Performance measures and incentives:
Loading negative coskewness to outperform the CAPM

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ABSTRACT

This study examines the incentives in fund management due to the adoption of specific performance measures. A mean-variance measure such as Jensen’s alpha incentivizes fund managers to load negative coskewness risk. This risk is shown to be priced in the UK stock market during the period January 1991- December 2005, bearing a premium of 2.09% p.a. Hence, a new performance measure, the intercept of the Harvey-Siddique two-factor asset pricing model is proposed to be more appropriate for prudent investors. Using this model, the performance of UK equity unit trusts is examined for the same period. Though managers exhibited significantly negative ability, they were correctly responding to their incentives, loading negative coskewness and reaping part of the corresponding premium.

JEL Classification: G12, G23

Key words: Coskewness, Mutual funds, Performance evaluation.
1 Introduction

The most important development in the financial markets during the last decades is their domination by institutional investors. The Office of National Statistics (ONS) reports that the individual ownership of the companies listed in the London Stock Exchange (LSE) has decreased from 54% in 1963 to just 12.8% in 2006. One of the most successful investment vehicles is the unit trust 1. According to the Investment Institute Company (IIC), the 1,903 unit trusts with a British domicile were managing $786 bil. in December 2006.2

The outstanding success of the mutual funds is due to the fact that they provide access to professional management and a highly diversified portfolio even for investors with a low initial capital. In a world of perfect competition and symmetric information, investing in actively managed mutual funds would be an optimal solution. However, the delegated nature of fund management creates a series of problems related to asymmetric information.

The informational asymmetries between the mutual fund shareholder (principal) and the manager (agent) may cause problems in three levels (see Spencer, 2000, for an analytical discussion). Firstly, there is the case of adverse selection. The most capable managers are more likely to get employed in different types of investment vehicles, where the compensation structure is more directly linked to performance. Closed-end funds, hedge funds and private banking services could attract the best managers. Secondly, there is the moral hazard problem. Once the investment has taken place, the manager could attempt to expropriate wealth from the investors, most commonly by charging a high expense ratio. The third issue refers to the ex post verification, i.e. the problem of fairly evaluating the investment outcome. To resolve the last problem, it is necessary to have an objective way to select and compensate managers.

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1 The term "unit trust" corresponds to the most commonly used term "open-end mutual fund". Henceforth, the two terms will be interchangeably used.

2 See the 2007 IIC Fact Book for further details.
Measuring investment performance has attracted a lot of attention in the literature and various measures have been suggested, according to which managers should be classified and rewarded. The most commonly used measures are the Sharpe ratio, the Treynor ratio and Jensen’s alpha, the intercept of the CAPM. All these measures have their roots in the mean-variance world of Markowitz (1952). Consequently, there are a series of problems inherent in these measures, since they neglect the intertemporal risk premia priced in the capital markets (see Cambpell and Vuolteenaho, 2004) as well as the risk premia arising due to the deviation of asset returns’ from normality (see Harvey and Siddique, 2000).

Severe criticism to the CAPM assumptions comes from utility theory too. The assumption of quadratic preferences is clearly rejected since it implies increasing absolute risk aversion (IARA). A desirable property of a utility function is that agents are averse to negative skewness and have a preference for payoffs exhibiting positive skewness. This behaviour is termed prudence (see Kimball, 1990). Furthermore, experimental evidence (see Kahneman and Tversky, 1979) indicates that there is an asymmetrically higher impact on utility by losses in comparison to gains, leading to utility frameworks such as Prospect Theory or Disappointment Aversion (Gul, 1991). These utility functions imply that agents are even more averse to negative skewness. Hence, aversion to negative skewness is a crucial feature that has been neglected in asset pricing.

A recent contribution to the literature is the introduction of the Carhart’s alpha, the intercept of the Carhart (1997) regression that extends the CAPM by adding the returns of size, value and momentum strategies as risk factors. However, there are two major problems with this measure: Firstly, there is no robust, universally accepted theoretical reason why these strategies should be considered as risk factors. As a result, we run into the problem of regarding randomly fluctuating returns as risk factors. Secondly, this measure attributes returns to specific strategies, not their fundamental source of risk;
consequently, there will always be the incentive for fund managers to construct alternative strategies that outperform this measure too. We provide evidence that the size, value and momentum strategies have negatively coskewed returns.

This study has two main aims: The first is to review the assumptions on which the most commonly used performance measures are based and to examine the incentives these measures generate. Fund managers try to distinguish themselves from their peers on the basis of these measures, responding to these incentives by adopting investment strategies that generate excess returns and help them outperform. The second is to propose an appropriate performance measure for risk-averse, prudent investors that is based on sound economic reasoning and to evaluate UK equity unit trusts according to this measure.

In particular, after showing that a negative coskewness premium is priced in the UK stock market, the Harvey and Siddique (2000) asset pricing model, which adds a zero-cost negative coskewness spread strategy as an extra factor to the CAPM, is proposed to be the most appropriate one for a prudent investor. This model takes into account the risk premia formed in capital markets due to the participants’ aversion to negative skewness. The intercept of this model, which we term as the *Harvey-Siddique alpha*, is employed as a performance measure to evaluate the performance of UK equity unit trusts during the period January 1991- December 2005.

In order to perform this analysis, the returns of a zero-cost coskewness spread portfolio have been calculated for the UK, showing that the average monthly return of this strategy was 2.09% p.a. over the period 1991-2005. Previewing our results, the median unit trust investing in the FTSE All Share universe had a Harvey-Siddique alpha of $-2.36\%$ p.a., while the corresponding median Jensen’s alpha was $-1.77\%$ p.a. and the median Carhart alpha was $-2.32\%$ p.a. With respect to the managers’ incentives, it is shown that almost all of the examined trusts had a positive loading on the negative
coskewness spread strategy. Most interestingly, the trusts with the highest Jensen’s alphas were those with the most positive loadings on the negative coskewness factor. We also provide evidence that the nonnormality of the trusts’ performance distribution can be partly attributed to heterogeneous risk-taking, with the coskewness strategy being a main source of this heterogeneity.

The main message of this study is that prudent investors should employ the Harvey-Siddique alpha in order to neutralize the incentives of trust managers to load this type of risk. For these investors, most of the UK unit trusts exhibited a significantly negative managerial ability. However, trust managers were very successful in reaping the negative coskewness premium priced in the market boosting their returns and correctly responding to their incentives, since they have been evaluated according to mean-variance measures that regard this premium as a "free lunch".

The rest of the paper is organized as follows: Section 2 discusses the relationship between skewness, preferences and asset pricing. Section 3 reviews the most commonly used performance measures, discussing the incentives they generate and Section 4 provides the details of the data and related methodological issues. Section 5 discusses the results of unit trust performance evaluation and Section 6 presents the results of the subperiod and bootstrap analysis. Section 7 concludes.

2 Motivation and Theoretical concepts

2.1 Skewness and preferences

It is expected that a risk-averse and prudent investor has a preference over a positively skewed payoff distribution and an aversion towards a negatively skewed one. There is significant actual evidence in the markets supporting this argument. The very popular portfolio insurance products are protecting investors against downside risk. Moreover, modern risk management mainly
deals with the avoidance of extreme negative returns. The most characteristic example is the measurement of Value-at-Risk (VaR).

Furthermore, option-implied distributions, especially after the 1987 crash, are typically negatively skewed. In particular, deep out-of-the-money puts, which are popular instruments for portfolio insurance, have quite high prices relative to the ones implied by the Black and Scholes (1973) model. As a result, the implied volatility-strike price graph exhibits a "smirk", in contrast to the constant volatility assumption of Black and Scholes. This feature of option prices has been termed crashophobia (see Jackwerth, 2004).

On the other hand, the preference for positive skewness is evident in lotteries. Agents are willing to participate in lotteries with positively skewed payoffs (see for example, Golec and Tamarkin, 1998), even though these have negative expected values (unfair games). It is worth mentioning that the participation in such unfair games increases as positive skewness increases (e.g. jackpots in lotteries).

The impact of skewness is often examined using the power utility function, that treats symmetrically utility gains and losses due to a wealth change of the same magnitude. Actually, this is also a property of the mean-variance analysis. Despite this assumption, there is significant experimental evidence that agents are mainly averse to losses, not just to volatility. The Prospect Theory of Kahnemann and Tversky (1979) as well as the Disappointment Aversion framework of Gul (1991) imply that investors maintain an asymmetric attitude towards losses as compared to gains. In general, this class of utility functions captures the feature of first-order risk aversion and implies that investors are even more averse to negative skewness in comparison to power utility agents.

