A Comparison of Quantitative and Qualitative Hedge Funds

Ludwig Chincarini*

November 30, 2009.
Preliminary Draft
Comments Welcome

Abstract

In the last 20 years, the number of hedge funds and the amount of assets managed by them have grown dramatically. In addition, there has been a evolving distinction between quantitative hedge funds and qualitative hedge funds. This paper examines the differences between quantitative and qualitative hedge funds in a variety of ways, including management differences and performance differences. The study finds that both quantitative and qualitative hedge funds have positive risk-adjusted returns. The study also finds that overall, quantitative hedge funds as a group have higher αs than qualitative hedge funds. The study also suggests that this additional performance may be due to better timing ability.

JEL Classification: G0, G10, G11, and G23
Key Words: quantitative portfolio management, alpha, hedge funds, returns

*The author would like to thank Alex Nakao for dedicated research assistance, Jason Price, Mary Martin, and the Claremont libraries for aid in acquiring the hedge fund data. We also thank Scott Esser for help with the data, and Neer Asherie and Michael Steinberger for useful discussions. Contact: Ludwig Chincarini, CFA, Ph.D., is an assistant professor at the Department of Economics, Pomona College, 425 N. College Avenue #211, Claremont, CA 91711. Email: chincarinil@hotmail.com. Phone: 909-621-8881. Fax: 909-621-8576.

I Introduction

In the last few years, quantitative portfolio management and quantitative *equity* portfolio management in particular have been on the rise (see Figure 1). The growth in this method of investing can be attributed to many factors, but perhaps four of them stand out. First, there has been an advancement in the education and tools for assessing financial markets quantitatively. Second, there has been a dramatic improvement in the technology required to efficiently examine the markets quantitatively. Third, there has been an increasing demand from pension funds and other large institutional investors for an *investment process*. Quantitative investing lends itself more easily to a more structured investment process. Fourth, some have argued that a quantitative disciplined investment process might lead to superior returns than a qualitative investment process. In particular, Chincarini and Kim (2006) have discussed the potential advantages and disadvantages of quantitative funds (Table 1) arguing that the advantages outweight the disadvantages.

[INSERT FIGURE 1 ABOUT HERE]

[INSERT TABLE 1 ABOUT HERE]

This paper is focused on addressing the last of these potential reasons for the growth in quantitative portfolio management. In particular, we attempt to study the performance characteristics of quantitative and qualitative hedge funds. The advantages for quantitative funds include the breadth of selections, the elimination of behavioral errors (which might be particularly important during the financial crisis of 2008 - 2009), and the potential lower administration costs (after hedge fund fees). The disadvantages for quantitative hedge funds include the reduced use of qualitative types of data, the reliance on historical data, the ability to quickly react to new economic paradigms. These three might have been especially crippling during the financial crisis of 2008 and 2009. Finally, there is the potential of data mining, which will lead to strategies that aren't as

effective once implemented. In this paper, we will only focus on the return differences rather than attempting to detail which of the advantages or disadvantages in central in the return differences. We will however, attempt to determine whether any of the return differences can be atributed to simple observable characteristics of the hedge funds.

The paper is organized as follows: section II describes the hedge fund database used in this study; section III discusses the differences between quantitative and qualitative hedge funds in terms of fund characteristics, including fees, average age, investability, liquidity, transparency, and legal structure; section IV discusses the performance models used to test for differences in ability between quantitative and qualitative managers and presents those results; section **??** examines whether any of the fund characteristic differences can explain any differences in performance; and section V concludes the paper.

II Data

The hedge fund data used for this paper was obtained from Hedge Fund Research, which is one of the most extensive and reliable hedge fund databases for practitioners. It is also used by academics, but to a lesser extent than TASS. The data covers the period January 1970 to June 2009. The dataset is free of survivorship bias, since both the *live* and *dead* databases were merged together.[1]

Table 2 reports the summary statistics for all of the hedge fund data, excluding fund-of-funds. The summary statistics are presented for both the live and dead fund separately and together.

[INSERT TABLE 2 ABOUT HERE]

As of June 2009, the HFR database contains a total of 10007 hedge funds (excluding fund-of-funds of which there are 3,798). This is comprised of 5501 dead funds (of that total, 2766

[1]The database may still suffer from problems that all hedge fund databases suffer, such as *selection bias* which could lead to higher or lower average returns.

are liquidated funds and 2735 are non reporting funds) and 4506 live funds with the live funds comprising a total of $913.535 billion in assets under management. The HFR database has recently updated the definition of their categories. There are five broad categories and sub-categories within those: Equity Hedge[2], Event-Driven[3], Macro[4], Relative Value[5], and Fund of Funds[6].

We further reduce the data by eliminating funds that only report quarterly (97 funds were dropped), since we are using monthly returns in our performance analysis. We also dropped funds that did not have 36 consecutive months of data, since we felt that would be a minimum number of observations to run Newey-West corrected regressions. Unfortunately, a total of 3,516 funds were dropped due to this. Across fund categories, 52% were from Equity Hedge, 9% from Event-Driven, 21% from Macro, and 18% from Relative Value. Of the funds that were dropped, 1,288 (or 37%) came from Active funds. These consist of newer funds that have existed for less than 3 years. Another 1,190 (34%) came from liquidated funds and 1,038 (29%) came from non-reporting, but existing funds.[7] Finally, we drop funds for which the performance numbers are missing (166 funds). This leaves a data set with a group of 6,394 hedge funds with about 53% from Equity Hedge, 10% from Event-Driven, 20% from Macro, and 17% from Relative Value.

In the our hedge fund database, funds are classified according to their *main strategy* and their *sub-strategy*. We use this information to make our primary distinction between quantitative funds and qualitative funds. No division of quantitative and qualitative will be with complete precision. After reading the hedge fund category descriptions, we divided the hedge funds according to Table

[2]Sub-Categories are Energy/Basic Materials, Equity Market Neutral, Fundamental Growth, Fundamental Value, Quantitative Directional, Short Bias, Technology/Health Care, Multi-Strategy.

[3]Subcategories are Activist, Credit Arbitrage, Distressed/Restructuring, Merger Arbitrage, Private Issue/Regulation D, Special Situations, Multi-Strategy.

[4]Subcategories are Active Trading, Commodity Discretionary, Commodity Systematic, Currency Discretionary, Commodity Systematic, Discretionary Thematic, Systematic Diversified, Multi-Strategy.

[5]Subcategories are Fixed Income -Asset Backed, Fixed Income-Converible Arbitrage, Fixed Income-Corporate, Fixed Income-Sovereign, Volatility, Yield Alternatives, Multi-Strategy.

[6]Subcategories are Conservative, Diversified, Market Defensive, and Strategy.

[7]It is difficult to know how this dropping will bias the results, but it may be in the direction of less performance.

3.

[INSERT TABLE 3 ABOUT HERE]

Of all the hedge fund sub-categories we classified 10 as quantitative or qualitative and did not categorize 18 of them as well as not including the fund-of-fund categories. Of the ones categorized, we used either the strategy name and/or description to determine whether the funds were quantitative or qualitative hedge funds (see Appendix A for strategy descriptions). Our main method used to classify was to look for the term *quantitative* or description of a similar nature to place a fund in the quantative category. We also looked for words like *discretionary* to classify qualitative funds and *systematic* to classify quantitative funds. Of the four main hedge fund categories, we only found two of them reliable enough to classify. Thus, in the Equity Hedge category, we classified Equity Market Neutral and Quantitative Directional as quantitative hedge funds and Fundamental Growth and Fundamental Value as qualitative categories. In the Macro category, we classified Commodity Systematic, Currency Systematic, and Systematic Diversified as quantitative funds and Commodity Discretionary, Currency Discretionary, and Diversified Thematic as qualitative funds. We did not classify any of the Event Driven funds since these funds vary too substantially within the category and it was not clear from the descriptions how to separate quantitative and qualitative funds. We also did not classify any of the Relative Value funds, even though many of these funds use quantitative techniques, because the broader descriptions left us no clear cut way to divide them.[8] We also left out a couple of Macro funds that could not be easily divided on description alone.

[8] In subsequent work, we will actually read through the individual fund descriptions to create a new classification system of quantitative and qualitative funds.

III Management Differences

Table 4 produces some broad management characteristics about the quantitative and qualitative hedge funds. This information is from the most recent available information in the database as of June 2009. First, there are many more non-quantative hedge funds in our study, almost double. This is both true as of June 2009 as well as on average across time (see the Avg. Number column). Second, the average assets under management (AUM) over the entire time period is also higher for qualitative funds. We also created a measure of the growth in new assets over the entire period for each hedge fund. We computed the average growth rate of new assets into the average hedge fund using the formula for monthly growth in flows as: $g_t = \frac{\text{New Flows}_t}{AUM_{t-1}}$, where New $\text{Flows}_t = \text{AUM}_t - \text{AUM}_{t-1} \cdot (1 + r_{it})$, where r_{it} is the net returns of fund i from $t-1$ to t. Using our measure, we find that on average across time and across funds, the average qualitative fund has had an average growth in assets of 17% per month compared to quantitative funds of 10%. Third, the average management fee does not differ too much, but is almost 10bps higher for the average qualitative fund. The average incentive fees are roughly the same for both types of fund. Fourth, of all the quantitative funds, 83% have high water marks, while 92% of the qualitative funds have high water marks. Quantitative funds have a slightly higher percentage of funds with hurdle rates.

In the same table, we breakdown the statistics by hedge fund sub-strategy. The items of note are that Equity Market Neutral funds have had by far the largest AUM growth amongst quantitative funds, while Fundamental Value and Currency Discretionary have had the highest AUM growth for the qualitative category.

[INSERT TABLE 4 ABOUT HERE]

Table 5 contains other characteristics of these hedge fund categories. The average minimum investment for quantitative funds is much higher than for qualitative funds ($7.4M versus $2.10M).

Both types of funds are generally open to new investments (91% of the funds), while they both allow investors to make subscriptions roughly every four months (0.31% per year). About 67% and 62% of quantitative and qualitative funds have US addresses. The average firm size of quantitative funds is substantially larger ($17M versus $7M). This might feflect the economies of scale inherent in launching other quantitative hedge funds within the same firm with a similar quantitative process. On the whole, qual funds look more illiquid, in the sense that the average redemption period is longer, the amount of advanced notice a hedge funds needs for withdrawals is longer, and they have on average almost double the lockup period (124 days versus 70 days). Quantitative hedge funds seem to be less transparent on average than qual funds. In our sample, 33% are SEC registered compared to 46% of the qual funds. This might be due to the sensitive nature of proprietary models.

[INSERT TABLE 5 ABOUT HERE]

Table 6 is the final table that we present on the management differences between quant and qual funds. The percentage of funds that use leverage is roughly equivalent at 74% and 76%. The types of legal structure are very similar, with limited partnerships (LP) and limited liability companies (LLP) being the most common. On the whole, quant funds tend to invest less in North America than qual funds. Macro funds have almost zero investments in North America both for qual and quant funds.

Overall, despite some minor differences, the management characteristics of quant and qual funds do not seem to be altogether different.

[INSERT TABLE 6 ABOUT HERE]

IV Performance Differences

In order to examine the performance differences of quantitative and qualitative hedge funds, we must use performance metrics. In this paper, in addition to standard return and risk measures as well as risk-adjusted measures, we also examine excess performance measures after acccounting for some type of asset-pricing model.

In order to understand both the market timing ability of hedge funds and the unexplained or excess performance by employing several models. The first model is a standard CAPM, the Fama-French three-factor model, the Fama-French model with an additional factors for momentum. In addition to these standard models, we employ a market-timing factor as well as a timing factor for each of the Fama-French factors. Thus, the models estimated are the following:

$$\tilde{r}_{it} = \alpha_{iT} + \beta_{1iT}\text{RMRF} + \epsilon_{it} \; t = 1, 2, ...T \tag{1}$$

$$\tilde{r}_{it} = \alpha_{iT} + \beta_{1iT}\text{RMRF} + \beta_{2iT}\text{SMB} + \beta_{3iT}\text{HML} + \epsilon_{it} \; t = 1, 2, ...T \tag{2}$$

$$\tilde{r}_{it} = \alpha_{iT} + \beta_{1iT}\text{RMRF} + \beta_{2iT}\text{SMB} + \beta_{3iT}\text{HML} + \beta_{4iT}\text{MOM} + \epsilon_{it} \; t = 1, 2, ...T \tag{3}$$

where $\tilde{r}_{it}(= r_{it} - r_{ft})$ is the return on a hedge fund portfolio in excess of the risk-free rate, RMRF is the excess return on a value-weighted aggregate market proxy, SMB, HML, and MOM are the returns on a value-weighted, zero-investment, factor-mimicking portfolios for size, book-to-market equity, and one-year momentum in stock returns as computed by Fama and French.[9] These models are typically employed to extract the *stock picking skill* of the portfolio manager or has Henrikson and Merton like to call *security analysis* or the *microforecasting ability* of the portfolio manager.

