically, we would expect the mispricing to be due to skewness in a fund's distribution.

[Insert Table 7 here please]

Table 7 reports the estimates of the skewness and kurtosis coefficients (from equations 20 and 21) for alpha (Panel A) and t-alpha (Panel B). In each panel model (1) reports the alpha error, defined as $\hat{\alpha}_i^{RALS} - \hat{\alpha}_i^{OLS}$, and corresponding significance level. Model 2 reports the estimates of *skewness* and *kurtosis* coefficients, excluding control variables (equation 20) and model 3 reports the estimates of *skewness*, *kurtosis* and control variable coefficients (equation 21). Looking initially at Panel A Model 1, the alpha error is statistically significant, 0.58% per annum. In Model 2, the two explanatory variables are positive and statistically significant and the intercept is no longer significantly different from zero. These two factors explain the mispricing. When the control variables are also specified, in Model 3, the results are almost identical. Of the control variables, *notice* and min^2 are statistically significant from zero.

In Panel B results are reported for t-alpha. Both the *skewness* and *kurtosis* coefficients are highly significant, explaining a portion of the error, but it is not until the control variables are also specified that the error becomes insignificant from zero. Here *dlock* and min^2 are the two statistically significant control variables.

[Insert Table 8 here please]

To get a sense of the alpha errors for dead (Panel A) and live (Panel B) normal and non-normal funds we repeat the analysis for alpha for each of these classifications in Table 8. Looking first in Panel A at normally distributed dead funds we can see that the error is statistically significant, 0.54% per annum. Specifying the *skewness* and *kurtosis* variables, explains all of this error but only the *skewness* coefficient is statistically significant from zero. For the non-normal funds the error is far larger, 1.45% per annum, but is again fully explained by the two explanatory variables. In Panel B, the live normal funds have an alpha error, insignificant from zero, whereas in the live non-normal funds, error is 0.39% per annum. For live non-normal funds the specification of the *skewness* and *kurtosis* factors explains the error but only the *skewness* coefficient is statistically significant from zero.

To recap the results indicate that the OLS error is present for live and dead non-normal funds, and dead normal funds. The specification of the *skewness* and *kurtosis* variables explains the error in all cases but only the *skewness* coefficient is significant in all cases.

[Insert Table 9 here please]

Next to further investigate the importance of skewness in OLS mispricing, in Panel A of Table 9 we report the performance of all funds estimated by OLS and RALS sorted on skewness. The results are striking. OLS misprices fund performance for all fund deciles with the exception of decile 6, where the mean skewness is close to zero. For funds which have negative skewness, OLS overstates performance by between 8 and 19 basis points per month. For funds exhibiting positive skewness OLS understates performance by between 7 and 54 basis points per month.

To examine whether there is variability in these results within the sample Panels B to K reports results for the different styles. There are no exceptions. We find no situation where OLS significantly

understates performance for negatively skewed funds. Likewise we find no significant over-pricing occurs for funds with positive skewness.

The fund style where the OLS errors are largest is Managed Futures. This is perhaps unsurprising as the strategy encompasses several styles which exhibit different characteristics (Bhardwaj, Gorton and Rouwenhorst (2008)). The performance of the most negatively skewed funds is overstated by 6% and the performance of funds exhibiting most positive skewness is understated by 12% per annum. Other strategies where the positively skewed funds' performance is heavily understated by OLS are Emerging Markets (12%) and Convertible Arbitrage (8%). At the other end of the distribution, Global Macro and Multi-Strategy negative skewness funds' performance is overestimated by 6% and 3.7% per annum, respectively.

[Insert Table 10 here please]

Table 10 repeats this analysis for fund performance as measured by t-statistic of alpha. Panel A, presents the baseline results for the full sample. Again OLS overstates performance for the funds exhibiting negative skewness and overstates performance for the most negatively skewed funds. The exception is decile 6, where the mean skewness is close to zero and OLS understates performance for this group of funds by a statistically significant 2.5% per annum. Panels B to K report results for the different styles. The results generally support the findings from alpha but there are four unusual results. For Event Driven, Emerging Markets Fixed Income Arbitrage and Long Short Equity Hedge we find evidence of OLS understating results for funds whose skewness is close to zero.

5.3 Robustness checks

As we focus on a sample period subsequent to 1993 our sample is relatively free of survivorship bias issues. However, both incubation and backfill bias and illiquidity-induced serial correlation have been shown to affect hedge fund performance estimates. In the present study we are more interested in relative performance rather than absolute performance. As such it would not be expected that the key finding of this paper will be sensitive to these features of hedge fund data. Nonetheless, in this section of

the paper we address the outstanding issues by repeating the analysis (1) after removing the first twelve months of returns for each hedge fund to eliminate backfill bias, and (2) unsmoothing returns following Getmansky, Lo and Makarov (2004).

Before proceeding to these robustness tests we initially check to ensure our results are insensitive to the minimum number of observations for the fund to be included in the sample. We repeat the analysis using thirty six months rather than twenty four month as a minimum and re-estimate the model. Results of this sensitivity analysis for performance as measured by alpha are reported in Panel A of Table 11 while a similar analysis for t-statistic of alpha is reported in Panel A of Table 12.

[Insert Table 11 here please]

Table 11, Panel B and Table 12 Panel B report the results for the backfill bias robustness check for alpha and t- alpha respectively.

[Insert Table 12 here please]

Finally, following Kosowski, Naik and Teo (2007) we use the Getmansky, Lo and Makarov (2004) unsmoothing coefficients to unsmooth our hedge fund returns. The results of this analysis are reported in Panel C of Table 11 and Table 12 for Alpha and t-statistic of Alpha respectively. The results of these robustness checks indicate that our findings are not driven by backfill bias, choice of minimum observations or illiquidity induced serial correlation.

The results presented in this section of the paper have demonstrated that OLS systematically misprices hedge funds, and this mispricing is induced by the non-normality in the funds distributions, principally skewness. This finding may be unsurprising given the non-normality observed in hedge funds' returns by other studies () and the consequent violation of the conditions for OLS to be unbiased.

What is surprising is the scale of the mispricing. We estimate that for funds with highly positively (negatively) skewed returns the OLS mispricing is in the region of 6% (2%) per annum. For institutional investors and fund of funds these are very important issues. What is considered positive alpha when measured by OLS is often due to a fund benefiting from a risk premium for pursuing a negatively skewed strategy. Likewise a fund with perceived below average performance and positive

skewness is often simply being penalised due to the statistical characteristics of the strategy. Irrespective of whether we measure performance using alpha or t-statistic of alpha the bias remains.

6. Conclusions

Consistent with expectations from a utility framework, hedge fund managers' returns are in part attributable to their exposure to a skewness risk premium. Due to this, performance measures estimated by OLS will overstate the performance of some funds and understate the performance of others. The scale of the mispricing is non-trivial. For funds within the top 10% sorted on historical returns skewness this represents approximately 6% per annum of mispricing. For the bottom 10% of funds ranked by skewness this represents a mispricing of 2.4% per annum.

These finding have broader implications both within and beyond the hedge fund industry. There is a growing body of literature examining skewness preference. Our results support the hypothesis that as investors avoid negatively skewed assets, there is a risk premium for holding them. We show that managers who pursue strategies which feature these characteristics receive a premium of approximately 2% per annum.

With a growing focus on fat tails in financial markets there is growing literature on the implementation of alternative robust estimation techniques. Our study adds to this literature, demonstrating that a new innovative estimator that is relatively easy to implement can increase efficiency over ordinary least squares.

Perhaps our most important results are in the area of hedge fund performance measurement. We demonstrate that while OLS is reasonably accurate in measuring aggregate hedge fund performance, this is principally due to hedge fund returns in aggregate being relatively normal. When we look within the broader sample at funds with alternative statistical characteristics OLS becomes a far less useful tool. The fund distribution is critical to performance estimation.

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Figure 1

Kernel density estimate of the OLS and RALS estimated alpha distribution for all funds

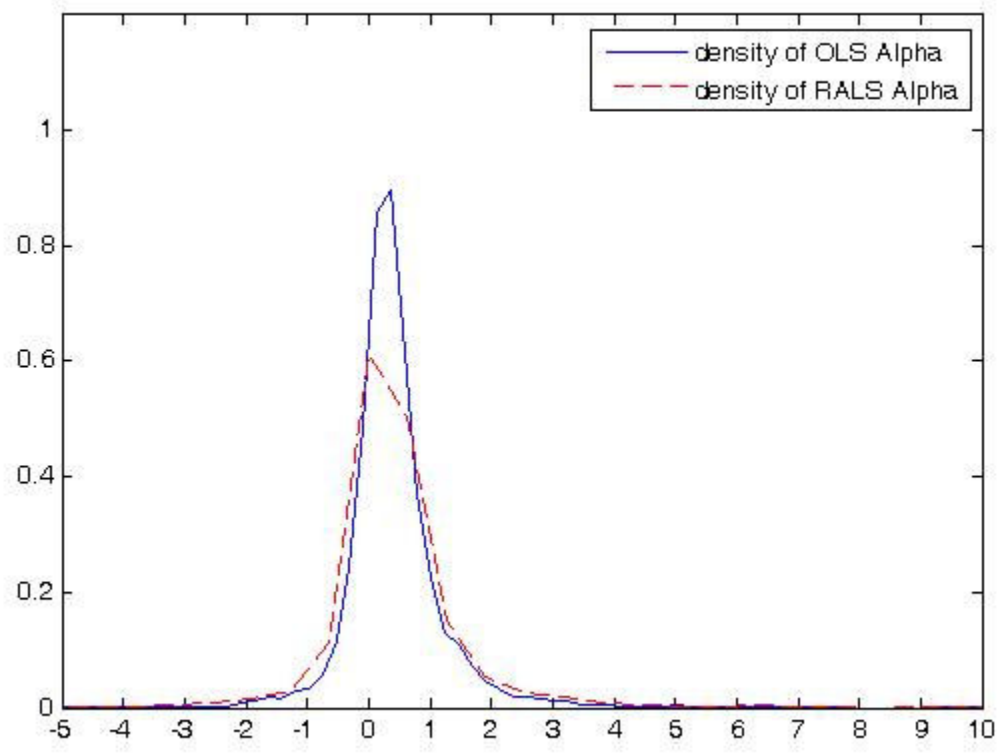


Figure 2

Kernel density estimate of the OLS and RALS estimated t-statistic of alpha distribution for all funds