The non-participation in capital markets can be regarded as a consequence of first-order risk aversion (see Barberis et al., 2006 for a resolution of the equity premium puzzle within this framework). In particular, mean-variance theory predicts that even agents who are very risk averse should hold a
portion of their portfolio in the risky asset that bears a positive premium. Nevertheless, actual data show that a large proportion of households have zero holdings in risky assets (see e.g. Haliassos and Bertaut, 1995).

There are a number of regulatory and psychological issues related to loss aversion. Moreover, pension funds and insurance companies usually face legal obligations to pay out fixed or quasi-fixed amounts. The same holds for households with liabilities over mortgages, loan installments or fees. Habit formation is another example of anchoring one’s preferences around a reference point and being reluctant to accept any wealth level below that point. This mixture of obligations and preferences make pension funds, insurance companies and individuals extremely averse to negative movements in asset prices.

2.2 Coskewness in asset pricing

The central problem in Asset Pricing is to find a valid Stochastic Discount Factor (SDF) $M$ for future payoffs. Formally, the SDF is assumed to be positive (see Harrison and Kreps, 1979), it is unique under complete markets and satisfies the following relationship:

\[ P_t = E_t[M_{t+s}X_{t+s}] \] (1)

where $P_t$ is the price of an asset at time $t$ and $X_{t+s}$ denotes the asset’s payoff at time $t + s$.

In a one-period ahead framework, gross returns $R_{t+1} = \frac{X_{t+1}}{P_t} \equiv 1 + r_{t+1}$ are employed to re-write equation (1) as:

\[ 1 = E_t[M_{t+1}R_{t+1}] \] (2)

It is straightforward to derive the following relationships (see Smith and Wickens, 2002), which relate the SDF, the risky and the risk-free asset return $r_f^t$:
\[ 1 = E_t(M_{t+1})(1 + r_t^f) \Rightarrow E_t(M_{t+1}) = \frac{1}{1 + r_t^f} \quad (3) \]

and

\[ E_t(R_{t+1}) = \frac{1 - \text{Cov}(M_{t+1}, R_{t+1})}{E_t(M_{t+1})} \quad (4) \]

Combining these two equations we get a central result in asset pricing theory:

\[ E_t(r_{t+1}) = -(1 + r_t^f)\text{Cov}(M_{t+1}, r_{t+1}) \quad (5) \]

This equation implies that the excess expected return of a risky asset depends on the covariance of the SDF with this return.

Harvey and Siddique (2000) use the marginal rate of substitution \( \frac{U'(W_{t+1})}{U'(W_t)} \) as an SDF to show the implications of this specification. Taking a first-order Taylor series expansion of \( U'(W_{t+1}) \) around \( W_t \), we get the standard CAPM analysis.

However, there is no particular reason why the truncation of the Taylor series expansion should occur at the first order. If the truncation takes place at the second order, then:

\[
\begin{align*}
U'(W_{t+1}) &\approx U'(W_t) + U''(W_t)(W_{t+1} - W_t) + \frac{U'''(W_t)(W_{t+1} - W_t)^2}{2!} \\
\frac{U'(W_{t+1})}{U'(W_t)} &\approx 1 + \frac{U''(W_t)W_t}{U'(W_t)}r_{m,t+1} + \frac{U'''(W_t)W_t^2}{2U'(W_t)}r_{m,t+1}^2 = \\
&= 1 - \gamma r_{m,t+1} + \frac{U''(W_t)W_t U''(W_t)W_t}{2U'(W_t)}r_{m,t+1}^2 = \\
&= 1 - \gamma r_{m,t+1} + \frac{1}{2}\eta r_{m,t+1}^2
\end{align*}
\]

where we have used the simple relationship \( W_{t+1} = W_t(1 + r_{m,t+1}) \), the definition of the Arrow-Pratt measure of Relative Risk Aversion, \( \gamma \equiv -\frac{U'''(W_t)W_t}{U''(W_t)} \).
and the measure of Relative Prudence $\eta \equiv \frac{U''(W_t)W_t}{U''(W_t)}$, as defined by Kimball (1990). Furthermore, defining $\bar{b} \equiv \frac{U''(W_t)W_t}{U'(W_t)} = -\gamma$ and $\bar{c} \equiv \frac{U'''(W_t)W_t^2}{2U'(W_t)} = \frac{1}{2} \gamma \eta r^2_{m,t+1}$, the SDF implied by (6) can now be written as:

$$M_{t+1} = 1 + \bar{b}r_{m,t+1} + \bar{c}r^2_{m,t+1}$$

(7)

This is not a linear SDF any more, since the squared market returns are involved. Recalling the fundamental asset pricing equation (5) of the SDF approach, the expected excess return of an asset now depends on the covariance of this asset returns not only with the market returns but also with the squared market returns. This is exactly what coskewness measures. In the case of a prudent and risk-averse investor, we have that $\eta > 0 \Rightarrow \bar{c} > 0$, so the fundamental equation of asset pricing (5) can be written as:

$$E_t(r_{t+1}) - r^f_t = -(1 + r^f_t)\bar{b}Cov(r_{M,t+1},r_{t+1}) - (1 + r^f_t)\bar{c}Cov(r^2_{M,t+1},r_{t+1})$$

(8)

Therefore, for given $Cov(r_{M,t+1},r_{t+1})$, we have two cases with respect to $Cov(r^2_{M,t+1},r_{t+1})$. On the one hand, if $Cov(r^2_{M,t+1},r_{t+1}) > 0$, then $E_t(r_{t+1}) - r^f_t$ is now lower in comparison to the case of $\bar{c} = 0$. This implies that if the risky asset’s returns are positively coskewed with the market returns, then this asset will bear a lower risk premium. On the other hand, if $Cov(r^2_{M,t+1},r_{t+1}) < 0$, then $E_t(r_{t+1}) - r^f_t$ is now higher. In other words, a prudent investor seeks an extra risk premium in order to hold an asset, the returns of which are characterized by negative coskewness. Therefore, if financial markets are populated by prudent investors, expected returns should be higher for assets exhibiting negative coskewness. This is a key result in our analysis, predicting the existence of a negative coskewness premium.
3 Performance measures and incentives in fund management

3.1 Raw returns

Since the work of Markowitz (1952), it has been understood that there exists a direct positive relationship between risk and returns. However, managers and funds are still often ranked according to their raw returns. The new breed of funds, appearing as "absolute return" seeking funds, reflects the lack of understanding of the link between risk and return. Using raw returns as a performance measure essentially means that the investor is indifferent to risk, i.e., his utility is not decreasing in volatility/risk, and risk premia are thought to be "free lunches". Evaluating a manager’s performance using such a measure, he will be incentivised to undertake the highest possible risk.

3.2 Sharpe ratio

On the other hand, the most of the studies have been evaluating investment strategies according to their risk-adjusted returns. One of the most commonly used measures of risk-adjusted performance is the Sharpe ratio due to Sharpe (1966):

$$ SR = \frac{E(R_p) - r^f}{\sigma_p} $$

where $E(R_p)$ is the average fund’s return over a specific period, $r^f$ is the risk-free rate and $\sigma_p$ is the standard deviation of the fund’s returns in the same period. Using this measure, fund managers do not have the incentive to invest in more volatile assets, since higher volatility essentially penalizes their excess returns.

The Sharpe ratio is a purely mean-variance measure, neglecting higher moments. Nevertheless, these higher moments bear risk premia in a market
with prudent investors, as it was previously discussed. Consequently, the rational response of the fund manager is to invest in assets that exhibit negative skewness in order to reap the corresponding risk premia and be classified as a Winner.

There are a series of examples documenting the existence of these strategies. Investing in emerging countries’ bonds as well as non-investment grade bonds is a straightforward case. These bonds have a higher probability of default in comparison to investment grade bonds. As a result, their returns are more negatively skewed and they provide higher yields. If a manager matches bonds with the same volatility but with different levels of skewness, he will achieve a higher Sharpe ratio—until the default occurs.