For the tests of market timing, the above models have been modified to include a term that captures the market timing ability (or macroforecasting skills) of the portfolio manager.

[9]Source: http://mba.tuck.dartmouth.edu/pages/faculty/ken.french/data_library.html.

$$\tilde{r}_{it} = \alpha_{iT} + \beta_{1iT}\text{RMRF} + \gamma_{iT}\text{TIMING} + \epsilon_{it} \; t = 1, 2, ...T \quad (4)$$
$$\tilde{r}_{it} = \alpha_{iT} + \beta_{1iT}\text{RMRF} + \beta_{2iT}\text{SMB} + \beta_{3iT}\text{HML} + \gamma_{iT}\text{TIMING} + \epsilon_{it} \; t = 1, 2, ...T \quad (5)$$
$$\tilde{r}_{it} = \alpha_{iT} + \beta_{1iT}\text{RMRF} + \beta_{2iT}\text{SMB} + \beta_{3iT}\text{HML} + \beta_{4iT}\text{MOM} + \gamma_{iT}\text{TIMING} + \epsilon_{it} \; t = 1, 2, ...T \quad (6)$$

where TIMING is the standard measure of market timing, $\max(0, -[r_{M,t} - r_{f,t}])$ (Henrikson-Merton (1981). Focusing on the first equation, which is a standard CAPM test with a TIMING variable, a perfect market timer should have a $\beta = 1$ and a $\gamma = 1$. This would imply an equity portfolio manager that is 100% invested in equities, however in any month where the return of the market is less than the risk-free rate, the manager will sell the entire portfolio and put the securities in cash.[10] In reality, it will be rare for hedge fund managers to engage in such an extreme market timing procedure, however Merton (1981) shows that as long as the timer has greater than random accuracy in predicting up and down markets and that he alters beta accordingly in up and down markets, then γ will be positive and significant. Thus, a test for a positive and significant γ is sufficient to find market timing ability.

A Raw Performance

Table 7 shows performance summary statistics for the various funds. Generally, quantitative funds have a higher average return and a lower average standard deviation than qual funds. Amongst the quant funds, the highest average return comes from the Quantitative Directional strategy. The correlations of the fund categories with the S&P 500 are quite low at 0.27 and 0.25 for quant and qual respectively. The risk-adjusted return measures provide mixed evidence, but overall seems in favor of quant funds. The average Sharpe ratio is hgiher for the qual category, while the Sortino, Omega, Calmar, and Sterling ratios are higher for the quant category.

[10] In theory, the portfolio manager does not need to liquidate the entire portfolio, they could simply engage in a position that effectively changes the β from 1 to 0.

Table 8 shows the performance of the quant and qual funds in other sub-periods, as well as in up and down markets. The quant and qual funds perform similarly in up markets (11.73% and 11.74% respectively). However, the quant funds do significantly better in down markets (-3.84% versus -6.20%). This is mainly driven by the presence of Equity Market Neutral funds. Generally, in the 1990s quant funds outperformed qual funds, but this was reversed in the period from 2000-2009. During the financial crisis (which we measure from January 2007 - June 2009), quant funds did better than qual funds (5.99% versus 5.49%). The examination of the returns of both quant and qual funds indicates that although the returns are not much more skewed than the normal distribution, they have much more kurtosis. But there does not seem to be a difference along this aspect between quant and qual funds.

Although the preliminary investigation of the returns of quant and qual funds suggests a slight advantage to quant funds, this analysis has in now way controlled for the risks of these funds. For example, Equity Market Neutral funds have substantially different risk profiles than Fundamental Growth funds. We attempt to control for this in the next section.

[INSERT TABLE 7 ABOUT HERE]

[INSERT TABLE 8 ABOUT HERE]

B Risk-Adjusted Performance

Table 9 contains the risk-adjusted return measures from the models discussed earlier in Section IV. Columns (1) - (4) represent panel regressions on quant funds using a CAPM model, three-factor Fama-French model, and four-factor Fama-French model, and a three-factor Fama-French model controlling for fixed sub-strategy effects and yearly time effects. Columns (5) - (8) do the same but for a panel of qualitative funds. Columns (9) - (12) run panel regressions including both quant and

qual funds with a three-factor Fama-French model with (Column (10)) and without (Column (9)) interaction dummies on the parameters and a four-factor model with (Column (11))and without (Column (12)) interaction dummies on the independent variables. In all cases, a dummy for quant funds is included in the regressions with coefficient δ. Column (13) - (16) contains the results of four-factor panel regressions with interactive effects on the quant and qual sub-strategies, in a pair-wise comparison. That is, in each case, there is one qual fund compared against one quant fund. Column (13) is Equity Market Neutral versus Fundamental Growth, Column (14) is Quantitative Directional versus Fundamental Value, Column (15) is Commodity Systematic versus Commodity Discretionary, and Column (16) is Currency Systematic versus Currency Discretionary.

[INSERT TABLE 9 ABOUT HERE]

Columns (1) - (3) indicate that quant funds have large and significant αs even when using a four-factor model. Column (3) reports an α of 0.50 which is equivalent to 0.5% per month or 6% per year. The qual funds also have positive and significant αs, although generally smaller than the quant funds.

Columns (9) - (12) report the pooled regressions. The important coefficient is the coefficient on δ which reports the amount to add or subtract from α to get the true α of quant funds versus qual funds. In Column (9), the $\hat{\delta}$ is negative, however, we did not control for the fact that quant and qual funds most likely have very different factor exposures. In Column (10), we control for this factor exposure difference and find that the $\hat{\delta}$ is indeed positive and significant. In fact, in this specification, we find that the α is 0.55%, with $\delta = 0.07$. Thus, quant funds have an α that is 7 bps higher per month than qual funds. This result is even stronger when we use the four-factor model in the specification of Column (12).

When we examine this issue by sub-strategy, we find that generally the difference is small and insignificant for most categories, except that Fundamental Growth (qual type of fund) outperforms Equity Market Neutral (a quant type of fund). Although not shown in the table, Systematic Diversified (a quant type of fund) also significantly outperforms Discretionary Thematic (a qual type of fund). In the aggregate, the latter result dominates making the aggregate performance of quant funds higher than that of qual funds.

As further look into the issue, we performed the same analysis on equal-weighted composites of each category. That is, every month, we took all the hedge funds that were quant funds and took the equal-weighted average of their returns and created a monthly index for quant fund performance. We did a similar thing for qual funds and sub-strategies. We then took these indices and investigated the same performance issues. These results are produced in Table 10.

[INSERT TABLE 10 ABOUT HERE]

The results are qualitatively very similar. The quant index has a positive and significant $\hat{\alpha}$ that is substantially higher than the $\hat{\alpha}$ of the qual funds. The $\hat{\alpha}$ in the four-factor pooled regressions in 0.77% per month and the $\hat{\delta}$ is 0.67% per month. Thus, for the index composites the quant funds have almost double the α of the qual funds.

[ADD PAIRED DISCUSSION]

In order to examine this issue from yet another perspective, rather than using pooled regressions, we run regressions on each individual hedge fund in each category and then average the coefficient estimates, as well as compute the average of the t-statistics, and the percentage of funds in each category that recorded a positive and significant value for that coefficient.[11] For each category,

[11]The reader should note that the average t-statistics does not tell us anything about the average coefficient's significance. In fact, a more appropriate measure for the average coefficient's significance is to construct the statistics

the number of funds used to compute the average coefficients is presented as N. The results are produced in Table 11.

[INSERT TABLE 11 ABOUT HERE]

The results are presented for three of the performance models; the CAPM model, the three-factor Fama-French model, and the four-factor Fama-French model. Focusing on the quant category, we find that the average $\hat{\alpha}$s are all positive and significant. For the Fama-French four-factor model, 23% of the quant funds have a positive and significant $\hat{\alpha}$. Generally, the average $\hat{\alpha}$s for the quant funds is greater than the average α for the qual funds. Although a greater percentage of qual funds have positive average $\hat{\alpha}$s.

The evidence presented for our hedge fund sample over the period 1970-2009 suggests that quant funds as a group outperformed qual funds on a risk-adjusted basis.

C Market Timing

In this section, we investigate the different in market timing ability between quan and qual funds. We implement the same regressions as before with a Henrikkson-Merton timing variable included a discussed earlier in Section IV. The results are presented in Table 12. Columns (1) - (4) show a positive and significant timing coefficient ($\hat{\gamma} > 0$) for the quant hedge funds, as well as a positive $\hat{\alpha}$. The qual funds, on the other hand, have negative and significant timing coefficients (see Columns (5) - (8)). Columns (9) - (12) present the pooled regression results of quant and qual hedge funds

"average" t-statistic assuming that the coefficients of each fund are uncorrelated. If we are interested in the statistic, $\bar{\hat{x}} = \frac{1}{N}\sum_{i=1}^{N} \hat{x}$, then assuming normality from the central limit theorem and independence across parameter estimates, we can use $s_{\bar{\hat{x}}} = \frac{1}{N}\sqrt{\sum_{i=1}^{N} s_{i\hat{x}}^2}$, where N is the number of hedge funds used in the average. The "average" t-statistic or the t-statistic of the average of the parameter across the hedge funds is given by t-stat $= \frac{\bar{\hat{x}}}{s_{\bar{\hat{x}}}}$. While the assumption of independence may not necessarily be true, it isn't any worse than computing the average t-statistic, which is not really interpretable. Although not reported, these t-statistics are very high. These statistics are available from the authors upon request.

with a timing variable included. The interaction dummy on the timing variable shows decisively that the pooled timing coefficient for hedge funds is negative ($\hat{\beta}_{Timing} < 0$), but that quant funds exhibit a positive timing coefficient ($\hat{\beta}_{Quant \times Timing} > 0$). In fact, the interaction term is quite large, for the three-factor (Column (10)) it is 0.20 and for the four-factor model (Column (12)) it is 0.23.

[INSERT TABLE 12 ABOUT HERE]

Another very interesting result is that when the timing variable is included in the pooled regressions, the coefficient of $\hat{\delta}$ becomes negative and significant (ranging from -0.04% to a high of -0.30%). This evidence seems to suggest that on average quant funds' excess performance over qual funds comes from the quant hedge funds' ability to engage in market timing of some sort. It should be noted that significant of the market timing variable may be due to the timing of other factors in their quantitative models but is being picked up by the market timing proxy.

D The Financial Crisis of 2007-2009

In this section we compare the performance of quant and qual funds during the financial crisis of 2008. Although the exact dates of the financial crisis may vary by one's perspective, we chose a period that gave us sufficient observations and encapsulated the crisis. Some observers noted that the worst month of the financial crisis for quant funds was August 2007. Clearly, other times in 2008 were more devastating to the overall markets, including the near failure of Bear Stearns in March 2008 and the collapse of Lehmann Brothers in September 2008. In order to capture enough data and all of these events, we used the period January 2007 - June 2009 as our measurement period. Table 13 contains the results of the analysis over this period. Generally, quant funds have positive and significant αs over the crisis period. Qual funds have mixed evidence. The $\hat{\alpha}$ is positive and significant for the three-factor model specification, but negative and significant for the four-factor

model specification. Columns (9) - (12) show that the $\hat{\delta}$s are all positive and signficant indicating that the quant hedge funds had a significantly higher α during the crisis. The $\hat{\delta}$ estimates range from as little as 8 bps per month to as much as 42 bps per month. The evidence for the paired funds suggests no statistics difference between the funds, which again suggests that the results are mainly driven by the Systematic Diversified quantitative sub-strategy.

[INSERT TABLE 13 ABOUT HERE]

E Composition of Deciles

Another way to examine the performance of the quantitative and qualitative hedge funds is to examine their relative performance. We look at this relative performance in three ways. First, we examine the raw returns of both quantitative and qualitative hedge funds. Second, we investigate the risk-adjusted returns using the three-factor α, and third, we use the risk-adjusted returns using the four-factor α. For various time periods, we sort the performance of these hedge funds from highest to lowest and then compute the percentage of quantitative hedge funds in each decile for the period. We report those percentages in Table 15.

[INSERT TABLE 15 ABOUT HERE]

V Conclusion

The growth of hedge funds over the last 20 years has been enormous. There has been a literature to determine whether hedge funds can perform well on a risk-adjusted basis, since they tend to attract talented people, have less investing restrictions, and have higher incentives. With the hedge fund world, two camps of management have also grown; the traditional qualitative or fundamental camp and the quantitative camp. This paper takes a first look at the different types of hedge

fund managing styles. Quantitative and qualitative hedge funds are examined in a variety of ways, including their management differences and their performance differences. The paper finds that management differences among quantitative and qualitative hedge funds are few. First, there are many more qualitative funds with more assets under management. Second, the average quant hedge fund has a larger firm size. Third, the average quant hedge fund has more liquidity for investors. Fourth, the average percent of quantitative hedge funds registered with the SEC is less than the average number of qualitative funds.

