Ca' Foscari
University
of Venice

Master's Degree programme – Second Cycle
(*D.M. 270/2004*)
in Economics and Finance

Final Thesis

Mutual Fund Performance
Evidence from Italian Equity Funds

Supervisor
Ch. Prof. Fulvio Corsi

Assistant Supervisor
Ch. Prof. Loriana Pelizzon

Graduand
Dario Strusi
Matriculation Number 835851

Academic Year
2015 / 2016

ABSTRACT

The aim of this thesis is to investigate the performance of Italian equity mutual funds during 2006-2015, using different sample sizes and market benchmarks.

Selective ability, market timing ability and performance persistence are analysed. The selectivity models are the CAPM, the Fama-French three-factor model and the Carhart four-factor model. The market timing models are the Treynor-Mazuy and Henriksson-Merton models. The performance persistence models are the Goetzmann and Ibbotson non-parametric test and the Grinblatt and Titman parametric test.

The standard approach developed in the literature is to estimate the number of significant funds as a measure of positive or negative performance, without determining what proportion of these significant funds are false discoveries. The present study applies the False Discovery Rate (FDR) approach, a technique used to weed out results due to luck alone and estimate the percentage of funds which truly have selective and market timing abilities. A simulation using R software is run to apply the FDR approach on a larger and more representative sample.

AKNOWLEDGEMENTS

I would first like to thank my thesis supervisor Prof. Fulvio Corsi for the continuous support and patient guidance throughout my writing. He went above and beyond his academic role and cheerfully welcomed me in his office whenever I needed help.

I am also grateful to all the professors at Ca' Foscari University of Venice for sharing their immense knowledge and fostering my interest for finance. They were extremely understanding in facilitating my study abroad programs, which enabled me to build a strong network of personal and professional relationships.

Finally, I would like to thank my parents for their unparalleled love and encouragement. Thank you for all the sacrifices you made and all the opportunities you gave me.

Contents

1 Introduction

1.1 Purpose and Outline of the Study

Mutual funds have entered the Italian market in 1984, and therefore the empirical evidence of performance measurement is limited, especially if compared with the US literature. The goal of the present study is to bridge this gap, by evaluating selective ability, market timing ability and performance persistence of Italian equity funds. In order to achieve this, a sample of 27 Italian equity funds has been extracted from Bloomberg database. Cesari and Panetta (2002) analysed a distant period in time (1984-1995) and did not include any four-factor model. Barucci (2007) considered a more recent study period (1997-2006), but focused on Jensen's alpha only. The present study is the most recent since it covers the period 2006-2015. On the flip side, the sample is not very representative of the whole population. From the initial sample of 32 funds, 5 of them were dropped because found with no returns, ending up with 27 funds. Moreover, risk factors to build the Fama-French and Carhart models were unavailable after 2013. For this reason, the sample size for multifactor models was further reduced to 19 funds during the period 2006-2013. Because of the limitedness of the sample size, we generate a larger sample of 1000 funds using R software and apply the CAPM. This study not only identifies funds exhibiting significant selectivity and market timing coefficients, but also controls for false discoveries in mutual fund performance, following the seminal paper by Barras et al. (2010).

This research focuses on open-end funds. Among the various categories, we consider only equity funds, i.e. those funds investing at least 70% of their assets in stocks. The objective of this thesis is to investigate Italian equity mutual funds, answering the following questions:

- Do Italian equity mutual fund managers have selective ability to outperform a passive benchmark? Jensen, Fama-French and Carhart models are used.
- Do Italian equity mutual fund managers have market timing ability? Treynor-Mazuy and Henriksson-Merton models are used.
- Do Italian equity mutual funds perform persistently? Both the non-parametric test by Goetzmann and Ibbotson and the parametric test by Grinblatt and Titman are used.

This dissertation is divided into the following sections. Section 1 introduces the topic. Section 2 presents the various performance measurement models. Section 3 reviews the relevant literature, from the efficient market hypothesis to selectivity, market timing and performance persistence. Section 4 presents the theory about false discoveries and performs a simulation using R software. Section 5 presents the sample of funds and all the other variables required by the study. Section 6 presents the findings of the analysis. Section 7 draws the main conclusions.

1.2 Categories of Mutual Funds

Mutual funds are investment vehicles made up of a pool of funds collected from many investors and allocated to stocks, cash, bonds and other securities. This provides small investors with the opportunity to access capital markets and benefit from portfolio diversification. Systematic risk is reduced by investing in assets with a low degree of correlation, with different styles and within different industries and countries.

Mutual funds can be either open-end or closed-end.

- *Open-end* mutual funds can be bought or sold anytime during the day. For this reason, open-end mutual funds must keep a certain level of liquidity. This can limit the fund performance, but ensures that the funds stands ready daily to buy and sell as many shares as required by investors. Open-end funds can create and destroy shares according to buy and sell orders. The price is calculated after the buy and sell orders and is set at the net asset value (NAV) at the end of the trading day.

- *Closed-end* mutual funds also allow investors to buy and sell shares in the open market, but only issue a set amount of the shares. Investors willing to redeem their shares must find a counterparty willing to buy them in the marketplace. The price at which investors can buy or sell their shares is driven by demand and supply and often trails below the NAV of the fund.

The next classification is based on the nature of the assets the funds invest in.

- *Bond funds*: cannot invest in stocks, but only in bonds and other debt instruments. Bond funds are adequate for investors with a low risk appetite, willing to achieve capital gains in the medium term.
- *Balanced funds*: have equity exposures between 10% and 90%, with the goal of achieving higher returns than bond funds, but being exposed to less volatility than equity funds.
- *Money market funds*: cannot invest in stocks, but only invest in money market securities and short-term securities that mature in 6 months or less.
- *Equity funds*: must allocate at least 70% of total assets to stocks. The goal is to achieve capital gains in the medium-long term. Equity funds suit investors having medium-high risk appetite and medium-long time horizon, able to invest their savings without withdrawal needs to meet unexpected expenses.
- *Flexible funds*: have no asset allocation constraints for equity and can invest 0-100% of their assets in stocks. Investors who

choose these funds have high risk appetite and a medium-long term horizon.

Mutual funds can have different management styles.

- *Passive management* is most common in the equity market, where the fund mimics a market index (Portfolio Performance, 2017). For instance, the Vanguard 500 Index Fund includes all the 500 stocks of the Standard and Poor's 500 Index on a market capitalisation basis. Passive management is based on the efficient market hypothesis (EMH), stating that asset prices fully reflect available information. According to the EMH, it makes little sense to try to anticipate the future to beat the market, because that would increase management fees and risk, without improving the performance. Passive management is also chosen in the presence of market inefficiencies, if the extra performance is not believed to cover management fees. Index funds are an example of passive funds.
- *Active management* is based on the claim that asset prices do not reflect their intrinsic value. The active manager exploits market inefficiencies by buying undervalued assets and selling overvalued assets. Active management can create value through selective ability and market timing. *Selective ability*, also known as selectivity or security selection, is a micro approach consisting in the ability to identify and buy (sell) undervalued (overvalued) securities. *Market timing* is a macro approach quantifying the ability to anticipate the market, buying before a bullish market and selling before a bearish market.

Along with selective ability and market timing, performance persistence is another interesting aspect when analysing the performance of mutual funds. The test for performance persistence distinguishes skill from luck, determines whether past performance is predictive of future performance and whether past winners (losers) repeat.

1.3 Overview of Performance Measurement Models

The mutual fund industry and its performance have received a lot of attention by researchers and practitioners. Different performance measures have been proposed to evaluate the performance of mutual funds and identify superior mutual funds.

A first measure of performance is given by raw returns, which do not consider the riskiness of an investment and therefore are inadequate to select the top performing mutual funds. Raw returns for an actively managed mutual fund can be compared with some benchmark, representing a passively managed fund, in order to obtain a relative performance measure, defined as excess return.

Modern portfolio theory by Markowitz introduced the concept of risk-adjusted returns, stating that the expected return of an investment must be corrected for its level of risk, as measured by volatility or standard deviation. The academic literature proposed several risk-adjusted performance measures, such as the Sharpe (1966) and Treynor (1965) ratios. Jensen (1968) developed a regression model based on the CAPM where the fund excess return is regressed against the market excess return. The intercept, named Jensen's alpha, measures the outperformance (if positive) or the underperformance (if negative) with respect to the chosen benchmark. The single factor model developed by Jensen is a simplified version of the theory expressing the portfolio return as a function of n risk factors (multifactor models). Fama and French (1992) expanded the Jensen model, proposing the Fama-French three-factor model, where the risk factors are excess market return, size and book-to-market. Carhart (1997) added an extra risk factor (momentum) to the Fama-French model, proposing the Carhart four-factor model. All of the above mentioned models include an intercept (alpha), which explains the positive or negative contribution of the fund manager to the fund return. Each model has a level of complexity that is an increasing function of the number of risk factors.

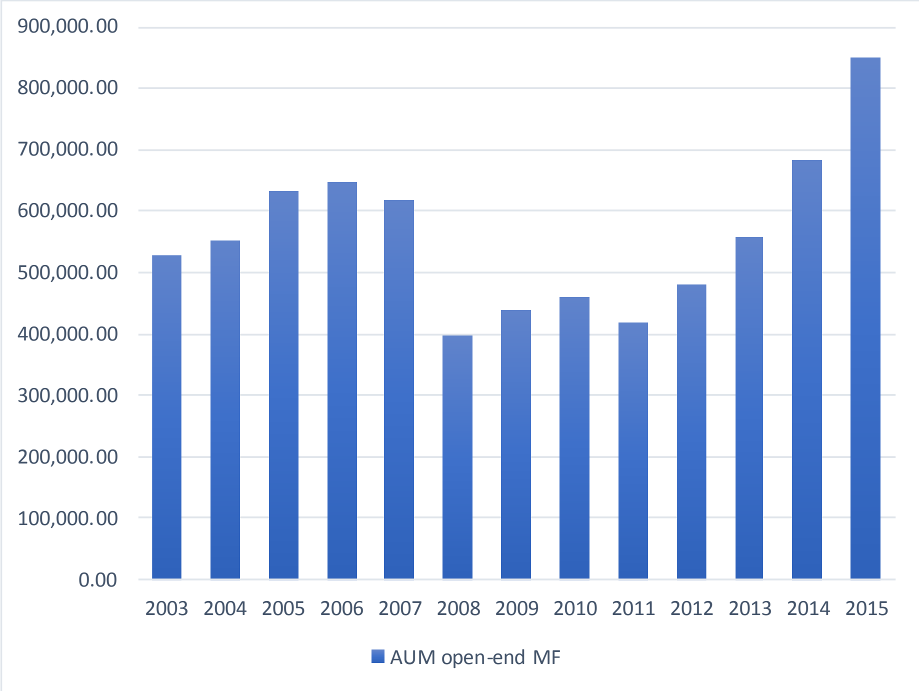
Both the single and multi-factor models focus only on selectivity. In order to separate stock picking and market timing skills, two market timing models have been proposed by Treynor and Mazuy (1966) and Henriksson and Merton (1981).

As for performance persistence, both parametric and non-parametric tests are employed. Goetzmann and Ibbotson (1994) used a two-way contingency table to perform a non-parametric test. Grinblatt and Titman (1992) and Brown, Goetzmann, Ibbotson and Ross (1992) used a regression model to perform a parametric test.

1.4 Key Industry Figures of Mutual Funds in Italy

Mutual funds have become increasingly important investment tools in modern capital markets. When the first mutual fund appeared in Italy in 1984, assets under management (AUM) were only €568 million. AUM in open-end mutual funds in Italy at the end of 2015 were €850 billion (see Figure 1.1). After peaking to €648 billion in 2006, AUM decreased from €616 billion in 2007 to €398 billion in 2008 (-35%), due to the liquidity crunch during the great financial crisis. By the end of 2014 open-end funds topped €683 billion in AUM, exceeding the pre-crisis level

Figure 1.1 - AUM in open-end mutual funds in Italy, 2003-2015 (billion €)



Source: Own elaboration on Assogestioni data

Funds under non Italian law account for 72% of the total AUM. Of the 4,520 mutual funds at the end of 2015, only 905 (20%) are under Italian law. These results (see Table 1.1) show how mutual funds under non Italian law dominate the industry. In a low interest rate environment, with a highly volatile stock market, flexible funds (€9 billion in net inflows in 2015) prevail, given the absence of constraints in the asset allocation. Bond funds manage the greatest amount of assets (€349 billion), followed by flexible funds (€204 billion) and equity funds (€188 billion). Most open-end mutual funds in Italy (4,520) are equity funds (1,638) and bond funds (1,403), weighting together 67% on the total (see Table 1.2).

Table 1.1 - Open-end mutual funds in Italy by law, 2015

(million € except no. Funds)	Net inflows	AUM	no. Funds
Funds under Italian law	2,737.24	234,459.00	905
Funds under non Italian law	6,523.79	615,494.69	3,615
Total	**9,261.03**	**849,954.25**	**4,520**

Source: Own elaboration on Assogestioni data

Table 1.2 - Open-end mutual funds in Italy by category, 2015

(million € except no. Funds)

Open-end funds		Net inflows	AUM	no. Funds
	Equity	3,465.22	188,337.98	1,638
	Balanced	1,409.43	68,085.40	254
	Bond	-2,068.02	349,240.84	1,403
	Money market	-217.39	35,084.72	150
	Flexible	6,809.43	203,883.22	978
	Hedge	-137.63	5,321.35	97
	Total	**9,261.03**	**849,954.25**	**4,520**

Source: Own elaboration on Assogestioni data

2 Theory

2.1 Efficient Market Hypothesis

The efficient market hypothesis (EMH) is an idea developed in 1970 by Eugene Fama. It is based on the following assumptions:

- Investors are *rational* and value securities rationally;
- If some investors are *irrational* and their investment decisions are *uncorrelated*, then their trades cancel each other and prices continue to reflect fundamental values;
- If some investors are *irrational* and their investment decisions are *correlated* (they exhibit herd behaviour), arbitrageurs (smart investors) intervene and bring back prices in line with their fundamental values (Sutton, 2000, p.632).

Market prices equal firms' fundamental values, i.e. the discounted value of expected future dividends. Whenever new information about the fundamental value of an asset appears, investors adjust their expectations instantaneously. For instance, if a firm reports good news in quarterly earnings, investors expect higher future dividends and quickly incorporate the new information content in asset prices. Prices adjust to the new level determined by the new present value of expected dividends. In efficient financial markets, "security prices at any time "fully reflect" all available information" (Fama, 1970, p.383). Assets may look overvalued or undervalued, but according to the EMH, asset prices simply adjust to new information, which is unpredictable by its very nature.

According to Shleifer (2000), it is impossible for the average investor (in the stock market, in pension funds or mutual funds, etc.) to "beat the market" (obtain above market returns) through security selection and market timing. Because of the randomness of the market, investors are better off investing in low-cost, passive portfolios. If the

EMH holds, investors must follow the market in order to maximise returns.

The EMH assumes investors are rational. Even assuming investors were *not rational*, markets would still be efficient. Irrational investors would trade randomly. When there is a high number of investors having *uncorrelated* investment strategies, it is likely that trades will cancel each other, maintaining prices close to their fundamental value (Shleifer, 2000).

When investors are *irrational* and have *correlated* investment strategies, the EMH still holds because of arbitrage opportunities, i.e. simultaneous purchase and sale of the same asset to profit from a difference in price. Let us assume that a group of irrational investors (noise traders) becomes excessively pessimistic about the future of a company and starts selling their stocks in the company, causing the price to fall below its fundamental value. Friedman (1953) argues that rational traders (arbitrageurs) will intervene, buying the undervalued stock and hedging by selling a “substitute” security, i.e. a stock of a company with similar cash flows. The increase in the demand for the undervalued security will bring back the price to its fundamental value (Kaizoji, 2008, p.4). The same rationale applies to an overvalued security, with arbitrageurs selling the overvalued stock and buying a “substitute” security.

The fact that investors are rational rules out arbitrage opportunities. New available information gets immediately and correctly reflected in asset prices. The price adjustment to the fundamental value is immediate so that arbitrageurs cannot profit from it.

Asset prices do not change if no new information is available. If shifts in offer or demand of a stock are only due to investors’ personal expectations about the positive or negative performance of a company, with no new information available, the stock price will not be affected. Notice that fair pricing of all securities does not mean that they will all have the same performance. The expected return of a security is a function of its risk. Therefore an investor can gain more just because she took on more risk.

We said that asset prices incorporate all available information at any point in time. But there are different kinds of information, and therefore three different versions of the EMH:

- *Weak form efficiency*: current prices reflect past information only. It is not possible to beat the market by analysing past prices and returns. Prices are efficient when fully reflecting all available information about past prices and traded volumes.
- *Semi-strong form efficiency*: current prices reflect "all publicly available information" (Clarke, 2001). The use of public information cannot provide any gain, because the new public information is immediately incorporated in asset prices. The assumption is stronger than the weak form, because public information includes not only past prices, but also financial statements, earnings and merger announcements, etc. (Clarke 2001). Past prices constitute only a part of public information.
- *Strong form efficiency*: current prices reflect "all existing information, both public and private" (Clarke, 2001). It is not possible to beat the market by using information not publicly known yet, i.e. profit from insider trading activity.

The most important statement of the EMH, and what will be tested in this study, is that no investor should be able to beat the market. According to the EMH, the best strategy is to invest in a low-cost index fund. Selective and market timing abilities should therefore be null and mutual fund managers as a group should not be able to outperform passive market indices. Manager would achieve gross returns in line with those earned by the passive index, but after computing net returns (deducting expenses) would end up with negative returns. This study will test whether fund managers are able to outperform the market or not, violating or validating the EMH.

2.2 Performance Measurement Ratios

The *Sharpe Ratio* is the most widely used indicator for risk-adjusted performance. It was introduced in 1966 by William Sharpe with the name reward-to-volatility ratio, as a measure for the performance of mutual funds. Before Sharpe, returns were just compared to a market index, without any adjustment for risk. The Sharpe ratio (S_i) measures the excess return of a mutual fund over a riskless asset, divided by the standard deviation of the mutual fund (Portfolio Performance, 2017). The Sharpe ratio therefore takes into account not only the return offered by a mutual fund, but also its risk. Often mutual funds are ranked according to this ratio and the best funds are those displaying the highest excess return per unit of risk (Morningstar, 2017). The Sharpe ratio considers the standard deviation of the fund, and not its beta, because it assumes non-systematic risk cannot be completely eliminated.

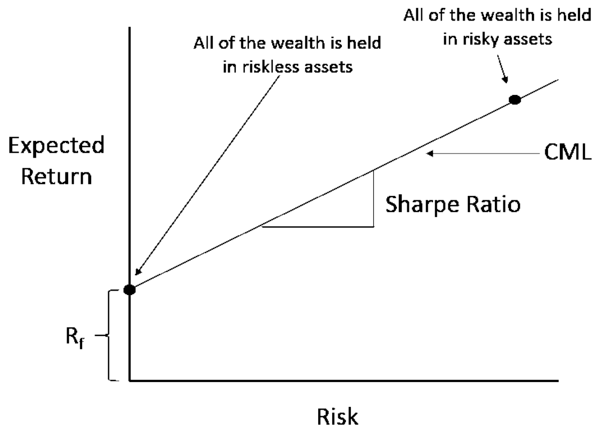
$$S_i = \frac{r_i - r_f}{\sigma_i}$$

with i=1,…,N

where:
N is the number of funds in the sample;
r_i is the average return for the i-th fund over the time period;
r_f is the average risk free rate over the time period;
σ_i is the standard deviation of the i-th fund over the time period.

The Sharpe ratio is an increasing function of the excess return of the fund and a decreasing function of the standard deviation of the fund. The Sharpe ratio is related to the capital market line (CML), i.e. the line resulting from all possible combinations between the risk free asset and a risky portfolio. From a geometric point of view, the Sharpe ratio can be defined as the slope of the line connecting the risk free rate and the fund return on the expected return-standard deviation plane (see Figure 2.1). The higher the Sharpe ratio, the higher the slope of the line: the preferred fund is the one positioned along the straight line through r_f having maximum slope.

Figure 2.1 – Capital Market Line and Sharpe Ratio



Source: Redford, C., 2014. Portfolio Theory

The Sharpe ratio presents some drawbacks. First of all, it is meaningful only when compared with another investment. Secondly, the Sharpe ratio falls short when returns do not follow a normal distributions and present skewness or kurtosis. When returns show heavy tails, the Sharpe ratio can lead to wrong investment decisions.

The *Treynor ratio*, introduced by Jack Treynor in 1965, derives from the Capital Asset Pricing Model (CAPM), where the standard deviation is replaced by systematic risk measured by beta (Portfolio Performance, 2017). The assumption here is that non-systematic risk can be eliminated. The Treynor ratio (T_i) measures the excess return of a mutual fund over a riskless asset, divided by the beta of the mutual fund.

$$T_i = \frac{r_i - r_f}{\beta_i}$$

with i=1,…,N

where:
N is the number of funds in the sample;

r_i is the average return for the i-th fund over the time period;

r_f is the average risk free rate over the time period;

β_i is the beta of the i-th fund over the time period.

The Treynor ratio is related to the security market line (SML), i.e. the line resulting from all possible combinations between the risk free asset and the market portfolio. From a geometric point of view, the Treynor ratio can be defined as the slope of the line connecting the risk free rate and the fund return on the expected return-beta plane. The preference for the Sharpe ratio or the Treynor ratio depends on the assumptions about the type of the investment. For large mutual funds, the Treynor ratio may be more appropriate because non-systematic risk is usually diversified away.

2.3 The Single Factor Capital Asset Pricing Model (CAPM)

In 1968 Michael Jensen developed a risk-adjusted performance measure to investigate the stock picking ability of a fund manager. Jensen's alpha (α) measures the excess return of a security above the return which would be justified by its systematic risk, as predicted by the Capital Asset Pricing Model (Portfolio Performance, 2017).

The CAPM is an equilibrium model that identifies the relationship between the expected return of a security (in this case of a mutual fund) and its risk as expressed by beta. The CAPM assumes the following:

- Investors are risk averse and maximise expected utility;
- Investors are mean-variance optimizers;
- All investors face the same one-period horizon;
- All investors can borrow and lend at the risk free rate;
- Investors have homogenous expectations for all the inputs entering the optimization process, i.e. expected returns, variance and covariances of the risky assets;

- No taxes nor transaction costs;
- Assets are infinitely indivisible;
- No restrictions on short selling.

According to modern portfolio theory, only systematic risk is relevant. There is no reward for non-systematic risk, because it can be eliminated through diversification. Mutual funds are usually diversified, therefore they should bear systematic risk only. Beta is a measure of the market risk or systematic risk of a security, and measures the correlation between the fund return and the market return (or other benchmark). It determines whether the fund is more or less risky than the market. If $\beta=1$, the fund is as risky as the market; if $\beta>1$, it is riskier than the market. If $\beta<1$, it is less risky than the market.

$$\beta = \frac{cov(r_i, r_m)}{var(r_m)}$$

with i=1,…,N

where N is the number of funds in the sample.

The numerator is the covariance between the fund returns and the market returns. The denominator is the variance of the market returns. The market can be replaced by an appropriate benchmark. In that case beta would be the covariance between the fund returns and the benchmark returns, divided by the variance of the benchmark returns.

Jensen's alpha can be defined as follows:

$$\alpha_i = r_i - E(r_i)$$

with i=1,…,N

where:
N is the number of funds in the sample;

α_i is the Jensen's alpha of the fund;
r_i is the realised return of the fund;
$E(r_i)$ is the expected return as predicted by CAPM, i.e. according to its systematic risk β.

$E(r_i)$ can be determined using the classical formulation of CAPM:

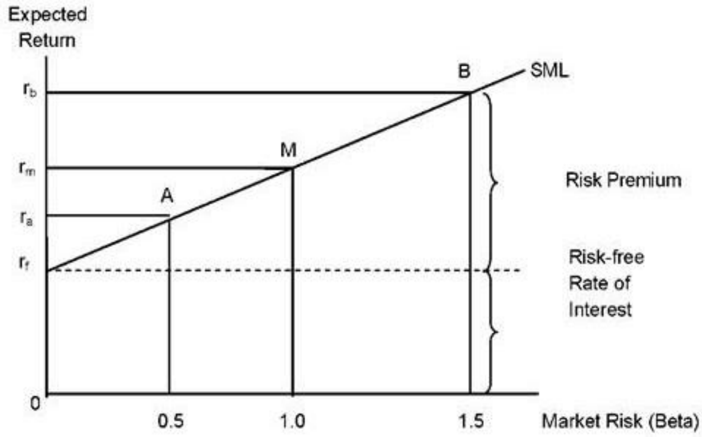
$$E(r_i) = r_f + \beta_i\left[E(r_m) - r_f\right]$$

with i=1,…,N

where:
N is the number of funds in the sample;
$E(r_i)$ is the expected return of the fund according to CAPM;
R_f is the risk free rate;
$E(r_m)$ is the expected market return.

The above expression is known as Security Market Line (SML). The SML represents the linear relationship between the fund excess return and its beta. The slope of the SML is the market risk premium (see Figure 2.2).

Figure 2.2 – Security Market Line



Source: Academlib, 2016. Security Market Line

The CAPM states that the expected return of a risky asset is equal to the risk free rate, plus a risk premium that is proportional to the systematic risk of the asset. Beta can be thought as the risk contribution of the considered asset to the risk of the market portfolio. The CAPM relationship can also be written in terms of excess returns:

$$E(r_i) - r_f = \beta_i[E(r_m) - r_f]$$

with i=1,…,N

where:
N is the number of funds in the sample.

The CAPM considers ex ante or expected returns, while in practice what we observe are ex post or realized returns. The single index model uses realized returns and is the suitable form for empirical analyses.

$$r_{i,t} - r_{f,t} = \alpha_i + \beta_i(r_{m,t} - r_{f,t}) + \varepsilon_{i,t}$$
$$R_{i,t} = \alpha_{i,t} + \beta_{i,t}R_{m,t} + \varepsilon_{i,t}$$

with i=1,…,N and t=1,…,T

where:
N is the number of mutual funds in the sample;
T is the number of time steps;
R_i is the fund excess return;
R_m is the market excess return;
ε_i is a random component (stochastic error) with zero expected value, representing the idiosyncratic, firm-specific risk.

In practice we regress the fund excess returns against the market index excess returns, estimating the coefficients α and β, where α is the intercept and β is the slope of the regression line.

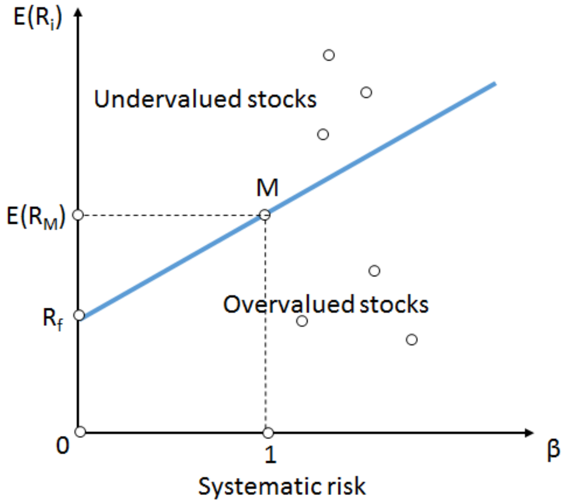
The CAPM predicts that α_i should be zero for all assets. This statement is about *expected returns* for securities: the expected value of alpha according to CAPM should be zero for all securities. Since the index model is about *realized returns*, it is about the realized value of alpha: according to the index model, the average alpha value for a sample of mutual funds returns should be zero (Bodie et al., 2011, p.295).

The CAPM holds if the estimate for α is not significantly different from zero. The CAPM falls short if $\alpha \neq 0$, meaning that the model is not able to explain a significant portion of the fund excess return. In this case factors other than the excess market index returns affect the fund returns. If $\alpha > 0$ the fund excess returns are higher than predicted by CAPM; if $\alpha < 0$ the fund excess returns are lower than predicted by CAPM (see Figure 2.3).

Mutual funds showing significantly positive α over time are able to beat the market, i.e. obtain a higher expected return than is consistent with their content of systematic risk. The excess return is achieved by the fund manager by buying undervalued securities and selling overvalued securities. Mutual funds showing significantly negative α over time are not able to beat the market and do not have selective ability. By buying overvalued securities they obtain a lower expected return than is consistent with systematic risk.

The CAPM and the index model look similar but show important differences. First of all, they have different objectives: CAPM is an equilibrium model determining what the price for risky securities should be; the index model aims at simplifying the calculations required to build the efficient frontier as the number of securities increases. Secondly, the portfolio used to compute β is different: the CAPM uses the market portfolio; the index model uses a market index as a benchmark. Moreover, the index model divides total risk in two components: systematic (market-wide) risk and non-systematic (idiosyncratic) risk.

Figure 2.3 – Capital Asset Pricing Model and mispricing



Source: Pilkington, P., 2013. The CAPM and the Non-Ergodic Axiom

2.4 Multifactor Models

According to the CAPM, beta is the only relevant measure of a stock's risk and only beta is necessary to explain differences in yield between securities. Empirical studies instead suggest that expected returns on securities can be explained by more than one variable (Suppa-Aim, 2010, p.22).

The Arbitrage Pricing Theory (APT) was developed by Stephen Ross in 1976. Unlike the CAPM, the APT specifies a multiple linear relationship between asset returns and different risk factors. The return on a risky asset is a linear combination of various macroeconomic factors. APT does not explicitly mention these factors, but assigns a key role to variables like GDP, inflation, unemployment, etc. Other models, like Fama-French, use fundamental factors, such as industry, market capitalization and book value.

The Fama-French model (1993) starts from the evidence that there is no perfect linearity between risk and returns as measured by beta. Inspired by the work of Basu (1977) and Banz (1981), Fama and French developed a three-factor model, the factors being:

- *Market risk premium*, equal to the difference between the market return and the risk free rate;
- *Size* of the company, measured by the market capitalization of the stock;
- *Book-to-market* (B/M) value, i.e. the ratio between the book value and the market value of the stock.

The size effect is widely accepted within the academic community. Small stocks are less liquid because of higher trading costs. In addition, small cap companies are riskier than large cap companies. A rational investor should therefore ask for a higher risk premium on small stocks.

More controversial is the explanation for the book-to-market effect. High book-to market (low price-to-book) stocks are known as "value stocks", while low book-to-market (high price-to-book) stocks are known as "growth stocks". A possible reason for value stocks earning higher returns than growth stocks may be that investors overreact to growth prospects for growth stocks. This would make growth stocks relatively overvalued and value stocks relatively undervalued.

Fama and French (1993) found that the risk premiums did not depend only on systematic risk, measured by beta, but showed a higher sensitivity to all the three factors when considered together. They obtained the following relationship for the risk premium of a stock:

$$r_{i,t} - r_{f,t} = \alpha_i + \beta_i(r_{m,t} - r_{f,t}) + s_i SMB_t + h_i HML_t + \varepsilon_{i,t}$$

with i=1,…,N and t=1,…,T

where:
N is the number of mutual funds in the sample;
T is the number of time steps;
α_i is the intercept of the regression and measures the performance of the mutual fund;

β_i, s_i and h_i are the slope coefficients.

Excess mutual fund returns, generated by strategies exploiting the inconsistencies of the CAPM, are decomposed into:

- Excess market returns;
- Returns generated by buying small stocks and selling large stocks (Small Minus Big – SMB);
- Returns generated by buying stocks with high B/M and selling stocks with low B/M (High Minus Low – HML) (Babalos, 2008, p.13).

Carhart (1997) added to the Fama-French model the momentum effect as analysed in Jegadeesh and Titman (1993). He found that best (worst) performing stocks over a 3-12 month period tend to perform well (poorly) also over the subsequent period (Suppa-Aim, 2010, p.25).

$$r_{i,t} - r_{f,t} = \alpha_i + \beta_i(r_{m,t} - r_{f,t}) + s_i SMB_t + h_i HML_t + w_i WML_t + \varepsilon_{i,t}$$

with i=1,…,N and t=1,…,T

where:
N is the number of mutual funds in the sample;
T is the number of time steps.

Returns generated by the momentum effect are obtained by buying stocks with high past performance and selling stocks with low past performance (Winners Minus Losers – WML). The intercept of this regression is a performance measure that takes into account not only market risk but also excess returns generated by the SMB, HML and WML strategies (Babalos, 2008, p.14).

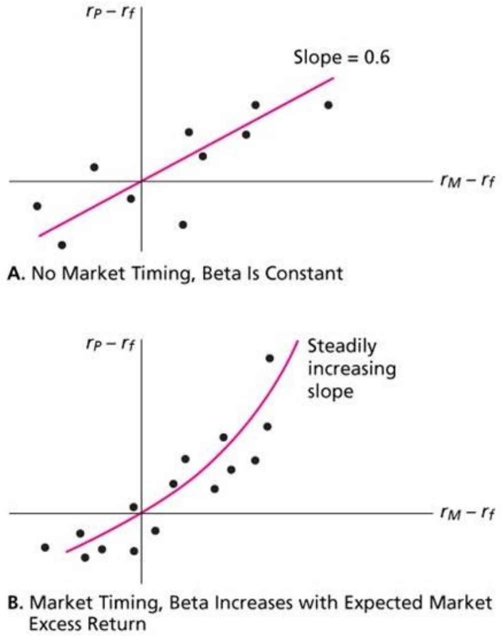
2.5 Market Timing Models

In absence of market timing, the intercept of the regression (Jensen's alpha) is accurate in quantifying the ability of fund managers to obtain superior returns. But the Jensen's alpha only measures selective ability and can be downward-biased in the presence of market timing ability. Jensen's alpha is estimated by regressing the excess fund returns against the market excess returns. The systematic risk of the fund, measured by its beta, is assumed to stay constant during the whole time period. But systematic risk can change because of deliberate choices by the fund manager or because of random fluctuations of the systematic risk of the securities included in the fund portfolio.

Market timing is the ability of mutual fund managers to predict market movements and adjust their portfolios accordingly. If they expect a bullish market they will increase beta; if they expect a bearish market they will decrease beta. The adjustment of the beta of the portfolio comes from a change in the investment mix between the risky and the risk free assets.

Treynor and Mazuy (1966) claimed that the relationship between the excess fund returns and the excess market returns, called characteristic line, was not a straight line as in Figure 2.4 A. If fund managers change the portfolio's risk in response to anticipated changes of market conditions, they will hold a portfolio with a high beta in bull market conditions and a portfolio with a low beta when in bear market conditions. The characteristic line will have a convex shape, becoming steeper as the market return increases (see Figure 2.4 B). If the fund manager times the market incorrectly, the characteristic line will have a concave shape.

Figure 2.4 – Market timing: characteristic lines



Source: Bodie, et al., 2011. Investments, p.835

Merton (1981) defined market timing as the ability of a fund manager to predict whether the market return will be higher or lower than the risk free rate. The manager will then switch between risky and risk free assets according to her predictions. In particular, if the manager predicts that $r_{m,t} > r_{f,t}$, she will switch from risk free to risky assets. Market timing models are an improvement of the Jensen's model since they differentiate between security selection (microforecasting) and market timing (macroforecasting).

In this study we use two different models which have been suggested in the literature.

The first one is based on the quadratic regression of Treynor and Mazuy (1966): if the fund manager changes the risk of the portfolio in response to anticipated changes of market conditions, increasing beta when a positive excess market returns is expected, and decreasing it in the opposite scenario, the characteristic line of the fund will no longer be linear and the beta becomes

$$\beta_{im} = \beta_i + \gamma^{TM}(r_{m,t} - r_{f,t})$$

that substituted into the equation

$$r_{i,t} - r_{f,t} = \alpha_i + \beta_{im}(r_{m,t} - r_{f,t}) + \varepsilon_{i,t}$$

gives the following characteristic line for the fund:

$$r_{i,t} - r_{f,t} = \alpha_i + \beta_i(r_{m,t} - r_{f,t}) + \gamma^{TM}(r_{m,t} - r_{f,t})^2 + \varepsilon_{i,t}$$

where:

α_i measures the selective ability of the manager;

γ^{TM} measures the market timing ability.

A positive (and statistically significant) value of γ^{TM} indicates superior market timing ability of the manager.

An alternative model to capture market timing ability has been proposed by Henriksson and Merton (1981), who defined market timing as the ability of managers to anticipate market movements, predicting whether the risky asset returns will be higher or lower than the risk free rate. As in the Treynor-Mazuy model, funds can alter portfolio composition subject to market movements, but the Henriksson-Merton model also incorporates the idea that fund managers can elect the level of market risk depending on whether they expect the excess market return to be positive or negative (Drew et al., 2005, p.112). The manager chooses β_{i0} if $r_{m,t} \leq r_{f,t}$ and $\beta_i (> \beta_{i0})$ if $r_{m,t} > r_{f,t}$.

If we define a dummy variable D_m such that

$$D_m = \begin{cases} 1 \; if \; r_{m,t} > r_{f,t} \\ 0 \; if \; r_{m,t} \leq r_{f,t} \end{cases}$$

$$D_m = \frac{\max(0, r_{m,t} - r_{f,t})}{r_{m,t} - r_{f,t}}$$

we can rewrite the beta of the market timing model by Henriksson and Merton as:

$$\beta_{im} = \beta_{i0} + (\beta_i - \beta_{i0})D_m = \beta_{i0} + (\beta_i - \beta_{i0})\frac{\max(0, r_{m,t} - r_{f,t})}{r_{m,t} - r_{f,t}}$$

Substituting this into the equation

$$r_{i,t} - r_{f,t} = \alpha_i + \beta_{im}(r_{m,t} - r_{f,t}) + \varepsilon_{i,t}$$

we obtain:

$$r_{i,t} - r_{f,t} = \alpha_i + \beta_{i0}(r_{m,t} - r_{f,t}) + (\beta_i - \beta_{i0})(r_{m,t} - r_{f,t})D_m + \varepsilon_{i,t}$$

$$r_{i,t} - r_{f,t} = \alpha_i + \beta_{i0}(r_{m,t} - r_{f,t}) + \gamma^{HM}\max(0, r_{m,t} - r_{f,t}) + \varepsilon_{i,t}$$

where $\gamma^{HM} = (\beta_i - \beta_{i0}) > 0$

In up-markets the portfolio beta is β_i ($>\beta_{i0}$), while in down-markets beta is only β_{i0}. If a manager possess market timing ability, the up-market beta β_i should be higher than the down-market beta β_{i0}. Merton and Henriksson interpret timing ability as a call option with strike price equal to the risk free rate, so that the return from market timing ability, $\max(0, r_{m,t} - r_{f,t})$, is the payoff from the call option.

3 Research on Performance Measurement

3.1 Selective Ability

Sharpe (1966) carries out the first empirical test about selective ability. He measures the reward-to-volatility ratio for 34 US equity mutual funds from 1954 to 1963, using annual returns. He does the same for the Dow Jones Index (DJIA) and compares the sample mean of the funds and that of the DJIA, assuming a normal distribution for the Sharpe ratio. The sample mean of the funds is 0.633, while the sample mean of the DJIA is 0.677. Using net returns (subtracting management fees), 11 funds outperform the DJIA, while 23 underperform. Using gross returns (adding back management fees), 19 outperform and 15 underperform. Sharpe concludes that mutual funds outperform the market index, but management fees bring the performance into negative territory.

Jensen (1968) estimates the CAPM for 115 US mutual funds during 1945-1964. This study, differently from Sharpe's study, uses beta rather than the standard deviation and also serves a different purpose. Jensen studies the ability of fund managers to obtain higher returns than consistent with the level of systematic risk. In other terms, he estimates the CAPM relationship by computing risk-adjusted excess returns (alphas). Jensen concludes that fund managers are not able on average to outperform the market (S&P 500): the average alpha for the sample, net of management fees, is -0.011, i.e. annual mutual fund alphas are on average 1.1% lower than market returns (see Table 3.1). 76 funds show a negative alpha; 39 funds have a positive alpha. Using gross returns (adding back management fees), alpha is still negative, -0.004 (-0.4%). Even though the results prove that the average mutual fund cannot outperform the market, it is still possible that at least one fund outperforms. Therefore Jensen runs a time series regression for each fund using net returns and computes the t-statistic for each individual funds' alpha estimate. At the 5% significance level, 14 funds have significantly negative alphas, 3 funds have significantly positive alphas and 98 funds have alphas that are not statistically different from zero (see Table 3.2). Moreover, on a sample of 115 funds, just by chance 5-6 funds should be significant. The conclusion is that mutual funds on average cannot outperform the market, nor any individual fund is able to. This conclusion holds even when using gross returns, meaning that mutual funds cannot even recoup management fees. Jensen suggests that his study supports the strong form version of the Efficient Market Hypothesis, i.e. gathering and analysing information does not lead to outperformance.

Table 3.1 - Jensen (1968). Average estimated regression statistics, 1945-1964

Alpha (net returns)	-0.011
Alpha (gross returns)	0.004
Beta	0.840
R squared	0.865

Source: Tables 2 and 4 in Jensen, M., 1968. The Performance of Mutual Funds in the Period 1945-1964. JoF 23(2), pp.400-403

Table 3.2 - Jensen (1968). Individual fund alphas, 1945-1964

Zero	98
Positive	3
Negative	14
Total	**115**

Source: Table 3 in Jensen, M., 1968. The Performance of Mutual Funds in the Period 1945-1964. JoF 23(2), pp.401-403

McDonald (1974) analyses the performance of 123 US mutual funds during 1960-1969. He uses different measures to evaluate mutual fund performance versus the market: mean monthly excess returns, Treynor ratio, Sharpe Ratio and Jensen's alpha. An unweighted index of all NYSE stocks is chosen as a benchmark. Let us focus on the risk-adjusted measures, leaving aside the monthly excess returns which are not adjusted for risk. The mean Treynor Ratio for the funds is 0.518, slightly higher than the market index value of 0.51. Approximately half (67 of 123) of the funds have higher values of Treynor ratio than the market index. The mean Sharpe ratio for the funds is 0.112, lower than the market index value of 0.133. Two-thirds (84 of 123) of the funds have lower values of Sharpe ratio than the market index. While Jensen obtains a mean annual alpha of -1.1%, McDonald finds a positive mean annual alpha of about 1.5%. At the 5% significance level, 117 of 123 funds have alphas that are insignificantly different from zero. 6 of 123 funds have alphas that are significantly different from zero, a proportion one would expect due to chance. The conclusion is that mutual funds do not perform significantly differently than the market.

Malkiel (1995) uses the CAPM model to compute alpha for a set of US equity mutual funds during 1972-1991. The average alpha, using the S&P 500 Index as a benchmark, is equal to -0.06%, with a t-statistic of -0.21, therefore not statistically different from zero (Malkiel, 1995, p.555). Using the Wilshire 5,000 Index as a benchmark, the average alpha is equal to -0.02% (t-statistic=0.13), but no individual alpha is statistically different from zero (Malkiel, 1995, p.556). The result is in accordance with Jensen's study.

Gruber (1996) analyses the performance of 270 US mutual funds during 1985-1994, using relative returns to the market, risk-adjusted returns from a single index model, and risk-adjusted returns from a four-index model. The S&P 500 Index is used as a market proxy. The factors in the multi-index model are the market, a size factor, a growth factor and a bond factor. Relative returns to the market (unadjusted) are -1.94% per year. Using a single index model, the average alpha is -1.56%. Using the four-factor model, the average alpha is -0.65%. All the three models suggest that mutual funds underperform the market.

Other academics claim that mutual funds are able to beat the market and reject the results obtained by Sharpe (1965) and Jensen (1968). Carlson (1970) investigates the performance of 82 US equity mutual funds during the 20-year period from 1948 to 1967, approximately the same period considered by Jensen. Using S&P 500 as the market index, the 82 funds obtain an average alpha of 0.6%, significantly higher than the -1.1% obtained by Jensen when using the same benchmark. Carlson suggests the choice of different time periods and/or different market indices as an explanation for the divergent results.

Mains (1977) argues that Jensen's (1968) results are biased, because mutual fund annual returns have been computed assuming dividends are reinvested at the end of the year, when in reality dividends are paid quarterly. Also systematic risk has been computed incorrectly. Both the issues have caused the alpha estimates to be downward biased. Mains (1977) uses monthly returns to fix the problem and rerun Jensen's study. The result this time is an average positive alpha of 0.09%. Mains concludes that mutual funds are not negative performers as stated by Jensen, but rather neutral performers. The performance is positive when using gross returns instead of net returns.

Further studies carried out in the mid-80s, over a time period ensuing the one chosen by Jensen, arrive at different conclusions than Jensen. Ippolito (1989) analyses the performance of 143 US mutual funds during a 20-year span (1965-1984). The study tests the efficient market hypothesis (EMH) when information is costly to obtain. Ippolito builds on the theories developed by Grossman and Stiglitz (1980), who state that if information is free, market efficiency ensures that security prices reflect all available information. Conversely, if information is costly, trades are made at different prices which do not reflect full information and that difference compensates investors for the cost of gathering information (Ippolito, 1989, p.1). If security prices reflect all available information, the market is overefficient, i.e. it is so well informed that investors cannot be compensated for gathering information. The scenario where information is costly is more realistic. If the market is efficient (there is compensation for gathering information), actively managed mutual funds necessarily outperform any passive strategy in order to recoup expenses of research and trading. Ippolito uses Jensen's methodology but obtains completely different results. Mutual funds analysed by Ippolito between 1965 and 1984 outperform their benchmarks (S&P 500, NYSE index, and an equally weighted S&P stock - Salomon Brothers long-term bond market index). The average alpha for the sample is 0.83 based on the S&P 500, 0.87 based on the NYSE index and 2.48 based on the S&P - Salomon Brothers index (see Table 3.3). Of the 143 funds, 127 have alphas that are insignificantly different from zero, 4 have significantly negative alphas and 12 significantly positive alphas (see Table 3.4). Being the results at a 5% significance level, 6-7 funds are expected to have significant alphas just by chance. Notice that positive alphas are net of management fees but gross of load charges (sales charges on purchase of shares from the fund). Subtracting load charges, alphas are no longer significantly positive, therefore risk-adjusted returns are just enough to offset management fees. Mutual funds imposing higher management fees earn higher risk-adjusted returns and are able to offset the higher fees. Mutual fund managers have selective ability.

Table 3.3 - Ippolito (1989). Average alpha estimate for different market indices, 1965-1984

S&P 500	0.83
NYSE	0.87
S&P - Salomon	2.48

Source: Table II in Ippolito, R., 1989. Efficiency With Costly Information A Study of Mutual Fund Performance, 1965-1984. QJE 104(1), p.8

Table 3.4 - Ippolito (1989). Individual fund alphas, 1965-1984	
Zero	127
Positive	12
Negative	4
Total	**143**

Source: Table I in Ippolito, R., 1989. Efficiency With Costly Information A Study of Mutual Fund Performance, 1965-1984. QJE 104(1), p.6

Elton et al. (1993) point out that the divergence between the results obtained by Jensen and Ippolito is due to the different performance of non-S&P assets in the respective time periods. Holding non-S&P assets causes negative alphas during the period studied by Jensen and positive alphas during the period studied by Ippolito, even if mutual fund managers have no selective ability (Elton et al., 1993, p.3). Accounting for the performance of non-S&P assets, Ippolito's findings are reversed and consistent with Jensen's study. Mutual funds underperform passive benchmarks (Elton et al., 1993, p.21).

Grinblatt and Titman (1989) argue that it is not surprising that mutual funds do not outperform the market, since skilled mutual fund managers charge higher fees and this reduces net returns. Selective ability can be detected only by using gross returns. Grinblatt and Titman use Jensen's model and choose the following benchmarks: "the monthly rebalanced equally weighted portfolio of all CRSP (New York and American Stock Exchange) securities, the CRSP value-weighted index, 10 factor portfolios created with factor-analytic procedures developed in Lehmann and Modest (1988), and the eight-portfolio benchmark, formed on the basis of firm size, dividend yield, and past returns developed in Grinblatt and Titman (1988)" (Grinblatt and Titman, 1989, p.395). Monthly net returns for the 1975-1984 period are collected. Aggressive-growth, growth funds and funds with the smallest NAV obtain the highest values of alpha. These funds also impose the highest expenses, which bring net performance close to zero, but superior performance may actually exist.