Goetzmann et al. (2007) analyze methods of maximizing a portfolio’s Sharpe ratio using derivatives. Shorting different fractions of out-of-the-money puts and calls creates a negatively skewed distribution of returns and leads to the maximum Sharpe ratio. Their example also shows that hedge funds and other investment vehicles that use derivative assets can manipulate their Sharpe ratio. Leland (1999) provides an example of a dynamic strategy of cash and stocks as well as static strategies using options that generate negative skewness and outperform in terms of Sharpe ratio. Therefore, such funds should not be evaluated by mean-variance measures.

The inappropriateness of the Sharpe ratio for skewed returns is also mentioned in Ziemba (2005), who provides a modification of the Sharpe ratio to emphasize the importance of the downside risk. The Symmetric Downside-Risk Sharpe ratio is given by:

\[
DSR = \frac{E(R_p) - r^f}{\sqrt{2(\sigma_-^2)}}
\]  

(10)

with

\[
\sigma_-^2 = \frac{1}{(T-1)} \sum_{t=1}^{T} (R_{t} - E(R_p))^2
\]  

(11)

and the returns \((R_t)\) used are those below the average \(E(R_p)\). This meas-
ure adjusts the excess returns by using the semi-variance instead of variance.

### 3.3 Jensen Alpha and Treynor Ratio

Within the CAPM framework, Jensen (1968) introduced the intercept of the following regression as a measure for the fund manager’s ability:

\[ r_{p,t} = \alpha_{Jensen} + \beta_p r_{M,t} + \epsilon_t \]  

(12)

where \( r_{p,t} \) stands for the excess returns of the trust, \( r_M \) the excess return of a suitable market index and \( \beta_p \) the fund’s CAPM beta.

The intercept (\( \alpha_{Jensen} \)) shows whether the manager has added any value over and above the return justified by the risk he had undertaken. The concept of risk here is summarized in the CAPM beta. Closely related is the measure proposed by Treynor (1965):

\[ TR = \frac{E(R_p) - r^f}{\beta_p} \]

(13)

Following the spirit of the Sharpe ratio, the Treynor ratio adjusts excess returns for the corresponding CAPM beta risk (\( \beta_p \)).

As it has been discussed, the CAPM is a mean-variance static measure, neglecting all other sources of risk, in particular those arising due to the higher moments and the stochastic evolution of the underlying risk factors affecting the asset returns. Consequently, if evaluated by the CAPM, managers are incentivised to employ portfolio strategies, which load intertemporal and higher co-moments risks in the portfolios. It is known that fund managers construct portfolio strategies which exploit patterns such as the size, value and momentum "anomalies" to add value to their portfolios. Temporary success of these strategies generates a positive Jensen alpha classifying the manager as a Winner. These portfolio strategies are supposed to have zero CAPM beta risk but they are not necessarily riskless.
3.4 Carhart Alpha

The basic doctrine of financial theory is that "free lunches" in the spirit of Harrison and Kreps (1979) should be ruled out. Furthermore, since the Fama-French (1993) and momentum (see Jegadeesh and Titman, 1993) strategies are very simple to construct and implement, these returns cannot be regarded as genuinely added value. Reflecting these arguments, Carhart (1997) suggested the intercept of the four-factor model:

\[
r_{p,t} = \alpha_{Carhart} + \beta_p r_{M,t} + \beta_1 SMB + \beta_2 HML + \beta_3 MOM + \epsilon_t
\]

i.e. the Carhart alpha, as a performance measure.

The Carhart regression (14) essentially attributes the fund’s returns generated by the size (SMB), value (HML) and momentum (MOM) strategies to the corresponding risk factors. The intercept of this regression \(\alpha_{Carhart}\) reveals the value the manager has added to his portfolio above what the beta risk could justify and these known strategies could generate. The most important feature of this measure is that it neutralizes the incentive to adopt these strategies, since they are recognized as risk factors.

Despite the significance of this contribution, the Carhart measure has two main disadvantages. Firstly, managers would still try to find patterns in stock returns in order to outperform on the basis of this measure too. Even though the Carhart model reduces the possible opportunities, there exist other such strategies that generate abnormal returns within this model. The need for a more general measure capturing all these types of risks is obvious. Secondly, there is no robust theory explaining why the size, value and momentum strategies are risk factors. Hence, this model may misinterpret randomly fluctuating returns for risk factors, penalizing genuinely added

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3 Accepting "free lunches" would be equivalent to discarding asset allocation. If there exist strategies that add value to portfolios without undertaking any further risk, then the optimal portfolio choice collapses to an infinite demand schedule for these strategies.

14
value. Consequently, a measure based on sound economic theory is needed.

### 3.5 Harvey-Siddique alpha

Given the theoretical motivation of Section 2, this study argues that a prudent investor should evaluate his investments according to the following model:

$$ r_{p,t} = a_{HS} + \beta_p r_{M,t} + c(S^- - S^+) + \epsilon_t $$

where \((S^- - S^+)\) is the negative coskewness spread strategy, as defined in the previous chapter. The intercept of this model, \((a_{HS})\), termed as the Harvey-Siddique alpha, will give us the value added by the manager over and above the covariance and negative coskewness risks.

As Harvey and Siddique (2000, p. 1276) point out, this asset pricing model has two main advantages over a model which would include the squared market returns as a factor (see Kraus and Litzenberger, 1976): Firstly, the measure of standardized coskewness is constructed by residuals, so it is by construction independent of the market return and, secondly, \(\beta_p\) in (15) is similar to the standard CAPM beta. Moreover, standardized coskewness is unit free and analogous to a factor loading.

Apart from the parsimony in comparison to the Carhart (1997) measure, the suggested measure is also more general since it captures the excess returns from any possible strategy that loads negative skewness to the portfolio and it is based on an asset pricing model built within a rigorous utility theory framework.

### 4 Data and Methodology

We follow the methodology of Harvey and Siddique (2000) to construct the zero-cost negative coskewness portfolio, \((S^- - S^+)\). Using 60 monthly excess returns \(r_{it}\), we regress the market model for each individual stock \(i\)
extracting the residuals $\varepsilon_{it}$, which are by definition orthogonal to the excess market returns $r_M$. Therefore, these residuals are net of the systematic risk as this is measured by the covariance of the stock returns with the market returns. However, they still incorporate the coskewness risk. Therefore, we can get a measure of the standardized coskewness of each stock with the market return. This is given by:

$$
\beta_{SKD} = \frac{E[\varepsilon_{i,t} \varepsilon_{M,t}^2]}{\sqrt{E[\varepsilon_{i,t}^2] E[\varepsilon_{M,t}^2]}}
$$

where $\varepsilon_{it}$ is the residual previously extracted from the market model for stock $i$ at time $t$ and $\varepsilon_{M,t}$ is the deviation of the excess market return at time $t$ from the average excess market return in the examined period.

Ranking the stocks according to this coskewness measure, we form a value-weighted portfolio of the 30% most positively coskewed stocks ($S^+$), while the 30% most negatively coskewed stocks form another portfolio ($S^-$). The next step is to find their returns on the 61st month. The spread of these two portfolios' returns ($S^- - S^+$) will yield the return generated by the self-financing strategy of buying stocks with the most negatively coskewed returns and selling short stocks with the most positively coskewed returns.

To construct the coskewness measure $\beta_{SKD}$ we employ data for monthly returns and market values of all stocks being listed in the FTSE All Share Index during the period 1986-2005 with at least 61 observations. The number of stocks utilized to create the coskewness portfolios varied from 413 (with market value of £339,404 mil.) in December 1991 to 581 in January 2004, (with market value of £1,045,331 mil.). The risk-free rate is given by the interbank monthly rate and the market returns are the returns of the FTSE All Share Index. The source for the data and the FTSE All Share Index listings is Thomson Datastream and Worldscope.
The coskewness portfolios’ returns are constructed for the period January 1991-December 2005. Panel A of Table 1 presents the average returns of the zero-cost coskewness spread portfolio \((S^- - S^+)\) and panel B presents the excess market returns for various periods. A striking feature of the zero-cost portfolio is that it yielded, on average, a return of 2.09% p.a., over the period 1991-2005. The subperiod analysis showed that negative coskewness was more significantly priced in the last subperiod, i.e. 2001-2005.

To provide empirical evidence for the argument that the Fama-French and momentum strategies mimick negative coskewness, we explore the properties of their returns. Following Cuthbertson et al. (2006), we proxy the Size strategy returns as the difference between the monthly returns of the Hoare Govett Small Cap and the FTSE 100 index and the Value strategy returns as the spread between the monthly returns of the MSCI UK Growth and the MSCI UK Value indices. The returns of the Momentum strategy were calculated by ranking all available stocks at time \(t\) according to their returns between the months \(t-12\) and \(t-1\). The top 30% (value-weighted) of these stocks were classified as Winners and the bottom 30% as Losers. The spread of their monthly returns at \(t+1\) is taken as the momentum strategy return. The portfolios were monthly rebalanced.

