North South Business Review, Volume 10, Number 2, June 2020, ISSN 1991-4938

PERFORMANCE EVALUATION OF US MUTUAL FUNDS – A LOOK AT 'GROWTH FUNDS', 'GROWTH AND INCOME FUNDS' AND 'INCOME FUNDS'

Shahran Abu Sayeed[1]

ABSTRACT

This study evaluates the performances of domestic equity mutual funds in the US. Three performance measurement models act as tools in measuring the performances. Using monthly data from January 1993 to December 2012, it is found that funds, on average, underperform the benchmark across the entire period. Moreover, it is also shown that amongst the three style categories of funds, 'Growth Funds' report the lowest average abnormal performance as compared to 'Growth and Income Funds' and 'Income Funds'.

Key words: Performance, Capital Asset Pricing Model, Fama-French Three-Factor Model and Carhart Four-Factor Model, Growth Funds, Growth and Income Funds, Income Funds

1. INTRODUCTION

In analysing investment performance evaluation, I look at mutual funds in the US market. Given the large domination and the role played by US mutual funds in the fund management industry, it is critical to evaluate their performance over long periods in order to see whether the benefits derived from these investment companies last through long periods.

The primary reason for the existence of mutual funds is that they are able to benefit from the advantages of diversification by pooling large amount of funds from investors which they then use to purchase securities. Individual investors cannot achieve this advantage on their own. Investment companies invest in portfolios of funds and thereby reduce the overall investment risk. The portfolios may include a range of stocks, equities, bonds or even money market instruments. Besides diversification, investors benefit from numerous other advantages by investing their money in mutual funds. For example, small investors are able to participate in investments that may be available to only larger investors in addition to getting access to professional investment management and daily liquidity. However, it is important to mention at this stage that together with advantages, there are a few

1. Department of Accounting and Finance at the School of Business and Economics, North South University in Dhaka, Bangladesh.

disadvantages faced by the investors. Investors incur expenses as mutual funds charge investors with fees such as 12b-1 fees, load fees, which may include front-end load fees or bank-end load fees, and management fees.

The different types of investment companies include mutual funds, closed-end funds, unit investment trusts and exchange-traded funds. Among these, mutual funds are the largest and the most common type. Out of the total value of over $14.7 trillion of net assets under management by U.S. registered investment companies that Investment Company Institute report, for the first time ever, mutual fund assets alone exceeded $13 trillion in 2012, (2013 ICI Fact Book). Mutual funds have become the most popular type because of the convenience that it provides to investors. Mutual funds continuously sell and buy back fund share and hence have particularly become a very useful type of investment company. In 2012, out of a total number of 16,380 investment companies, 8,752 of them were mutual funds that were open-end funds, (2013 ICI Fact Book). Number of open-end funds increased 52% since 1995. Given the dominating role played by open-end mutual funds and their importance in the financial market, I focus my analysis on the investment performance on these types of funds only. More precisely the evaluation is narrowed down to a particular type of mutual fund that invests only in equities, commonly known as equity funds. Equity funds held majority of the assets in the US mutual fund industry. In 2012, 33 percent of mutual fund assets were in domestic equity funds and the rest were in foreign equity funds, bond funds, money market funds and hybrid funds.

The sheer size of domestic equity funds has motivated researchers to carry out studies on evaluating performances of these funds as reported, amongst other ones, by Chen at al. (2004) and Jiang et al. (1999). Since prior studies exist on performance evaluation of domestic equity mutual funds, it only motivates us to further evaluate particularly which type of US domestic equity funds contribute to their overwhelming performance. Therefore, the purpose in this paper is to evaluate the performance of specific groups of domestic equity funds in the U.S. namely 'Growth Funds', 'Growth and Income Funds' and 'Income Funds'. Further, this paper aims to shed light for developing countries to invest in these particular types of domestic equity funds given their significant contribution in the growth of the economy. Using monthly data from January 1993 to December 2012, I examine the performances of the above mentioned domestic equity funds by utilizing three performance measurement models. These are the Capital Asset Pricing Model (CAPM), Fama-French (1993) Three-Factor Model (FF3FM) and Carhart (1997) Four-Factor Model (C4FM).

2. LITERATURE REVIEW

2.1 Investment Performance Evaluation and Economies of Scale

In analysing the performance of mutual funds, one interesting issue to consider is the economies of scale. According to the theory of economies of scale, as the size of a company increases, average cost of output falls and overall performance increases. Just like any other organisation running business operations, it is interesting to see whether mutual funds also benefit from cost advantages due to increases in scale. Measuring performance based on the size or asset composition of the fund is a convenient approach to look into this matter. Together with fund size, other critical issues, such as persistence of fund performance and agency relationship between managers and investors, arise when evaluating performance of mutual funds.

For obvious reasons there are advantages to increases in scale such as larger resources for research and lower expense ratios (Chen et al. 2004), otherwise funds would not have incentives to grow in the first place. However, Perold and Salomon (1991) and Lowenstein (1997) find that large asset base erodes fund performance because of trading costs associated with liquidity. Chen at al. (2004) support this theory and state that where small funds can put all of its money in its best ideas, larger funds on the other hand are not able to do this because of the lack of liquidity. It forces large funds to put its money in ideas that are not so good and take larger positions per stock than the optimal amount and thereby reduces its performance.

However, there are also relevant literatures on the performance of mutual funds which suggests that performance erodes with fund size such as in the paper by Chen et al. (2004). They begin their research by collecting data on mutual funds from 1963 to 1999. They use cross sectional variation to check whether performance depends on lagged fund size. Chen et al. (2004) uses various performance benchmarks in their analysis to account for the effects of heterogeneity which may arise since the sample funds they use may have different styles. Chen et al. (2004) find that a fund's performance is inversely correlated with its lagged fund size. They report that the funds in their sample on average underperform the market portfolio by about 96 basis points annually after deducting fees and expenses. They state this finding as statistically significant and economically important.

In addition, organisational diseconomies lead small firms to outperform larger ones. One type of organisational diseconomy is hierarchy costs (Aghion and Tirole, 1997 and Stein, 2002). According to Chen et al. (2004), hierarchy costs may be especially important and relevant to mutual funds affecting the performance of funds as its scale increases. They argue that where there are hierarchies in large organisations,

agents find it hard to communicate their ideas to the top level officials of the fund and hence it becomes difficult for them to have their ideas implemented. This affects agents' ex ante decisions of the kind of ideas they want to work on.

2.2 Performance Measurement Models

According to Wermers (2011) performance evaluation models attempts to measure an asset managers' precision of private information about market returns, security or sector with the best possible statistical accuracy. Two types of approaches exist in the literature for evaluating performances – i) returns-based performance evaluation and ii) portfolio holdings based performance evaluation. Since data on the returns of mutual funds is more available on a frequent basis, the focus in this paper is given to returns-based approach only. Furthermore, returns-based performance evaluation relies on less information from fund managers.

Three models of performance measurement are mainly used in evaluating mutual fund performance. These are i) the Capital Asset Pricing Model (CAPM) which is described in Sharpe (1964) and Lintner (1965), ii) Fama and French's (1993) Three-factor model (FF3FM) and iii) Carhart (1997) 4-factor model (C4FM). The three models of performance measures are mentioned below:

i) $R_i = \alpha_{it} + \beta_{it}(RMRF) + e_{it}$ $t=1, 2,\ldots, T$ - CAPM
ii) $R_i = \alpha_{it} + \beta_{it}(RMRF) + s_{it}(SMB) + h_{it}(HML) + e_{it} t=1, 2,\ldots, T$ - FF3FM
iii) $R_i = \alpha_{it} + \beta_{it}(RMRF) + s_{it}(SMB) + h_{it}(HML) + m_{it}(UMD) + e_{it} t=1, 2,\ldots,T$ - C4FM

In context to the above three models, R_i is the monthly excess return over the risk free rate (i.e. the one-month Treasury-bill return) on a portfolio of fund, α_{it} is the performance measure of the portfolio, RMRF is the excess return on the market portfolio, SMB, HML and UMD are the returns on the value weighted, zero-investment, factor-mimicking portfolios for size, book-to-market equity and one-year momentum in stock returns and e_{it} is a generic term that is uncorrelated with all other independent terms.