Wermers (2000) uses two datasets: the equity holdings of all US mutual funds existing from 1975 to 1994, and monthly net returns of all mutual funds existing from 1962 to 1997, including expense ratios and trading costs. The two databases are then merged by matching mutual fund names in order to obtain a complete profile of each mutual fund. The stocks held by mutual funds outperform the CRSP value weighted index by 1.3% per year, but mutual fund net returns are 1% below the CRSP index. Of the discrepancy of -2.3%, 0.7% is due to the underperformance of non-stock holdings, and 1.6% is due to expenses and transaction costs. Therefore, considering only stock holdings, mutual funds are able to outperform the market, but cash and bonds holdings drag down their net performance.

Fama and French (2010) analyse the performance of 1,308 US mutual funds during the period 1984-2006. The methodologies used are the CAPM, the three-factor model of Fama and French (1993) and the four-factor model of Carhart (1997). The market return is the return on a portfolio of NYSE, Amex and NASDAQ stocks. Both equally weighted (EW) and value weighted (VW) portfolios are created. Using net returns, mutual funds perform very poorly: annualised alphas are always negative, ranging from -1.13% (CAPM, VW returns) to -0.81% (Fama-French model, VW Returns). This is in accordance with the studies carried out by Jensen (1968), Malkiel (1995) and Gruber (1996). Using gross returns, alphas are positive with EW returns, from 0.18% (CAPM) to 0.39% (Carhart model), and mostly negative with VW returns, from -0.18% (CAPM) to 0.13% (Fama-French model).

Table 3.5 - Fama and French (2010). Average alpha estimates, 1984-2006					
	Methodology	Net		Gross	
		coeff	t-stat	coeff	t-stat
EW Returns	CAPM	-1.11%	-1.80	0.18%	0.31
	Fama-French	-0.93%	-2.13	0.36%	0.85
	Carhart	-0.92%	-2.05	0.39%	0.90
VW Returns	CAPM	-1.13%	-3.03	-0.18%	-0.49
	Fama-French	-0.81%	-2.50	0.13%	0.40
	Carhart	-1.00%	-3.02	-0.05%	-0.15

Source: Table II in Fama E., French, K., 2010. Luck versus Skill in the Cross-Section of Mutual Fund Returns, JoF 65(5), p.1920

3.2 Market Timing Ability

Treynor and Mazuy (1966) are the first to test market timing ability. They consider a sample of 57 US open-end mutual funds during the period 1953-1962. Most stocks tend to move up or down together and some stocks are more volatile than others, i.e. they are more sensitive to market-wide movements. If mutual fund managers expect the market to fall, they sell the most volatile stocks to buy less volatile securities like bonds. If mutual fund managers expect the market to rise, they sell less volatile securities to buy more volatile stocks. As a result, mutual fund managers having market timing ability should be holding more volatile portfolios when the market rises. The time period between 1953 and 1962 is considered to be adequate, since it is long enough to contain several ups and downs in the market, and short enough to keep fund policies homogenous. None of the 57 mutual funds shows market timing ability. Only one of the 57 funds shows a convex security characteristic line, while the others present a straight line. Mutual fund managers have no selective ability and investors can benefit from investing in mutual funds only if managers have selective ability.

Henriksson (1984) analyses 116 US open-end mutual funds during 1968-1980, using the market timing model developed by Henriksson and Merton (1981). Merton (1981) evaluates market timing without assuming any specific distribution of market returns or any specific security valuation methodology. Mutual fund managers rebalance the portfolio according to whether they forecast the market to outperform the risk free rate, without trying to estimate the magnitude of the outperformance. The market index is a value-weighted portfolio of all stocks on the NYSE. The study provides evidence that mutual funds do not have market timing ability: the market timing coefficient is negative for 62% of the funds. Only 3 of 116 funds have significantly positive market timing coefficients at the 5% significance level, and only 1 of 116 at the 1% significance level. Henriksson also discovers a negative relationship between selectivity and market timing ability: 49 of the 59 funds with positive alpha have a negative market timing coefficient (Aragon and Ferson, 2007, p.30).

Chang and Lewellen (1984) analyse 67 US mutual funds from 1971 to 1979, using the Henriksson-Merton model. The market portfolio is represented by the value weighted CRSP index. 41 of the 67 funds show positive alpha; 5 of 67 show significant alpha estimates, but of these, 3 are negative values (inferior selective ability). The 2 funds exhibiting significantly positive alpha are also 2 of the 3 funds that have significantly negative market timing ability. This means that there is a negative relationship between selectivity and market timing, in accordance with Henriksson's (1984) study. Beta is higher in down-markets than in up-markets. 7 of 67 mutual funds show a difference between up-market and down-market betas, but of these, 5 have negative market timing ability. The conclusion is that mutual fund managers have no selective and market timing abilities.

3.3 Performance Persistence

Sharpe (1966) is the first to test the performance persistence of mutual funds. He compares the performance of 34 US mutual funds during 1944-1953 and during 1954-1963, finding a positive though not perfect correlation of 0.36 (t-statistic=1.88) between the rankings for each sub-period. Sharpe also ranks mutual funds according to the Treynor ratio: the correlation between the two periods is 0.4 (t-statistic=2.47).

Jensen (1968) analyses 115 mutual funds during 1945-1964 and tries to find a relationship between the rankings based on Jensen's alpha. He concludes that there is little evidence that any individual fund can do better than what we would expect from random choice (Jensen, 1968, p.415).

Carlson (1970) considers 82 US equity mutual funds during the 20-year period from 1948 to 1967. He finds no evidence of performance persistence over 10-year periods, but the phenomenon becomes weakly relevant when the time period is further divided into 5-year sub-periods.

Grinblatt and Titman (1992) consider 279 US funds from 1974 to 1984. First, they divide the 10-year period into two 5-year sub-periods. Second, they compute the abnormal returns for each fund for each 5-year period. Third, they perform a cross sectional regression of abnormal returns in the last 5-year period on abnormal returns on the previous 5-year period. They finally test the statistical significance of the slope coefficients. The null hypothesis is that the slope coefficient is insignificantly different from zero and there is no performance persistence. A significantly positive t-statistic leads to the rejection of the null, supporting the alternative hypothesis that performance persistence does exist. The estimate for the slope coefficient is 0.28 and is significant almost at the 1% significance level (t-statistic=2.64). That means there is a significantly positive relationship between past and future performance: a mutual fund with an alpha of 1% in the first 5 years is expected to achieve an alpha of 0.28% in the following 5-year period (Grinblatt and Titman, 1992, p.1980). The results indicate that mutual funds exhibit positive performance persistence.

Brown et al. (1992) consider the period 1976-1987. They highlight the importance of survivorship bias. Poorly performing mutual funds are likely to shut down, leading to spurious performance persistence. For this reason a survivor-bias-free database is used. In each 3-year evaluation period, mutual funds are classified as winners if they are in the top half based on Jensen's alpha, and losers if they are in the bottom half. Brown et al. count the number of funds that repeat or do not repeat themselves in the following period, defining winners-winners (WW), winners-losers (WL), losers-winners (LW) and losers-losers (LL). Illustrating their results in two-way contingency tables (see Table 3.6), they determine that if a fund is ranked as a winner in the first 3-year period, it has over 50% probability to be a winner in the following 3-year period too (Brown et al., 1992, p.555). Given the number of WW, WL, LW and LL, they compute the cross product ratio (CPR), defined as:

$$CPR = \frac{WW \times LL}{WL \times LW}$$

A $CPR > 1$ reveals performance persistence. For the period 1976-1981, $CPR = \frac{44\times44}{19\times19} = 5.36$. For 1979-1984, $CPR = \frac{35\times35}{33\times33} = 1.12$. For 1982-1987, $CPR = \frac{52\times52}{25\times25} = 4.24$.

Performance persistence is strong and statistically significant in 1976-1981 and 1982-1987, and weak and not statistically significant in 1979-1984, when the CPR is only slightly higher than one.

Table 3.6 - Brown et al. (1992). Two-way contingency tables for performance persistence, 1976-1987

	1979-1981 winners	1979-1981 losers	**Total**
1976-1978 winners	44	19	**63**
1976-1978 losers	19	44	**63**
Total	**63**	**63**	**126**
	1982-1984 winners	1982-1984 losers	**Total**
1979-1981 winners	35	33	**68**
1979-1981 losers	33	35	**68**
Total	**68**	**68**	**136**
	1985-1987 winners	1985-1987 losers	**Total**
1982-1984 winners	52	25	**77**
1982-1984 losers	25	52	**77**
Total	**77**	**77**	**154**

Source: Table 1 in Brow n et al., 1992. Survivorship Bias in Performance Studies. RFS 5(4), p.556

Hendricks et al. (1993) analyse a sample of 165 US equity mutual funds from 1974 to 1988. They find there is positive performance persistence in the first 4 quarters and negative performance persistence afterwards. Mutual fund performance, evaluated using the Sharpe ratio and Jensen's alpha, is correlated to short-run performance persistence. In fact, the higher the ranking of a fund, the better the performance in the following quarter, both in terms of Sharpe ratio and Jensen's alpha. Funds having short-run positive performance persistence are called "hot hands", while funds having short-run negative performance persistence are called "icy hands". "Icy hands funds are more inferior than hot hands are superior" (Giles et al., 2002, p.20).

Goetzmann and Ibbotson (1994) analyse 276 US mutual funds during the period 1976-1988, using a similar methodology to the one used by Brown et al. (1992). Mutual funds are classified as winners or losers based on raw returns and Jensen risk-adjusted returns, over intervals of 2 years. The aim of the study is to check whether performance lasts more than one year, therefore requiring less frequent portfolio rebalancing. Table 3.7 shows two-way contingency tables, where funds are first ranked as winners and losers according to whether their 2-year returns are above or below average. Performance persistence in the following 2-year period is evaluated estimating alpha. From the two-way contingency tables, it is possible to compute the number of repeat winners (WW), repeat losers (LL), first winners and then losers (WL) and first losers and then winners (LW). This can be done by summing up the top left, bottom right, top right and bottom left corners respectively:

$$WW = 49 + 49 + 39 + 49 + 49 = 235$$

$$LL = 48 + 49 + 39 + 50 + 48 = 234$$

$$WL = 14 + 18 + 30 + 28 + 40 = 130$$

$$LW = 48 + 49 + 39 + 50 + 48 = 128$$

The number of initial winners (W) and initial losers (L) can be computed by summing over the top and the bottom rows under each "total" column respectively:

$$W = 63 + 67 + 69 + 77 + 89 = 365$$

$$L = 63 + 66 + 69 + 75 + 89 = 362$$

From these measures, Goetzmann and Ibbotson (1994) compute the percentage of initial winners that win (WW/W) or lose (WL/W) during the following period. Similarly they compute the percentage of initial losers that lose (LL/L) or win (LW/L) during the following period.

$$\frac{WW}{W} = \frac{235}{365} = 64.38\%$$

$$\frac{WL}{W} = \frac{130}{365} = 35.62\%$$

$$\frac{LL}{L} = \frac{234}{362} = 64.64\%$$

$$\frac{LW}{W} = \frac{128}{362} = 35.36\%$$

Table 3.7 - Goetzmann and Ibbotson (1994). Two-way contingency tables for performance persistence, 1976-1988

	1978-1979 winners	1978-1979 losers	**Total**
1976-1977 winners	49	14	**63**
1976-1977 losers	15	48	**63**
Total	**64**	**62**	**126**
	1980-1981 winners	1980-1981 losers	**Total**
1978-1979 winners	49	18	**67**
1978-1979 losers	17	49	**66**
Total	**66**	**67**	**133**
	1982-1983 winners	1982-1983 losers	**Total**
1980-1981 winners	39	30	**69**
1980-1981 losers	30	39	**69**
Total	**69**	**69**	**138**
	1984-1985 winners	1984-1985 losers	**Total**
1982-1983 winners	49	28	**77**
1982-1983 losers	25	50	**75**
Total	**74**	**78**	**152**
	1986-1987 winners	1986-1987 losers	**Total**
1984-1985 winners	49	40	**89**
1984-1985 losers	41	48	**89**
Total	**90**	**88**	**178**

Source: Goetzmann and Ibbotson, 1994. Do Winners Repeat? Patterns in Mutual Fund Performance. JPM 20(2)

This study confirms that past performance and relative rankings are useful to predict future mutual fund performance. Goetzmann and Ibbotson (1994) state that there is strong evidence of performance persistence, since both winners and losers are likely to repeat.

Malkiel (1995) considers a sample that goes from 210 funds in 1971 to 684 funds in 1991. He uses the same two-way contingency tables used by Goetzmann and Ibbotson (1994), based on alpha estimates. He finds evidence of performance persistence in the 70s, but not in the 80s: repeat winners are 65.1% in the 70s but only 51.7% in the 80s. Initial winners are more likely to be winners, rather than losers, in the following period (WW>WL). Winning persistence is significant in all but two years. Initial losers are more likely to be losers, rather than winners, in the following period (LL>LW). According to Malkiel, there is evidence of "hot hands", but just for the first decade (1980-1991). Moreover, choosing to invest in "hot hands" mutual funds leads to high load charges (up to 8% of NAV), and investors are better off investing in a low cost index fund.

Brown and Goetzmann (1995) analyse 372 funds in 1976 up to 829 funds in 1988. They use contingency tables based on CAPM alphas and Fama-French alphas. 1,304 funds are repeat winners (WW), 1,237 are repeat losers (LL) and 1,936 reverse roles (either WL or LW). An advantage of picking winners is that they are less likely to shut down. In fact, losers in a given period are twice as likely to shut down in the following period as compared to winners in the same given period. Negative performance persistence (repeat losers) is stronger than positive performance persistence (repeat winners). Brown and Goetzmann (1995) rank funds in octiles and "show that previous years' rankings are strong predictors of negative alphas (9 out of 12 years the bottom octile has a negative alpha) but are not necessarily good predictors of positive alphas (7 out of 12 years the top octile has a positive alpha)" (Anderson and Ahmed, 2005, p.38). That means that past performance can tell investors which funds to avoid, but is not very effective in suggesting which funds to pick.

Elton et al. (1996) analyse 188 funds during 1977-1993. They use a four-factor model to obtain 1-year and 3-year alphas and, according to these measures, rank the funds into deciles. They "find that past performance is predictive of future risk-adjusted performance in both the short run and longer run" (Elton et al., 1996). Performance persistence is stronger for 3-year alphas than for 1-year alphas. Investing in the top decile, one can expect to earn 0.009% per month when performance is based on 1-year alphas, and 0.015% when performance is based on 3-year alphas. Conversely, investing in the bottom decile produces negative excess returns: -4.37% based on 1-year alphas, and -3.97% based on 3-year alphas. The study claims that mutual fund performance persistence exists and can be beneficial for investors.

Carhart (1997) believes that previous studies well document performance persistence, but fail to identify the true cause of performance persistence. He claims that performance persistence is not due to selective ability, common investment strategies or differential information, but rather to common factors in stock returns and differences in expenses and transaction costs (Carhart, 1997, p.79). For instance, in Hendriks et al.'s (1993) study, the momentum factor explains performance persistence. Carhart (1997) attributes performance to the following factors: beta, small-minus-big (SMB), high-minus-low (HML) and momentum (WML). Carhart estimates that mutual funds in the top decile will outperform mutual funds in the bottom decile by 3.5%, even though outperformance is due to the inferior performance of bottom funds rather than to the superior performance of top funds. The size (SMB) and momentum (WML) factors explain most of the performance persistence phenomenon. Pursuing a momentum strategy can be effective for investors, but most of the times expenses and transaction costs lead to underperformance (Carhart, 1997, p.80).

3.4 Empirical Studies on Mutual Funds in Italy

The first study about the performance of mutual funds in the Italian market is performed by Cesari and Panetta (2002), who analyse 82 Italian open-end equity mutual funds between 1985 and 1995, using both net and gross returns as well as single factor (CAPM) and multifactor (Fama-French) models (Cesari and Panetta, 2002, p.100). Using net returns (calculated after management fees and taxes, but before distribution fees), the performance of Italian equity funds is positive but statistically indifferent from zero: the net alpha for the entire sample is an insignificant 1.09%, both with the single factor and 3-factor models (see Table 3.8). The Fama-French 3-factor model has a higher adjusted R-squared and therefore is the most appropriate to evaluate mutual fund performance. Using gross returns (adding back management fees), the performance is always positive and statistically significant: the gross alpha for the sample is a significant 2.41% (see Table 3.8). In other terms, mutual funds may have superior performance, but the extra performance is absorbed by management fees. The result confirms the efficiency market hypothesis (EMH) as developed by Ippolito (1989), building on Grossman and Stiglitz (1980), stating that investors are compensated for gathering information (Cesari and Panetta, 2002, p.99). Market timing ability is investigated using Treynor-Mazuy (1966) and Henriksson-Merton (1981) models. The timing coefficients are negative and never significant, meaning that fund managers cannot anticipate market-wide movements (see Table 3.9).

Table 3.8 - Cesari and Panetta (2002).
Net Alpha vs Gross Alpha, 1985-1995

Model	Net Alpha (%)	Gross Alpha (%)	Adj R^2
CAPM	1.09	2.41*	0.88
Fama-French	1.09	2.41**	0.93

*Significant at the 10% level
**Significant at the 5% level

Source: Table 2 in Cesari, R. and Panetta, F., 2002.
The Performance of Italian Equity Funds. JBF 26(1), p.112

Table 3.9 - Cesari and Panetta (2002).
Market Timing Coefficients, 1985-1995

Model	Treynor-Mazuy	Henriksson-Merton
CAPM	-0.08	-0.04
Fama-French	-0.11	-0.03

Source: Table 3 in Cesari, R. and Panetta, F., 2002.
The Performance of Italian Equity Funds. JBF 26(1), p.114

These results are confirmed by Otten and Bams (2002), who analyse the performance of 506 mutual funds in the 5 most important European countries (including 37 Italian funds) between 1991 and

1998. The study considers only equity funds investing in their domestic market, and despite the limited sample size, it takes into account 44% of the Italian equity mutual funds. Italian funds obtain the second highest mean return, 15.2%, proportionately to the highest risk as expressed by a standard deviation of 19.6% (see Table 3.10).

Table 3.10 - Otten and Bams (2002). Summary statistics for European mutual funds, 1991-1998

Country	Mean Return (%)	Std Deviation (%)
France	10.9	14.2
Germany	13.9	17.5
Italy	15.2	19.6
Netherlands	22.0	16.6
UK	12.3	13.9

Source: Table 3 in Otten, R. and Bams, D., 2002. European Mutual Fund Performance. EFM 8(1), p.80

The methodologies used by Otten and Bams (2002) are the Fama-French three-factor model and the Carhart four-factor model (see Table 3.11). The net alpha estimates produced by the two methodologies provide quite different results in the case of Italian and UK mutual funds. In particular, using the Fama-French model, and therefore dropping the momentum factor (WML), Italian funds show a better performance (from 0.84% to 1.80%), while UK funds having significantly positive alphas at the 5% level become significant only at the 10% level, with alpha estimates decreasing from 1.33% to 0.93%. This can be explained by the fact that Italian funds have a positive loading on the WML factor and a quite high return of the WML portfolio. Therefore, when dropping the WML factor, alpha increases (Otten and Bams, 2002, p.87). UK funds, instead, have a negative loading on the momentum factor and a quite high return of the WML portfolio (Otten and Bams, 2002, p.87). Therefore, when dropping the WML factor, alpha decreases. Italian funds successfully implement a momentum strategy, investing in funds having good past performance (winners), while UK funds unsuccessfully follow the opposite strategy, investing in funds with bad past performance (losers). The Carhart four-factor model is more appropriate than the Fama-French three factor model to estimate mutual fund performance, as it has a higher average adjusted R-squared (see Table 3.11).

Table 3.11 - Otten and Bams (2002). Carhart 4-factor vs Fama-French 3-factor model (net returns), 1991-1998

Country	Carhart alpha (%)	Adj R^2	FF alpha (%)	Adj R^2
France	0.22	0.97	0.23	0.96
Germany	-1.20	0.97	-1.32	0.96
Italy	0.84	0.95	1.80	0.94
Netherlands	1.80	0.95	2.02*	0.95
UK	1.33**	0.98	0.93*	0.98

*Significant at the 10% level
**Significant at the 5% level

Source: Table 6 in Otten, R. and Bams, D., 2002. European Mutual Fund Performance. EFM 8(1), p.87

As in the studies by Jensen (1968), Ippolito (1989) and Cesari and Panetta (2002), mutual fund performance is considerably higher before fees. Gross and net performance are compared using the Carhart model. Considering gross returns, mutual funds are able to beat the market, as shown by the significantly positive alphas. Italian and UK funds exhibit significantly positive gross alphas at the 5% level, French and Dutch funds at the 10% level (see Table 3.12). Net alphas are all positive, except for Germany, though only UK mutual funds exhibit a significant net alpha. Italian mutual funds earn a positive net alpha of 0.84%, which is statistically insignificant (see Table 3.12).

Table 3.12 - Otten and Bams (2002). Net Alpha vs Gross Alpha, Carhart model, 1991-1998		
Country	**Net Alpha (%)**	**Gross Alpha (%)**
France	0.22	1.4*
Germany	-1.20	-0.36
Italy	0.84	2.88**
Netherlands	1.80	2.64*
UK	1.33**	2.56**

*Significant at the 10% level
**Significant at the 5% level

Source: Table 8 in Otten, R. and Bams, D., 2002. European Mutual Fund Performance. EFM 8(1), p.90

Casarin et al. (2003) reach similar conclusions considering 57 Italian equity mutual funds between 1988 and 1999: net returns and market timing coefficients are not statistically different from zero. Petrella (2006) instead, analysing Italian equity mutual funds between 1999 and 2004, finds that gross excess returns are statistically not different from zero, while net excess returns are negative with a positive market timing, especially for equity funds.

Barucci (2007) analyses both foreign and Italian mutual funds operating in Italy between 1997 and 2006, using CAPM, Treynor-Mazuy (1966) and Henriksson-Merton (1981) models. He carries out one of the most complete studies about the performance of mutual funds in Italy and obtains completely different results from Cesari and Panetta (2002) and Otten and Bams (2002). Italian mutual funds underperform relative benchmarks in terms of net returns, generating negative alphas, which are statistically significant at the 1% significance level (see Table 3.13). On the contrary, foreign mutual funds perform similarly to their benchmarks. Italian funds (under Italian law) show a significantly positive market timing, while foreign funds (under non Italian law) show a negative, though statistically insignificant, market timing. Barucci also analyses gross performance (gross of distribution fees, but net of management fees). Using Treynor-Mazuy and Henriksson-Merton models, gross alphas are statistically indifferent from zero during 1997-2006 (see Table 3.14), but are significantly positive at the 1% significance level during 2004-2006 (see Table 3.15), meaning that Italian funds are able to outperform their benchmark during this sub-period.

Table 3.13 - Barucci (2007). Net Performance, 1997-2006

Model	Variable	Italian Funds	Foreign Funds
CAPM	Alpha	-0.0012*	0.0001
	R-squared	0.8150	0.6864
Treynor-Mazuy	Alpha	-0.0015*	0.0001
	Market Timing coeff	0.2153*	-0.0556
	R-squared	0.8154	0.6865
Henriksson-Merton	Alpha	-0.0015*	0.0003
	Market Timing coeff	0.0205	-0.0230
	R-squared	0.8150	0.6865

Regressions based on 682 Italian funds and 301 foreign funds
*Significant at the 1% level

Source: Tables 27 in Barucci, E., 2007. Raccolta e performance dei fondi comuni di investimento in Italia. Assogestioni WP 1, p.65

Table 3.14 - Barucci (2007). Gross Performance of Italian funds, 1997-2006

Model	Variable	Coefficient
CAPM	Alpha	0.0003*
	R-squared	0.8136
Treynor-Mazuy	Alpha	-0.0001
	Market Timing coeff	0.2456*
	R-squared	0.8142
Henriksson-Merton	Alpha	-0.0002
	Market Timing coeff	0.0389*
	R-squared	0.8183

Regressions based on 568 Italian funds
*Significant at the 1% level

Source: Table 33 in Barucci, E., 2007. Raccolta e performance dei fondi comuni di investimento in Italia. Assogestioni WP 1, p.72

Table 3.15 - Barucci (2007). Gross Performance of Italian funds, 2004-2006

Model	Variable	Coefficient
CAPM	Alpha	0.0002**
	R-squared	0.8208
Treynor-Mazuy	Alpha	0.0005*
	Market Timing coeff	-0.5441*
	R-squared	0.8217
Henriksson-Merton	Alpha	0.0005*
	Market Timing coeff	-0.0442*
	R-squared	0.8210

Regressions based on 568 Italian funds
*Significant at the 1% level
**Significant at the 5% level

Source: Table 32 in Barucci, E., 2007. Raccolta e performance dei fondi comuni di investimento in Italia. Assogestioni WP 1, pp.70-71

4 False Discoveries in Mutual Fund Performance

4.1 False Discoveries Theory

The goal of this study is to detect the mutual funds which truly outperform their benchmarks. After computing net returns, we compute alpha from the various asset pricing models. We aim to classify the M mutual funds in our sample as either:

- *Unskilled funds*, having $\alpha<0$, i.e. unable to perform well enough to cover expenses;
- *Zero-alpha funds*, having $\alpha=0$, i.e. just able to cover expenses;
- *Skilled funds*, having $\alpha>0$, i.e. able to obtain positive after cost alphas.

When analysing the performance of mutual funds, we test a null hypothesis of no outperformance ($\alpha=0$) versus an alternative of positive or negative performance ($\alpha\neq0$). We choose a rejection region and an associated significance level γ (Cuthbertson and Nitzsche, 2013, p.88), measuring the probability of committing a type I error, i.e. rejecting the null when the null is true. If the estimated alpha lies in the rejection region, or equivalently the p-value is smaller than γ, we reject the null of no outperformance (Cuthbertson and Nitzsche, 2013, p.88). A lucky (or unlucky) fund is a fund with a significant estimated alpha (we reject the null), while it truly has a zero alpha, i.e. the null is true and should not be rejected (Barras et al., 2005, p.5). In single hypothesis testing, at $\gamma=5\%$, we would expect 5% of the zero-alpha funds to exhibit significant estimates. These funds will be either lucky funds, i.e. positive significant estimate but true alpha is zero, or unlucky funds, i.e. negative significant estimate but true alpha is zero (Barras et al., 2005, p.1). On the contrary, in multiple hypothesis testing, the probability of finding at least one fund with significant alpha at γ=5% is much higher than 5% (Barras et al., 2005, p.1). For M independent tests, this probability is equal to the compound type I error and is equal to $1-(1-\gamma)^M$. If M=50 and γ=0.05, the probability is $1-(1-0.05)^{50}=0.92$ (Cuthbertson and Nitzsche, 2013, p.88).

A possible solution to reduce the compound type I error is to choose a conservative significance level γ. For instance Bonferroni test sets $\gamma/M=0.000125$ (VanderWeele, 2015, p.344). This has the advantage of controlling the compound type I error, known as FWER (Family Wise Error Rate) at γ, but may exclude truly outperforming mutual funds (Cuthbertson and Nitzsche, 2013, p.88). On one hand, this type of test limits the number of funds with significant alpha estimates but true zero alpha. On the other hand, it provides no information about the prevalence of non-zero alpha funds. Other statistical tests have been proposed to balance the risk of committing type I errors and the chance of identifying truly performers. Benjamini and Hochberg (1995) proposed the False Discovery Rate (FDR), defined as the expected proportion of false positives over all the positives, or equivalently the number of erroneously rejected null hypotheses over the total number of rejected null hypotheses. The FDR approach can separate truly significant funds from false discoveries, and can provide information about the location of skilled funds in the right tail and unskilled funds in the left tail. For each mutual fund the following statistical test is carried out:

$$H_0: \alpha_i = 0$$

$$H_1: \alpha_i \neq 0$$

with i=1,…,M
where M is the number of mutual funds in the sample.

α_i is computed with the single-index or multi-index models. The individual fund p-values are computed with asymptotic theory. The i-th fund exhibits a significant performance if its p-value is smaller than the chosen significance level γ. Using the standard approach, we would simply count the number of significant funds. But this approach cannot distinguish skill from luck (Barras et al., 2005, p.6). The FDR approach, instead, identifies how many funds, among the significant funds, are truly skilled (Barras et al., 2005, p.1):

$$S(\gamma) = F(\gamma) + T(\gamma)$$

where:

$S(\gamma)$ is the number of significant funds;

$F(\gamma)$ is the number of lucky (unlucky) funds or false discoveries;

$T(\gamma)$ is the number of truly significant funds.

The procedure to compute the truly non-zero alpha funds is the following. From the individual mutual fund p-values we compute the FDR, defined as the expected proportion of lucky (unlucky) funds among the significant funds (Barras et al., 2005, p.7):

$$FDR(\gamma) = E\left(\frac{F(\gamma)}{S(\gamma)}\middle| S(\gamma) > 0\right)$$

The impact of luck can be measured by computing the number of lucky funds:

$$F(\gamma) = FDR(\gamma) \times S(\gamma)$$

From the number of lucky funds we can finally compute the number of truly non-zero alpha funds:

$$T(\gamma) = S(\gamma) - F(\gamma)$$

Let us see more in detail how to go through each step. First of all, we have to compute the FDR. We use expected proportions of funds belonging to a given category, rather than counting the number of funds belonging to that category (see Section 4.2).

Let us define:

$E(S_\gamma^+)$ is the expected proportion of significantly positive funds;

$E(S_\gamma^-)$ is the expected proportion of significantly negative funds;

$E(F_\gamma^+)$ is the expected proportion of lucky funds, i.e. zero-alpha funds with positive and significant alpha estimates;

$E(F_\gamma^-)$ is the expected proportion of unlucky funds, i.e. zero-alpha funds with negative and significant alpha estimates;

$E(T_\gamma^+)$ is the expected proportion of skilled funds;

$E(T_\gamma^-)$ is the expected proportion of unskilled funds;

π_A^+ is the unobservable proportion of skilled funds in the population, estimated by $E(T_\gamma^+)$;

π_A^- is the unobservable proportion of unskilled funds in the population, estimated by $E(T_\gamma^-)$.

At the γ significance level, the probability that a fund exhibits "good luck" is γ/2 (Cuthbertson and Nitzsche, 2013, p.88). Defining the (unknown) proportion of zero-alpha funds in the population π_0, the expected proportion of lucky funds (Cuthbertson and Nitzsche, 2013, p.88) is:

$$E(F_\gamma^+) = \pi_0(\gamma/2)$$

Adjusting the expected proportion of significantly positive funds for the presence of lucky funds:

$$E\left(T_\gamma^+\right) = E\left(S_\gamma^+\right) - E\left(F_\gamma^+\right) = E(S_\gamma^+) - \pi_0(\gamma/2)$$

In a two-tailed test, the probability that a fund exhibits "bad luck" is also γ/2, and the expected proportion of unskilled funds is:

$$E\left(T_\gamma^-\right) = E\left(S_\gamma^-\right) - E\left(F_\gamma^-\right) = E(S_\gamma^-) - \pi_0(\gamma/2)$$

The choice of γ determines the portion of the tail considered to separate lucky funds from skilled funds and unlucky funds from unskilled funds. As we increase the significance level γ, we increase the chance of including skilled and unskilled funds, and therefore $E(T_\gamma^+)$ and $E(T_\gamma^-)$ converge to the true population parameters π_A^+ and π_A^-. Type II error is minimized as we minimize the risk of failing to reject the null, when the alternative is true, i.e. erroneously classifying skilled and unskilled mutual funds as zero-alpha funds. Fine-tuning γ also provides information about the location of skilled and unskilled funds. Let us consider the right tail of the distribution and examine how an increase of γ may affect the number of skilled funds $E(T_\gamma^+)$. If the number of skilled funds slightly increases with γ, skilled funds are concentrated further out in the extreme right tail of the cross-sectional distribution; the new significant funds are mostly lucky funds (Cuthbertson and Nitzsche, 2013, p.88). If the number of skilled funds largely increases with γ, skilled funds are more dispersed in the right tail; the new significant funds are truly significant funds (Barras et al., 2010).

The FDR for the significantly positive alpha funds (Cuthbertson and Nitzsche, 2013, p.88) is:

$$FDR_\gamma^+ = \frac{E\left(F_\gamma^+\right)}{E\left(S_\gamma^+\right)} = \frac{\pi_0(\gamma/2)}{E\left(S_\gamma^+\right)}$$

We require an estimate of π_0. For this purpose it useful to think about the distribution of mutual fund p-values. Truly null p-values verify the null α_i=0 and have a uniform distribution in [0,1]. Truly alternative p-values have small p-values having a spike near zero (Barras et al., 2005, p.9). We know that all the p-values larger than a certain threshold λ belong to truly zero alpha funds.

The proportion of individual fund p-values exceeding λ (left hand side of the equation below), can be approximated by the area to the right of λ, the light-shaded area in Figure 4.1 (Cuthbertson and Nitzsche, 2013, p.89):

$$E\left(\frac{\#\{p_i > \lambda)}{M}\right) = (1-\lambda)\hat{\pi}_0(\lambda)$$

The formula to estimate π_0 becomes:

$$\hat{\pi}_0(\lambda) = \frac{W(\lambda)}{M(1-\lambda)} = \frac{\#\{p_i > \lambda)}{M(1-\lambda)}$$

where:

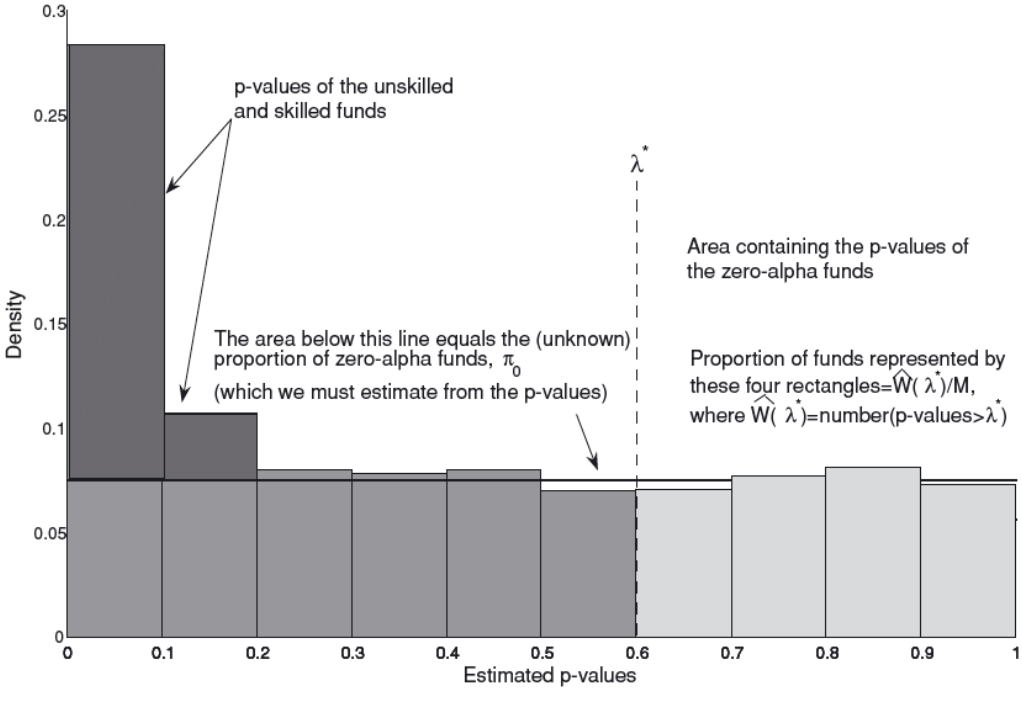
$W(\lambda)$ is the number of p-values greater than λ;

M is the total number of p-values;

λ is the tuning parameter ranging from 0 to 1.

The first and simplest method to estimate $\hat{\pi}_0(\lambda)$ is to choose a value λ for which the histogram of the p-values becomes flat (Cuthbertson and Nitzsche, 2013, p.89). This is an "eyeball" estimate that approximates $\hat{\pi}_0(\lambda)$ with the height of the flat portion of the histogram. If λ tends to zero, almost all the p-values are greater than λ and most of the p-values distribution is flat. Therefore the numerator tends to M and $\hat{\pi}_0(\lambda)$ tends to 1, meaning that almost all the funds are truly zero alpha funds. As λ increases, the chance of including non-zero alpha funds decreases, and the bias in the estimate of $\hat{\pi}_0(\lambda)$ decreases. At the same time, fewer p-values are included and therefore the variance in the estimate of $\hat{\pi}_0(\lambda)$ increases (Cuthbertson and Nitzsche, 2013, p.89).

Figure 4.1– Histogram of fund p-values



Source: Barras, et al., 2010. False Discoveries in Mutual Fund Performance: Measuring Luck in Estimated Alpha. JoF 65(1), p.188

Other methods to estimate $\hat{\pi}_0(\lambda)$ exist. A second method is the MSE-bootstrap method suggested by Storey (2002) and Barras et al.

(2010). The value of λ is chosen so that the MSE (Mean Square Error) is minimized:

$$\lambda = \arg \min_{\lambda \in [0,1]} \{E[\pi_0(\lambda) - \pi_0]^2\}$$

A third method is the smoothing method by Storey and Tibshirani (2003). First, $\hat{\pi}_0(\lambda)$ is plotted against λ and a cubic spline is fitted to the data. Extrapolating the curve to λ=1 yields $\hat{\pi}_0(\lambda)$. We use R software and the `fdrtool` package to compute this estimate. The function used is `pval.estimate.eta0` and requires the following inputs:

- `p`: the individual fund p-values;
- `method`: the algorithm to compute $\hat{\pi}_0(\lambda)$, either the "bootstrap" (Storey, 2002) or the default "smoother" (Storey and Tibshirani, 2003) methods;
- `lambda`: the tuning parameter for the "bootstrap" and "smoother" methods, belonging to the interval [0,1];
- `diagnostic.plot`: if true (the default) the histogram of the p-values is plotted along with $\hat{\pi}_0(\lambda)$.

In practice, a value of λ between 0.5 and 0.6 yields similar estimates of $\hat{\pi}_0(\lambda)$ for all the three methods (Barras et al., 2010). Moreover Barras et al. (2010) carry out a Monte Carlo simulation to prove that the estimators for $\hat{\pi}_0(\lambda)$ are accurate and are not sensitive to the method used nor to the chosen significance level λ. The estimators are also robust to cross sectional correlation of mutual fund residuals, which should be low for monthly data (Cuthbertson, 2011, p.9).

In our study, the smoothing method will be used (the bootstrap method yields the same results and can be employed to double check our estimates). The FDR approach will be used not only to check the significance of the alpha estimates, but also of the market timing coefficients. This is an original contribution of this thesis as compared to past studies.

4.2 False Discoveries Simulation

In this section we use R software to carry out a simulation implementing the False Discoveries approach and showing how to correct for the presence of false discoveries, coming up with the estimated percentage of truly skilled or unskilled funds. The chosen significance levels are γ=5% and γ=10%. We run 1000 simulation (M=1000), representing a sample of 1000 mutual funds. The number of observations (time steps) for each fund is set equal to 100 (n=100). We specify the inputs of the simulation, namely the population parameters α and β. The *first simulation* is carried out under the hypothesis H_0 that α=0 for all mutual funds: all the funds are assumed to possess no selective ability. The *second simulation* is carried out under the hypothesis H_1 that some funds do possess selective ability: 5% of the alphas are set equal to 0.3%, while the remaining 95% are set equal to zero. The inputs of the simulation mirror the data in S1. Alpha is chosen outside the 95% confidence interval for alpha, ranging [-0.1063, 0.1580]. The value of alpha is close to 0.3026%, the value belonging to the only significantly positive fund, GESFEAC. Beta is extracted randomly from a normal distribution, with mean equal to the sample mean (0.7963) and standard deviation equal to the sample standard deviation (0.1531). The vector of the excess market returns contains 100 values, randomly extracted from a normal distribution with a mean equal to the sample mean (-1.5327%) and standard deviation equal to the sample standard deviation (6.5762). The error term is a normal random variable with zero mean and standard deviation equal to one. Mutual fund excess returns, representing the dependent variable, are generated according to the CAPM. Then, mutual fund excess returns are regressed against the market excess return, using the `lm` function to fit a linear model to the data. We run the regression 1000 times and come up with 1000 estimates of α and 1000 of β. We extract the alpha p-values and count the number of p-values below the chosen significance level: this is an estimate for the number of significant funds. Then we compute the number of false discoveries. The number of skilled (unskilled) funds is computed as the difference between significant funds and false discoveries. The FDR analysis is carried out both in the right and left tail, and both at the 5% and 10% significance levels. The formulas used are the ones outlined in Section 4.1.

When analysing the results of the FDR study, we report the main statistics as proportions (percentages), i.e. dividing the given fund count by the total number of funds M. The proportion of significant funds is estimated by counting the p-values lower than the chosen significance level and dividing the result by the number of p-values M. The proportion of significantly positive funds is computed by counting the number of t-statistics greater than the positive t-critical and dividing it by M:

$$E(S^{+}) = \frac{\#\{t_i > t^{*}\}}{M}$$

Similarly, the proportion of significantly negative funds is estimated dividing the number of t-statistics lower than the negative t-critical by M:

$$E(S^{-}) = \frac{\#\{t_i < -t^{*}\}}{M}$$

The proportion of false discoveries is the same for the right and left tail, and requires as inputs the estimated proportion of null funds in the population $\hat{\pi}_0(\lambda)$ and the chosen significance level γ.

$$E(F^{+}) = E(F^{-}) = \widehat{\pi_0}(\gamma/2)$$

The proportion of null funds (pi zero) is estimated as:

$$\hat{\pi}_0(\lambda) = \frac{\#\{p_i > \lambda)}{M(1-\lambda)}$$

where $\lambda \in [0,1]$ is estimated with either the smoothing or the bootstrap method.

The estimated proportion of skilled funds is:

$$E(T^{+}) = E(S^{+}) - E(F^{+})$$

Similarly, the estimated proportion of unskilled funds is:

$$E(T^{-}) = E(S^{-}) - E(F^{-})$$

Let us comment on the results of the *first simulation* (see Table 4.1), under the hypothesis that mutual funds have a true alpha equal to zero, or equivalently that the proportions of skilled and unskilled funds in the population π_A^+ and π_A^- are equal to zero. 56 of the 1000 mutual funds exhibit significant alpha estimates, which is equivalent to 5.6%, a proportion one would expect due to chance. 2.90% of funds are significantly positive, indicated by $E(S^+)$, but the FDR correctly recognises that almost all of the significant funds, 2.17%, are false discoveries, indicated by $E(F^+)$. Similarly among the 2.70% significantly negative funds $E(S^-)$, 2.17% are false discoveries $E(F^-)$. Therefore, estimated skilled funds $E(T^+)$ and unskilled funds $E(T^-)$ represent respectively 0.73% and 0.53% of the total number of funds. The correction of the FDR approach is substantial, as the estimated proportions of skilled and unskilled funds are close to the proportion of skilled funds in the population $\pi_A^+ = \pi_A^- = 0\%$, with a bias below 1%. Also at the 10% significance level, the FDR remains high and the estimated percentages of skilled and unskilled funds low, equal to 1.55% and 1.15% respectively. The additional significant funds at the 10% level are almost entirely false discoveries. There is a small bias here as well, as the estimated proportions of skilled and unskilled funds $E(T^+)$ and $E(T^-)$ are 1-1.5% higher than the true proportions used as inputs in the simulation π_A^+ and π_A^-. The FDR study ascertains selective ability of mutual fund managers is due to luck.

Table 4.1 - CAPM, FDR under H_0		
pi_zero	0.8695	
sign lev	5%	10%
E(S+)	2.90%	5.90%
E(F+)	2.17%	4.35%
FDR+	74.96%	73.69%
E(T+)	0.73%	1.55%
E(S-)	2.70%	5.50%
E(F-)	2.17%	4.35%
FDR-	80.51%	79.05%
E(T-)	0.53%	1.15%
H_0: α=0		

In the *second simulation* (see Table 4.2), we assume 5% of mutual funds have selective ability, as measured by an alpha different from zero, equal to 0.3%. In other terms, the proportion of skilled funds in the population π_A^+ is equal to 5%, whereas the proportion of unskilled funds in the population π_A^- is equal to 0%. Now 97 funds are statistically significant at the 5% significance level. The number of significant p-values greatly increases with respect to H_0, as showed by the spike in proximity to zero in the p-values histogram (see Appendix F). There are far more significantly positive funds, $E(S^+)$=7.20%, than significantly negative funds, $E(S^-)$=2.50%. The percentage of significantly positive funds is corrected for the false discoveries, $E(F^+)$=2.02%, returning the estimated percentage of skilled funds, $E(T^+)$=5.18%. We can see how the percentage of significantly positive funds is upward biased, and the FDR study brings it back towards the true percentage π_A^+=5%. In the left tail, almost all the 2.50% significantly negative funds $E(S^-)$ are recognised as false discoveries, leaving the estimated percentage of unskilled funds at $E(T^-)$=0.48%, close to the true percentage π_A^-=0%. Both in the right and left tail, the bias in our estimation is lower than 0.5%, proving the FDR correction is accurate. At the 10% significance level, 10.30% of the funds are significantly positive, but only 6.25% are skilled. Similarly, of the 5.10% significantly negative funds, the majority are false discoveries, and only 1.05% are unskilled. As with the first simulation, the bias at the 10% significance level is in the range 1-1.5%, as the results of the FDR correction are slightly higher than they should. Again, the FDR approach proves to be reliable, since it is able to retrieve estimates of the truly skilled and unskilled funds which are very close to the population parameters.

Table 4.2 - CAPM, FDR under H_1

pi_zero	0.8093	
sign lev	5%	10%
E(S+)	7.20%	10.30%
E(F+)	2.02%	4.05%
FDR+	28.10%	39.28%
E(T+)	5.18%	6.25%
E(S-)	2.50%	5.10%
E(F-)	2.02%	4.05%
FDR-	80.93%	79.34%
E(T-)	0.48%	1.05%

H_1: 5% of the alphas are positive;
95% of the alphas are equal to zero

5 Data and Methodology

5.1 Data Description

Data are extracted from Bloomberg database. All dividends are assumed to be invested again for the purpose of calculating net returns. The following criteria are applied to maximise the number of actively managed equity funds for the observed period:

1) Fund Geographical Focus: Italy
2) Country of Domicile: Italy
3) Manager Location: Italy
4) Fund type: Open-End, Mutual Fund
5) Fund Objective: Equity
6) Fund Asset Class Focus: Equity

A list of 32 Italian funds is obtained at the first attempt, but 5 of them are dropped because found with no returns (highlighted cells in Table 5.2). The discarded funds are: ACAITA (ACOMEA ITALIA-Q2), SYSCITI (SYMPHONIA AZION SM CP ITAL-I), ANIITAB (ANIMA ITALIA-B), ANITLAD (ANIMA INIZIATIVA ITALIA-AD) and AITPMIA (ANIMA INIZIAT ITALIA PMI-A). The sample is then narrowed to 27 Italian actively managed equity funds over the period January 2006 to December 2015, for a total of 120 monthly observations.