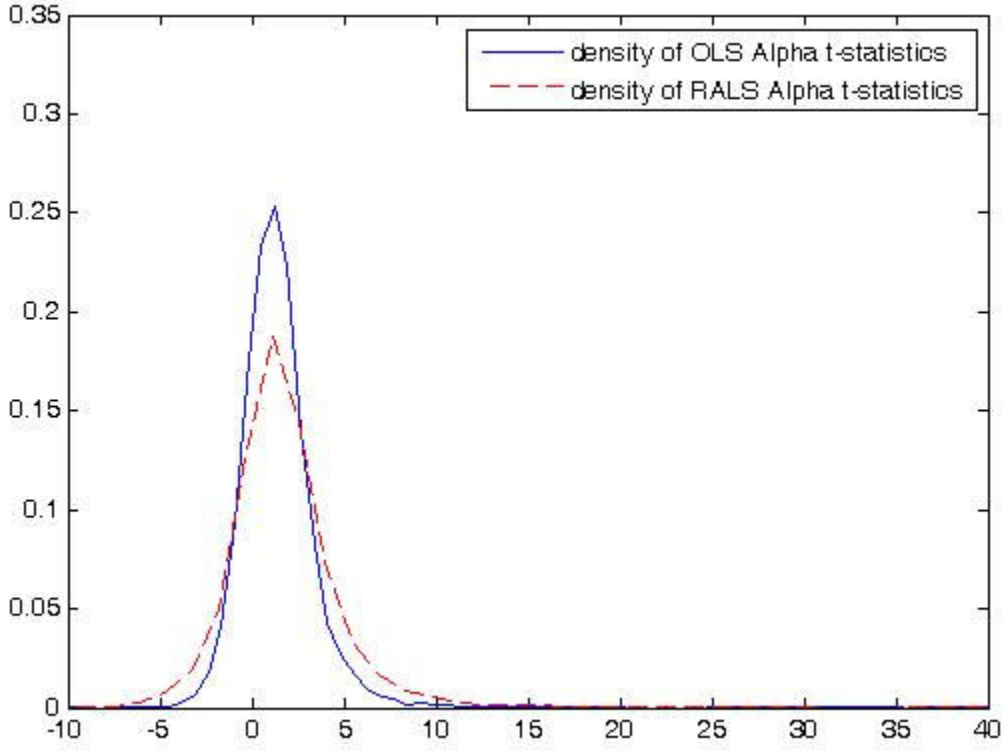
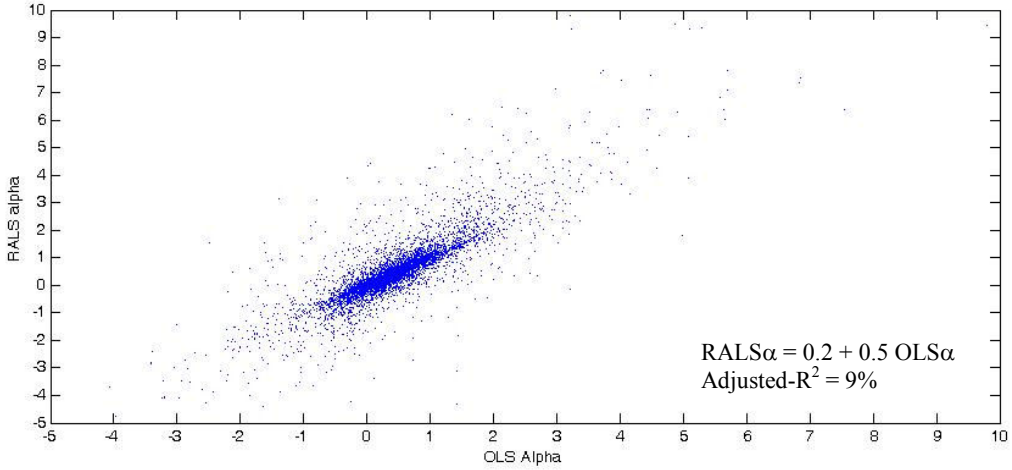


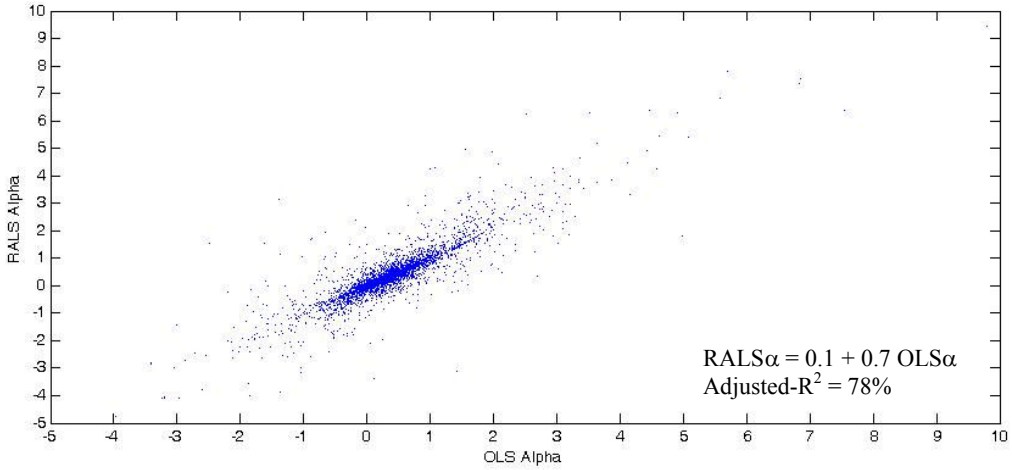
Figure 3 Impact of switching model on performance estimates

The two sets of alphas are (1) the OLS alpha and (2) the RALS alpha. Figure 6A shows alphas when the model is estimated for all funds. Figure 6B shows alphas when the models are estimated only for funds which exhibit normally distributed OLS fund residuals. Figure 6C shows alphas when the models are estimated for funds exhibiting non-normally distributed OLS fund residuals. Residuals are considered non-normal if Jarque and Bera tests of normality are rejected at the 5% level. Results from regressing RALS alpha on OLS alpha are also included in each figure.

(A) All Funds



(B) Normally distributed OLS fund residual



(C) Non-normally distributed OLS fund residual

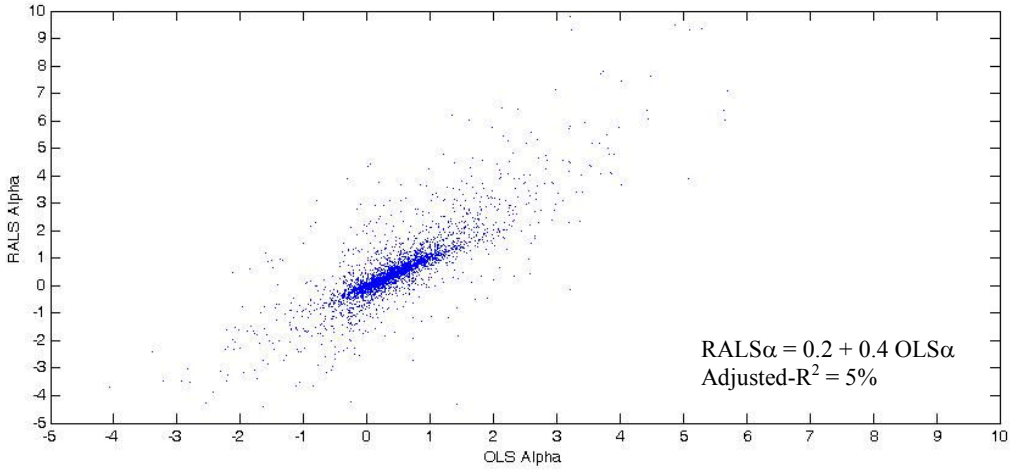


Table 1
Summary Statistics of Reported Monthly Returns

The summary statistics are the numbers of funds, *N*, and the equally-weighted averages of the mean monthly return, μ,standard deviation of monthly returns, σ, the Sharpe Ratio, SR, the skewness, Skew and the excess kurtosis, Kurt. A fund is classified as being non-normally distributed if it is rejected using the Jarque Bera test (at the 10% level).

	Normally Distributed Funds						Non-Normally Distributed Funds					
Fund Category	*N*	*μ*	*σ*	*SR*	*Skew*	*Kurt*	*N*	*μ*	*σ*	*SR*	*Skew*	*Kurt*
Panel A: Dead Funds												
Convertible Arbitrage	53	0.44	1.55	0.33	-0.11	0.06	78	0.62	2.16	0.53	-0.70	6.59
Event Driven	60	0.87	6.09	0.20	0.08	0.31	124	0.64	7.19	0.15	-0.74	7.00
Equity Market Neutral	110	0.49	1.99	0.30	-0.07	0.07	113	0.53	2.39	0.27	-0.13	3.69
Emerging Markets	93	0.95	2.63	0.53	0.04	0.27	184	0.87	2.99	0.41	-0.23	5.97
Fixed Income Arbitrage	48	0.48	1.14	0.60	-0.18	0.33	109	0.60	2.33	0.62	-1.28	10.56
Fund of Funds	287	0.47	2.15	0.34	-0.12	0.08	294	0.49	2.84	0.30	-0.49	5.76
Global Macro	83	0.38	4.09	0.11	0.09	0.14	111	0.41	3.86	0.17	0.33	4.02
Long Short Equity Hedge	502	0.75	4.14	0.25	-0.03	0.22	558	1.08	5.39	0.24	-0.36	4.49
Managed Futures	184	0.36	5.26	0.07	0.11	0.18	181	0.61	6.15	0.12	0.06	4.14
Multi-Strategy	64	0.75	2.47	0.63	-0.03	0.32	65	0.92	3.05	0.36	-0.22	9.44
All Funds	1495	0.60	3.47	0.29	-0.02	0.18	1828	0.75	4.26	0.29	-0.14	5.52
Panel B: Live Funds												
Convertible Arbitrage	23	0.70	1.28	0.70	-0.08	0.24	50	0.74	2.23	0.67	0.02	3.65
Event Driven	113	1.66	3.47	0.55	-0.11	0.15	94	1.75	5.17	0.50	0.09	6.06
Equity Market Neutral	91	0.69	1.70	0.47	-0.08	0.00	103	0.69	1.98	0.48	0.09	4.52
Emerging Markets	95	1.03	2.02	0.92	-0.11	0.30	202	1.00	2.10	0.60	-0.18	4.53
Fixed Income Arbitrage	62	0.62	1.32	0.83	-0.14	0.03	106	0.60	2.04	0.66	-0.97	14.05
Fund of Funds	921	0.73	1.77	0.46	-0.28	0.06	848	0.66	1.83	0.45	-0.43	4.30
Global Macro	91	0.93	3.44	0.28	-0.14	0.20	63	0.88	4.17	0.25	0.25	4.32
Long Short Equity Hedge	542	1.22	3.22	0.43	-0.11	0.11	570	1.14	3.86	0.34	0.33	4.33
Managed Futures	126	1.05	5.67	0.21	0.03	-0.80	88	1.04	4.65	0.26	0.35	2.97
Multi-Strategy	139	0.85	2.24	0.46	-0.18	0.19	193	0.83	2.53	0.52	-0.47	6.47
All Funds	2208	0.94	2.53	0.46	-0.18	0.09	2329	0.89	2.75	0.45	-0.15	4.97