The Capital Asset Pricing Model (CAPM) of William F. Sharpe (1964) takes into account only one factor of risk and that is the risk that arises out of the market. This measure of risk is given by β_{it} which is the loading on RMRF. However, given the CAPM anomalies, the Fama-French (1993) Three-Factor Model is able to explain a lot of the cross-sectional variation in average returns with additional factors that takes into account the effect of the size and book-to-market. Respective factors are

represented by SMB ('small' minus 'big') and HML ('high' minus 'low').

Carhart (1997) reports that the 4-factor model is consistent with a model of market equilibrium that has four risk factors. The mean return is attributable to four strategies – high versus low beta stock, value versus growth stocks, and one-year return momentum versus contrarian stocks. Carhart (1997) finds that the 4-factor model is able to explain considerable variation in returns. The low correlations of the three factors with each other and each of their high mean returns suggest that the 4-factor model explains well the sizeable time series variation and cross-sectional variation on the portfolios of stocks. Moreover multicollinearity does not affect each of the factor loadings of this model substantially (Carhart, 1997). He further finds that compared to the CAPM and the 3-factor model, the 4-factor model reduces the average pricing errors to a great extent and eliminates all of the patterns in it, which indicates that this model explains the cross-sectional variation in average stock returnsquite well.

Cuthbertson et al. (2010) report that models of performance measures plays another significant role in addition to evaluating performances. They identify whether managers of funds have the ability to market-time. Taking the CAPM as an example, the model can be decomposed into two parts in order to identify which part of the managed portfolio return is due to the benchmark return β_{it}(RMRF)which is known as market-timing and which part is due to the remainder of the model$\alpha_{it} + e_{it}$which is known as security selection.

2.3 Performance and Persistence of Funds

Persistent fund performance is a key issue in the mutual fund industry. It should be noted that funds do not always produce abnormal performance i.e. their performance is not always persistent relative to other funds, however it still benefits the investor. These funds are successful at stock picking strategies at infrequent intervals (Cuthbertson et al. 2010).

Focusing on the performance of actively managed and index funds in the US, I first look at the paper by Elton, Gruber and Busse (2004). They use only 52 US, S&P500 index funds that ranges from January 2006 to December 2001. As their measure of abnormal performance they use the CAPM and the fund's differential return over the market index and find that the abnormal performance reported by the CAPM is -0.41% per annum and performance reported by the average index fund's differential return is -0.485% per year. This underperformance arises out of the total expense ratio (TER) of 0.444% due to advertising, rebalancing, cash flow

and management fees. These expenses have to be incurred in order to track the index closely. For funds that are actively managed, Cuthbertson et al. (2010) report in their analysis of other empirical research of US and UK funds that Jensen's alpha is used as a measure of risk adjusted performance.

Fund returns can be gross and net. Gross returns are returns to the fund whereas net returns are returns to the investor. Gross fund returns are before expenses are adjusted but after the deduction of transaction costs. It includes expense ratios. On the other hand net returns include load fees and personal taxes but it does not include total expense ratio.

Considering net returns, research shows that the average managed fund underperforms the benchmark. Using data from 1974-1994, based on CRSP net return Wermers (2000) finds abnormal performance based on the Carhart 4 factor measure to be of -1.16% per annum which is statistically significant at the 1% level. This indicates underperformance by the average fund in the sample. This is consistent with the results reported by Kosowski et al. (2006) who also shows that the 'average managed fund' underperforms the benchmark. Data used by Kosowski et al. (2006) ranges from 1975 to 2002 and covers 1700 funds and they find that the alpha based on net returns is -0.5% per year.

An interesting point to observe here would be how can mutual funds that have consistent underperformance manage to survive through long periods. Poorly performing funds exist may be due to the reason that investors are 'locked in' (such as through pension plans) and they may also have accrued capital gains (Gruber, 1996). However, it is also likely that investors behave irrationally. For e.g. they may be persuaded by the advertisements or follow the recommendations of brokers blindly (Cuthbertson et al. 2010).

3. METHODOLOGY

3.1 Data Source and Description

The main objective of this paper is to carry out the investment performance evaluation of a particular type of institutional investor in a specific market. More precisely across various asset classes that are there, a specific one had to be chosen in order to evaluate its performance.

Investment Company Factbook (2013) acts a crucial guide in explaining the dominating role played by US Mutual Funds amongst other types of investment companies (Closed-end funds, Exchange Traded Funds and Unit Investment Trusts). Of the $26.8 trillion of assets under management worldwide, US mutual fund assets

accounted for 49 percent of it. As noted earlier in this study that 33 percent of mutual fund assets were in Domestic Equity Mutual Fund, this gives an idea of the sheer size of this particular type of mutual fund. Consistent with prior studies, I evaluate the performance of Domestic Equity Fund of the US Mutual Fund Industry. However my analysis is for the period 1993 to 2012 and consists of only 'Growth Funds', 'Growth and Income Funds' and 'Income Funds' which adds up to 1206 distinct funds in my sample. This accounted for 13.8% of total number of US mutual funds in 2012 which shows that these particular type of funds to be popular choices for investors and in essence contribute in large part to the growth and development of an economy.

First, a full sample analysis is carried out using the CAPM, FF3FM and C4FM across the entire period. This is done in order to analyse the behaviour of all the funds over the whole period. The average performance of all the funds across the three performance measurement models is quite interesting to see, especially when the distribution of their performances is presented in a histogram, as shown in this study. I further examine the performances of all the funds for each performance measurement model separately. Furthermore, when the funds are sorted into five equally weighted portfolios according to their abnormal performances as measured by the alphas, it enables us to distinguish between the worst and the best performing funds. Next, I evaluate the performance of the three groups of funds separately across the three performance measurement models for the whole period.

In order to evaluate the performance of domestic equity mutual funds, I collect data from the Center for Research in Security Prices (CRSP) Survivor-Bias-Free US Mutual Funds Database from January 1993 to December 2012. It is important to mention that the CRSP database is specifically designed for research purposes on the historical performance of open-ended mutual funds by using survivor-bias-free data. Information such as the history of each mutual fund's name, investment style, fee structure, holdings, asset allocation, etc. is provided by the database.

I use the Strategic Insight Objective code that spans from 1993 to 1998, Lipper Objective Code that begins from 1998 and the CRSP Objective Code that provides continuity of all the codes and also provides consistency with the other codes from different sources to select the funds in my sample[3]. I further narrow down my analysis on only Growth Funds (consisting of Capital Appreciation Funds – 'CA' and Growth Funds – 'G'), Growth and Income Funds – 'GI' and Income Funds

[3] *The CRSP Objective Code maps the Strategic Insights, Wiesenberger, and Lipper Objective Codes into a continuous series that provides continuity.*

(consisting of Equity Income Funds – 'EI') and further include only those funds that are still active. Finally my sample consists of 1206 distinct funds.

Out of the full sample of 1206 funds[4], 710 of them are 'Growth Funds' as shown in Table 1. Under the Lipper objective, these funds consist of Capital Appreciation (CA) funds and Growth Funds (G). However, the Strategic Insight Objective terms these funds as Equity USA Aggressive Growth (AGG) and Equity USA Growth (GRO) funds. 'Growth Funds' that are Capital Appreciation Funds ('CA' also known as aggressive growth funds) are those funds that invest in securities with higher risk in return for potentially higher returns or gains. On the other hand funds that are known only as Growth Funds (G) are those funds that invest primarily in the stocks of companies with above-average risk in return for potentially above-average gains. These companies often pay very little or no dividends and their stock prices tend to be more volatile from day to day.