Table 5.1 - Annual sample size

Year	Number of funds
2006	14
2007	14
2008	16
2009	18
2010	18
2011	19
2012	19
2013	21
2014	23
2015	27

Table 5.2 - Mutual Fund Sample, 32 Funds, 31/12/06 - 31/12/15

Ticker	Fund Name
ACAITA IM Equity	ACOMEA ITALIA-Q2
AREREII IM Equity	ARCA ECONOMIA REALE EQ IT-IA
SYAZSCI IM Equity	SYMPHONIA AZION SMALL CP ITA
AREREIP IM Equity	ARCA ECONOMIA REALE EQ IT-PA
BPBAZIT IM Equity	UBI PRAMERICA AZIONI ITALIA
COMSMCP IM Equity	EURIZON AZIONI PMI ITALIA
ANITPMI IM Equity	ANIMA INIZIATIVA ITALIA PMI
GNAZITC IM Equity	GESTNORD AZIONI ITALIA-C
INVAZIO IM Equity	BNL AZIONI ITALIA
GEPIAZA IM Equity	GESTNORD AZIONI ITALIA
FIDIMIT IM Equity	FIDEURAM ITALIA
GESFEAC IM Equity	ANIMA ITALIA-F EUR ACC
DUCGITY IM Equity	ANIMA GEO ITALIA-Y
GESITAL IM Equity	ANIMA ITALIA-A
DUCAZIT IM Equity	ANIMA GEO ITALIA-A
MEDFITI IM Equity	MEDIOLANUM FLESS ITALIA-I
ARCAZIT IM Equity	ARCA AZIONI ITALIA
MEDRICR IM Equity	MEDIOLANUM FLESSIBLE ITAL-LA
BNAZITL IM Equity	EURIZON AZIONI ITALIA
SYSELIT IM Equity	SYMPHONIA SELEZIONE ITALIA-I
BIMAZI IM Equity	SYMPHONIA SELEZIONE ITALIA
GSEAFND IM Equity	GESTIELLE OBIETTIVO ITALIA-A
ZENAZII IM Equity	ZENIT PIANETA ITALIA-I
ZENAZIO IM Equity	ZENIT PIANETA ITALIA-R
ALSTARS IM Equity	ALLIANZ AZ ITALIA ALL STARS
ACITAA2 IM Equity	ACOMEA ITALIA-A2
AITALQ2 IM Equity	ACOMEA ITALIA-Q2
SAIGALI IM Equity	ACOMEA ITALIA-A1
SYSCITI IM Equity	SYMPHONIA AZION SM CP ITAL-I
ANIITAB IM Equity	ANIMA ITALIA-B
ANITLAD IM Equity	ANIMA INIZIATIVA ITALIA-AD
AITPMIA IM Equity	ANIMA INIZIAT ITALIA PMI-A

The sample is survivor-bias-free, since no fund has ceased to exist during the sample period. The risk-free rate is Italy 3 months Treasury bill rate (GBOTG3M Index). The benchmarks used are the FTSEMIB Index, which consists of the 40 most liquid and capitalized stocks listed on the Italian stock exchange (Bloomberg, 2016), and the MSCI Italy Index (M7IT Index), which comprises the large and mid cap segments of the Italian market, covering approximately 85% of the Italian equities (MSCI, 2016). The FTSE MIB is the benchmark recommended by Bloomberg. The Morgan Stanley Capital International Italy (MSCI Italy NR EUR) is the benchmark used by Morningstar and is employed to build the risk factors in the multifactor models. We carry out 3 different analyses:

- Study 1 (S1): we first use the FTSE MIB as a benchmark and evaluate mutual fund performance from January 2006 to December 2015 using the CAPM only.
- Study 2 (S2): we rerun the CAPM, but use a sample of 19 mutual funds from April 2006 to March 2013.
- Study 3 (S3): we keep the same sample period and sample size of S2, but use the MSCI Italy Index as a benchmark; we apply both CAPM and multifactor models, namely the Fama-French and Carhart models.

For each study, we also analyse market timing abilities, using Treynor-Mazuy and Henriksson-Merton models, and performance persistence, using both non-parametric and parametric approaches.

Table 5.3 - Studies Performed			
Variables	Study 1	Study 2	Study 3
Market	FTSE MIB	FTSE MIB	MSCI ITALY
Risk Free	3-Month T-Bill	3-Month T-Bill	3-Month T-Bill
Start Date	31/12/2006	28/04/2006	28/04/2006
End Date	31/12/2015	28/03/2013	28/03/2013
No. Years	10	7	7
No. Monthly Obs.	120	84	84
No. Funds	27	19	19
CAPM	Y	Y	Y
Multifactor Models	N	N	Y
Market Timing	Y	Y	Y
Persistence	Y	Y	Y
Legend: Y = used; N = not used			

5.2 Performance Measurement Models

Mutual fund returns are net of management fees and calculated through NAV, assuming dividends are reinvested each month:

$$r_{i,t} = \frac{NAV_{i,t} + D_t}{NAV_{i,t-1}} - 1$$

with i=1,…,N and t=1,…,T

where:
$NAV_{i,t}$ is the net asset value of the i-th fund at time t;
$NAV_{i,t-1}$ is the net asset value of the i-th fund at time t-1;
D_t is the dividend paid by the i-th fund at time t.

The *Single Index model* in terms of excess returns is:

$$R_{i,t} = \alpha_{i,t} + \beta_{i,t} R_{m,t} + \varepsilon_{i,t}$$

with i=1,…,N and t=1,…,T

where:
N is the number of mutual funds in the sample;

T is the number of time steps;

α_i is the selectivity coefficient;

β_i is the systematic risk coefficient;

R_i is the fund excess return over the 3-month Treasury bill rate;

R_m is the FTSE MIB (or MSCI Italy) excess return over the 3-month Treasury bill rate;

ε_i is a random component (stochastic error) with zero expected value, representing the idiosyncratic, fund-specific risk.

The *Fama-French three-factor model* is:

$$r_{i,t} - r_{f,t} = \alpha_i + \beta_i(r_{m,t} - r_{f,t}) + s_i SMB_t + h_i HML_t + \varepsilon_{i,t}$$

with i=1,…,N and t=1,…,T

where:

N is the number of mutual funds in the sample;

T is the number of time steps;

SMB is the Small Minus Big factor;

HML is the High Minus Low factor.

The Small Minus Big (SMB) and High Minus Low (HML) factors have been created by Stefano Marmi (2012) from the data provided by FactSet, following the methodology outlined in Fama and French (1993). First, all Italian stocks are sorted in descending order according to their market capitalisation (ME) and classified as either Small or Big. The size breakpoint is the median market equity. Second, all the stocks are sorted according to their Book-to-Market ratio (BE/ME). BE/ME of June t is computed as the ratio between the book value of the company for the last fiscal year end before March t and the market value of the company for March t. Companies with negative book values are discarded. The BE/ME breakpoints are the 30^{th} and 70^{th} percentiles. In other terms, 30% of the stocks exhibiting the lowest BE/ME are classified as low (L), 30% of the stocks exhibiting the highest BE/ME as high (H), and the remaining 40% with intermediate BE/ME as medium (M). After this double classification, a 2x3 grid combining size and BE/ME and 6 value-weighted portfolios are created: SL (Small/Low), SM (Small/Medium), SH (Small/High), BL (Big/Low), BM (Big/Medium), BH (Big/High). Finally, the SMB factor is obtained as the difference between the average return on the 3 small portfolios (SL, SM, SH) and the average return of the 3 big portfolios (BL, BM, BH).

$$SMB = \frac{SL + SM + SH}{3} - \frac{BL + BM + BH}{3}$$

Similarly, the HML factor is the difference between the average return on the 2 value (high BE/ME) portfolios (HS, HB) and the average return of the 2 growth (low BE/ME) portfolios (LS, LB).

$$HML = \frac{HS + HB}{2} - \frac{LS + LB}{2}$$

The value-weighted returns on the 6 portfolios are computed for July of year t to June of t+1, and portfolios are rebalanced in July t+1. The double classification of the stocks according to size (ME) and Book-to-Market ratio (BE/ME), the formation of six value-weighted portfolios and the final arithmetic average, ensure there is no collinearity between the SMB and HML factors. In fact, the SMB factor is obtained averaging small and big portfolios having approximately the same weighted average BE/ME, and therefore should not be affected by BE/ME. Similarly, the HML factor is obtained averaging value and growth portfolios having approximately the same size, and should not be affected by size. Using common risk factors affecting returns minimises idiosyncratic risk. Finally, weighting the 6 portfolios for their value minimises the variance of the returns, since the latter is negatively correlated to size.

The *Carhart four-factor model* is:

$$r_{i,t} - r_{f,t} = \alpha_i + \beta_i(r_{m,t} - r_{f,t}) + s_i SMB_t + h_i HML_t + w_i WML_t + \varepsilon_{i,t}$$

with i=1,…,N and t=1,…,T

where:
N is the number of mutual funds in the sample;
T is the number of time steps;
SMB is the Small Minus Big factor;
HML is the High Minus Low factor;
WML is the Winners Minus Losers factor.

The Winner Minus Losers (WML) factor is also known as momentum (MOM) factor. The methodology is the one outlined in Carhart (1997). First, all Italian stocks are sorted in descending order according to their market capitalisation (ME) and classified as either Small or Big. The size breakpoint is the median market equity. Second, all the stocks are sorted according to their past performance. For portfolios formed at the end of year t-1, the momentum return is the cumulative stock return from t-12 to t-2. The momentum breakpoints are the 30th and 70th percentiles. In other terms, 30% of the stocks exhibiting the lowest past performance are classified as losers (L), 30% of the stocks exhibiting the highest past performance as winners (W) and the remaining 40% with intermediate momentum as neutral (N). After this double classification, a 2x3 grid combining size and momentum and 6 value-weighted portfolios are created: SL (Small/Losers), SN (Small/Neutral), SW (Small/Winners), BL (Big/Losers), BN (Big/Neutral), BW (Big/Winners). Finally, the WML factor is obtained as the difference between the average return on the 2 winner portfolios (SW, BW) and the average return of the 2 loser portfolios (SL, BL).

$$WML = \frac{SW + BW}{2} - \frac{SL + BL}{2}$$

The *Treynor-Mazuy model* is:

$$r_{i,t} - r_{f,t} = \alpha_i + \beta_i(r_{m,t} - r_{f,t}) + \gamma^{TM}(r_{m,t} - r_{f,t})^2 + \varepsilon_{i,t}$$

where:

α_i is the selectivity coefficient;

γ^{TM} is the market timing coefficient.

The *Henriksson-Merton model* is:

$$r_{i,t} - r_{f,t} = \alpha_i + \beta_{i0}(r_{m,t} - r_{f,t}) + \gamma^{HM}\max(0, r_{m,t} - r_{f,t}) + \varepsilon_{i,t}$$

where:

α_i is the selectivity coefficient;

γ^{HM} is the market timing coefficient.

5.3 Performance Persistence Tests

The first test for performance persistence is the *non-parametric test* by Brown and Goetzmann (1995), using two-way contingency tables introduced by Goetzmann and Ibbotson (1994). The non-parametric test measures mutual fund performance using raw returns (net returns) and risk-adjusted returns (alpha). Performance persistence is evaluated both in the short-term (1-year interval) and long-term (2-year interval).

Monthly mutual fund returns are compounded to create 1-year or 2-year cumulative returns:

$$r_a = \prod_{t=1}^{T}(1 + r_{i,t}) - 1$$

with i=1,…,N and t=1,…,T

where:
N is the number of mutual funds in the sample;
T is the number of months in the time interval (T=12 for 1-year evaluation period and T=24 for 2-year evaluation period);
$r_{i,t}$ is the monthly return of the i-th fund at time t;
r_a is the cumulative 1-year or 2-year return.

Alpha is computed using the single index model, the Fama-French 3-factor model and the Carhart 4-factor model. Monthly mutual fund returns are regressed against the proper market benchmark and/or risk factors to obtain the alpha estimate. 12 and 24 monthly observations are required for 1-year and 2-year alphas respectively.

Mutual funds are ranked each year (or every 2 years) according to their net returns or alpha (CAPM, Fama-French and Carhart alphas). In each evaluation period T (either 1-year or 2-year), the median return or alpha is computed, and funds with a performance higher than or equal to the median are called winners (W), while funds with a performance below the median are called losers (L).

Mutual funds are persistent if they are either winners or losers in two consecutive 1-year (short-term performance persistence) or 2-year periods (long-term performance persistence). Winners in two consecutive periods (repeat winners) are denoted as WW; losers in two consecutive periods (repeat losers) as LL. Non-repeat performers are named WL if they are winners in the previous period and losers in the following one, LW if they are losers in the previous period and winners in the following one. Two-way contingency tables are created to include WW, LL, WL and LW. The statistical test for performance persistence is the one adopted by Brown and Goetzmann (1995). The null hypothesis states that the number of repeat performers (WW and LL) is greater than the number of non-repeat performers (WL and LW), i.e. performance persistence exists. The alternative states that the number of repeat performers is lower than the number of non-repeat performers, i.e. performance persistence does not exist. The significance level α is 5%. The test statistic is built upon the cross product ratio, defined as the "ratio of funds which show persistence in performance to the ones which do not" (Agarwal and Naik, 2000):

$$CPR = \frac{WW \times LL}{WL \times LW}$$

If the CPR is greater than 1, performance persistence exists. If the CPR is lower than 1, performance persistence does not exist. For the statistical significance of the test, the following test statistic is created:

$$Z = \frac{\ln(CPR)}{\sigma[\ln(CPR)]}, \qquad Z \sim N(0,1)$$

$$\sigma[\ln(CPR)] = \sqrt{\frac{1}{WW} + \frac{1}{WL} + \frac{1}{LW} + \frac{1}{LL}}$$

The Z-statistic is normally distributed and is computed by dividing the logarithm of the estimated CPR by its standard error. A value of the Z-statistic greater than 1.645 provides evidence of statistical significance.

The second test for performance persistence is the *parametric test* by Grinblatt and Titman (1992) to discover whether past performance is a good indicator of future performance. The test is based on alpha estimates from the single-index, Fama-French and Carhart models. During each evaluation period (1-year or 2-year), a portfolio p including all the cross-sectional alphas of mutual funds for that period is created.

The last period t+1 cross-sectional alphas, $r_{p(t+1)}$, are regressed against the previous period t cross-sectional alphas, $r_{p(t)}$.

$$r_{p(t+1)} = \alpha_p + \beta_p r_{p(t)} + \varepsilon_p$$

with t=1,…,T
where T is the number of evaluation periods.

For each evaluation period, a significantly positive slope coefficient on past alpha indicates positive performance persistence, whereas a significantly negative slope coefficient indicates negative performance persistence. The parametric test indicates the trend of persistence, either positive or negative, rather than only detecting the presence of performance persistence like the non-parametric test.

5.4 Testing Assumptions for Regression Analysis

The following assumptions are known as Gauss-Markov assumptions for time series data and ensure OLS estimators are BLUE (Best Linear Unbiased Estimators) conditional on X:

1) Linear in parameters: "the time series process follows a model that is linear in its parameters" (Wooldridge, 2013, p.349). Studies upon CAPM show that the relationship between past returns and beta is linear.

$$y_t = \beta_0 + \beta_1 x_{t1} + \cdots + \beta_k x_{tk} + u_t, \qquad t = 1,2,\dots,n$$

2) No perfect collinearity: "in the sample (and therefore in the underlying time series process), no independent variable is constant nor a perfect linear combination of the others" (Wooldridge, 2013, p.350). It is not necessary to test this assumptions, since EViews cannot run a regression suffering from perfect collinearity. In this sense, the test is automatically carried out by EViews. In the case of extreme (but not perfect) collinearity, OLS estimates are still unbiased, BLUE and consistent, but standard errors become higher and t-statistics smaller. Because of the way risk factors are built in multifactor models, there is no problem of collinearity between the factors (see Section 5.2).

3) Zero conditional mean: "for each t, the expected value of the error u_t, given the explanatory variables for *all* time periods, is zero" (Wooldridge, 2013, p.350). This assumption is strictly connected to the normality assumption, so we refer to the normality test.

$$E(u_t|X) = 0, \qquad t = 1,2,\dots,n$$

4) Homoscedasticity: "Conditional on X, the variance of u_t is the same for all t" (Wooldridge, 2013, p.352).

$$Var\ (u_t|X) = Var\ (u_t) = \sigma^2, \qquad t = 1,2,\dots,n$$

When heteroscedasticity is present, the variance of the error terms does not remain constant through the whole process. In presence of heteroscedasticity, OLS estimators are still unbiased, but are no longer BLUE (Best Linear Unbiased Estimators), meaning that they no longer have the smallest variance among all linear unbiased estimators (Wooldridge, 2013, p.158).

To investigate the presence of heteroscedasticity, we run *White's Test* using EViews (View → Residual Diagnostics → Heteroskedasticity Tests → White). White (1980) runs the following auxiliary regression to detect heteroscedasticity, where squared residuals are regressed against all the squares and the cross products of all the k independent variables. For instance, if k=3:

$$\hat{u}^2 = \delta_0 + \delta_1 x_1 + \delta_2 x_2 + \delta_3 x_3 + \delta_4 x_1^2 + \delta_5 x_2^2 + \delta_6 x_3^2 + \delta_7 x_1 x_2 + \delta_8 x_1 x_3 + \delta_9 x_2 x_3 + \varepsilon$$

The null hypothesis is that residuals are homoscedastic. The alternative hypothesis is that residuals are heteroscedastic. The chosen significance level α is 5%. The White's test statistic is Obs*R-squared, where Obs is the number of observations and R-squared is the coefficient of determination. White's test statistic is asymptotically distributed as a χ^2 (Chi-Square) with k degrees of freedom, where k is the number of slope coefficients in the regression, excluding the intercept (Zulehner, 2008, p.3). A p-value (Prob. Chi-Square) lower than 5% leads to the rejection of the null, meaning that heteroscedasticity is present. If the p-value is greater than 5%, we fail to reject the null, meaning that there is no heteroscedasticity problem. White's test can be used as a general test for model misspecifications: the null hypothesis assumes homoscedasticity, linearity of the model in its parameters and independence of the regressors. If the null is rejected, one of these conditions has been violated. Possible reasons for heteroscedasticity are model misspecification, omitted variables or incorrect functional form (Zulehner, 2008, pp.3-4).

5) No serial correlation: “Conditional on X, the errors in two different time periods are uncorrelated” (Wooldridge, 2013, p.353).

$$Corr(u_t, u_s) = 0, \qquad for\ all\ t \neq s$$

Autocorrelation is a common problem for time series data, where observations follow each other. Autocorrelation is present when the error term is correlated over time. As with heteroscedasticity, OLS estimators are still consistent but are no longer BLUE. Positive correlation causes standard errors to be too small and t-statistics too large. Negative correlation causes standard errors to be too large and t-statistics too small (Zulehner, 2008, p.24). The presence of correlations between errors over time can be expressed as follows:

$$u_t = \rho u_{t-1} + \varepsilon_t$$

Where ε_t is an error term with mean zero and constant variance

The Breusch-Godfrey *Serial Correlation LM Test* is used to detect the presence of autocorrelation (View → Residual Diagnostics → Serial Correlation LM Test). The null hypothesis is that there is no serial correlation. The alternative hypothesis is that there is serial correlation. The test produces again the Obs*R-squared statistic and the related Chi-Square probability. The chosen significance level α is 5%. A p-value (Prob. Chi-Square) lower than 5% leads to the rejection of the null, meaning that serial correlation is present. If the p-value is greater than 5%, we fail to reject the null, meaning that there is no serial correlation problem.

White (1980) proposes a heteroscedasticity consistent covariance matrix estimator. The limitation of White's covariance matrix is that it requires the residuals of the estimated equation to be serially uncorrelated. In fact, in order to test for heteroscedasticity, the errors u_t should not be serially correlated, since any serial correlation would invalidate the results of the test. Thus it makes sense to test serial correlation first. Newey and West (1987) propose a more general covariance matrix estimator, which corrects both heteroscedasticity and autocorrelation. Newey-West standard errors, called HAC (Heteroscedasticity and Autocorrelation Consistent), ensure OLS estimates are consistent. The point estimates remain exactly the same as with the default estimation method; only the standard errors (and the associated t-statistics) change with respect to the original regression. Newey-West estimation method will be used in this study to deal with heteroscedasticity and autocorrelation.

There is a sixth assumption that allows us to use OLS standard errors and t-statistics:

6) Normality: "the errors u_t are independent of X and are independently and identically distributed as Normal$(0,\sigma^2)$" (Wooldridge, 2013, p.355).
   When residuals do not follow a normal distribution, it is not possible to obtain exact sampling distributions of the t-statistics, in order to perform hypothesis testing (Wooldridge, 2013, p.158). The normality assumption can be relaxed if the sample size is relatively large. In this study asymptotic normality does not hold, since we are considering a relatively small sample ($n<30$).
   To check residuals are normally distributed, we run *Jarque-Bera Test* (View → Residual Diagnostics → Histogram – Normality Test). The null hypothesis is that residuals are

normally distributed. The alternative hypothesis is that residuals follow a non-normal distribution. The test produces the Jarque-Bera statistic, which includes both skewness and kurtosis, and follows a χ^2 (Chi-Square) distribution with 2 degrees of freedom:

$$JB = n\left(\frac{Sk^2}{6} + \frac{(Kur - 3)^2}{24}\right)$$

Where:
n is the number of observations;
Sk is the sample skewness;
Kur is the sample kurtosis.

At the 5% significance level, a p-value lower than 5% leads to the rejection of the null, meaning that residuals are not normally distributed. If the p-value is greater than 5%, we fail to reject the null, meaning that residuals are normally distributed.

6 Analysis

6.1 Selective Ability

6.1.1 The Single Factor Capital Asset Pricing Model (CAPM)

Before analysing the results of the CAPM model, we notice that many of the mutual funds included in the sample suffer from problems with the assumptions. In all the three studies, more than a half of the funds suffer from heteroscedasticity: 59.26% in S1, 63.16% in S2 and 57.89% in S3. Less than a half of the funds suffer from autocorrelation: 40.74% in S1, 15.79% in S2 and 42.11% in S3. Newey-West estimation method is used to correct both heteroscedasticity and autocorrelation. As for the normality assumption, 29.63% of the funds exhibit non-normal residuals in S1; 36.84% in S2 and 68.42% in S3. Nothing can be done to correct non-normality. White's test, serial correlation LM test and Jarque-Bera tests for the three studies are presented in Tables A1, A2 and A3 respectively.

Tables 6.1, 6.2 and 6.3 present the regression estimates of the CAPM model for S1, S2 and S3 respectively. The estimated single-index alpha and beta are reported, along with their p-values and t-statistics. Table 6.4 reports the summary statistics for the alpha and beta estimates for all the three studies. Tables 6.5 and 6.6 show how the FDR approach is applied to S1 and S2 to come up with the percentages of true significant funds in the sample. The FDR study cannot be applied to S3, because none of the funds shows a significant single-index alpha.

Let us first comment on the results from the first study (S1). 1 of 27 alpha estimates (GESFEAC) is significantly positive at both the 10% and 5% significance level, and is equal to 0.3026% (see Table 6.1). 5 alpha estimates are significantly negative at the 10% level, and 2 at the 5% level. The average alpha of the 27 mutual funds in Italy is 0.0259% per month from 2006 to 2015, but the superior performance is not statistically significant, as the p-value is 0.6907 (see Table 6.4). The most successful fund, AREREII, exhibits an insignificantly positive alpha of 0.7744%; the worst fund, GSEAFND, exhibit a significantly negative alpha of -0.4822% at the 5% level; the median alpha is -0.0664%. The percentage of false discoveries among the significantly positive funds is 1.16%, meaning that the estimated percentage of truly skilled funds among significantly positive funds (3.70%) is only 2.55% (see Table 6.5). Increasing the significance level from 5% to 10%, no additional funds are significant, therefore we cannot implement the FDR approach. In the left tail of the distribution, the percentage of significantly negative funds of 7.41% is decreased by the same percentage of false discoveries of 1.16%, yielding 6.25% of estimated truly unskilled funds. Increasing the significance level to 10%, new additional funds become significant, rising to 18.52%. The FDR approach estimates that also the false discoveries increase (2.32%), bringing the estimated percentage of truly unskilled funds at the 10% significance level to 16.20%. The FDR approach shows that unskilled funds outnumber skilled funds, and skilled funds are concentrated in the extreme right tail, whereas unskilled funds are more dispersed in the left tail. All the individual fund beta estimates are significant at the 5% significance level, and except three (AREREII, AREREIP and ANITPMI) also at the 1% level (see Table 6.1). The average beta is 0.7963 and is statistically significant at the 1% significance level; the minimum beta is 0.4464; the maximum beta is 1.1121 (see Table 6.4). The explanatory power of the regression is measured by the adjusted R-squared. The highest value of 97.76% belongs to ARCAZIT, the lowest of 49.23% to ANITPMI (see Table 6.1). The average adjusted R-squared is 85.67%, meaning that the FTSEMIB Index can explain 85.67% of the total variation of mutual fund returns.

Table 6.1 - CAPM estimates, S1

	alpha						beta				adj R^2
	coeff	std error	tstat	prob	sign 5%	sign 10%	coeff	std error	tstat	prob	
AREREII	0.7744	0.4829	1.6037	0.1528	0	0	0.4464	0.1601	2.7888	0.0270	0.6413
SYAZSCI	-0.0664	0.3097	-0.2145	0.8307	0	0	0.5503	0.0828	6.6472	0.0000	0.6165
AREREIP	0.7141	0.4893	1.4596	0.1878	0	0	0.4580	0.1630	2.8101	0.0261	0.6464
BPBAZIT	-0.1560	0.1585	-0.9841	0.3271	0	0	0.8085	0.0243	33.2777	0.0000	0.8035
COMSMCP	-0.2459	0.3160	-0.7780	0.4381	0	0	0.7493	0.0519	14.4425	0.0000	0.7643
ANITPMI	0.6946	0.9385	0.7401	0.4781	0	0	0.5704	0.1931	2.9539	0.0161	0.4923
GNAZITC	0.1079	0.2386	0.4521	0.6549	0	0	0.9086	0.0515	1.7627	0.0000	0.9228
INVAZIO	-0.2874	0.1225	-2.3450	0.0207	1	1	0.8344	0.0249	33.4741	0.0000	0.9498
GEPIAZA	-0.0961	0.0981	-0.9799	0.3292	0	0	0.8277	0.0197	42.0999	0.0000	0.9705
FIDIMIT	0.1145	0.1235	0.9271	0.3558	0	0	0.8739	0.0219	39.9256	0.0000	0.9680
GESFEAC	0.3026	0.1387	2.1820	0.0366	1	1	0.8691	0.0268	3.2414	0.0000	0.9704
DUCGITY	0.1774	0.1186	1.4953	0.1382	0	0	0.7967	0.0303	26.3318	0.0000	0.9514
GESITAL	-0.1795	0.1073	-1.6733	0.0969	0	1	0.8353	0.0239	34.9823	0.0000	0.9710
DUCAZIT	-0.1033	0.0951	-1.0857	0.2798	0	0	0.8261	0.0195	42.3094	0.0000	0.9677
MEDFITI	-0.2729	0.2163	-1.2618	0.2202	0	0	0.8468	0.0493	1.7161	0.0000	0.9305
ARCAZIT	-0.1354	0.1032	-1.3114	0.1923	0	0	0.8360	0.0231	36.2655	0.0000	0.9776
MEDRICR	-0.2337	0.1257	-1.8591	0.0655	0	1	0.7716	0.0187	4.1288	0.0000	0.9353
BNAZITL	-0.0485	0.3180	-0.1525	0.8790	0	0	0.8414	0.0489	17.2249	0.0000	0.5119
SYSELIT	-0.2389	0.2136	-1.1188	0.2753	0	0	0.9193	0.0487	1.8872	0.0000	0.9418
BIMAZI	-0.2303	0.1378	-1.6714	0.0973	0	1	0.8142	0.0286	28.4745	0.0000	0.9495
GSEAFND	-0.4822	0.1565	-3.0818	0.0026	1	1	0.7550	0.0303	24.8793	0.0000	0.8972
ZENAZII	0.0981	0.2187	0.4484	0.6549	0	0	0.7712	0.0452	17.0666	0.0000	0.8851
ZENAZIO	-0.2798	0.1989	-1.4072	0.1620	0	0	0.8082	0.0405	19.9358	0.0000	0.8927
ALSTARS	-0.0229	0.2224	-0.1028	0.9184	0	0	0.6810	0.0423	16.0981	0.0000	0.8390
ACITAA2	0.4128	0.3163	1.3048	0.1976	0	0	1.0765	0.0573	18.7713	0.0000	0.8979
AITALQ2	0.4463	0.4927	0.9059	0.3951	0	0	1.1121	0.1142	9.7343	0.0000	0.9312
SAIGALI	-0.0653	0.2293	-0.2846	0.7764	0	0	0.9120	0.0497	18.3608	0.0000	0.9050
# sign					3	6					

* coeff: expressed in percentage. adj R^2: red for min, blue for max

Let us now comment on the second study (S2), where the sample period is 2006-2013 and there are 19 funds in the sample. The market benchmark is again the FTSEMIB Index. The only mutual fund which exhibits a significant alpha in S1 (GESFEAC) disappears from the sample, leaving no significantly positive fund in S2. At the same time, although the number of fund in the sample decreases, the number of significantly negative funds increases: 11 funds are significantly negative at the 10% significance level and 9 funds at the 5% level (see Table 6.2). The average mutual fund monthly alpha is -0.3046% and is statistically significant at the 1% significance level (p-value=0.0004). This is equivalent to an annualized net alpha of -3.5942% per year, meaning that on average Italian mutual funds earn 3.5942% less than the FTSEMIB Index on an annual basis. The highest alpha of 0.4128% belongs to ACITAA2, but is not statistically significant; the worst fund is SYAZSCI, with a significantly negative alpha of -0.8690% at the 5% significance level; the median alpha is -0.3208%. The FDR approach cannot investigate skilled funds in the right tail of the distribution, since no fund has a positive alpha estimate, and the estimated percentage of truly skilled funds would turn negative. The percentage of significantly negative funds is 47.37% at the 5% level; being the percentage of false discoveries equal to 1.41%, the estimated percentage of unskilled funds at the 5% level is 45.96%. Increasing the significance level from 5% to 10%, new funds become significant, raising the percentage of significantly negative funds to 57.89%. The percentage of false discoveries correspondently increases to 2.82%, leaving 55.07% of mutual funds as truly unskilled (see Table 6.6). All the individual fund beta estimates are statistically significant at the 1% significance level (p-value=0). Beta ranges from 0.4464 to 1.1121, with an average of 0.7963 and a median of 0.8261 (see Table 6.4). As for the explanatory power of the regression, the lowest adjusted R-squared is 42.49% and belongs to BNAZITL, the highest of 97.67% to ARCAZIT (see Table 6.2). The average adjusted R-squared is 86.93%, meaning that 86.93% of the variation of the mutual fund returns can be explained by the FTSEMIB Index.

Table 6.2 - CAPM estimates, S2											
	alpha						beta				adj R^2
	coeff	std error	tstat	prob	sign 5%	sign 10%	coeff	std error	tstat	prob	
SYAZSCI	-0.8690	0.4160	-2.0891	0.0423	1	1	0.4590	0.0893	5.1383	0.0000	0.6155
BPBAZIT	-0.3363	0.2069	-1.6254	0.1079	0	0	0.7940	0.0223	35.5988	0.0000	0.7613
COMSMCP	-0.8612	0.3070	-2.8050	0.0063	1	1	0.7025	0.0519	13.5333	0.0000	0.7679
INVAZIO	-0.5066	0.1518	-3.3370	0.0013	1	1	0.8095	0.0354	22.8557	0.0000	0.9499
GEPIAZA	-0.3141	0.1274	-2.4655	0.0158	1	1	0.7997	0.0244	32.8005	0.0000	0.9711
FIDIMIT	0.1145	0.1235	0.9271	0.3558	0	0	0.8739	0.0219	39.9256	0.0000	0.9680
DUCGITY	-0.0029	0.1453	-0.0201	0.9840	0	0	0.7682	0.0389	19.7626	0.0000	0.9423
GESITAL	-0.1795	0.1073	-1.6733	0.0969	0	1	0.8353	0.0239	34.9823	0.0000	0.9710
DUCAZIT	-0.3208	0.1218	-2.6326	0.0101	1	1	0.8002	0.0254	31.5012	0.0000	0.9646
ARCAZIT	-0.3360	0.1142	-2.9413	0.0042	1	1	0.8096	0.0215	37.6579	0.0000	0.9767
MEDRICR	-0.2337	0.1257	-1.8591	0.0655	0	1	0.7716	0.0187	4.1288	0.0000	0.9353
BNAZITL	-0.2222	0.5416	-0.4103	0.6826	0	0	0.8141	0.0689	11.8071	0.0000	0.4249
BIMAZI	-0.4278	0.1451	-2.9480	0.0042	1	1	0.7923	0.0294	26.9164	0.0000	0.9450
GSEAFND	-0.5349	0.1770	-3.0227	0.0033	1	1	0.7859	0.0405	19.4169	0.0000	0.9165
ZENAZII	0.0339	0.2484	0.1364	0.8920	0	0	0.7505	0.0541	13.8846	0.0000	0.8887
ZENAZIO	-0.2798	0.1989	-1.4072	0.1620	0	0	0.8082	0.0405	19.9358	0.0000	0.8927
ALSTARS	-0.4245	0.2595	-1.6362	0.1070	0	0	0.6022	0.0539	11.1665	0.0000	0.8098
ACITAA2	0.4128	0.3163	1.3048	0.1976	0	0	1.0765	0.0573	18.7713	0.0000	0.8979
SAIGALI	-0.4984	0.2371	-2.1021	0.0386	1	1	0.8443	0.0435	19.4162	0.0000	0.9170
# sign					9	11					

* coeff: expressed in percentage. adj R^2: red for min, blue for max

In S3, we keep the same sample of 19 mutual funds during 2006-2013, but we use the MSCI Italy Index as a benchmark. The results from the CAPM show that none of the mutual funds is statistically significant (see Table 6.3). The average mutual fund alpha is -0.0414% and is not statistically significant (p-value=0.3127). The highest alpha of 0.2273% belongs to DUCGITY, the lowest of -0.3459% to COMSMCP, but none is statistically significant. The median alpha is -0.0046%. Since no fund exhibits significant alpha estimates, the FDR approach cannot be implemented. All the individual fund beta estimates are statistically significant (p-value=0). The average beta is 0.7946, ranging from 0.4592 to 1.0781. The lowest adjusted R-squared value belongs again to BNAZITL (40.59%), the highest to FIDIMIT (97.92%). The average adjusted R-squared is 86.99%, meaning the MSCI Italy Index can explain 86.99% of the total variation of the mutual fund returns. The average R-squared in S3 is approximately the same of S2, suggesting that both the FTSEMIB and the MSCI Italy Index are adequate benchmarks.

Table 6.3 - CAPM estimates, S3											
	alpha						beta				adj R^2
	coeff	std error	tstat	prob	sign 5%	sign 10%	coeff	std error	tstat	prob	
SYAZSCI	-0.3398	0.3199	-1.0620	0.2938	0	0	0.4592	0.1072	4.2857	0.0001	0.6151
BPBAZIT	-0.0046	0.2006	-0.0227	0.9819	0	0	0.8080	0.0193	41.8811	0.0000	0.7441
COMSMCP	-0.3459	0.2428	-1.4245	0.1581	0	0	0.7125	0.0385	18.4895	0.0000	0.8042
INVAZIO	-0.2073	0.1340	-1.5477	0.1256	0	0	0.8220	0.0497	16.5449	0.0000	0.9438
GEPIAZA	0.0074	0.1148	0.0644	0.9488	0	0	0.8162	0.0379	21.5418	0.0000	0.9736
FIDIMIT	0.1018	0.0894	1.1385	0.2582	0	0	0.8708	0.0247	35.2718	0.0000	0.9792
DUCGITY	0.2273	0.1889	1.2032	0.2335	0	0	0.7881	0.0265	29.7059	0.0000	0.9343
GESITAL	-0.1071	0.1046	-1.0239	0.3089	0	0	0.8302	0.0349	23.8119	0.0000	0.9752
DUCAZIT	0.0004	0.1076	0.0038	0.9970	0	0	0.8176	0.0357	22.9277	0.0000	0.9727
ARCAZIT	-0.0348	0.1015	-0.3432	0.7323	0	0	0.8256	0.0337	24.5213	0.0000	0.9789
MEDRICR	0.0416	0.1304	0.3189	0.7506	0	0	0.7715	0.0207	37.2830	0.0000	0.9436
BNAZITL	0.0771	0.4250	0.1814	0.8565	0	0	0.8426	0.0666	12.6551	0.0000	0.4059
BIMAZI	-0.0899	0.1157	-0.7765	0.4397	0	0	0.8113	0.0404	20.0606	0.0000	0.9495
GSEAFND	-0.1843	0.1510	-1.2207	0.2257	0	0	0.8042	0.0516	15.5946	0.0000	0.9262
ZENAZII	0.2254	0.2519	0.8950	0.3747	0	0	0.7744	0.0356	21.7593	0.0000	0.8940
ZENAZIO	-0.1240	0.1784	-0.6950	0.4890	0	0	0.7978	0.0283	28.1832	0.0000	0.9053
ALSTARS	0.0613	0.2367	0.2591	0.7964	0	0	0.6061	0.0624	9.7169	0.0000	0.8024
ACITAA2	0.1764	0.5882	0.2999	0.7673	0	0	1.0781	0.0919	11.7334	0.0000	0.8668
SAIGALI	-0.2671	0.1956	-1.3652	0.1759	0	0	0.8616	0.0567	15.1916	0.0000	0.9136
# sign					0	0					

* coeff: expressed in percentage. adj R^2: red for min, blue for max

Table 6.4 - CAPM Summary Statistics

	S1		S2		S3	
	alpha	beta	alpha	beta	alpha	beta
Mean	**0.0259**	**0.7963**	**-0.3046**	**0.7963**	**-0.0414**	**0.7946**
Standard Error	0.0643	0.0295	0.0708	0.0295	0.0398	0.0272
Median	-0.0664	0.8261	-0.3208	0.8261	-0.0046	0.8113
Standard Deviation	0.3340	0.1531	0.3087	0.1531	0.1736	0.1186
Sample Variance	0.1116	0.0234	0.0953	0.0234	0.0301	0.0141
t-statistic	0.4024	27.0318	-4.3003	27.0318	-1.0387	29.2015
p-value	**0.6907**	**0.0000**	**0.0004**	**0.0000**	**0.3127**	**0.0000**
Kurtosis	0.1829	1.1491	0.8794	1.1491	-0.6950	4.4581
Skewness	0.9902	-0.5798	0.2703	-0.5798	-0.2322	-0.7912
Range	1.2565	0.6657	1.2818	0.6657	0.5732	0.6188
Minimum	-0.4822	0.4464	-0.8690	0.4464	-0.3459	0.4592
Maximum	0.7744	1.1121	0.4128	1.1121	0.2273	1.0781
Count	27	27	19	27	19	19

* Mean and median alpha expressed in percentage

Table 6.5 - CAPM alpha, FDR, S1

pi_zero	0.4632	
sign lev	5%	10%
E(S+)	3.70%	3.70%
E(F+)	1.16%	2.32%
FDR+	31.27%	62.53%
E(T+)	2.55%	1.39%
E(S-)	7.41%	18.52%
E(F-)	1.16%	2.32%
FDR-	15.63%	12.51%
E(T-)	6.25%	16.20%

Table 6.6 - CAPM alpha, FDR, S2

pi_zero	0.5649	
sign lev	5%	10%
E(S+)	0.00%	0.00%
E(F+)	1.41%	2.82%
FDR+	#DIV/0!	#DIV/0!
E(T+)	-1.41%	-2.82%
E(S-)	47.37%	57.89%
E(F-)	1.41%	2.82%
FDR-	2.98%	4.88%
E(T-)	45.96%	55.07%

6.1.2 Multifactor Models

This paragraph is related to the third study (S3), where we add new risk factors to build the Fama-French three-factor model and the Carhart four-factor model.

Let us start from the *Fama-French three-factor model*. The residual analysis shows that 63.16% of funds suffer from heteroscedasticity, 36.84% from serial correlation and 84.21% from non-normality (see Table B.1). Newey-West standard errors are used to correct both heteroscedasticity and autocorrelation. Adding the SMB and HML factors, a new mutual fund becomes significant: ACITAA2 earns a significantly positive alpha at the 5% significance level, equal to 0.8611% (see Table 6.7). The average alpha is 0.0637% and not statistically significant (p-value=0.2496). The FDR approach reveals that among 5.26% of significantly positive funds at the 5% significance level, 2.50% are false discoveries, and 2.76% are truly skilled (see Table 6.9). No additional fund becomes significant at the 10% significance level, so the FDR study is not reliable. No fund is significantly negative, so no analysis can be carried out in the left tail of the distribution. As for the explanatory power of the regression, we see that adding the SMB and HML factors increases the average adjusted R-squared from 86.99% to 88.29%. The three factors explain 88.29% of the total variation of mutual funds returns. As in all the other studies, all individual fund beta estimates are statistically significant (p-value=0). The average beta or market loading is 0.8159 and is statistically significant (p-value=0). Beta ranges from 0.5092 to 1.0050, showing a lower variation range as compared to the CAPM in S3.

Let us now analyse the loadings of the three factors. The analysis of the SMB and HML loading factors follows Bernstein (2001). If the SMB loading factor is equal to zero, the fund is large cap; if it is greater than 0.5, it is small cap. If the HML factor is zero, it is a growth fund; if it is greater than 0.3, it is a value fund. The relationship between HML loadings and value/growth funds is just a presumption, but studies have proved that funds which are identified as either value or growth funds display consistent factor loadings (Davis, 2000 and Chan et al., 2002). The HML factor is value minus growth, i.e. high BE/ME minus low BE/ME. 9 of 19 SMB loadings are statistically significant, and positive, at the 10% significance level, and 7 SMB loadings are significant at the 5% level (see Table 6.7). The average SMB loading is 0.0878 and is statistically significant at the 1% significance level (p-value=0.0044). The SMB loadings are always smaller than 0.5, suggesting that the funds are mostly large cap, consistent with the market cap classification by Bloomberg and Morningstar. 4 of the 19 HML loadings are significantly positive at the 10% significance level, of which 2 are also significant at the 5% level (see Table 6.7). ACITAA2 is the only fund displaying a HML loading greater than 0.3; the HML loading of 0.4058 is significant at the 5% level and identifies a value fund. 2 funds show significantly negative HML loadings at the 10% level, and one of those is significantly negative at the 5% level (see Table 6.7). The average HML loading is 0.0199, though not statistically significant (p-value=0.6013). Most of the funds are indeed growth funds.

Table 6.7 - Fama-French estimates, S3

	alpha						beta				SMB				HML				adj R^2
	coeff	std error	tstat	prob	sign 5%	sign 10%	coeff	std error	tstat	prob	coeff	std error	tstat	prob	coeff	std error	tstat	prob	
SYAZSCI	0.0521	0.3125	0.1668	0.8683	0	0	0.5092	0.1221	4.1715	0.0001	0.2956	0.0861	3.4349	0.0013	0.2206	0.1105	1.9968	0.0521	0.7160
BPBAZIT	-0.0905	0.1894	-0.4779	0.6340	0	0	0.8025	0.0354	22.6374	0.0000	-0.1021	0.1047	-0.9749	0.3325	-0.0911	0.0534	-1.7068	0.0917	0.7438
COMSMCP	-0.0905	0.3333	-0.2715	0.7867	0	0	0.8025	0.0610	13.1659	0.0000	-0.1021	0.0972	-1.0503	0.2968	-0.0911	0.1070	-0.8514	0.3971	0.7438
INVAZIO	-0.1919	0.1440	-1.3329	0.1864	0	0	0.8181	0.0521	15.7177	0.0000	0.0104	0.0448	0.2330	0.8164	0.0312	0.0496	0.6294	0.5309	0.9428
GEPIAZA	0.0078	0.1176	0.0664	0.9472	0	0	0.8179	0.0410	19.9410	0.0000	0.0032	0.0270	0.1171	0.9071	-0.0046	0.0321	-0.1428	0.8868	0.9730
FIDIMIT	0.1352	0.0967	1.3971	0.1662	0	0	0.8839	0.0251	35.2636	0.0000	0.0574	0.0316	1.8179	0.0728	0.0019	0.0245	0.0770	0.9388	0.9799
DUCGITY	0.2240	0.1978	1.1323	0.2621	0	0	0.7802	0.0327	23.8573	0.0000	-0.0206	0.0548	-0.3753	0.7088	0.0130	0.0595	0.2176	0.8285	0.9355
GESITAL	-0.0906	0.1095	-0.8276	0.4104	0	0	0.8410	0.0362	23.2048	0.0000	0.0354	0.0241	1.4672	0.1462	-0.0126	0.0281	-0.4470	0.6561	0.9752
DUCAZIT	0.0241	0.1108	0.2174	0.8284	0	0	0.8265	0.0377	21.9070	0.0000	0.0401	0.0255	1.5693	0.1205	0.0025	0.0332	0.0756	0.9399	0.9728
ARCAZIT	-0.0324	0.1080	-0.3000	0.7649	0	0	0.8227	0.0357	23.0209	0.0000	-0.0021	0.0213	-0.0975	0.9226	0.0119	0.0335	0.3567	0.7223	0.9785
MEDRICR	0.1102	0.1244	0.8859	0.3783	0	0	0.8072	0.0227	35.5008	0.0000	0.1324	0.0363	3.6511	0.0005	-0.0233	0.0399	-0.5840	0.5608	0.9506
BNAZITL	0.0197	0.4321	0.0457	0.9637	0	0	0.9429	0.1126	8.3766	0.0000	0.1012	0.0893	1.1331	0.2606	-0.3800	0.3305	-1.1498	0.2536	0.4130
BIMAZI	-0.0388	0.1172	-0.3315	0.7411	0	0	0.8241	0.0410	20.0825	0.0000	0.0760	0.0392	1.9378	0.0562	0.0250	0.0346	0.7223	0.4722	0.9618
GSEAFND	-0.1124	0.1411	-0.7967	0.4280	0	0	0.8280	0.0501	16.5128	0.0000	0.1165	0.0438	2.6575	0.0095	0.0174	0.0459	0.3799	0.7050	0.9293
ZENAZII	0.3156	0.2375	1.3288	0.1896	0	0	0.8695	0.0605	14.3760	0.0000	0.2651	0.0821	3.2272	0.0021	-0.0763	0.0589	-1.2955	0.2008	0.9187
ZENAZIO	-0.0050	0.1678	-0.0300	0.9762	0	0	0.8754	0.0373	23.4515	0.0000	0.2550	0.0500	5.0990	0.0000	-0.0885	0.0430	-2.0596	0.0427	0.9325
ALSTARS	0.2131	0.2730	0.7805	0.4382	0	0	0.6041	0.0451	13.3862	0.0000	0.1030	0.0756	1.3621	0.1783	0.1464	0.0821	1.7831	0.0797	0.8122
ACITAA2	0.8611	0.3744	2.2997	0.0336	1	1	1.0050	0.0739	13.5908	0.0000	0.2553	0.0840	3.0402	0.0070	0.4058	0.0905	4.4840	0.0003	0.9510
SAIGALI	-0.1003	0.1994	-0.5027	0.6166	0	0	0.8423	0.0476	17.6851	0.0000	0.1491	0.0527	2.8301	0.0059	0.2691	0.0777	3.4615	0.0009	0.9445
# sign					1	1													

* coeff: expressed in percentage. adj R^2: red for min, blue for max. Green colour for statistical significance at 5% level; yellow colour for statistical significance at 10% level. All beta coeff are significant

Table 6.8 - Fama-French Summary Statistics, S3				
	alpha	beta	SMB	HML
Mean	**0.0637**	**0.8159**	**0.0878**	**0.0199**
Standard Error	0.0535	0.0245	0.0270	0.0374
Median	0.0078	0.8241	0.0760	0.0025
Standard Deviation	0.2334	0.1068	0.1176	0.1628
Sample Variance	0.0545	0.0114	0.0138	0.0265
t-statistic	1.1899	33.3096	3.2570	0.5319
p-value	**0.2496**	**0.0000**	**0.0044**	**0.6013**
Kurtosis	7.3457	3.8576	-0.5900	2.3895
Skewness	2.3969	-1.4740	0.2754	0.2032
Range	1.0530	0.4957	0.3977	0.7858
Minimum	-0.1919	0.5092	-0.1021	-0.3800
Maximum	0.8611	1.0050	0.2956	0.4058
Count	19	19	19	19

* Mean and median alpha expressed in percentage

Table 6.9 - Fama-French alpha, FDR, S3		
pi_zero	1	
sign lev	5%	10%
E(S+)	5.26%	5.26%
E(F+)	2.50%	5.00%
FDR+	47.50%	95.00%
E(T+)	2.76%	0.26%
E(S-)	0.00%	0.00%
E(F-)	2.50%	5.00%
FDR-	#DIV/0!	#DIV/0!
E(T-)	-2.50%	-5.00%

Finally, we add the WML factor and interpret the results of the *Carhart four-factor model*. The residual analysis shows that the percentage of funds suffering from heteroscedasticity increases with respect to the

Fama-French model, while autocorrelation and non-normality problems are reduced. 68.42% of the funds suffer from heteroscedasticity, 21.05% from autocorrelation and 73.68% from non-normality (see Table B.2). Newey-West estimation method is used to correct for heteroscedasticity and autocorrelation. ACITAA2 still earns the highest risk-adjusted return (alpha=0.6980%), but no longer statistically significant at the 10% significance level (p-value=0.1132). The only statistically significant alpha, at the 10% significance level, belongs to ZENAZII (alpha=0.4633%). The average alpha is again positive, 0.0847%, but not statistically significant at the 10% significance level (p-value=0.1010). According to the FDR approach, almost all the significant funds are false discoveries, since the estimated proportion of null funds is equal to one. Therefore, among the 5.26% significant funds at 10%, only 0.29% are truly skilled (see Table 6.12). Adding the WML factor, the explanatory power of the regression increases: the average adjusted R-squared goes up from 88.29% to 89.42%. The four factors contribute to explain 89.42% of the total variation of mutual fund returns. All the individual betas, as well as the average beta are statistically significant (p-value=0). The average beta increases to 0.8615 and the range shrinks further to 0.6367-1.0056.