Table 2
Summary Statistics and Correlation Matrix of Factors Used to Analyze Hedge Fund Returns

The summary statistics are the mean monthly return, μ,standard deviation of monthly returns, σ, the Sharpe Ratio, *SR*, the skewness, *Skew* and the excess kurtosis, *Kurt*.

Panel A: Summary Statistics

	μ	σ	*SR*	*Skew*	*Kurt*
SNPRF	0.01	0.04	0.16	-0.62	3.87
SCMLC	0.00	0.03	0.03	0.06	7.80
BD10RET	0.00	0.05	-0.01	0.79	4.64
BAAMTSY	0.00	0.03	-0.01	-0.24	5.62
PTFSBD	-0.01	0.15	-0.10	1.49	6.24
PTFSFX	0.00	0.19	-0.03	1.34	5.93
PTFSCOM	-0.01	0.13	-0.06	1.37	6.41

Panel B: Correlation Matrix

	SNPRF	SCMLC	BD10RET	BAAMTSY	PTFSBD	PTFSFX	PTFSCOM
SNPRF	1.00						
SCMLC	-0.04	1.00					
BD10RET	0.04	0.05	1.00				
BAAMTSY	-0.11	-0.17	-0.89	1.00			
PTFSBD	-0.14	-0.03	-0.03	0.04	1.00		
PTFSFX	-0.11	0.04	-0.14	0.13	0.16	1.00	
PTFSCOM	-0.09	-0.01	-0.02	0.02	0.17	0.26	1.00

Table 3

Summary Statistics and Tests of Normality on Hedge Fund Residuals Full Sample

This table reports the distributional properties of hedge fund returns by investment objective. Column one reports the number of funds in each investment category. Columns two and three report the mean OLS estimated alpha and t-statistic of alpha, respectively, across funds in each category. Alphas are estimated using the Fung and Hsieh (2004) model. Columns four and five report the mean kurtosis and skewness of residuals. Column six reports the percentage of fund residuals for which normality is rejected using the Jarque Bera test (at the 10% level) within each investment category. Columns seven and eight report the mean RALS estimated alpha and t-statistic of alpha, respectively, across funds in each category. Column nine reports the mean efficiency gain from RALS estimation relative to OLS estimation.

	N	OLS alpha	t-statistic	Kurtosis	skewness	% Jarque Bera	RALS alpha	t-statistic	ρ^*
All Funds	7860	0.41	1.39	5.07	0.00	0.51	0.46	1.67	0.69
Convertible Arbitrage Funds	204	0.29	2.32	5.49	-0.12	0.58	0.31	2.42	0.69
Event Driven Funds	574	0.55	2.46	5.38	0.12	0.61	0.67	3.23	0.67
Equity Market Neutral Funds	417	0.30	1.37	4.53	0.02	0.47	0.32	1.82	0.68
Emerging Markets Funds	391	0.64	1.34	4.96	0.09	0.51	0.80	2.00	0.69
Fixed Income Arbitrage Funds	325	0.30	2.20	8.57	-0.47	0.63	0.24	2.59	0.60
Fund of Funds	2350	0.25	1.27	5.04	-0.20	0.51	0.22	1.18	0.71
Global Macro Funds	348	0.26	0.55	4.38	0.06	0.41	0.29	0.65	0.69
Long Short Equity Hedge Funds	2172	0.59	1.32	4.71	0.26	0.51	0.72	1.80	0.70
Managed Futures Funds	579	0.28	0.45	4.19	0.00	0.40	0.36	0.43	0.71
Multi-Strategy Funds	461	0.47	1.96	6.03	-0.07	0.55	0.51	2.53	0.63

Table 4

Summary Statistics and Tests of Normality on Hedge Fund Residuals

This table reports the distributional properties of hedge fund returns by investment objective. Column one reports the number of funds in each investment category. Columns two and three report the mean OLS estimated alpha and t-statistic of alpha, respectively. Columns four and five report the mean RALS estimated alpha and t-statistic of alpha. Column six reports the mean efficiency gain from RALS estimation.

	Normally Distributed Funds						*Non-Normally Distributed Funds*					
Fund Category	*N*	*OLSa*	*RALSa*	*OLSt*	*RALSt*	ρ^*	*N*	*OLSa*	*RALSa*	*OLSt*	*RALSt*	ρ^*
Panel A: Dead Funds												
Convertible Arbitrage	58	0.18	0.14	1.45	0.99	0.68	73	0.20	0.15	1.55	1.40	0.67
Event Driven	80	-0.17	0.07	-0.11	0.27	0.76	104	0.04	0.27	0.36	0.85	0.70
Equity Market Neutral	119	0.12	0.07	0.56	0.63	0.66	104	0.35	0.42	1.24	1.48	0.71
Emerging Markets	105	0.45	0.58	1.94	2.53	0.71	172	0.52	0.70	1.77	2.48	0.62
Fixed Income Arbitrage	50	0.29	0.24	1.53	1.51	0.76	107	0.29	0.24	2.48	2.52	0.56
Fund of Funds	300	0.02	0.01	0.51	0.37	0.69	281	0.05	0.08	0.91	1.02	0.69
Global Macro	98	0.14	0.10	0.21	0.33	0.69	96	0.07	0.08	0.43	0.57	0.68
Long Short Equity Hedge	490	0.25	0.31	0.59	0.78	0.69	570	0.55	0.80	1.16	1.71	0.72
Managed Futures	204	-0.02	-0.03	-0.03	-0.31	0.69	161	0.19	0.35	0.12	0.03	0.68
Multi-Strategy	63	0.19	0.19	1.87	2.38	0.74	66	0.58	0.68	1.76	2.40	0.58
All Funds	1581	0.15	0.17	0.64	0.71	0.70	1742	0.33	0.47	1.12	1.45	0.68
Panel B: Live Funds												
Convertible Arbitrage	28	0.39	0.42	3.36	4.06	0.77	45	0.51	0.73	4.05	4.87	0.70
Event Driven	113	1.30	1.42	2.35	3.36	0.63	94	1.18	1.26	2.43	3.11	0.68
Equity Market Neutral	102	0.34	0.36	1.23	1.67	0.65	92	0.44	0.46	2.70	3.88	0.70
Emerging Markets	118	0.57	0.59	2.89	3.80	0.65	179	0.62	0.73	3.13	3.97	0.71
Fixed Income Arbitrage	71	0.27	0.25	2.19	2.87	0.61	97	0.32	0.25	2.26	3.02	0.53
Fund of Funds	840	0.37	0.31	1.33	1.22	0.73	929	0.29	0.24	1.57	1.47	0.71
Global Macro	106	0.43	0.45	0.59	0.42	0.67	48	0.50	0.71	1.38	1.95	0.71
Long Short Equity Hedge	575	0.79	0.80	1.60	2.10	0.66	537	0.75	0.91	1.85	2.50	0.71
Managed Futures	141	0.59	0.71	0.95	1.26	0.72	73	0.74	0.76	1.59	1.78	0.80
Multi-Strategy	146	0.49	0.50	1.37	2.04	0.59	186	0.52	0.57	2.51	3.02	0.64
All Funds	2249	0.55	0.55	1.52	1.81	0.68	2288	0.51	0.55	1.99	2.35	0.70

Table 5
Performance of Funds Sorted on OLS Alpha by Investment Objective

Panel A reports the statistical significance of performance measures for all funds. Panels B to K show the results for the subsample of funds in specific investment categories. The first (last) column in each Panel reports the decile of funds with the lowest (highest) OLS alpha, followed by results for the next decile of funds with the second lowest (highest) alpha. In each panel the first and second rows report the mean OLS alpha estimate based on heteroscedasticity and autocorrelation consistent standard errors as well as the p-value of alpha for each decile. The third and fourth rows report the mean RALS alpha estimate as well at the p-value of alpha. The fifth and sixth rows report the estimated OLS alpha error as well as the p-value of the OLS alpha error.