'Growth and Income Funds' consist of a smaller sample of 559 funds as shown in Table 1. Lipper and Strategic Insight Objectives term these funds as Growth and Income (GI) funds and Equity USA Growth and Income (GRI) and Equity USA Income and Growth (ING) funds respectively. Growth and Income Funds are a combination of funds that focus on capital appreciation and current income generation through dividends or interest payments.

'Income Funds' are a very small number of funds in the Domestic Equity Mutual Funds industry. I find only 97 Income Funds in my sample in the entire sample of 1206 funds as reported in Table 1. As the name of these funds suggest, 'Income Funds' are those funds that mainly seek current income generation than capital appreciation and hence the small number of these funds suggest their low popularity than the ones in the other Style categories.

Table 1. Number of Funds

	Growth Fund	Growth and Income Fund	Income Fund
Number of Funds	710	559	97

Note: This table shows number of funds of each style category for the sample period from January 1993 to December 2012.

[4]There are overlapping amongst the different category of funds. Such as funds appearing as Growth Funds may also appear in the Growth and Income category.

3.2 Data Variables, Adjustment and Measurement

In order to evaluate the performance of the full sample of funds over the entire period (1993 to 2012), returns for each fund had to be collected for every month for the 20 year period from the CRSP Mutual Fund database, which means that one fund had 240 observations of monthly returns for this whole period of 20 years. This gave an observation of 289,440 for the full sample of 1206 funds. It is important to mention that, as reported in the CRSP database guide, monthly returns are calculated as a change in Net Asset Values (NAV) that includes reinvested dividends from one period to the next. Moreover the NAVs are net of all management expenses and 12b-1 fees that do not include front and rear load fees. Furthermore, not all funds report their monthly returns every year throughout the period in the CRSP database. In this case, the values in those years were simply treated as missing entries.

Regression analysis models require funds to report their excess returns. Since this was not readily available, the monthly risk-free rates were deducted from the raw monthly returns, collected from CRSP, for each fund throughout the entire period and the excess returns were found. The descriptive statistics of fund excess returns are reported in Table 1. The risk-free rates were collected from the Kenneth R. French Data Library. The monthly risk-free rates are the monthly US Treasury bill rates reported in percentage units. As a result of this, monthly fund returns had to be transformed to percentage units from decimal units in order to maintain consistency. Excess returns for each fund every month were calculated in MATLAB. This was done in MATLAB because of the large number of observations in the data.

Table 2.Fund Excess Returns

	All Funds	Growth Fund	Growth and Income Fund	Income Fund
Average	0.37% (4.84%)	0.38% (5.10%)	0.35% (4.48%)	0.42% (4.01%)
Minimum	-66.59%	-48.37%	-66.59%	-22.23%
Maximum	532.20%	53.10%	532.20%	15.91%

Note: The table shows the average values, the standard deviation in parenthesis, the minimum and the maximum values of pooled data of fund excess returns across all the years in the sample (January 1993 to December 2012). The table reports the respective values for 'All Funds', 'Growth Funds', 'Growth and Income Funds' and 'Income Funds'.

Table 2 reports the averages and the standard deviation (in parenthesis) of the pooled data of the excess fund returns across all the years in the sample. Minimum and maximum fund excess returns are also reported for all funds and for each of the style category of funds in the rows below the average values. For the whole sample, the average excess return is 37 basis points with a standard deviation of 4.84 percent. Across the three style of funds, 'Income' Funds report highest mean excess return (42 basis per month) than that of 'Growth' and 'Growth and Income' Funds.The average excess return for 'Growth Funds' is 0.38%, whereas 'Growth and Income' Funds have a slightly lower average excess return of 0.35%. Across all the funds in the sample, the fund that reported the lowest excess return was in Growth and Income Fund category. That specific fund reported a return of -66.59% in the month of January, 1993. However, the highest excess return in a month was also reported by a fund in this same category. That particular fund had an excess return of 532.20% in the month of September, 1997 and was the only fund to report such a large figure. It is also important to mention that the monthly excess returns for all other funds in the sample ranged between -48.37% to 53.10%.

Further data that were collected from the Kenneth R. French Data Library include the risk factors for each of the three performance measure models used in this paper to evaluate the performance of the funds. The factors are the market risk premium (Rm-Rf), small minus big (SMB), high minus low (HML) and momentum (MOM). For the CAPM regression model, Market returns in excess of the risk-free rate, Rm-Rf, were collected for every month in the 20 year period. French's Data library report that the excess return on the market is the value-weighted return of all CRSP firms incorporated in the US and listed on the NYSE, AMEX or NASDAQ that have a CRSP share code of 10 or 11 at the beginning of month t, good shares and price data at the beginning of t, and good return data for t minus the one-month Treasury bill rate.

For the Fama-French Three-Factor model two additional risk factors are included that the CAPM fails to consider. These are SMB (Small Minus Big) which captures the difference between the return on a portfolio of small stocks and the return on a portfolio of large stocks and the HML (High Minus Low) which captures the difference between the returns on a portfolio of high book-to-market stocks and the returns on a portfolio of low book-to-market stocks. Monthly SMB and HML

values were collected from French's data library for the whole period of our analysis (January 1993 to December 2012).

The third model of performance measurement employed is the Carhart Four-Factor model which includes another additional factor to the Fama-French Three-Factor model called momentum (MOM). The momentum factor captures cross-sectional variation in momentum-sorted portfolio returns. It is calculated as the difference between the average return on the two high prior return portfolios and the average return on the two low prior return portfolios. MOM makes the Four-Factor model consistent with a market equilibrium model with four risk factors. Again, data for MOM was collected monthly for the entire period of 20 years from the same source as above.

3.3 Identification and Description of the Performance Measurement Models

In assessing the performance of mutual funds, I employ three measures of performance evaluation models in order to contrast and compare the results of each model for the full sample of funds and for each fund style. The first model used is the Capital Asset Pricing Model (CAPM) of William F. Sharpe (1964) where only one element of risk is taken into consideration and that is the risk arising out of the market. The measurement of the abnormal performance is represented by the intercept of the model.

$$R_{it} = \alpha_{it} + \beta_{it}(RMRF) + e_{it} \qquad t=1, 2,\ldots., T \qquad (1)$$

Equation (1) above represents the CAPM, where R_{it} is the monthly excess return of the fund over the risk free rate (i.e. the one-month Treasury-bill return) at time *t*, α_{it} is the performance measure of that fund at time *t*, RMRF is the excess return on the CRSP value-weighted portfolio of all NYSE, AMEX and NASDAQ stocks (i.e. the market portfolio), β_{it} is the loading on the market portfolio and e_{it} is a generic term that is uncorrelated with all other independent terms.