As Panel A of Table 1 shows, the Size and Value strategies yielded significant positive returns mainly during the subperiod 2001-2005. The coefficients of standardized coskewness for the period Jan 2001- Dec 2005 were \(\beta_{SMB}^{SKD} = -0.257\) for the Size (SMB) strategy and \(\beta_{HML}^{SKD} = -0.107\) for the Value (HML) strategy. The Momentum (MOM) strategy yielded a positive average return throughout the examined period, but this was even higher during the last subperiod. The coefficient of standardized coskewness was \(\beta_{MOM}^{SKD} = -0.08\) for the whole period and \(\beta_{MOM}^{SKD} = -0.43\) for the last subperiod. Hence, all these strategies had negatively coskewed returns indeed, especially when they yielded high average returns. As a result, a trust manager who followed these strategies was loading negative skewness to his port-
5 Unit trusts’ performance

5.1 Average returns and Sharpe ratios

The average excess returns earned by the equity trusts along with the excess market returns are given in Panel B of Table 1. An interesting result is that the trusts exhibited consistently lower returns in comparison to the excess returns of the FTSE All Share Index in the whole sample period as well as in the three subperiods examined. The high fees they charged is regarded as the main reason why this underperformance is observed. Non-stock holdings could provide another explanation, but the lack of holdings data does not allow us to test that formally. However, the results of the CAPM analysis showed that the beta of the trusts was approximately 0.93, providing some evidence for this argument.

Panel B of Table 1 also provides the average Sharpe ratios of the trusts for the period January 1991- December 2005. For the calculation of this average, the individual Sharpe ratio of each trust with more than 60 monthly returns was firstly calculated. During bear market phases Sharpe ratios can take negative values. The purpose of calculating this measure is to compare it with the Downside Sharpe Ratio (DSR) that replaces the variance of the monthly returns with their semi-variance. The DSR is also reported in Panel B of Table 1. The most important finding is that the average DSR is much lower in comparison to average Sharpe ratio. The explanation for this finding is that the returns’ semivariance was much higher than their variance; consequently, the excess returns were much more severely penalized using the DSR measure.

This result was consistent for all of the individual trusts and shows that the trusts’ returns were negatively skewed indeed. This is an interesting finding for prudent investors who are averse to negative skewness as well as for loss averse investors who are even more averse to this feature. It also
shows that if the DSR replaces the Sharpe ratio as a performance measure, the managers will be incentivized to avoid large negative returns, meeting the preferences of their clients.

5.2 Jensen alpha

Focusing now on measures based on asset pricing models, the first measure to employ is Jensen’s alpha, given by the intercept of regression (12). Over the period 1991-2005, the median trust had a Jensen’s alpha of \(-1.77\%\) p.a. Figure 1 shows the distribution of the trusts’ Jensen alphas during this period. It is evident that the majority of the trusts have negative alphas, but their distribution is positively skewed. This implies that there are a few trusts who have quite high positive alphas. Having ranked the trusts according to their alphas, Table 3 shows the corresponding values for various percentiles of the distribution. The upper 25% of the trusts had a positive alpha, though very few of these estimates were statistically significant. On the other hand, the bottom 45% of the trusts exhibited alphas of less than \(-2\%\) p.a..

The common practice of ranking trusts according to their alpha point estimates can be misleading, since the standard error of the estimate is not taken into account. It has been suggested (see Kosowski et al., 2006) that ranking trusts according to their t-statistics is more appropriate, since this adjusts the point estimate for its in-sample variability (standard error). Table 5 presents such a ranking, using the corresponding t-OLS values. Using a 95% confidence interval for the t-statistic, only 5% of the trusts exhibit significantly positive managerial ability. On the other hand, more than 30% of the trusts exhibited significantly negative managerial ability.

An immediate conclusion from the shape of the distribution is that, according to this static, mean-variance measure, significant managerial ability existed, but only for a very small portion of the trust managers. Furthermore, even the quadratic investors who chose the bottom 30% trusts would
have been significantly better off if they had invested in a low-cost index fund. Since we deal with net returns, high expenses and management fees could well be a reason for the significant underperformance of many trusts. The nonnormality of the alphas’ distribution can be explained in two ways: Either trust managers exhibit heterogeneous abilities, with a few managers being highly skillful, or these managers adopted heterogeneous risk-taking strategies. The next subsections investigate further these hypotheses.

5.3 Carhart alpha

This subsection evaluates the trusts by using the intercept of the Carhart asset pricing model (equation 14) as a performance measure. The rankings of the trusts according to their Carhart alphas, along with the corresponding t-statistics and p-values are given in Table 3, while Table 5 provides the rankings according to the t-values of the Carhart alpha point estimates. In comparison to the Jensen’s alpha, the main conclusion is that the achieved performance is now much lower for every percentile of the trusts’ distribution. Figure 2 exhibits the distribution of the trusts’ Carhart alphas.

In particular, the median trust’s performance was $-2.32\%$ p.a. over the period January 1991- December 2005. Therefore, it is argued that attributing the returns of the size, momentum and value strategies to the corresponding risk factors, as the Carhart regression does, significantly diminishes the performance of the trust managers. Interestingly, there were very few funds that exhibited a positive and statistically significant alpha over this period. This result points to the argument that if an investor considers the documented anomalies as risk factors, he would be much better off investing in an index fund rather than the median UK equity unit trust.

With respect to managerial incentives, Figure 3 depicts the loadings of

---

4The Kolmogorov-Smirnov test was employed to formally test the hypothesis of normality for the standardized alphas. The hypothesis of normality was rejected at levels even lower than 1%. 

20
the trusts’ returns on the size, value and momentum factors over the whole sample period. It is interesting to observe that the managers mainly followed size strategies, while there is no evidence for the adoption of value and momentum strategies since the estimates of the corresponding loadings are evenly distributed around zero for the examined trusts. The explanation for this result is derived again from the fact that these strategies yielded highly volatile returns that were not consistently positive throughout our sample period. Consequently, we would not expect managers to stick to specific strategies even when these were not outperforming. This is a fundamental issue showing the main disadvantage of the Carhart model, that is to assume that managers follow specific strategies even though these do not persistently yield positive returns and do not rigorously represent any specific risk factor.

5.4 Harvey-Siddique alpha

This subsection presents the results of the unit trusts’ evaluation using the Harvey-Siddique asset pricing model of equation (15). Interestingly, the examined trusts had a median Harvey-Siddique (H-S) alpha of $-2.36\%$ p.a. This is much lower than the median Jensen’s alpha. Figure 1 plots the distribution of the H-S alphas along with the distribution of the Jensen’s alphas. It is evident that the whole distribution is shifted to the left as we switch from the Jensen’s alpha to the Harvey-Siddique alpha. The main explanation for this difference is that trust managers followed coskewness strategies indeed, earning positive returns, which were regarded as "abnormal returns" according to the CAPM. If a manager had genuinely added value to his portfolio without adding negative coskewness, then there should be no significant difference between these two measures.

To verify this conjecture, it is interesting to note that 263 out of the total 273 trusts had a positive loading (coefficient) on the coskewness portfolio and this positive loading was statistically significant at a 95\% confidence level for 175 funds during the examined period. Figure 4 plots the density of
the loadings on the coskewness strategy, showing that the 95% of the trusts had a positive coefficient estimate and more than the 50% of the trusts had a coefficient point estimate of more than 0.25. This finding confirms that the majority of the funds were employing strategies which essentially loaded negative skewness to the funds, without this implying that they consciously followed the specific negative coskewness spread strategy we analyzed in the previous chapter.\textsuperscript{5}

Ranking the trusts according to their Harvey-Siddique alphas, Table 3 reports their estimates for various percentiles of this distribution. It is striking to observe that only the 16% of the trusts had positive alphas. On the other hand, the 55% of the funds had an alpha of less than $-2\%$ p.a.. Ranking the trusts according to the t-values of these alphas in Table 5, the results are equivalent. Only 3 funds had significantly positive alphas at a 95% confidence level, while 41% of the trusts had significantly negative alpha estimates. With respect to the distribution of the alphas, this is now closer to normality,\textsuperscript{6} being less positively skewed in comparison to the Jensen alphas’ distribution.