The number of statistically significant SMB loadings increases: 12 of the 19 funds exhibit significantly positive SMB loadings at the 10% significance level, 11 of 19 at the 5% level (see Table 6.10). The average SMB loading is again positive, equal to 0.1334, and statistically significant at the 1% significance level (p-value=0.0005). No fund has a SMB loading greater than 0.5, suggesting that the funds are likely large cap. All the statistically significant HML loadings become positive: 5 funds are significant at the 10% significance level and 5 funds at the 5% level (see Table 6.10). 3 of the 5 significant funds have HML loadings close or greater than 0.3, suggesting a more pronounced value tilt. Even though the average HML loading increases from 0.0199 to 0.0597, it is still statistically insignificant at the 10% level (p-value=0.1147). All the funds, except ACITAA2, have positive WML loadings, and all the significant WML loadings are positive. 11 funds exhibit significant WML loadings at the 10% significance level, and 6 of these are significant at the 5% level (see Table 6.10). The significant WML loadings increase the goodness-of-fit. The average WML loading is 0.0771 and significant at the 1% level (p-value=0.0001), suggesting Italian equity mutual funds follow a momentum strategy (see Table 6.11).

Table 6.10 - Carhart estimates, S3

	alpha						beta				SMB				HML				WML				adj R^2
	coeff	std error	tstat	prob	sign 5%	sign 10%	coeff	std error	tstat	prob	coeff	std error	tstat	prob	coeff	std error	tstat	prob	coeff	std error	tstat	prob	
SYAZSCI	0.0000	0.2936	0.6174	0.5402	0	0	0.6794	0.0566	11.9996	0.0000	0.4045	0.1088	3.7163	0.0006	0.3608	0.1328	2.7164	0.0095	0.2624	0.1385	1.8938	0.0650	0.7692
BPBAZIT	-0.0817	0.1892	-0.4319	0.6670	0	0	0.8246	0.0320	25.7740	0.0000	-0.0936	0.0987	-0.9490	0.3455	-0.0773	0.0503	-1.5344	0.1289	0.0381	0.0580	0.6565	0.5134	0.7412
COMSMCP	-0.0849	0.1987	-0.4275	0.6702	0	0	0.8429	0.0463	18.2025	0.0000	0.3986	0.0589	6.7719	0.0000	0.1112	0.0661	1.6807	0.0968	0.0986	0.0495	1.9935	0.0497	0.8740
INVAZIO	-0.1640	0.1310	-1.2520	0.2143	0	0	0.8884	0.0251	35.3597	0.0000	0.0372	0.0404	0.9206	0.3601	0.0750	0.0524	1.4300	0.1566	0.1208	0.0593	2.0376	0.0449	0.9504
GEPIAZA	0.0249	0.1028	0.2424	0.8091	0	0	0.8610	0.0173	49.7074	0.0000	0.0196	0.0266	0.7347	0.4647	0.0223	0.0365	0.6105	0.5433	0.0742	0.0500	1.4852	0.1415	0.9760
FIDIMIT	0.1484	0.0947	1.5665	0.1212	0	0	0.9173	0.0144	63.7354	0.0000	0.0701	0.0293	2.3927	0.0191	0.0227	0.0253	0.8970	0.3725	0.0575	0.0293	1.9654	0.0529	0.9814
DUCGITY	0.2362	0.1413	1.6711	0.1001	0	0	0.7907	0.1057	7.4825	0.0000	-0.0142	0.0997	-0.1419	0.8876	0.0211	0.0593	0.3561	0.7231	0.0163	0.0911	0.1789	0.8587	0.9312
GESITAL	-0.0708	0.0990	-0.7154	0.4765	0	0	0.8910	0.0176	50.6907	0.0000	0.0544	0.0227	2.4015	0.0187	0.0186	0.0303	0.6129	0.5417	0.0860	0.0416	2.0657	0.0421	0.9791
DUCAZIT	0.0405	0.0967	0.4185	0.6767	0	0	0.8679	0.0264	32.8379	0.0000	0.0558	0.0275	2.0267	0.0461	0.0283	0.0345	0.8195	0.4150	0.0711	0.0412	1.7248	0.0885	0.9754
ARCAZIT	-0.0150	0.0969	-0.1546	0.8775	0	0	0.8667	0.0168	51.7267	0.0000	0.0146	0.0214	0.6840	0.4960	0.0393	0.0359	1.0947	0.2770	0.0756	0.0402	1.8779	0.0641	0.9816
MEDRICR	0.1269	0.1210	1.0485	0.2976	0	0	0.8494	0.0282	30.1260	0.0000	0.1484	0.0358	4.1402	0.0001	0.0030	0.0403	0.0734	0.9417	0.0725	0.0301	2.4051	0.0185	0.9534
BNAZITL	0.0446	0.4239	0.1052	0.9165	0	0	1.0056	0.1140	8.8190	0.0000	0.1251	0.0946	1.3221	0.1900	-0.3409	0.3272	-1.0418	0.3007	0.1079	0.0574	1.8795	0.0639	0.4083
BIMAZI	-0.0275	0.1136	-0.2420	0.8094	0	0	0.8527	0.0245	34.7476	0.0000	0.0869	0.0396	2.1925	0.0313	0.0428	0.0384	1.1150	0.2682	0.0492	0.0446	1.1043	0.2728	0.9628
GSEAFND	-0.0831	0.1442	-0.5765	0.5659	0	0	0.9019	0.0350	25.7485	0.0000	0.1446	0.0388	3.7293	0.0004	0.0635	0.0452	1.4032	0.1645	0.1271	0.0439	2.8927	0.0049	0.9379
ZENAZII	0.4633	0.2399	1.9317	0.0589	0	1	0.9632	0.0690	13.9595	0.0000	0.3274	0.0735	4.4515	0.0000	0.0035	0.0575	0.0602	0.9523	0.1449	0.0585	2.4788	0.0165	0.9269
ZENAZIO	0.0148	0.1679	0.0882	0.9299	0	0	0.9254	0.0396	23.3910	0.0000	0.2741	0.0445	6.1607	0.0000	-0.0573	0.0424	-1.3515	0.1804	0.0861	0.0524	1.6413	0.1047	0.9360
ALSTARS	0.2508	0.1952	1.2850	0.2039	0	0	0.6367	0.1062	5.9953	0.0000	0.1229	0.1145	1.0733	0.2876	0.1718	0.0736	2.3342	0.0231	0.0506	0.0960	0.5269	0.6003	0.8108
ACITAA2	0.6980	0.4179	1.6702	0.1132	0	0	0.9420	0.1021	9.2222	0.0000	0.2023	0.1030	1.9635	0.0662	0.3438	0.1142	3.0113	0.0079	-0.1077	0.1198	-0.8989	0.3813	0.9510
SAIGALI	-0.0924	0.1912	-0.4834	0.6301	0	0	0.8620	0.0237	36.3256	0.0000	0.1567	0.0498	3.1477	0.0023	0.2814	0.0842	3.3428	0.0013	0.0340	0.0731	0.4648	0.6434	0.9423
# sign					0	1																	

* coeff. expressed in percentage. adj R^2: red for min, blue for max. Green colour for statistical significance at 5% level; yellow colour for statistical significance at 10% level. All beta coeff are significant

Table 6.11 - Carhart Summary Statistics, S3					
	alpha	beta	SMB	HML	WML
Mean	**0.0847**	**0.8615**	**0.1334**	**0.0597**	**0.0771**
Standard Error	0.0490	0.0201	0.0313	0.0360	0.0160
Median	0.0249	0.8667	0.1229	0.0283	0.0742
Standard Deviation	0.2137	0.0878	0.1364	0.1569	0.0700
Sample Variance	0.0457	0.0077	0.0186	0.0246	0.0049
t-statistic	1.7287	42.7789	4.2626	1.6578	4.8049
p-value	**0.1010**	**0.0000**	**0.0005**	**0.1147**	**0.0001**
Kurtosis	2.8107	2.0351	-0.0240	2.0195	4.2007
Skewness	1.6046	-1.1661	0.7013	-0.1024	0.0350
Range	0.8620	0.3689	0.4981	0.7017	0.3701
Minimum	-0.1640	0.6367	-0.0936	-0.3409	-0.1077
Maximum	0.6980	1.0056	0.4045	0.3608	0.2624
Count	19	19	19	19	19
* Mean and median alpha expressed in percentage					

Table 6.12 - Carhart alpha, FDR, S3		
pi_zero	1	
sign lev	5%	10%
E(S+)	0.00%	5.26%
E(F+)	2.50%	5.00%
FDR+	#DIV/0!	95.00%
E(T+)	-2.50%	0.26%
E(S-)	0.00%	0.00%
E(F-)	2.50%	5.00%
FDR-	#DIV/0!	#DIV/0!
E(T-)	-2.50%	-5.00%

6.2 Market Timing Ability

6.2.1 Treynor-Mazuy Model

Newey-West method is used to correct heteroscedasticity and autocorrelation problems. In S1, 59.26% of the funds suffer from heteroscedasticity, 48.15% from autocorrelation and 25.93% from non-normality (see Table C.1). In S2, the percentages are 31.58%, 36.84% and 31.58% respectively (see Table C.2). In S3, the percentage of funds suffering from autocorrelation decreases, but heteroscedasticity and non-normality problems accentuate: 47.37% suffers from heteroscedasticity, 26.32% from autocorrelation and 73.68% from non-normality (see Table C.3). The goal of this analysis is to separate each alpha estimate from the CAPM into selective ability and market timing ability, as measured by the alpha and the market timing coefficients from the Treynor-Mazuy (TM) model.

Let us start with S1. 2 of 27 funds exhibit significantly positive alpha estimates at the 10% significance level. One fund exhibits a significantly negative alpha estimate at the 5% level (see Table 6.13). The average alpha is 0.1350%, but is not statistically significant (p-value=0.2626). This result is consistent with the results from CAPM and confirms mutual funds do not possess selective ability. The FDR estimates that the proportion of null funds is equal to one. At the 5% significance level, 3.70% are significantly positive, of which 2.50% are false discoveries, leaving the percentage of skilled funds at 1.20%. Increasing the significance level to 10%, the additional significant funds bring the percentage of significant funds up to 7.41%. The percentage of false discoveries increases to 5%, leaving 2.41% of skilled funds. The behaviour in the left tail at the 5% significance level is similar to the right tail: 3.70% of funds are significant, 2.50% are false discoveries, and 1.20% are unskilled (see Table 6.17). No additional fund is significantly negative at 10%, so the FDR approach does not work in the left tail. The FDR approach reveals that skilled funds are more dispersed in the right tail than unskilled funds are in the left tail. Only 1 of 27 funds has market timing ability: SYSELIT displays a market timing coefficient of 0.0251, which is significant at the 5% level. 4 funds have perverse (negative) market timing ability, since their market timing coefficients are significantly negative at the 10% level, and 1 of them at the 5% level (see Table 6.13). According to the FDR approach, the percentage of false discoveries among funds possessing market timing ability is 1.25%, meaning that 2.45% of the sample funds truly time the market. Increasing the significance level to 10, no additional fund shows a significant market timing coefficient, and therefore the FDR approach cannot be implemented. In the left tail, at the 5% level, the percentage of significant funds (3.70%) is corrected for the same percentage of false discoveries (1.25%), leaving the percentage of perverse market timers at 2.45%. Increasing the significance level to 10%, the number of perverse market timers increases from 3.70% to 14.81%. The percentage of false discoveries increases accordingly to 2.50%, meaning that the estimated percentage of truly perverse market timers at the 10% level is 12.32% (see Table 6.18). The FDR approach reveals that market timers are concentrated in the extreme right tail, while perverse market timers are more dispersed in the left tail. The average market timing coefficient is slightly negative, equal to -0.0031, and statistically significant at the 1% level (p-value=0). The average alpha from the CAPM was 0.0259%, though not statistically significant. Selective ability is actually higher, but still statistically insignificant, according to the TM model. Mutual funds are penalised by perverse market timing, as showed by the significantly negative market timing coefficient. SYSELIT shows an opposite pattern: it has negative selective ability, but successfully times the market.

Table 6.13 - Treynor-Mazuy estimates, S1

	alpha				beta				TM						adj R^2
	coeff	std error	tstat	prob	coeff	std error	tstat	prob	coeff	std error	tstat	prob	sign 5%	sign 10%	
AREREII	1.2169	0.9539	1.2757	0.2492	0.4227	0.1388	3.0450	0.0227	-0.0243	0.0420	-0.5796	0.5833	0	0	0.6603
SYAZSCI	0.5886	0.4203	1.4004	0.1654	0.5535	0.0602	9.1916	0.0000	-0.0157	0.0092	-1.6990	0.0933	0	1	0.6604
AREREIP	1.1769	0.9660	1.2184	0.2688	0.4331	0.1406	3.0812	0.0216	-0.0255	0.0425	-0.5987	0.5713	0	0	0.6664
BPBAZIT	-0.0790	0.1865	-0.4235	0.6727	0.8023	0.0249	32.1606	0.0000	-0.0019	0.0019	-1.0089	0.3151	0	0	0.8040
COMSMCP	-0.1869	0.3478	-0.5374	0.5920	0.7446	0.0478	15.5698	0.0000	-0.0015	0.0041	-0.3553	0.7230	0	0	0.7646
ANITPMI	2.3972	1.1978	2.0013	0.0804	0.6636	0.1753	3.7856	0.0053	-0.0752	0.0386	-1.9491	0.0871	0	1	0.6557
GNAZITC	-0.0027	0.3083	-0.0088	0.9930	0.8911	0.0604	1.4763	0.0000	0.0060	0.0104	0.5780	0.5684	0	0	0.9238
INVAZIO	-0.2035	0.1283	-1.5861	0.1154	0.8277	0.0247	33.5720	0.0000	-0.0021	0.0025	-0.8368	0.4044	0	0	0.9504
GEPIAZA	-0.0145	0.1210	-0.1201	0.9046	0.8211	0.0271	30.2883	0.0000	-0.0020	0.0019	-1.0608	0.2910	0	0	0.9711
FIDIMIT	0.1588	0.1218	1.3039	0.1948	0.8703	0.0211	41.1866	0.0000	-0.0011	0.0013	-0.8737	0.3841	0	0	0.9682
GESFEAC	0.1881	0.1754	1.0727	0.2917	0.8635	0.0273	3.1651	0.0000	0.0045	0.0042	1.0634	0.2958	0	0	0.9715
DUCGITY	0.2153	0.1205	1.7878	0.0771	0.7940	0.0257	30.9144	0.0000	-0.0008	0.0030	-0.2630	0.7932	0	0	0.9515
GESITAL	-0.0834	0.1125	-0.7416	0.4598	0.8275	0.0225	36.6982	0.0000	-0.0024	0.0014	-1.7543	0.0820	0	1	0.9718
DUCAZIT	-0.0254	0.0990	-0.2566	0.7980	0.8198	0.0191	43.0320	0.0000	-0.0019	0.0019	-1.0100	0.3146	0	0	0.9683
MEDFITI	-0.5402	0.3424	-1.5777	0.1296	0.8252	0.0382	21.5939	0.0000	0.0147	0.0116	1.2721	0.2173	0	0	0.9360
ARCAZIT	-0.0718	0.1072	-0.6700	0.5042	0.8309	0.0237	34.9867	0.0000	-0.0016	0.0015	-1.0612	0.2908	0	0	0.9780
MEDRICR	-0.1585	0.1710	-0.9267	0.3560	0.7655	0.0258	29.6874	0.0000	-0.0019	0.0019	-0.9630	0.3375	0	0	0.9358
BNAZITL	0.1943	0.3671	0.5294	0.5975	0.8219	0.0506	16.2572	0.0000	-0.0060	0.0044	-1.3638	0.1752	0	0	0.5146
SYSELIT	-0.6950	0.2622	-2.6507	0.0150	0.8825	0.0460	1.9205	0.0000	0.0251	0.0099	2.5413	0.0190	1	1	0.9555
BIMAZI	-0.1467	0.1482	-0.9903	0.3241	0.8074	0.0275	29.3483	0.0000	-0.0021	0.0019	-1.0669	0.2882	0	0	0.9502
GSEAFND	-0.2298	0.1591	-1.4438	0.1515	0.7347	0.0266	27.6089	0.0000	-0.0063	0.0023	-2.7525	0.0069	1	1	0.9035
ZENAZII	0.3223	0.2816	1.1444	0.2556	0.7590	0.0382	19.8588	0.0000	-0.0047	0.0049	-0.9670	0.3362	0	0	0.8884
ZENAZIO	-0.1516	0.2122	-0.7145	0.4763	0.7979	0.0364	21.9203	0.0000	-0.0032	0.0030	-1.0579	0.2923	0	0	0.8941
ALSTARS	-0.0084	0.2278	-0.0369	0.9706	0.6800	0.0426	15.9501	0.0000	-0.0003	0.0042	-0.0713	0.9433	0	0	0.8390
ACITAA2	0.0466	0.3724	0.1250	0.9010	1.1049	0.0477	23.1547	0.0000	0.0099	0.0063	1.5525	0.1266	0	0	0.9022
AITALQ2	-0.1877	0.8265	-0.2271	0.8279	1.1461	0.1203	9.5298	0.0001	0.0349	0.0364	0.9586	0.3748	0	0	0.9403
SAIGALI	-0.0757	0.2089	-0.3625	0.7176	0.9128	0.0592	15.4253	0.0000	0.0003	0.0041	0.0637	0.9493	0	0	0.9050
# sign													2	5	

* coeff: expressed in percentage. adj R^2: red for min, blue for max. Green colour for statistical significance at 5% level; yellow colour for statistical significance at 10% level

In S2, we use a sample of 19 mutual funds from 2006 to 2013. No fund shows selective or market timing abilities. 6 funds have significantly negative alpha estimates at the 10% level, and 3 at the 5% level (see Table 6.14). Applying the FDR approach, 1.76% of the 15.79% significantly negative alphas at the 5% level are false discoveries. This leaves the estimated percentage of unskilled funds at the 5% level at 14.03%. Increasing the significance level to 10%, the percentage of significant funds doubles to 31.58%, and so does the percentage of false discoveries. The estimated percentage of unskilled funds at the 10% level is therefore 28.06% (see Table 6.19). Unskilled funds are dispersed in the left tail. The average alpha is negative, -0.1726%, and statistically significant at the 1% significance level (p-value=0.0091). The result is consistent with the CAPM results. 7 of 19 funds have significantly negative market timing coefficients at the 10% level, and 4 at the 5% level (see Table 6.14). The estimated proportion of funds with null market timing ability is equal to zero, therefore all the funds with significantly negative market timing ability are perverse market timers. The percentage of negative market timers is 21.05% at the 5% significance level, and 36.84% at the 10% level (see Table 6.20). Funds with perverse market timing are dispersed in the left tail. The average market timing coefficient is -0.0037% and statistically significant at the 1% significance level (p-value=0.0017). The average alpha from the CAPM was a significant -0.3046%. According to the TM model, selective ability is less negative, but a significantly negative market timing ability worsens the risk-adjusted performance of mutual funds.

Table 6.14 - Treynor-Mazuy estimates, S2

	alpha				beta				TM						adj R^2
	coeff	std error	tstat	prob	coeff	std error	tstat	prob	coeff	std error	tstat	prob	sign 5%	sign 10%	
SYAZSCI	0.0582	0.4088	0.1424	0.8874	0.4626	0.0460	10.0535	0.0000	-0.0178	0.0046	-3.8776	0.0003	1	1	0.7054
BPBAZIT	-0.2488	0.2585	-0.9628	0.3385	0.7862	0.0246	31.9038	0.0000	-0.0020	0.0024	-0.8406	0.4031	0	0	0.7589
COMSMCP	-0.7478	0.3601	-2.0765	0.0410	0.6925	0.0442	15.6612	0.0000	-0.0026	0.0047	-0.5562	0.5796	0	0	0.7663
INVAZIO	-0.3724	0.1586	-2.3476	0.0213	0.7977	0.0290	27.4943	0.0000	-0.0031	0.0016	-1.8640	0.0659	0	1	0.9510
GEPIAZA	-0.1925	0.1246	-1.5455	0.1261	0.7890	0.0158	49.9611	0.0000	-0.0028	0.0014	-2.0248	0.0462	1	1	0.9721
FIDIMIT	-0.0379	0.1351	-0.2803	0.7799	0.8415	0.0196	42.8671	0.0000	-0.0019	0.0015	-1.2776	0.2050	0	0	0.9666
DUCGITY	0.1060	0.2369	0.4475	0.6561	0.7607	0.0258	29.4471	0.0000	-0.0019	0.0023	-0.8284	0.4107	0	0	0.9420
GESITAL	-0.2711	0.1314	-2.0630	0.0423	0.8011	0.0167	48.0986	0.0000	-0.0030	0.0014	-2.0781	0.0409	1	1	0.9700
DUCAZIT	-0.2006	0.1390	-1.4437	0.1527	0.7895	0.0176	44.8211	0.0000	-0.0027	0.0015	-1.7932	0.0767	0	1	0.9656
ARCAZIT	-0.2343	0.1295	-1.8096	0.0741	0.8006	0.0175	45.7525	0.0000	-0.0023	0.0010	-2.2675	0.0260	1	1	0.9774
MEDRICR	-0.2345	0.1974	-1.1879	0.2384	0.7523	0.0250	30.0699	0.0000	-0.0027	0.0022	-1.2248	0.2242	0	0	0.9266
BNAZITL	0.1180	0.5873	0.2010	0.8412	0.7840	0.0778	10.0736	0.0000	-0.0078	0.0056	-1.3777	0.1721	0	0	0.4225
BIMAZI	-0.2913	0.1739	-1.6748	0.0978	0.7803	0.0220	35.3895	0.0000	-0.0031	0.0019	-1.6281	0.1074	0	0	0.9461
GSEAFND	-0.3331	0.2144	-1.5539	0.1241	0.7681	0.0272	28.2655	0.0000	-0.0046	0.0024	-1.9528	0.0543	0	1	0.9193
ZENAZII	0.4865	0.3156	1.5417	0.1290	0.7264	0.0513	14.1688	0.0000	-0.0080	0.0063	-1.2577	0.2139	0	0	0.8984
ZENAZIO	-0.2359	0.2372	-0.9944	0.3230	0.7697	0.0418	18.4360	0.0000	-0.0051	0.0039	-1.3362	0.1852	0	0	0.8955
ALSTARS	-0.2535	0.2929	-0.8655	0.3902	0.5904	0.0446	13.2297	0.0000	-0.0030	0.0034	-0.8973	0.3732	0	0	0.8089
ACITAA2	0.0031	0.7040	0.0044	0.9965	1.0613	0.1051	10.1003	0.0000	0.0060	0.0098	0.6065	0.5514	0	0	0.8725
SAIGALI	-0.3974	0.2227	-1.7843	0.0781	0.8354	0.0441	18.9243	0.0000	-0.0023	0.0021	-1.0832	0.2819	0	0	0.9168
# sign													4	7	

* coeff. expressed in percentage. adj R^2: red for min, blue for max. Green colour for statistical significance at 5% level; yellow colour for statistical significance at 10% level

As we switch from the FTSEMIB to the MSCI Italy Index in S3, all the significant alpha estimates are positive. 5 of 19 alpha estimates are significantly positive at the 10% significance level, and 3 of them are statistically significant at the 5% level (see Table 6.15). The average alpha is 0.1718% and is statistically significant at the 1% significance level (p-value=0.0014). This result is quite different from the CAPM, where none of the funds had significant alpha estimates, and the average alpha was statistically not different from zero. Applying the FDR approach, 14.49% of the 15.79% significant funds at the 5% level are skilled funds, since 1.30% are false discoveries. Increasing the significance level to 10%, 26.32% are significant funds, 2.60% are false discoveries, and 23.71% are skilled funds (see Table 6.21). Skilled funds are dispersed in the right tail. If on one hand selective ability is positive for all the significant funds, on the other hand market timing ability is negative for all the significant funds. 13 of 19 funds show significantly negative market timing coefficients at the 10% significance level, and 11 of them at the 5% level (see Table 6.15). This is the highest number of significantly negative market timing coefficients among all the three studies. The average market timing coefficient is -0.0051 and is statistically significant (p-value=0.0001). The FDR approach reveals that perverse market timers are concentrated in the left tail, as the number of funds with negative market timing ability slightly increases with the significance level. The percentage of significant funds at the 5% level is 57.89%, false discoveries are 0.89%, and negative market timers are 57.01%. As we increase the significance level to 10%, the percentage of significant funds rises to 68.42%, which corrected for the 1.78% false discoveries, yields 66.65% negative market timers (see Table 6.22). The average alpha in S3 according to the CAPM was -0.0414%. The TM model breaks up the negative risk-adjusted performance into positive selectivity and negative market timing ability, where both are statistically significant.

Table 6.15 - Treynor-Mazuy estimates, S3

	alpha				beta				TM						adj R^2
	coeff	std error	tstat	prob	coeff	std error	tstat	prob	coeff	std error	tstat	prob	sign 5%	sign 10%	
SYAZSCI	0.5534	0.3441	1.6084	0.1147	0.5390	0.0466	11.5658	0.0000	-0.0210	0.0052	-4.0685	0.0002	1	1	0.7551
BPBAZIT	0.1155	0.2546	0.4536	0.6513	0.8074	0.0145	55.5177	0.0000	-0.0030	0.0019	-1.5871	0.1164	0	0	0.7422
COMSMCP	-0.2021	0.2733	-0.7395	0.4617	0.7118	0.0467	15.2546	0.0000	-0.0036	0.0039	-0.9365	0.3518	0	0	0.8043
INVAZIO	-0.0055	0.1167	-0.0471	0.9626	0.8209	0.0395	20.7941	0.0000	-0.0051	0.0019	-2.6584	0.0095	1	1	0.9475
GEPIAZA	0.1820	0.1002	1.8163	0.0730	0.8153	0.0289	28.2042	0.0000	-0.0044	0.0020	-2.2148	0.0296	1	1	0.9768
FIDIMIT	0.2154	0.0907	2.3752	0.0199	0.8702	0.0191	45.5686	0.0000	-0.0029	0.0010	-2.7566	0.0072	1	1	0.9802
DUCGITY	0.3547	0.1189	2.9847	0.0041	0.7881	0.0440	17.9120	0.0000	-0.0025	0.0029	-0.8774	0.3838	0	0	0.9343
GESITAL	0.0749	0.0907	0.8258	0.4114	0.8292	0.0248	33.3846	0.0000	-0.0046	0.0015	-3.0703	0.0029	1	1	0.9785
DUCAZIT	0.1655	0.0981	1.6869	0.0955	0.8168	0.0265	30.8782	0.0000	-0.0042	0.0014	-2.9314	0.0044	1	1	0.9755
ARCAZIT	0.1257	0.0850	1.4784	0.1432	0.8248	0.0250	32.9276	0.0000	-0.0041	0.0015	-2.7517	0.0073	1	1	0.9815
MEDRICR	0.1835	0.1571	1.1684	0.2461	0.7708	0.0303	25.4223	0.0000	-0.0036	0.0016	-2.1996	0.0307	1	1	0.9454
BNAZITL	0.3622	0.4760	0.7609	0.4489	0.8411	0.0606	13.8888	0.0000	-0.0072	0.0030	-2.3628	0.0205	1	1	0.4022
BIMAZI	0.1016	0.1085	0.9369	0.3516	0.8104	0.0302	26.8545	0.0000	-0.0048	0.0019	-2.5885	0.0114	1	1	0.9637
GSEAFND	0.0349	0.1547	0.2255	0.8222	0.8031	0.0401	20.0237	0.0000	-0.0055	0.0023	-2.4267	0.0175	1	1	0.9296
ZENAZII	0.6276	0.2833	2.2151	0.0310	0.7795	0.0440	17.7226	0.0000	-0.0080	0.0054	-1.4723	0.1468	0	0	0.9039
ZENAZIO	0.0926	0.1942	0.4766	0.6349	0.7967	0.0346	23.0520	0.0000	-0.0055	0.0030	-1.7954	0.0763	0	1	0.9093
ALSTARS	0.2303	0.2195	1.0490	0.2984	0.6061	0.0584	10.3752	0.0000	-0.0033	0.0029	-1.1418	0.2581	0	0	0.8020
ACITAA2	0.1398	0.5816	0.2403	0.8126	1.0799	0.1153	9.3678	0.0000	0.0009	0.0089	0.1058	0.9169	0	0	0.8598
SAIGALI	-0.0869	0.1658	-0.5242	0.6016	0.8607	0.0496	17.3406	0.0000	-0.0046	0.0026	-1.7450	0.0848	0	1	0.9050
# sign													11	13	

* coeff: expressed in percentage. adj R^2: red for min, blue for max. Green colour for statistical significance at 5% level; yellow colour for statistical significance at 10% level

Table 6.16 - Treynor-Mazuy Summary Statistics						
	S1		S2		S3	
	alpha	TM	alpha	TM	alpha	TM
Mean	**0.1350**	**-0.0031**	**-0.1726**	**-0.0037**	**0.1718**	**-0.0051**
Standard Error	0.1179	0.0036	0.0591	0.0010	0.0456	0.0010
Median	-0.0254	-0.0019	-0.2345	-0.0028	0.1398	-0.0044
Standard Deviation	0.6124	0.0188	0.2576	0.0044	0.1990	0.0043
Sample Variance	0.3751	0.0004	0.0664	0.0000	0.0396	0.0000
t-statistic	1.1451	-0.8680	-2.9199	-3.6895	3.7648	-5.2002
p-value	**0.2626**	**0.0000**	**0.0091**	**0.0017**	**0.0014**	**0.0001**
Kurtosis	6.7990	8.2577	2.0749	6.5034	1.0002	11.6424
Skewness	2.3362	-1.9232	0.4885	-1.4561	0.6598	-3.0061
Range	3.0922	0.1101	1.2343	0.0238	0.8297	0.0219
Minimum	-0.6950	-0.0752	-0.7478	-0.0178	-0.2021	-0.0210
Maximum	2.3972	0.0349	0.4865	0.0060	0.6276	0.0009
Count	27	27	19	19	19	19

* Mean and median alpha expressed in percentage

Table 6.17 - Alpha, TM, FDR, S1		
pi_zero	1	
sign lev	5%	10%
E(S+)	3.70%	7.41%
E(F+)	2.50%	5.00%
FDR+	67.50%	67.50%
E(T+)	1.20%	2.41%
E(S-)	3.70%	3.70%
E(F-)	2.50%	5.00%
FDR-	67.50%	135.00%
E(T-)	1.20%	-1.30%

Table 6.18 - Market timing coeff, TM, FDR, S1		
pi_zero	0.4995	
sign lev	5%	10%
E(S+)	3.70%	3.70%
E(F+)	1.25%	2.50%
FDR+	33.72%	67.43%
E(T+)	2.45%	1.21%
E(S-)	3.70%	14.81%
E(F-)	1.25%	2.50%
FDR-	33.72%	16.86%
E(T-)	2.45%	12.32%

Table 6.19 - Alpha, TM, FDR, S2		
pi_zero	0.7032	
sign lev	5%	10%
E(S+)	0.00%	0.00%
E(F+)	1.76%	3.52%
FDR+	#DIV/0!	#DIV/0!
E(T+)	-1.76%	-3.52%
E(S-)	15.79%	31.58%
E(F-)	1.76%	3.52%
FDR-	11.13%	11.13%
E(T-)	14.03%	28.06%

Table 6.20 - Market timing coeff, TM, FDR, S2		
pi_zero	0	
sign lev	5%	10%
E(S+)	0.00%	0.00%
E(F+)	0.00%	0.00%
FDR+	#DIV/0!	#DIV/0!
E(T+)	0.00%	0.00%
E(S-)	21.05%	36.84%
E(F-)	0.00%	0.00%
FDR-	0.00%	0.00%
E(T-)	21.05%	36.84%

Table 6.21 - Alpha, TM, FDR, S3		
pi_zero	0.5209	
sign lev	5%	10%
E(S+)	15.79%	26.32%
E(F+)	1.30%	2.60%
FDR+	8.25%	9.90%
E(T+)	14.49%	23.71%
E(S-)	0.00%	0.00%
E(F-)	1.30%	2.60%
FDR-	#DIV/0!	#DIV/0!
E(T-)	-1.30%	-2.60%

Table 6.22 - Market timing coeff, TM, FDR, S3		
pi_zero	0.3551	
sign lev	5%	10%
E(S+)	0.00%	0.00%
E(F+)	0.89%	1.78%
FDR+	#DIV/0!	#DIV/0!
E(T+)	-0.89%	-1.78%
E(S-)	57.89%	68.42%
E(F-)	0.89%	1.78%
FDR-	1.53%	2.59%
E(T-)	57.01%	66.65%

6.2.2 Henriksson-Merton Model

The results from the residual analysis for the Henriksson-Merton (HM) model are the following. In S1, 55.56% of the funds suffer from heteroscedasticity, 51.85% from serial correlation and 22.22% from non-normality (see Table C.4). In S2, 26.32% of the funds suffer from heteroscedasticity, 42.11% from autocorrelation and 31.58% from non-normality (see Table C.5). In S3, 47.37% of the funds suffer from heteroscedasticity, 26.32% from autocorrelation and 68.42% from non-normality (see Table C.6). Newey-West standard errors are used to correct both heteroscedasticity and autocorrelation.

In S1, no fund exhibits significantly positive alpha estimates, but instead 2 funds show significantly negative alpha estimates at the 5% level (see Table 6.23). As in the TM model, the average alpha is positive, but not statistically significant: the estimate of 0.1446% has a p-value equal to 0.3022 (see Table 6.26). The FDR study reveals that among the 7.41%

significant funds, 2.50% are false discoveries, and 4.91% are truly skilled (see Table 6.27%). One fund, GSEAFND has a significantly negative market timing coefficient at the 5% significance level (see Table 6.23). The FDR approach reveals that among the 3.70% significantly positive funds at the 5% significance level, only 2.50% are true market timers, as the percentage of false discoveries amounts to 1.20%. Increasing the significance level to 10%, additional funds become significant, raising the percentage of significant funds to 7.41%. The percentage of false discoveries consequently increases to 2.41%, yielding 5% of true market timers at the 10% level. The behaviour of significantly negative market timers at the 5% level in the left tail is the same of the right tail: of the 3.70% significant funds, only 2.50% are perverse market timers (see Table 6.28). As the number of perverse market timers does not increase with the significance level, the FDR cannot be implemented for significantly negative funds. The average market timing coefficient is negative as in the TM model, but now it is not statistically significant: the estimate of -0.0348 is not statistically different from zero, as its p-value is 0.4996 (see Table 6.26). The average alpha according to CAPM was an insignificant 0.0259%. The HM model shows that selectivity is actually higher and market timing ability is negative. Both selectivity and market timing are statistically insignificant, and therefore it is difficult to separately identify the contribution of the two components to the overall risk-adjusted performance.

Table 6.23 - Henriksson-Merton estimates, S1

	alpha				beta				HM						adj R^2
	coeff	std error	tstat	prob	coeff	std error	tstat	prob	coeff	std error	tstat	prob	sign 5%	sign 10%	
AREREII	1.2169	0.9539	1.2757	0.2492	0.4227	0.1388	3.0450	0.0227	-0.0243	0.0420	-0.5796	0.5833	0	0	0.6603
SYAZSCI	0.7851	0.7478	1.0499	0.2970	0.3882	0.2100	1.8491	0.0682	-0.3205	0.3002	-1.0678	0.2889	0	0	0.6335
AREREIP	1.0847	1.3227	0.8200	0.4435	0.3514	0.3668	0.9582	0.3749	-0.1945	0.6209	-0.3132	0.7647	0	0	0.6521
BPBAZIT	0.0062	0.2172	0.0287	0.9772	0.7702	0.0460	16.7351	0.0000	-0.0642	0.0600	-1.0693	0.2871	0	0	0.8040
COMSMCP	-0.1890	0.4175	-0.4528	0.6515	0.7359	0.0875	8.4104	0.0000	-0.0225	0.1416	-0.1588	0.8741	0	0	0.7644
ANITPMI	2.8346	1.9216	1.4752	0.1784	0.1118	0.4082	0.2739	0.7911	-1.0153	0.8033	-1.2640	0.2418	0	0	0.5768
GNAZITC	0.0068	0.4221	0.0162	0.9872	0.9302	0.0906	1.0267	0.0000	0.0572	0.1955	0.2927	0.7721	0	0	0.9230
INVAZIO	-0.2017	0.1825	-1.1054	0.2713	0.8142	0.0555	14.6590	0.0000	-0.0339	0.0703	-0.4820	0.6307	0	0	0.9499
GEPIAZA	0.0391	0.1548	0.2524	0.8012	0.7958	0.0523	15.2166	0.0000	-0.0535	0.0608	-0.8791	0.3811	0	0	0.9709
FIDIMIT	0.1735	0.1392	1.2467	0.2150	0.8600	0.0375	22.9216	0.0000	-0.0234	0.0515	-0.4539	0.6508	0	0	0.9681
GESFEAC	0.0392	0.2314	0.1696	0.8665	0.9252	0.0477	1.9384	0.0000	0.1292	0.0916	1.4102	0.1684	0	0	0.9722
DUCGITY	0.2298	0.2176	1.0561	0.2937	0.7857	0.0486	16.1726	0.0000	-0.0185	0.0969	-0.1905	0.8493	0	0	0.9514
GESITAL	-0.0139	0.1353	-0.1026	0.9184	0.7962	0.0411	19.3560	0.0000	-0.0656	0.0503	-1.3031	0.1951	0	0	0.9715
DUCAZIT	0.0211	0.1502	0.1406	0.8885	0.7967	0.0448	17.7841	0.0000	-0.0492	0.0562	-0.8757	0.3830	0	0	0.9680
MEDFITI	-0.8557	0.3714	-2.3041	0.0315	0.9886	0.0887	1.1150	0.0000	0.3260	0.1733	1.8811	0.0739	0	1	0.9405
ARCAZIT	-0.0583	0.1375	-0.4241	0.6722	0.8178	0.0456	17.9302	0.0000	-0.0305	0.0531	-0.5745	0.5667	0	0	0.9777
MEDRICR	-0.1242	0.2284	-0.5435	0.5878	0.7458	0.0396	18.8249	0.0000	-0.0433	0.0686	-0.6319	0.5287	0	0	0.9355
BNAZITL	0.4650	0.5380	0.8642	0.3892	0.7203	0.1383	5.2076	0.0000	-0.2032	0.1837	-1.1061	0.2710	0	0	0.5146
SYSELIT	-0.9750	0.3464	-2.8147	0.0104	1.0984	0.0827	1.3282	0.0000	0.4118	0.1617	2.5474	0.0187	1	1	0.9556
BIMAZI	-0.1622	0.1999	-0.8115	0.4187	0.7981	0.0545	14.6411	0.0000	-0.0269	0.0725	-0.3717	0.7108	0	0	0.9496
GSEAFND	0.0734	0.1975	0.3719	0.7107	0.6239	0.0496	12.5867	0.0000	-0.2199	0.0773	-2.8449	0.0052	1	1	0.9039
ZENAZII	0.3965	0.4482	0.8848	0.3787	0.7101	0.0804	8.8298	0.0000	-0.1065	0.1546	-0.6892	0.4925	0	0	0.8864
ZENAZIO	-0.0667	0.2932	-0.2275	0.8204	0.7580	0.0652	11.6194	0.0000	-0.0843	0.1065	-0.7918	0.4301	0	0	0.8936
ALSTARS	-0.0239	0.3268	-0.0731	0.9419	0.6812	0.0883	7.7163	0.0000	0.0004	0.1373	0.0026	0.9979	0	0	0.8390
ACITAA2	-0.2490	0.5232	-0.4760	0.6361	1.2291	0.1175	10.4580	0.0000	0.2662	0.1903	1.3991	0.1677	0	0	0.9023
AITALQ2	-0.3480	1.1335	-0.3070	0.7692	1.3405	0.3143	4.2650	0.0053	0.4169	0.5321	0.7834	0.4632	0	0	0.9376
SAIGALI	-0.2005	0.2806	-0.7145	0.4763	0.9439	0.1184	7.9707	0.0000	0.0535	0.1337	0.4003	0.6897	0	0	0.9052
# sign													2	3	

* coeff: expressed in percentage. adj R^2: red for min, blue for max. Green for statistical significance at 5% level; yellow colour for statistical signifcance at 10% level

In S2, the only significant alpha estimate belongs to ZENAZII, with an alpha of 1.0314%, which is significant at the 10% level (see Table 6.24). The average alpha is equal to 0.0634%, though not statistically significant (p-value=0.4864). In the TM model, all the significant alpha estimates were negative, and the average alpha was negative and not significant. According to the FDR study at the 10% significance level, among the 5.26% significant funds, 3.29% are false discoveries, leaving 1.98% of truly skilled funds (see Table 6.29). The results for market timing ability are more similar to the TM model, since all the significant funds have negative market timing coefficients. 6 of 19 funds have significantly negative market timing coefficients at the 10% significance level, and 2 of them at the 5% level (see Table 6.24). According to the FDR approach, among the 10.53% significant funds at the 5% level, 0.83% are false discoveries, and therefore only 9.70% are truly negative market timers. Perverse market timers are dispersed in the left tail of the distribution, since the number of significant funds greatly increases with the significance level. Among the 31.58% significant funds at the 10% level, 1.65% are false discoveries, 29.93% being true negative market timers (see Table 6.30). The average HM market timing coefficient is -0.1479 and statistically significant (p-value=0.0001), similarly to the TM model. The negative and significant alpha from the CAPM (-0.3046%) can be decomposed in the HM model in positive selective ability (insignificant 0.0634%) and negative market timing ability (significant -0.1479%).

Table 6.24 - Henriksson-Merton estimates, S2

	alpha				beta				HM						adj R^2
	coeff	std error	tstat	prob	coeff	std error	tstat	prob	coeff	std error	tstat	prob	sign 5%	sign 10%	
SYAZSCI	0.8133	0.6395	1.2717	0.2100	0.1706	0.1039	1.6413	0.1077	-0.5570	0.1778	-3.1320	0.0030	1	1	0.6773
BPBAZIT	-0.1369	0.3238	-0.4228	0.6736	0.7473	0.0535	13.9776	0.0000	-0.0752	0.0770	-0.9772	0.3314	0	0	0.7590
COMSMCP	-0.5472	0.4721	-1.1590	0.2499	0.6291	0.0898	7.0037	0.0000	-0.1185	0.1632	-0.7261	0.4699	0	0	0.7670
INVAZIO	-0.2625	0.2056	-1.2766	0.2054	0.7525	0.0447	16.8472	0.0000	-0.0921	0.0675	-1.3632	0.1766	0	0	0.9504
GEPIAZA	-0.0579	0.1837	-0.3154	0.7533	0.7398	0.0379	19.4995	0.0000	-0.0967	0.0505	-1.9139	0.0592	0	1	0.9719
FIDIMIT	0.0828	0.1659	0.4992	0.6190	0.8009	0.0358	22.3660	0.0000	-0.0775	0.0567	-1.3685	0.1749	0	0	0.9667
DUCGITY	0.2771	0.3447	0.8039	0.4246	0.7130	0.0608	11.7334	0.0000	-0.0898	0.0908	-0.9890	0.3266	0	0	0.9423
GESITAL	-0.1164	0.1710	-0.6809	0.4979	0.7458	0.0258	28.9206	0.0000	-0.1080	0.0433	-2.4922	0.0147	1	1	0.9699
DUCAZIT	-0.0629	0.1940	-0.3243	0.7466	0.7399	0.0390	18.9675	0.0000	-0.0973	0.0569	-1.7085	0.0914	0	1	0.9654
ARCAZIT	-0.1328	0.1678	-0.7913	0.4311	0.7621	0.0291	26.1531	0.0000	-0.0767	0.0429	-1.7886	0.0774	0	1	0.9772
MEDRICR	-0.0940	0.2752	-0.3415	0.7336	0.7025	0.0553	12.6985	0.0000	-0.0970	0.0807	-1.2007	0.2334	0	0	0.9265
BNAZITL	0.6467	0.8069	0.8014	0.4252	0.6109	0.1985	3.0771	0.0029	-0.3278	0.2558	-1.2813	0.2037	0	0	0.4239
BIMAZI	-0.2004	0.2442	-0.8204	0.4144	0.7391	0.0491	15.0554	0.0000	-0.0858	0.0717	-1.1975	0.2346	0	0	0.9453
GSEAFND	-0.0992	0.2994	-0.3315	0.7411	0.6840	0.0602	11.3671	0.0000	-0.1644	0.0878	-1.8713	0.0649	0	1	0.9190
ZENAZII	1.0314	0.5426	1.9007	0.0627	0.5614	0.1225	4.5819	0.0000	-0.3199	0.2070	-1.5450	0.1282	0	0	0.8989
ZENAZIO	0.0953	0.3372	0.2825	0.7783	0.6595	0.0865	7.6241	0.0000	-0.2099	0.1319	-1.5910	0.1155	0	0	0.8964
ALSTARS	0.0510	0.4213	0.1211	0.9040	0.5085	0.0664	7.6549	0.0000	-0.1525	0.1352	-1.1282	0.2637	0	0	0.8104
ACITAA2	0.1519	1.1643	0.1305	0.8975	1.0522	0.2495	4.2168	0.0005	0.0355	0.3586	0.0990	0.9222	0	0	0.8708
SAIGALI	-0.2342	0.2330	-1.0051	0.3178	0.7826	0.0749	10.4418	0.0000	-0.0997	0.0844	-1.1804	0.2413	0	0	0.9171
# sign													2	6	

* coeff: expressed in percentage. adj R^2: red for min, blue for max. Green for statistical significance at 5% level; yellow colour for statistical signifcance at 10% level

In S3, the results from the alpha estimates in the HM model are very similar to the TM model. All the significant alphas are positive: 5 funds are significant at the 10% level and 2 funds at the 5% level (see Table 6.25). According to the FDR analysis, among the 10.53% significantly positive funds at the 5% level, 9.40% are skilled funds. Increasing the significance level to 10%, the percentage of significantly positive funds rises to 26.32%, of which 24.06% are skilled (see Table 6.31). Skilled funds look dispersed in the right tail. The average alpha is 0.3829% and is significant at the 1% significance level (p-value=0.0002), in accordance with the TM model. As for the market timing coefficients, the significant ones are all negative, as in the TM model, but are less numerous. 8 funds have significantly negative market timing coefficients at the 10% level, and 5 of them at the 5% level (see Table 6.25). According to the FDR approach, 0.86% of the 26.32% significantly negative market timing coefficients at the 5% level are false discoveries, meaning that 25.45% are perverse market timers. Negative market timers are dispersed in the left tail, since the number of significant funds increases to 42.11% at the 10% significance level. 1.73% are false discoveries, and therefore 40.38% are perverse market timers at the 10% significance level (see Table 6.32). The average market timing coefficient is a significant -0.1631 (p-value=0), more negative than the TM model, but with the same p-value. The negative alpha estimate from the CAPM (insignificant -0.0414%) is due to positive selective ability and negative market timing ability, where both selectivity and market timing are statistically significant.