The second model, as shown in Equation (2), below used to measure abnormal returns is the Eugene F. Fama and Kenneth R. French (1993) Three-Factor Model (FF3FM). This model takes into consideration two additional risk factors that the CAPM fails to incorporate. These are the SMB and the HML. These two additional factors captures the difference between the return on a portfolio of small stocks and the return on a portfolio of large stocks (SMB – Small market capitalization stocks minus Big market capitalization stocks) and the difference between the returns on a

portfolio of high book-to-market stocks and the returns on a portfolio of low book-to-market stocks (HML – High book-to-market ratio stocks minus Low book-to-market ratio stocks). The Three-Factor model captures a lot of the cross-sectional variation in average stock returns and is able to absorb most of the anomalies that remained in the CAPM. Fama and French (1993) show that this model provides a good description of returns on portfolios formed on size and book to market value. The third model for evaluating mutual fund performance that is used in this paper is the Carhart Four-Factor Model (C4FM). This model adds the momentum (UMD) factor in addition to the Fama-French's Three-Factor Model. The momentum (UMD) factor captures Jegadeesh and Titman's (1993) momentum anomaly. Carhart (1997) show that this model of performance measure can explain considerable variation in returns. It is able to explain the sizeable time-series variation and cross-sectional variation in the mean return on the portfolio of stocks well. Furthermore, he finds that the 4-Factor Model substantially improves the average pricing errors of the CAPM and the Fama-French Three-factor Model and explains the cross-sectional variation in average stock returnsquite well. Equation (2) and (3) below represent the FF3M and the C4FM respectively

$$R_{it} = \alpha_{it} + \beta_{it}(\text{RMRF}) + s_{it}(\text{SMB}) + h_{it}(\text{HML}) + e_{it} \quad t=1, 2,\ldots., T \tag{2}$$

$$R_{it} = \alpha_{it} + \beta_{it}(\text{RMRF}) + s_{it}(\text{SMB}) + h_{it}(\text{HML}) + m_{it}(\text{UMD}) + e_{it}\, t=1, 2,\ldots., T \tag{3}$$

where $R_{it}$is the monthly excess return of the fund over the risk free rate (i.e. the one-month Treasury-bill return) in month *t*, $\alpha_{it}$is the performance measure of that fund in month *t*, RMRF is the excess return on the CRSP value-weighted portfolio of all NYSE, AMEX and NASDAQ stocks (i.e. the market portfolio), β_{it} is the loading on the market portfolio (RMRF), s_{it}, h_{it} and $m_{it}$are the respective loadings on SMB, HML and UMD ('momentum') factors.

3.4 Full Sample Regression using MATLAB

In order to conduct the regression for the full sample,R_i, the monthly excess returns of the funds wererequired. Since this was not readily available it required a process to collect them. CRSP reports the raw returns of the funds in the format nx1 vector, where n is the number of funds. To calculate excess return for each fund every month MATLAB was used. It acted as a very useful tool in transforming these observations of the returns in the format nxp matrix, where n is the number of the months and p is the number of funds in the sample. The observations of the returns needed to be in this particular format, first to calculate the excess returns of each fund every month and second, to regress the excess returns on the four risk-factors

in order to get the values of the intercept, which is the abnormal performance measure (the alphas), of each of the three models mentioned above.

3.4.1 Description of the Output

Regressing the excess returns of all the funds in the sample every month on the various factors loadings using MATLAB using specific codes resulted in a single value of abnormal performance measure (alpha) for each fund for the whole period. The resultant format of the alphas – px1 vector, contained the alpha estimates (from CAPM, FF3FM and C4FM) for each of the fund. The output of the regressions also reported the factor loadings for the Market, SMB, HML and the UMD from each of the three performance measurement models. The corresponding factor loadings were produced in the format – px1 vector, which contained the loadings for each of the factors for each fund. The output of the regressions also produced the alpha intervals (from CAPM, FF3FM and C4FM) in the format – px2 matrix, that contained the 95% confidence interval for the (CAPM, FF3FM and C4FM) alpha estimates for each of the fund. This allowed me to calculate the standard errors for the alpha estimates and the relevant t-statistics for each of the corresponding fund quite easily.

In addition to evaluating the performance of the full sample of funds, I also measure the annual performance for the entire period of each of the three style categories (Growth; Growth and Income; and Income) of funds that make up my full sample using the CAPM, FF3FM and C4FM.

4. EMPIRICAL ANALYSIS

4.1 A full sample analysis

In measuring the performance of all the funds in the sample, three models of performance measures have been employed. Namely these are the Capital Asset Pricing Model (CAPM), Fama and French (1993) Three-Factor model (FF3FM) and the Carhart (1997) Four-Factor model (C4FM).

Table 3. Full Sample of Funds

	CAPM	FF3FM	C4FM
Alpha	-0.10%	-0.14%	-0.12%
	(-17.88)	(-24.88)	(-23.20)
RMRF	0.90	0.90	0.90
	(127.46)	(134.23)	(128.01)
SMB		0.07	0.06
		(15.55)	(14.52)
HML		0.08	0.08
		(12.91)	(12.94)
UMD			-0.02
			(-6.96)

Note: Thist able shows the performance of all the funds calculated using three performance measuring models – Capital Asset Pricing Model (CAPM), Fama and French (1993) Three-Factor Model (FF3FM) and the Carhart (1997) Four Factor Model (C4FM). The sample period is from January 1993 to December 2012. Performance measure is reported as the average value of alpha for the full sample and the relevant t-statistic is reported in parenthesis. This table also reports the average values of all the various factor loadings (RMRF, SMB, HML and UMD) for the full sample of funds over the above mentioned period.

Table 3 reports the average values of alpha and the average values for all the factor loadings i.e. of RMRF, SMB, HML and the UMD for all the funds in the sample across the three performance measurement models. The first column reports the results using the Capital Asser Pricing Model. The second column reports the Fama-French Three-Factor model results and the third column reports the Carhart Four-Factor model results. The average performance of all the funds in the sample ranges from -0.10% to -0.14% across the three performance measures. This shows underperformances by the average fund over the entire period (January 1993 to December 2012) that is also statistically significant. Under all the measures used, the average value of the loading on RMRF (which is the Market Beta) is 0.90 which is consistent with the results of other past research papers. An average Beta of 0.90 reflects the fact that mutual funds hold some cash or bonds in their portfolios. The table also shows the average loadings of SMB and HML as 0.07 and 0.08 under the FF3FM and 0.06 and 0.08 under the C4FM respectively, all figures reported

are statistically significant. The momentum factor (UMD) loads negatively when performance is measured using the C4FM. It reports an average value of -0.02 which is also statistically significant.

It is quite interesting to see the distribution of the overall performance of all the funds using histograms generated across the three performance measurement models for the entire 20 year period. Figure 1 shows that when the CAPM was employed the performance of the funds mainly ranged from -1.01% to 0.71% with majority of the funds reporting negative performance of -0.41% to -0.06%. There were about 490 funds in the sample with positive abnormal performance. The figure also shows that there was 1 fund out of the total 1206 that had a positive abnormal performance of more than 1.74%. However, its performance was found to be statistically insignificant. Furthermore, Figure 2 shows the distribution of the t-statistics of the abnormal performances for all funds, calculated using the CAPM, over the entire period. It shows that number of funds that had statistically significant abnormal performance over the entire period is just above 350 out of the total 1206 funds.

When the FF3FM was used to measure performance, a similar pattern as the CAPM was found. Out of the total number of 1206 funds in the sample, about 770 of them reported underperformance and only about 430 of the funds had positive abnormal performance as shown in Figure 3. Most of the funds had an abnormal performance ranging between -0.33% to 0.10%. However, when considering the statistical significance of the performances of the funds, the relevant t-statistic distribution of the performance of all the funds in the sample showed that about 450 funds had statistically significant abnormal performance (see Figure 4). There was also one fund in the sample that is considered an outlier since that fund reported an abnormal performance of 1.88% which is much beyond the average performance of the other funds in the sample. Furthermore the performance of that particular fund was found to statistically insignificant.

Similarly Figure 5 shows the performance of the all the funds in the sample that was measured using the C4FM. The average abnormal performance of -0.12% all the funds in the sample, as reported in Table 3, can be attributed to the underperformance by the majority of the funds. 823 funds reported negative performance that ranged between -0.88% to -0.33% as shown in Figure 5. However, performance ranged between 0.04% to 0.50% for the funds that had positive abnormal performance. The presence of the outlier is still evident in the figure. However, its performance is again found to be statistically insignificant. Figure 6 shows the distribution of the t-statistics of the abnormal performance for each of the fund in the sample over the

entire period of 20 years, calculated using the C4FM. It shows that, out of the total number of 1206 funds in the sample, about 370 funds report statistically significant abnormal performance.