Interestingly, the two trusts with the highest Jensen alphas (15.5\% and 13.71\% p.a. correspondingly), which account for the extreme positive tail of the distribution, are the trusts with the 2nd and 8th (out of 273) highest loadings of the coskewness risk factor (with coefficient point estimates of 1.53 and 0.98 correspondingly). Hence, the conjecture of heterogeneous risk-taking previously made is supported and part of this heterogeneity is due to the negative coskewness risk.

\textsuperscript{5}Fund management practice shows that managers try to find and exploit patterns in stock returns in order to generate portfolios that beat the measures according to which they are evaluated. Therefore, a negative coskewness strategy does not necessarily mean that the manager consciously picks stocks with this characteristic, but that the strategies he implements actually mimick this statistical characteristic.

\textsuperscript{6}The null hypothesis of normality is marginally rejected at a 5\% level using the Kolmogorov-Smirnov test.
There are two main conclusions from these results: The first is that prudent investors, who are averse to negative skewness and should use the Harvey-Siddique alpha to evaluate their trust managers, would have been better off by investing in a low-cost index fund as compared to more than 80% of the available trusts over the period 1991-2005. The second conclusion is that managers were very successful in reaping the negative coskewness premium, presenting it as "added value"- higher Jensen’s alpha, due to the static, mean-variance nature of the measure employed to evaluate them. Figure 5 presents in a scatterplot the estimate of the Jensen alpha for each trust versus the estimate of the negative coskewness strategy loading, demonstrating this positive relationship.\(^7\) The trusts with the highest Jensen alphas were on average those that loaded most of the negative coskewness risk. In other words, unit trusts would have been useful investment vehicles for agents with quadratic preferences, who regard the coskewness premium as "free lunch", but not for prudent investors.

6 Further results

6.1 Subperiod analysis

Due to the high turnover of trust managers as well as the different market phases they face, it is interesting to examine whether the previous findings are robust for shorter time periods. Therefore, the total period is split into three subperiods of 5 years each. Panel B of Table 1 provides the average returns the trusts achieved as well as their Sharpe ratios and their DSRs. Table 2 presents their average Jensen, Carhart and Harvey-Siddique alphas. The average DSRs are consistently lower (in absolute value) in comparison to the average Sharpe ratios for all the three subperiods. Hence, the semivariance of the trusts’ returns remained much higher than their variance regardless of the

\(^7\)The Pearson correlation coefficient of these two series is 0.45.
market phase they experienced. With respect to their average returns, there has been a significant improvement in the following subperiods as compared to the initial period of 1991-1995, when trusts underperformed the market by more than 400 bps.

There are three possible explanations for this improvement: The first is that there may have been a decrease in the expenses of the industry due to higher competition provoked by the entry of new trusts, so more of the managers’ ability was finally captured by the individual shareholder.\(^8\) The second explanation is that the trusts may have been more exposed to beta risk from 1995 onwards. This hypothesis cannot be supported by the data, since the average beta estimate of the trusts remained relatively stable and close to 0.93 for all three subperiods. The third explanation is that managers may have added part of the coskewness premium to their portfolios during the two last subperiods.

As Table of the previous chapter presents, the coskewness spread strategy yielded high positive returns only after 1996. These returns were as high as 3.39% p.a. during 2001-2005. Interestingly, the number of funds having positive loadings of the coskewness risk increased as this premium was increasing. While during the period 1991-1995 there were 113 trusts out of total 150 having a positive loading (and only 26 of them being statistically significant at a 5% level), during the period 1996-2000 there were 167 out of 197 trusts with positive loadings (with 46 of them being significant), while during the period 2001-2005, as many as 252 out of the total 265 trusts were loading negative coskewness risk (with 160 of these coefficients being now statistically significant). This was actually the period that the Value, Size and Momentum strategies yielded high positive returns, characterized by negative coskewness. Hence, trust managers responded very quickly to the existence of this premium, employing strategies that mimicked negative

\(^8\)This hypothesis is not testable, since no data on UK unit trusts’ expenses were available.
coskewness. Moreover, they correctly acted according to their incentives, since the most of them were evaluated either through their raw returns or through mean-variance measures.

The previous analysis explains the significant improvement in trusts’ Jensen alphas over the subperiods presented in Table 4, where the median trust had an alpha of $-4.1\%$ p.a. during 1991-1995 and then significantly improved to $-2.01\%$ p.a. and $-1.4\%$ p.a. in the next subperiods. Hence, these results provide further evidence that the trusts were successful in reaping the negative coskewness premium, actually increasing their exposure to this risk during the period its premium was at its highest levels. While this strategy would have yielded a significant gain for a quadratic investor, it does not do so for a prudent one, because at the same time it loads the negative skewness risk that he is averse to.

With respect to the Carhart alpha, Table 4 presents the trusts’ rankings according to their point estimates and Table 6 presents their rankings according to their t-values for the three subperiods examined. The general conclusion is that alphas are significantly reduced as we switch from the CAPM to the Carhart regression. The most significant reduction in the performance, however, takes place in the third subperiod, Jan 2001- Dec 2005. As the results show, even the top-ranked trust had a Carhart alpha of only $4.93\%$ p.a. in comparison to a Jensen alpha of $11.11\%$ p.a., while the median trust scored quite badly, achieving a Carhart alpha of $-2.81\%$ p.a. Moreover, the investors who selected the bottom 30% of the trusts experienced a significantly negative performance of less than $-3.73\%$ p.a.

The explanation for this significant modification of the results is that during the third subperiod of our sample the size, value and momentum strategies yielded very high positive returns. Hence, for the managers who followed these strategies during this subperiod these returns were translated into a higher Jensen alpha, but not into a high Carhart alpha, since they were attributed as premia to the corresponding factors. This result underlines
how different conclusions an investor can extract using different asset pricing models for performance evaluation.

In order to examine the evolution of managerial ability for a prudent investor, Table 4 presents the Harvey-Siddique alphas and their t-statistics for the three subperiods across various percentiles of the distribution. With respect to their point estimates, in all three periods less than 30% of the trusts had positive alphas. The median trust severely underperformed during the period 1991-1995 having a H-S alpha of $-4.25\%$ p.a. This performance was significantly improved in 1996-2000, but the median trust still had an alpha of $-2.43\%$ p.a. Nevertheless, this improvement was not continued in 2001-2005, since the median fund achieved a H-S alpha of $-2.68\%$ p.a.

Figure 6 plots the distributions of the trusts’ alphas for each of the subperiods. While the distribution of alphas in 1996-2000 was shifted to the right in comparison to the previous subperiod, it was then shifted to the left during the period 2001-2005, exhibiting a large concentration of values around the mean. Ranking trusts according to the t-values of their H-S alphas in Table 6, it is surprising to see that in the second and the third subperiod, apart from the top two trusts, there was no other with a significantly positive alpha. On the other hand, in all three subperiods, more than 30% of the trusts had significantly negative H-S alphas.

### 6.2 Bootstrap analysis

The previous subsections relied on standard t-statistics to examine the significance of the performance estimates. This is a valid procedure under the assumption of normality for the regressions’ residuals. Nevertheless, the nonnormality of the alphas’ distribution and the evidence of heterogeneous risk-taking may cast doubts on the validity of the normality assumption, especially for the trusts with extreme alphas. If the residuals are not normally distributed, then the t-statistics may lead to spurious results and the extreme alpha estimates may be due to sampling variability, i.e. luck. In or-
order to control for the sampling variability, this subsection employs a simple bootstrap methodology (see Hall, 1992, for an introduction).

In particular, we employ a procedure similar to the one suggested by Kosowski et al. (2006), adjusted for the Harvey-Siddique asset pricing model.\(^9\)

Extracting the time series of residuals \(\{\epsilon_{i,t}, t = T_{i0}, ..., T_{i1}\}\) for each trust \(i\) from the regression,

\[
r_t = \hat{a}_{HS} + \hat{b}_M r_t + \hat{c}(S^- - S^+) t + \hat{\epsilon}_t
\]  

(18)

we draw a sample with replacement for each of these trusts and create a pseudo-time series of resampled residuals \(\{\epsilon_{i,t}, t = s_{T_{i0}}^{b^I}, ..., s_{T_{i1}}^{b^I}\}\), where \(b^I\) is an index for the bootstrap number and where each of the time series indices \(s_{T_{i0}}^{b^I}, ..., s_{T_{i1}}^{b^I}\) are drawn randomly from \([T_{i0}, ..., T_{i1}]\).