Performance differences, although not large seem to exist. Generally, quant funds perform better than qualitative funds using a variety of risk-adjusted performance metrics. Quantitative funds also seem to be better market timers than qual funds. In fact, it may be precisely the market timing that allows them to outperform the qual funds. Finally, much of the quant fund's success over qual funds seems to come from Macro funds, rather than the pure equity funds.

VI Appendix

A Main and Sub Hedge Fund Categories in HFR Database

Equity Hedge (Total): Equity Hedge strategies maintain positions both long and short in primarily equity and equity derivative securities. A wide variety of investment processes can be employed to arrive at an investment decision, including both quantitative and fundamental techniques; strategies can be broadly diversified or narrowly focused on specific sectors and can range broadly in terms of levels of net exposure, leverage employed, holding period, concentrations of market capitalizations and valuation ranges of typical portfolios. Equity Hedge managers would typically maintain at least 50%, and may in some cases be substantially entirely invested in equities, both long and short . EH is further subdivided into 7 sub-strategies:

EH: Energy/Basic Materials strategies which employ investment processes designed to identify opportunities in securities in specific niche areas of the market in which the Manager maintains a level of expertise which exceeds that of a market generalist in identify companies engaged in the production and procurement of inputs to industrial processes, and implicitly sensitive to the direction of price trends as determined by shifts in supply and demand factors, and implicitly sensitive to the direction of broader economic trends. Energy/Basic Materials strategies typically maintain a primary focus in this area or expect to maintain in excess of 50% of portfolio exposure to these sectors over a various market cycles.

EH: Equity Market Neutral strategies employ sophisticated quantitative techniques of analyzing price data to ascertain information about future price movement and relationships between securities, select securities for purchase and sale. These can include both Factor-based and Statistical Arbitrage/Trading strategies. Factor-based investment strategies include strategies in which the investment thesis is predicated on the systematic analysis of common relationships between securities. In many but not all cases, portfolios are constructed to be neutral to one or multiple variables, such as broader equity markets in dollar or beta terms, and leverage is frequently employed to enhance the return profile of the positions identified. Statistical Arbitrage/Trading strategies consist of strategies in which the investment thesis is predicated on exploiting pricing anomalies which may occur as a function of expected mean reversion inherent in security prices; high frequency techniques may be employed and trading strategies may also be employed on the basis on technical analysis or opportunistically to exploit new information the investment manager believes has not been fully, completely or accurately discounted into current security prices. Equity Market Neutral Strategies typically maintain characteristic net equity market exposure no greater than 10% long or short.

EH: Fundamental Growth strategies employ analytical techniques in which the investment thesis is predicated on assessment of the valuation characteristics on the underlying companies which are expected to have prospects for earnings growth and capital appreciation exceeding those of the broader equity market. Investment theses are focused on characteristics of the firms financial statements in both an absolute sense and relative to other similar securities and more broadly, market indicators. Strategies employ investment processes designed to identify attractive opportunities in securities of companies which are experiencing or expected to experience abnormally high levels of growth compared with relevant benchmarks growth in earnings, profitability, sales or market share.

EH: Fundamental Value strategies which employ investment processes designed to identify attractive opportunities in securities of companies which trade a valuation metrics by which the manager determines them to be inexpensive and undervalued when compared with relevant benchmarks. Investment theses are focused on characteristics of the firms financial statements in both an absolute sense and relative to other similar securities and more broadly, market indicators. Relative to Fundamental Growth strategies, in which earnings growth and capital appreciation is expected as a function of expanding market share and revenue increases, Fundamental Value strategies typically focus on equities which currently generate high cash flow, but trade at discounted valuation multiples, possibly as a result of limited anticipated growth prospects or generally out of favor conditions, which may be specific to sector or specific holding.

EH: Quantitative Directional strategies employ sophisticated quantitative analysis of price, other technical and fundamental data to ascertain relationships among securities and to select securities for purchase and sale. These can include both Factor-based and Statistical Arbitrage/Trading strategies. Factor-based investment strategies include strategies in which the investment thesis is predicated on the systematic analysis of common relationships between securities. Statistical Arbitrage/Trading strategies consist of strategies in which the investment thesis is predicated on exploiting pricing anomalies which may occur as a function of expected mean reversion inherent in security prices; high frequency techniques may be employed and trading strategies may also be employed on the basis on technical analysis or opportunistically to exploit new information the investment manager believes has not been fully, completely or accurately discounted into current security prices. Quantitative Directional Strategies typically maintain varying levels of net long or short equity market exposure over various market cycles.

EH: Short-Biased strategies employ analytical techniques in which the investment thesis is predicated on assessment of the valuation characteristics on the underlying companies with the goal of identifying overvalued companies. Short Biased strategies may vary the investment level or the level of short exposure over market cycles, but the primary distinguishing characteristic is that the manager maintains consistent short exposure and expects to outperform traditional equity managers in declining equity markets. Investment theses may be fundamental or technical in nature and manager has a particular focus, above that of a market generalist, on identification of overvalued companies and would expect to maintain a net short equity position over various market cycles.

EH: Technology/Healthcare strategies employ investment processes designed to identify opportunities in securities in specific niche areas of the market in which the Manager maintain a level of expertise which exceeds that of a market generalist in identifying opportunities in companies engaged in all development, production and application of technology, biotechnology and as related to production of pharmaceuticals and healthcare industry. Though some diversity exists as an across sub-strategy, strategies implicitly exhibit some characteristic sensitivity to broader growth trends, or in the case of the latter, developments specific to the healthcare industry. Technology/Healthcare strategies typically maintain a primary focus in this area or expect to maintain in excess of 50% of portfolio exposure to these sectors over a various market cycles.

EH: Multi-Strategy Investment Managers maintain positions both long and short in primarily equity and equity derivative securities. A wide variety of investment processes can be employed to arrive at an investment decision, including both quantitative and fundamental techniques; strategies can be broadly diversified or narrowly focused on specific sectors and can range broadly in terms of levels of net exposure, leverage employed, holding period, concentrations of market capitalizations and valuation ranges of typical portfolios. EH Multi-Strategy managers do not maintain more than 50% exposure in any one Equity Hedge sub-strategy.

Event-Driven (Total): Investment Managers who maintain positions in companies currently or prospectively involved in corporate transactions of a wide variety including but not limited to mergers, restructurings, financial distress, tender offers, shareholder buybacks, debt exchanges, security issuance or other capital structure adjustments. Security types can range from most senior in the capital structure to most junior or subordinated, and frequently involve additional derivative securities. Event Driven exposure includes a combination of sensitivities to equity markets, credit markets and idiosyncratic, company specific developments. Investment theses are typically predicated on fundamental characteristics (as opposed to quantitative), with the realization of the thesis predicated on a specific development exogenous to the existing capital structure.

ED: Activist strategies may obtain or attempt to obtain representation of the companys board of directors in an effort to impact the firms policies or strategic direction and in some cases may advocate activities such as division or asset sales, partial or complete corporate divestiture, dividend or share buybacks, and changes in management. Strategies employ an investment process primarily focused on opportunities in equity and equity related instruments of companies which are currently or prospectively engaged in a corporate transaction, security issuance/repurchase, asset sales, division spin-off or other catalyst oriented situation. These involve both announced transactions as well as situations which pre-, post-date or situations in which no formal announcement is expected to occur. Activist strategies are distinguished from other Event-Driven strategies in that, over a given market cycle, Activist strategies would expect to have greater than 50% of the portfolio in activist positions, as described.

ED: Credit Arbitrage strategies employ an investment process designed to isolate attractive opportunities in corporate fixed income securities; these include both senior and subordinated claims as well as bank debt and other outstanding obligations, structuring positions with little of no broad credit market exposure. These may also contain a limited exposure to government, sovereign, equity, convertible or other obligations but

the focus of the strategy is primarily on fixed corporate obligations and other securities are held as component of positions within these structures. Managers typically employ fundamental credit analysis to evaluate the likelihood of an improvement in the issuers creditworthiness, in most cases securities trade in liquid markets and managers are only infrequently or indirectly involved with company management. Fixed Income - Corporate strategies differ from Event Driven: Credit Arbitrage in that the former more typically involve more general market hedges which may vary in the degree to which they limit fixed income market exposure, while the latter typically involve arbitrage positions with little or no net credit market exposure, but are predicated on specific, anticipated idiosyncratic developments.

ED: Distressed/Restructuring strategies which employ an investment process focused on corporate fixed income instruments, primarily on corporate credit instruments of companies trading at significant discounts to their value at issuance or obliged (par value) at maturity as a result of either formal bankruptcy proceeding or financial market perception of near term proceedings. Managers are typically actively involved with the management of these companies, frequently involved on creditors committees in negotiating the exchange of securities for alternative obligations, either swaps of debt, equity or hybrid securities. Managers employ fundamental credit processes focused on valuation and asset coverage of securities of distressed firms; in most cases portfolio exposures are concentrated in instruments which are publicly traded, in some cases actively and in others under reduced liquidity but in general for which a reasonable public market exists. In contrast to Special Situations, Distressed Strategies employ primarily debt (greater than 60%) but also may maintain related equity exposure.

ED: Merger Arbitrage strategies which employ an investment process primarily focused on opportunities in equity and equity related instruments of companies which are currently engaged in a corporate transaction. Merger Arbitrage involves primarily announced transactions, typically with limited or no exposure to situations which pre-, post-date or situations in which no formal announcement is expected to occur. Opportunities are frequently presented in cross border, collared and international transactions which incorporate multiple geographic regulatory institutions, with typically involve minimal exposure to corporate credits. Merger arbitrage strategies typically have over 75% of positions in announced transactions over a given market cycle.

ED: Private Issue/Regulation D strategies which employ an investment process primarily focused on opportunities in equity and equity related instruments of companies which are primarily private and illiquid in nature. These most frequently involve realizing an investment premium for holding private obligations or securities for which a reasonably liquid market does not readily exist until such time as a catalyst such as new security issuance or emergence from bankruptcy proceedings occurs. Managers employ fundamental valuation processes focused on asset coverage of securities of issuer firms, and would expect over a given market cycle to maintain greater than 50ED: Special Situations strategies which employ an investment process primarily focused on opportunities in equity and equity related instruments of companies which are currently engaged in a corporate transaction, security issuance/repurchase, asset sales, division spin-off or other catalyst oriented situation. These involve both announced transactions as well as situations which pre-, post-date or situations in which no formal announcement is expected to occur. Strategies employ an investment process focusing broadly on a wide spectrum of corporate life cycle investing, including but not limited to distressed, bankruptcy and post bankruptcy security issuance, announced acquisitions and corporate division spin-offs, asset sales and other security issuance impacting an individual capital structure focusing primarily on situations identified via fundamental research which are likely to result in a corporate transactions or other realization of shareholder value through the occurrence of some identifiable catalyst. Strategies effectively employ primarily equity (greater than 60%) but also corporate debt exposure, and in general focus more broadly on post-bankruptcy equity exposure and exit of restructuring proceedings.

ED: Multi-Strategy managers would typically have no greater than 50% exposure to any one, distinct Event-Driven sub-strategy.

Macro (Total): Investment Managers which trade a broad range of strategies in which the investment process is predicated on movements in underlying economic variables and the impact these have on equity, fixed income, hard currency and commodity markets. Managers employ a variety of techniques, both discretionary and systematic analysis, combinations of top down and bottom up theses, quantitative and fundamental approaches and long and short term holding periods. Although some strategies employ RV techniques, Macro strategies are distinct from RV strategies in that the primary investment thesis is predicated on predicted or future movements in the underlying instruments, rather than realization of a valuation discrepancy between securities. In a similar way, while both Macro and equity hedge managers may hold equity securities, the overriding investment thesis is predicated on the impact movements in underlying macroeconomic variables may have on security prices, as opposes to EH, in which the fundamental characteristics on the company are the most significant and integral to investment thesis.

Macro: Active Trading strategies employ either discretionary or rule-based high-frequency strategies to trade multiple asset classes. Distinguished from Systematic: Diversified strategies by their high portfolio turnover and a trade duration of five days or less, and from Equity Hedge: Quantitative Directional by their significant use of asset classes other than equities, these strategies employ an investment process predicated on evaluation of historical and current price and other technical, fundamental and quantitative market data to determine trading opportunities lasting from a few seconds to a few days at a time. Positions may be defined as momentum-based, mean reversion, or spread/arbitrage trades. These strategies frequently employ leverage and are active across market sectors including equities, fixed income, foreign exchange, and commodity asset classes, utilize cash, futures, and/or options, and are generally diversified in geography. These trading strategies characteristically emphasize rapid response to new fundamental and technical market information, generally utilize liquid markets, and often derive alpha from market volatility and instability.