4.1.1 Full Sample Analysis using the Capital Asset Pricing Model

Table 4. Full Sample of Fund Analysis using CAPM

Portfolio	Alphas	RMRF
1	-0.37%	0.92
2	-0.20%	0.90
3	-0.10%	0.91
4	-0.01%	0.86
5	0.16%	0.90

Note: The table shows the performance of five portfolios of funds as the average Alphas of each portfolio and also reports the corresponding average loading on RMRF for each portfolio, under the CAPM. RMRF is the return on the market portfolio in excess of the one-month Treasury bill rate. The portfolios are equally weighted and sorted based on lowest Alpha values to highest Alpha values where portfolio 1 holds the funds with the lowest abnormal performance (lowest alphas) and portfolio 5 holds the funds with the highest abnormal performance (highest alphas).

Using the Capital Asset Pricing Model to measure the performance of all the funds in the sample, from Table 3 we can see that the average performance of all the funds in the sample is -0.10%. We can further see a breakdown of this figure from Table 4 where the full sample of funds have been sorted into five equally weighted portfolios based on the highest and the lowest performances. Here we can see that the poorest performing funds (Portfolio 1) actually have a much lower negative average performance of -0.37% whereas the best performers (Portfolio 5) have a positive average performance of 0.16%. Segregating the average performance of all the funds in this manner into different portfolios gives us a clearer picture. We

can distinguish between the poorest and best performing funds more conveniently. However, it is also important to mention that there is only a slight variation in the average market beta (the loading on RMRF) between the poorest and the best performing portfolio. Funds in Portfolio 1 actually have a higher average loading on RMRF (0.92) than Portfolio 5 funds (0.90). This result is consistent with findings by Chen et al. (2004) who report that funds with positive abnormal performance have a lower loading on RMRF than funds with negative abnormal performance.

Furthermore the two figures below show the distribution of t-statistics for all the funds in Portfolio 1 and Portfolio 5, highlighting relevant significant abnormal performance of each fund in the portfolios. Figure 7 shows that the number of funds with significant average performance of -0.37% in Portfolio 1 is just above 200 whereas Figure 8 shows that out of 242 funds in Portfolio 5 that report average positive abnormal performance of 0.16%, the number of funds with statistically significant positive abnormal performance is only 24. This gives a picture of the presence of small number of funds in the whole sample of 1206 funds that truly have positive abnormal performance for the entire period when performance is measured using the CAPM.

4.1.2 Full Sample Analysis using the Fama-French Three-Factor Model

The second model of performance measure that is used is the Fama-French three-factor model. This model captures the CAPM average return anomalies by adding two more factors in the CAPM – the SMB and HML. The SMB takes into account the difference between the return on a portfolio of small stocks and the return on a portfolio of large stocks (small minus big) and the HML takes into account the difference between the return on a portfolio of high book to market stocks and the return on a portfolio of low book to market stocks (high minus low). These two additional factors can do a better job than the single factor in the CAPM in explaining the cross-section of average returns.

As shown in Table 3 the average performance of all the funds in the sample calculated using the FF3FM is -0.139% with an overall average loading on the RMRF (the market beta) of 0.90. What is interesting to look at is how the various factors in this model load, when the overall sample is categorised into 5 equally weighted portfolios based on performance levels. Table 5 shows that Portfolio 1 consists of the poorest performing funds and Portfolio 5 consists of the best performing funds in terms of their alpha measures.

Table 5. Full Sample of Fund Analysis using FF3FM

Portfolio	Alphas	RMRF	SMB	HML
1	-0.40%	0.86	0.07	0.12
2	-0.23%	0.87	0.08	0.13
3	-0.14%	0.90	0.07	0.10
4	-0.05%	0.93	0.04	0.07
5	0.12%	0.94	0.07	-0.01

Note: The table shows the performance of five portfolios of funds as the average Alphas of each portfolio and also reports the corresponding average loadings on various factors for each portfolio, under the FF3FM. RMRF is the return on the market portfolio in excess of the one-month Treasury bill rate. SMB is the return on a portfolio of small stocks minus large stocks. HML is the return on a portfolio of high book-to-market stocks minus low book-to-market stocks. The portfolios are equally weighted and sorted based on lowest Alpha values to highest Alpha values where portfolio 1 holds the funds with the lowest abnormal performance (lowest alphas) and portfolio 5 holds the funds with the highest abnormal performance (highest alphas).

Table 5 shows that the poorest performing funds in Portfolio 1 which consists of 241 funds have an average abnormal performance of -0.40% whereas the funds in Portfolio 5, consisting of the same number of funds as in Portfolio 1, report an average abnormal performance of 0.12%. Even though there is a positive abnormal performance amongst the funds in portfolio 5, there overall average performance of funds remain to be -0.139% due to the fact that in Portfolios 2 to 4 the average abnormal performance of funds are all negative. This means that the majority of funds in the sample have negative abnormal performance over the time period. The poorest and the best performing funds have similar loadings on the SMB. However, the best performing funds load negatively on the HML but the poorest performing funds have an average HML factor loading of 0.12.

Figures 9 and 10 show the distribution of the t-statistics for all the funds in portfolios 1 and 2. Figure 9 reports that out of the 241 funds in portfolio 1 that have an average performance of -0.40%, 232 of those funds have a statistically significant negative

abnormal performance. However, the number of funds with significant positive abnormal performance in Portfolio 5 is only 15 as can be seen from Figure 10.

4.1.3 Full Sample Analysis using the Carhart Four-Factor Model

Table 6. Full Sample of Fund Analysis using C4FM

Portfolio	Alphas	RMRF	SMB	HML	UMD
1	-0.38%	0.87	0.07	0.06	0.00
2	-0.21%	0.89	0.05	0.07	-0.02
3	-0.12%	0.91	0.04	0.08	-0.03
4	-0.03%	0.92	0.06	0.09	-0.03
5	0.12%	0.88	0.08	0.09	-0.04

Note: The table shows the performance of five portfolios of funds as the average Alphas of each portfolio and also reports the corresponding average loadings on various factors for each portfolio, under the C4FM. RMRF is the return on the market portfolio in excess of the one-month Treasury bill rate. SMB is the return on a portfolio of small stocks minus large stocks. HML is the return on a portfolio of high book-to-market stocks minus low book-to-market stocks. UMD is the return on a portfolio of past winner stocks minus past loser stocks. The portfolios are equally weighted and sorted based on lowest Alpha values to highest Alpha values where portfolio 1 holds the funds with the lowest abnormal performance (lowest alphas) and portfolio 5 holds the funds with the highest abnormal performance (highest alphas).

As a third model for measuring performance of mutual funds Carhart (1997) Four-Factor model has been used. The results of the overall average performance for the full sample of funds from the C4FM is -0.12% as shown in Table 3 and has an average loading on the RMRF (the market beta) of 0.90 which is similar to loadings reported by the CAPM and the FF3FM. Again, the full sample of funds has been divided into 5 equally weighted portfolios based on performance levels in the same manner as it has been done for CAPM and FF3FM, i.e. Portfolio 1 consists of the funds with the poorest performance and Portfolio 5 consists of the funds with the best performance from the full sample as shown in Table 6. As under the CAPM

and the FF3M, there is significant difference in the average performance of the poorest performing funds and best performing funds under the C4FM as well. Portfolio 1 funds have an average abnormal performance of -0.38% whereas funds in Portfolio 5 have a positive average abnormal performance of 0.12. The result is similar to that found from the CAPM and the FF3FM. The poorest and the best funds in the sample load almost in the same manner on SMB and HML as the FF3M but here another factor called momentum (UMD) is added that takes into account the difference in returns between the portfolio of past winner stocks and the portfolio of past loser stocks. The poor performing funds in this case have higher loading than the funds that have better performance on momentum. For instance, Portfolio 1 funds take a loading of 0.00 on UMD whereas the corresponding loading for funds in Portfolio 5 is -0.04.