Table 6.25 - Henriksson-Merton estimates, S3

	alpha				beta				HM						adj R^2
	coeff	std error	tstat	prob	coeff	std error	tstat	prob	coeff	std error	tstat	prob	sign 5%	sign 10%	
SYAZSCI	1.2623	0.7983	1.5813	0.1208	0.7951	0.1188	6.6936	0.0000	-0.5871	0.2894	-2.0287	0.0484	1	1	0.6841
BPBAZIT	0.2104	0.3988	0.5276	0.5992	0.8487	0.0461	18.4191	0.0000	-0.0874	0.0938	-0.9319	0.3542	0	0	0.7418
COMSMCP	0.0437	0.4031	0.1084	0.9139	0.7863	0.1019	7.7197	0.0000	-0.1583	0.1459	-1.0853	0.2810	0	0	0.8056
INVAZIO	0.1219	0.1820	0.6698	0.5049	0.8843	0.0516	17.1367	0.0000	-0.1338	0.0845	-1.5843	0.1170	0	0	0.9456
GEPIAZA	0.2981	0.1683	1.7715	0.0802	0.8713	0.0314	27.7883	0.0000	-0.1182	0.0812	-1.4559	0.1493	0	0	0.9753
FIDIMIT	0.3208	0.1168	2.7468	0.0074	0.9123	0.0303	30.0992	0.0000	-0.0890	0.0411	-2.1661	0.0332	1	1	0.9799
DUCGITY	0.4086	0.2559	1.5967	0.1156	0.8175	0.0914	8.9400	0.0000	-0.0620	0.1253	-0.4946	0.6227	0	0	0.9337
GESITAL	0.2147	0.1445	1.4861	0.1411	0.8911	0.0350	25.4463	0.0000	-0.1308	0.0644	-2.0302	0.0456	1	1	0.9772
DUCAZIT	0.2921	0.1518	1.9246	0.0578	0.8729	0.0359	24.2869	0.0000	-0.1186	0.0624	-1.9005	0.0609	0	1	0.9744
ARCAZIT	0.2305	0.1394	1.6536	0.1021	0.8759	0.0309	28.3740	0.0000	-0.1079	0.0655	-1.6479	0.1033	0	0	0.9803
MEDRICR	0.3045	0.2130	1.4291	0.1568	0.8213	0.0504	16.3010	0.0000	-0.1068	0.0619	-1.7252	0.0883	0	1	0.9447
BNAZITL	0.6778	0.4881	1.3887	0.1687	0.9564	0.0674	14.1819	0.0000	-0.2442	0.1311	-1.8628	0.0661	0	1	0.4020
BIMAZI	0.2176	0.1748	1.2447	0.2168	0.8696	0.0410	21.2339	0.0000	-0.1250	0.0788	-1.5859	0.1166	0	0	0.9618
GSEAFND	0.1493	0.2532	0.5895	0.5572	0.8674	0.0612	14.1835	0.0000	-0.1356	0.1012	-1.3399	0.1840	0	0	0.9269
ZENAZII	1.3056	0.4501	2.9006	0.0054	0.9572	0.1065	8.9868	0.0000	-0.3698	0.1706	-2.1675	0.0346	1	1	0.9090
ZENAZIO	0.4133	0.2554	1.6185	0.1094	0.8996	0.0637	14.1302	0.0000	-0.2184	0.0944	-2.3121	0.0233	1	1	0.9107
ALSTARS	0.5294	0.3115	1.6997	0.0944	0.6821	0.1035	6.5880	0.0000	-0.1600	0.1251	-1.2790	0.2058	0	0	0.8037
ACITAA2	0.2294	0.6124	0.3746	0.7121	1.0870	0.1103	9.8568	0.0000	-0.0202	0.2527	-0.0797	0.9373	0	0	0.8598
SAIGALI	0.0453	0.2116	0.2141	0.8310	0.9208	0.0467	19.6992	0.0000	-0.1270	0.1095	-1.1600	0.2495	0	0	0.9145
# sign													5	8	

* coeff. expressed in percentage. adj R^2: red for min, blue for max. Green for statistical significance at 5% level; yellow colour for statistical signifcance at 10% level

Table 6.26 - Henriksson-Merton Summary Statistics						
	S1		S2		S3	
	alpha	HM	alpha	HM	alpha	HM
Mean	**0.1446**	**-0.0348**	**0.0634**	**-0.1479**	**0.3829**	**-0.1631**
Standard Error	0.1373	0.0508	0.0893	0.0299	0.0810	0.0291
Median	0.0062	-0.0305	-0.0629	-0.0973	0.2921	-0.1270
Standard Deviation	0.7137	0.2639	0.3891	0.1302	0.3531	0.1269
Sample Variance	0.5093	0.0696	0.1514	0.0170	0.1247	0.0161
t-statistic	1.0527	-0.6846	0.7106	-4.9502	4.7273	-5.6058
p-value	**0.3022**	**0.4996**	**0.4864**	**0.0001**	**0.0002**	**0.0000**
Kurtosis	7.3368	7.0242	1.4431	4.8487	3.2595	6.8540
Skewness	2.1773	-1.6286	1.2622	-1.9998	1.9221	-2.4393
Range	3.8096	1.4322	1.5786	0.5925	1.2619	0.5669
Minimum	-0.9750	-1.0153	-0.5472	-0.5570	0.0437	-0.5871
Maximum	2.8346	0.4169	1.0314	0.0355	1.3056	-0.0202
Count	27	27	19	19	19	19

* Mean and median alpha expressed in percentage

Table 6.27 - Alpha, HM, FDR, S1		
pi_zero	1	
sign lev	5%	10%
E(S+)	0.00%	0.00%
E(F+)	2.50%	5.00%
FDR+	#DIV/0!	#DIV/0!
E(T+)	-2.50%	-5.00%
E(S-)	7.41%	7.41%
E(F-)	2.50%	5.00%
FDR-	33.75%	67.50%
E(T-)	4.91%	2.41%

Table 6.28 - Market timing coeff, HM, FDR, S1		
pi_zero	0.4811	
sign lev	5%	10%
E(S+)	3.70%	7.41%
E(F+)	1.20%	2.41%
FDR+	32.47%	32.47%
E(T+)	2.50%	5.00%
E(S-)	3.70%	3.70%
E(F-)	1.20%	2.41%
FDR-	32.47%	64.94%
E(T-)	2.50%	1.30%

Table 6.29 - Alpha, HM, FDR, S2		
pi_zero	0.6573	
sign lev	5%	10%
E(S+)	0.00%	5.26%
E(F+)	1.64%	3.29%
FDR+	#DIV/0!	62.44%
E(T+)	-1.64%	1.98%
E(S-)	0.00%	0.00%
E(F-)	1.64%	3.29%
FDR-	#DIV/0!	#DIV/0!
E(T-)	-1.64%	-3.29%

Table 6.30 - Market timing coeff, HM, FDR, S2		
pi_zero	0.3304	
sign lev	5%	10%
E(S+)	0.00%	0.00%
E(F+)	0.83%	1.65%
FDR+	#DIV/0!	#DIV/0!
E(T+)	-0.83%	-1.65%
E(S-)	10.53%	31.58%
E(F-)	0.83%	1.65%
FDR-	7.85%	5.23%
E(T-)	9.70%	29.93%

Table 6.31 - Alpha, HM, FDR, S3		
pi_zero	0.4520	
sign lev	5%	10%
E(S+)	10.53%	26.32%
E(F+)	1.13%	2.26%
FDR+	10.73%	8.59%
E(T+)	9.40%	24.06%
E(S-)	0.00%	0.00%
E(F-)	1.13%	2.26%
FDR-	#DIV/0!	#DIV/0!
E(T-)	-1.13%	-2.26%

Table 6.32 - Market timing coeff, HM, FDR, S3		
pi_zero	0.3450	
sign lev	5%	10%
E(S+)	0.00%	0.00%
E(F+)	0.86%	1.73%
FDR+	#DIV/0!	#DIV/0!
E(T+)	-0.86%	-1.73%
E(S-)	26.32%	42.11%
E(F-)	0.86%	1.73%
FDR-	3.28%	4.10%
E(T-)	25.45%	40.38%

6.3 Short Term Performance Persistence

6.3.1 Non-Parametric Test in the Short Term based on Raw Returns

Mutual funds are ranked each year according to their compound annual returns. Funds with raw returns equal to or higher than the median return are classified as winners (W), whereas funds with returns lower than the median are classified as losers (L). Two-way contingency tables are created and a non-parametric test on performance persistence is carried out at the 5% significance level.

In S1, mutual funds are ranked based on raw returns in each year from 2006 to 2015 (see Table D.1). The number of winners (W) and losers (L) for each year is reported in Table 6.33. Two-way contingency tables are built in Table 6.34, and the results of the non-parametric test on 1-year raw returns are reported in Table 6.35. The number of repeat performers is much higher than the number of non-repeat performers, as showed by the CPR ratio of 2.0512, which is statistically significant at the 5% significance level (Z-statistic=2.2205). The CPR is greater than one in 7 of the 9 sub-periods, but is statistically significant only in 2009-2010. Performance persistence based on raw returns exists and is statistically significant.

Table 6.33 - W and L in each 1-year period based on raw returns, S1

Year	W	L	Tot funds
2006	7	7	14
2007	7	7	14
2008	8	8	16
2009	9	8	17
2010	9	9	18
2011	9	9	18
2012	10	9	19
2013	10	9	19
2014	12	11	23
2015	12	11	23

Table 6.34 - Two-way contingency tables based on 1-year raw returns, S1

	2007 W	2007 L		2012 W	2012 L
2006 W	5	2	2011 W	6	3
2006 L	2	5	2011 L	3	6
	2008 W	2008 L		2013 W	2013 L
2007 W	4	3	2012 W	5	5
2007 L	2	5	2012 L	4	5
	2009 W	2009 L		2014 W	2014 L
2008 W	3	5	2013 W	5	5
2008 L	5	3	2013 L	5	4
	2010 W	2010 L		2015 W	2015 L
2009 W	6	3	2014 W	7	5
2009 L	2	6	2014 L	5	6
	2011 W	2011 L			
2010 W	6	3			
2010 L	3	6			

Table 6.35 - Non parametric test based on 1-year raw returns, S1

	WW	LL	WL	LW	CPR	LOR	s.e.	zstat	N
2006-2007	5	5	2	2	6.2500	1.8326	1.1832	1.5488	14
2007-2008	4	5	3	2	3.3333	1.2040	1.1328	1.0628	14
2008-2009	3	3	5	5	0.3600	-1.0217	1.0328	-0.9892	16
2009-2010	6	6	3	2	6.0000	1.7918	1.0801	1.6588	17
2010-2011	6	6	3	3	4.0000	1.3863	1.0000	1.3863	18
2011-2012	6	6	3	3	4.0000	1.3863	1.0000	1.3863	18
2012-2013	5	5	5	4	1.2500	0.2231	0.9220	0.2420	19
2013-2014	5	4	5	5	0.8000	-0.2231	0.9220	-0.2420	19
2014-2015	7	6	5	5	1.6800	0.5188	0.8423	0.6159	23
Combined results	**47**	**46**	**34**	**31**	**2.0512**	**0.7184**	**0.3236**	**2.2205**	**158**

Green colour for statistical significance at 5% level

In S2 and S3, mutual funds are ranked according to their raw returns from 2007 to 2012 (see Tables D.2 and 6.36) and two-way contingency tables are created (see Table 6.37). The non-parametric test is carried out on 5 different sub-periods, from 2007-2008 to 2011-2012 (see Table 6.38). The CPR is greater than one in 4 of the 5 periods, but is statistically significant only in 2009-2010, as in S1. The overall CPR is 2.5940 and is statistically significant at the 5% level (Z-statistic=2.0719). The conclusion is that performance persistence based on raw returns exists and is statistically significant, as in S1.

Table 6.36 - W and L in each 1-year period based on raw returns, S2 and S3

Year	W	L	Tot funds
2007	7	7	14
2008	8	8	16
2009	9	8	17
2010	9	9	18
2011	9	9	18
2012	10	9	19

Table 6.37 - Two-way contingency tables based on 1-year raw returns, S2 and S3

	2008 W	2008 L		2011 W	2011 L
2007 W	4	3	2010 W	6	3
2007 L	2	5	2010 L	3	6
	2009 W	2009 L		2012 W	2012 L
2008 W	3	5	2011 W	6	3
2008 L	5	3	2011 L	3	6
	2010 W	2010 L			
2009 W	6	3			
2009 L	2	6			

Table 6.38 - Non parametric test based on 1-year raw returns, S2 and S3

	WW	LL	WL	LW	CPR	LOR	s.e.	zstat	N
2007-2008	4	5	3	2	3.3333	1.2040	1.1328	1.0628	14
2008-2009	3	3	5	5	0.3600	-1.0217	1.0328	-0.9892	16
2009-2010	6	6	3	2	6.0000	1.7918	1.0801	1.6588	17
2010-2011	6	6	3	3	4.0000	1.3863	1.0000	1.3863	18
2011-2012	6	6	3	3	4.0000	1.3863	1.0000	1.3863	18
Combined results	**25**	**26**	**17**	**15**	**2.5490**	**0.9357**	**0.4516**	**2.0719**	**83**

Green colour for statistical significance at 5% level

6.3.2 Non-Parametric Test in the Short Term based on the CAPM, Fama-French and Carhart Alpha

First, 1-year alpha is computed for each mutual fund by regressing mutual fund returns against the relative benchmark during the given year. Second, mutual funds are ranked each year according to their alpha: funds with an alpha estimate higher than or equal to the median are classified as winners (W), whereas funds with an alpha estimate lower than the median are classified as losers (L). Finally, the non-parametric test on performance persistence is carried out.

For S1, single-index alpha estimates from 2006 to 2015 are reported in Table D.3 and used to rank funds in Table D.4 and Table 6.39. Two-way contingency tables are created in Table 6.40. The non-parametric test considers 9 sub-periods, from 2006-2007 to 2014-1015 (see Table 6.41). The CPR is greater than one in 5 of the 9 periods, though statistically significant only in 2009-2010. The overall CPR is 1.5892, but is statistically insignificant at the 5% level (Z-statistic=1.4662). Positive performance persistence is stronger than negative performance persistence: the number of repeat winners (WW) is 49, while the number of repeat losers (LL) is 42. Performance persistence phenomenon based on single-index alphas exists, but is not statistically significant.

Table 6.39 - W and L in each 1-year period based on single-index alphas, S1

Year	W	L	Tot funds
2006	7	7	14
2007	7	7	14
2008	9	8	17
2009	9	9	18
2010	9	9	18
2011	10	9	19
2012	10	9	19
2013	11	10	21
2014	12	11	23
2015	14	13	27

Table 6.40 - Two-way contingency tables based on 1-year single-index alphas, S1

	2007 W	2007 L		2012 W	2012 L
2006 W	3	4	2011 W	6	4
2006 L	4	3	2011 L	4	5
	2008 W	2008 L		2013 W	2013 L
2007 W	5	2	2012 W	7	3
2007 L	3	4	2012 L	3	6
	2009 W	2009 L		2014 W	2014 L
2008 W	5	4	2013 W	5	6
2008 L	4	4	2013 L	7	3
	2010 W	2010 L		2015 W	2015 L
2009 W	8	1	2014 W	5	7
2009 L	2	7	2014 L	5	6
	2011 W	2011 L			
2010 W	5	4			
2010 L	5	4			

Table 6.41 - Non parametric test based on 1-year single-index alphas, S1

	WW	LL	WL	LW	CPR	LOR	s.e.	zstat	N
2006-2007	3	3	4	4	0.5625	-0.5754	1.0801	-0.5327	14
2007-2008	5	4	2	3	3.3333	1.2040	1.1328	1.0628	14
2008-2009	5	4	4	4	1.2500	0.2231	0.9747	0.2289	17
2009-2010	8	7	1	2	28.0000	3.3322	1.3296	2.5062	18
2010-2011	5	4	4	5	1.0000	0.0000	0.9487	0.0000	18
2011-2012	6	5	4	4	1.8750	0.6286	0.9309	0.6752	19
2012-2013	7	6	3	3	4.6667	1.5404	0.9880	1.5591	19
2013-2014	5	3	6	7	0.3571	-1.0296	0.9181	-1.1215	21
2014-2015	5	6	7	5	0.8571	-0.1542	0.8423	-0.1830	23
Combined results	**49**	**42**	**35**	**37**	**1.5892**	**0.4632**	**0.3159**	**1.4662**	**163**

Green colour for statistical significance at 5% level

In S2, single-index alphas are computed for each mutual fund in each year from 2007 to 2012 (see Table D.5) and rankings are formed accordingly (see Table D.6 and Table 6.42). Two-way contingency tables are created (see Table 6.43) and performance persistence is evaluated in the 5 sub-periods from 2007-2008 to 2011-2012 (see Table 6.44). The

CPR is greater than one in each sub-period, though statistically significant in 2009-2010 only, as in S1. The total CPR is 2.0294, but is not statistically significant at the 5% level (Z-statistic=1.6032). Performance persistence is stronger among winners than among losers: the number of repeat winners (WW) is 27, whereas the number of repeat losers (LL) is 23. Performance persistence based on single-index alphas is nevertheless statistically not significant.

Table 6.42 - W and L in each 1-year period based on single-index alphas, S2

Year	W	L	Tot funds
2007	7	6	13
2008	9	8	17
2009	9	9	18
2010	9	9	18
2011	10	9	19
2012	10	9	19

Table 6.43- Two-way contingency tables based on 1-year single-index alphas, S2

	2008 W	2008 L		2011 W	2011 L
2007 W	4	3	2010 W	5	4
2007 L	3	3	2010 L	5	4
	2009 W	2009 L		2012 W	2012 L
2008 W	5	4	2011 W	6	4
2008 L	4	4	2011 L	4	5
	2010 W	2010 L			
2009 W	7	2			
2009 L	2	7			

Table 6.44- Non parametric test based on 1-year single-index alphas, S2									
	WW	LL	WL	LW	CPR	LOR	s.e.	zstat	N
2007-2008	4	3	3	3	1.3333	0.2877	1.1180	0.2573	13
2008-2009	5	4	4	4	1.2500	0.2231	0.9747	0.2289	17
2009-2010	7	7	2	2	12.2500	2.5055	1.1339	2.2097	18
2010-2011	5	4	4	5	1.0000	0.0000	0.9487	0.0000	18
2011-2012	6	5	4	4	1.8750	0.6286	0.9309	0.6752	19
Combined results	**27**	**23**	**17**	**18**	**2.0294**	**0.7077**	**0.4415**	**1.6032**	**85**
Green colour for statistical significance at 5% level									

In S3, single index-alphas are computed using the MSCI Italy Index as a benchmark, instead of the FSTEMIB Index (see Table D.7). Winners (W) and losers (L) in each year from 2007 to 2012 are reported in Table D.8 and Table 6.45 and two-way contingency tables are created (see Table 6.46). Similarly to S2, the CPR is always greater than one in each sub-period, but is statistically significant in only one of them, 2008-2009 (see Table 6.47). The total CPR is 2.1242 and is now statistically significant at the 5% level (Z-statistic=1.7156). Differently from S1 and S2, there is no prevalence of positive performance persistence, as the number of repeat winners (WW=26) is close to the number of repeat losers (LL=25). Performance persistence based on single-index alphas is present and statistically significant.

Table 6.45 - W and L in each 1-year period based on single-index alphas, S3			
Year	W	L	Tot funds
2007	7	7	14
2008	9	8	17
2009	9	9	18
2010	9	9	18
2011	10	9	19
2012	10	9	19

Table 6.46 - Two-way contingency tables based on 1-year single-index alphas, S3

	2008 W	2008 L		2011 W	2011 L
2007 W	3	4	2010 W	5	4
2007 L	3	4	2010 L	5	4
	2009 W	2009 L		2012 W	2012 L
2008 W	6	3	2011 W	6	4
2008 L	2	6	2011 L	4	5
	2010 W	2010 L			
2009 W	6	3			
2009 L	3	6			

Table 6.47 - Non parametric test based on 1-year single-index alphas, S3

	WW	LL	WL	LW	CPR	LOR	s.e.	zstat	N
2007-2008	3	4	4	3	1.0000	0.0000	1.0801	0.0000	14
2008-2009	6	6	3	2	6.0000	1.7918	1.0801	1.6588	17
2009-2010	6	6	3	3	4.0000	1.3863	1.0000	1.3863	18
2010-2011	5	4	4	5	1.0000	0.0000	0.9487	0.0000	18
2011-2012	6	5	4	4	1.8750	0.6286	0.9309	0.6752	19
Combined results	**26**	**25**	**18**	**17**	**2.1242**	**0.7534**	**0.4391**	**1.7156**	**86**

Green colour for statistical significance at 5% level

In S3, performance persistence is further investigated using multifactor models, namely the Fama-French three-factor model and the Carhart four-factor model. Fama-French alphas are computed in each year in Table D.9 and mutual funds are ranked accordingly (see Table D.10 and Table 6.48). Two-way contingency tables are created and the non-parametric test is performed (see Tables 6.49 and 6.50). The CPR is greater than one in 3 of the 5 sub-periods, but is statistically significant in 2008-2009 only, as with the single-index model. The total CPR is 1.9319, but is statistically insignificant at the 5% level (Z-statistic=1.5044). Performance persistence is even weaker when adding the WML factor to build the Carhart four-factor model. The CPR is greater than one in 3 of the 5 periods, as with the Fama-French model, but is never statistically significant (see Table 6.53). The CPR is only slightly above one, being equal to 1.3233, and shows a lower Z-statistic, equal to 0.6472. Performance persistence evaluated using the multifactor models is not statistically significant.

Table 6.48 - W and L in each 1-year period based on Fama-French alphas, S3

Year	W	L	Tot funds
2007	7	7	14
2008	9	8	17
2009	9	9	18
2010	9	9	18
2011	9	10	19
2012	10	9	19

Table 6.49 - Two-way contingency tables based on 1-year Fama-French alphas, S3

	2008 W	2008 L
2007 W	3	4
2007 L	3	4

	2011 W	2011 L
2010 W	3	6
2010 L	6	3

	2009 W	2009 L
2008 W	6	3
2008 L	1	7

	2012 W	2012 L
2011 W	6	3
2011 L	4	6

	2010 W	2010 L
2009 W	6	3
2009 L	3	6

Table 6.50 - Non parametric test based on 1-year Fama-French alphas, S3

	WW	LL	WL	LW	CPR	LOR	s.e.	zstat	N
2007-2008	3	4	4	3	1.0000	0.0000	1.0801	0.0000	14
2008-2009	6	7	3	1	14.0000	2.6391	1.2817	2.0590	17
2009-2010	6	6	3	3	4.0000	1.3863	1.0000	1.3863	18
2010-2011	3	3	6	6	0.2500	-1.3863	1.0000	-1.3863	18
2011-2012	6	6	3	4	3.0000	1.0986	0.9574	1.1475	19
Combined results	**24**	**26**	**19**	**17**	**1.9319**	**0.6585**	**0.4377**	**1.5044**	**86**

Green colour for statistical significance at 5% level

Table 6.51- W and L in each 1-year period based on Carhart alphas, S3			
Year	W	L	Tot funds
2007	7	7	14
2008	9	8	17
2009	10	8	18
2010	9	9	18
2011	10	9	19
2012	10	9	19

Table 6.52 - Two-way contingency tables based on 1-year Carhart alphas, S3					
	2008 W	2008 L		2011 W	2011 L
2007 W	4	3	2010 W	4	5
2007 L	2	5	2010 L	6	3
	2009 W	2009 L		2012 W	2012 L
2008 W	6	3	2011 W	6	4
2008 L	3	5	2011 L	4	5
	2010 W	2010 L			
2009 W	4	6			
2009 L	4	4			

Table 6.53 - Non parametric test based on 1-year Carhart alphas, S3									
	WW	LL	WL	LW	CPR	LOR	s.e.	zstat	N
2007-2008	4	5	3	2	3.3333	1.2040	1.1328	1.0628	14
2008-2009	6	5	3	3	3.3333	1.2040	1.0165	1.1844	17
2009-2010	4	4	6	4	0.6667	-0.4055	0.9574	-0.4235	18
2010-2011	4	3	5	6	0.4000	-0.9163	0.9747	-0.9401	18
2011-2012	6	5	4	4	1.8750	0.6286	0.9309	0.6752	19
Combined results	**24**	**22**	**21**	**19**	**1.3233**	**0.2801**	**0.4329**	**0.6472**	**86**

6.3.3 Parametric Test in the Short Term based on the CAPM, Fama-French and Carhart Alpha

In order to run the parametric test of performance persistence, we run a year-by-year cross-sectional regression of mutual fund alphas on alphas during the previous year (Kumar, 2008, p.19). The adjusted R-squared we obtain is quite low, as it is usual for cross-sectional regressions. White and Newey-West standard errors are used to correct for heteroscedasticity and autocorrelation where necessary.

In S1, 6 of the 9 slope coefficients are positive, though only one, in 2009-2010, is statistically significant at the 5% level (see Table 6.54). The slope coefficient for the entire observation period is negative, equal to -0.0622, and is statistically not significant (p-value=0.3344). This result specifies the negative trend of the persistence and is an accordance with the non-parametric test, pointing out performance persistence based on the single-index alpha is not statistically significant.

Table 6.54 - Parametric test based on 1-year single-index alphas, S1

		alpha				beta					
dep var	indep var	coeff	std error	tstat	prob	coeff	std error	tstat	prob	sign 5%	sign 10%
2007	2006	-0.5828	0.0791	-7.3692	0.0000	0.5756	0.3151	1.8269	0.0927	0	1
2008	2007	-0.4780	0.1267	-3.7729	0.0027	0.3478	0.2006	1.7336	0.1086	0	0
2009	2008	0.3219	0.0865	3.7228	0.0020	0.0151	0.0736	0.2046	0.8406	0	0
2010	2009	-0.1166	0.0595	-1.9593	0.0677	0.3230	0.1387	2.3288	0.0333	1	1
2011	2010	-0.8494	0.1571	-5.4072	0.0001	0.2142	0.7511	0.2852	0.7791	0	0
2012	2011	0.2198	0.1160	1.8955	0.0752	0.1758	0.1043	1.6862	0.1100	0	0
2013	2012	0.7648	0.1385	5.5205	0.0000	-0.9043	0.4528	-1.9971	0.0621	0	1
2014	2013	-0.1381	0.1050	-1.3151	0.2041	-0.1737	0.1152	-1.5079	0.1480	0	0
2015	2014	0.3395	0.1056	3.2144	0.0042	-0.1127	0.2319	-0.4861	0.6320	0	0
Combined regression results (using HAC standard errors):											
foll	prec	-0.0672	0.0757	-0.8880	0.3758	-0.0622	0.0642	-0.9683	0.3344	0	0

Alpha coeff in percentage

In S2, all the 5 slope coefficients are positive, and only one is statistically significant at the 5% level (see Table 6.55). This is analogous to the parametric test in S1. The slope coefficient for the entire period is -0.0346 and is not statistically significant (p-value=0.6753). Performance persistence based on the single-index alpha is not statistically significant, as showed in the non-parametric test.

Table 6.55 - Parametric test based on 1-year single-index alphas, S2

		alpha				beta					
dep var	indep var	coeff	std error	tstat	prob	coeff	std error	tstat	prob	sign 5%	sign 10%
2008	2007	-0.4780	0.1267	-3.7729	0.0027	0.3478	0.2006	1.7336	0.1086	0	0
2009	2008	0.3219	0.0865	3.7228	0.0020	0.0151	0.0736	0.2046	0.8406	0	0
2010	2009	-0.1166	0.0595	-1.9593	0.0677	0.3230	0.1387	2.3288	0.0333	1	1
2011	2010	-0.8494	0.1571	-5.4072	0.0001	0.2142	0.7511	0.2852	0.7791	0	0
2012	2011	0.2198	0.1160	1.8955	0.0752	0.1758	0.1043	1.6862	0.1100	0	0
Combined regression results (using HAC standard errors):											
foll	prec	-0.2295	0.0993	-2.3103	0.0233	-0.0346	0.0824	-0.4204	0.6753	0	0

Alpha coeff in percentage

In S3, 4 of the 5 slope coefficients are positive, but none is statistically significant at the 5% level (see Table 6.56). The slope coefficient for the entire period is equal to -0.0672 and not statistically significant (p-value=0.4388). The result highlights the negative trend of performance persistence based on the single-index alpha, but considers it statistically insignificant, as opposed to the significant result from the non-parametric test.

Table 6.56 - Parametric test based on 1-year single-index alphas, S3

		alpha				beta					
dep var	indep var	coeff	std error	tstat	prob	coeff	std error	tstat	prob	sign 5%	sign 10%
2008	2007	-0.2584	0.0528	-4.8917	0.0004	0.0245	0.2553	0.0958	0.9253	0	0
2009	2008	0.2783	0.0787	3.5363	0.0030	0.0224	0.1300	0.1725	0.8653	0	0
2010	2009	0.1454	0.0503	2.8888	0.0107	0.2297	0.1246	1.8439	0.0838	0	1
2011	2010	-0.3670	0.1967	-1.8656	0.0805	-0.0996	0.7456	-0.1336	0.8954	0	0
2012	2011	0.3877	0.0734	5.2791	0.0001	0.1817	0.1019	1.7835	0.0924	0	1
Combined regression results (using HAC standard errors):											
foll	prec	0.0393	0.0675	0.5824	0.5619	-0.0672	0.0864	-0.7780	0.4388	0	0
Alpha coeff in percentage											

Further analyses are carried out in S3 considering the Fama-French and Carhart models. Using the Fama-French model, 4 of 6 slope coefficients are positive and only one, in 2009-2010, is statistically significant (see Table 6.57). The slope coefficient for the entire period is equal to -0.1504 and is statistically insignificant (p-value=0.2426). Performance persistence based on the Fama-French alpha is negative, but statistically insignificant, in accordance with the single-index model in S3. Evidence of performance persistence is even weaker using the Carhart model. None of the slope coefficient is statistically significant. The slope coefficient for the entire period is -0.0912 and statistically insignificant at the 5% level (see Table 6.58).

Table 6.57- Parametric test based on 1-year Fama-French alphas, S3

		alpha				beta					
dep var	indep var	coeff	std error	tstat	prob	coeff	std error	tstat	prob	sign 5%	sign 10%
2008	2007	-0.2420	0.0597	-4.0532	0.0016	0.1098	0.2582	0.4251	0.6783	0	0
2009	2008	0.2342	0.0325	7.2007	0.0000	0.0163	0.0318	0.5130	0.6155	0	0
2010	2009	-0.0037	0.0518	-0.0720	0.9435	0.5024	0.1561	3.2189	0.0054	1	1
2011	2010	-0.2791	0.1060	-2.6341	0.0180	-1.0384	0.5003	-2.0757	0.0544	0	1
2012	2011	0.5020	0.0972	5.1666	0.0001	0.2272	0.1716	1.3238	0.2031	0	0
Combined regression results (used HAC):											
foll	prec	0.0273	0.0666	0.4108	0.6823	-0.1504	0.1278	-1.1767	0.2426	0	0
Alpha coeff in percentage											

Table 6.58 - Parametric test based on 1-year Carhart alphas, S3											
		alpha				beta					
dep var	indep var	coeff	std error	tstat	prob	coeff	std error	tstat	prob	sign 5%	sign 10%
2008	2007	-0.2238	0.0569	-3.9300	0.0020	0.1159	0.0758	1.5304	0.1518	0	0
2009	2008	0.5942	0.1377	4.3162	0.0006	0.0391	0.2993	0.1306	0.8978	0	0
2010	2009	-0.1541	0.0652	-2.3626	0.0312	0.0574	0.0802	0.7156	0.4846	0	0
2011	2010	-0.4671	0.1064	-4.3901	0.0005	-0.6404	0.5165	-1.2400	0.2328	0	0
2012	2011	0.3897	0.0890	4.3810	0.0004	-0.0330	0.1112	-0.2971	0.7700	0	0
Combined regression results (used HAC):											
foll	prec	0.0451	0.0835	0.5404	0.5904	-0.0912	0.0875	-1.0422	0.3003	0	0
Alpha coeff in percentage											

6.4 Long Term Performance Persistence

6.4.1 Non-Parametric Test in the Long Term based on Raw Returns

In order to evaluate mutual fund performance in the long term, monthly raw returns are compounded to create 2-year raw returns. In each 2-year interval mutual funds are ranked and the funds having 2-year raw returns equal to or higher than the median return are classified as winners (W), whereas funds having 2-year returns lower than median are classified as losers (L). Then two-way contingency tables are created and the non-parametric test is carried out.

In S1, mutual funds are ranked according to raw returns in 9 intervals of 2 years each, from 2006-2007 to 2014-2015 (see Table E.1 and Table 6.59). Two-way contingency tables are created (see Table 6.60) and the non-parametric test is carried out for 7 sub-periods, to test for performance persistence between each 2-year interval. The CPR is greater than one for 6 of the 7 periods, but is statistically significant only in 2008/2009 to 2010/2011 (see Table 6.61). The CPR for the entire period is 2.0696 and is statistically significant at the 5% level (Z-statistic=1.9338). Performance persistence in the long term based on raw returns is statistically significant.

Table 6.59 - W and L in each 2-year period based on raw returns, S1

Year	W	L	Tot funds
2006-2007	7	7	14
2007-2008	7	7	14
2008-2009	8	8	16
2009-2010	9	9	18
2010-2011	9	9	18
2011-2012	9	9	18
2012-2013	10	9	19
2013-2014	10	9	19
2014-2015	12	11	23

Table 6.60 - Two-way contingency tables based on 2-year raw returns, S1

	2008-2009 W	2008-2009 L		2012-2013 W	2012-2013 L
2006-2007 W	4	3	2010-2011 W	5	4
2006-2007 L	2	5	2010-2011 L	4	5
	2009-2010 W	2009-2010 L		2013-2014 W	2013-2014 L
2007-2008 W	1	6	2011-2012 W	5	4
2007-2008 L	5	2	2011-2012 L	4	5
	2010-2011 W	2010-2011 L		2014-2015 W	2014-2015 L
2008-2009 W	7	1	2012-2013 W	6	4
2008-2009 L	1	7	2012-2013 L	3	6
	2011-2012 W	2011-2012 L			
2009-2010 W	6	3			
2009-2010 L	4	5			

Table 6.61 - Non parametric test based on 2-year raw returns, S1									
	WW	LL	WL	LW	CPR	LOR	s.e.	zstat	N
06/07-08/09	4	5	3	2	3.3333	1.2040	1.1328	1.0628	14
07/08-09/10	1	2	6	5	0.0667	-2.7081	1.3663	-1.9821	14
08/09-10/11	7	7	1	1	49.0000	3.8918	1.5119	2.5742	16
09/10-11/12	6	5	3	4	2.5000	0.9163	0.9747	0.9401	18
10/11-12/13	5	5	4	4	1.5625	0.4463	0.9487	0.4704	18
11/12-13/14	5	5	4	4	1.5625	0.4463	0.9487	0.4704	18
12/13-14/15	6	6	4	3	3.0000	1.0986	0.9574	1.1475	19
Combined results	**34**	**35**	**25**	**23**	**2.0696**	**0.7273**	**0.3761**	**1.9338**	**117**

Green colour for statistical significance at 5% level

In S2 and S3, mutual funds are ranked in 5 periods of 2 years each, from 2007-2008 to 2011-2012 (see Table E.2 and Table 6.62). In order to build two-way contingency tables (see Table 6.63) and run the non-parametric test (see Table 6.64), 3 different periods are identified, from 2007/08 – 2009/10 to 2009/10 – 2011/12. Performance persistence is strong and statistically significant in 2008/09 – 2010/11, but not in the other periods. The CPR for the entire period is 1.96 and is not statistically significant at the 5% level (Z-statistic=1.1493). The conclusion is the same of S1: performance persistence in the long term based on raw returns is not statistically significant.

Table 6.62- W and L in each 2-year period based on raw returns, S2 and S3			
Year	W	L	Tot funds
2007-2008	7	7	14
2008-2009	8	8	16
2009-2010	9	9	18
2010-2011	9	9	18
2011-2012	9	9	18

Table 6.63 - Two-way contingency tables based on 2-year raw returns, S2 and S3		
	2009-2010 W	2009-2010 L
2007-2008 W	1	6
2007-2008 L	5	2
	2010-2011 W	2010-2011 L
2008-2009 W	7	1
2008-2009 L	1	7
	2011-2012 W	2011-2012 L
2009-2010 W	6	3
2009-2010 L	4	5

Table 6.64 - Non parametric test based on 2-year raw returns, S2 and S3

	WW	LL	WL	LW	CPR	LOR	s.e.	zstat	N
07/08-09/10	1	2	6	5	0.0667	-2.7081	1.3663	-1.9821	14
08/09-10/11	7	7	1	1	49.0000	3.8918	1.5119	2.5742	16
09/10-11/12	6	5	3	4	2.5000	0.9163	0.9747	0.9401	18
Combined results	**14**	**14**	**10**	**10**	**1.9600**	**0.6729**	**0.5855**	**1.1493**	**48**

Green colour for statistical significance at 5% level

6.4.2 Non-Parametric Test in the Long Term based on the CAPM, Fama-French and Carhart Alpha

In order to perform the non-parametric test about performance persistence in the long term, mutual funds are first ranked in each 2-year interval according to their alpha estimates. Funds having alpha estimates equal to or greater than the median are classified as winners (W), whereas funds with alpha estimates lower than the median are classified as losers (L). Two-way contingency tables are created to test for performance persistence between one 2-year period and the following, and the non-parametric test is carried out.

In S1, mutual fund single-index alphas are computed in each 2-year interval from 2006-2007 to 2014-2015 (see Table E.3). Mutual funds are ranked during this time period (see Table E.4 and Table 6.65) and two-way contingency tables are created (see Table 6.66). The CPR is always equal to or greater than one, except in 2010/2011 – 2012/2013, but is never statistically significant (see Table 6.67). The CPR for the entire period is 1.4505 and is not statistically significant at the 5% level (Z-statistic=1.0096). Performance persistence in the long term based on the single-index alpha is not statistically significant.

Table 6.65- W and L in each 2-year period based on single-index alphas, S1

Year	W	L	Tot funds
2006-2007	7	7	14
2007-2008	7	7	14
2008-2009	8	9	17
2009-2010	9	9	18
2010-2011	9	9	18
2011-2012	10	9	19
2012-2013	10	9	19
2013-2014	10	10	20
2014-2015	11	11	22

Table 6.66 - Two-way contingency tables based on 2-year single-index alphas, S1

	2008-2009 W	2008-2009 L		2012-2013 W	2012-2013 L
2006-2007 W	5	2	2010-2011 W	4	5
2006-2007 L	2	5	2010-2011 L	5	4
	2009-2010 W	2009-2010 L		2013-2014 W	2013-2014 L
2007-2008 W	3	4	2011-2012 W	5	5
2007-2008 L	3	4	2011-2012 L	3	6
	2010-2011 W	2010-2011 L		2014-2015 W	2014-2015 L
2008-2009 W	5	3	2012-2013 W	6	4
2008-2009 L	4	5	2012-2013 L	5	4
	2011-2012 W	2011-2012 L			
2009-2010 W	4	5			
2009-2010 L	4	5			

Table 6.67- Non parametric test based on 2-year single-index alphas, S1									
	WW	LL	WL	LW	CPR	LOR	s.e.	zstat	N
06/07-08/09	5	5	2	2	6.2500	1.8326	1.1832	1.5488	14
07/08-09/10	3	4	4	3	1.0000	0.0000	1.0801	0.0000	14
08/09-10/11	5	5	3	4	2.0833	0.7340	0.9916	0.7402	17
09/10-11/12	4	5	5	4	1.0000	0.0000	0.9487	0.0000	18
10/11-12/13	4	4	5	5	0.6400	-0.4463	0.9487	-0.4704	18
11/12-13/14	5	6	5	3	2.0000	0.6931	0.9487	0.7306	19
12/13-14/15	6	4	4	5	1.2000	0.1823	0.9309	0.1958	19
Combined results	**32**	**33**	**28**	**26**	**1.4505**	**0.3719**	**0.3684**	**1.0096**	**119**

In S2, single-index alphas are computed in each 2-year period from 2007-2008 to 2011/2012 (see Table E.5). Mutual funds are ranked accordingly (see Tables E.6 and 6.68) and two-way contingency tables are created (see Table 6.69). There is even larger evidence in favour of the null hypothesis of no performance persistence. The CPR is greater than one in only 1 of the 3 sub-periods and is never statistically significant (see Table 6.70). The CPR for the entire period is 1.2727 and is statistically insignificant at the 5% level (Z-statistic=0.4204).

Table 6.68 - W and L in each 2-year period based on single-index alphas, S2			
Year	W	L	Tot funds
2007-2008	7	7	14
2008-2009	8	9	17
2009-2010	9	9	18
2010-2011	9	9	18
2011-2012	10	9	19

Table 6.69 - Two-way contingency tables based on 2-year single-index alphas, S2		
	2009-2010 W	2009-2010 L
2007-2008 W	3	4
2007-2008 L	3	4
	2010-2011 W	2010-2011 L
2008-2009 W	5	3
2008-2009 L	4	5
	2011-2012 W	2011-2012 L
2009-2010 W	4	5
2009-2010 L	4	5

Table 6.70 - Non parametric test based on 2-year single-index alphas, S2

	WW	LL	WL	LW	CPR	LOR	s.e.	zstat	N
07/08-09/10	3	4	4	3	1.0000	0.0000	1.0801	0.0000	14
08/09-10/11	5	5	3	4	2.0833	0.7340	0.9916	0.7402	17
09/10-11/12	4	5	5	4	1.0000	0.0000	0.9487	0.0000	18
Combined results	**12**	**14**	**12**	**11**	**1.2727**	**0.2412**	**0.5736**	**0.4204**	**49**

In S3, single-index alphas are computed using the MSCI Italy as a benchmark (see Table E.7) and mutual funds are ranked (see Tables E.8 and 6.71). Two-way contingency tables are created (see Table 6.72). 2 of the 3 periods show a CPR greater than 1, but none exhibits a statistically significant CPR (see Table 6.73). The CPR for the entire period is 1.2803 and is not statistically significant at the 5% level (p-value=0.4314). As in S1 and S3, performance persistence based on the single-index is statistically insignificant. The results from the Fama-French model are analogous. The CPR is greater than 1 in 2 of the 3 sub-periods, but is never statistically significant (see Table 6.76). The CPR for the entire period is 1.2727 and is not statistically significant at the 5% level (Z-statistic=0.4204). The Carhart model provides even stronger evidence in favour of the null hypothesis of no performance persistence. The CPR is always lower than 0.65 and never statistically significant (see Table 6.79). The number of non-repeat performers is much higher than the number of repeat performers, which leads to a CPR for the entire period of 0.2813, which is not statistically significant at the 5% level. The Z-statistic lies in the extreme left tail of the distribution and is equal to -2.1109.

Table 6.71 - W and L in each 2-year period based on single-index alphas, S3			
Year	W	L	Tot funds
2007-2008	7	7	14
2008-2009	8	9	17
2009-2010	9	9	18
2010-2011	10	9	19
2011-2012	10	9	19

Table 6.72 - Two-way contingency tables based on 2-year single-index alphas, S3		
	2009-2010 W	2009-2010 L
2007-2008 W	2	5
2007-2008 L	4	3
	2010-2011 W	2010-2011 L
2008-2009 W	5	2
2008-2009 L	4	5
	2011-2012 W	2011-2012 L
2009-2010 W	5	4
2009-2010 L	4	5

Table 6.73 - Non parametric test based on 2-year single-index alphas, S3									
	WW	LL	WL	LW	CPR	LOR	s.e.	zstat	N
07/08-09/10	2	3	5	4	0.3000	-1.2040	1.1328	-1.0628	14
08/09-10/11	6	5	2	4	3.7500	1.3218	1.0567	1.2508	17
09/10-11/12	5	5	4	4	1.5625	0.4463	0.9487	0.4704	18
Combined results	**13**	**13**	**11**	**12**	**1.2803**	**0.2471**	**0.5728**	**0.4314**	**49**

Table 6.74- W and L in each 2-year period based on Fama-French alphas, S3

Year	W	L	Tot funds
2007-2008	6	8	14
2008-2009	8	9	17
2009-2010	9	9	18
2010-2011	9	9	18
2011-2012	10	9	19

Table 6.75 - Two-way contingency tables based on 2-year Fama-French alphas, S3

	2009-2010 W	2009-2010 L
2007-2008 W	2	4
2007-2008 L	4	4
	2010-2011 W	**2010-2011 L**
2008-2009 W	5	3
2008-2009 L	4	5
	2011-2012 W	**2011-2012 L**
2009-2010 W	5	4
2009-2010 L	4	5

Table 6.76 - Non parametric test based on 2-year Fama-French alphas, S3

	WW	LL	WL	LW	CPR	LOR	s.e.	zstat	N
07/08-09/10	2	4	4	4	0.5000	-0.6931	1.1180	-0.6200	14
08/09-10/11	5	5	3	4	2.0833	0.7340	0.9916	0.7402	17
09/10-11/12	5	5	4	4	1.5625	0.4463	0.9487	0.4704	18
Combined results	**12**	**14**	**11**	**12**	**1.2727**	**0.2412**	**0.5736**	**0.4204**	**49**

Table 6.77 - W and L in each 2-year period based on Carhart alphas, S3			
Year	W	L	Tot funds
2007-2008	7	7	14
2008-2009	8	9	17
2009-2010	9	9	18
2010-2011	9	9	18
2011-2012	10	9	19

Table 6.78 - Two-way contingency tables based on 2-year Carhart alphas, S3		
	2009-2010 W	2009-2010 L
2007-2008 W	1	6
2007-2008 L	5	2
	2010-2011 W	2010-2011 L
2008-2009 W	3	5
2008-2009 L	6	3
	2011-2012 W	2011-2012 L
2009-2010 W	4	5
2009-2010 L	5	4

Table 6.79 - Non parametric test based on 2-year Carhart alphas, S3									
	WW	LL	WL	LW	CPR	LOR	s.e.	zstat	N
07/08-09/10	1	2	6	5	0.0667	-2.7081	1.3663	-1.9821	14
08/09-10/11	3	3	5	6	0.3000	-1.2040	1.0165	-1.1844	17
09/10-11/12	4	4	5	5	0.6400	-0.4463	0.9487	-0.4704	18
Combined results	**8**	**9**	**16**	**16**	**0.2813**	**-1.2685**	**0.6009**	**-2.1109**	**49**

6.4.3 Parametric Test in the Long Term based on the CAPM, Fama-French and Carhart Alpha

The parametric test for performance persistence in the long term is carried out by running a cross-sectional regression of mutual fund 2-year alphas on 2-year alphas during the previous period. A positive slope coefficient indicates positive performance persistence, whereas a negative slope coefficient indicates negative performance persistence.

In S1, 5 of the 7 slope coefficients are positive, while the remaining 2 are negative. One slope coefficient is significantly positive, in 2008/09 – 2010/11, and one is significantly negative, in 2011/12 – 2013/14 (see Table 6.80). The slope coefficient for the entire period is equal to 0.3960 and is statistically significant at the 1% level (p-value=0.0011). Performance persistence based on the single-index alpha is positive and statistically significant. This results is in contrast with the non-parametric test, where performance persistence was not statistically significant.

Table 6.80 - Parametric test based on 2-year single-index alphas, S1

		alpha				beta					
dep var	indep var	coeff	std error	tstat	prob	coeff	std error	tstat	prob	sign 5%	sign 10%
08_09	06_07	-0.4247	0.1121	-3.7890	0.0026	0.2893	0.2995	0.9661	0.3531	0	0
09_10	07_08	0.4076	0.2529	1.6117	0.1330	0.3739	0.3279	1.1405	0.2763	0	0
10_11	08_09	-0.0682	0.0889	-0.7664	0.4553	0.6631	0.2210	2.9998	0.0090	1	1
11_12	09_10	-0.3721	0.0884	-4.2101	0.0007	0.4138	0.3843	1.0767	0.2976	0	0
12_13	10_11	0.3069	0.1099	2.7914	0.0131	-0.2497	0.2238	-1.1157	0.2810	0	0
13_14	11_12	0.1382	0.0711	1.9455	0.0684	-0.3710	0.1520	-2.4405	0.0259	1	1
14_15	12_13	0.0155	0.0726	0.2139	0.8332	0.2104	0.3061	0.6875	0.5010	0	0
Combined regression results (using HAC standard errors):											
foll	prec	-0.0390	0.0544	-0.7164	0.4750	0.3960	0.1183	3.3468	0.0011	1	0
Alpha coeff in percentage											

In S2, all the slope coefficients are positive, but only one is statistically significant, in 2008/09 – 2010/11 (see Table 6.81). The slope coefficient for the entire period is 0.2161, but is not statistically significant (p-value=0.1301). The parametric test specifies the positive trend of performance persistence based on the single-index alpha, but states it is not statistically significant, in accordance with the non-parametric test.