Using this pseudo-time series of resampled residuals, we construct for each trust \(i\) a time-series of pseudo-monthly excess returns \(r_{t}^{b^I}\) for each bootstrapped sample \(b^I\), under the null hypothesis that the trust \(i\) exhibited no managerial ability, i.e. \(\hat{a}_{HS,i} = 0\):

\[
r_{t}^{b} = \hat{b}_M r_t + \hat{c}(S^- - S^+) t + \epsilon_{i,t}^{b^I}
\]  

(19)

for \(t = T_{i0}, ..., T_{i1}\) and \(t = s_{T_{i0}}^{b^I}, ..., s_{T_{i1}}^{b^I}\). We subsequently use these pseudo-returns to estimate regression (15) for each bootstrap sample \(b^I\) and we get an alpha estimate \(\{\hat{a}_{HS}^{b^I}\}\).

Repeating the previous methodology 1,000 times, we have a distribution of 1,000 alpha estimates for each fund \(i\), under the hypothesis that \(\hat{a}_{HS,i} = 0\). Performing the same methodology for all funds \(i = 1, ...N\), we can derive a cross-section of bootstrapped alphas as well as their bootstrapped t-statistics. These alphas and t-statistics result purely due to sampling variation, having imposed the null hypothesis of a no managerial ability.

\(^9\)Cuthbertson et al. (2006) employ a bootstrap methodology to evaluate UK unit trusts for a series of commonly used performance measures.
This methodology may be used for a series of robustness checks (see Kosowski et al., 2006 for numerous examples). The aim of this subsection is to report the distribution of the bootstrapped alphas for each of the funds in Table 3, i.e. for different percentiles of the Harvey-Siddique alpha distribution for the entire period. If the actual alpha estimate of a trust is higher (lower) than the 95% of the bootstrapped alpha estimates under the null hypothesis of zero alpha, this means that the trust exhibited genuine positive (negative) managerial skill beyond luck caused by sampling variability. Figure 7 visualizes how this comparison works. The vertical line shows the point estimate of the Harvey-Siddique alpha derived from the standard regression analysis, while the curve represents the distribution of the bootstrapped alphas under the hypothesis that this alpha is zero. The last line in Table 3 shows the bootstrapped p-values of the trusts’ H-S alphas estimates.

For all of the funds below the median, the negative managerial ability is genuine and not due to (bad) luck. Figure 7 shows that this is true for the median trust (panel B2), the bottom 90% trust (panel C1) and the bottom trust (panel C2). On the other hand, we identify that for a few top trusts the positive managerial ability is again genuine, at least at a 10% confidence level. Figure 7 shows that this is true for the top trust (panel A1) and the top 10% trust (panel A2). In general, the qualitative conclusions were not different from the standard inference analysis.

Controlling for the impact of sampling variation is more crucial when the residuals’ distribution is asymmetric. However, as it can be seen from Figure 7, the derived bootstrapped alphas’ distributions for a series of funds are relatively symmetric, hence there is no significant difference in terms of statistical inference with respect to the parametric case of the standard regression analysis. This is a quite interesting result, contrasting the skewed bootstrapped alphas’ distributions derived in Kosowski et al. (2006). The explanation we put forward is that the inclusion of a coskewness factor considerably contributes to the symmetry of the residuals’ distribution, since
it attributes highly skewed returns to the corresponding risk factor, unlike other models which would regard them as residuals.

7 Conclusion

Higher moments in asset returns is a relatively neglected issue in the investment performance evaluation literature. This issue becomes even more important if one takes into account the experimental evidence that large negative returns affect utility asymmetrically more than positive returns do. Consequently, a prudent investor should not use mean-variance measures to evaluate his investments, because they neglect his actual preferences and regard the negative coskewness premium as a "free lunch".

In the case of delegated asset management, this issue is very crucial, since the fund manager, if judged by mean-variance measures, will falsely interpret that the fund shareholder has no preferences over skewness and he will be incentivised to follow tactical asset allocation strategies that load this type of risk in order to reap the corresponding premium. Clearly, this situation generates a mismatch between objectives and outcomes, leading to erroneous conclusions with respect to the ex post verification of the investment performance.

The limitations of the static, mean-variance measures motivate the adoption of a performance measure that adjusts for the negative coskewness premium, documented to be priced in the UK stock market. The Harvey-Siddique two-factor asset pricing model is qualified to be appropriate for a prudent investor and it has a sound theoretical basis, unlike the Carhart asset pricing model. The intercept of this model, which we term as the Harvey-Siddique alpha, will reveal the genuine outperformance for such an investor, resolving the ex post verification problem.

This measure was employed for the evaluation of the UK equity unit trusts that had as a benchmark the FTSE All Share Index for the period January
1991- December 2005. The vast majority of the trusts exhibited a negative Harvey-Siddique alpha, significantly underperforming their benchmark. Actually, the median underperformance of the trusts (−2.12%) for prudent investors was of greater magnitude than the current average expense ratio they charge (circa 1.6%).

Interestingly, the most of the trusts loaded negative coskewness to their portfolios, capturing part of the corresponding premium and correctly responding to their incentives, since they are currently being evaluated by mean-variance measures. This finding shows how a prudent investor would misinterpret this premium for genuinely added value if he was using such a measure too. Hence, the call for the shift of interest from outperforming to matching investors’ preferences and objectives becomes even more important reflecting the advice of Charles Ellis (2005, p. 115) not to play "the Loser’s Game of trying to beat the market- a game that almost every investor will eventually lose".
References


Table 1: Descriptive Statistics

Panel A: Coskewness, Size, Value and Momentum returns

<table>
<thead>
<tr>
<th>Periods</th>
<th>Average Coskewness Strategy Spread returns ((S^-)-(S^+)) (p.a.)</th>
<th>Average Size Strategy Returns (p.a.)</th>
<th>Average Value Strategy Returns (p.a.)</th>
<th>Average Momentum Strategy Returns (p.a.)</th>
</tr>
</thead>
<tbody>
<tr>
<td>1991-1995</td>
<td>0.25%</td>
<td>-0.96%</td>
<td>1.11%</td>
<td>1.84%</td>
</tr>
<tr>
<td>1996-2000</td>
<td>2.63%</td>
<td>-0.08%</td>
<td>0.07%</td>
<td>1.13%</td>
</tr>
<tr>
<td>2001-2005</td>
<td>3.39%</td>
<td>7.35%</td>
<td>5.32%</td>
<td>3.13%</td>
</tr>
<tr>
<td>1991-2005</td>
<td>2.09%</td>
<td>2.11%</td>
<td>2.16%</td>
<td>2.03%</td>
</tr>
</tbody>
</table>

Panel B: Market returns, Trusts’ returns and Sharpe Ratios

<table>
<thead>
<tr>
<th>Periods</th>
<th>Average Market Excess Returns (p.a.)</th>
<th>Trusts’ Average Excess Returns (p.a.)</th>
<th>Average Sharpe Ratio</th>
<th>Average Downside Sharpe Ratio</th>
</tr>
</thead>
<tbody>
<tr>
<td>1991-1995</td>
<td>8.75%</td>
<td>4.61%</td>
<td>0.089</td>
<td>0.511</td>
</tr>
<tr>
<td>1996-2000</td>
<td>7.66%</td>
<td>5.76%</td>
<td>0.116</td>
<td>0.065</td>
</tr>
<tr>
<td>2001-2005</td>
<td>-1.11%</td>
<td>-2.01%</td>
<td>-0.04</td>
<td>-0.022</td>
</tr>
<tr>
<td>1991-2005</td>
<td>5.10%</td>
<td>2.93%</td>
<td>0.039</td>
<td>0.024</td>
</tr>
</tbody>
</table>

Notes: Panel A presents the average annualized returns of the coskewness strategy \((S^-) - (S^+)\) as well as of the size, value and momentum strategies derived from monthly returns during the period January 1991- December 2005 and the subperiods January 1991- December 1995, January 1996- December 2000 and January 2001- December 2005. Panel B presents the average annualized excess market and trusts’ returns as well as the average Sharpe ratios and Downside Sharpe ratios, defined in Section 3.2, for the same periods.
### Table 2: Average Trusts’ Performance