The figures below again tell us a similar story, as under the CAPM and the FF3FM, that in the full sample of funds a large proportion of them have statistically significant negative abnormal performance (as can be seen from the t-statistics distribution of the performance of Portfolio 1 funds in Figure 11) and funds that have significant positive abnormal performance is comparatively quite small as shown in Figure 12 (the t-statistics distribution of the performance of Portfolio 5 funds).

4.2. Performance of Growth Funds, Growth and Income Funds, and Income Funds

Table 7. Performance of Growth Funds

	CAPM	FF3FM	C4FM
Alpha	-0.06% (-2.07)	-0.11% (-3.90)	-0.10% (-3.77)
RMRF	0.93	0.89	0.88
SMB		0.13	0.11
HML		-0.06	-0.08
UMD			0.03

Note: Table shows the averages of pooled data of abnormal performances across all the years in the sample and the relevant factor loadings of 'Growth Funds' calculated using three performance

measuring models – Capital Asset Pricing Model (CAPM), Fama and French (1993) Three-Factor Model (FF3FM) and the Carhart (1997) Four-Factor Model (C4FM). The t-statistics are shown in parenthesis. The sample period is from January 1993 to December 2012.

Table 7 shows the averages of pooled data of abnormal performances across all the years in the sample and the relevant factor loadings of Growth Funds. Average abnormal performance ranges from -0.06% to -0.11% across the three performance measuring models with average loading on the RMRF (the market beta) of around 0.90. This gives the idea that under any of the performance measurement models mentioned in this paper, the average performance of the Growth Funds remains negative on an annual basis. The average performances of the funds across all the three measuring models have been found to be statistically significant. The average abnormal performance reaching as low as -0.11% (as measured by the FF3FM) also reflects the fact that Growth Funds being those funds which invest in securities with comparatively higher risk. Furthermore, the table shows that Growth Funds load positively on the SMB and negatively on the HML under both the FF3M and the C4FM. Growth funds also have a very low positive loading on the momentum factor (UMD).

Table 8. Performance of Growth and Income Funds

	CAPM	FF3FM	C4FM
Alpha	-0.06% (-2.14)	-0.04% (-1.44)	-0.08% (-3.34)
RMRF	0.80	0.85	0.86
SMB		-0.03	-0.02
HML		0.12	0.13
UMD			-0.05

Note: Table shows the averages of pooled data of abnormal performances across all the years in the sample and the relevant factor loadings of 'Growth and Income Funds' calculated using three performance measuring models – Capital Asset Pricing Model (CAPM), Fama and French (1993)

Three-Factor Model (FF3FM) and the Carhart (1997) Four-Factor Model (C4FM). The t-statistics are shown in parenthesis. The sample period is from January 1993 to December 2012.

Averages of pooled abnormal performance and the factor loadings for 'Growth and Income Funds' across all the three performance measurement models is reported in Table 8. 'Growth and Income Funds' shows less extreme performance when compared to the performance of 'Growth Funds'. Across the three performance measurement models, the average abnormal performance ranges from -0.06% to -0.08% which is also found to be statistically significant except for the Three-Factor Model. The funds have an average RMRF loading of around 0.84, which is slightly less than that of 'Growth Funds'. This seems rational since this group of funds also include Income funds. However, 'Growth and Income Funds' have negative average loading on the SMB, positive average loading on the HML and negative average loading on the UMD.

Table 9. Performance of Income Funds

	CAPM	FF3FM	C4FM
Alpha	0.01% (0.09)	0.06% (0.69)	-0.002% (-0.04)
RMRF	0.75	0.84	0.86
SMB		-0.04	-0.03
HML		0.22	0.24
UMD			-0.07

Note: Table shows the averages of pooled data of abnormal performances across all the years in the sample and the relevant factor loadings of 'Income Funds' calculated using three performance measuring models – Capital Asset Pricing Model (CAPM), Fama and French (1993) Three-Factor Model (FF3FM) and the Carhart (1997) Four-Factor Model (C4FM). The t-statistics are shown in parenthesis. The sample period is from January 1993 to December 2012.

Table 9 reports the averages of pooled abnormal performance and the factor loadings for Income Funds across all the years in the period (1993 to 2012). It shows that amongst the three group of funds, Income Funds are the only ones that report positive but very low average abnormal performances of 0.01% and 0.06% when measured by the CAPM and the Three-Factor Model respectively. However, the average performances of these funds have been found to be statistically insignificant across all the performance measurement models. Income funds also have a lower average loading on the RMRF of around 0.82. This may be because Income Funds are not as aggressive as Growth Funds. Out of the 1206 funds in the sample, there are only 97 Income Funds. However, the loading on SMB for the Three-Factor Model is -0.04 and the corresponding loading on the Four-Factor Model is -0.03. Income Funds load positively on HML across both performance measurement models and negatively on UMD, which is a similar pattern like that of Growth and Income Funds.

The analysis of the performance of funds across the three performance measurement models shows underperformance by the average fund over the entire time period. Significant negative average performances are reported for the full sample of funds. When these funds are sorted into five equally weighted portfolios according to their performances, it shows that the difference between the average performance of the best performing portfolio and the poorest performing portfolio is around 0.50% across all the performance measurement models. However, the poor performing funds dominate in the full sample. 'Growth Funds' and 'Growth and Income Funds' report significant negative average performance across almost all the performance measurement models. However, 'Income Funds' show a positive but insignificant abnormal performance under the CAPM and FF3FM.

5. CONCLUSION

In this paper the performance of U.S. mutual funds have been evaluated.More precisely three groups of domestic equity mutual funds receive attention in this study. Using monthly data from January 1993 to December 2012 of 'Growth Funds', 'Growth and Income Funds' and 'Income Funds', I evaluate the performances of the funds in each group by utilizing three performance measurement tools. These are the Capital Asset Pricing Model (CAPM), the Fama-French Three-Factor Model (FF33FM) and the Carhart Four-Factor Model (C4FM).

Consistent with past research on the performance of U.S. mutual funds, I find the results of the performance of the funds in my sample to have negative average abnormal performance across all three performance measurement models during the entire time period. In analysing the performance of the full sample of funds,

I find an average abnormal performance of -0.10% under CAPM. To make my results robust, when performance is measured using two additional performance measurement models – FF3FM and C4FM – that addresses more risk factors such as the effect of size, book-to-market and momentum, I find similar results of underperformance by the average fund. Moreover, performances are also found to be statistically significant. This shows that the ability of the models to explain the cross-sectional variation in average returns.

To further investigate the behaviour of the funds, I sort the full sample of funds into five equally weighted portfolios according to their performances. This allows me to segregate the poor performing funds from the better ones into smaller groups and observe how each of the portfolio performs. Across all three performance measurement models, I find that four out of the five portfolios report negative average performance. This gives a clear picture of the underperformance by the majority of the funds in the sample. Moreover, this also enables us to distinguish between the best and the poorest performing group of funds. Amongst the poor performing portfolios, I find the poorest one to have an average performance of -0.40% under the FF3FM. However amongst the best performing portfolios, the one to report the highest figure had an average abnormal performance of 0.16%. This was found under the CAPM but it should be noted that the number of funds reporting positive abnormal performance in the sample is very small. I find that the difference in the average performance of the best performing portfolio and the poorest performing portfolio to be around 0.50% across all performance measurement models.

I further analyse the performance of the funds in my sample for the three style categories separately. Given the aggressive nature of 'Growth Funds', I find the average performance of the funds in this group to be the lowest as compared to 'Growth and Income Funds' and 'Income Funds'. This may be the result of 'Growth Funds' investing in relatively higher risky securities than 'Growth and Income Funds' and 'Income Funds'.