Table 6.81- Parametric test based on 2-year single-index alphas, S2

		alpha				beta					
dep var	indep var	coeff	std error	tstat	prob	coeff	std error	tstat	prob	sign 5%	sign 10%
09_10	07_08	0.4076	0.2529	1.6117	0.1330	0.3739	0.3279	1.1405	0.2763	0	0
10_11	08_09	-0.0682	0.0889	-0.7664	0.4553	0.6631	0.2210	2.9998	0.0090	1	1
11_12	09_10	-0.3721	0.0884	-4.2101	0.0007	0.4138	0.3843	1.0767	0.2976	0	0
Combined regression results (using HAC standard errors):											
foll	prec	-0.1970	0.0829	-2.3771	0.0204	0.2161	0.1409	1.5331	0.1301	0	0
Alpha coeff in percentage											

In S3, 2 of the 3 slope coefficients are positive, but none is statistically significant at the 5% level (see Table 6.82). The slope coefficient for the entire period is equal to 0.3056, but is not statistically significant at the 5% level (only at 10%). Performance persistence based on the single-index alpha is positive, but not statistically significant. This is consistent with the non-parametric test. Using the Fama-French model to estimate alphas, performance persistence is still statistically insignificant. 2 of the 3 slope coefficients are negative, and none of the periods exhibits significant results (see Table 6.83). The slope coefficient for the entire period remains positive, equal to 0.1014, and statistically insignificant at the 5% level (only at 10%), as with the single-index model. Employing the Carhart model, 2 of the 3 slope coefficients are negative and no slope coefficient is statistically significant at the 5% level (see Table 6.84). The slope coefficient for the entire period is now negative, equal to -0.1126, but still statistically insignificant (p-value=0.3480). The multifactor models confirm the results of the single-index model, as well as of the non-parametric test. Performance persistence in the long term based on the single-index, Fama-French and Carhart models is not statistically significant.

Table 6.82- Parametric test based on 2-year single-index alphas, S3

		alpha				beta					
dep var	indep var	coeff	std error	tstat	prob	coeff	std error	tstat	prob	sign 5%	sign 10%
09_10	07_08	0.1315	0.1040	1.2648	0.2300	-0.0948	0.4830	-0.1963	0.8477	0	0
10_11	08_09	0.0515	0.0852	0.6051	0.5542	0.4096	0.2459	1.6656	0.1165	0	0
11_12	09_10	-0.0110	0.0822	-0.1342	0.8949	0.0298	0.3125	0.0952	0.9253	0	0
Combined regression results:											
foll	prec	-0.0200	0.0456	-0.4379	0.6629	0.3056	0.1641	1.8630	0.0670	0	1
Alpha coeff in percentage											

Table 6.83 - Parametric test based on 2-year Fama-French alphas, S3

		alpha				beta					
dep var	indep var	coeff	std error	tstat	prob	coeff	std error	tstat	prob	sign 5%	sign 10%
09_10	07_08	-0.0837	0.0827	-1.0123	0.3314	-0.5957	0.3087	-1.9299	0.0776	0	1
10_11	08_09	-0.0553	0.0424	-1.3035	0.2120	0.0736	0.1207	0.6096	0.5512	0	0
11_12	09_10	0.0956	0.0632	1.5113	0.1502	-0.1018	0.3051	-0.3338	0.7428	0	0
Combined regression results:											
foll	prec	-0.0132	0.0341	-0.3867	0.7002	0.1014	0.1329	0.7632	0.4481	0	0
Alpha coeff in percentage											

Table 6.84 - Parametric test based on 2-year Carhart alphas, S3

		alpha				beta					
dep var	indep var	coeff	std error	tstat	prob	coeff	std error	tstat	prob	sign 5%	sign 10%
09_10	07_08	-0.0567	0.0823	-0.6898	0.5035	-0.6314	0.3068	-2.0578	0.0620	0	1
10_11	08_09	-0.2255	0.0493	-4.5706	0.0004	0.0543	0.1073	0.5059	0.6203	0	0
11_12	09_10	0.0974	0.0661	1.4735	0.1600	-0.0664	0.2964	-0.2240	0.8256	0	0
Combined regression results:											
foll	prec	-0.0128	0.0392	-0.3275	0.7443	-0.1126	0.1191	-0.9454	0.3480	0	0
Alpha coeff in percentage											

7 Conclusion

This study has analysed the performance of Italian equity mutual funds using the CAPM, the Fama-French three-factor model and the Carhart four-factor model. Moreover, performance persistence has been analysed both in the short and in the long term, using non-parametric (two-way contingency tables and CPR ratio) and parametric tests (regression analysis). We have performed three different studies, named S1, S2 and S3 respectively, involving different time windows and market benchmarks. When assessing statistical significance, both 5% and 10% significance levels have been considered, but more relevance has been assigned to the 5% cut-off.

Using the CAPM, the average mutual fund single-index alpha is positive but insignificant in S1, negative and significant in S2, and negative and insignificant in S3. Only 3.70% of funds exhibit a significantly positive alpha at the 5% significance level in S1, whereas no fund shows a positive alpha in S2 and S3. Multifactor models confirm these results. The average alpha is positive, but never significant, according to the Fama-French and Carhart models. Using the Fama-French model, only 5.26% of funds are statistically significant at 5%. In the cases where at least one fund is statistically significant at the 5% level, namely with the CAPM in S1 and with the Fama-French model in S3, the False Discoveries approach can estimate the proportion of funds which are truly skilled. 2.55% of the funds are skilled in the first case, and 2.76% in the second case. These percentages, applied to our sample size, imply that after the FDR correction the number of skilled funds decreases from one to zero, meaning that no fund has selective ability. In a larger and more representative sample of 100 funds, 2-3 of them would be skilled and possess true selective ability. The results of our study suggest that mutual fund managers on average are not able to outperform the market and do not possess selective ability.

Market timing models show that Italian mutual funds possess perverse market timing. Using both the Treynor-Mazuy (TM) and Henriksson-Merton (HM) models, the average mutual fund market timing coefficient is always significantly negative at the 5% level, except for the HM model in S1, where the negative coefficient is not significant. Both using the TM and HM models, 3.70% of funds have a significantly positive market timing coefficient in S1, while no fund has a significantly positive market timing coefficient in S2 and S3. The FDR approach corrects these percentages for the two market timing models in S1. The percentages of false discoveries are 1.25% for the TM model, and 1.20% for the HM model. This leaves the estimated percentage of funds possessing market timing ability at 2.45% for the TM model, 2.50% for the HM model. Applied to the 27 funds sample in S1, this decreases the number of market timers from one to zero, meaning that no fund shows market timing ability. On a larger sample of 100 funds, 2-3 funds would display market timing ability. The conclusion of our study is that mutual fund managers fail to anticipate market-wide movements and do not possess market timing ability.

Performance persistence in the short term based on raw returns is statistically significant at the 5% level in all the three studies. Raw returns do not take into account risk. Therefore, ranking mutual funds according to risk-adjusted measures, such as alpha, is more accurate. Performance persistence in the short term measured by the CAPM, Fama-French and Carhart alphas is evaluated using both non-parametric and parametric tests. The results show that performance persistence is never statistically significant, except for the non-parametric test based on 1-year single-index alphas in S3. Performance persistence in the long term based on raw returns is again statistically significant in S1, but no more in S2 and S3. Non-parametric tests based on CAPM, Fama-French and Carhart alphas fail to reject the null of no performance persistence. Parametric tests give evidence of performance persistence in the long term only when using 2-year single-index alphas in S1. We conclude that there is not enough evidence that Italian equity mutual funds can perform persistently in the short as well as in the long term.

The results suggest the absence of selective ability, market timing ability and performance persistence among Italian equity mutual funds. This is consistent with the studies of Cesari and Panetta (1998, 2002), Otten and Bams (2002) and Casarin et al. (2003, 2008). Cesari and Panetta (2002) and Casarin et al. (2008) find that the average mutual fund net alpha is not significantly different from zero and market timing coefficients are negative and insignificant, as in our study. We cannot state whether mutual fund managers have superior performance before fees, as in Cesari and Panetta (2002) and Otten and Bams (2002), since our study only uses net returns. The disappearance of performance persistence in the long term using risk-adjusted returns is consistent with Casarin et al.'s (2008) and Goetzmann and Ibbotson's (1994) findings.

Using an updated sample and applying the False Discoveries approach to both selectivity and market timing coefficients are the main contributions of the present study. Obvious limitations are the limited sample size and sample period. It would be interesting to repeat the analysis considering a larger and more representative sample. This would also make the False Discoveries analysis easier to interpret. Also, the results are valid for Italian equity funds only. This discards other categories of mutual funds, such as flexible funds, that currently dominate the Italian mutual fund industry.

Appendix

Appendix A – CAPM

Table A.1 - CAPM, Residual Diagnostics, S1										
		heterosk - White			autocorr - LM			normality - JB		
		obsR2	p_chisq	heterosk	obsR2	p_chisq	autocorr	JB_stat	p_chisq	non-norm
	ARERElI	7.0263	0.0298	1	2.6916	0.2603	0	0.0926	0.9548	0
	SYAZSCI	37.5676	0.0000	1	3.9471	0.1390	0	45.4171	0.0000	1
	AREREIP	7.1113	0.0286	1	2.9257	0.2316	0	0.0880	0.9570	0
	BPBAZIT	0.8030	0.6693	0	17.7661	0.0001	1	6120.2870	0.0000	1
	COMSMCP	7.0236	0.0298	1	6.5144	0.0385	1	0.1925	0.9082	0
	ANITPMI	5.2421	0.0727	0	3.7330	0.1547	0	0.0900	0.9560	0
	GNAZITC	1.4320	0.4887	0	0.7930	0.6727	0	72.4905	0.0000	1
	INVAZIO	16.3763	0.0003	1	2.6636	0.2640	0	5.2181	0.0736	0
	GEPIAZA	34.4992	0.0000	1	5.8975	0.0524	0	1.6723	0.4334	0
	FIDIMIT	5.6716	0.0587	0	10.2889	0.0058	1	3.8581	0.1453	0
	GESFEAC	0.5284	0.7678	0	0.0500	0.9753	0	30.1608	0.0000	1
	DUCGITY	12.0445	0.0024	1	1.5916	0.4512	0	794.9697	0.0000	1
	GESITAL	17.4737	0.0002	1	6.4893	0.0390	1	2.9061	0.2339	0
	DUCAZIT	17.5896	0.0002	1	5.9693	0.0506	0	5.0221	0.0812	0
	MEDFITI	4.4952	0.1057	0	1.3333	0.5134	0	1.2550	0.5339	0
	ARCAZIT	23.6654	0.0000	1	7.6839	0.0215	1	2.8743	0.2376	0
	MEDRICR	5.6510	0.0593	0	5.8035	0.0549	0	5.5180	0.0643	0
	BNAZITL	2.5458	0.2800	0	29.5802	0.0000	1	17602.2500	0.0000	1
	SYSELIT	1.4232	0.4909	0	5.2897	0.0710	0	1.8835	0.3899	0
	BIMAZI	14.6045	0.0007	1	8.0509	0.0179	1	1.4872	0.4754	0
	GSEAFND	9.3335	0.0094	1	2.1001	0.3499	0	3.5340	0.1703	0
	ZENAZII	11.7486	0.0032	1	6.1340	0.0466	1	6.0632	0.0482	1
	ZENAZIO	7.7792	0.0205	1	7.3324	0.0256	1	0.6021	0.7401	0
	ALSTARS	14.4815	0.0007	1	3.1232	0.2098	0	2.2938	0.3176	0
	ACITAA2	4.4934	0.1057	0	6.9084	0.0316	1	1.5714	0.4558	0
	AITALQ2	1.5453	0.4618	0	2.1490	0.3415	0	0.7030	0.7036	0
	SAIGALI	28.7275	0.0000	1	15.2038	0.0005	1	6.0474	0.0486	1
Tot	27			16			11			8
				59.26%			40.74%			29.63%

Table A.2 - CAPM, Residual Diagnostics, S2

	heterosk - White			autocorr - LM			normality - JB		
	obsR2	p_chisq	heterosk	obsR2	p_chisq	autocorr	JB_stat	p_chisq	non-norm
SYAZSCI	23.0776	0.0000	1	0.9120	0.6338	0	28.8594	0.0000	1
BPBAZIT	0.7492	0.6876	0	13.8071	0.0010	1	2645.3430	0.0000	1
COMSMCP	7.7075	0.0212	1	2.0567	0.3576	0	0.4810	0.7862	0
INVAZIO	10.0763	0.0065	1	3.3031	0.1918	0	2.8257	0.2434	0
GEPIAZA	13.0051	0.0015	1	4.6502	0.0978	0	0.0801	0.9607	0
FIDIMIT	2.9248	0.2317	0	5.3784	0.0679	0	1.8981	0.3871	0
DUCGITY	8.1581	0.0169	1	1.2583	0.5330	0	324.2858	0.0000	1
GESITAL	5.7580	0.0562	0	3.9559	0.1384	0	0.0970	0.9527	0
DUCAZIT	6.8085	0.0332	1	4.1177	0.1276	0	1.7685	0.4130	0
ARCAZIT	6.6813	0.0354	1	7.1940	0.0274	1	0.5785	0.7488	0
MEDRICR	2.6708	0.2631	0	4.0209	0.1339	0	1.7404	0.4189	0
BNAZITL	2.9084	0.2336	0	21.4079	0.0000	1	6153.4060	0.0000	1
BIMAZI	7.5306	0.0232	1	3.7940	0.1500	0	0.6954	0.7063	0
GSEAFND	6.4376	0.0400	1	2.1322	0.3443	0	6.8701	0.0322	1
ZENAZII	9.0789	0.0107	1	3.0973	3.0973	0	8.9033	0.0117	1
ZENAZIO	5.1205	0.0773	0	4.9303	0.0850	0	0.4121	0.8138	0
ALSTARS	6.2517	0.0439	1	1.2371	0.5387	0	0.6406	0.7259	0
ACITAA2	4.1793	0.1237	0	5.4951	0.0641	0	0.4400	0.8025	0
SAIGALI	11.6216	0.0030	1	5.4051	0.0670	0	38.0463	0.0000	1
Total 19			12			3			7
%			63.16%			15.79%			36.84%

Table A.3 - CAPM, Residual Diagnostics, S2

		heterosk - White			autocorr - LM			normality - JB		
		obsR2	p_chisq	heterosk	obsR2	p_chisq	autocorr	JB_stat	p_chisq	non-norm
	SYAZSCI	28.8138	0.0000	1	0.3567	0.8366	0	75.9655	0.0000	1
	BPBAZIT	0.6204	0.7333	0	17.0343	0.0002	1	3486.8850	0.0000	1
	COMSMCP	4.4671	0.1071	0	0.3294	0.8482	0	1.1026	0.5762	0
	INVAZIO	16.2809	0.0003	1	6.8845	0.0320	1	39.7609	0.0000	1
	GEPIAZA	39.2196	0.0000	1	7.7712	0.0205	1	138.7463	0.0000	1
	FIDIMIT	7.0324	0.0297	1	0.2087	0.9009	0	25.2452	0.0000	1
	DUCGITY	5.8454	0.0538	0	0.1914	0.9087	0	913.8964	0.0000	1
	GESITAL	36.6343	0.0000	1	4.1623	0.1248	0	61.2361	0.0000	1
	DUCAZIT	33.0276	0.0000	1	1.5199	0.4677	0	26.7693	0.0000	1
	ARCAZIT	31.5681	0.0000	1	6.9311	0.0313	1	100.6566	0.0000	1
	MEDRICR	3.5714	0.1677	0	1.8096	0.4046	0	9.5530	0.0084	1
	BNAZITL	1.9198	0.3829	0	22.7381	0.0000	1	6431.3190	0.0000	1
	BIMAZI	31.8850	0.0000	1	7.6323	0.0220	1	19.3090	0.0001	1
	GSEAFND	22.3425	0.0000	1	6.1468	0.0463	1	4.4299	0.1092	0
	ZENAZII	4.1297	0.1268	0	3.4158	0.1812	0	2.7321	0.2551	0
	ZENAZIO	1.7463	0.4176	0	1.4895	0.4748	0	3.1608	0.2059	0
	ALSTARS	6.2343	0.0443	1	0.6520	0.7218	0	1.1691	0.5573	0
	ACITAA2	3.9228	0.1407	0	3.4678	0.1766	0	0.3493	0.8398	0
	SAIGALI	11.6216	0.0030	1	10.1374	0.0063	1	55.3983	0.0000	1
Total	19			11			8			13
%				57.89%			42.11%			68.42%

Appendix B – Multifactor Models

Table B.1 - Fama-French, Residual Diagnostics, S3										
		heterosk - White			autocorr - LM			normality - JB		
		obsR2	p_chisq	heterosk	obsR2	p_chisq	autocorr	JB_stat	p_chisq	non-norm
	SYAZSCI	35.7794	0.0000	1	0.3621	0.8344	0	101.1320	0.0000	1
	BPBAZIT	4.4138	0.8821	0	17.1286	0.0002	1	3234.1440	0.0000	1
	COMSMCP	15.7476	0.0723	0	4.8554	0.0882	0	2.3756	0.3049	0
	INVAZIO	28.8945	0.0007	1	6.8793	0.0321	1	41.6266	0.0000	1
	GEPIAZA	48.2683	0.0000	1	8.0500	0.0179	1	141.8910	0.0000	1
	FIDIMIT	27.6648	0.0011	1	0.3521	0.8386	0	18.5854	0.0000	1
	DUCGITY	13.2275	0.1526	0	0.2404	0.8868	0	831.5988	0.0000	1
	GESITAL	43.7891	0.0000	1	3.8893	0.1430	0	79.4663	0.0000	1
	DUCAZIT	38.8254	0.0000	1	0.9571	0.6197	0	28.9259	0.0000	1
	ARCAZIT	43.5957	0.0000	1	7.0466	0.0295	1	94.3896	0.0000	1
	MEDRICR	10.4032	0.3188	0	1.0705	0.5855	0	53.7957	0.0000	1
	BNAZITL	3.5660	0.9376	0	20.5197	0.0000	1	5888.2130	0.0000	1
	BIMAZI	43.4970	0.0000	1	6.2673	0.0436	1	6.4685	0.0394	1
	GSEAFND	30.1897	0.0004	1	7.2237	0.0270	1	2.1995	0.3330	0
	ZENAZII	17.8356	0.0371	1	3.3644	0.1860	0	7.7681	0.0206	1
	ZENAZIO	18.2092	0.0328	1	1.3737	0.5032	0	14.1328	0.0009	1
	ALSTARS	16.6983	0.0537	0	0.6132	0.7359	0	7.7503	0.0208	1
	ACITAA2	3.4178	0.9454	0	0.0766	0.9624	0	41.6908	0.0000	1
	SAIGALI	45.1307	0.0000	1	4.2543	0.1192	0	4.1452	0.1259	0
Total	19			12			7			16
%				63.16%			36.84%			84.21%

Table B.2 - Carhart, Residual Diagnostics, S3										
		heterosk - White			autocorr - LM			normality - JB		
		obsR2	p_chisq	heterosk	obsR2	p_chisq	autocorr	JB_stat	p_chisq	non-norm
	SYAZSCI	34.1043	0.0000	1	0.8127	0.6661	0	20.8150	0.0000	1
	BPBAZIT	5.7950	0.9714	0	17.2862	0.0002	1	3177.8910	0.0000	1
	COMSMCP	16.3437	0.2928	0	5.8749	0.0530	0	2.2770	0.3203	0
	INVAZIO	47.3246	0.0000	1	4.3321	0.1146	0	12.5030	0.0019	1
	GEPIAZA	58.3115	0.0000	1	6.4104	0.0406	1	38.7502	0.0000	1
	FIDIMIT	37.6601	0.0006	1	1.7864	0.4093	0	25.6732	0.0000	1
	DUCGITY	34.7840	0.0016	1	0.1814	0.9133	0	949.6063	0.0000	1
	GESITAL	52.5455	0.0000	1	1.6582	0.4364	0	13.9209	0.0009	1
	DUCAZIT	46.6274	0.0000	1	0.2248	0.8937	0	5.0509	0.0800	0
	ARCAZIT	44.7751	0.0000	1	5.1887	0.0747	0	59.5424	0.0000	1
	MEDRICR	23.4261	0.0537	0	0.2132	0.8989	0	52.8478	0.0000	1
	BNAZITL	6.0700	0.9647	0	20.4399	0.0000	1	6007.9600	0.0000	1
	BIMAZI	37.8133	0.0006	1	4.5514	0.1027	0	6.8919	0.0319	1
	GSEAFND	16.5524	0.2808	0	7.2776	0.0263	1	7.9528	0.0188	1
	ZENAZII	24.8953	0.0356	1	1.2279	0.5412	0	0.9496	0.6220	0
	ZENAZIO	35.8879	0.0011	1	1.9396	0.3792	0	4.0767	0.1302	0
	ALSTARS	37.5409	0.0006	1	0.7883	0.6742	0	14.5540	0.0007	1
	ACITAA2	4.7131	0.9894	0	0.0576	0.9716	0	40.8076	0.0000	1
	SAIGALI	63.2395	0.0000	1	3.9175	0.1410	0	5.1169	0.0774	0
Total	19			13			4			14
%				68.42%			21.05%			73.68%

Appendix C – Market Timing Models

Table C.1 - Treynor-Mazuy, Residual Diagnostics, S1									
	heterosk - White			autocorr - LM			normality - JB		
	obsR2	p_chisq	heterosk	obsR2	p_chisq	autocorr	JB_stat	p_chisq	non-norm
ARERЕII	5.8291	0.2123	0	1.8435	0.3978	0	0.7967	0.6714	0
SYAZSCI	16.1487	0.0028	1	4.8549	0.0883	0	0.0690	0.9661	0
AREREIP	5.8982	0.2069	0	1.9532	0.3766	0	0.8026	0.6694	0
BPBAZIT	1.4624	0.8333	0	17.5550	0.0002	1	6166.6200	0.0000	1
COMSMCP	13.8532	0.0078	1	6.7438	0.0343	1	0.0967	0.9528	0
ANITPMI	0.7019	0.9511	0	3.8719	0.1443	0	0.4730	0.7894	0
GNAZITC	2.8075	0.5905	0	1.0898	0.5799	0	66.3718	0.0000	1
INVAZIO	11.8907	0.0182	1	2.3083	0.3153	0	8.4940	0.0143	1
GEPIAZA	19.2563	0.0007	1	6.7466	0.0343	1	0.2792	0.8697	0
FIDIMIT	16.1052	0.0029	1	11.2751	0.0036	1	2.9252	0.2316	0
GESFEAC	1.5796	0.8124	0	0.2799	0.8694	0	35.5183	0.0000	1
DUCGITY	13.5542	0.0089	1	1.4653	0.4806	0	889.1707	0.0000	1
GESITAL	9.0220	0.0606	0	8.1032	0.0174	1	3.7279	0.1551	0
DUCAZIT	14.3524	0.0063	1	5.8828	0.0528	0	3.2654	0.1954	0
MEDFITI	9.7606	0.0447	1	0.4423	0.8016	0	0.8884	0.6413	0
ARCAZIT	12.9684	0.0114	1	8.6218	0.0134	1	3.6612	0.1603	0
MEDRICR	10.2694	0.0361	1	6.2798	0.0433	1	5.6673	0.0588	0
BNAZITL	4.0488	0.3994	0	29.3389	0.0000	1	17622.1700	0.0000	1
SYSELIT	8.1652	0.0857	0	1.1170	0.5721	0	0.4248	0.8086	0
BIMAZI	9.6714	0.0463	1	10.4350	0.0054	1	1.3477	0.5097	0
GSEAFND	9.5323	0.0491	1	4.0214	0.1339	0	7.4957	0.0236	1
ZENAZII	14.1054	0.0070	1	6.3404	0.0420	1	2.3566	0.3078	0
ZENAZIO	21.6923	0.0002	1	8.8790	0.0118	1	0.2710	0.8733	0
ALSTARS	22.7800	0.0001	1	3.2010	0.2018	0	2.3344	0.3112	0
ACITAA2	3.4272	0.4890	0	7.3437	0.0254	1	3.6240	0.1633	0
AITALQ2	2.6282	0.6218	0	5.2490	0.0725	0	0.1684	0.9192	0
SAIGALI	33.0644	0.0000	1	15.3746	0.0005	1	5.9545	0.0509	0
Tot 27			16			13			7
			59.26%			48.15%			25.93%

Table C.2 - Treynor-Mazuy, Residual Diagnostics, S2									
	heterosk - White			autocorr - LM			normality - JB		
	obsR2	p_chisq	heterosk	obsR2	p_chisq	autocorr	JB_stat	p_chisq	non-norm
SYAZSCI	2.6072	0.6255	0	2.3364	0.3109	0	3.2298	0.1989	0
BPBAZIT	1.5186	0.8233	0	13.5708	0.0011	1	2660.6020	0.0000	1
COMSMCP	13.0036	0.0113	1	2.2818	0.3195	0	0.2263	0.8930	0
INVAZIO	9.9069	0.0420	1	2.5360	0.2814	0	9.1184	0.0105	1
GEPIAZA	5.2608	0.2616	0	5.6444	0.0595	0	0.6977	0.7055	0
FIDIMIT	10.0952	0.0389	1	6.8195	0.0330	1	1.3610	0.5064	0
DUCGITY	9.4807	0.0501	0	0.9161	0.6325	0	433.5600	0.0000	1
GESITAL	4.2422	0.3742	0	5.7828	0.0555	0	2.4415	0.2950	0
DUCAZIT	8.4312	0.0770	0	4.0563	0.1316	0	2.1989	0.3331	0
ARCAZIT	3.7744	0.4374	0	8.6456	0.0133	1	3.8056	0.1491	0
MEDRICR	6.1519	0.1881	0	4.5789	0.1013	0	2.2088	0.3314	0
BNAZITL	5.2888	0.2589	0	21.2529	0.0000	1	6190.4700	0.0000	1
BIMAZI	6.1344	0.1893	0	5.6391	0.0596	0	2.4137	0.2991	0
GSEAFND	5.5692	0.2337	0	2.9883	0.2244	0	15.5052	0.0004	1
ZENAZII	17.0550	0.0019	1	2.1603	0.3395	0	0.4852	0.7846	0
ZENAZIO	15.7305	0.0034	1	7.2848	0.0262	1	0.1027	0.9500	0
ALSTARS	14.8098	0.0051	1	0.7645	0.6823	0	0.4251	0.8085	0
ACITAA2	4.8801	0.2998	0	6.3145	0.0425	1	0.8303	0.6602	0
SAIGALI	9.4338	0.0511	0	13.9275	0.0009	1	45.6076	0.0000	1
Total 19			6			7			6
%			31.58%			36.84%			31.58%

Table C.3 - Treynor-Mazuy, Residual Diagnostics, S3

	heterosk - White			autocorr - LM			normality - JB		
	obsR2	p_chisq	heterosk	obsR2	p_chisq	autocorr	JB_stat	p_chisq	non-norm
SYAZSCI	2.1971	0.6996	0	2.9102	0.2334	0	16.2222	0.0003	1
BPBAZIT	1.9811	0.7392	0	17.9170	0.0001	1	3508.6390	0.0000	1
COMSMCP	9.9764	0.0408	1	0.1632	0.9216	0	1.7007	0.4273	0
INVAZIO	28.8945	0.0007	1	6.8793	0.0321	1	41.6266	0.0000	1
GEPIAZA	15.8279	0.0033	1	2.0324	0.3620	0	65.2329	0.0000	1
FIDIMIT	9.1288	0.0580	0	0.4195	0.8108	0	32.7914	0.0000	1
DUCGITY	7.2372	0.1239	0	0.0034	0.9983	0	1210.2100	0.0000	1
GESITAL	12.2281	0.0157	1	1.6794	0.4318	0	28.2600	0.0000	1
DUCAZIT	14.5386	0.0058	1	0.4703	0.7905	0	14.0758	0.0009	1
ARCAZIT	9.9215	0.0418	1	1.5501	0.4607	0	60.4074	0.0000	1
MEDRICR	5.7817	0.2161	0	0.5215	0.7705	0	15.0038	0.0006	1
BNAZITL	3.5273	0.4737	0	23.6550	0.0000	1	6487.7010	0.0000	1
BIMAZI	11.2840	0.0236	1	6.1043	0.0473	1	27.4654	0.0394	1
GSEAFND	6.6352	0.1565	0	3.7703	0.1518	0	9.6759	0.0079	1
ZENAZII	8.6164	0.0714	0	1.2300	0.5406	0	0.0140	0.9930	0
ZENAZIO	9.7547	0.0448	1	1.2870	0.5254	0	2.6153	0.2705	0
ALSTARS	17.8238	0.0013	1	0.5096	0.7751	0	3.5124	0.1727	0
ACITAA2	4.8279	0.3054	0	3.6250	0.1632	0	0.3756	0.8288	0
SAIGALI	9.4669	0.0504	0	7.6426	0.0219	1	68.1817	0.0000	1
Total 19			9			5			14
%			47.37%			26.32%			73.68%

Table C.4 - Henriksson-Merton, Residual Diagnostics, S1									
	heterosk - White			autocorr - LM			normality - JB		
	obsR2	p_chisq	heterosk	obsR2	p_chisq	autocorr	JB_stat	p_chisq	non-norm
AREREII	6.8540	0.1438	0	2.3977	0.3015	0	0.3059	0.8582	0
SYAZSCI	40.2435	0.0000	1	4.3305	0.1147	0	5.4350	0.0660	0
AREREIP	6.8898	0.1418	0	2.5538	0.2789	0	0.3135	0.8549	0
BPBAZIT	2.12847	0.7121	0	17.5543	0.0002	1	6189.6040	0.0000	1
COMSMCP	13.9030	0.0076	1	6.7033	0.0350	1	0.1417	0.9316	0
ANITPMI	2.4094	0.6609	0	5.1729	0.0753	0	0.3624	0.8343	0
GNAZITC	3.4080	0.4920	0	0.9937	0.6085	0	72.7201	0.0000	1
INVAZIO	14.5918	0.0056	1	2.5938	0.2734	0	6.0933	0.0475	1
GEPIAZA	26.5818	0.0000	1	7.1195	0.0284	1	0.1692	0.9189	0
FIDIMIT	14.0713	0.0071	1	11.1068	0.0039	1	2.8579	0.2396	0
GESFEAC	2.4416	0.6551	0	0.3605	0.8351	0	32.8108	0.0000	1
DUCGITY	13.0728	0.0109	1	1.5520	0.4602	0	848.9752	0.0000	1
GESITAL	12.5883	0.0135	1	8.5307	0.0140	1	2.4645	0.2916	0
DUCAZIT	14.9031	0.0049	1	6.3643	0.0415	1	2.7785	0.2493	0
MEDFITI	6.4283	0.1694	0	0.3238	0.8505	0	0.8373	0.6579	0
ARCAZIT	20.3733	0.0004	1	8.4131	0.0149	1	2.6709	0.2630	0
MEDRICR	9.2264	0.0557	0	6.4805	0.0392	1	4.8850	0.0869	0
BNAZITL	4.7293	0.3162	0	28.8825	0.0000	1	17639.0000	0.0000	1
SYSELIT	7.0317	0.1342	0	0.8944	0.6394	0	0.3983	0.8194	0
BIMAZI	13.1361	0.0106	1	9.1295	0.0104	1	1.1268	0.5693	0
GSEAFND	11.6325	0.0203	1	3.9600	0.1381	0	5.1327	0.0768	0
ZENAZII	15.2895	0.0041	1	7.2106	0.0272	1	3.1727	0.2047	0
ZENAZIO	16.8587	0.0021	1	9.2397	0.0099	1	0.1834	0.9124	0
ALSTARS	20.8003	0.0003	1	3.1769	0.2042	0	2.2941	0.3176	0
ACITAA2	3.5690	0.4675	0	7.4343	0.0243	1	3.6650	0.1600	0
AITALQ2	3.2886	0.5107	0	4.2522	0.1193	0	0.2892	0.8654	0
SAIGALI	35.4741	0.0000	1	15.6172	0.0004	1	5.4499	0.0655	0
Tot 27			15			14			6
			55.56%			51.85%			22.22%

Table C.5 - Henriksson-Merton, Residual Diagnostics, S2									
	heterosk - White			autocorr - LM			normality - JB		
	obsR2	p_chisq	heterosk	obsR2	p_chisq	autocorr	JB_stat	p_chisq	non-norm
SYAZSCI	6.3320	0.1757	0	1.7999	0.4066	0	3.3749	0.1850	0
BPBAZIT	1.6958	0.7915	0	13.6155	0.0011	1	2672.5070	0.0000	1
COMSMCP	12.3823	0.0147	1	2.5052	0.2858	0	0.1272	0.9384	0
INVAZIO	10.1279	0.0383	1	2.9036	0.2342	0	6.9539	0.0309	1
GEPIAZA	5.9501	0.2029	0	6.3721	0.0413	1	0.7143	0.6997	0
FIDIMIT	9.4430	0.0509	0	7.3804	0.0250	1	0.9019	0.6370	0
DUCGITY	8.5300	0.0740	0	0.8933	0.6398	0	455.2879	0.0000	1
GESITAL	5.1054	0.2766	0	6.6700	0.0356	1	1.9662	0.3741	0
DUCAZIT	7.2567	0.1229	0	4.6377	0.0984	0	1.4159	0.4926	0
ARCAZIT	4.2809	0.3693	0	8.9120	0.0116	1	3.0833	0.2140	0
MEDRICR	6.5682	0.1605	0	5.0281	0.0809	0	1.7427	0.4184	0
BNAZITL	5.9591	0.2022	0	20.7623	0.0000	1	6233.0480	0.0000	1
BIMAZI	5.9872	0.2001	0	5.4393	0.0659	0	1.5473	0.4613	0
GSEAFND	5.9494	0.2030	0	3.0143	0.2215	0	10.7068	0.0047	1
ZENAZII	15.4849	0.0038	1	3.7331	0.1547	0	0.4412	0.8020	0
ZENAZIO	12.9437	0.0116	1	8.3122	0.0157	1	0.4873	0.7838	0
ALSTARS	12.9036	0.0118	1	0.7592	0.6842	0	0.3759	0.8287	0
ACITAA2	5.7455	0.2190	0	5.8005	0.0550	0	0.5108	0.7746	0
SAIGALI	9.4390	0.0510	0	13.4088	0.0012	1	50.5801	0.0000	1
Total 19			5			8			6
%			26.32%			42.11%			31.58%

Table C.6 - Henriksson-Merton, Residual Diagnostics, S3									
	heterosk - White			autocorr - LM			normality - JB		
	obsR2	p_chisq	heterosk	obsR2	p_chisq	autocorr	JB_stat	p_chisq	non-norm
SYAZSCI	11.1340	0.0251	1	2.3462	0.3094	0	11.4687	0.0032	1
BPBAZIT	3.7165	0.4457	0	17.7026	0.0001	1	3473.3810	0.0000	1
COMSMCP	8.2167	0.0840	0	0.4126	0.8136	0	2.3798	0.3043	0
INVAZIO	28.8945	0.0007	1	11.0751	0.0257	1	31.5866	0.0000	1
GEPIAZA	23.2236	0.0001	1	4.6019	0.1002	0	54.1647	0.0000	1
FIDIMIT	8.3824	0.0785	0	0.0930	0.9546	0	33.2197	0.0000	1
DUCGITY	6.2290	0.1827	0	0.0142	0.9929	0	1101.6680	0.0000	1
GESITAL	16.8057	0.0021	1	2.7702	0.2503	0	19.1085	0.0001	1
DUCAZIT	16.6425	0.0023	1	0.0642	0.9684	0	9.6328	0.0081	1
ARCAZIT	15.0748	0.0045	1	2.9863	0.2247	0	48.2217	0.0000	1
MEDRICR	6.2068	0.1842	0	1.0560	0.5898	0	13.7949	0.0010	1
BNAZITL	4.2653	0.3713	0	23.3268	0.0000	1	6541.3600	0.0000	1
BIMAZI	14.4588	0.0060	1	8.1103	0.0173	1	18.9239	0.0001	1
GSEAFND	9.4211	0.0514	0	5.2686	0.0718	0	4.0141	0.1344	0
ZENAZII	7.1454	0.1284	0	2.5258	0.2828	0	0.1898	0.9095	0
ZENAZIO	7.0184	0.1349	0	0.1349	0.2917	0	3.9525	0.1386	0
ALSTARS	13.9023	0.0076	1	0.6411	0.7258	0	5.5224	0.0632	0
ACITAA2	4.9724	0.2901	0	3.5338	0.1709	0	0.3235	0.8506	0
SAIGALI	9.5523	0.0487	1	8.2413	0.0162	1	71.3071	0.0000	1
Total 19			9			5			13
%			47.37%			26.32%			68.42%

Appendix D – Short Term Performance Persistence

Table D.1 - Mutual funds ranked based on 1-year raw returns, S1

Year	2006		2007		2008		2009		2010		2011		2012		2013		2014		2015
AREREII	#N/A	AREREII	#N/A	AREREII	#N/A	AREREII	#N/A	AREREII	#N/A	AREREII	#N/A	AREREII	#N/A	AREREII	#N/A	AREREII	#N/A	AREREII	#N/A
SYAZSCI	#N/A	SYAZSCI	#N/A	SYAZSCI	#N/A	SYAZSCI	#N/A	AREREIP	#N/A	AREREIP	#N/A	AREREIP	#N/A	AREREIP	#N/A	AREREIP	#N/A	AREREIP	#N/A
AREREIP	#N/A	AREREIP	#N/A	AREREIP	#N/A	AREREIP	#N/A	ANITPMI	#N/A	ANITPMI	#N/A	ANITPMI	#N/A	ANITPMI	#N/A	ANITPMI	#N/A	ANITPMI	#N/A
ANITPMI	#N/A	ANITPMI	#N/A	ANITPMI	#N/A	ANITPMI	#N/A	GNAZITC	#N/A	GNAZITC	#N/A	GNAZITC	#N/A	GNAZITC	#N/A	AITALQ2	#N/A	AITALQ2	#N/A
GNAZITC	#N/A	GNAZITC	#N/A	GNAZITC	#N/A	GNAZITC	#N/A	GESFEAC	#N/A	GESFEAC	#N/A	GESFEAC	#N/A	GESFEAC	#N/A	FIDIMIT	5.4425	COMSMCP	39.9433
GESFEAC	#N/A	GESFEAC	#N/A	GESFEAC	#N/A	GESFEAC	#N/A	MEDFITI	#N/A	MEDFITI	#N/A	MEDFITI	#N/A	MEDFITI	#N/A	ACITAA2	5.3485	SYAZSCI	32.7570
DUCGITY	#N/A	DUCGITY	#N/A	MEDFITI	#N/A	MEDFITI	#N/A	SYSELIT	#N/A	SYSELIT	#N/A	SYSELIT	#N/A	SYSELIT	#N/A	DUCGITY	4.6421	ACITAA2	24.4632
MEDFITI	#N/A	MEDFITI	#N/A	SYSELIT	#N/A	SYSELIT	#N/A	ACITAA2	#N/A	ACITAA2	#N/A	AITALQ2	#N/A	AITALQ2	#N/A	SAIGALI	4.2406	SAIGALI	23.4927
SYSELIT	#N/A	SYSELIT	#N/A	ZENAZII	#N/A	ACITAA2	#N/A	AITALQ2	#N/A	AITALQ2	#N/A	MEDRICR	18.1738	COMSMCP	50.8387	GESFEAC	3.7836	FIDIMIT	23.2985
ZENAZII	#N/A	ZENAZII	#N/A	ACITAA2	#N/A	AITALQ2	#N/A	ALSTARS	2.5382	ZENAZII	-16.3846	GSEAFND	17.4652	SYAZSCI	45.8130	BPBAZIT	3.7218	GNAZITC	21.9040
ALSTARS	#N/A	ALSTARS	#N/A	AITALQ2	#N/A	FIDIMIT	29.8045	COMSMCP	-0.1493	GEPIAZA	-16.5115	BPBAZIT	16.8637	ZENAZII	35.1892	DUCAZIT	3.0922	INVAZIO	21.1013
ACITAA2	#N/A	ACITAA2	#N/A	ALSTARS	-29.1727	GSEAFND	26.8374	DUCGITY	-1.9557	ZENAZIO	-17.1013	ACITAA2	16.4070	ZENAZIO	34.2216	GESITAL	2.8954	GEPIAZA	20.7952
AITALQ2	#N/A	AITALQ2	#N/A	DUCGITY	-34.6496	MEDRICR	26.7540	ZENAZII	-2.2521	DUCGITY	-17.3651	ZENAZII	16.2501	FIDIMIT	33.9792	GNAZITC	2.2013	BPBAZIT	20.5581
FIDIMIT	16.4292	DUCAZIT	-0.8736	MEDRICR	-39.5100	COMSMCP	26.3879	SYAZSCI	-2.6344	MEDRICR	-17.3916	DUCGITY	15.2832	BIMAZI	31.7509	ARCAZIT	1.7470	BNAZITL	19.6696
GESITAL	15.6501	BNAZITL	-3.5191	GEPIAZA	-39.6233	ZENAZII	25.0754	FIDIMIT	-2.7304	DUCAZIT	-18.5171	SAIGALI	15.1448	ACITAA2	31.0165	GEPIAZA	1.4214	ZENAZII	19.5613
GSEAFND	15.6288	GEPIAZA	-3.5792	ARCAZIT	-40.3500	DUCGITY	24.6513	MEDRICR	-2.8888	BIMAZI	-18.8617	ZENAZIO	15.0999	SAIGALI	30.2414	ALSTARS	1.3327	DUCGITY	19.5203
BNAZITL	15.0811	ARCAZIT	-3.7633	GSEAFND	-40.8056	BPBAZIT	24.3740	ZENAZIO	-3.0371	FIDIMIT	-19.4248	FIDIMIT	14.8918	DUCGITY	26.8905	BNAZITL	1.2915	ZENAZIO	19.1675
GEPIAZA	14.5646	FIDIMIT	-3.8688	DUCAZIT	-40.9348	ZENAZIO	24.3585	DUCAZIT	-3.2314	BPBAZIT	-19.9588	ARCAZIT	14.7232	GEPIAZA	25.9105	GSEAFND	1.2420	GESFEAC	18.6493
BPBAZIT	14.1360	BIMAZI	-4.6914	BIMAZI	-40.9824	GESITAL	24.1460	BNAZITL	-3.3942	ARCAZIT	-19.9783	GEPIAZA	14.0112	MEDRICR	25.1558	MEDRICR	-2.6435	ARCAZIT	18.3061
BIMAZI	14.0958	BPBAZIT	-4.7011	BNAZITL	-41.3502	INVAZIO	23.8048	INVAZIO	-3.4834	ALSTARS	-21.2050	DUCAZIT	13.5713	DUCAZIT	24.9998	SYAZSCI	-2.7913	ALSTARS	17.9085
DUCAZIT	14.0230	GESITAL	-5.3303	SAIGALI	-41.3668	DUCAZIT	23.4212	GESITAL	-3.7147	INVAZIO	-21.4055	GESITAL	13.4414	GESITAL	24.6373	BIMAZI	-3.7278	SYSELIT	17.8526
ARCAZIT	13.9625	SAIGALI	-5.4075	GESITAL	-41.7255	BIMAZI	22.8810	ARCAZIT	-3.9608	BNAZITL	-21.4844	ALSTARS	13.3966	ARCAZIT	24.0476	COMSMCP	-3.7550	GESITAL	17.7455
INVAZIO	13.5267	INVAZIO	-6.5499	FIDIMIT	-42.6177	ARCAZIT	22.5501	BPBAZIT	-4.0852	SYAZSCI	-22.3922	BNAZITL	11.9327	ALSTARS	23.5754	INVAZIO	-3.8215	DUCAZIT	17.7414
MEDRICR	13.5149	MEDRICR	-7.1183	BPBAZIT	-43.0688	ALSTARS	21.6430	GEPIAZA	-4.8891	GESITAL	-23.3259	BIMAZI	11.7886	BNAZITL	23.2287	SYSELIT	-5.6205	BIMAZI	16.9127
ZENAZIO	13.0502	GSEAFND	-8.3325	COMSMCP	-43.1156	BNAZITL	21.2833	GSEAFND	-6.6968	GSEAFND	-23.7661	INVAZIO	9.1397	BPBAZIT	22.3493	MEDFITI	-5.7399	MEDFITI	15.9023
SAIGALI	12.9610	ZENAZIO	-8.5331	INVAZIO	-43.1245	GEPIAZA	20.8584	SAIGALI	-7.1605	COMSMCP	-25.2456	SYAZSCI	7.6375	INVAZIO	21.8985	ZENAZII	-6.6622	MEDRICR	15.4751
COMSMCP	7.4713	COMSMCP	-10.5718	ZENAZIO	-46.8973	SAIGALI	19.0150	BIMAZI	-7.2157	SAIGALI	-28.6883	COMSMCP	3.9143	GSEAFND	15.3099	ZENAZIO	-7.6608	GSEAFND	5.9324
median	14.0594		-5.0157		-41.1663		24.1460		-3.3128		-19.9685		14.7232		25.9105		1.3327		19.5203

All values in percentages. Green colour for above (or equal to) median values; red colour for below median values

Table D.2 - Mutual funds ranked based on 1-year raw returns, S2 and S3

Year	2007		2008		2009		2010		2011		2012
SYAZSCI	#N/A	SYAZSCI	#N/A	SYAZSCI	#N/A	ACITAA2	#N/A	ACITAA2	#N/A	MEDRICR	18.1738
DUCGITY	#N/A	ZENAZII	#N/A	ACITAA2	#N/A	ALSTARS	2.5382	ZENAZII	-16.3846	GSEAFND	17.4652
ZENAZII	#N/A	ACITAA2	#N/A	FIDIMIT	29.8045	COMSMCP	-0.1493	GEPIAZA	-16.5115	BPBAZIT	16.8637
ALSTARS	#N/A	ALSTARS	-29.1727	GSEAFND	26.8374	DUCGITY	-1.9557	ZENAZIO	-17.1013	ACITAA2	16.4070
ACITAA2	#N/A	DUCGITY	-34.6496	MEDRICR	26.7540	ZENAZII	-2.2521	DUCGITY	-17.3651	ZENAZII	16.2501
DUCAZIT	-0.8736	MEDRICR	-39.5100	COMSMCP	26.3879	SYAZSCI	-2.6344	MEDRICR	-17.3916	DUCGITY	15.2832
BNAZITL	-3.5191	GEPIAZA	-39.6233	ZENAZII	25.0754	FIDIMIT	-2.7304	DUCAZIT	-18.5171	SAIGALI	15.1448
GEPIAZA	-3.5792	ARCAZIT	-40.3500	DUCGITY	24.6513	MEDRICR	-2.8888	BIMAZI	-18.8617	ZENAZIO	15.0999
ARCAZIT	-3.7633	GSEAFND	-40.8056	BPBAZIT	24.3740	ZENAZIO	-3.0371	FIDIMIT	-19.4248	FIDIMIT	14.8918
FIDIMIT	-3.8688	DUCAZIT	-40.9348	ZENAZIO	24.3585	DUCAZIT	-3.2314	BPBAZIT	-19.9588	ARCAZIT	14.7232
BIMAZI	-4.6914	BIMAZI	-40.9824	GESITAL	24.1460	BNAZITL	-3.3942	ARCAZIT	-19.9783	GEPIAZA	14.0112
BPBAZIT	-4.7011	BNAZITL	-41.3502	INVAZIO	23.8048	INVAZIO	-3.4834	ALSTARS	-21.2050	DUCAZIT	13.5713
GESITAL	-5.3303	SAIGALI	-41.3668	DUCAZIT	23.4212	GESITAL	-3.7147	INVAZIO	-21.4055	GESITAL	13.4414
SAIGALI	-5.4075	GESITAL	-41.7255	BIMAZI	22.8810	ARCAZIT	-3.9608	BNAZITL	-21.4844	ALSTARS	13.3966
INVAZIO	-6.5499	FIDIMIT	-42.6177	ARCAZIT	22.5501	BPBAZIT	-4.0852	SYAZSCI	-22.3922	BNAZITL	11.9327
MEDRICR	-7.1183	BPBAZIT	-43.0688	ALSTARS	21.6430	GEPIAZA	-4.8891	GESITAL	-23.3259	BIMAZI	11.7886
GSEAFND	-8.3325	COMSMCP	-43.1156	BNAZITL	21.2833	GSEAFND	-6.6968	GSEAFND	-23.7661	INVAZIO	9.1397
ZENAZIO	-8.5331	INVAZIO	-43.1245	GEPIAZA	20.8584	SAIGALI	-7.1605	COMSMCP	-25.2456	SYAZSCI	7.6375
COMSMCP	-10.5718	ZENAZIO	-46.8973	SAIGALI	19.0150	BIMAZI	-7.2157	SAIGALI	-28.6883	COMSMCP	3.9143
median	-5.0157		-41.1663		24.1460		-3.3128		-19.9685		14.7232