Panel A: All Funds

	1.	2.	3.	4.	5.	6.	7.	8.	9.	10.
OLS alpha	-0.83	-0.13	0.05	0.17	0.28	0.38	0.51	0.68	0.96	2.02
p-value	0.29	0.66	0.78	0.41	0.25	0.16	0.13	0.11	0.08	0.07
RALS alpha	-0.91	-0.18	0.05	0.16	0.27	0.39	0.53	0.68	1.07	2.51
p-value	0.21	0.42	0.56	0.38	0.23	0.16	0.13	0.12	0.07	0.06
OLS alpha error	0.09	0.05	0.00	0.01	0.00	-0.01	-0.02	0.00	-0.10	-0.49
p-value	0.02	0.01	0.89	0.59	0.69	0.42	0.06	0.78	0.00	0.00

Panel B: Convertible Arbitrage Funds

	1.	2.	3.	4.	5.	6.	7.	8.	9.	10.
OLS alpha	-0.70	-0.15	0.05	0.19	0.28	0.36	0.41	0.48	0.64	1.16
p-value	0.16	0.59	0.72	0.31	0.13	0.09	0.04	0.06	0.04	0.06
RALS alpha	-0.86	-0.37	-0.06	0.09	0.28	0.29	0.41	0.54	0.70	1.79
p-value	0.10	0.33	0.54	0.27	0.15	0.23	0.07	0.03	0.03	0.02
OLS alpha error	0.15	0.21	0.11	0.10	0.00	0.06	0.00	-0.06	-0.06	-0.63
p-value	0.31	0.07	0.01	0.05	0.88	0.20	0.91	0.15	0.16	0.00

Panel C: Event Driven Funds

	1.	2.	3.	4.	5.	6.	7.	8.	9.	10.
OLS alpha	-0.51	0.05	0.20	0.29	0.39	0.50	0.61	0.74	0.95	2.16
p-value	0.37	0.70	0.27	0.15	0.06	0.04	0.02	0.04	0.02	0.07
RALS alpha	-0.43	0.00	0.17	0.32	0.43	0.53	0.64	0.65	1.06	3.12
p-value	0.14	0.41	0.23	0.13	0.04	0.04	0.02	0.04	0.03	0.03
OLS alpha error	-0.08	0.05	0.03	-0.02	-0.04	-0.03	-0.03	0.09	-0.11	-0.96
p-value	0.57	0.35	0.37	0.41	0.03	0.17	0.34	0.23	0.00	0.00

Panel D: Equity Market Neutral Funds

	1.	2.	3.	4.	5.	6.	7.	8.	9.	10.
OLS alpha	-0.60	-0.18	0.00	0.12	0.22	0.31	0.41	0.56	0.79	1.46
p-value	0.24	0.55	0.83	0.51	0.29	0.21	0.13	0.09	0.06	0.04
RALS alpha	-0.74	-0.22	0.01	0.11	0.22	0.35	0.41	0.49	0.82	1.81
p-value	0.16	0.42	0.63	0.41	0.19	0.14	0.14	0.11	0.06	0.01
OLS alpha error	0.14	0.04	-0.01	0.01	0.00	-0.04	-0.01	0.07	-0.04	-0.36
p-value	0.02	0.43	0.59	0.75	0.98	0.30	0.78	0.12	0.55	0.00

Panel E: Emerging Market Funds

	1.	2.	3.	4.	5.	6.	7.	8.	9.	10.
OLS alpha	-1.77	-0.47	0.00	0.28	0.47	0.68	0.93	1.24	1.84	3.08
p-value	0.15	0.44	0.84	0.40	0.23	0.20	0.11	0.09	0.06	0.04
RALS alpha	-2.07	-0.28	0.28	0.41	0.59	0.63	1.16	1.45	2.19	3.56
p-value	0.14	0.41	0.60	0.29	0.19	0.17	0.07	0.06	0.08	0.03
OLS alpha error	0.30	-0.20	-0.29	-0.13	-0.12	0.05	-0.23	-0.20	-0.35	-0.47
p-value	0.41	0.03	0.05	0.13	0.14	0.57	0.02	0.22	0.03	0.00

Table 5 cont'd

Panel F: Fixed Income Arbitrage Funds

	1.	2.	3.	4.	5.	6.	7.	8.	9.	10.
OLS alpha	-0.56	-0.09	0.06	0.17	0.24	0.33	0.42	0.56	0.74	1.23
p-value	0.36	0.70	0.67	0.36	0.23	0.15	0.05	0.07	0.04	0.02
RALS alpha	-0.98	-0.11	0.01	0.12	0.18	0.34	0.39	0.48	0.72	1.47
p-value	0.20	0.49	0.41	0.40	0.24	0.18	0.08	0.12	0.07	0.01
OLS alpha error	0.42	0.03	0.05	0.05	0.06	-0.01	0.03	0.08	0.01	-0.24
p-value	0.00	0.67	0.20	0.17	0.25	0.73	0.37	0.04	0.81	0.00

Panel G: Fund of Funds

	1.	2.	3.	4.	5.	6.	7.	8.	9.	10.
OLS alpha	-0.57	-0.06	0.06	0.13	0.20	0.27	0.34	0.44	0.58	1.14
p-value	0.27	0.78	0.71	0.43	0.26	0.17	0.12	0.12	0.09	0.07
RALS alpha	-0.69	-0.12	0.02	0.09	0.16	0.24	0.30	0.38	0.57	1.21
p-value	0.21	0.46	0.57	0.43	0.32	0.20	0.17	0.15	0.10	0.09
OLS alpha error	0.12	0.06	0.04	0.04	0.04	0.03	0.04	0.05	0.01	-0.07
p-value	0.00	0.00	0.01	0.00	0.00	0.04	0.00	0.00	0.61	0.00

Panel H: Global Macro Funds

	1.	2.	3.	4.	5.	6.	7.	8.	9.	10.
OLS alpha	-1.10	-0.32	-0.16	-0.01	0.13	0.27	0.44	0.66	0.95	1.82
p-value	0.30	0.53	0.66	0.91	0.66	0.47	0.35	0.18	0.12	0.11
RALS alpha	-1.43	-0.25	-0.22	0.01	0.22	0.43	0.56	0.64	1.09	1.92
p-value	0.23	0.30	0.45	0.65	0.55	0.35	0.28	0.20	0.08	0.07
OLS alpha error	0.33	-0.07	0.06	-0.03	-0.09	-0.16	-0.12	0.03	-0.14	-0.10
p-value	0.11	0.67	0.48	0.73	0.22	0.17	0.24	0.42	0.16	0.00

Panel I: Long Short Equity Hedge Funds

	1.	2.	3.	4.	5.	6.	7.	8.	9.	10.
OLS alpha	-0.71	-0.09	0.13	0.30	0.43	0.55	0.71	0.94	1.29	2.37
p-value	0.35	0.79	0.69	0.36	0.20	0.16	0.13	0.10	0.07	0.07
RALS alpha	-0.78	-0.06	0.19	0.42	0.47	0.61	0.75	1.07	1.49	3.03
p-value	0.25	0.56	0.51	0.27	0.18	0.14	0.14	0.08	0.06	0.04
OLS alpha error	0.08	-0.04	-0.06	-0.12	-0.03	-0.05	-0.03	-0.14	-0.19	-0.66
p-value	0.19	0.31	0.10	0.00	0.10	0.02	0.22	0.00	0.00	0.00

Panel J: Managed Futures Funds

	1.	2.	3.	4.	5.	6.	7.	8.	9.	10.
OLS alpha	-1.60	-0.57	-0.28	-0.06	0.11	0.32	0.55	0.79	1.21	2.40
p-value	0.17	0.42	0.55	0.89	0.79	0.48	0.29	0.22	0.14	0.08
RALS alpha	-1.47	-0.62	-0.30	-0.07	-0.02	0.24	0.59	0.94	1.22	3.11
p-value	0.16	0.27	0.41	0.51	0.50	0.44	0.26	0.19	0.12	0.09
OLS alpha error	-0.13	0.05	0.02	0.01	0.12	0.08	-0.04	-0.15	-0.01	-0.71
p-value	0.40	0.72	0.88	0.95	0.14	0.23	0.38	0.07	0.93	0.00

Panel K: Multi Strategy Funds

	1.	2.	3.	4.	5.	6.	7.	8.	9.	10.
OLS alpha	-0.70	-0.05	0.09	0.21	0.33	0.45	0.56	0.73	0.98	2.11
p-value	0.36	0.78	0.67	0.34	0.15	0.11	0.09	0.07	0.07	0.04
RALS alpha	-0.94	-0.01	0.12	0.15	0.25	0.46	0.62	0.74	1.05	2.63
p-value	0.18	0.49	0.46	0.27	0.16	0.12	0.07	0.09	0.06	0.04
OLS alpha error	0.24	-0.04	-0.04	0.07	0.08	-0.01	-0.05	-0.01	-0.07	-0.52
p-value	0.07	0.60	0.46	0.16	0.15	0.80	0.17	0.80	0.49	0.00

Table 6
Performance of Funds Sorted on OLS t-alpha by Investment Objective

Panel A reports the statistical significance of performance measures for all funds. Panels B to K show the results for the subsample of funds in specific investment categories. The first (last) column in each Panel reports the decile of funds with the lowest (highest) OLS alpha, followed by results for the next decile of funds with the second lowest (highest) alpha. In each panel the first and second rows report the mean OLS t-statistic of alpha estimate based on heteroscedasticity and autocorrelation consistent standard errors as well as the p-value of alpha for each decile. The third and fourth rows report the mean RALS alpha t-statistic of alpha estimate as well at the p-value. The fifth and sixth rows report the estimated OLS t-statistic of alpha error as well as the p-value of this error.

Panel A: All Funds

	1.	2.	3.	4.	5.	6.	7.	8.	9.	10.
OLS t-alpha	-1.61	-0.36	0.18	0.62	1.02	1.42	1.81	2.28	2.99	5.55
p-value	0.22	0.73	0.85	0.54	0.32	0.17	0.08	0.03	0.01	0.00
RALS t-alpha	-2.65	-0.74	0.16	0.73	1.25	1.79	2.28	2.95	3.76	7.14
p-value	0.19	0.46	0.56	0.46	0.32	0.20	0.12	0.04	0.01	0.00
OLS error	1.04	0.39	0.02	-0.11	-0.22	-0.37	-0.47	-0.67	-0.77	-1.60
p-value	0.00	0.00	0.60	0.01	0.00	0.00	0.00	0.00	0.00	0.00

Panel B: Convertible Arbitrage Funds

	1.	2.	3.	4.	5.	6.	7.	8.	9.	10.
OLS t-alpha	-1.74	-0.51	0.28	0.88	1.36	1.82	2.20	2.90	3.74	10.62
p-value	0.13	0.62	0.77	0.39	0.19	0.08	0.03	0.01	0.00	0.00
RALS t-alpha	-3.52	-1.66	-0.23	0.57	1.60	2.11	2.73	3.29	4.70	12.53
p-value	0.13	0.30	0.58	0.31	0.24	0.17	0.05	0.01	0.00	0.00
OLS error	1.78	1.14	0.51	0.31	-0.24	-0.30	-0.54	-0.39	-0.96	-1.91
p-value	0.00	0.09	0.02	0.38	0.39	0.30	0.08	0.15	0.04	0.04