Evaluating the performances of 'Growth Fund', 'Growth and Income Fund' and 'Income Fund' in this paper has enabled us to have a deeper understanding of their significant contribution to the US mutual fund industry. It further enables us to understand that the growth of US mutual funds stem from these different types of domestic equity funds. As this paper focused on only three types of domestic equity fund, there is scope for further research on other types such as 'Hybrid Fund' and 'Bond Fund'. Further this paper not only shows us its significance but also proves to be valuable to corporate managers in the asset management industry. US domestic equity fund could act as a model for developing countries as investment in this industry may contribute in the development and growth of that economy.

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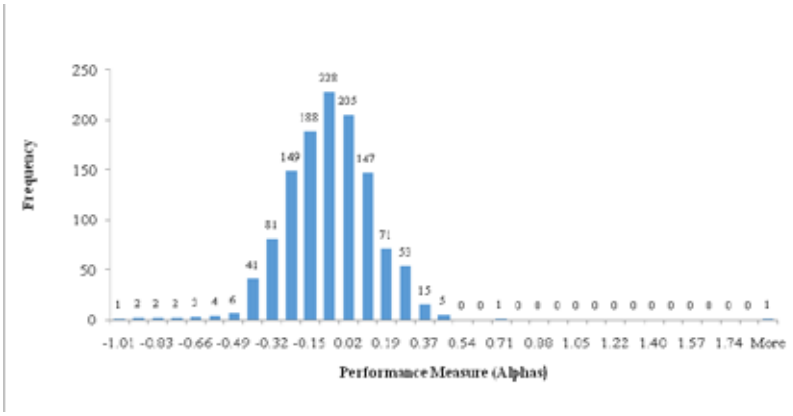
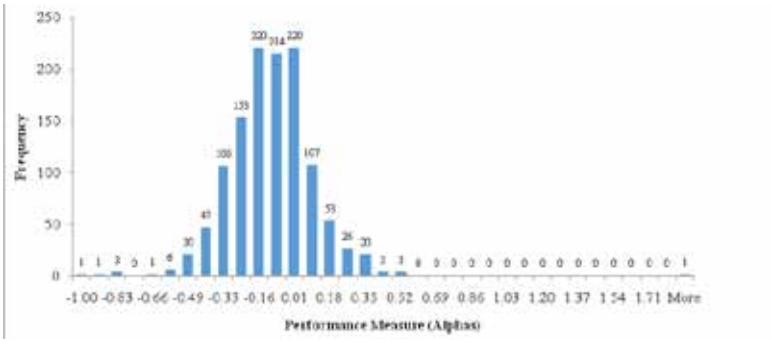
APPENDIX



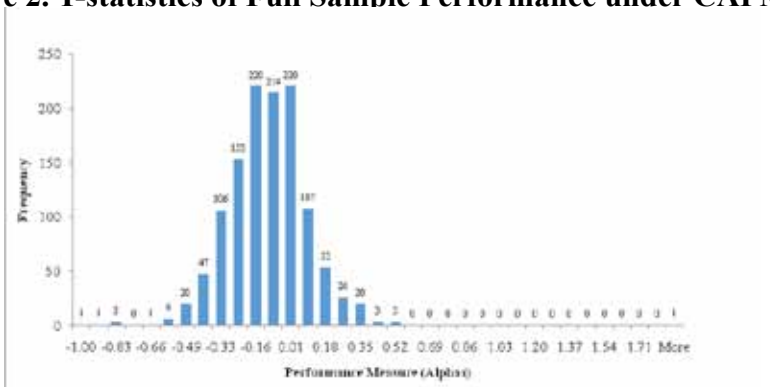
Note: This figure shows the distribution of the overall performance over the entire period (from January 1993 to December 2012) of all the funds in the sample using the Capital Asset Performance Model (CAPM).

Figure 1. Full Sample Performance under CAPM



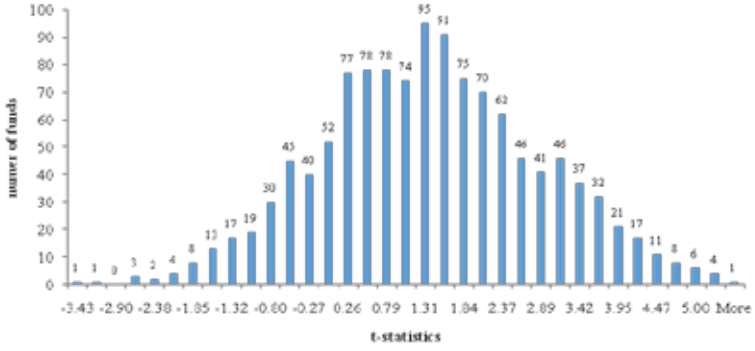
Note: This figure shows the distribution of the t-statistics of the abnormal performances, calculated using the CAPM, for all funds in the sample over the entire period from January 1993 to December 2012.

Figure 2. T-statistics of Full Sample Performance under CAPM



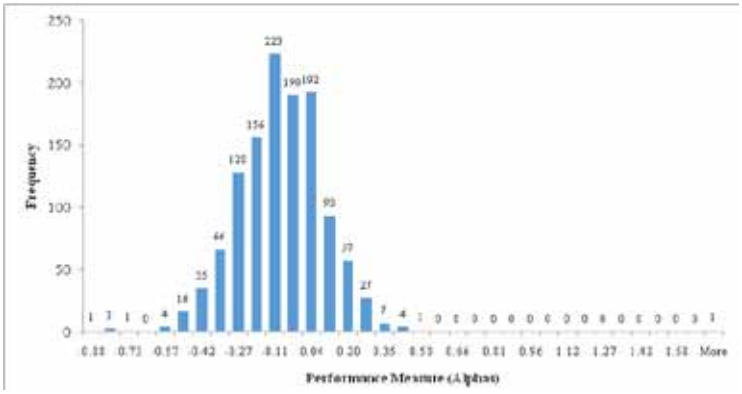
Note: This figure shows the distribution of the overall performance of all the funds in the sample over the entire period (from January 1993 to December 2012) using the Fama-French Three-Factor Model (FF3FM).

Figure 3. Full Sample Performance under FF3FM



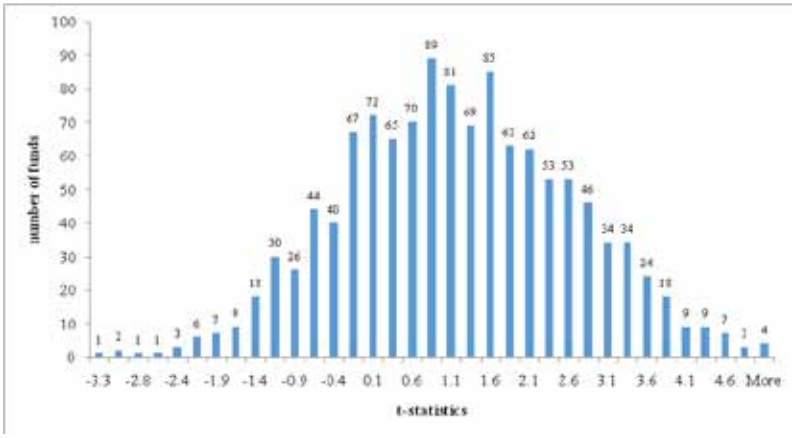
Note: This figure shows the distribution of the t-statistics of the abnormal performances, calculated using the FF3FM, for all funds in the sample over the entire period from January 1993 to December 2012.