<table>
<thead>
<tr>
<th>Periods</th>
<th>Number of trusts ≥ 60 obs.</th>
<th>Aver. Jensen’s alpha (p.a.)</th>
<th>Aver. Carhart’s alpha (p.a.)</th>
<th>Aver. Harvey-Siddique alpha (Pct/Year)</th>
</tr>
</thead>
<tbody>
<tr>
<td>1991-1995</td>
<td>150</td>
<td>-3.65%</td>
<td>-3.37%</td>
<td>-3.81%</td>
</tr>
<tr>
<td>1996-2000</td>
<td>197</td>
<td>-1.30%</td>
<td>-1.57%</td>
<td>-1.91%</td>
</tr>
<tr>
<td>2001-2005</td>
<td>265</td>
<td>-0.98%</td>
<td>-2.68%</td>
<td>-2.33%</td>
</tr>
<tr>
<td>1991-2005</td>
<td>273</td>
<td>-1.23%</td>
<td>-1.97%</td>
<td>-2.12%</td>
</tr>
</tbody>
</table>

Notes: This Table presents the number of trusts with more than 60 observations during the whole sample period as well as in each of the subperiods examined. It also reports the average annualized Jensen, Carhart and Harvey-Siddique alphas of the trusts for the same periods. These performance measures are defined in Section 3.
<table>
<thead>
<tr>
<th></th>
<th>Top 8%</th>
<th>1%</th>
<th>5%</th>
<th>10%</th>
<th>30%</th>
<th>Median</th>
<th>70%</th>
<th>90%</th>
<th>95%</th>
<th>99%</th>
<th>Bottom</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Jen sen alpha</strong></td>
<td>15.51%</td>
<td>9.05%</td>
<td>4.57%</td>
<td>2.31%</td>
<td>-0.37%</td>
<td>-1.77%</td>
<td>-2.96%</td>
<td>-4.32%</td>
<td>-4.89%</td>
<td>-6.08%</td>
<td>-15.67%</td>
</tr>
<tr>
<td><strong>t-stat</strong></td>
<td>1.97</td>
<td>1.96</td>
<td>2.31</td>
<td>1.35</td>
<td>-0.27</td>
<td>-0.97</td>
<td>-3.59</td>
<td>-3.38</td>
<td>-2.62</td>
<td>-3.89</td>
<td>-3.97</td>
</tr>
<tr>
<td><strong>p-value</strong></td>
<td>0.03</td>
<td>0.03</td>
<td>0.01</td>
<td>0.09</td>
<td>0.37</td>
<td>0.25</td>
<td>&lt;0.01</td>
<td>&lt;0.01</td>
<td>0.01</td>
<td>&lt;0.01</td>
<td>&lt;0.01</td>
</tr>
<tr>
<td><strong>Carhart alpha</strong></td>
<td>13.68%</td>
<td>4.92%</td>
<td>3.01%</td>
<td>1.08%</td>
<td>-1%</td>
<td>-2.32%</td>
<td>-3.37%</td>
<td>-4.66%</td>
<td>-5.48%</td>
<td>-7.15%</td>
<td>-16.49%</td>
</tr>
<tr>
<td><strong>t-stat</strong></td>
<td>1.98</td>
<td>3.2</td>
<td>0.98</td>
<td>0.51</td>
<td>-2.64</td>
<td>-1.56</td>
<td>-3.88</td>
<td>-4.25</td>
<td>-2.42</td>
<td>-2.57</td>
<td>-4.23</td>
</tr>
<tr>
<td><strong>p-value</strong></td>
<td>0.03</td>
<td>&lt;0.01</td>
<td>0.25</td>
<td>0.35</td>
<td>0.01</td>
<td>0.13</td>
<td>&lt;0.01</td>
<td>&lt;0.01</td>
<td>0.01</td>
<td>0.01</td>
<td>&lt;0.01</td>
</tr>
<tr>
<td><strong>H-S alpha</strong></td>
<td>11.20%</td>
<td>6.45%</td>
<td>2.87%</td>
<td>0.88%</td>
<td>-1.20%</td>
<td>-2.36%</td>
<td>-3.69%</td>
<td>-4.97%</td>
<td>-5.68%</td>
<td>-6.94%</td>
<td>-17.07%</td>
</tr>
<tr>
<td><strong>t-stat</strong></td>
<td>1.43</td>
<td>1.84</td>
<td>1.01</td>
<td>0.49</td>
<td>-0.88</td>
<td>-2.34</td>
<td>-3.53</td>
<td>-3.61</td>
<td>-2.37</td>
<td>-4.27</td>
<td>-4.28</td>
</tr>
<tr>
<td><strong>p-value</strong></td>
<td>0.14</td>
<td>0.08</td>
<td>0.21</td>
<td>0.35</td>
<td>0.29</td>
<td>0.01</td>
<td>&lt;0.01</td>
<td>&lt;0.01</td>
<td>0.01</td>
<td>&lt;0.01</td>
<td>&lt;0.01</td>
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<tr>
<td>boots, p-value</td>
<td>0.07</td>
<td>0.03</td>
<td>0.15</td>
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<td>&lt;0.01</td>
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</table>

Notes: Table 3 presents the rankings of the trusts over the whole sample period January 1991- December 2005 made on the estimates of the annualized Jensen, Carhart and Harvey-Siddique alphas. In particular, the annualized alpha estimates for various percentiles of the trusts’ rankings are reported along with their corresponding t-statistics and p-values. For the Harvey-Siddique alpha, the p-values from the bootstrap methodology analyzed in Section 6.2 are also reported.

Table 4: Alpha Rankings

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<th>Top</th>
<th>1%</th>
<th>5%</th>
<th>10%</th>
<th>30%</th>
<th>median</th>
<th>70%</th>
<th>90%</th>
<th>95%</th>
<th>99%</th>
<th>Bottom</th>
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</tr>
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<td>7.13%</td>
<td>3.01%</td>
<td>1.48%</td>
<td>-2.41%</td>
<td>-4.10%</td>
<td>-5.44%</td>
<td>-7.21%</td>
<td>-8.31%</td>
<td>-14.79%</td>
<td>-15.05%</td>
</tr>
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<td>&lt;0.01</td>
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<td>3.67%</td>
<td>1.15%</td>
<td>-2.23%</td>
<td>-3.68%</td>
<td>-5.03%</td>
<td>-6.86%</td>
<td>-7.91%</td>
<td>-13.57%</td>
<td>-14.07%</td>
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<td>-4.25%</td>
<td>-5.49%</td>
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<td>&lt;0.01</td>
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<td>6.44%</td>
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<td>-2.01%</td>
<td>-3.11%</td>
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<td>&lt;0.01</td>
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<td>1.95%</td>
<td>-0.72%</td>
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<td>-3.54%</td>
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<td><strong>Panel C: 2001-2005</strong></td>
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<tr>
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<td>2.73%</td>
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<td>-1.40%</td>
<td>-2.73%</td>
<td>-3.93%</td>
<td>-5.07%</td>
<td>-11.69%</td>
<td>-20.78%</td>
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<td>4.69%</td>
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<td>0.39%</td>
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<td>-2.81%</td>
<td>-3.73%</td>
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<td>0.39</td>
<td>0.32</td>
<td>0.09</td>
<td>&lt;0.01</td>
<td>0.02</td>
<td>&lt;0.01</td>
<td>&lt;0.01</td>
<td>&lt;0.01</td>
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<td>H-S alpha</td>
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<td>8.01%</td>
<td>3.13%</td>
<td>0.76%</td>
<td>-1.35%</td>
<td>-2.68%</td>
<td>-3.65%</td>
<td>-4.86%</td>
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<td>-11.94%</td>
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<td>0.25</td>
<td>0.01</td>
<td>0.14</td>
<td>0.05</td>
<td>0.01</td>
<td>&lt;0.01</td>
</tr>
</tbody>
</table>
Notes: Table 5 presents the rankings of the trusts over the whole sample period January 1991- December 2005 now made on the t-statistics of the Jensen, Carhart and Harvey-Siddique alphas. In particular, the t-statistics for various percentiles of the trusts’ rankings are reported along with their corresponding annualized alphas and p-values.