Panel C: Event Driven Funds

	1.	2.	3.	4.	5.	6.	7.	8.	9.	10.
OLS t-alpha	-1.15	0.20	0.93	1.52	1.95	2.36	2.86	3.46	4.32	7.74
p-value	0.36	0.78	0.37	0.14	0.06	0.02	0.01	0.00	0.00	0.00
RALS t-alpha	-1.45	0.04	1.04	2.23	2.91	3.32	3.51	4.52	5.37	10.27
p-value	0.14	0.40	0.31	0.15	0.07	0.01	0.01	0.00	0.00	0.00
OLS error	0.30	0.16	-0.11	-0.71	-0.96	-0.96	-0.64	-1.06	-1.05	-2.53
p-value	0.36	0.44	0.61	0.00	0.01	0.00	0.00	0.00	0.00	0.00

Panel D: Equity Market Neutral Funds

	1.	2.	3.	4.	5.	6.	7.	8.	9.	10.
OLS t-alpha	-1.50	-0.57	-0.01	0.52	0.90	1.33	1.76	2.21	3.05	6.32
p-value	0.17	0.58	0.88	0.61	0.38	0.20	0.09	0.03	0.01	0.00
RALS t-alpha	-2.20	-0.98	0.12	0.42	1.11	1.95	2.40	3.10	3.54	9.23
p-value	0.15	0.43	0.61	0.43	0.37	0.16	0.08	0.05	0.00	0.00
OLS error	0.70	0.41	-0.12	0.10	-0.21	-0.62	-0.64	-0.89	-0.49	-2.90
p-value	0.00	0.02	0.32	0.60	0.28	0.00	0.00	0.00	0.01	0.00

Panel E: Emerging Market Funds

	1.	2.	3.	4.	5.	6.	7.	8.	9.	10.
OLS t-alpha	-2.08	-0.70	0.00	0.57	1.06	1.57	1.97	2.43	3.09	5.33
p-value	0.08	0.50	0.89	0.58	0.30	0.13	0.06	0.02	0.00	0.00
RALS t-alpha	-2.13	-0.81	0.42	0.97	1.46	2.32	3.63	3.11	4.48	6.45
p-value	0.13	0.41	0.59	0.40	0.29	0.16	0.04	0.03	0.00	0.00
OLS error	0.05	0.11	-0.42	-0.40	-0.40	-0.74	-1.66	-0.68	-1.39	-1.12
p-value	0.76	0.59	0.02	0.04	0.21	0.01	0.00	0.01	0.00	0.00

Table 6 Cont'd

Panel F: Fixed Income Arbitrage Funds

	1.	2.	3.	4.	5.	6.	7.	8.	9.	10.
OLS t-alpha	-1.20	-0.32	0.24	0.75	1.32	1.78	2.34	3.03	4.30	11.17
p-value	0.30	0.76	0.80	0.46	0.20	0.08	0.03	0.01	0.00	0.00
RALS t-alpha	-3.45	-1.46	0.01	0.73	1.28	2.00	2.70	3.84	6.67	15.60
p-value	0.24	0.46	0.47	0.45	0.30	0.18	0.09	0.02	0.00	0.00
OLS error	2.25	1.14	0.23	0.02	0.03	-0.21	-0.36	-0.82	-2.37	-4.43
p-value	0.00	0.05	0.30	0.94	0.81	0.46	0.27	0.02	0.00	0.03

Panel G: Fund of Funds

	1.	2.	3.	4.	5.	6.	7.	8.	9.	10.
OLS t-alpha	-1.70	-0.25	0.29	0.65	0.99	1.34	1.69	2.16	2.81	4.70
p-value	0.25	0.81	0.78	0.52	0.33	0.19	0.10	0.04	0.01	0.00
RALS t-alpha	-3.07	-0.67	0.05	0.39	0.95	1.40	1.67	2.38	3.35	5.40
p-value	0.19	0.48	0.54	0.53	0.40	0.28	0.20	0.07	0.01	0.00
OLS error	1.37	0.42	0.24	0.26	0.04	-0.06	0.03	-0.22	-0.53	-0.70
p-value	0.00	0.00	0.00	0.00	0.54	0.39	0.65	0.00	0.00	0.00

Panel H: Global Macro Funds

	1.	2.	3.	4.	5.	6.	7.	8.	9.	10.
OLS t-alpha	-2.13	-0.63	-0.31	-0.02	0.29	0.59	1.02	1.48	1.97	3.40
p-value	0.17	0.54	0.76	0.94	0.77	0.56	0.31	0.15	0.06	0.01
RALS t-alpha	-4.08	-0.55	-0.72	0.13	0.69	0.78	1.48	2.02	2.81	4.15
p-value	0.17	0.38	0.45	0.61	0.52	0.50	0.26	0.17	0.09	0.01
OLS error	1.96	-0.08	0.42	-0.16	-0.39	-0.19	-0.46	-0.54	-0.84	-0.74
p-value	0.01	0.66	0.05	0.38	0.10	0.24	0.04	0.03	0.03	0.02

Panel I: Long Short Equity Hedge

	1.	2.	3.	4.	5.	6.	7.	8.	9.	10.
OLS t-alpha	-1.25	-0.20	0.31	0.76	1.13	1.47	1.82	2.22	2.74	4.16
p-value	0.31	0.84	0.76	0.46	0.27	0.15	0.08	0.03	0.01	0.00
RALS t-alpha	-2.01	-0.26	0.57	1.17	1.67	2.28	2.43	2.87	3.61	5.63
p-value	0.26	0.55	0.54	0.38	0.22	0.13	0.10	0.04	0.01	0.00
OLS error	0.76	0.06	-0.26	-0.42	-0.53	-0.81	-0.61	-0.66	-0.87	-1.47
p-value	0.00	0.46	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00

Panel J: Managed Futures

	1.	2.	3.	4.	5.	6.	7.	8.	9.	10.
OLS t-alpha	-2.14	-0.94	-0.44	-0.10	0.19	0.59	1.01	1.35	1.91	3.14
p-value	0.08	0.36	0.67	0.92	0.85	0.56	0.32	0.19	0.07	0.01
RALS t-alpha	-3.23	-1.22	-0.59	-0.20	-0.07	0.88	1.14	1.50	2.44	3.69
p-value	0.08	0.31	0.44	0.52	0.54	0.40	0.36	0.22	0.07	0.01
OLS error	1.09	0.28	0.15	0.11	0.26	-0.29	-0.13	-0.15	-0.53	-0.55
p-value	0.00	0.10	0.44	0.63	0.12	0.06	0.39	0.34	0.00	0.00

Panel K: Multi Strategy Funds

	1.	2.	3.	4.	5.	6.	7.	8.	9.	10.
OLS t-alpha	-1.51	-0.14	0.37	0.78	1.26	1.73	2.15	2.95	4.09	7.77
p-value	0.29	0.86	0.72	0.45	0.22	0.09	0.04	0.01	0.00	0.00
RALS t-alpha	-3.01	-0.48	0.72	1.32	1.25	1.97	3.11	3.99	5.84	10.43
p-value	0.16	0.51	0.45	0.39	0.24	0.16	0.05	0.01	0.00	0.00
OLS error	1.50	0.34	-0.35	-0.54	0.00	-0.24	-0.97	-1.04	-1.75	-2.66
p-value	0.02	0.26	0.17	0.02	0.99	0.17	0.00	0.00	0.00	0.00

Table 7
Source of alpha and t-stat alpha estimation error

This table reports the estimated parameters from the following cross sectional regressions $z_i = \gamma_0 + \gamma_1 skew_i + \gamma_2 kurt_i + \epsilon$; $z_i = \gamma_0 + \gamma_1 skew_i + \gamma_2 kurt_i + \sum_{j=1}^{J} \beta_j C_{ji} + \epsilon$ where $z_i = \hat{a}_i^{RALS} - \hat{a}_i^{OLS}$ (Panel A) or $z_i = t\hat{a}_i^{RALS} - t\hat{a}_i^{OLS}$ (Panel B) $\hat{a}_i^{RALS}$ is the intercept of the RALS estimated time-series regression of fund *i*'s returns against the Fung and Hsieh benchmark factors. $\hat{a}_i^{OLS}$ is the intercept of the OLS estimated time-series regression of fund *i*'s returns against the Fung and Hsieh benchmark factors. $t\hat{a}_i^{RALS}$ and $t\hat{a}_i^{OLS}$ are the corresponding intercept t-statistics. *skew* and *kurt* are the estimates of skewness and kurtosis for fund *i* and C_{ji} are the control variables: *dlock*, *notice*, *min*, $notice^2$, min^2 and *dlock.notice*. The variables dlock, notice, and min correspond to the lockup indicator, redemption notice period (in 30-day units), and minimum investment size (in millions of dollars). The variables $notice^2$ and min^2 allow for non-linearity in the return and share restriction relation. The last variable, *dlock.notice* allows for interaction between the lockup and notice period restrictions.

Model	γ_0	γ_1	γ_2	β_1	β_2	β_3	β_4	β_5	β_6
Panel A: All Funds Alpha									
1	0.58								
	0.00								
2	0.05	2.85	0.10						
	0.70	0.00	0.00						
3	0.20	2.84	0.10	0.31	-0.35	0.00	0.00	0.08	0.00
	0.27	0.00	0.00	0.19	0.04	0.61	0.67	0.02	0.87
Panel B: All Funds t-Stat of Alpha									
1	3.32								
	0.00								
2	2.10	9.22	0.23						
	0.00	0.00	0.00						
3	0.26	9.15	0.21	1.26	0.61	0.01	0.00	0.46	0.00
	0.61	0.00	0.00	0.06	0.20	0.71	0.50	0.00	0.61

Table 8
Source of alpha estimation error

This table reports the estimated parameters from the following cross sectional regressions $z_i = \gamma_0 + \gamma_1 skew_i + \gamma_2 kurt_i + \epsilon$; $z_i = \gamma_0 + \gamma_1 skew_i + + \gamma_2 kurt_i + \sum_{j=1}^{J} \beta_j C_{ji} + \epsilon$ where $z_i = \hat{a}_i^{RALS} - \hat{a}_i^{OLS}$. Results are reported for the dead (Panel A) and live (Panel B) samples of returns, for normally distributed and non-normally distributed funds. P-values are in parentheses.