Macro: Commodity Discretionary strategies are reliant on the fundamental evaluation of market data, relationships and influences as they pertain primarily to commodity markets including positions in energy, agricultural, resources or metal assets, and as interpreted by an individual or group of individuals who make decisions on portfolio positions; strategies employ an investment process most heavily influenced by top down analysis of macroeconomic variables. Portfolio positions typically are predicated on the evolution of investment themes the Manager expect to materialize over a relevant timeframe, which in many cases contain contrarian or volatility focused components. Investment Managers also may trade actively in developed and emerging markets, focusing on both absolute and relative levels on equity markets, interest rates/fixed income markets, currency; frequently employing spread trades to isolate a differential between instrument identified by the Investment Manager to be inconsistent with expected value. Commodity Discretionary strategies typically would expect to have greater than 35% of portfolio in dedicated commodity exposure over a given market cycle.

Macro: Commodity Systematic strategies have investment processes typically as function of mathematical, algorithmic and technical models, with little or no influence of individuals over the portfolio positioning. Strategies which employ an investment process designed to identify opportunities in markets exhibiting trending or momentum characteristics across commodity assets classes, frequently with related ancillary exposure in commodity sensitive equities or other derivative instruments. Strategies typically employ quantitative process which focus on statistically robust or technical patterns in the return series of the asset, and typically focus on highly liquid instruments and maintain shorter holding periods than either discretionary or mean reverting strategies. Although some strategies seek to employ counter trend models, strategies benefit most from an environment characterized by persistent, discernable trending behavior. Commodity Systematic strategies typically would expect to have greater than 35% of portfolio in dedicated commodity exposure over a given market cycle.

Macro: Currency Discretionary strategies are reliant on the fundamental evaluation of market data, relationships and influences as they pertain primarily to currency markets including positions in global foreign exchange markets, both listed and unlisted, and as interpreted by an individual or group of individuals who make decisions on portfolio positions; strategies employ an investment process most heavily influenced by top down analysis of macroeconomic variables. Portfolio positions typically are predicated on the evolution of investment themes the Manager expect to materialize over a relevant timeframe, which in many cases contain contrarian or volatility focused components. Investment Managers also may trade actively in developed and emerging markets, focusing on both absolute and relative levels on equity markets, interest rates/fixed income markets, currency; frequently employing spread trades to isolate a differential between instrument identified by the Investment Manager to be inconsistent with expected value. Currency Discretionary strategies typically would expect to have greater than 35% of portfolio in dedicated currency exposure over a given market cycle.

Macro: Currency Systematic strategies have investment processes typically as function of mathematical, algorithmic and technical models, with little or no influence of individuals over the portfolio positioning. Strategies which employ an investment process designed to identify opportunities in markets exhibiting trending or momentum characteristics across currency assets classes, frequently with related ancillary exposure

in sovereign fixed income. Strategies typically employ quantitative process which focus on statistically robust or technical patterns in the return series of the asset, and typically focus on highly liquid instruments and maintain shorter holding periods than either discretionary or mean reverting strategies. Although some strategies seek to employ counter trend models, strategies benefit most from an environment characterized by persistent, discernable trending behavior. Currency Systematic strategies typically would expect to have greater than 35% of portfolio in dedicated currency exposure over a given market cycle.

Macro: Discretionary Thematic strategies are primarily reliant on the evaluation of market data, relationships and influences, as interpreted by an individual or group of individuals who make decisions on portfolio positions; strategies employ an investment process most heavily influenced by top down analysis of macroeconomic variables. Investment Managers may trade actively in developed and emerging markets, focusing on both absolute and relative levels on equity markets, interest rates/fixed income markets, currency and commodity markets; frequently employing spread trades to isolate a differential between instrument identified by the Investment Manager to be inconsistent with expected value. Portfolio positions typically are predicated on the evolution of investment themes the Manager expect to materialize over a relevant timeframe, which in many cases contain contrarian or volatility focused components.

Macro: Systematic Diversified strategies have investment processes typically as function of mathematical, algorithmic and technical models, with little or no influence of individuals over the portfolio positioning. Strategies which employ an investment process designed to identify opportunities in markets exhibiting trending or momentum characteristics across individual instruments or asset classes. Strategies typically employ quantitative process which focus on statistically robust or technical patterns in the return series of the asset, and typically focus on highly liquid instruments and maintain shorter holding periods than either discretionary or mean reverting strategies. Although some strategies seek to employ counter trend models, strategies benefit most from an environment characterized by persistent, discernable trending behavior. Systematic Diversified strategies typically would expect to have no greater than 35% of portfolio in either dedicated currency or commodity exposures over a given market cycle.

Macro: Multi-Strategy Strategies which employ components of both Discretionary and Systematic Macro strategies, but neither exclusively both. Strategies frequently contain proprietary trading influences, and in some cases contain distinct, identifiable sub-strategies, such as equity hedge or equity market neutral, or in some cases a number of sub-strategies are blended together without the capacity for portfolio level disaggregation. Strategies employ an investment process is predicated on a systematic, quantitative evaluation of macroeconomic variables in which the portfolio positioning is predicated on convergence of differentials between markets, not necessarily highly correlated with each other, but currently diverging from their historical levels of correlation. Strategies focus on fundamental relationships across geographic areas of focus both inter and intra-asset classes, and typical holding periods are longer than trend following or discretionary strategies.

Relative Value (Total): Investment Managers who maintain positions in which the investment thesis is predicated on realization of a valuation discrepancy in the relationship between multiple securities. Managers employ a variety of fundamental and quantitative techniques to establish investment theses, and security types range broadly across equity, fixed income, derivative or other security types. Fixed income strategies are typically quantitatively driven to measure the existing relationship between instruments and, in some cases, identify attractive positions in which the risk adjusted spread between these instruments represents an attractive opportunity for the investment manager. RV position may be involved in corporate transactions also, but as opposed to ED exposures, the investment thesis is predicated on realization of a pricing discrepancy between related securities, as opposed to the outcome of the corporate transaction. RV is further subdivided into 6 sub-strategies:

RV: Fixed Income-Asset Backed includes strategies in which the investment thesis is predicated on realization of a spread between related instruments in which one or multiple components of the spread is a fixed income instrument backed physical collateral or other financial obligations (loans, mortgages, credit cards) other than those of a specific corporation. Strategies employ an investment process designed to isolate attractive opportunities between a variety of fixed income instruments specifically securitized by collateral commitments which frequently include loans, pools and portfolios of loans, receivables, real estate, mortgage, machinery or other tangible financial commitments. Investment thesis may be predicated on an attractive spread given the nature and quality of the collateral, the liquidity characteristics of the underlying instruments and on issuance and trends in collateralized fixed income instruments, broadly speaking. In many cases, investment managers hedge, limit or offset interest rate exposure in the interest of isolating the risk of the position to strictly the yield disparity of the instrument relative to the lower risk instruments.

RV: Fixed Income-Convertible Arbitrage includes strategies in which the investment thesis is predicated on realization of a spread between related instruments in which one or multiple components of the spread is a convertible fixed income instrument. Strategies employ an investment process designed to isolate attractive opportunities between the price of a convertible security and the price of a non-convertible security, typically of the same issuer. Convertible arbitrage positions maintain characteristic sensitivities to credit quality the issuer, implied and realized volatility of the underlying instruments, levels of interest rates and the valuation of the issuers equity, among other more general market and idiosyncratic sensitivities.

RV: Fixed Income-Corporate includes strategies in which the investment thesis is predicated on realization of a spread between related instruments in which one or multiple components of the spread is a corporate fixed income instrument. Strategies employ an investment process designed to isolate attractive opportunities between a variety of fixed income instruments, typically realizing an attractive spread between multiple corporate bonds or between a corporate and risk free government bond. Fixed Income-Corporate strategies differ from Event Driven: Credit Arbitrage in that the former more typically involve more general market hedges which may vary in the degree to which they limit fixed income market exposure, while the latter typically involve arbitrage positions with little or no net credit market exposure, but are predicated on specific, anticipated idiosyncratic developments.

RV: Fixed Income - Sovereign includes strategies in which the investment thesis is predicated on realization of a spread between related instruments in which one or multiple components of the spread is a sovereign fixed income instrument. Strategies employ an investment process designed to isolate attractive opportunities between a variety of fixed income instruments, typically realizing an attractive spread between multiple sovereign bonds or between a corporate and risk free government bond. Fixed Income Sovereign typically employ multiple investment processes including both quantitative and fundamental discretionary approaches and relative to other Relative Value Arbitrage sub-strategies, these have the most significant top-down macro influences, relative to the more idiosyncratic fundamental approaches employed. RV: Fixed Income: Sovereign funds would typically have a minimum of 50% exposure to global sovereign fixed income markets, but characteristically maintain lower net exposure than similar strategies in Macro: Multi-Strategy sub-strategy.

RV: Volatility strategies trade volatility as an asset class, employing arbitrage, directional, market neutral or a mix of types of strategies, and include exposures which can be long, short, neutral or variable to the direction of implied volatility, and can include both listed and unlisted instruments. Directional volatility strategies maintain exposure to the direction of implied volatility of a particular asset or, more generally, to the trend of implied volatility in broader asset classes. Arbitrage strategies employ an investment process designed to isolate opportunities between the price of multiple options or instruments containing implicit optionality. Volatility arbitrage positions typically maintain characteristic sensitivities to levels of implied and realized volatility, levels of interest rates and the valuation of the issuers equity, among other more general market and idiosyncratic sensitivities.

RV: Yield Alternative strategies employ an investment thesis is predicated on realization of a spread between related instruments in which one or multiple components of the spread contains a derivative, equity, real estate, MLP or combination of these or other instruments. Strategies are typically quantitatively driven to measure the existing relationship between instruments and, in some cases, identify attractive positions in which the risk adjusted spread between these instruments represents an attractive opportunity for the investment manager. Strategies employ an investment process designed to isolate opportunities in yield oriented securities, which can include equity, preferred, listed partnerships (MLPs), REITs and some other corporate obligations. In contrast to fixed income arbitrage, yield alternative contain primarily non-fixed income securities, and in contrast to equity hedge strategies, the investment thesis is more predicated on the yield realized from the securities than on price appreciation of the underlying securities.

RV: Multi-Strategies employ an investment thesis is predicated on realization of a spread between related yield instruments in which one or multiple components of the spread contains a fixed income, derivative, equity, real estate, MLP or combination of these or other instruments.

Strategies are typically quantitatively driven to measure the existing relationship between instruments and, in some cases, identify attractive positions in which the risk adjusted spread between these instruments represents an attractive opportunity for the investment manager. In many cases these strategies may exist as distinct strategies across which a vehicle which allocates directly, or may exist as related strategies over which a single individual or decision making process manages. Multi-strategy is not intended to provide broadest-based mass market investors appeal, but are most frequently distinguished from others arbitrage strategies in that they expect to maintain ¿30% of portfolio exposure in 2 or more strategies meaningfully distinct from each other that are expected to respond to diverse market influences.

Fund of Funds (Total): Fund of Funds invest with multiple managers through funds or managed accounts. The strategy designs a diversified portfolio of managers with the objective of significantly lowering the risk (volatility) of investing with an individual manager. The Fund of Funds manager has discretion in choosing which strategies to invest in for the portfolio. A manager may allocate funds to numerous managers within a single strategy, or with numerous managers in multiple strategies. The minimum investment in a Fund of Funds may be lower than an investment in an individual hedge fund or managed account. The investor has the advantage of diversification among managers and styles with significantly less capital than investing with separate managers.

FOF - Conservative: FOFs classified as "Conservative" exhibit one or more of the following characteristics: seeks consistent returns by primarily investing in funds that generally engage in more "conservative" strategies such as Equity Market Neutral, Fixed Income Arbitrage, and Convertible Arbitrage; exhibits a lower historical annual standard deviation than the HFRI Fund of Funds Composite Index. A fund in the HFRI FOF Conservative Index shows generally consistent performance regardless of market conditions.

FOF - Diversified: FOFs classified as "Diversified" exhibit one or more of the following characteristics: invests in a variety of strategies among multiple managers; historical annual return and/or a standard deviation generally similar to the HFRI Fund of Fund Composite index; demonstrates generally close performance and returns distribution correlation to the HFRI Fund of Fund Composite Index. A fund in the HFRI FOF Diversified Index tends to show minimal loss in down markets while achieving superior returns in up markets.

FOF - Market Defensive: FOFs classified as "Market Defensive" exhibit one or more of the following characteristics: invests in funds that generally engage in short-biased strategies such as short selling and managed futures; shows a negative correlation to the general market benchmarks (S&P). A fund in the FOF Market Defensive Index exhibits higher returns during down markets than during up markets.

FOF Strategic: FOFs classified as "Strategic" exhibit one or more of the following characteristics: seeks superior returns by primarily investing in funds that generally engage in more opportunistic strategies such as Emerging Markets, Sector specific, and Equity Hedge; exhibits a greater dispersion of returns and higher volatility compared to the HFRI Fund of Funds Composite Index. A fund in the HFRI FOF Strategic Index tends to outperform the HFRI Fund of Fund Composite Index in up markets and underperform the index in down markets.