All values in percentages. Green colour for above (or equal to) median values; red colour for below median values

Table D.3 - 1-year Single-index alpha, S1

	alpha06				alpha07				alpha08				alpha09				alpha10			
	coeff	std error	tstat	prob	coeff	std error	tstat	prob	coeff	std error	tstat	prob	coeff	std error	tstat	prob	coeff	std error	tstat	prob
AREREII	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A
SYAZSCI	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	-0.2640	1.0841	-0.2436	0.8145	-0.2176	0.4870	-0.4468	0.6645
AREREIP	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A
BPBAZIT	0.1857	0.2415	0.7690	0.4597	-1.2315	4.5247	-0.2722	0.7910	-0.9717	0.6713	-1.4474	0.1784	0.1871	0.2280	0.8207	0.4310	-0.0854	0.2568	-0.3327	0.7463
COMSMCP	-0.1482	0.6583	-0.2252	0.8264	-0.4253	1.4342	-0.2966	0.7729	-0.8707	1.4880	-0.5852	0.5714	0.5487	0.4110	1.3352	0.2114	0.1131	0.5139	0.2202	0.8302
ANITPMI	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A
GNAZITC	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A
INVAZIO	-0.1609	0.2736	-0.5881	0.5695	-0.7092	0.6201	-1.1436	0.2794	-1.1108	0.6449	-1.7226	0.1157	0.2653	0.2903	0.9140	0.3822	0.1627	0.2547	0.6388	0.5373
GEPIAZA	-0.0017	0.2603	-0.0065	0.9950	-0.5201	0.3635	-1.4307	0.1830	-0.7617	0.3662	-2.0799	0.0642	0.0099	0.1870	0.0531	0.9587	-0.0636	0.1986	-0.3202	0.7554
FIDIMIT	0.3662	0.3184	1.1500	0.2769	-0.1868	0.4906	-0.3807	0.7114	-0.4490	0.4884	-0.9192	0.3796	0.5547	0.2352	2.3586	0.0400	0.1861	0.2108	0.8828	0.3981
GESFEAC	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A
DUCGITY	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	-0.9913	1.3912	-0.7125	0.4924	0.2731	0.1595	1.7122	0.1176	0.1462	0.1868	0.7827	0.4520
GESITAL	0.1361	0.3682	0.3695	0.7194	-0.5868	0.4590	-1.2784	0.2300	-0.7985	0.3314	-2.4098	0.0367	0.2268	0.2332	0.9724	0.3538	0.0810	0.2018	0.4013	0.6966
DUCAZIT	0.0393	0.4029	0.0975	0.9242	-0.3952	0.4706	-0.8399	0.4206	-0.8139	0.5266	-1.5456	0.1532	0.1884	0.1591	1.1847	0.2635	0.0350	0.1869	0.1873	0.8551
MEDFITI	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A
ARCAZIT	-0.1969	0.2578	-0.7637	0.4627	-0.6239	0.3450	-1.8082	0.1007	-0.8066	0.3328	-2.4237	0.0358	0.1158	0.1492	0.7765	0.4554	0.0499	0.1403	0.3558	0.7294
MEDRICR	-0.0894	0.3427	-0.2609	0.7995	-0.5313	0.6410	-0.8289	0.4265	-0.6292	0.6240	-1.0084	0.3371	0.4472	0.2548	1.7551	0.1098	-0.0619	0.2922	-0.2119	0.8365
BNAZITL	0.0247	0.3170	0.0778	0.9395	-0.6600	0.3692	-1.7877	0.1041	-0.4521	0.5540	-0.8160	0.4335	1.2825	5.3393	0.2402	0.8150	0.1399	0.2106	0.6644	0.5215
SYSELIT	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A
BIMAZI	0.1216	0.4269	0.2848	0.7816	-0.8957	0.6213	-1.4416	0.1800	-0.7237	0.6778	-1.0679	0.3107	0.1904	0.2163	0.8801	0.3994	-0.2502	0.4255	-0.5880	0.5696
GSEAFND	0.7313	0.6301	1.1606	0.2728	0.1394	0.8183	0.1703	0.8682	-0.3991	0.5691	-0.7013	0.4991	0.5058	0.2762	1.8315	0.0969	-0.1613	0.2602	-0.6197	0.5493
ZENAZII	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	3.5551	1.6688	2.1303	0.1002	0.3040	0.4692	0.6479	0.5316	0.1715	0.5738	0.2988	0.7712
ZENAZIO	-0.1113	0.2849	-0.3906	0.7043	-0.6429	0.7427	-0.8657	0.4070	-0.2798	0.8236	-0.3398	0.7411	0.2551	0.4760	0.5361	0.6036	0.1061	0.5728	0.1853	0.8567
ALSTARS	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	-1.6687	1.5226	-1.0960	0.2988	0.3216	0.3952	0.8137	0.4348	0.1500	0.5818	0.2578	0.8018
ACITAA2	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A
AITALQ2	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A
SAIGALI	-0.1905	0.2749	-0.6930	0.5041	-0.4837	0.5074	-0.9533	0.3629	-0.7240	0.3964	-1.8263	0.0978	-0.1053	0.1490	-0.7063	0.4961	-0.2554	0.2518	-1.0142	0.3344

Coeff in percentage. Green colour for statistical significance at 5% level; yellow colour for statistical significance at 10% level

Table D.3 - 1-year Single-index alpha, S1

	alpha11				alpha12				alpha13				alpha14				alpha15			
	coeff	std error	tstat	prob	coeff	std error	tstat	prob	coeff	std error	tstat	prob	coeff	std error	tstat	prob	coeff	std error	tstat	prob
AREREII	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	0.7744	0.5442	1.4231	0.1977
SYAZSCI	-2.0195	0.7527	-2.6831	0.0230	-0.3838	0.6091	-0.6302	0.5427	2.0190	0.4658	4.3341	0.0015	-0.4522	0.7673	-0.5893	0.5687	1.2685	0.7854	1.6151	0.1374
AREREIP	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	0.7141	0.5520	1.2936	0.2368
BPBAZIT	-0.8946	0.2275	-3.9322	0.0028	0.3168	0.3705	0.8553	0.4124	0.4556	0.2337	1.9495	0.0798	0.0660	0.3196	0.2065	0.8405	0.3350	0.3227	1.0379	0.3238
COMSMCP	-2.2647	0.8270	-2.7385	0.0209	-0.6570	0.7607	-0.8638	0.4080	2.3108	0.6078	3.8021	0.0035	-0.5276	0.8390	-0.6289	0.5435	1.6635	0.6857	2.4260	0.0357
ANITPMI	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	0.6946	0.9385	0.7401	0.4781
GNAZITC	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	-0.3696	1.8351	-0.2014	0.8590	-0.0562	0.2522	-0.2228	0.8282	0.4827	0.1921	2.5125	0.0308
INVAZIO	-0.7622	0.4028	-1.8921	0.0878	-0.2390	0.2013	-1.1872	0.2626	0.2072	0.2437	0.8503	0.4151	-0.5623	0.3427	-1.6407	0.1319	0.4361	0.3594	1.2136	0.2528
GEPIAZA	-0.1876	0.2673	-0.7018	0.4988	0.1256	0.2669	0.4706	0.6480	0.5409	0.1857	2.9122	0.0155	-0.1201	0.2514	-0.4776	0.6432	0.4016	0.1894	2.1207	0.0600
FIDIMIT	-0.5359	0.3281	-1.6334	0.1334	0.1866	0.2701	0.6910	0.5053	1.0348	0.2340	4.4229	0.0013	0.2044	0.2541	0.8045	0.4398	0.5628	0.1958	2.8751	0.0165
GESFEAC	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	0.6147	0.3229	1.9035	0.0935	0.0690	0.1732	0.3983	0.6988	0.2699	0.1915	1.4092	0.1891
DUCGITY	-0.2687	0.3263	-0.8237	0.4293	0.2150	0.2805	0.7667	0.4610	0.5903	0.1768	3.3394	0.0075	0.1383	0.1757	0.7871	0.4495	0.3243	0.1906	1.7014	0.1197
GESITAL	-0.8610	0.2815	-3.0585	0.0121	0.0703	0.2149	0.3272	0.7502	0.4593	0.1795	2.5584	0.0285	-0.0027	0.1734	-0.0157	0.9877	0.2062	0.1905	1.0824	0.3045
DUCAZIT	-0.3823	0.3258	-1.1731	0.2679	0.0889	0.2808	0.3166	0.7581	0.4647	0.1767	2.6298	0.0252	0.0136	0.1766	0.0770	0.9402	0.1986	0.1891	1.0505	0.3182
MEDFITI	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	-0.7302	0.3199	-2.2829	0.0456	0.2002	0.2421	0.8272	0.4274
ARCAZIT	-0.5045	0.2362	-2.1361	0.0584	0.1718	0.2307	0.7449	0.4735	0.3786	0.1313	2.8847	0.0163	-0.0967	0.1392	-0.6945	0.5032	0.2179	0.1453	1.4996	0.1646
MEDRICR	-0.5252	0.5879	-0.8935	0.3926	0.4106	0.4426	0.9277	0.3754	0.5680	0.3570	1.5910	0.1427	-0.4627	0.2723	-1.6991	0.1202	0.2496	0.2004	1.2453	0.2414
BNAZITL	-0.5078	0.2795	-1.8167	0.0993	-0.0482	0.1704	-0.2828	0.7831	0.3267	0.2030	1.6094	0.1386	-0.1310	0.2164	-0.6053	0.5585	0.3056	0.1640	1.8633	0.0920
SYSELIT	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	-0.7192	0.3281	-2.1923	0.0531	0.2160	0.1648	1.3101	0.2195
BIMAZI	-0.4348	0.2870	-1.5149	0.1608	-0.0428	0.3051	-0.1401	0.8914	0.9768	0.2319	4.2122	0.0018	-0.5536	0.3205	-1.7274	0.1148	0.1519	0.1515	1.0029	0.3396
GSEAFND	-1.1177	0.7256	-1.5405	0.1545	0.3630	0.3305	1.0986	0.2977	-0.1311	0.4505	-0.2911	0.7769	-0.1289	0.1730	-0.7448	0.4735	-0.1673	0.3728	-0.4488	0.6631
ZENAZII	-0.7437	0.5705	-1.3034	0.2216	0.2561	0.3709	0.6905	0.5056	1.3086	0.4788	2.7328	0.0211	-0.7954	0.4967	-1.6015	0.1404	0.3763	0.4358	0.8636	0.4081
ZENAZIO	-0.8132	0.5714	-1.4233	0.1851	0.1720	0.3668	0.4690	0.6491	1.2485	0.4768	2.6187	0.0257	-0.8841	0.5030	-1.7577	0.1093	0.3539	0.4316	0.8199	0.4314
ALSTARS	-1.8193	0.6145	-2.9604	0.0143	0.0783	0.2628	0.2979	0.7719	0.3061	0.1418	2.1589	0.0562	-0.1258	0.1847	-0.6813	0.5112	0.1123	0.2241	0.5009	0.6273
ACITAA2	-1.8193	0.6145	-2.9604	0.0143	0.0783	0.2628	0.2979	0.7719	0.3061	0.1418	2.1589	0.0562	-0.1258	0.1847	-0.6813	0.5112	0.1123	0.2241	0.5009	0.6273
AITALQ2	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	0.4463	0.4927	0.9059	0.3951
SAIGALI	-1.5975	0.7496	-2.1313	0.0589	0.2725	0.6642	0.4103	0.6902	0.5788	0.5089	1.1372	0.2820	0.1416	0.7368	0.1921	0.8515	0.3564	0.5062	0.7040	0.4975

Coeff in percentage. Green colour for statistical significance at 5% level; yellow colour for statistical significance at 10% level

Table D.4 - Mutual funds ranked based on 1-year single-index alphas, S1

Year	2006		2007		2008		2009		2010		2011		2012		2013		2014		2015
AREREII	#N/A	AREREII	#N/A	AREREII	#N/A	AREREII	#N/A	AREREII	#N/A	AREREII	#N/A	AREREII	#N/A	AREREII	#N/A	AREREII	#N/A	COMSMCP	1.6635
SYAZSCI	#N/A	SYAZSCI	#N/A	SYAZSCI	#N/A	AREREIP	#N/A	AREREIP	#N/A	AREREIP	#N/A	AREREIP	#N/A	AREREIP	#N/A	AREREIP	#N/A	SYAZSCI	1.2685
AREREIP	#N/A	AREREIP	#N/A	AREREIP	#N/A	ANITPMI	#N/A	ANITPMI	#N/A	ANITPMI	#N/A	ANITPMI	#N/A	ANITPMI	#N/A	ANITPMI	#N/A	AREREII	0.7744
ANITPMI	#N/A	ANITPMI	#N/A	ANITPMI	#N/A	GNAZITC	#N/A	GNAZITC	#N/A	GNAZITC	#N/A	GNAZITC	#N/A	MEDFITI	#N/A	AITALQ2	#N/A	AREREIP	0.7141
GNAZITC	#N/A	GNAZITC	#N/A	GNAZITC	#N/A	GESFEAC	#N/A	GESFEAC	#N/A	GESFEAC	#N/A	GESFEAC	#N/A	SYSELIT	#N/A	FIDIMIT	0.2044	ANITPMI	0.6946
GESFEAC	#N/A	GESFEAC	#N/A	GESFEAC	#N/A	MEDFITI	#N/A	MEDFITI	#N/A	MEDFITI	#N/A	MEDFITI	#N/A	AITALQ2	#N/A	SAIGALI	0.1416	FIDIMIT	0.5628
DUCGITY	#N/A	DUCGITY	#N/A	MEDFITI	#N/A	SYSELIT	#N/A	SYSELIT	#N/A	SYSELIT	#N/A	SYSELIT	#N/A	COMSMCP	2.3108	DUCGITY	0.1383	GNAZITC	0.4827
MEDFITI	#N/A	MEDFITI	#N/A	SYSELIT	#N/A	ACITAA2	#N/A	ACITAA2	#N/A	AITALQ2	#N/A	AITALQ2	#N/A	SYAZSCI	2.0190	GESFEAC	0.0690	AITALQ2	0.4463
SYSELIT	#N/A	SYSELIT	#N/A	ACITAA2	#N/A	AITALQ2	#N/A	AITALQ2	#N/A	GEPIAZA	-0.1876	MEDRICR	0.4106	ZENAZII	1.3086	BPBAZIT	0.0660	INVAZIO	0.4361
ZENAZII	#N/A	ZENAZII	#N/A	AITALQ2	#N/A	BNAZITL	1.2825	FIDIMIT	0.1861	DUCGITY	-0.2687	GSEAFND	0.3630	ZENAZIO	1.2485	DUCAZIT	0.0136	GEPIAZA	0.4016
ALSTARS	#N/A	ALSTARS	#N/A	ZENAZII	3.5551	FIDIMIT	0.5547	ZENAZII	0.1715	DUCAZIT	-0.3823	BPBAZIT	0.3168	FIDIMIT	1.0348	GESITAL	-0.0027	ZENAZII	0.3763
ACITAA2	#N/A	ACITAA2	#N/A	ZENAZIO	-0.2798	COMSMCP	0.5487	INVAZIO	0.1627	BIMAZI	-0.4348	SAIGALI	0.2725	BIMAZI	0.9768	GNAZITC	-0.0562	SAIGALI	0.3564
AITALQ2	#N/A	AITALQ2	#N/A	GSEAFND	-0.3991	GSEAFND	0.5058	ALSTARS	0.1500	ARCAZIT	-0.5045	ZENAZII	0.2561	GESFEAC	0.6147	ARCAZIT	-0.0967	ZENAZIO	0.3539
GSEAFND	0.7313	GSEAFND	0.1394	FIDIMIT	-0.4490	MEDRICR	0.4472	DUCGITY	0.1462	BNAZITL	-0.5078	DUCGITY	0.2150	DUCGITY	0.5903	GEPIAZA	-0.1201	BPBAZIT	0.3350
FIDIMIT	0.3662	FIDIMIT	-0.1868	BNAZITL	-0.4521	ALSTARS	0.3216	BNAZITL	0.1399	MEDRICR	-0.5252	FIDIMIT	0.1866	SAIGALI	0.5788	ALSTARS	-0.1258	DUCGITY	0.3243
BPBAZIT	0.1857	DUCAZIT	-0.3952	MEDRICR	-0.6292	ZENAZII	0.3040	COMSMCP	0.1131	FIDIMIT	-0.5359	ZENAZIO	0.1720	MEDRICR	0.5680	ACITAA2	-0.1258	BNAZITL	0.3056
GESITAL	0.1361	COMSMCP	-0.4253	BIMAZI	-0.7237	DUCGITY	0.2731	ZENAZIO	0.1061	ZENAZII	-0.7437	ARCAZIT	0.1718	GEPIAZA	0.5409	GSEAFND	-0.1289	GESFEAC	0.2699
BIMAZI	0.1216	SAIGALI	-0.4837	SAIGALI	-0.7240	INVAZIO	0.2653	GESITAL	0.0810	INVAZIO	-0.7622	GEPIAZA	0.1256	DUCAZIT	0.4647	BNAZITL	-0.1310	MEDRICR	0.2496
DUCAZIT	0.0393	GEPIAZA	-0.5201	GEPIAZA	-0.7617	ZENAZIO	0.2551	ARCAZIT	0.0499	ZENAZIO	-0.8132	DUCAZIT	0.0889	GESITAL	0.4593	SYAZSCI	-0.4522	ARCAZIT	0.2179
BNAZITL	0.0247	MEDRICR	-0.5313	GESITAL	-0.7985	GESITAL	0.2268	DUCAZIT	0.0350	GESITAL	-0.8610	ALSTARS	0.0783	BPBAZIT	0.4556	MEDRICR	-0.4627	SYSELIT	0.2160
GEPIAZA	-0.0017	GESITAL	-0.5868	ARCAZIT	-0.8066	BIMAZI	0.1904	MEDRICR	-0.0619	BPBAZIT	-0.8946	ACITAA2	0.0783	ARCAZIT	0.3786	COMSMCP	-0.5276	GESITAL	0.2062
MEDRICR	-0.0894	ARCAZIT	-0.6239	DUCAZIT	-0.8139	DUCAZIT	0.1884	GEPIAZA	-0.0636	GSEAFND	-1.1177	GESITAL	0.0703	BNAZITL	0.3267	BIMAZI	-0.5536	MEDFITI	0.2002
ZENAZIO	-0.1113	ZENAZIO	-0.6429	COMSMCP	-0.8707	BPBAZIT	0.1871	BPBAZIT	-0.0854	SAIGALI	-1.5975	BIMAZI	-0.0428	ALSTARS	0.3061	INVAZIO	-0.5623	DUCAZIT	0.1986
COMSMCP	-0.1482	BNAZITL	-0.6600	BPBAZIT	-0.9717	ARCAZIT	0.1158	GSEAFND	-0.1613	ALSTARS	-1.8193	BNAZITL	-0.0482	ACITAA2	0.3061	SYSELIT	-0.7192	BIMAZI	0.1519
INVAZIO	-0.1609	INVAZIO	-0.7092	DUCGITY	-0.9913	GEPIAZA	0.0099	SYAZSCI	-0.2176	ACITAA2	-1.8193	INVAZIO	-0.2390	INVAZIO	0.2072	MEDFITI	-0.7302	ALSTARS	0.1123
SAIGALI	-0.1905	BIMAZI	-0.8957	INVAZIO	-1.1108	SAIGALI	-0.1053	BIMAZI	-0.2502	SYAZSCI	-2.0195	SYAZSCI	-0.3838	GSEAFND	-0.1311	ZENAZII	-0.7954	ACITAA2	0.1123
ARCAZIT	-0.1969	BPBAZIT	-1.2315	ALSTARS	-1.6687	SYAZSCI	-0.2640	SAIGALI	-0.2554	COMSMCP	-2.2647	COMSMCP	-0.6570	GNAZITC	-0.3696	ZENAZIO	-0.8841	GSEAFND	-0.1673
median	0.0115		-0.5591		-0.7617		0.2602		0.0654		-0.7622		0.1256		0.5409		-0.1258		0.3350

All values in percentages. Green colour for above (or equal to) median values; red colour for below median values

Table D.5 - 1-year Single-index alpha, S2

	alpha07				alpha08				alpha09				alpha10				alpha11				alpha12			
	coeff	std error	tstat	prob	coeff	std error	tstat	prob	coeff	std error	tstat	prob	coeff	std error	tstat	prob	coeff	std error	tstat	prob	coeff	std error	tstat	prob
SYAZSCI	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	-0.2640	1.0841	-0.2436	0.8145	-0.2176	0.4870	-0.4468	0.6645	-2.0195	0.7527	-2.6831	0.0230	-0.3838	0.6091	-0.6302	0.5427
BPBAZIT	-1.2315	4.5247	-0.2722	0.7910	-0.9717	0.6713	-1.4474	0.1784	0.1871	0.2280	0.8207	0.4310	-0.0854	0.2568	-0.3327	0.7463	-0.8946	0.2275	-3.9322	0.0028	0.3168	0.3705	0.8553	0.4124
COMSMCP	-0.4253	1.4342	-0.2966	0.7729	-0.8707	1.4880	-0.5852	0.5714	0.5487	0.4110	1.3352	0.2114	0.1131	0.5139	0.2202	0.8302	-2.2647	0.8270	-2.7385	0.0209	-0.6570	0.7607	-0.8638	0.4080
INVAZIO	-0.7092	0.6201	-1.1436	0.2794	-1.1108	0.6449	-1.7226	0.1157	0.2653	0.2903	0.9140	0.3822	0.1627	0.2547	0.6388	0.5373	-0.7622	0.4028	-1.8921	0.0878	-0.2390	0.2013	-1.1872	0.2626
GEPIAZA	-0.5201	0.3635	-1.4307	0.1830	-0.7617	0.3662	-2.0799	0.0642	0.0099	0.1870	0.0531	0.9587	-0.0636	0.1986	-0.3202	0.7554	-0.1876	0.2673	-0.7018	0.4988	0.1256	0.2669	0.4706	0.6480
FIDIMIT	-0.1868	0.4906	-0.3807	0.7114	-0.4490	0.4884	-0.9192	0.3796	0.5547	0.2352	2.3586	0.0400	0.1861	0.2108	0.8828	0.3981	-0.5359	0.3281	-1.6334	0.1334	0.1866	0.2701	0.6910	0.5053
DUCGITY	#N/A	#N/A	#N/A	#N/A	-0.9913	1.3912	-0.7125	0.4924	0.2731	0.1595	1.7122	0.1176	0.1462	0.1868	0.7827	0.4520	-0.2687	0.3263	-0.8237	0.4293	0.2150	0.2805	0.7667	0.4610
GESITAL	-0.5868	0.4590	-1.2784	0.2300	-0.7985	0.3314	-2.4098	0.0367	0.2268	0.2332	0.9724	0.3538	0.0810	0.2018	0.4013	0.6966	-0.8610	0.2815	-3.0585	0.0121	0.0703	0.2149	0.3272	0.7502
DUCAZIT	-0.3952	0.4706	-0.8399	0.4206	-0.8139	0.5266	-1.5456	0.1532	0.1884	0.1591	1.1847	0.2635	0.0350	0.1869	0.1873	0.8551	-0.3823	0.3258	-1.1731	0.2679	0.0889	0.2808	0.3166	0.7581
ARCAZIT	-0.6239	0.3450	-1.8082	0.1007	-0.8066	0.3328	-2.4237	0.0358	0.1158	0.1492	0.7765	0.4554	0.0499	0.1403	0.3558	0.7294	-0.5045	0.2362	-2.1361	0.0584	0.1718	0.2307	0.7449	0.4735
MEDRICR	-0.5313	0.6410	-0.8289	0.4265	-0.6292	0.6240	-1.0084	0.3371	0.4472	0.2548	1.7551	0.1098	-0.0619	0.2922	-0.2119	0.8365	-0.5252	0.5879	-0.8935	0.3926	0.4106	0.4426	0.9277	0.3754
BNAZITL	-0.6600	0.3692	-1.7877	0.1041	-0.4521	0.5540	-0.8160	0.4335	1.2825	5.3393	0.2402	0.8150	0.1399	0.2106	0.6644	0.5215	-0.5078	0.2795	-1.8167	0.0993	-0.0482	0.1704	-0.2828	0.7831
BIMAZI	-0.8957	0.6213	-1.4416	0.1800	-0.7237	0.6778	-1.0679	0.3107	0.1904	0.2163	0.8801	0.3994	-0.2502	0.4255	-0.5880	0.5696	-0.4348	0.2870	-1.5149	0.1608	-0.0428	0.3051	-0.1401	0.8914
GSEAFND	0.1394	0.8183	0.1703	0.8682	-0.3991	0.5691	-0.7013	0.4991	0.5058	0.2762	1.8315	0.0969	-0.1613	0.2602	-0.6197	0.5493	-1.1177	0.7256	-1.5405	0.1545	0.3630	0.3305	1.0986	0.2977
ZENAZII	#N/A	#N/A	#N/A	#N/A	3.5551	1.6688	2.1303	0.1002	0.3040	0.4692	0.6479	0.5316	0.1715	0.5738	0.2988	0.7712	-0.7437	0.5705	-1.3034	0.2216	0.2561	0.3709	0.6905	0.5056
ZENAZIO	-0.6429	0.7427	-0.8657	0.4070	-0.2798	0.8236	-0.3398	0.7411	0.2551	0.4760	0.5361	0.6036	0.1061	0.5728	0.1853	0.8567	-0.8132	0.5714	-1.4233	0.1851	0.1720	0.3668	0.4690	0.6491
ALSTARS	#N/A	#N/A	#N/A	#N/A	-1.6687	1.5226	-1.0960	0.2988	0.3216	0.3952	0.8137	0.4348	0.1500	0.5818	0.2578	0.8018	-1.8193	0.6145	-2.9604	0.0143	0.0783	0.2628	0.2979	0.7719
ACITAA2	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	-1.8193	0.6145	-2.9604	0.0143	0.0783	0.2628	0.2979	0.7719
SAIGALI	-0.4837	0.5074	-0.9533	0.3629	-0.7240	0.3964	-1.8263	0.0978	-0.1053	0.1490	-0.7063	0.4961	-0.2554	0.2518	-1.0142	0.3344	-1.5975	0.7496	-2.1313	0.0589	0.2725	0.6642	0.4103	0.6902

Coeff in percentage. Green colour for statistical significance at 5% level; yellow colour for statistical significance at 10% level

Table D.6 - Mutual funds ranked based on 1-year single-index alphas, S2

Year	2007	Year	2008	Year	2009	Year	2010	Year	2011	Year	2012
SYAZSCI	#N/A	SYAZSCI	#N/A	ACITAA2	#N/A	ACITAA2	#N/A	GEPIAZA	-0.1876	MEDRICR	0.4106
GESFEAC	#N/A	ACITAA2	#N/A	FIDIMIT	0.5547	FIDIMIT	0.1861	DUCGITY	-0.2687	GSEAFND	0.3630
DUCGITY	#N/A	ZENAZII	3.5551	BNAZITL	1.2825	ZENAZII	0.1715	DUCAZIT	-0.3823	BPBAZIT	0.3168
ZENAZII	#N/A	ZENAZIO	-0.2798	COMSMCP	0.5487	INVAZIO	0.1627	BIMAZI	-0.4348	SAIGALI	0.2725
ALSTARS	#N/A	GSEAFND	-0.3991	GSEAFND	0.5058	ALSTARS	0.1500	ARCAZIT	-0.5045	ZENAZII	0.2561
ACITAA2	#N/A	FIDIMIT	-0.4490	MEDRICR	0.4472	DUCGITY	0.1462	BNAZITL	-0.5078	DUCGITY	0.2150
FIDIMIT	-0.1868	BNAZITL	-0.4521	ALSTARS	0.3216	BNAZITL	0.1399	MEDRICR	-0.5252	FIDIMIT	0.1866
DUCAZIT	-0.3952	MEDRICR	-0.6292	ZENAZII	0.3040	COMSMCP	0.1131	FIDIMIT	-0.5359	ZENAZIO	0.1720
COMSMCP	-0.4253	BIMAZI	-0.7237	DUCGITY	0.2731	ZENAZIO	0.1061	ZENAZII	-0.7437	ARCAZIT	0.1718
SAIGALI	-0.4837	SAIGALI	-0.7240	INVAZIO	0.2653	GESITAL	0.0810	INVAZIO	-0.7622	GEPIAZA	0.1256
GEPIAZA	-0.5201	GEPIAZA	-0.7617	ZENAZIO	0.2551	ARCAZIT	0.0499	ZENAZIO	-0.8132	DUCAZIT	0.0889
MEDRICR	-0.5313	INVAZIO	-0.7985	GESITAL	0.2268	DUCAZIT	0.0350	GSEAFND	-1.1177	ALSTARS	0.0783
GESITAL	-0.5868	ALSTARS	-0.8066	BIMAZI	0.1904	MEDRICR	-0.0619	SAIGALI	-1.5975	ACITAA2	0.0783
ARCAZIT	-0.6239	GESITAL	-0.8139	DUCAZIT	0.1884	GEPIAZA	-0.0636	GESITAL	-0.8610	GESITAL	0.0703
ZENAZIO	-0.6429	ARCAZIT	-0.8707	BPBAZIT	0.1871	BPBAZIT	-0.0854	BPBAZIT	-0.8946	BIMAZI	-0.0428
BNAZITL	-0.6600	DUCAZIT	-0.9717	ARCAZIT	0.1158	GSEAFND	-0.1613	ALSTARS	-1.8193	BNAZITL	-0.0482
INVAZIO	-0.7092	COMSMCP	-0.9913	GEPIAZA	0.0099	SYAZSCI	-0.2176	ACITAA2	-1.8193	INVAZIO	-0.2390
BIMAZI	-0.8957	BPBAZIT	-1.1108	SAIGALI	-0.1053	BIMAZI	-0.2502	SYAZSCI	-2.0195	SYAZSCI	-0.3838
BPBAZIT	-1.2315	DUCGITY	-1.6687	SYAZSCI	-0.2640	SAIGALI	-0.2554	COMSMCP	-2.2647	COMSMCP	-0.6570
median	-0.5868		-0.7617		0.2602		0.0654		-0.7622		0.1256

Table D.7 - 1-year Single-index alpha, S3

	alpha07				alpha08				alpha09				alpha10				alpha11				alpha12			
	coeff	std error	tstat	prob	coeff	std error	tstat	prob	coeff	std error	tstat	prob	coeff	std error	tstat	prob	coeff	std error	tstat	prob	coeff	std error	tstat	prob
SYAZSCI	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	0.3090	1.1274	0.2741	0.7919	0.1345	0.4027	0.3341	0.7452	-1.1638	0.4623	-2.5176	0.0305	0.0975	0.5310	0.1837	0.8579
BPBAZIT	0.0454	2.4065	0.0189	0.9853	-0.5280	0.5196	-1.0162	0.3335	0.0127	0.2954	0.0432	0.9664	0.1281	0.1968	0.6507	0.5299	-0.3723	0.2144	-1.7364	0.1131	0.5849	0.3214	1.8199	0.0988
COMSMCP	-0.4236	0.6179	-0.6855	0.5086	-0.3020	0.9833	-0.3071	0.7650	0.6356	0.3641	1.7455	0.1115	0.4065	0.4005	1.0150	0.3340	-1.4187	0.5598	-2.5345	0.0296	-0.3378	0.6684	-0.5055	0.6242
INVAZIO	-0.2442	0.2384	-1.0241	0.3299	-0.5633	0.3417	-1.6486	0.1302	0.2744	0.4459	0.6154	0.5521	0.2758	0.2456	1.1229	0.2877	-0.3240	0.4029	-0.8044	0.4399	-0.1060	0.1848	-0.5734	0.5790
GEPIAZA	-0.0110	0.0991	-0.1108	0.9140	-0.1947	0.1846	-1.0543	0.3165	-0.0575	0.3403	-0.1691	0.8691	0.1023	0.1408	0.7266	0.4841	0.2189	0.2155	1.0155	0.3338	0.2740	0.1948	1.4064	0.1899
FIDIMIT	0.0317	0.1425	0.2228	0.8282	-0.1652	0.2443	-0.6759	0.5144	0.3768	0.2065	1.8246	0.0980	0.3202	0.1760	1.8199	0.0988	-0.1162	0.2795	-0.4158	0.6863	0.3525	0.1916	1.8401	0.0956
DUCGITY	#N/A	#N/A	#N/A	#N/A	-0.0668	1.0795	-0.0619	0.9519	0.1967	0.2514	0.7826	0.4520	0.3320	0.1412	2.3512	0.0406	0.1345	0.2396	0.5614	0.5869	0.3837	0.1947	1.9714	0.0770
GESITAL	-0.1425	0.1393	-1.0234	0.3302	-0.3140	0.1391	-2.2568	0.0476	0.1354	0.3323	0.4076	0.6922	0.2249	0.1708	1.3166	0.2173	-0.4665	0.2445	-1.9079	0.0855	0.2853	0.1722	1.6571	0.1285
DUCAZIT	0.2089	0.1543	1.3535	0.2057	-0.2925	0.3150	-0.9284	0.3751	0.1120	0.2566	0.4363	0.6719	0.2220	0.1406	1.5789	0.1454	0.0202	0.2387	0.0848	0.9341	0.2588	0.1951	1.3263	0.2142
ARCAZIT	-0.0430	0.0929	-0.4629	0.6534	-0.2542	0.1254	-2.0270	0.0702	0.0260	0.2810	0.0924	0.9282	0.1966	0.1366	1.4393	0.1806	-0.1158	0.1874	-0.6178	0.5505	0.3474	0.1640	2.1183	0.0602
MEDRICR	-0.2547	0.2303	-1.1060	0.2946	-0.0855	0.3143	-0.2722	0.7910	0.4180	0.3543	1.1799	0.2654	0.1901	0.2679	0.7098	0.4940	-0.0362	0.4567	-0.0793	0.9383	0.6960	0.3758	1.8519	0.0938
BNAZITL	-0.0327	0.1253	-0.2609	0.7994	-0.1011	0.2681	-0.3772	0.7139	1.1330	5.4417	0.2082	0.8392	0.2701	0.1551	1.7407	0.1124	-0.1688	0.2332	-0.7237	0.4859	0.1987	0.1463	1.3583	0.2042
BIMAZI	-0.1334	0.2272	-0.5872	0.5701	-0.2298	0.3946	-0.5823	0.5733	0.1520	0.2106	0.7218	0.4869	-0.0875	0.3306	-0.2647	0.7967	-0.0270	0.1766	-0.1529	0.8815	0.1218	0.2123	0.5738	0.5788
GSEAFND	-0.2304	0.3376	-0.6826	0.5103	-0.0332	0.4224	-0.0786	0.9389	0.5255	0.2848	1.8455	0.0947	-0.0247	0.2067	-0.1195	0.9073	-0.6347	0.6062	-1.0470	0.3197	0.5981	0.2758	2.1687	0.0553
ZENAZII	#N/A	#N/A	#N/A	#N/A	2.2273	1.1462	1.9433	0.1239	0.2108	0.4700	0.4485	0.6634	0.3464	0.5078	0.6822	0.5106	-0.1223	0.5009	-0.2441	0.8121	0.6733	0.3377	1.9934	0.0742
ZENAZIO	-0.3725	0.2873	-1.2965	0.2239	-0.3637	0.5248	-0.6930	0.5041	0.1611	0.4761	0.3383	0.7421	0.2801	0.5073	0.5522	0.5929	-0.1922	0.5009	-0.3838	0.7092	0.5904	0.3341	1.7668	0.1077
ALSTARS	#N/A	#N/A	#N/A	#N/A	-0.0897	1.1329	-0.0791	0.9385	0.5418	0.4164	1.3011	0.2224	0.5397	0.4969	1.0861	0.3029	-0.9719	0.4735	-2.0527	0.0672	0.2376	0.2147	1.1068	0.2943
ACITAA2	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	-1.7402	1.3818	-1.2593	0.2635	0.3088	0.5509	0.5605	0.5875
SAIGALI	-0.1258	0.1476	-0.8521	0.4141	-0.2332	0.1832	-1.2731	0.2318	-0.1587	0.2799	-0.5671	0.5832	-0.0915	0.1630	-0.5614	0.5869	-1.2243	0.5872	-2.0851	0.0637	0.2172	0.5504	0.3947	0.7014

Coeff in percentage. Green colour for statistical significance at 5% level; yellow colour for statistical significance at 10% level

Table D.8 - Mutual funds ranked based on 1-year single-index alphas, S3

Year	2007	Year	2008	Year	2009	Year	2010	Year	2011	Year	2012
SYAZSCI	#N/A	SYAZSCI	#N/A	ACITAA2	#N/A	ACITAA2	#N/A	GEPIAZA	0.2189	MEDRICR	0.6960
DUCGITY	#N/A	ACITAA2	#N/A	BNAZITL	1.1330	ALSTARS	0.5397	DUCGITY	0.1345	ZENAZII	0.6733
ZENAZII	#N/A	ZENAZII	2.2273	COMSMCP	0.6356	COMSMCP	0.4065	DUCAZIT	0.0202	GSEAFND	0.5981
ALSTARS	#N/A	GSEAFND	-0.0332	ALSTARS	0.5418	ZENAZII	0.3464	BIMAZI	-0.0270	ZENAZIO	0.5904
ACITAA2	#N/A	DUCGITY	-0.0668	GSEAFND	0.5255	DUCGITY	0.3320	MEDRICR	-0.0362	BPBAZIT	0.5849
DUCAZIT	0.2089	MEDRICR	-0.0855	MEDRICR	0.4180	FIDIMIT	0.3202	ARCAZIT	-0.1158	DUCGITY	0.3837
BPBAZIT	0.0454	ALSTARS	-0.0897	FIDIMIT	0.3768	ZENAZIO	0.2801	FIDIMIT	-0.1162	FIDIMIT	0.3525
FIDIMIT	0.0317	BNAZITL	-0.1011	SYAZSCI	0.3090	INVAZIO	0.2758	ZENAZII	-0.1223	ARCAZIT	0.3474
GEPIAZA	-0.0110	FIDIMIT	-0.1652	INVAZIO	0.2744	BNAZITL	0.2701	BNAZITL	-0.1688	ACITAA2	0.3088
BNAZITL	-0.0327	GEPIAZA	-0.1947	ZENAZII	0.2108	GESITAL	0.2249	ZENAZIO	-0.1922	GESITAL	0.2853
ARCAZIT	-0.0430	BIMAZI	-0.2298	DUCGITY	0.1967	DUCAZIT	0.2220	INVAZIO	-0.3240	GEPIAZA	0.2740
SAIGALI	-0.1258	SAIGALI	-0.2332	ZENAZIO	0.1611	ARCAZIT	0.1966	BPBAZIT	-0.3723	DUCAZIT	0.2588
BIMAZI	-0.1334	ARCAZIT	-0.2542	BIMAZI	0.1520	MEDRICR	0.1901	GESITAL	-0.4665	ALSTARS	0.2376
GESITAL	-0.1425	DUCAZIT	-0.2925	GESITAL	0.1354	SYAZSCI	0.1345	GSEAFND	-0.6347	SAIGALI	0.2172
GSEAFND	-0.2304	COMSMCP	-0.3020	DUCAZIT	0.1120	BPBAZIT	0.1281	ALSTARS	-0.9719	BNAZITL	0.1987
INVAZIO	-0.2442	GESITAL	-0.3140	ARCAZIT	0.0260	GEPIAZA	0.1023	SYAZSCI	-1.1638	BIMAZI	0.1218
MEDRICR	-0.2547	ZENAZIO	-0.3637	BPBAZIT	0.0127	GSEAFND	-0.0247	SAIGALI	-1.2243	SYAZSCI	0.0975
ZENAZIO	-0.3725	BPBAZIT	-0.5280	GEPIAZA	-0.0575	BIMAZI	-0.0875	COMSMCP	-1.4187	INVAZIO	-0.1060
COMSMCP	-0.4236	INVAZIO	-0.5633	SAIGALI	-0.1587	SAIGALI	-0.0915	ACITAA2	-1.7402	COMSMCP	-0.3378
median	-0.1296		-0.2298		0.2038		0.2235		-0.1922		0.2853

All values in percentages. Green colour for above (or equal to) median values; red colour for below median values

Table D.9 - 1-year Fama-French alpha, S3

	alpha07				alpha08				alpha09				alpha10				alpha11				alpha12			
	coeff	std error	tstat	prob	coeff	std error	tstat	prob	coeff	std error	tstat	prob	coeff	std error	tstat	prob	coeff	std error	tstat	prob	coeff	std error	tstat	prob
SYAZSCI	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	0.5770	1.1743	0.4913	0.6440	0.2371	0.4583	0.5173	0.6189	-0.9678	0.4769	-2.0293	0.0769	0.4660	0.4590	1.0152	0.3397
BPBAZIT	-0.0338	2.8992	-0.0116	0.9910	-0.3511	0.4895	-0.7172	0.4937	0.0191	0.2813	0.0680	0.9474	-0.0605	0.1652	-0.3660	0.7239	-0.2568	0.2464	-1.0422	0.3278	0.4723	0.3454	1.3674	0.2087
COMSMCP	-0.3733	0.3836	-0.9733	0.3589	-0.3717	0.9192	-0.4044	0.6965	0.6178	0.4029	1.5334	0.1637	0.4071	0.4032	1.0095	0.3423	-1.3048	0.6794	-1.9206	0.0910	0.0124	0.6619	0.0187	0.9855
INVAZIO	-0.2658	0.2569	-1.0349	0.3310	-0.6285	0.3903	-1.6103	0.1460	0.3349	0.3274	1.0229	0.3363	0.1759	0.2835	0.6204	0.5522	-0.5713	0.5000	-1.1426	0.2862	-0.2126	0.1698	-1.2516	0.2461
GEPIAZA	-0.0289	0.1264	-0.2283	0.8252	-0.1223	0.1971	-0.6206	0.5522	-0.0248	0.3177	-0.0780	0.9398	-0.0078	0.1362	-0.0575	0.9555	0.0600	0.2585	0.2323	0.8222	0.2107	0.1913	1.1014	0.3028
FIDIMIT	-0.0111	0.1636	-0.0680	0.9475	-0.1140	0.2678	-0.4257	0.6816	0.3785	0.1897	1.9955	0.0811	0.2183	0.1848	1.1817	0.2712	-0.2399	0.3541	-0.6774	0.5173	0.4178	0.2043	2.0447	0.0751
DUCGITY	#N/A	#N/A	#N/A	#N/A	0.1139	1.2276	0.0927	0.9284	0.2148	0.2269	0.9467	0.3715	0.2535	0.1548	1.6373	0.1402	-0.0511	0.2614	-0.1955	0.8499	0.4448	0.1988	2.2369	0.0557
GESITAL	-0.1289	0.1667	-0.7737	0.4614	-0.2949	0.1507	-1.9577	0.0860	0.1569	0.3324	0.4720	0.6496	0.1360	0.1893	0.7183	0.4930	-0.6577	0.2815	-2.3365	0.0477	0.2468	0.1805	1.3674	0.2087
DUCAZIT	0.2361	0.1892	1.2479	0.2474	-0.3408	0.3646	-0.9347	0.3773	0.1295	0.2276	0.5691	0.5849	0.1433	0.1540	0.9307	0.3792	-0.1641	0.2600	-0.6310	0.5457	0.3207	0.1989	1.6125	0.1455
ARCAZIT	-0.0456	0.1188	-0.3838	0.7112	-0.2569	0.1407	-1.8260	0.1053	0.0528	0.2457	0.2149	0.8352	0.1204	0.1351	0.8914	0.3987	-0.2836	0.2136	-1.3277	0.2209	0.3246	0.1859	1.7466	0.1189
MEDRICR	-0.3462	0.2489	-1.3911	0.2017	-0.0729	0.3688	-0.1977	0.8482	0.4514	0.3360	1.3434	0.2160	0.1320	0.3126	0.4223	0.6839	-0.0213	0.4180	-0.0509	0.9606	0.7562	0.4121	1.8349	0.1039
BNAZITL	-0.0933	0.1514	-0.6163	0.5548	-0.1816	0.2975	-0.6106	0.5584	0.1336	4.4371	0.0301	0.9767	0.1599	0.1568	1.0200	0.3376	-0.3729	0.2645	-1.4097	0.1963	0.1172	0.1385	0.8463	0.4220
BIMAZI	-0.0490	0.2770	-0.1767	0.8641	-0.2062	0.4142	-0.4978	0.6320	0.1853	0.1951	0.9496	0.3701	-0.0104	0.3878	-0.0267	0.9793	-0.2282	0.1737	-1.3135	0.2254	0.1941	0.2177	0.8918	0.3985
GSEAFND	-0.3547	0.3171	-1.1186	0.2958	-0.0111	0.4958	-0.0225	0.9826	0.5425	0.3106	1.7466	0.1188	-0.0948	0.2383	-0.3977	0.7012	-0.9309	0.5940	-1.5672	0.1557	0.5813	0.3236	1.7963	0.1102
ZENAZII	#N/A	#N/A	#N/A	#N/A	2.3694	0.8486	2.7922	0.1079	0.2143	0.5264	0.4071	0.6946	0.0522	0.4319	0.1209	0.9068	0.0264	0.5390	0.0490	0.9621	0.7984	0.3663	2.1794	0.0609
ZENAZIO	-0.4365	0.1837	-2.3766	0.0448	-0.4775	0.5920	-0.8067	0.4432	0.1625	0.5334	0.3046	0.7684	-0.0150	0.4322	-0.0347	0.9732	-0.0400	0.5383	-0.0744	0.9425	0.7065	0.3643	1.9394	0.0884
ALSTARS	#N/A	#N/A	#N/A	#N/A	0.2152	1.2481	0.1724	0.8674	0.5275	0.4556	1.1578	0.2803	0.5464	0.4361	1.2530	0.2456	-0.9162	0.5682	-1.6123	0.1456	0.2352	0.2371	0.9919	0.3503
ACITAA2	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	-0.6269	2.1943	-0.2857	0.7937	0.8659	0.1128	7.6759	0.0001
SAIGALI	-0.1195	0.1505	-0.7944	0.4499	-0.1829	0.2042	-0.8956	0.3966	-0.1307	0.2511	-0.5204	0.6169	-0.1783	0.1789	-0.9967	0.3481	-0.4045	0.4407	-0.9179	0.3855	0.7736	0.1130	6.8478	0.0001

Coeff in percentage. Green colour for statistical significance at 5% level; yellow colour for statistical significance at 10% level