	Normally Distributed Funds									Non-Normally Distributed Funds								
Model	γ_0	γ_1	γ_2	β_1	β_2	β_3	β_4	β_5	β_6	γ_0	γ_1	γ_2	β_1	β_2	β_3	β_4	β_5	β_6
Panel A: Dead Funds																		
1	0.54									1.45								
	0.01									0.00								
2	1.12	11.79	-0.22							0.05	2.92	0.20						
	0.19	0.00	0.26							0.90	0.00	0.00						
3	1.07	11.84	-0.21	-0.81	0.19	0.01	0.00	-0.04	0.29	0.40	2.92	0.20	0.60	-0.85	-0.01	0.00	0.20	0.01
	0.12	0.00	0.30	0.08	0.67	0.89	0.95	0.79	0.26	0.50	0.00	0.00	0.45	0.13	0.76	0.80	0.06	0.75
Panel B: Live Funds																		
1	0.10									0.39								
	0.34									0.00								
2	-0.70	7.73	0.36							0.24	1.90	0.01						
	0.14	0.00	0.00							0.19	0.00	0.50						
3	-0.34	7.75	0.39	0.21	-0.73	0.00	0.00	0.16	0.02	0.05	1.88	0.01	0.36	0.10	0.00	0.00	0.01	-0.04
	0.34	0.00	0.00	0.36	0.00	0.83	0.59	0.01	0.58	0.84	0.00	0.57	0.25	0.64	0.91	0.97	0.84	0.01

Table 9
Alpha of Funds Sorted on Historical Skewness by Investment Objective

Panel A reports the statistical significance of performance measures for all funds. Panels B to K show the results for the subsample of funds in specific investment categories. The first (last) column in each Panel reports the decile of funds with the lowest (highest) skewness, followed by results for the next decile of funds with the second lowest (highest) skewness. In each panel the first row reports the mean estimate of skewness for each decile. The second and third rows report the mean OLS alpha estimate based on heteroscedasticity and autocorrelation consistent standard errors as well as the p-value of alpha for each decile. The fourth and fifth rows report the mean RALS alpha estimate as well at the p-value of alpha. The sixth and seventh rows report the estimated OLS alpha error as well as the p-value of the OLS alpha error.

Panel A: All Funds

	1.	2.	3.	4.	5.	6.	7.	8.	9.	10.
Skewness	-2.42	-0.97	-0.65	-0.43	-0.24	-0.06	0.14	0.39	0.76	1.96
OLS alpha	0.06	0.21	0.30	0.32	0.32	0.38	0.43	0.51	0.63	0.94
p-value	0.35	0.36	0.30	0.30	0.31	0.28	0.30	0.29	0.24	0.20
RALS alpha	-0.13	0.06	0.22	0.23	0.29	0.38	0.49	0.67	0.88	1.47
p-value	0.24	0.31	0.29	0.27	0.27	0.23	0.23	0.21	0.18	0.12
OLS alpha error	0.19	0.15	0.08	0.08	0.03	-0.00	-0.07	-0.16	-0.25	-0.54
p-value	0.00	0.00	0.00	0.00	0.03	0.94	0.00	0.00	0.00	0.00

Panel B: Convertible Arbitrage Funds

	1.	2.	3.	4.	5.	6.	7.	8.	9.	10.
Skewness	-2.93	-1.12	-0.75	-0.51	-0.35	-0.20	-0.07	0.14	0.49	1.95
OLS alpha	-0.08	0.23	0.06	0.38	0.31	0.12	0.37	0.26	0.50	0.67
p-value	0.28	0.28	0.28	0.17	0.21	0.20	0.11	0.33	0.16	0.17
RALS alpha	-0.22	0.20	-0.15	0.29	0.28	0.04	0.39	0.18	0.56	1.35
p-value	0.20	0.27	0.17	0.12	0.20	0.23	0.13	0.21	0.12	0.11
OLS alpha error	0.14	0.03	0.20	0.09	0.04	0.07	-0.02	0.08	-0.06	-0.68
p-value	0.37	0.50	0.01	0.10	0.47	0.01	0.51	0.33	0.16	0.00

Panel C: Event Driven Funds

	1.	2.	3.	4.	5.	6.	7.	8.	9.	10.
Skewness	-2.71	-1.24	-0.80	-0.53	-0.25	-0.03	0.18	0.51	0.96	2.31
OLS alpha	0.04	0.25	0.28	0.39	0.55	0.64	0.60	0.49	0.88	1.33
p-value	0.37	0.24	0.22	0.18	0.16	0.16	0.15	0.11	0.09	0.05
RALS alpha	-0.02	0.15	0.20	0.34	0.53	0.70	0.71	0.73	1.29	1.93
p-value	0.12	0.19	0.14	0.15	0.12	0.13	0.07	0.07	0.05	0.04
OLS alpha error	0.06	0.10	0.07	0.04	0.02	-0.07	-0.11	-0.24	-0.40	-0.60
p-value	0.66	0.03	0.08	0.03	0.50	0.39	0.04	0.00	0.01	0.00

Panel D: Equity Market Neutral Funds

	1.	2.	3.	4.	5.	6.	7.	8.	9.	10.
Skewness	-1.92	-0.82	-0.45	-0.30	-0.16	0.01	0.18	0.42	0.79	1.84
OLS alpha	0.07	0.10	0.19	0.23	0.30	0.34	0.32	0.30	0.47	0.72
p-value	0.45	0.31	0.34	0.38	0.28	0.32	0.23	0.25	0.23	0.15
RALS alpha	-0.04	-0.07	0.15	0.09	0.23	0.39	0.34	0.37	0.59	1.18
p-value	0.31	0.27	0.28	0.35	0.24	0.21	0.20	0.16	0.20	0.09
OLS alpha error	0.11	0.17	0.05	0.13	0.06	-0.05	-0.02	-0.07	-0.12	-0.47
p-value	0.11	0.00	0.25	0.00	0.18	0.19	0.49	0.00	0.17	0.00

Panel E: Emerging Market Funds

	1.	2.	3.	4.	5.	6.	7.	8.	9.	10.
Skewness	-2.90	-1.20	-0.65	-0.40	-0.20	-0.02	0.11	0.30	0.61	1.78
OLS alpha	-0.12	0.31	0.24	0.78	0.49	0.44	0.95	0.78	0.81	1.63
p-value	0.29	0.36	0.30	0.20	0.27	0.19	0.21	0.23	0.31	0.20
RALS alpha	-0.41	0.03	0.21	0.71	0.60	0.43	1.35	1.06	1.35	2.62
p-value	0.17	0.37	0.27	0.17	0.25	0.22	0.13	0.18	0.21	0.09
OLS alpha error	0.30	0.28	0.03	0.07	-0.11	0.01	-0.40	-0.28	-0.53	-0.98
p-value	0.39	0.03	0.77	0.36	0.31	0.86	0.00	0.00	0.00	0.00

Table 9 Cont'd

Panel F: Fixed Income Arbitrage Funds

	1.	2.	3.	4.	5.	6.	7.	8.	9.	10.
Skewness	-6.02	-2.73	-1.45	-0.83	-0.56	-0.34	-0.10	0.30	0.88	2.68
OLS alpha	0.14	0.08	0.21	0.21	0.18	0.28	0.26	0.35	0.49	0.85
p-value	0.32	0.35	0.26	0.41	0.30	0.30	0.35	0.13	0.15	0.07
RALS alpha	-0.24	-0.18	0.18	0.18	0.11	0.24	0.17	0.36	0.60	1.15
p-value	0.22	0.28	0.23	0.31	0.34	0.23	0.28	0.18	0.06	0.08
OLS alpha error	0.38	0.26	0.03	0.03	0.07	0.03	0.09	-0.01	-0.11	-0.30
p-value	0.00	0.01	0.54	0.39	0.00	0.30	0.09	0.49	0.02	0.00

Panel G: Fund of Funds

	1.	2.	3.	4.	5.	6.	7.	8.	9.	10.
Skewness	-2.32	-1.11	-0.85	-0.67	-0.52	-0.37	-0.19	0.03	0.35	1.43
OLS alpha	0.04	0.20	0.18	0.32	0.28	0.24	0.25	0.25	0.30	0.48
p-value	0.34	0.39	0.36	0.29	0.30	0.26	0.28	0.27	0.33	0.20
RALS alpha	-0.10	0.04	0.08	0.25	0.21	0.18	0.24	0.23	0.39	0.66
p-value	0.25	0.36	0.32	0.29	0.30	0.27	0.26	0.23	0.25	0.16
OLS alpha error	0.14	0.16	0.11	0.07	0.08	0.06	0.01	0.02	-0.09	-0.18
p-value	0.00	0.00	0.00	0.00	0.00	0.00	0.54	0.25	0.00	0.00

Panel H: Global Macro Funds

	1.	2.	3.	4.	5.	6.	7.	8.	9.	10.
Skewness	-1.48	-0.69	-0.36	-0.14	0.02	0.23	0.40	0.60	0.93	1.92
OLS alpha	-0.41	0.08	0.18	-0.02	0.37	0.27	0.55	0.53	0.49	0.57
p-value	0.41	0.58	0.42	0.49	0.39	0.45	0.38	0.44	0.37	0.36
RALS alpha	-0.87	-0.09	0.07	-0.11	0.32	0.58	0.71	0.57	0.77	0.95
p-value	0.25	0.41	0.34	0.41	0.37	0.30	0.22	0.39	0.20	0.28
OLS alpha error	0.46	0.17	0.11	0.08	0.05	-0.31	-0.16	-0.05	-0.29	-0.37
p-value	0.03	0.00	0.45	0.52	0.27	0.02	0.04	0.72	0.02	0.00

Panel I: Long Short Equity Hedge Funds

	1.	2.	3.	4.	5.	6.	7.	8.	9.	10.
Skewness	-1.42	-0.62	-0.37	-0.18	-0.04	0.13	0.33	0.60	0.99	2.21
OLS alpha	0.37	0.38	0.44	0.42	0.57	0.52	0.64	0.67	0.83	1.11
p-value	0.34	0.32	0.33	0.33	0.29	0.32	0.28	0.24	0.24	0.22
RALS alpha	0.20	0.33	0.34	0.40	0.62	0.58	0.88	0.90	1.12	1.81
p-value	0.28	0.28	0.29	0.28	0.21	0.24	0.20	0.16	0.18	0.11
OLS alpha error	0.17	0.05	0.10	0.01	-0.06	-0.06	-0.24	-0.22	-0.29	-0.70
p-value	0.00	0.09	0.00	0.65	0.15	0.05	0.00	0.00	0.00	0.00