B Tables

Table 1: The Advantages and Disadvantages of QEPM versus Qualitative Management

Advantages		
Criteria	QEPM	Qualitative
Objectivity	High	Low
Breadth	High	Low
Behavioral Errors	Low	High
Replicability	High	Low
Costs	Low	High
Controlled Risk	High	Low
Disadvantages		
Criteria	QEPM	Qualitative
Qualitative Inputs	Low	High
Historical Data Reliance	High	Low
Data Mining	High	Low
Reactivity	Low	High

Note: Source: Chincarini and Kim (2006).

Table 2: Hedge Fund Database Summary Statistics

Group	Total Number	Avg. Number	Avg. AUM	Avg. Growth	Avg. M. Fee	Avg. I. Fee	Avg. Age	High Water (%)	Hurdle Rate (%)

Note: This table reports the time-series averages of annual cross-sectional averages from 19XX - June, 2009. Avg. Number is the average number of hedge funds across monthly observations, Avg. AUM represents the average assets under management across months, Avg. Growth computes the average growth rate of new assets into the average hedge fund using the formula for monthly growth in flows as: $g_t = \frac{\text{New Flows}_t}{AUM_{t-1}}$, where $\text{New Flows}_t = \text{AUM}_t - \text{AUM}_{t-1} \cdot (1 + r_{it})$, where r_{it} is the net returns of fund i from $t-1$ to t, Avg. M. Fee is the average management fee across hedge funds, Avg. I. Fee is the average incentive fee across hedge funds, High Water (%) is the percentage of hedge funds in the database with a high water mark across funds and time, and Hurdle Rate (%) is the percentage of funds with a hurdle rate across funds and time.

Table 3: Classification of Quantitative and Qualitative Funds

		Categorized	
		Quantitative	Qualitative
Number	Main	Sub	Sub
1.	Equity Hedge		
		EH: Equity Market Neutral	EH: Fundamental Growth
		EH: Quantitative Directional	EH: Fundamental Value
2.	Macro		
		M: Commodity Systematic	M: Commodity Discretionary
		M: Currency Systematic	M: Currency Discretionary
		M: Systematic Diversified	M: Discretionary Thematic
		Uncategorized	
1.	Equity Hedge		
		EH: Energy/Basic Materials	EH: Short-Biased
		EH: Technology/Healthcare	EH: Multi-Strategy
2.	Event-Driven		
		ED: Activist	ED: Credit Arbitrage
		ED: Distressed/Restructuring	ED: Merger Arbitrage
		ED: Private Issue/Regulation D	ED: Special Situations
3.	Macro		
		M: Active Trading	M: Multi-Strategy
4.	Relative Value		
		RV: Fixed Income-Asset Backed	RV: Fixed-Income-Convertible Arbitrage
		RV: Fixed Income-Corporate	RV: Fixed Income-Sovereign
		RV: Volatility	RV: Yield Alternative
		RV: Multi-Strategies	
5.	Fund of Funds		
		FOF: Conservative	FOF: Diversified
		FOF: Diversified	FOF: Market Defensive
		FOF: Strategic	

Note: Source: HFR strategy descriptions and authors' judgement. For a full description of each fund main category and sub-category, see the appendix.

Table 4: Characteristics of Quantitative and Qualitative Hedge Funds I

Group	Total Number	Avg. Number	Avg. AUM	Avg. Growth	Avg. M. Fee	Avg. I. Fee	Avg. Age	High Water (%)	Hurdle Rate (%)
Quantitative	1834	335.97	99.12	1.10	1.57	18.93	7.16	82.99	13.09
Qualitative	2456	603.77	132.18	1.17	1.46	18.95	7.00	91.61	12.09
Quant. Sub.									
EH:EqMktNeu	472	120.23	233.08	1.19	1.39	19.18	6.50	87.50	22.67
EH:QuantDir	299	74.48	97.94	1.05	1.29	16.86	7.37	75.92	15.38
EH:Tech/Hlth	237	65.06	53.37	1.03	1.38	19.58	6.47	93.25	10.13
M:CmdtySys	71	24.96	49.67	1.04	1.22	16.23	7.09	74.65	19.72
M:CrrcySystm	161	41.85	156.82	1.06	1.65	20.07	7.41	82.61	8.70
M:SysDivrsf'd	594	118.33	62.69	1.10	1.95	19.47	7.78	79.97	5.89
Qual. Sub.									
EH:FndmtlGr	780	194.74	131.44	1.05	1.49	18.50	7.11	87.31	16.67
EH:FndmtlVal	1350	363.76	124.46	1.25	1.38	19.20	7.00	93.78	9.70
M:CmdtyDiscr	18	7.82	48.54	1.06	1.85	15.00	6.38	66.67	5.56
M:CrrcyDiscr	19	8.41	97.52	1.25	1.43	16.58	7.93	89.47	10.53
M:DscrThm	289	67.86	214.18	1.15	1.71	19.41	6.69	94.81	11.42

Note: This table reports the time-series averages of annual cross-sectional averages from 1970 - June, 2009. Avg. Number is the average number of hedge funds across monthly observations, Avg. AUM represents the average assets under management across months, Avg. Growth computes the average growth rate of new assets into the average hedge fund using the formula for monthly growth in flows as: $g_t = \frac{\text{New Flows}_t}{AUM_{t-1}}$, where $\text{New Flows}_t = \text{AUM}_t - \text{AUM}_{t-1} \cdot (1 + r_{it})$, where r_{it} is the net returns of fund i from $t-1$ to t, Avg. M. Fee is the average management fee across hedge funds, Avg. I. Fee is the average incentive fee across hedge funds, High Water (%) is the percentage of hedge funds in the database with a high water mark across funds and time, and Hurdle Rate (%) is the percentage of funds with a hurdle rate across funds and time.

Table 5: Characteristics of Quantitative and Qualitative Hedge Funds II

	Investability					Liquidity			Transparency
Group	Minimum Invest. (Mil.)	Subscription	Open for Investment	Country Located	Firm Size	Redemption.	Advance. Notice	Lockup	SEC Registered
Quantitative	8.54	29.65	0.91	64.11	18.79	42.10	21.21	52.51	32.15
Qualitative	2.16	34.00	0.91	61.90	7.43	68.99	34.22	124.19	47.12
Quant. Sub.									
EH:EqMktNeu	23.65	32.45	0.91	59.96	45.82	46.34	27.10	74.61	48.82
EH:QuantDir	1.60	39.89	0.92	75.17	3.99	76.78	30.80	116.10	34.27
M:CmdtySys	0.44	22.41	1.00	43.66	1.58	24.10	11.01	7.03	19.72
M:CrrcySystm	2.81	22.93	0.90	55.77	21.81	26.73	14.44	14.62	21.79
M:SysDivrsf'd	1.88	24.40	0.88	66.78	4.80	27.03	13.70	15.39	21.85
EH:FndmtlGr	0.62	32.78	0.91	55.42	5.92	65.25	35.22	118.35	44.85
Qual. Sub.									
EH:FndmtlVal	3.23	35.97	0.92	65.95	8.02	76.48	35.23	142.05	51.42
M:CmdtyDiscr	0.27	27.22	0.78	44.44	7.78	33.89	25.67	26.76	16.67
M:CrrcyDiscr	4.27	17.16	1.00	63.16	9.22	17.26	17.58	0.00	31.58
M:DscrThm	1.19	29.58	0.90	61.07	8.57	49.64	28.59	70.52	36.07

Note: This table reports the average of the fund characteristics as of June 2009. Minimum Invest. reports the average minimum investment required, subscription reports the average frequency that investors are allowed to make subscriptions, Open for Investment reports the percentage of hedge funds that are open for new investments, Country located is the percentage of hedge funds with a US address, Firm Size is the average size of the entire firm, Redemption reports the average frequency for redemption, Advance Notice reports the average number of days the hedge fund requires for notice to withdraw funds, Lockup reports the average number of months that investor funds cannot be withdrawn, SEC registered reports the percentage of hedge funds that are registered with the SEC.

Table 6: Characteristics of Quantitative and Qualitative Hedge Funds III

		Legal Structure							Regional Investment Focus				
Group	Leverage	L.P.	Corp.	L.L.C.	M.A.	I.C.	U.T.	Other	North America	Latin America	Asia	Europe	Other
Quantitative	73.71	25.39	12.44	17.33	6.44	3.54	16.56	18.30	16.88	0.39	3.29	5.80	33.05
Qualitative	76.08	37.13	10.88	20.07	8.68	4.49	0.93	17.82	26.76	0.93	14.27	15.45	16.47
Quant. Sub.													
EH:EqMktNeu	68.52	29.76	12.42	16.70	10.06	6.85	3.85	20.34	29.76	0.43	8.35	14.35	15.20
EH:QuantDir	68.18	46.15	8.74	17.48	3.85	1.40	7.34	15.03	25.87	1.05	2.80	5.94	8.04
M:CmdtySys	60.56	18.31	16.90	35.21	7.04	0.00	7.04	15.49	9.86	0.00	1.41	2.82	85.92
M:CrrcySystm	85.90	6.41	10.26	19.87	7.05	1.92	39.10	15.38	0.64	0.00	0.64	0.00	60.26
M:SysDivrsf'd	79.02	17.48	14.34	14.86	4.55	2.80	26.57	19.41	7.17	0.17	0.35	0.70	46.15
EH:FndmtlGr	74.80	31.71	7.86	23.04	7.45	4.61	0.00	25.34	16.53	2.17	24.12	14.36	10.84
Qual. Sub.													
EH:FndmtlVal	74.98	43.15	11.94	17.06	9.10	4.21	0.46	14.08	36.80	0.31	11.48	19.36	9.49
M:CmdtyDiscr	66.67	11.11	22.22	22.22	22.22	0.00	11.11	11.11	22.22	0.00	0.00	5.56	72.22
M:CrrcyDiscr	84.21	5.26	15.79	10.53	21.05	0.00	36.84	10.53	0.00	0.00	0.00	0.00	100.00
M:DscrThm	84.64	27.14	12.86	26.79	8.21	6.07	2.50	16.43	8.93	0.71	3.21	1.79	54.64

Note: This table reports the average of the fund characteristics as of June 2009. Leverage reports the percentage of funds that use leverage, Legal reports the percentage of firms set up as various legal entities, including limited partnerships (L.P.), L.L.C. (limited liability companies), corporations (Corp.), and other, which represented all other forms of legal entities. Regional Investment Focus reports the percentage of firms that focus on investing in a particular region, including North America, Latin America, Asia, Europe, and Other.

Table 7: Hedge Fund Database Performance Summary Statistics

						Risk-Adjusted Return Measures				
Group	Mean	S.D.	Max.	Min.	ρ	Sharpe	Sortino	Omega	Calmar	Sterling
Quantitative	10.61	16.08	285.42	-90.78	0.27	0.46	0.05	1.35	5.80	7.91
Qualitative	10.18	16.96	172.20	-86.60	0.25	0.49	0.04	1.33	4.19	6.22
Quant. Sub.										
EH:EqMktNeu	6.18	8.20	53.82	-30.45	0.25	0.42	0.03	1.30	5.31	8.61
EH:QuantDir	13.07	21.53	241.32	-90.78	0.28	0.48	0.05	1.34	7.33	9.59
EH:Tech/Hlth	12.85	20.45	107.01	-46.70	0.48	0.58	0.06	1.38	6.39	8.08
M:CmdtySys	9.94	18.96	94.99	-38.56	0.00	0.39	0.04	1.28	3.97	4.77
M:CrrcySystm	10.39	14.60	285.42	-46.20	0.12	0.34	0.05	1.38	5.08	6.24
M:SysDivrsf'd	12.16	17.97	111.10	-54.50	0.17	0.49	0.05	1.37	5.61	7.24
Qual. Sub.										
EH:FndmtlGr	11.40	21.44	172.20	-77.50	0.17	0.47	0.04	1.30	2.76	3.36
EH:FndmtlVal	9.44	14.78	97.61	-60.80	0.34	0.51	0.04	1.35	4.95	8.09
M:CmdtyDiscr	11.86	13.52	67.27	-33.59	0.21	0.68	0.06	1.54	4.82	5.93
M:CrrcyDiscr	9.89	10.13	63.23	-26.77	0.40	0.59	0.06	1.59	3.87	4.40
M:DscrThm	10.26	15.69	106.51	-86.60	0.15	0.47	0.05	1.36	4.47	5.39
S&P 500 Index	11.39	15.53	13.47	-21.54	1.00	0.38	0.15	1.30	0.48	0.49
Bond Index	8.58	9.04	14.35	-9.04	0.18	0.33	0.14	1.26	2.83	3.31

Note: This table reports the time-series averages of annual cross-sectional averages from 1970 - June, 2009. Mean is the cross-section of individual fund returns and then averaged across time and then annualized by multiplying by 12. S.D. is the standard deviation across time of the average cross-section returns computed for the mean. Max. and Min. are the maximum (minimum) monthly return by any hedge fund over the period. ρ represents the correlation of the averaged series over time with the S&P 500 returns. The Risk-Adjusted measures are the standard Sharpe ratio, Sharpe $= \frac{\bar{r}_{it}-\bar{r}_{ft}}{\sigma_i}$, the Sortino ratio is given by Sortino $= \frac{\bar{r}_{it}-\bar{r}_{ft}}{\sqrt{LPM_{2i}(\bar{r}_{it})}}$, the Omega is given by Omega $= \frac{\bar{r}_{it}-\bar{r}_{ft}}{LPM_{1i}(\bar{r}_{it})}+1$, where $LPM_{ni}(\tau) = \frac{1}{T}\sum_{i=1}^{T}[\min(r_{it}-\tau, 0)]^n$. The latter two are similar to the Sharpe ratio but use downside-risk measures rather than variance. The Calmar ratio is given by Calmar $= \frac{\bar{r}_{it}-\bar{r}_{ft}}{-\mathrm{MD}_{i1}}$, and the Sterling ratio is given by Sterling $= \frac{\bar{r}_{it}-\bar{r}_{ft}}{\sum_{j=1}^{N}-\mathrm{MD}_{ij}}$, where MD_{i1} is the maximum drawdown of the fund from peak to trough during the existence of the fund, MD_{i2} is the next largest drawdown of the fund, and so on. In the case of the Sterling measure, we take $N = 4$ to represent the four largest drawdowns for the fund during the period of concern. The drawdowns are computed by creating an index series of the fund based upon net returns. The risk-adjusted measures are computed only for funds with at least 36 months of data. S&P 500 total return data and the 10-year Treasury bond total return data were obtained from Global Financial Data.