<table>
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<tr>
<th>Panel</th>
<th>t-Jen sen</th>
<th>Jensen alpha</th>
<th>p-value</th>
<th>t-Carhart</th>
<th>Carhart alpha</th>
<th>p-value</th>
<th>t-H-S</th>
<th>H-S alpha</th>
<th>p-value</th>
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<tr>
<td>A: 1991-1995</td>
<td>2.88</td>
<td>14.83%</td>
<td>&lt;0.01</td>
<td>3.36</td>
<td>12.91%</td>
<td>&lt;0.01</td>
<td>2.81</td>
<td>14.23%</td>
<td>&lt;0.01</td>
</tr>
<tr>
<td>t-Jen sen</td>
<td>2.18</td>
<td>14.83%</td>
<td>0.04</td>
<td>2.57</td>
<td>7.13%</td>
<td>0.01</td>
<td>2.14</td>
<td>6.50%</td>
<td>0.04</td>
</tr>
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<td>1%</td>
<td>1.14</td>
<td>2.23%</td>
<td>0.21</td>
<td>1.53</td>
<td>5.52%</td>
<td>0.08</td>
<td>1.08</td>
<td>2.43%</td>
<td>0.22</td>
</tr>
<tr>
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<td>1.48%</td>
<td>0.38</td>
<td>-1.14</td>
<td>-2.23%</td>
<td>0.36</td>
<td>-1.00</td>
<td>-4.56%</td>
<td>0.39</td>
</tr>
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<td>0.25</td>
<td>-1.90</td>
<td>-3.35%</td>
<td>0.05</td>
<td>-1.86</td>
<td>-2.43%</td>
<td>0.24</td>
</tr>
<tr>
<td>10%</td>
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<td>-2.41%</td>
<td>0.07</td>
<td>-2.72</td>
<td>-6.15%</td>
<td>&lt;0.01</td>
<td>-2.71</td>
<td>-5.80%</td>
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<td>0.01</td>
<td>-3.47</td>
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<td>&lt;0.01</td>
<td>-3.24</td>
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<td>-6.86%</td>
<td>&lt;0.01</td>
<td>-4.69</td>
<td>-9.84%</td>
<td>&lt;0.01</td>
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<tr>
<td>90%</td>
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<td>-9.84%</td>
<td>&lt;0.01</td>
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<td>-9.2%</td>
<td>&lt;0.01</td>
<td>-4.92</td>
<td>-9.06%</td>
<td>&lt;0.01</td>
</tr>
<tr>
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<td>-4.74</td>
<td>-9.84%</td>
<td>&lt;0.01</td>
<td>-4.92</td>
<td>-9.2%</td>
<td>&lt;0.01</td>
<td>-4.92</td>
<td>-9.06%</td>
<td>&lt;0.01</td>
</tr>
<tr>
<td>99%</td>
<td>-4.74</td>
<td>-9.84%</td>
<td>&lt;0.01</td>
<td>-4.92</td>
<td>-9.2%</td>
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<td>-9.06%</td>
<td>&lt;0.01</td>
</tr>
<tr>
<td>Bottom</td>
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<td>&lt;0.01</td>
<td>-4.92</td>
<td>-9.2%</td>
<td>&lt;0.01</td>
<td>-4.92</td>
<td>-9.06%</td>
<td>&lt;0.01</td>
</tr>
<tr>
<td>B: 1996-2000</td>
<td>2.38</td>
<td>11.78%</td>
<td>0.02</td>
<td>2.65</td>
<td>10.49%</td>
<td>&lt;0.01</td>
<td>2.81</td>
<td>4.93%</td>
<td>&lt;0.01</td>
</tr>
<tr>
<td>t-Jen sen</td>
<td>1.94</td>
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<td>0.06</td>
<td>2.63</td>
<td>7.64%</td>
<td>0.16</td>
<td>2.14</td>
<td>4.69%</td>
<td>0.22</td>
</tr>
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<td>0.16</td>
<td>1.47</td>
<td>2.16%</td>
<td>0.29</td>
<td>1.08</td>
<td>2.43%</td>
<td>0.39</td>
</tr>
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<td>0.29</td>
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<td>0.39</td>
<td>0.18</td>
<td>0.97</td>
<td>0.24</td>
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<td>-0.18</td>
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<td>-1.00</td>
<td>-4.97%</td>
<td>0.25</td>
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<td>-1.86</td>
<td>-7.7%</td>
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<td>0.03</td>
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<td>-3.12%</td>
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<td>-2.68</td>
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</tr>
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<td>&lt;0.01</td>
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<td>-3.12%</td>
<td>&lt;0.01</td>
</tr>
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<td>-4.86</td>
<td>-3.12%</td>
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</tr>
<tr>
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<td>2.07</td>
<td>8.01%</td>
<td>0.05</td>
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<td>4.69%</td>
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<td>3.96%</td>
<td>0.24</td>
</tr>
<tr>
<td>p-value</td>
<td>0.96</td>
<td>-0.03%</td>
<td>0.40</td>
<td>-0.82</td>
<td>-1.23%</td>
<td>0.39</td>
<td>-0.62</td>
<td>-2.88%</td>
<td>0.38</td>
</tr>
<tr>
<td>t-Carhart</td>
<td>-0.02</td>
<td>-1.53%</td>
<td>0.31</td>
<td>-1.57</td>
<td>-3.92%</td>
<td>0.14</td>
<td>-1.27</td>
<td>-3.30%</td>
<td>0.33</td>
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<td>Carhart alpha</td>
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<td>-3.24%</td>
<td>0.14</td>
<td>-2.11</td>
<td>-4.52%</td>
<td>0.03</td>
<td>-2.00</td>
<td>-3.97%</td>
<td>0.05</td>
</tr>
<tr>
<td>p-value</td>
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<td>-4.93%</td>
<td>0.03</td>
<td>-2.95</td>
<td>-7.29%</td>
<td>0.01</td>
<td>-2.85</td>
<td>-8.1%</td>
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</tr>
<tr>
<td>t-H-S</td>
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<td>-3.58%</td>
<td>0.01</td>
<td>-3.29</td>
<td>-5.71%</td>
<td>&lt;0.01</td>
<td>-3.02</td>
<td>-3.60%</td>
<td>&lt;0.01</td>
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<tr>
<td>H-S alpha</td>
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<td>-3.21%</td>
<td>&lt;0.01</td>
<td>-5.01</td>
<td>-3.71%</td>
<td>&lt;0.01</td>
<td>-4.21</td>
<td>-3.17%</td>
<td>&lt;0.01</td>
</tr>
<tr>
<td>p-value</td>
<td>-4.30</td>
<td>-2.95%</td>
<td>&lt;0.01</td>
<td>-6.20</td>
<td>-4.15%</td>
<td>&lt;0.01</td>
<td>-5.69</td>
<td>-3.80%</td>
<td>&lt;0.01</td>
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</table>
Figure 1: This Figure shows the distribution of the trusts’ Jensen alphas (blue dash-dot line) and the distribution of the trusts’ Harvey-Siddique alphas (black continuous line) during the period January 1991- December 2005. This distribution as well as the distributions in the following figures were smoothed using a kernel density estimator. We employed a Gaussian kernel function and the corresponding optimal bandwidth (see Silverman, 1986).
Figure 2: This Figure shows the distribution of the trusts' Carhart alphas (blue dash-dot line) and the distribution of the trusts' Harvey-Siddique alphas (black continuous line) during the period January 1991- December 2005.
Figure 3: This Figure plots the densities of the estimated loadings on the size ($\beta_1$, red solid line), value ($\beta_2$, blue dashed line) and momentum ($\beta_3$, black dash-dotted line) strategies for each trust from equation (14) for the period January 1991-December 2005. The red vertical line corresponds to a zero coefficient.
Figure 4: This Figure plots the density (blue line) of the coefficient estimates \( c \) on the coskewness strategy for each trust from equation (15) for the period January 1991- December 2005. The red vertical line corresponds to a zero coefficient.
Figure 5: This Figure presents the scatterplot of the Jensen alpha estimates from equation (12) versus the coefficient estimates (c) on the coskewness strategy from equation (15) for each trust for the period January 1991- December 2005. It also plots the fitted values from a standard least squares regression involving these variables.
Figure 6: This Figure shows the distribution of the trusts’ Harvey-Siddique alphas for the periods: January 1991- December 1995 (red continuous line), January 1996- December 2000 (black dashed line) and January 2001- December 2005 (blue dot-dash line).
Figure 7: This Figure shows the density of the bootstrapped Harvey-Siddique alphas under the null hypothesis of no managerial ability (blue line) and the actual estimate of the H-S alpha (red vertical line) for various rankings of the trusts according to this estimate for the period January 1991-December 2005.