Panel J: Managed Futures Funds

	1.	2.	3.	4.	5.	6.	7.	8.	9.	10.
Skewness	-1.67	-0.53	-0.23	-0.07	0.08	0.24	0.37	0.56	0.83	1.60
OLS alpha	-0.26	-0.14	0.10	0.14	0.34	0.25	0.34	0.40	0.66	1.01
p-value	0.49	0.46	0.47	0.38	0.37	0.41	0.38	0.41	0.31	0.34
RALS alpha	-0.75	-0.49	0.23	0.05	0.29	0.31	0.50	0.64	0.89	1.94
p-value	0.33	0.31	0.39	0.33	0.26	0.34	0.27	0.26	0.27	0.21
OLS alpha error	0.49	0.35	-0.14	0.09	0.05	-0.06	-0.15	-0.24	-0.23	-0.93
p-value	0.00	0.01	0.17	0.38	0.56	0.32	0.01	0.03	0.01	0.00

Panel K: Multi Strategy Funds

	1.	2.	3.	4.	5.	6.	7.	8.	9.	10.
Skewness	-3.72	-1.39	-0.87	-0.61	-0.41	-0.20	0.11	0.43	0.87	2.35
OLS alpha	0.03	0.25	0.23	0.37	0.42	0.42	0.35	0.64	0.82	1.21
p-value	0.35	0.31	0.37	0.34	0.21	0.30	0.27	0.20	0.17	0.14
RALS alpha	-0.34	0.16	0.20	0.43	0.38	0.39	0.28	0.72	1.06	1.80
p-value	0.19	0.22	0.28	0.29	0.21	0.25	0.19	0.14	0.11	0.08
OLS alpha error	0.37	0.09	0.04	-0.06	0.04	0.03	0.07	-0.08	-0.24	-0.59
p-value	0.01	0.03	0.26	0.35	0.28	0.49	0.35	0.10	0.00	0.00

Table 10
t-alpha of Funds Sorted on Historical Skewness by Investment Objective

Panel A reports the statistical significance of performance measures for all funds. Panels B to K show the results for the subsample of funds in specific investment categories. The first (last) column in each Panel reports the decile of funds with the lowest (highest) skewness, followed by results for the next decile of funds with the second lowest (highest) skewness. In each panel the first row reports the mean estimate of skewness for each decile. The second and third rows report the mean OLS t-statistic of alpha estimate based on heteroscedasticity and autocorrelation consistent standard errors as well as the p-value for each decile. The fourth and fifth rows report the mean RALS t-statistic of alpha estimate as well at the p-value. The sixth and seventh rows report the estimated OLS error as well as the p-value of this error.

Panel A: All Funds

	1.	2.	3.	4.	5.	6.	7.	8.	9.	10.
Skewness	-2.42	-0.97	-0.65	-0.43	-0.24	-0.06	0.14	0.39	0.76	1.96
OLS t-alpha	0.76	1.04	1.25	1.14	1.19	1.31	1.38	1.54	2.05	2.24
p-value	0.35	0.36	0.30	0.30	0.31	0.28	0.30	0.29	0.24	0.20
RALS t-alpha	0.25	0.78	1.10	1.00	1.20	1.52	1.73	2.13	3.00	3.96
p-value	0.24	0.31	0.29	0.27	0.27	0.23	0.23	0.21	0.18	0.12
OLS error	0.51	0.26	0.15	0.14	-0.01	-0.21	-0.34	-0.58	-0.96	-1.72
p-value	0.00	0.01	0.00	0.03	0.83	0.00	0.00	0.00	0.00	0.00

Panel B: Convertible Arbitrage Funds

	1.	2.	3.	4.	5.	6.	7.	8.	9.	10.
Skewness	-2.93	-1.12	-0.75	-0.51	-0.35	-0.20	-0.07	0.14	0.49	1.95
OLS t-alpha	0.49	1.57	1.20	2.30	1.99	0.68	2.53	1.61	5.44	4.88
p-value	0.28	0.28	0.28	0.17	0.21	0.20	0.11	0.33	0.16	0.17
RALS t-alpha	-0.23	1.71	0.33	2.50	1.74	-0.39	2.64	1.23	7.53	6.31
p-value	0.20	0.27	0.17	0.12	0.20	0.23	0.13	0.21	0.12	0.11
OLS error	0.72	-0.14	0.87	-0.21	0.26	1.06	-0.11	0.39	-2.08	-1.43
p-value	0.25	0.65	0.01	0.68	0.34	0.02	0.41	0.33	0.06	0.00

Panel C: Event Driven Funds

	1.	2.	3.	4.	5.	6.	7.	8.	9.	10.
Skewness	-2.71	-1.24	-0.80	-0.53	-0.25	-0.03	0.18	0.51	0.96	2.31
OLS t-alpha	0.86	1.95	1.95	2.36	2.30	3.24	2.58	2.62	3.32	3.33
p-value	0.37	0.24	0.22	0.18	0.16	0.16	0.15	0.11	0.09	0.05
RALS t-alpha	1.12	1.66	1.94	2.29	2.67	4.38	3.27	3.52	4.88	6.30
p-value	0.12	0.19	0.14	0.15	0.12	0.13	0.07	0.07	0.05	0.04
OLS error	-0.26	0.29	0.00	0.07	-0.37	-1.15	-0.68	-0.90	-1.56	-2.98
p-value	0.44	0.05	0.99	0.47	0.04	0.02	0.00	0.00	0.00	0.00

Panel D: Equity Market Neutral Funds

	1.	2.	3.	4.	5.	6.	7.	8.	9.	10.
Skewness	-1.92	-0.82	-0.45	-0.30	-0.16	0.01	0.18	0.42	0.79	1.84
OLS t-alpha	0.66	0.45	0.82	0.72	1.28	1.08	1.12	1.74	3.18	2.73
p-value	0.45	0.31	0.34	0.38	0.28	0.32	0.23	0.25	0.23	0.15
RALS t-alpha	0.30	0.43	0.65	0.36	1.63	1.41	1.55	2.56	4.89	4.57
p-value	0.31	0.27	0.28	0.35	0.24	0.21	0.20	0.16	0.20	0.09
OLS error	0.36	0.02	0.17	0.35	-0.36	-0.33	-0.43	-0.83	-1.70	-1.85
p-value	0.13	0.93	0.22	0.04	0.11	0.08	0.03	0.00	0.00	0.00

Panel E: Emerging Market Funds

	1.	2.	3.	4.	5.	6.	7.	8.	9.	10.
Skewness	-2.90	-1.20	-0.65	-0.40	-0.20	-0.02	0.11	0.30	0.61	1.78
OLS t-alpha	0.46	0.62	0.80	1.31	1.11	1.32	1.89	1.50	1.93	2.37
p-value	0.29	0.36	0.30	0.20	0.27	0.19	0.21	0.23	0.31	0.20
RALS t-alpha	0.80	0.53	0.67	1.48	1.39	1.61	3.48	2.64	3.10	4.26
p-value	0.17	0.37	0.27	0.17	0.25	0.22	0.13	0.18	0.21	0.09
OLS error	-0.33	0.10	0.14	-0.17	-0.28	-0.29	-1.59	-1.14	-1.18	-1.89
p-value	0.20	0.57	0.36	0.34	0.03	0.10	0.00	0.00	0.00	0.00

Table 10 Cont'd

Panel F: Fixed Income Arbitrage Funds

	1.	2.	3.	4.	5.	6.	7.	8.	9.	10.
Skewness	-6.02	-2.73	-1.45	-0.83	-0.56	-0.34	-0.10	0.30	0.88	2.68
OLS t-alpha	0.95	1.26	2.40	1.58	1.15	1.96	1.40	2.77	5.26	3.51
p-value	0.32	0.35	0.26	0.41	0.30	0.30	0.35	0.13	0.15	0.07
RALS t-alpha	-1.05	0.36	3.26	1.60	1.00	2.07	0.99	2.92	8.21	7.29
p-value	0.22	0.28	0.23	0.31	0.34	0.23	0.28	0.18	0.06	0.08
OLS error	2.01	0.90	-0.87	-0.01	0.16	-0.11	0.41	-0.16	-2.95	-3.78
p-value	0.02	0.03	0.37	0.96	0.16	0.58	0.05	0.30	0.04	0.00

Panel G: Fund of Funds

	1.	2.	3.	4.	5.	6.	7.	8.	9.	10.
Skewness	-2.32	-1.11	-0.85	-0.67	-0.52	-0.37	-0.19	0.03	0.35	1.43
OLS t-alpha	0.86	0.88	0.99	1.38	1.19	1.25	1.34	1.41	1.24	2.15
p-value	0.34	0.39	0.36	0.29	0.30	0.26	0.28	0.27	0.33	0.20
RALS t-alpha	0.28	0.12	0.78	1.21	0.89	1.10	1.37	1.49	1.56	3.04
p-value	0.25	0.36	0.32	0.29	0.30	0.27	0.26	0.23	0.25	0.16
OLS error	0.58	0.75	0.20	0.17	0.31	0.15	-0.03	-0.08	-0.32	-0.89
p-value	0.00	0.00	0.05	0.00	0.07	0.12	0.70	0.32	0.00	0.00

Panel H: Global Macro Funds

	1.	2.	3.	4.	5.	6.	7.	8.	9.	10.
Skewness	-1.48	-0.69	-0.36	-0.14	0.02	0.23	0.40	0.60	0.93	1.92
OLS t-alpha	-0.20	0.24	0.36	0.20	0.74	0.08	0.95	0.88	1.09	1.21
p-value	0.41	0.58	0.42	0.49	0.39	0.45	0.38	0.44	0.37	0.36
RALS t-alpha	-0.77	-0.03	-0.30	0.14	0.83	0.07	0.88	1.18	2.32	2.27
p-value	0.25	0.41	0.34	0.41	0.37	0.30	0.22	0.39	0.20	0.28
OLS error	0.57	0.27	0.66	0.06	-0.09	0.00	0.07	-0.30	-1.22	-1.06
p-value	0.03	0.12	0.03	0.77	0.49	1.00	0.90	0.11	0.00	0.01