Table 8: Hedge Fund Database Performance Summary Statistics

	Mean Returns							Non-Normality		
	Up	Down	70-80	80-90	90-00	00-09	07-09	Skewness	Kurtosis	Jacque-Bera
Quantitative	10.61	16.08	285.42	-90.78	0.27	0.46	4.60	1.35	5.80	7.91
Qualitative	10.18	16.96	172.20	-86.60	0.25	0.49	4.39	1.33	4.19	6.22
Quant. Sub.										
EH:EqMktNeu	6.18	8.20	53.82	-30.45	0.25	0.42	2.74	1.30	5.31	8.61
EH:QuantDir	13.07	21.53	241.32	-90.78	0.28	0.48	5.12	1.34	7.33	9.59
M:CmdtySys	9.94	18.96	94.99	-38.56	0.00	0.39	4.01	1.28	3.97	4.77
M:CrrcySystm	10.39	14.60	285.42	-46.20	0.12	0.34	4.71	1.38	5.08	6.24
M:SysDivrsf'd	12.16	17.97	111.10	-54.50	0.17	0.49	5.18	1.37	5.61	7.24
EH:FndmtlGr	11.40	21.44	172.20	-77.50	0.17	0.47	4.49	1.30	2.76	3.36
Qual. Sub.										
EH:FndmtlVal	9.44	14.78	97.61	-60.80	0.34	0.51	4.28	1.35	4.95	8.09
M:CmdtyDiscr	11.86	13.52	67.27	-33.59	0.21	0.68	6.30	1.54	4.82	5.93
M:CrrcyDiscr	9.89	10.13	63.23	-26.77	0.40	0.59	5.85	1.59	3.87	4.40
M:DscrThm	10.26	15.69	106.51	-86.60	0.15	0.47	4.57	1.36	4.47	5.39
S&P 500 Index	11.39	15.53	13.47	-21.54	1.00	0.38	0.15	1.30	0.48	0.49
Bond Index	8.58	9.04	14.35	-9.04	0.18	0.33	0.14	1.26	2.83	3.31

Note: This table reports the time-series averages of annual cross-sectional averages from 1970 - June, 2009. Mean is the cross-section of individual fund returns and then averaged across time and then annualized by multiplying by 12 for the various periods listed. Skewness is a measure of skewness of the sample distribution of fund returns, Kurtosis is a measure of kurtosis of the sample distribution, and Jacque-Bera measures the percentage of funds whose sample return distributions reject the hypothesis of normality.

Table 9: Differences in Alpha Performance of Quantitative and Qualitative Individual Hedge Funds

Indep. Variables	Quantitative				Qualitative				Both				Paired Funds			
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)	(13)	(14)	(15)	(16)
α	0.59	0.60	0.49	0.38	0.57	0.55	0.42	1.87	0.59	0.55	0.46	0.42	0.44	0.38	0.73	0.67
	35.81	35.08	28.52	0.61	41.18	38.83	29.32	1.95	41.13	38.83	32.36	29.32	14.79	23.29	5.25	5.61
β_{RMRF}	0.14	0.14	0.14	0.13	0.50	0.49	0.49	0.47	0.35	0.49	0.35	0.49	0.66	0.44	0.06	0.02
	25.09	23.77	23.92	22.40	105.61	99.61	99.63	94.66	89.87	99.61	90.05	99.63	68.38	76.00	1.80	0.90
β_{SMB}	.	0.02	0.01	0.02	.	0.09	0.07	0.10	0.07	0.09	0.05	0.07	0.10	0.07	-0.03	-0.01
	.	3.11	0.94	3.70	.	17.97	13.95	18.57	17.13	17.97	12.59	13.95	10.27	10.32	-0.64	-0.38
β_{HML}	.	-0.01	-0.01	-0.02	.	0.02	0.01	0.02	0.02	0.02	0.01	0.01	-0.02	0.05	-0.05	0.04
	.	-1.50	-2.07	-3.22	.	3.65	2.35	3.20	3.84	3.65	2.50	2.35	-2.17	6.19	-1.16	1.68
β_{MOM}	.	.	0.07	.	.	.	0.08	.	.	.	0.08	0.08	0.11	0.07	0.06	0.00
	.	.	16.65	.	.	.	22.53	.	.	.	27.31	22.53	15.32	14.40	2.63	0.09
$\beta_{Quant \times RMRF}$	.	.	.	.	.	.	.	.	.	-0.35	.	-0.35	-0.59	0.25	0.05	0.00
	.	.	.	.	.	.	.	.	.	-45.48	.	-45.54	-54.90	14.71	1.15	0.06
$\beta_{Quant \times SMB}$	.	.	.	.	.	.	.	.	.	-0.07	.	-0.07	-0.12	0.11	-0.00	-0.04
	.	.	.	.	.	.	.	.	.	-9.50	.	-8.44	-10.11	5.30	-0.01	-1.24
$\beta_{Quant \times HML}$	.	.	.	.	.	.	.	.	.	-0.03	.	-0.03	0.05	-0.09	0.18	-0.01
	.	.	.	.	.	.	.	.	.	-3.53	.	-3.10	3.85	-3.95	3.03	-0.46
$\beta_{Quant \times MOM}$	.	.	.	.	.	.	.	.	.	.	.	-0.01	-0.07	0.01	0.03	0.04
	.	.	.	.	.	.	.	.	.	.	.	-2.68	-8.49	0.92	1.18	2.88
δ	.	.	.	.	.	.	.	.	-0.07	0.05	-0.06	0.08	-0.23	-0.01	-0.24	-0.12
	.	.	.	.	.	.	.	.	-3.28	2.10	-2.99	3.37	-6.94	-0.12	-1.45	-0.90
N	1552	1552	1552	1552	2362	2362	2362	2362	3914	3914	3914	3914	1205	1593	89	175
$\bar{R}^2$	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.
Newey w/ 3 Lags	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Strategy Control?	No	No	No	Yes	No	No	No	Yes	No	No	No	No	No	No	No	No
Year Controls?	No	No	No	Yes	No	No	No	Yes	No	No	No	No	No	No	No	No
Main HF													EH	EH	M	M
Sub HF Q													EMN	QD	CoS	CuS
Sub HF Qual													FG	FV	CoD	CuD
F-stats and p-values testing exclusion of groups of variables																
Time Effects = 0	.	.	.	16.86	.	.	.	63.54	.	615.12	.	608.86	1040.17	85.99	2.79	0.60
	.	.	.	0.00	.	.	.	0.00	.	0.00	.	0.00	0.00	0.00	0.02	0.66
Fixed Effects = 0	.	.	.	47.75	.	.	.	6.43	.	781.06	.	776.91	1234.53	110.95	3.45	0.55
	.	.	.	0.00	.	.	.	0.00	.	0.00	.	0.00	0.00	0.00	0.02	0.65

Note: This table reports the pooled regressions of the hedge fund returns from January 1970 - June, 2009. The results are from the following ordinary least squares (OLS) regressions with standard errors corrected by the Newey-West (1997) procedure with three lags: $r_{it} = \alpha + \sum_{j=1}^{K} \beta_j r_{jt} + \lambda_t + \theta_s + \delta Z_i + \epsilon_t$, where r_{it} is the return from $t-1$ to t of fund i, K=1,3, or 4 depending on which model is used, the CAPM, the Fama-French three-factor, or the Fama-French four factor with momentum, λ_t is a series of dummies to control for time effects, θ_s is a set of dummies to control for fixed effects between hedge fund sub-categories, Z_i is a dummy variable which takes a value of 1 if the hedge fund is a qualitative hedge fund and 0 otherwise, and ϵ_{it} is the residual. Note: Both θ_s and Z_i are not used in the same regression as their would be perfect multicollinearity. Thus regression with strategy effects do not naturally have the quant dummy. Funds are excluded from the regression if they have less than 36 months of return data. After each fund's regression has been estimated, the parameters for category are averaged and reported in the table along with the average t-statistics, and the percentage of funds with a positive and significant t-statistic.

Table 10: Differences in Alpha Performance of Quantitative and Qualitative Hedge Fund Composites

Indep. Variables	Quantitative					Qualitative				Both				Paired Funds			
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)	(13)	(14)	(15)	(16)
α	1.48	1.48	1.44	-1.35	0.89	0.88	0.77	-0.48	1.00	0.88	0.93	0.77	0.76	0.69	0.82	1.17
	7.67	7.56	7.09	-3.72	5.78	5.95	5.11	-1.14	6.00	5.95	5.47	5.11	4.42	8.33	2.68	7.02
β_{RMRF}	0.11	0.12	0.12	0.11	0.53	0.52	0.51	0.51	0.28	0.52	0.28	0.51	0.67	0.52	0.07	0.03
	2.57	2.67	2.67	2.55	14.04	13.33	13.80	12.49	7.69	13.34	7.74	13.82	11.91	15.04	1.53	0.93
β_{SMB}		-0.03	-0.03	-0.04		0.19	0.19	0.19	0.05	0.19	0.04	0.19	0.27	0.13	0.04	-0.04
		-0.48	-0.49	-0.59		2.87	3.00	2.77	0.95	2.87	0.90	3.01	3.09	2.45	0.61	-0.91
β_{HML}		-0.01	-0.01	-0.01		0.04	0.04	0.04	-0.01	0.04	-0.01	0.04	0.03	0.04	-0.04	0.04
		-0.18	-0.14	-0.26		0.77	0.82	0.72	-0.25	0.77	-0.18	0.82	0.51	1.01	-0.48	0.89
β_{MOM}			0.04				0.08				0.05	0.08				
			0.95				2.16				1.94	2.16				
$\beta_{Quant \times RMRF}$										-0.40		-0.40	-0.58	0.21	-0.02	0.02
										-6.76		-6.90	-9.89	4.15	-0.22	0.20
$\beta_{Quant \times SMB}$										-0.22		-0.22	-0.28	0.07	-0.13	-0.14
										-2.38		-2.41	-3.11	0.74	-1.06	-1.30
$\beta_{Quant \times HML}$										-0.05		-0.05	-0.02	-0.06	0.11	-0.06
										-0.65		-0.66	-0.25	-1.03	0.90	-0.59
$\beta_{Quant \times MOM}$												-0.04				
												-0.84				
δ									0.40	0.61	0.40	0.67	-0.39	-0.12	0.16	0.81
									1.58	2.48	1.58	2.63	-2.19	-1.02	0.37	1.85
N	1552	1552	1552	1552	2362	2362	2362	2362	3914	3914	3914	3914	1205	1593	89	175
$\bar{R}^2$	0.02	0.02	0.02	0.06	0.42	0.44	0.45	0.45	0.11	0.18	0.12	0.18	0.53	0.80	0.01	0.01
Newey w/ 3 Lags	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Strategy Control?	No	No	No	Yes	No	No	No	Yes	No	No	No	No	No	No	No	No
Year Controls?	No	No	No	Yes	No	No	No	Yes	No	No	No	No	No	No	No	No
Main HF													EH	EH	M	M
Sub HF Q													EMN	QD	CoS	CuS
Sub HF Qual													FG	FV	CoD	CuD
F-stats and p-values testing exclusion of groups of variables																
Time Effects = 0				11.80				1.83		15.07		15.42	37.03	9.27	1.00	1.37
				0.00				0.16		0.00		0.00	0.00	0.00	0.41	0.24
Fixed Effects = 0										19.45		19.77	44.16	12.29	1.02	0.62
										0.00		0.00	0.00	0.00	0.38	0.60

Note: This table reports the pooled regressions of the hedge fund returns from January 1970 - June, 2009. The results are from the following ordinary least squares (OLS) regressions with standard errors corrected by the Newey-West (1997) procedure with three lags: $r_{it} = \alpha + \sum_{j=1}^{K} \beta_j r_{jt} + \lambda_t + \theta_s + \delta Z_i + \epsilon_t$, where r_{it} is the return from $t-1$ to t of fund i, K=1,3, or 4 depending on which model is used, the CAPM, the Fama-French three-factor, or the Fama-French four factor with momentum, λ_t is a series of dummies to control for time effects, θ_s is a set of dummies to control for fixed effects between hedge fund sub-categories, Z_i is a dummy variable which takes a value of 1 if the hedge fund is a qualitative hedge fund and 0 otherwise, and ϵ_{it} is the residual. Note: Both θ_s and Z_i are not used in the same regression as their would be perfect multicollinearity. Thus regression with strategy effects do not naturally have the quant dummy. Funds are excluded from the regression if they have less than 36 months of return data. After each fund's regression has been estimated, the parameters for category are averaged and reported in the table along with the average t-statistics, and the percentage of funds with a positive and significant t-statistic.