Figure 4. T-statistics of Full Sample Performance under FF3FM



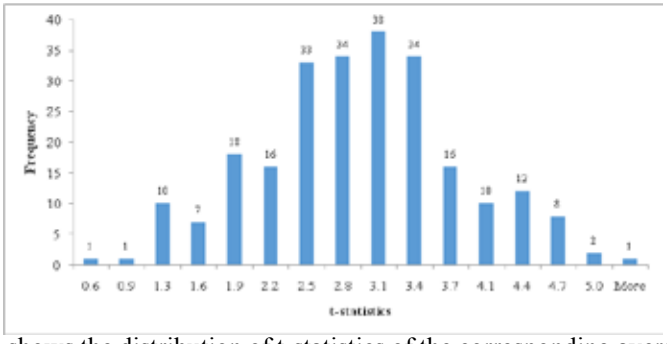
Note: This figure shows the distribution of the overall performance of all the funds in the sample over the entire period (from January 1993 to December 2012) using the Carhart Four-Factor Model (C4FM).

Figure 5. Full Sample Performance under C4FM



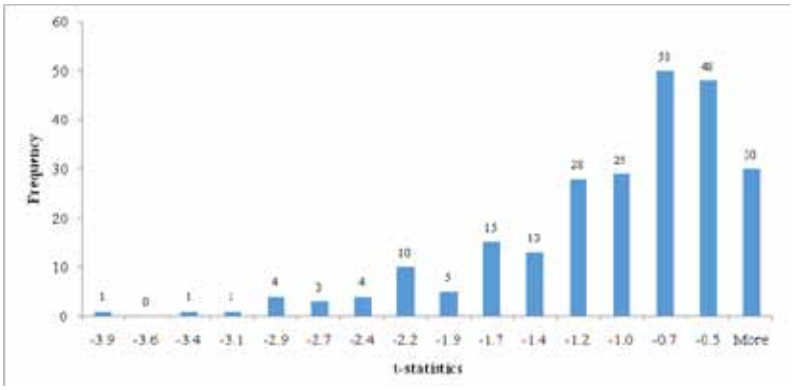
Note: This figure shows the distribution of the t-statistics of the abnormal performances, calculated using the C4FM, for all funds in the sample over the entire period from January 1993 to December 2012.

Figure 6. T-statistics of Full Sample Performance under C4FM



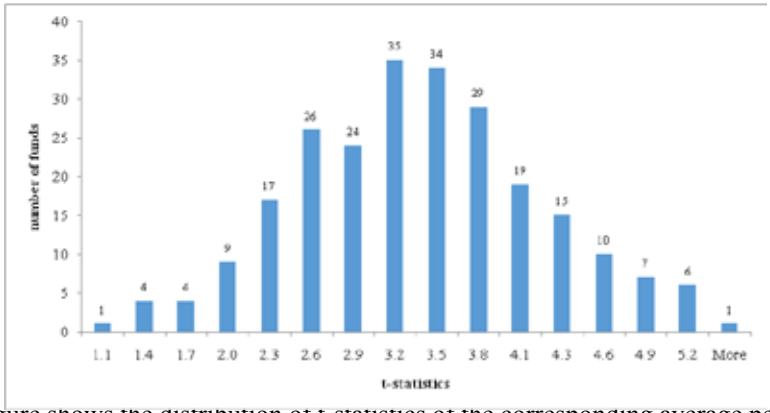
Note: This figure shows the distribution of t-statistics of the corresponding average performances of each fund in Portfolio 1 under the CAPM.

Figure 7. T-statistics of Portfolio 1 Fund Performance under CAPM



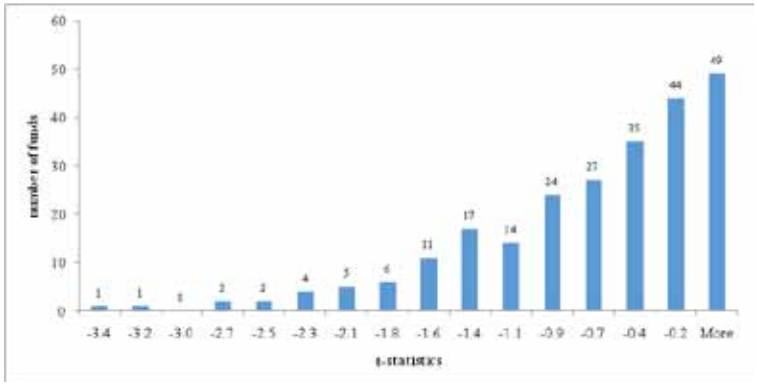
Note: This figure shows the distribution of t-statistics of the corresponding average performances of each fund in Portfolio 5 under the CAPM.

Figure 8. T-statistics of Portfolio 5 Fund Performance under CAPM



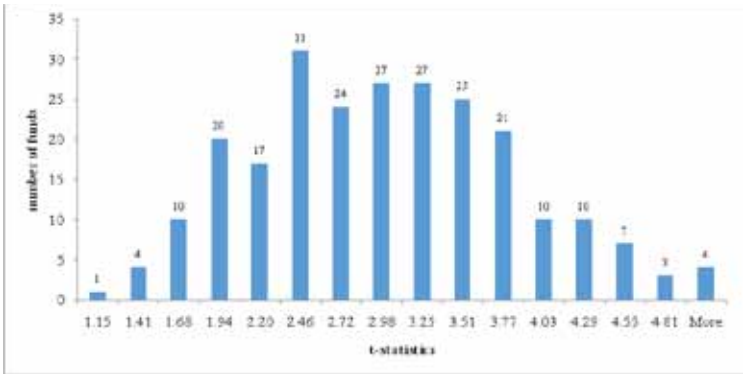
Note: This figure shows the distribution of t-statistics of the corresponding average performance of each fund in Portfolio 1 under the FF3FM.

Figure 9. T-statistics of Portfolio 1 Fund Performance under FF3FM



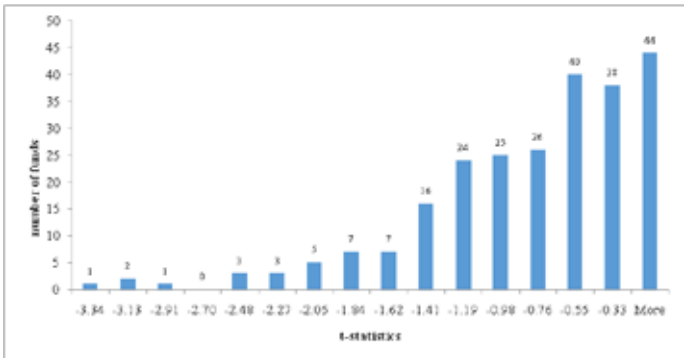
Note: This figure shows the distribution of t-statistics of the corresponding average performance of each fund in Portfolio 5 under the FF3FM.

Figure 10. T-statistics of Portfolio 5 Fund Performance under FF3FM



Note: This figure shows the distribution of t-statistics of the corresponding average performance of each fund in Portfolio 1 under the C4FM.

Figure 11. T-statistics of Portfolio 1 Fund Performance under C4FM



Note: This figure shows the distribution of t-statistics of the corresponding average performance of each fund in Portfolio 5 under the C4FM.

Figure 12. T-statistics of Portfolio 5 Fund Performance under C4FM

AUTHOR'S BIOGRAPHY

Shahran Abu Sayeed is a Lecturer of Department of Accounting and Finance at the School of Business and Economics, North South University in Dhaka, Bangladesh. Shahran holds a Master of Science Degree in Finance from Manchester Business School of The University of Manchester, UK. He holds an undergraduate degree with Cum Laudein BBA from North South University where he majored in Finance and International Business. Before joining North South University he was a full time Lecturer at the School of Business Studies in Southeast University. Shahran has also worked as an executive in Apex Husain Group for some time and currently acts as a Business Finance Consultant for other enterprises in Bangladesh. His research interests include Corporate Finance, Behavioral Finance and studying the performances of asset management companies in emerging markets.