Panel I: Long Short Equity Hedge

	1.	2.	3.	4.	5.	6.	7.	8.	9.	10.
Skewness	-1.42	-0.62	-0.37	-0.18	-0.04	0.13	0.33	0.60	0.99	2.21
OLS t-alpha	0.73	0.96	1.01	1.06	1.29	1.34	1.47	1.75	1.76	1.82
p-value	0.34	0.32	0.33	0.33	0.29	0.32	0.28	0.24	0.24	0.22
RALS t-alpha	0.35	1.01	1.01	1.17	1.62	1.74	2.15	2.49	2.79	3.64
p-value	0.28	0.28	0.29	0.28	0.21	0.24	0.20	0.16	0.18	0.11
OLS error	0.38	-0.06	0.00	-0.11	-0.33	-0.41	-0.68	-0.75	-1.03	-1.82
p-value	0.03	0.45	0.98	0.15	0.00	0.00	0.00	0.00	0.00	0.00

Panel J: Managed Futures

	1.	2.	3.	4.	5.	6.	7.	8.	9.	10.
Skewness	-1.67	-0.53	-0.23	-0.07	0.08	0.24	0.37	0.56	0.83	1.60
OLS t-alpha	-0.18	-0.21	0.19	0.21	0.49	0.62	0.65	0.63	1.20	0.96
p-value	0.49	0.46	0.47	0.38	0.37	0.41	0.38	0.41	0.31	0.34
RALS t-alpha	-0.99	-1.09	0.15	0.01	0.30	0.75	1.07	0.76	1.77	1.58
p-value	0.33	0.31	0.39	0.33	0.26	0.34	0.27	0.26	0.27	0.21
OLS error	0.81	0.88	0.03	0.19	0.19	-0.12	-0.42	-0.12	-0.57	-0.62
p-value	0.00	0.00	0.84	0.25	0.24	0.41	0.03	0.42	0.00	0.00

Panel K: Multi Strategy Funds

	1.	2.	3.	4.	5.	6.	7.	8.	9.	10.
Skewness	-3.72	-1.39	-0.87	-0.61	-0.41	-0.20	0.11	0.43	0.87	2.35
OLS t-alpha	0.75	1.30	1.74	1.25	2.31	1.75	2.03	2.79	2.40	3.22
p-value	0.35	0.31	0.37	0.34	0.21	0.30	0.27	0.20	0.17	0.14
RALS t-alpha	-0.35	1.35	2.44	1.29	3.15	1.99	2.31	3.39	3.79	5.87
p-value	0.19	0.22	0.28	0.29	0.21	0.25	0.19	0.14	0.11	0.08
OLS error	1.10	-0.05	-0.70	-0.04	-0.85	-0.24	-0.28	-0.60	-1.39	-2.65
p-value	0.02	0.82	0.33	0.76	0.11	0.21	0.04	0.02	0.00	0.00

Table 11
Robustness Checks Alpha of Funds Sorted on Historical Skewness

Panel A reports the statistical significance of performance measures for all funds estimated with a minimum of 3 years data. Panels B and C show the results for the Full Sample corrected for return serial correlation and backfill bias respectively. The first (last) column in each Panel reports the decile of funds with the lowest (highest) skewness, followed by results for the next decile of funds with the second lowest (highest) skewness. In each panel the first row reports the mean estimate of skewness for each decile. The second and third rows report the mean OLS alpha estimate based on heteroscedasticity and autocorrelation consistent standard errors as well as the p-value of alpha for each decile. The fourth and fifth rows report the mean RALS alpha estimate as well at the p-value of alpha. The sixth and seventh rows report the estimated OLS alpha error as well as the p-value of the OLS alpha error.

Panel A: All Funds (3 Years)

	1.	2.	3.	4.	5.	6.	7.	8.	9.	10.
Skewness	-2.44	-0.93	-0.61	-0.40	-0.21	-0.03	0.17	0.43	0.81	2.04
OLS alpha	0.09	0.20	0.26	0.33	0.34	0.41	0.46	0.50	0.64	0.89
p-value	0.34	0.34	0.28	0.29	0.29	0.26	0.28	0.27	0.22	0.17
RALS alpha	0.02	0.08	0.20	0.27	0.33	0.43	0.50	0.63	0.82	1.25
p-value	0.24	0.33	0.29	0.28	0.28	0.24	0.24	0.20	0.17	0.12
OLS alpha error	0.07	0.12	0.06	0.06	0.01	-0.01	-0.04	-0.12	-0.18	-0.36
p-value	0.00	0.00	0.00	0.00	0.61	0.28	0.01	0.00	0.00	0.00

Panel B: All Funds (Unsmoothed)

	1.	2.	3.	4.	5.	6.	7.	8.	9.	10.
Skewness	-2.42	-0.97	-0.65	-0.43	-0.24	-0.06	0.14	0.39	0.77	1.96
OLS alpha	0.05	0.20	0.29	0.30	0.30	0.36	0.40	0.48	0.60	0.90
p-value	0.36	0.36	0.31	0.31	0.31	0.29	0.30	0.30	0.25	0.21
RALS alpha	-0.14	0.05	0.22	0.22	0.27	0.36	0.47	0.64	0.84	1.42
p-value	0.24	0.31	0.29	0.28	0.27	0.24	0.24	0.21	0.18	0.12
OLS alpha error	0.18	0.15	0.08	0.08	0.03	0.00	-0.07	-0.16	-0.24	-0.52
p-value	0.00	0.00	0.00	0.00	0.05	0.95	0.00	0.00	0.00	0.00

Panel C: All Funds (No Backfill)

	1.	2.	3.	4.	5.	6.	7.	8.	9.	10.
Skewness	-2.38	-0.99	-0.70	-0.48	-0.29	-0.11	0.09	0.33	0.68	1.80
OLS alpha	0.06	0.22	0.23	0.28	0.29	0.32	0.41	0.45	0.56	1.05
p-value	0.36	0.36	0.30	0.29	0.33	0.31	0.31	0.33	0.25	0.23
RALS alpha	-0.11	0.08	0.12	0.19	0.27	0.32	0.50	0.56	0.74	1.16
p-value	0.23	0.31	0.27	0.23	0.28	0.26	0.25	0.24	0.18	0.14
OLS alpha error	0.17	0.13	0.11	0.09	0.02	0.00	-0.09	-0.12	-0.18	-0.11
p-value	0.00	0.00	0.00	0.00	0.32	0.98	0.00	0.00	0.00	0.71

Table 12
Robustness Checks t-alpha of Funds Sorted on Historical Skewness

Panel A reports the statistical significance of performance measures for all funds estimated with a minimum of 3 years data. Panels B and C show the results for the Full Sample corrected for return serial correlation and backfill bias respectively. The first (last) column in each Panel reports the decile of funds with the lowest (highest) skewness, followed by results for the next decile of funds with the second lowest (highest) skewness. In each panel the first row reports the mean estimate of skewness for each decile. The second and third rows report the mean OLS t-statistic of alpha estimate based on heteroscedasticity and autocorrelation consistent standard errors as well as the p-value for each decile. The fourth and fifth rows report the mean RALS t-statistic of alpha estimate as well at the p-value. The sixth and seventh rows report the estimated OLS error as well as the p-value of this error.

Panel A: All Funds (3 Years)

	1.	2.	3.	4.	5.	6.	7.	8.	9.	10.
Skewness	-2.42	-0.97	-0.65	-0.43	-0.24	-0.06	0.14	0.39	0.76	1.96
OLS t alpha	0.76	1.04	1.25	1.14	1.19	1.31	1.38	1.54	2.05	2.24
p-value	0.35	0.36	0.30	0.30	0.31	0.28	0.30	0.29	0.24	0.20
RALS t alpha	0.25	0.78	1.10	1.00	1.20	1.52	1.73	2.13	3.00	3.96
p-value	0.24	0.31	0.29	0.27	0.27	0.23	0.23	0.21	0.18	0.12
OLS alpha error	0.51	0.26	0.15	0.14	-0.01	-0.21	-0.34	-0.58	-0.96	-1.72
p-value	0.00	0.01	0.00	0.03	0.83	0.00	0.00	0.00	0.00	0.00

Panel B: All Funds (Unsmoothed)

	1.	2.	3.	4.	5.	6.	7.	8.	9.	10.
Skewness	-2.42	-0.97	-0.65	-0.43	-0.24	-0.06	0.14	0.39	0.77	1.96
OLS t alpha	0.70	0.95	1.21	1.05	1.14	1.27	1.29	1.41	1.95	2.16
p-value	0.36	0.36	0.31	0.31	0.31	0.29	0.30	0.30	0.25	0.21
RALS t alpha	0.18	0.68	1.06	0.90	1.14	1.47	1.65	1.94	2.90	3.88
p-value	0.24	0.31	0.29	0.28	0.27	0.24	0.24	0.21	0.18	0.12
OLS alpha error	0.52	0.27	0.15	0.15	0.00	-0.21	-0.35	-0.53	-0.95	-1.72
p-value	0.00	0.01	0.00	0.02	0.94	0.00	0.00	0.00	0.00	0.00

Panel C: All Funds (No Backfill)

	1.	2.	3.	4.	5.	6.	7.	8.	9.	10.
Skewness	-2.38	-0.99	-0.70	-0.48	-0.29	-0.11	0.09	0.33	0.68	1.80
OLS t alpha	0.79	0.98	1.17	1.20	1.12	1.19	1.28	1.29	1.82	2.10
p-value	0.36	0.36	0.30	0.29	0.33	0.31	0.31	0.33	0.25	0.23
RALS t alpha	0.44	0.56	1.02	1.29	1.25	1.45	1.75	1.84	2.61	3.50
p-value	0.23	0.31	0.27	0.23	0.28	0.26	0.25	0.24	0.18	0.14
OLS alpha error	0.36	0.42	0.15	-0.09	-0.13	-0.26	-0.48	-0.55	-0.80	-1.40
p-value	0.02	0.00	0.06	0.18	0.12	0.00	0.00	0.00	0.00	0.00