Table 11: Quantitative and Qualitative Individual Hedge Fund Regressions

Strategy		CAPM			Fama-French 3-Factor					Fama-French 4-Factor					
	N	α	β	$\bar{R}^2$	α	β_{RMRF}	β_{SMB}	β_{HML}	$\bar{R}^2$	α	β_{RMRF}	β_{SMB}	β_{HML}	β_{MOM}	$\bar{R}^2$
Quantitative	1588	0.47	0.17	0.12	0.46	0.17	0.05	0.00	0.14	0.37	0.17	0.04	0.01	0.06	0.16
		1.07	1.71	.	0.98	1.68	0.34	0.20	.	0.77	1.73	0.25	0.19	0.57	.
		0.30	0.35	.	0.28	0.34	0.15	0.13	.	0.22	0.34	0.13	0.13	0.19	.
Qualitative	2433	0.49	0.49	0.24	0.45	0.51	0.07	0.01	0.28	0.32	0.51	0.06	0.02	0.08	0.30
		1.18	4.11	.	1.08	4.09	0.67	0.19	.	0.83	4.16	0.55	0.18	0.70	.
		0.34	0.75	.	0.32	0.75	0.23	0.19	.	0.25	0.76	0.22	0.18	0.22	.
Quant. Sub.															
EH:EqMktNeu	472	0.24	0.06	0.07	0.20	0.08	0.01	0.03	0.12	0.14	0.08	0.01	0.03	0.05	0.14
		1.05	1.04	.	0.92	1.15	0.18	0.19	.	0.69	1.24	0.08	0.17	0.66	.
		0.28	0.30	.	0.26	0.29	0.13	0.17	.	0.22	0.31	0.14	0.17	0.23	.
EH:QuantDir	299	0.30	0.75	0.34	0.36	0.72	0.28	0.01	0.39	0.23	0.72	0.28	0.02	0.08	0.41
		0.72	6.69	.	0.66	6.44	1.52	0.70	.	0.48	6.52	1.47	0.72	0.51	.
		0.22	0.85	.	0.20	0.81	0.38	0.27	.	0.16	0.82	0.36	0.27	0.22	.
M:CmdtySys	71	0.61	0.17	0.07	0.58	0.19	-0.09	0.06	0.07	0.44	0.19	-0.12	0.05	0.09	0.07
		1.09	0.46	.	1.07	0.48	-0.26	0.36	.	0.78	0.48	-0.39	0.32	0.69	.
		0.28	0.23	.	0.28	0.27	0.01	0.11	.	0.23	0.28	0.00	0.13	0.15	.
M:CrrcySystm	161	0.56	0.03	0.02	0.54	0.04	-0.04	0.03	0.03	0.49	0.04	-0.03	0.03	0.04	0.02
		0.82	0.29	.	0.73	0.33	0.01	0.26	.	0.62	0.36	-0.02	0.26	0.21	.
		0.30	0.17	.	0.32	0.19	0.09	0.11	.	0.25	0.19	0.05	0.11	0.07	.
M:SysDivrsf'd	585	0.71	0.00	0.07	0.68	-0.01	0.01	-0.03	0.08	0.57	-0.00	-0.01	-0.03	0.07	0.08
		1.35	0.25	.	1.26	0.19	0.02	-0.07	.	1.03	0.22	-0.08	-0.09	0.62	.
		0.37	0.19	.	0.33	0.17	0.07	0.04	.	0.24	0.17	0.05	0.04	0.18	.
EH:FndmtlGr	773	0.53	0.68	0.27	0.52	0.71	0.06	-0.05	0.30	0.34	0.72	0.04	-0.04	0.12	0.32
		1.12	4.80	.	1.10	4.73	0.63	-0.23	.	0.78	4.76	0.50	-0.23	0.88	.
		0.30	0.86	.	0.30	0.86	0.24	0.14	.	0.22	0.86	0.22	0.13	0.24	.
Qual. Sub.															
EH:FndmtlVal	1335	0.46	0.44	0.25	0.40	0.45	0.09	0.03	0.29	0.30	0.45	0.08	0.04	0.06	0.31
		1.23	4.21	.	1.08	4.24	0.80	0.41	.	0.86	4.34	0.68	0.40	0.61	.
		0.37	0.75	.	0.33	0.76	0.26	0.23	.	0.27	0.77	0.25	0.23	0.21	.
M:CmdtyDiscr	18	0.75	0.04	0.00	0.76	0.07	-0.12	-0.02	0.00	0.66	0.06	-0.13	-0.03	0.05	0.01
		1.66	0.26	.	1.66	0.41	-0.36	0.04	.	1.39	0.38	-0.47	-0.01	0.67	.
		0.39	0.06	.	0.50	0.06	0.00	0.06	.	0.33	0.06	0.00	0.00	0.28	.
M:CrrcyDiscr	19	0.58	0.04	0.09	0.54	0.01	0.05	0.04	0.08	0.54	0.01	0.05	0.04	-0.00	0.07
		1.59	0.31	.	1.58	0.12	-0.22	0.24	.	1.44	0.12	-0.23	0.23	0.02	.
		0.63	0.21	.	0.53	0.21	0.05	0.00	.	0.47	0.21	0.05	0.00	0.00	.
M:DscrThm	288	0.49	0.27	0.14	0.43	0.29	0.04	0.08	0.16	0.34	0.29	0.01	0.08	0.07	0.17
		1.06	2.29	.	0.97	2.18	0.31	0.25	.	0.73	2.24	0.21	0.23	0.67	.
		0.29	0.51	.	0.30	0.50	0.14	0.13	.	0.25	0.52	0.14	0.12	0.23	.

Note: This table reports the time-series averages of annual cross-sectional averages from 1970 - June, 2009. This table shows the abnormal return of individual hedge funds from January 1970 to July 2009. The results are from the following ordinary least squares (OLS) regressions with standard errors corrected by the Newey-West (1997) procedure with three lags: $\tilde{r}_{it} = \alpha + \sum_{j=1}^{K} \beta_j r_{jt} + \epsilon_t$, where $\tilde{r}_{it}$ is the return from $t-1$ to t of fund i, K=1,3, or 4 depending on which model is used, the CAPM, the Fama-French three-factor, or the Fama-French four factor with momentum, and ϵ_{it} is the residual. Funds are excluded from the regression if they have less than 36 months of return data. After each fund's regression has been estimated, the parameters for category are averaged and reported in the table along with the average t-statistics, and the percentage of funds with a positive and significant t-statistic.

Table 12: Differences in Timing Ability Between Quantitative and Qualitative Hedge Funds

Indep. Variables	Quantitative				Qualitative				Both				Paired Funds			
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)	(13)	(14)	(15)	(16)
α	0.25	0.24	0.25	-0.17	0.61	0.58	0.62	0.04	0.48	0.58	0.49	0.62	0.83	0.51	0.94	0.66
	9.05	8.76	8.89	-0.28	28.31	26.50	27.92	0.03	24.69	26.50	25.39	27.92	18.12	20.21	4.46	3.60
β_{RMRF}	0.26	0.26	0.23	0.29	0.48	0.48	0.42	0.45	0.39	0.48	0.34	0.42	0.52	0.40	-0.02	0.02
	26.88	26.60	23.18	28.13	60.29	58.55	53.37	53.95	60.92	58.55	54.72	53.37	33.56	42.48	-0.40	0.58
β_{SMB}		0.03	0.01	0.03		0.09	0.07	0.09	0.07	0.09	0.05	0.07	0.09	0.06	-0.04	-0.01
		4.40	2.13	5.36		17.93	13.00	18.36	17.68	17.93	12.39	13.00	9.28	9.84	-0.73	-0.37
β_{HML}		0.00	-0.00	-0.01		0.02	0.01	0.02	0.02	0.02	0.01	0.01	-0.04	0.04	-0.06	0.04
		0.41	-0.61	-1.07		3.50	1.13	3.00	4.65	3.50	2.20	1.13	-3.46	5.56	-1.34	1.75
β_{MOM}			0.06				0.09				0.08	0.09	0.12	0.07	0.07	-0.00
			13.97				24.85				27.71	24.85	17.72	15.52	3.14	-0.01
β_{Timing}	0.20	0.20	0.15	0.27	-0.03	-0.02	-0.12	-0.02	0.06	-0.02	-0.02	-0.12	-0.22	-0.07	-0.13	0.01
	11.89	12.14	8.64	14.56	-1.91	-1.22	-8.46	-1.63	5.48	-1.22	-1.86	-8.46	-8.10	-4.69	-1.31	0.16
$\beta_{Quant \times RMRF}$										-0.22		-0.19	-0.48	0.25	0.06	0.05
										-17.47		-15.48	-27.28	9.18	0.78	1.02
$\beta_{Quant \times SMB}$										-0.07		-0.05	-0.11	0.11	-0.00	-0.04
										-8.60		-6.96	-9.40	5.16	-0.01	-1.13
$\beta_{Quant \times HML}$										-0.02		-0.01	0.06	-0.10	0.18	-0.01
										-2.00		-1.20	4.72	-3.97	3.01	-0.25
$\beta_{Quant \times MOM}$												-0.03	-0.08	0.01	0.03	0.03
												-5.90	-10.04	0.84	1.09	2.39
$\beta_{Quant \times Timing}$										0.22		0.26	0.18	-0.01	0.01	0.09
										10.10		12.04	5.90	-0.22	0.09	1.10
δ									-0.07	-0.34	-0.06	-0.37	-0.55	0.01	-0.00	-0.00
									-3.24	-9.63	-3.00	-10.34	-10.64	0.18	-1.04	-1.32
N	1552	1552	1552	1552	2362	2362	2362	2362	3914	3914	3914	342135	1205	138153	7417	175
$\bar{R}^2$												3914.00				
Newey w/ 3 Lags	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Strategy Control?	No	No	No	Yes	No	No	No	Yes	No	No	No	No	No	No	No	No
Year Controls?	No	No	No	Yes	No	No	No	Yes	No	No	No	No	No	No	No	No
Main HF													EH	EH	M	M
Sub HF Q													EMN	QD	CoS	CuS
Sub HF Qual													FG	FV	CoD	CuD
F-stats and p-values testing exclusion of groups of variables																
Time Effects = 0				18.79				61.56		392.63		340.60	721.57	60.19	2.34	0.73
				0.00				0.00		0.00		0.00	0.00	0.00	0.05	0.57
Fixed Effects = 0				47.71				61.56		141.49		104.08	331.39	52.54	3.09	0.67
				0.00				0.00		0.00		0.00	0.00	0.00	0.03	0.57

Note: This table reports the pooled regressions of the hedge fund returns from January 1970 - June, 2009. The results are from the following ordinary least squares (OLS) regressions with standard errors corrected by the Newey-West (1997) procedure with three lags: $r_{it} = \alpha + \sum_{j=1}^{K} \beta_j r_{jt} + \lambda_t + \theta_s + \gamma_l W_i + \delta Z_i + \epsilon_t$, where r_{it} is the return from $t-1$ to t of fund i, K=1,3, or 4 depending on which model is used, the CAPM, the Fama-French three-factor, or the Fama-French four factor with momentum, λ_t is a series of dummies to control for time effects, θ_s is a set of dummies to control for fixed effects between hedge fund sub-categories, Z_i is a dummy variable which takes a value of 1 if the hedge fund is a qualitative hedge fund and 0 otherwise, γ_l represents the timing factor, where $l = HM$ equals $\max(0, -[r_{M,t} - r_{f,t}])$ for the Henriksson-Merton model, $\left[\left(\left[\prod_{d \in t} \max\left(1 + r_{M,d}, 1 + r_{f,d}\right)\right] - 1\right) - r_{M,t}\right]_t$ for the GII (Goetzmann, Ingersoll, and Ivkovic) model, and ϵ_{it} is the residual. Note: Both θ_s and Z_i are not used in the same regression as their would be perfect multicollinearity. Thus regression with strategy effects do not naturally have the quant dummy. Funds are excluded from the regression if they have less than 36 months of return data. After each fund's regression has been estimated, the parameters for category are averaged and reported in the table along with the average t-statistics, and the percentage of funds with a positive and significant t-statistic.

Table 13: Differences in Alpha Performance of Quantitative and Qualitative Hedge Funds During Financial Crisis from January 2007-June 2009

Indep. Variables	Quantitative				Qualitative				Both				Paired Funds			
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)	(13)	(14)	(15)	(16)
α	0.20	0.20	0.03	0.08	0.23	0.13	-0.14	-0.08	0.01	0.13	-0.23	-0.14	-0.19	-0.19	0.57	0.20
	5.76	5.44	0.77	2.08	7.60	3.83	-4.79	-1.19	0.16	3.83	-7.51	-4.79	-3.11	-5.65	2.36	1.32
β_{RMRF}	0.08	0.13	0.11	0.14	0.49	0.57	0.55	0.55	0.42	0.57	0.40	0.55	0.78	0.49	0.08	-0.01
	7.79	10.90	9.50	12.04	53.90	59.68	56.70	58.90	53.59	59.68	50.34	56.70	39.54	45.09	1.41	-0.25
β_{SMB}	.	-0.22	-0.22	-0.20	.	-0.12	-0.12	-0.16	-0.16	-0.12	-0.15	-0.12	-0.28	-0.00	-0.43	-0.13
	.	-14.29	-14.16	-11.60	.	-8.48	-8.38	-10.23	-14.30	-8.48	-14.18	-8.38	-9.88	-0.02	-4.39	-2.45
β_{HML}	.	-0.08	-0.09	-0.12	.	-0.32	-0.33	-0.27	-0.24	-0.32	-0.25	-0.33	-0.51	-0.29	-0.11	0.08
	.	-5.28	-5.92	-6.59	.	-22.34	-23.69	-16.71	-21.55	-22.34	-23.05	-23.69	-19.85	-16.71	-1.18	1.84
β_{MOM}	.	.	0.05	.	.	.	0.08	.	.	.	0.07	0.08	0.12	0.05	0.05	0.01
	.	.	7.70	.	.	.	12.69	.	.	.	14.00	12.69	10.21	7.16	1.90	0.37
$\beta_{Quant \times RMRF}$	.	.	.	.	.	.	.	.	.	-0.44	.	-0.44	-0.69	0.05	0.19	0.04
	.	.	.	.	.	.	.	.	.	-29.76	.	-28.57	-31.82	1.18	2.50	1.13
$\beta_{Quant \times SMB}$	.	.	.	.	.	.	.	.	.	-0.10	.	-0.10	0.25	-0.04	-0.14	0.03
	.	.	.	.	.	.	.	.	.	-4.89	.	-4.90	7.62	-0.85	-1.13	0.42
$\beta_{Quant \times HML}$	.	.	.	.	.	.	.	.	.	0.23	.	0.24	0.32	0.05	0.07	-0.16
	.	.	.	.	.	.	.	.	.	10.96	.	11.32	10.50	0.88	0.59	-3.01
$\beta_{Quant \times MOM}$	.	.	.	.	.	.	.	.	.	.	.	-0.03	-0.08	-0.01	0.00	0.02
	.	.	.	.	.	.	.	.	.	.	.	-3.11	-5.84	-0.38	0.02	1.08
δ	.	.	.	.	.	.	.	.	0.43	0.08	0.43	0.17	-0.06	-0.00	-0.41	-0.28
	.	.	.	.	.	.	.	.	8.28	1.51	8.19	3.67	-0.80	-0.04	-1.41	-1.60
N	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
$\bar{R}^2$	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.
Newey w/ 3 Lags	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Strategy Control?	No	No	No	Yes	No	No	No	Yes	No	No	No	No	No	No	No	No
Year Controls?	No	No	No	Yes	No	No	No	Yes	No	No	No	No	No	No	No	No
Main HF													EH	EH	M	M
Sub HF Q													EMN	QD	CoS	CuS
Sub HF Qual													FG	FV	CoD	CuD
F-stats and p-values testing exclusion of groups of variables																
Time Effects = 0	.	.	.	42.15	.	.	.	75.59	.	232.81	.	206.03	270.48	1.08	3.76	2.94
	.	.	.	0.00	.	.	.	0.00	.	0.00	.	0.00	0.00	0.36	0.00	0.02
Fixed Effects = 0	.	.	.	25.84	.	.	.	10.94	.	299.87	.	274.70	358.20	1.37	3.40	3.85
	.	.	.	0.00	.	.	.	0.00	.	0.00	.	0.00	0.00	0.25	0.02	0.01

Note: This table reports the pooled regressions of the hedge fund returns from January 1970 - June, 2009. The results are from the following ordinary least squares (OLS) regressions with standard errors corrected by the Newey-West (1997) procedure with three lags: $r_{it} = \alpha + \sum_{j=1}^{K} \beta_j r_{jt} + \lambda_t + \theta_s + \delta Z_i + \epsilon_t$, where r_{it} is the return from $t-1$ to t of fund i, K=1,3, or 4 depending on which model is used, the CAPM, the Fama-French three-factor, or the Fama-French four factor with momentum, λ_t is a series of dummies to control for time effects, θ_s is a set of dummies to control for fixed effects between hedge fund sub-categories, Z_i is a dummy variable which takes a value of 1 if the hedge fund is a qualitative hedge fund and 0 otherwise, and ϵ_{it} is the residual. Funds are excluded from the regression if they have less than 36 months of return data. After each fund's regression has been estimated, the parameters for category are averaged and reported in the table along with the average t-statistics, and the percentage of funds with a positive and significant t-statistic.

Table 14: Performance Decile Composition of Quantitative and Qualitative Hedge Funds

Decile	70-09	70-75	75-80	80-85	85-90	90-95	95-00	00-05	05-09	70-80	80-90	90-00	00-09
						Raw Returns							
1													
2													
3													
4													
5													
6													
7													
8													
9													
10													
1-10													
n_1													
n_2													
						Fama-French 3-Factor α							
1													
2													
3													
4													
5													
6													
7													
8													
9													
10													
1-10													
n_1													
n_2													
						Fama-French 4-Factor α							
1													
2													
3													
4													
5													
6													
7													
8													
9													
10													
1-10													
n_1													
n_2													

Note: For each period, hedge fund returns are ranked from highest to lowest. They are divided into deciles. For each performance ranking, the table reports the percentage of quantitative hedge funds in that particular decile. Raw returns refers to a simple ranking of actual hedge fund returns net of fees. Fama-French 3-Factor α refers to ranking of hedge fund returns by the α generated from the three-factor model. Fama-French 4-Factor α refers to ranking of hedge fund returns by the α generated from the four-factor model. Factor models are estimated for the period listed. For example, 70-75 estimates the α from the period January 1970 through December 1974.

Table 15: Performance Decile Composition of Quantitative and Qualitative Hedge Funds

Decile	70-09	70-75	75-80	80-85	85-90	90-95	95-00	00-05	05-09	70-80	80-90	90-00	00-09

Note: For each period, hedge fund returns are ranked from highest to lowest. They are divided into deciles. For each performance ranking, the table reports the percentage of quantitative hedge funds in that particular decile. Raw returns refers to a simple ranking of actual hedge fund returns net of fees. Fama-French 3-Factor α refers to ranking of hedge fund returns by the α generated from the three-factor model. Fama-French 4-Factor α refers to ranking of hedge fund returns by the α generated from the four-factor model. Factor models are estimated for the period listed. For example, 70-75 estimates the α from the period January 1970 through December 1974.

VII Figures

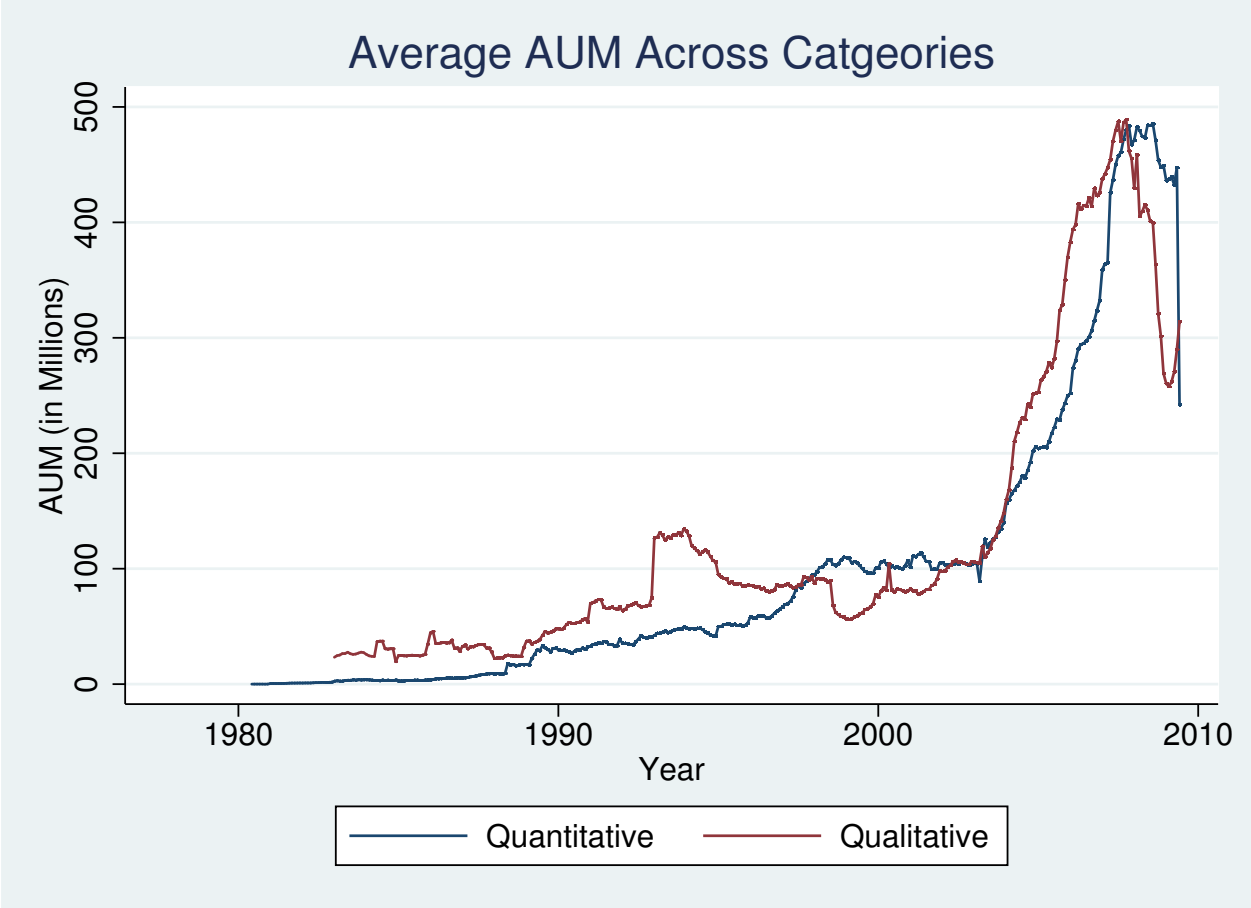

Figure 1: Growth of Quantitative and Qualitative Funds in AUM (Millions of Dollars)

References

[1] Ahmed, Parvez and Sudhir Nanda. "Performance of Enhanced Index and Quantitative Equity Funds". *The Financial Review*, 40:459–479, 2005.

[2] Breusch, T.S. "Testing for Autocorrelation in Dynamic Linear Models". *Australian Economic Papers*, 31:334–355, September 1978.

[3] Breusch, T.S. and A.R. Pagan. "A Simple Test for Heteroskedasticity and Random Coefficient Variation". *Econometrica*, 47:1287–1294, 1979.

[4] Chincarini, Ludwig B. and Daehwan Kim. *Quantitative Equity Portfolio Management*. McGraw-Hill, 2006.

[5] Godfrey, L.G. "Testing Against General Autoregressive and Moving Average Error Models when the Regressors Include Lagged Dependent Variables". *Econometrica*, 46:1293–1302, 1978.

[6] Goetzmann, William N., Ingersoll Jr., Jonathan and Zoran Ivkovic. "Monthly Measurement of Daily Timers". *Journal of Financial and Quantitative Analysis*, pages 257–291, September 2000.

[7] Henriksson, Roy D. and Robert C. Merton. "On Market Timing and Investment Performance: II: Statistical Procedures for Evaluating Forecasting Skills". *Journal of Business*, pages 513–533, 1981.

[8] Newey, W. and K. West. "A Simple, Positive Semi-Definite, Heteroskedascity and Autocorrelation Consistent Matrix". *Econometrica*, pages 703–708, 1987.

[9] Stock, James H. and Mark W. Watson. *Introduction to Econometrics*. Pearson, Addison Wesley, 2007.

[10] Wooldridge, Jeffrey M. *Introductory Econometrics: A Modern Approach*. South-Western, 2009.