Table D.10 - Mutual funds ranked based on 1-year Fama-French alphas, S3

Year	2007	Year	2008	Year	2009	Year	2010	Year	2011	Year	2012
SYAZSCI	#N/A	SYAZSCI	#N/A	ACITAA2	#N/A	ACITAA2	#N/A	GEPIAZA	0.0600	ACITAA2	0.8659
DUCGITY	#N/A	ACITAA2	#N/A	COMSMCP	0.6178	ALSTARS	0.5464	ZENAZII	0.0264	SAIGALI	0.7736
ZENAZII	#N/A	ZENAZII	2.3694	SYAZSCI	0.5770	COMSMCP	0.4071	MEDRICR	-0.0213	ZENAZII	0.7984
ALSTARS	#N/A	ALSTARS	0.2152	GSEAFND	0.5425	DUCGITY	0.2535	ZENAZIO	-0.0400	MEDRICR	0.7562
ACITAA2	#N/A	DUCGITY	0.1139	ALSTARS	0.5275	SYAZSCI	0.2371	DUCGITY	-0.0511	ZENAZIO	0.7065
DUCAZIT	0.2361	GSEAFND	-0.0111	MEDRICR	0.4514	FIDIMIT	0.2183	DUCAZIT	-0.1641	GSEAFND	0.5813
FIDIMIT	-0.0111	MEDRICR	-0.0729	FIDIMIT	0.3785	INVAZIO	0.1759	BIMAZI	-0.2282	BPBAZIT	0.4723
GEPIAZA	-0.0289	FIDIMIT	-0.1140	INVAZIO	0.3349	BNAZITL	0.1599	FIDIMIT	-0.2399	SYAZSCI	0.4660
BPBAZIT	-0.0338	GEPIAZA	-0.1223	DUCGITY	0.2148	DUCAZIT	0.1433	BPBAZIT	-0.2568	DUCGITY	0.4448
ARCAZIT	-0.0456	BNAZITL	-0.1816	ZENAZII	0.2143	GESITAL	0.1360	ARCAZIT	-0.2836	FIDIMIT	0.4178
BIMAZI	-0.0490	SAIGALI	-0.1829	BIMAZI	0.1853	MEDRICR	0.1320	BNAZITL	-0.3729	ARCAZIT	0.3246
BNAZITL	-0.0933	BIMAZI	-0.2062	ZENAZIO	0.1625	ARCAZIT	0.1204	SAIGALI	-0.4045	DUCAZIT	0.3207
SAIGALI	-0.1195	ARCAZIT	-0.2569	GESITAL	0.1569	ZENAZII	0.0522	INVAZIO	-0.5713	GESITAL	0.2468
GESITAL	-0.1289	GESITAL	-0.2949	BNAZITL	0.1336	GEPIAZA	-0.0078	ACITAA2	-0.6269	ALSTARS	0.2352
INVAZIO	-0.2658	DUCAZIT	-0.3408	DUCAZIT	0.1295	BIMAZI	-0.0104	GESITAL	-0.6577	GEPIAZA	0.2107
MEDRICR	-0.3462	BPBAZIT	-0.3511	ARCAZIT	0.0528	ZENAZIO	-0.0150	ALSTARS	-0.9162	BIMAZI	0.1941
GSEAFND	-0.3547	COMSMCP	-0.3717	BPBAZIT	0.0191	BPBAZIT	-0.0605	GSEAFND	-0.9309	BNAZITL	0.1172
COMSMCP	-0.3733	ZENAZIO	-0.4775	GEPIAZA	-0.0248	GSEAFND	-0.0948	SYAZSCI	-0.9678	COMSMCP	0.0124
ZENAZIO	-0.4365	INVAZIO	-0.6285	SAIGALI	-0.1307	SAIGALI	-0.1783	COMSMCP	-1.3048	INVAZIO	-0.2126
median	-0.1064		-0.1829		0.1998		0.1340		-0.2702		0.4178

All values in percentages. Green colour for above (or equal to) median values; red colour for below median values

Table D.11 - 1-year Carhart alpha, S3

	alpha07				alpha08				alpha09				alpha10				alpha11				alpha12			
	coeff	std error	tstat	prob	coeff	std error	tstat	prob	coeff	std error	tstat	prob	coeff	std error	tstat	prob	coeff	std error	tstat	prob	coeff	std error	tstat	prob
SYAZSCI	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	1.2784	0.6237	2.0498	0.1097	-0.1843	0.4270	-0.4315	0.6790	-0.9042	0.2943	-3.0719	0.0180	0.3641	0.4751	0.7662	0.4686
BPBAZIT	-2.5206	2.0308	-1.2412	0.2545	-0.4854	0.4251	-1.1418	0.2911	0.1467	0.3040	0.4826	0.6441	-0.0903	0.1971	-0.4581	0.6608	-0.2488	0.2585	-0.9622	0.3680	0.4345	0.3741	1.1614	0.2836
COMSMCP	-0.6658	0.3123	-2.1315	0.0705	-0.3749	0.9955	-0.3766	0.7176	0.8049	0.4337	1.8559	0.1059	0.1795	0.4468	0.4016	0.6999	-1.2167	0.3379	-3.6007	0.0087	0.0425	0.7251	0.0585	0.9549
INVAZIO	-0.4134	0.2494	-1.6573	0.1414	-0.6132	0.4212	-1.4560	0.1887	0.6230	0.2638	2.3613	0.0502	-0.0635	0.2776	-0.2286	0.8257	-0.5616	0.5316	-1.0564	0.3259	-0.2288	0.1846	-1.2394	0.2551
GEPIAZA	-0.1054	0.1201	-0.8773	0.4094	-0.1457	0.2062	-0.7063	0.5028	0.2843	0.2230	1.2746	0.2431	-0.1709	0.0931	-1.8358	0.1090	0.0567	0.2759	0.2054	0.8431	0.2367	0.2057	1.1506	0.2877
FIDIMIT	-0.1535	0.1117	-1.3751	0.2115	-0.1162	0.2900	-0.4007	0.7006	0.5713	0.0987	5.7896	0.0007	0.0426	0.1681	0.2536	0.8071	-0.2292	0.3727	-0.6150	0.5580	0.4765	0.2023	2.3556	0.0507
DUCGITY	#N/A	#N/A	#N/A	#N/A	-0.0413	1.2782	-0.0323	0.9751	0.3798	0.2121	1.7907	0.1165	0.0619	0.0979	0.6323	0.5473	-0.0443	0.2763	-0.1602	0.8773	0.4647	0.2159	2.1528	0.0683
GESITAL	-0.2608	0.1305	-1.9985	0.0858	-0.2949	0.1632	-1.8077	0.1136	0.4426	0.2745	1.6122	0.1509	-0.0798	0.1415	-0.5637	0.5906	-0.6574	0.3014	-2.1812	0.0655	0.2423	0.1981	1.2232	0.2608
DUCAZIT	0.1129	0.1732	0.6519	0.5353	-0.3213	0.3922	-0.8192	0.4397	0.3048	0.2054	1.4838	0.1814	-0.0462	0.0988	-0.4672	0.6545	-0.1571	0.2746	-0.5720	0.5852	0.3405	0.2159	1.5770	0.1588
ARCAZIT	-0.1138	0.1154	-0.9859	0.3570	-0.2311	0.1397	-1.6543	0.1420	0.2971	0.1655	1.7946	0.1158	-0.0058	0.1245	-0.0468	0.9640	-0.2775	0.2252	-1.2322	0.2577	0.3398	0.2026	1.6777	0.1373
MEDRICR	-0.4938	0.2386	-2.0697	0.0772	-0.0815	0.3990	-0.2043	0.8439	0.7117	0.3020	2.3564	0.0506	-0.3074	0.0851	-3.6111	0.0086	-0.0346	0.4390	-0.0789	0.9393	0.7125	0.4468	1.5948	0.1548
BNAZITL	-0.1925	0.1380	-1.3948	0.2057	-0.1913	0.3214	-0.5952	0.5704	2.4436	4.6710	0.5232	0.6170	0.0017	0.1358	0.0126	0.9903	-0.3728	0.2833	-1.3161	0.2296	0.1445	0.1453	0.9939	0.3534
BIMAZI	-0.2559	0.2299	-1.1128	0.3025	-0.2638	0.4276	-0.6170	0.5568	0.2999	0.1990	1.5073	0.1755	-0.3357	0.3809	-0.8813	0.4074	-0.2238	0.1838	-1.2177	0.2628	0.1715	0.2361	0.7264	0.4912
GSEAFND	-0.4163	0.3572	-1.1655	0.2820	-0.0473	0.5302	-0.0892	0.9314	0.7334	0.3123	2.3485	0.0512	-0.4171	0.1333	-3.1294	0.0166	-0.9104	0.6216	-1.4644	0.1865	0.4817	0.3150	1.5292	0.1701
ZENAZII	#N/A	#N/A	#N/A	#N/A	1.4529	3.1374	0.4631	0.7239	0.5564	0.5185	1.0730	0.3189	-0.2582	0.4515	-0.5718	0.5853	0.0123	0.5697	0.0216	0.9834	0.8439	0.3952	2.1353	0.0701
ZENAZIO	-0.5015	0.1988	-2.5228	0.0397	-0.5716	0.6016	-0.9501	0.3737	0.5100	0.5249	0.9717	0.3636	-0.3270	0.4511	-0.7250	0.4920	-0.0535	0.5696	-0.0939	0.9278	0.7532	0.3926	1.9187	0.0965
ALSTARS	#N/A	#N/A	#N/A	#N/A	0.0250	1.2753	0.0196	0.9849	0.7693	0.4776	1.6109	0.1512	0.1366	0.4003	0.3413	0.7429	-0.8567	0.4671	-1.8342	0.1093	0.2539	0.2585	0.9822	0.3587
ACITAA2	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	-2.6471	5.2380	-0.5054	0.6635	0.8715	0.1235	7.0540	0.0002
SAIGALI	-0.2006	0.1495	-1.3414	0.2217	-0.1111	0.1424	-0.7803	0.4608	0.1289	0.1550	0.8315	0.4331	-0.2625	0.2035	-1.2902	0.2380	-0.3668	0.4020	-0.9125	0.3918	0.7794	0.1237	6.3008	0.0004

Coeff in percentage. Green colour for statistical significance at 5% level; yellow colour for statistical significance at 10% level

Table D.12 - Mutual funds ranked based on 1-year Carhart alphas, S3

Year	2007	Year	2008	Year	2009	Year	2010	Year	2011	Year	2012
SYAZSCI	#N/A	SYAZSCI	#N/A	ACITAA2	#N/A	ACITAA2	#N/A	GEPIAZA	0.0567	ACITAA2	0.8715
DUCGITY	#N/A	ACITAA2	#N/A	BNAZITL	2.4436	COMSMCP	0.1795	ZENAZII	0.0123	ZENAZII	0.8439
ZENAZII	#N/A	ZENAZII	1.4529	SYAZSCI	1.2784	ALSTARS	0.1366	MEDRICR	-0.0346	SAIGALI	0.7794
ALSTARS	#N/A	ALSTARS	0.0250	COMSMCP	0.8049	DUCGITY	0.0619	DUCGITY	-0.0443	ZENAZIO	0.7532
ACITAA2	#N/A	DUCGITY	-0.0413	ALSTARS	0.7693	FIDIMIT	0.0426	ZENAZIO	-0.0535	MEDRICR	0.7125
DUCAZIT	0.1129	GSEAFND	-0.0473	GSEAFND	0.7334	BNAZITL	0.0017	DUCAZIT	-0.1571	GSEAFND	0.4817
GEPIAZA	-0.1054	MEDRICR	-0.0815	MEDRICR	0.7117	ARCAZIT	-0.0058	BIMAZI	-0.2238	FIDIMIT	0.4765
ARCAZIT	-0.1138	SAIGALI	-0.1111	INVAZIO	0.6230	DUCAZIT	-0.0462	FIDIMIT	-0.2292	DUCGITY	0.4647
FIDIMIT	-0.1535	FIDIMIT	-0.1162	FIDIMIT	0.5713	INVAZIO	-0.0635	BPBAZIT	-0.2488	BPBAZIT	0.4345
BNAZITL	-0.1925	GEPIAZA	-0.1457	ZENAZII	0.5564	GESITAL	-0.0798	ARCAZIT	-0.2775	SYAZSCI	0.3641
SAIGALI	-0.2006	BNAZITL	-0.1913	ZENAZIO	0.5100	BPBAZIT	-0.0903	SAIGALI	-0.3668	DUCAZIT	0.3405
BIMAZI	-0.2559	ARCAZIT	-0.2311	GESITAL	0.4426	GEPIAZA	-0.1709	BNAZITL	-0.3728	ARCAZIT	0.3398
GESITAL	-0.2608	BIMAZI	-0.2638	DUCGITY	0.3798	SYAZSCI	-0.1843	INVAZIO	-0.5616	ALSTARS	0.2539
INVAZIO	-0.4134	GESITAL	-0.2949	DUCAZIT	0.3048	ZENAZII	-0.2582	GESITAL	-0.6574	GESITAL	0.2423
GSEAFND	-0.4163	DUCAZIT	-0.3213	BIMAZI	0.2999	SAIGALI	-0.2625	ALSTARS	-0.8567	GEPIAZA	0.2367
MEDRICR	-0.4938	COMSMCP	-0.3749	ARCAZIT	0.2971	MEDRICR	-0.3074	SYAZSCI	-0.9042	BIMAZI	0.1715
ZENAZIO	-0.5015	BPBAZIT	-0.4854	GEPIAZA	0.2843	ZENAZIO	-0.3270	GSEAFND	-0.9104	BNAZITL	0.1445
COMSMCP	-0.6658	ZENAZIO	-0.5716	BPBAZIT	0.1467	BIMAZI	-0.3357	COMSMCP	-1.2167	COMSMCP	0.0425
BPBAZIT	-2.5206	INVAZIO	-0.6132	SAIGALI	0.1289	GSEAFND	-0.4171	ACITAA2	-2.6471	INVAZIO	-0.2288
median	-0.2559		-0.1913		0.5100		-0.0850		-0.2775		0.3641

All values in percentages. Green colour for above (or equal to) median values; red colour for below median values

Appendix E – Long Term Performance Persistence

Table E.1 - Mutual funds ranked based on 2-year raw returns, S1

Year	2006-2007		2008-2009
AREREII	#N/A	AREREII	#N/A
SYAZSCI	#N/A	SYAZSCI	#N/A
AREREIP	#N/A	AREREIP	#N/A
ANITPMI	#N/A	ANITPMI	#N/A
GNAZITC	#N/A	GNAZITC	#N/A
GESFEAC	#N/A	GESFEAC	#N/A
DUCGITY	#N/A	MEDFITI	#N/A
MEDFITI	#N/A	SYSELIT	#N/A
SYSELIT	#N/A	ZENAZII	#N/A
ZENAZII	#N/A	ACITAA2	#N/A
ALSTARS	#N/A	AITALQ2	#N/A
ACITAA2	#N/A	ALSTARS	-13.8435
AITALQ2	#N/A	DUCGITY	-18.5399
DUCAZIT	13.0269	MEDRICR	-23.3265
FIDIMIT	11.9248	GSEAFND	-24.9194
BNAZITL	11.0313	FIDIMIT	-25.5152
GEPIAZA	10.4641	ARCAZIT	-26.8988
ARCAZIT	9.6737	GEPIAZA	-27.0296
GESITAL	9.4856	DUCAZIT	-27.1010
BPBAZIT	8.7704	BIMAZI	-27.4786
BIMAZI	8.7431	GESITAL	-27.6546
SAIGALI	6.8526	COMSMCP	-28.1050
INVAZIO	6.0908	BNAZITL	-28.8676
GSEAFND	5.9941	BPBAZIT	-29.1923
MEDRICR	5.4345	INVAZIO	-29.5854
ZENAZIO	3.4035	SAIGALI	-30.2177
COMSMCP	-3.8903	ZENAZIO	-33.9623
median	8.7568		-27.2898

	2007-2008		2009-2010
AREREII	#N/A	AREREII	#N/A
SYAZSCI	#N/A	SYAZSCI	#N/A
AREREIP	#N/A	AREREIP	#N/A
ANITPMI	#N/A	ANITPMI	#N/A
GNAZITC	#N/A	GNAZITC	#N/A
GESFEAC	#N/A	GESFEAC	#N/A
DUCGITY	#N/A	MEDFITI	#N/A
MEDFITI	#N/A	SYSELIT	#N/A
SYSELIT	#N/A	ACITAA2	#N/A
ZENAZII	#N/A	AITALQ2	#N/A
ALSTARS	#N/A	FIDIMIT	26.2603
ACITAA2	#N/A	COMSMCP	26.1992
AITALQ2	#N/A	ALSTARS	24.7306
DUCAZIT	-41.4508	MEDRICR	23.0923
GEPIAZA	-41.7843	ZENAZII	22.2587
ARCAZIT	-42.5948	DUCGITY	22.2134
BNAZITL	-43.4141	ZENAZIO	20.5815
BIMAZI	-43.7512	GESITAL	19.5343
MEDRICR	-43.8158	INVAZIO	19.4922
SAIGALI	-44.5374	DUCAZIT	19.4330
GESITAL	-44.8317	BPBAZIT	19.2931
FIDIMIT	-44.8377	GSEAFND	18.3433
GSEAFND	-45.7380	ARCAZIT	17.6962
BPBAZIT	-45.7451	BNAZITL	17.1667
INVAZIO	-46.8498	GEPIAZA	14.9495
COMSMCP	-49.1293	BIMAZI	14.0142
ZENAZIO	-51.4286	SAIGALI	10.4928
	-44.6845		19.4922

	2008-2009		2010-2011
AREREII	#N/A	AREREII	#N/A
SYAZSCI	#N/A	AREREIP	#N/A
AREREIP	#N/A	ANITPMI	#N/A
ANITPMI	#N/A	GNAZITC	#N/A
GNAZITC	#N/A	GESFEAC	#N/A
GESFEAC	#N/A	MEDFITI	#N/A
MEDFITI	#N/A	SYSELIT	#N/A
SYSELIT	#N/A	ACITAA2	#N/A
ZENAZII	#N/A	AITALQ2	#N/A
ACITAA2	#N/A	ZENAZII	-18.2677
AITALQ2	#N/A	DUCGITY	-18.9812
ALSTARS	-13.8435	ALSTARS	-19.2050
DUCGITY	-18.5399	ZENAZIO	-19.6191
MEDRICR	-23.3265	MEDRICR	-19.7780
GSEAFND	-24.9194	GEPIAZA	-20.5933
FIDIMIT	-25.5152	DUCAZIT	-21.1501
ARCAZIT	-26.8988	FIDIMIT	-21.6249
GEPIAZA	-27.0296	ARCAZIT	-23.1478
DUCAZIT	-27.1010	BPBAZIT	-23.2286
BIMAZI	-27.4786	INVAZIO	-24.1432
GESITAL	-27.6546	BNAZITL	-24.1494
COMSMCP	-28.1050	SYAZSCI	-24.4366
BNAZITL	-28.8676	BIMAZI	-24.7164
BPBAZIT	-29.1923	COMSMCP	-25.3572
INVAZIO	-29.5854	GESITAL	-26.1742
SAIGALI	-30.2177	GSEAFND	-28.8714
ZENAZIO	-33.9623	SAIGALI	-33.7946
	-27.2898		-23.1882

	2009-2010		2011-2012
AREREII	#N/A	AREREII	#N/A
SYAZSCI	#N/A	AREREIP	#N/A
AREREIP	#N/A	ANITPMI	#N/A
ANITPMI	#N/A	GNAZITC	#N/A
GNAZITC	#N/A	GESFEAC	#N/A
GESFEAC	#N/A	MEDFITI	#N/A
MEDFITI	#N/A	SYSELIT	#N/A
SYSELIT	#N/A	ACITAA2	#N/A
ACITAA2	#N/A	AITALQ2	#N/A
AITALQ2	#N/A	MEDRICR	-2.3785
FIDIMIT	26.2603	ZENAZII	-2.7971
COMSMCP	26.1992	ZENAZIO	-4.5837
ALSTARS	24.7306	DUCGITY	-4.7358
MEDRICR	23.0923	GEPIAZA	-4.8137
ZENAZII	22.2587	BPBAZIT	-6.4609
DUCGITY	22.2134	FIDIMIT	-7.4257
ZENAZIO	20.5815	DUCAZIT	-7.4588
GESITAL	19.5343	ARCAZIT	-8.1965
INVAZIO	19.4922	BIMAZI	-9.2966
DUCAZIT	19.4330	GSEAFND	-10.4518
BPBAZIT	19.2931	ALSTARS	-10.6492
GSEAFND	18.3433	BNAZITL	-12.1154
ARCAZIT	17.6962	GESITAL	-13.0199
BNAZITL	17.1667	INVAZIO	-14.2222
GEPIAZA	14.9495	SYAZSCI	-16.4649
BIMAZI	14.0142	SAIGALI	-17.8883
SAIGALI	10.4928	COMSMCP	-22.3195
	19.4922		-8.7466

All values in percentages. Green colour for above (or equal to) median values; red colour for below median values

Table E.1 - Mutual funds ranked based on 2-year raw returns, S1

	2010-2011		2012-2013			2011-2012		2013-2014			2012-2013		2014-2015
AREREII	#N/A	AREREII	#N/A		AREREII	#N/A	AREREII	#N/A		AREREII	#N/A	AREREII	#N/A
AREREIP	#N/A	AREREIP	#N/A		AREREIP	#N/A	AREREIP	#N/A		AREREIP	#N/A	ANITPMI	#N/A
ANITPMI	#N/A	ANITPMI	#N/A		ANITPMI	#N/A	ANITPMI	#N/A		ANITPMI	#N/A	MEDFITI	#N/A
GNAZITC	#N/A	GNAZITC	#N/A		GNAZITC	#N/A	GNAZITC	#N/A		GNAZITC	#N/A	GSEAFND	#N/A
GESFEAC	#N/A	GESFEAC	#N/A		GESFEAC	#N/A	GESFEAC	#N/A		GESFEAC	#N/A	GESFEAC	34.6884
MEDFITI	#N/A	MEDFITI	#N/A		MEDFITI	#N/A	MEDFITI	#N/A		MEDFITI	#N/A	BNAZITL	31.1201
SYSELIT	#N/A	SYSELIT	#N/A		SYSELIT	#N/A	SYSELIT	#N/A		SYSELIT	#N/A	SYAZSCI	30.0091
ACITAA2	#N/A	AITALQ2	#N/A		ACITAA2	#N/A	AITALQ2	#N/A		AITALQ2	#N/A	AREREIP	29.0513
AITALQ2	#N/A	ZENAZII	57.1575		AITALQ2	#N/A	COMSMCI	45.1747		ZENAZII	57.1575	INVAZIO	28.7295
ZENAZII	-18.2677	SYAZSCI	56.9495		MEDRICR	-2.3785	SYAZSCI	41.7428		SYAZSCI	56.9495	ZENAZIO	25.0686
DUCGITY	-18.9812	COMSMCP	56.7429		ZENAZII	-2.7971	FIDIMIT	41.2710		COMSMCP	56.7429	GNAZITC	25.0450
ALSTARS	-19.2050	ZENAZIO	54.4889		ZENAZIO	-4.5837	ACITAA2	38.0240		ZENAZIO	54.4889	SYSELIT	24.5875
ZENAZIO	-19.6191	FIDIMIT	53.9312		DUCGITY	-4.7358	SAIGALI	35.7644		FIDIMIT	53.9312	COMSMCP	23.1385
MEDRICR	-19.7780	ACITAA2	52.5123		GEPIAZA	-4.8137	DUCGITY	32.7809		ACITAA2	52.5123	ZENAZII	22.5122
GEPIAZA	-20.5933	SAIGALI	49.9662		BPBAZIT	-6.4609	DUCAZIT	28.8651		SAIGALI	49.9662	ACITAA2	21.3823
DUCAZIT	-21.1501	MEDRICR	47.9014		FIDIMIT	-7.4257	GESITAL	28.2461		MEDRICR	47.9014	DUCGITY	21.2152
FIDIMIT	-21.6249	BIMAZI	47.2825		DUCAZIT	-7.4588	GEPIAZA	27.7001		BIMAZI	47.2825	FIDIMIT	21.1547
ARCAZIT	-23.1478	DUCGITY	46.2834		ARCAZIT	-8.1965	BPBAZIT	26.9030		DUCGITY	46.2834	MEDRICR	20.3729
BPBAZIT	-23.2286	GEPIAZA	43.5521		BIMAZI	-9.2966	BIMAZI	26.8395		GEPIAZA	43.5521	ALSTARS	19.4799
INVAZIO	-24.1432	BPBAZIT	42.9820		GSEAFND	-10.4518	ARCAZIT	26.2147		BPBAZIT	42.9820	AITALQ2	16.4735
BNAZITL	-24.1494	ARCAZIT	42.3114		ALSTARS	-10.6492	ZENAZII	26.1825		ARCAZIT	42.3114	BPBAZIT	12.5544
SYAZSCI	-24.4366	DUCAZIT	41.9639		BNAZITL	-12.1154	ALSTARS	25.2222		DUCAZIT	41.9639	BIMAZI	12.4226
BIMAZI	-24.7164	GESITAL	41.3903		GESITAL	-13.0199	BNAZITL	24.8203		GESITAL	41.3903	DUCAZIT	11.5959
COMSMCP	-25.3572	ALSTARS	40.1303		INVAZIO	-14.2222	ZENAZIO	23.9392		ALSTARS	40.1303	GEPIAZA	11.2287
GESITAL	-26.1742	BNAZITL	37.9333		SYAZSCI	-16.4649	MEDRICR	21.8474		BNAZITL	37.9333	GESITAL	10.0384
GSEAFND	-28.8714	GSEAFND	35.4490		SAIGALI	-17.8883	INVAZIO	17.2402		GSEAFND	35.4490	SAIGALI	9.2497
SAIGALI	-33.7946	INVAZIO	33.0396		COMSMCP	-22.3195	GSEAFND	16.7421		INVAZIO	33.0396	ARCAZIT	7.2481
median	-23.1882		46.2834			-8.7466		26.9030			46.2834		21.2152

All values in percentages. Green colour for above (or equal to) median values; red colour for below median values

Table E.2 - Mutual funds ranked based on 2-year raw returns, S2 and S3

Year	2007-2008		2009-2010			2008-2009		2010-2011			2009-2010		2011-2012
SYAZSCI	#N/A	SYAZSCI	#N/A		SYAZSCI	#N/A	ACITAA2	#N/A		SYAZSCI	#N/A	ACITAA2	#N/A
DUCGITY	#N/A	ACITAA2	#N/A		ZENAZII	#N/A	ZENAZII	-18.2677		BPBAZIT	-18.2677	MEDRICR	-2.3785
ZENAZII	#N/A	FIDIMIT	26.2603		ACITAA2	#N/A	DUCGITY	-18.9812		COMSMCP	-18.9812	ZENAZII	-2.7971
ALSTARS	#N/A	COMSMCP	26.1992		ALSTARS	-13.8435	ALSTARS	-19.2050		INVAZIO	-19.2050	ZENAZIO	-4.5837
ACITAA2	#N/A	ALSTARS	24.7306		DUCGITY	-18.5399	ZENAZIO	-19.6191		GEPIAZA	-19.6191	DUCGITY	-4.7358
DUCAZIT	-41.4508	MEDRICR	23.0923		MEDRICR	-23.3265	MEDRICR	-19.7780		FIDIMIT	-19.7780	GEPIAZA	-4.8137
GEPIAZA	-41.7843	ZENAZII	22.2587		GSEAFND	-24.9194	GEPIAZA	-20.5933		DUCGITY	-20.5933	BPBAZIT	-6.4609
ARCAZIT	-42.5948	DUCGITY	22.2134		FIDIMIT	-25.5152	DUCAZIT	-21.1501		GESITAL	-21.1501	FIDIMIT	-7.4257
BNAZITL	-43.4141	ZENAZIO	20.5815		ARCAZIT	-26.8988	FIDIMIT	-21.6249		DUCAZIT	-21.6249	DUCAZIT	-7.4588
BIMAZI	-43.7512	GESITAL	19.5343		GEPIAZA	-27.0296	ARCAZIT	-23.1478		ARCAZIT	-23.1478	ARCAZIT	-8.1965
MEDRICR	-43.8158	INVAZIO	19.4922		DUCAZIT	-27.1010	BPBAZIT	-23.2286		MEDRICR	-23.2286	BIMAZI	-9.2966
SAIGALI	-44.5374	DUCAZIT	19.4330		BIMAZI	-27.4786	INVAZIO	-24.1432		BNAZITL	-24.1432	GSEAFND	-10.4518
GESITAL	-44.8317	BPBAZIT	19.2931		GESITAL	-27.6546	BNAZITL	-24.1494		BIMAZI	-24.1494	ALSTARS	-10.6492
FIDIMIT	-44.8377	GSEAFND	18.3433		COMSMCP	-28.1050	SYAZSCI	-24.4366		GSEAFND	-24.4366	BNAZITL	-12.1154
GSEAFND	-45.7380	ARCAZIT	17.6962		BNAZITL	-28.8676	BIMAZI	-24.7164		ZENAZII	-24.7164	GESITAL	-13.0199
BPBAZIT	-45.7451	BNAZITL	17.1667		BPBAZIT	-29.1923	COMSMCP	-25.3572		ZENAZIO	-25.3572	INVAZIO	-14.2222
INVAZIO	-46.8498	GEPIAZA	14.9495		INVAZIO	-29.5854	GESITAL	-26.1742		ALSTARS	-26.1742	SYAZSCI	-16.4649
COMSMCP	-49.1293	BIMAZI	14.0142		SAIGALI	-30.2177	GSEAFND	-28.8714		ACITAA2	-28.8714	SAIGALI	-17.8883
ZENAZIO	-51.4286	SAIGALI	10.4928		ZENAZIO	-33.9623	SAIGALI	-33.7946		SAIGALI	-33.7946	COMSMCP	-22.3195
median	-44.6845		19.4922			-27.2898		-23.1882			-23.1882		-8.7466

All values in percentages. Green colour for above (or equal to) median values; red colour for below median values

Table E.3 - 2-year Single-index alpha, S1

	alpha 06-07				alpha 07-08				alpha 08-09				alpha 09-10				alpha 10-11			
	coeff	std error	tstat	prob	coeff	std error	tstat	prob	coeff	std error	tstat	prob	coeff	std error	tstat	prob	coeff	std error	tstat	prob
AREREII	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A
SYAZSCI	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	-0.7286	0.5459	-1.3348	0.1977	-1.0498	0.4599	-2.2829	0.0325
AREREIP	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A
BPBAZIT	-0.5900	1.7796	-0.3316	0.7434	-0.7972	1.7754	-0.4490	0.6578	-0.4298	0.2797	-1.5366	0.1386	0.1171	0.1766	0.6631	0.5141	-0.4828	0.1973	-2.4472	0.0228
COMSMCP	-0.4727	0.6521	-0.7249	0.4761	-1.0344	0.8765	-1.1801	0.2506	-0.8146	0.6370	-1.2788	0.2143	0.2743	0.3169	0.8657	0.3960	-0.9664	0.5165	-1.8709	0.0747
ANITPMI	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A
GNAZITC	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A
INVAZIO	-0.4231	0.2812	-1.5044	0.1467	-1.0130	0.3774	-2.6842	0.0135	-0.7470	0.3664	-2.0386	0.0537	0.0986	0.2192	0.4500	0.6571	-0.2721	0.2448	-1.1114	0.2784
GEPIAZA	-0.3154	0.2024	-1.5584	0.1334	-0.7781	0.2215	-3.5125	0.0020	-0.5820	0.2176	-2.6744	0.0139	-0.0577	0.1320	-0.4371	0.6663	-0.1557	0.1718	-0.9063	0.3746
FIDIMIT	0.0012	0.2605	0.0047	0.9963	-0.4552	0.2934	-1.5514	0.1351	-0.1512	0.2672	-0.5660	0.5771	0.3680	0.1528	2.4084	0.0248	-0.1657	0.2042	-0.8115	0.4258
GESFEAC	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A
DUCGITY	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	-0.2620	0.4511	-0.5808	0.5673	0.1937	0.1169	1.6574	0.1116	-0.0916	0.2062	-0.4443	0.6612
GESITAL	-0.2263	0.2635	-0.8589	0.3997	-0.8178	0.2355	-3.4727	0.0022	-0.5026	0.2485	-2.0226	0.0554	0.1155	0.1511	0.7645	0.4527	-0.3864	0.2100	-1.8401	0.0793
DUCAZIT	-0.3232	0.2854	-1.1327	0.2695	-0.6065	0.2998	-2.0227	0.0554	-0.5350	0.2639	-2.0268	0.0550	0.0974	0.1169	0.8330	0.4138	-0.2046	0.2069	-0.9891	0.3334
MEDFITI	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A
ARCAZIT	-0.4344	0.1459	-2.9779	0.0069	-0.8037	0.2024	-3.9717	0.0006	-0.5184	0.2095	-2.4741	0.0215	0.0476	0.1033	0.4610	0.6494	-0.2390	0.1613	-1.4823	0.1525
MEDRICR	-0.3214	0.3037	-1.0584	0.3013	-0.8868	0.3903	-2.2724	0.0332	-0.3964	0.3259	-1.2163	0.2368	0.2043	0.1889	1.0814	0.2913	-0.3261	0.3249	-1.0037	0.3264
BNAZITL	-0.3433	0.2244	-1.5301	0.1402	-0.5750	0.2864	-2.0075	0.0571	0.0560	2.7179	0.0206	0.9837	0.6227	2.5216	0.2470	0.8072	-0.1989	0.2017	-0.9859	0.3349
SYSELIT	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A
BIMAZI	-0.4221	0.3389	-1.2455	0.2260	-0.8312	0.3867	-2.1495	0.0428	-0.6327	0.2690	-2.3522	0.0280	-0.0988	0.2395	-0.4124	0.6840	-0.3667	0.2576	-1.4237	0.1686
GSEAFND	0.2931	0.4544	0.6450	0.5256	-0.6536	0.4493	-1.4547	0.1599	-0.5239	0.3830	-1.3679	0.1852	0.0476	0.2354	0.2023	0.8415	-0.6088	0.3664	-1.6616	0.1108
ZENAZII	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	-0.1079	0.6012	-0.1794	0.8599	0.2119	0.3474	0.6099	0.5482	-0.2335	0.3957	-0.5902	0.5611
ZENAZIO	-0.3635	0.3253	-1.1175	0.2758	-0.5132	0.4685	-1.0954	0.2852	-0.6612	0.4594	-1.4393	0.1641	0.1545	0.3492	0.4425	0.6625	-0.3006	0.3956	-0.7597	0.4555
ALSTARS	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	-0.7682	0.5732	-1.3402	0.1939	0.1882	0.3324	0.5663	0.5770	-0.7842	0.4627	-1.6949	0.1042
ACITAA2	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A
AITALQ2	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A
SAIGALI	-0.3866	0.2428	-1.5922	0.1256	-0.7767	0.2716	-2.8592	0.0091	-0.7588	0.2409	-3.1498	0.0047	-0.2274	0.1465	-1.5527	0.1348	-0.9030	0.4402	-2.0516	0.0523

Coeff in percentage. Green colour for statistical significance at 5% level; yellow colour for statistical significance at 10% level

Table E.3 - 2-year Single-index alpha, S1

	alpha 11-12				alpha 12-13				alpha 13-14				alpha 14-15			
	coeff	std error	tstat	prob	coeff	std error	tstat	prob	coeff	std error	tstat	prob	coeff	std error	tstat	prob
AREREII	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A
SYAZSCI	-1.1552	0.4762	-2.4259	0.0239	0.8349	0.4591	1.8184	0.0826	0.7522	0.5049	1.4900	0.1504	0.4241	0.5628	0.7537	0.4590
AREREIP	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A
BPBAZIT	-0.2292	0.2424	-0.9455	0.3547	0.3655	0.2164	1.6893	0.1053	0.2449	0.2015	1.2154	0.2371	0.2382	0.2387	0.9978	0.3292
COMSMCP	-1.2701	0.5484	-2.3162	0.0303	0.7952	0.5609	1.4176	0.1703	0.8469	0.5857	1.4460	0.1623	0.5649	0.5725	0.9868	0.3345
ANITPMI	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A
GNAZITC	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A
INVAZIO	-0.3911	0.2174	-1.7992	0.0857	-0.0226	0.1575	-0.1435	0.8872	-0.1734	0.2231	-0.7772	0.4453	-0.0439	0.2723	-0.1611	0.8735
GEPIAZA	0.0349	0.1823	0.1915	0.8499	0.3163	0.1653	1.9136	0.0688	0.1966	0.1687	1.1657	0.2562	0.1445	0.1629	0.8871	0.3846
FIDIMIT	-0.0965	0.2097	-0.4600	0.6501	0.6051	0.1926	3.1420	0.0047	0.6081	0.2712	2.2426	0.0353	0.3915	0.1611	2.4302	0.0237
GESFEAC	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	0.2985	0.1750	1.7052	0.1036	0.1824	0.1300	1.4029	0.1746
DUCGITY	0.0272	0.2044	0.1328	0.8955	0.3954	0.1635	2.4189	0.0243	0.3571	0.1288	2.7736	0.0111	0.2435	0.1296	1.8793	0.0735
GESITAL	-0.3718	0.1904	-1.9531	0.0636	0.2653	0.1401	1.8946	0.0714	0.2198	0.1300	1.6900	0.1052	0.1140	0.1295	0.8802	0.3882
DUCAZIT	-0.0946	0.2040	-0.4635	0.6475	0.2695	0.1636	1.6467	0.1138	0.2319	0.1290	1.7970	0.0861	0.1183	0.1293	0.9148	0.3702
MEDFITI	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	-0.2729	0.2163	-1.2618	0.2202
ARCAZIT	-0.1171	0.1678	-0.6976	0.4928	0.2759	0.1288	2.1414	0.0436	0.1357	0.1043	1.3007	0.2068	0.0745	0.1108	0.6721	0.5085
MEDRICR	-0.0509	0.3515	-0.1447	0.8862	0.4956	0.2722	1.8207	0.0823	0.0363	0.2418	0.1501	0.8820	-0.1273	0.1791	-0.7107	0.4847
BNAZITL	-0.3339	0.1839	-1.8157	0.0831	0.1584	0.1461	1.0840	0.2901	0.0858	0.1537	0.5581	0.5824	0.0890	0.1393	0.6386	0.5296
SYSELIT	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	-0.2389	0.2136	-1.1188	0.2753
BIMAZI	-0.1871	0.2002	-0.9343	0.3603	0.4399	0.2819	1.5602	0.1330	0.1918	0.2507	0.7648	0.4525	-0.1930	0.1920	-1.0051	0.3258
GSEAFND	-0.3158	0.3856	-0.8188	0.4217	0.1145	0.2705	0.4233	0.6762	-0.0722	0.3492	-0.2067	0.8381	-0.0859	0.2396	-0.3583	0.7235
ZENAZII	-0.2806	0.3358	-0.8358	0.4122	0.7978	0.3497	2.2817	0.0325	0.1998	0.4323	0.4621	0.6485	-0.2528	0.3419	-0.7395	0.4674
ZENAZIO	-0.3589	0.3346	-1.0726	0.2951	0.7255	0.3517	2.0628	0.0511	0.1250	0.4354	0.2871	0.7767	-0.3103	0.3457	-0.8975	0.3792
ALSTARS	-0.5116	0.4087	-1.2519	0.2237	0.1984	0.1465	1.3538	0.1895	0.0773	0.1269	0.6088	0.5489	-0.0017	0.1414	-0.0120	0.9906
ACITAA2	0.0674	0.6877	0.0980	0.9231	0.4945	0.3973	1.2445	0.2264	0.4205	0.4275	0.9836	0.3360	0.3289	0.4274	0.7696	0.4497
AITALQ2	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A
SAIGALI	-0.3215	0.5339	-0.6021	0.5533	0.4240	0.4000	1.0599	0.3007	0.3521	0.4307	0.8175	0.4224	0.2508	0.4279	0.5860	0.5638

Coeff in percentage. Green colour for statistical significance at 5% level; yellow colour for statistical significance at 10% level

Table E.4 - Mutual funds ranked based on 2-year single-index alphas, S1

Year	2006-2007		2008-2009		2007-2008		2009-2010		2008-2009		2010-2011		2009-2010		2011-2012
AREREII	#N/A	AREREII	#N/A	AREREII	#N/A	AREREII	#N/A	AREREII	#N/A	AREREII	#N/A	AREREII	#N/A	AREREII	#N/A
SYAZSCI	#N/A	SYAZSCI	#N/A	SYAZSCI	#N/A	AREREIP	#N/A	SYAZSCI	#N/A	AREREIP	#N/A	AREREIP	#N/A	AREREIP	#N/A
AREREIP	#N/A	AREREIP	#N/A	AREREIP	#N/A	ANITPMI	#N/A	AREREIP	#N/A	ANITPMI	#N/A	ANITPMI	#N/A	ANITPMI	#N/A
ANITPMI	#N/A	ANITPMI	#N/A	ANITPMI	#N/A	GNAZITC	#N/A	ANITPMI	#N/A	GNAZITC	#N/A	GNAZITC	#N/A	GNAZITC	#N/A
GNAZITC	#N/A	GNAZITC	#N/A	GNAZITC	#N/A	GESFEAC	#N/A	GNAZITC	#N/A	GESFEAC	#N/A	GESFEAC	#N/A	GESFEAC	#N/A
GESFEAC	#N/A	GESFEAC	#N/A	GESFEAC	#N/A	MEDFITI	#N/A	GESFEAC	#N/A	MEDFITI	#N/A	MEDFITI	#N/A	MEDFITI	#N/A
DUCGITY	#N/A	MEDFITI	#N/A	DUCGITY	#N/A	SYSELIT	#N/A	MEDFITI	#N/A	SYSELIT	#N/A	SYSELIT	#N/A	SYSELIT	#N/A
MEDFITI	#N/A	SYSELIT	#N/A	MEDFITI	#N/A	ACITAA2	#N/A	SYSELIT	#N/A	ACITAA2	#N/A	ACITAA2	#N/A	AITALQ2	#N/A
SYSELIT	#N/A	ACITAA2	#N/A	SYSELIT	#N/A	AITALQ2	#N/A	ACITAA2	#N/A	AITALQ2	#N/A	AITALQ2	#N/A	ACITAA2	0.0674
ZENAZII	#N/A	AITALQ2	#N/A	ZENAZII	#N/A	BNAZITL	0.6227	AITALQ2	#N/A	DUCGITY	-0.0916	BNAZITL	0.6227	GEPIAZA	0.0349
ALSTARS	#N/A	BNAZITL	0.0560	ALSTARS	#N/A	FIDIMIT	0.3680	BNAZITL	0.0560	GEPIAZA	-0.1557	FIDIMIT	0.3680	DUCGITY	0.0272
ACITAA2	#N/A	ZENAZII	-0.1079	ACITAA2	#N/A	COMSMCP	0.2743	ZENAZII	-0.1079	FIDIMIT	-0.1657	COMSMCP	0.2743	MEDRICR	-0.0509
AITALQ2	#N/A	FIDIMIT	-0.1512	AITALQ2	#N/A	ZENAZII	0.2119	FIDIMIT	-0.1512	BNAZITL	-0.1989	ZENAZII	0.2119	DUCAZIT	-0.0946
GSEAFND	0.2931	DUCGITY	-0.2620	FIDIMIT	-0.4552	MEDRICR	0.2043	DUCGITY	-0.2620	DUCAZIT	-0.2046	MEDRICR	0.2043	FIDIMIT	-0.0965
FIDIMIT	0.0012	MEDRICR	-0.3964	ZENAZIO	-0.5132	DUCGITY	0.1937	MEDRICR	-0.3964	ZENAZII	-0.2335	DUCGITY	0.1937	ARCAZIT	-0.1171
GESITAL	-0.2263	BPBAZIT	-0.4298	BNAZITL	-0.5750	ALSTARS	0.1882	BPBAZIT	-0.4298	ARCAZIT	-0.2390	ALSTARS	0.1882	BIMAZI	-0.1871
GEPIAZA	-0.3154	GESITAL	-0.5026	DUCAZIT	-0.6065	ZENAZIO	0.1545	GESITAL	-0.5026	INVAZIO	-0.2721	ZENAZIO	0.1545	BPBAZIT	-0.2292
MEDRICR	-0.3214	ARCAZIT	-0.5184	GSEAFND	-0.6536	BPBAZIT	0.1171	ARCAZIT	-0.5184	ZENAZIO	-0.3006	BPBAZIT	0.1171	ZENAZII	-0.2806
DUCAZIT	-0.3232	GSEAFND	-0.5239	SAIGALI	-0.7767	GESITAL	0.1155	GSEAFND	-0.5239	MEDRICR	-0.3261	GESITAL	0.1155	GSEAFND	-0.3158
BNAZITL	-0.3433	DUCAZIT	-0.5350	GEPIAZA	-0.7781	INVAZIO	0.0986	DUCAZIT	-0.5350	BIMAZI	-0.3667	INVAZIO	0.0986	SAIGALI	-0.3215
ZENAZIO	-0.3635	GEPIAZA	-0.5820	BPBAZIT	-0.7972	DUCAZIT	0.0974	GEPIAZA	-0.5820	GESITAL	-0.3864	DUCAZIT	0.0974	BNAZITL	-0.3339
SAIGALI	-0.3866	BIMAZI	-0.6327	ARCAZIT	-0.8037	GSEAFND	0.0476	BIMAZI	-0.6327	BPBAZIT	-0.4828	GSEAFND	0.0476	ZENAZIO	-0.3589
BIMAZI	-0.4221	ZENAZIO	-0.6612	GESITAL	-0.8178	ARCAZIT	0.0476	ZENAZIO	-0.6612	GSEAFND	-0.6088	ARCAZIT	0.0476	GESITAL	-0.3718
INVAZIO	-0.4231	INVAZIO	-0.7470	BIMAZI	-0.8312	GEPIAZA	-0.0577	INVAZIO	-0.7470	ALSTARS	-0.7842	GEPIAZA	-0.0577	INVAZIO	-0.3911
ARCAZIT	-0.4344	SAIGALI	-0.7588	MEDRICR	-0.8868	BIMAZI	-0.0988	SAIGALI	-0.7588	SAIGALI	-0.9030	BIMAZI	-0.0988	ALSTARS	-0.5116
COMSMCP	-0.4727	ALSTARS	-0.7682	INVAZIO	-1.0130	SAIGALI	-0.2274	ALSTARS	-0.7682	COMSMCP	-0.9664	SAIGALI	-0.2274	SYAZSCI	-1.1552
BPBAZIT	-0.5900	COMSMCI	-0.8146	COMSMCP	-1.0344	SYAZSCI	-0.7286	COMSMCP	-0.8146	SYAZSCI	-1.0498	SYAZSCI	-0.7286	COMSMCP	-1.2701
median	-0.3534		-0.5239		-0.7876		0.1163		-0.5239		-0.3133		0.1163		-0.2806

All values in percentages. Green colour for above (or equal to) median values; red colour for below median values

Table E.4 - Mutual funds ranked based on 2-year single-index alphas, S1

	2010-2011		2012-2013		2011-2012		2013-2014		2012-2013		2014-2015
AREREII	#N/A	AREREII	#N/A	AREREII	#N/A	AREREII	#N/A	AREREII	#N/A	AREREII	#N/A
AREREIP	#N/A	AREREIP	#N/A	AREREIP	#N/A	AREREIP	#N/A	AREREIP	#N/A	AREREIP	#N/A
ANITPMI	#N/A	ANITPMI	#N/A	ANITPMI	#N/A	ANITPMI	#N/A	ANITPMI	#N/A	ANITPMI	#N/A
GNAZITC	#N/A	GNAZITC	#N/A	GNAZITC	#N/A	GNAZITC	#N/A	GNAZITC	#N/A	GNAZITC	#N/A
GESFEAC	#N/A	GESFEAC	#N/A	GESFEAC	#N/A	MEDFITI	#N/A	GESFEAC	#N/A	AITALQ2	#N/A
MEDFITI	#N/A	MEDFITI	#N/A	MEDFITI	#N/A	SYSELIT	#N/A	MEDFITI	#N/A	COMSMCP	0.5649
SYSELIT	#N/A	SYSELIT	#N/A	SYSELIT	#N/A	AITALQ2	#N/A	SYSELIT	#N/A	SYAZSCI	0.4241
ACITAA2	#N/A	AITALQ2	#N/A	AITALQ2	#N/A	COMSMCP	0.8469	AITALQ2	#N/A	FIDIMIT	0.3915
AITALQ2	#N/A	SYAZSCI	0.8349	ACITAA2	0.0674	SYAZSCI	0.7522	SYAZSCI	0.8349	ACITAA2	0.3289
DUCGITY	-0.0916	ZENAZII	0.7978	GEPIAZA	0.0349	FIDIMIT	0.6081	ZENAZII	0.7978	SAIGALI	0.2508
GEPIAZA	-0.1557	COMSMCP	0.7952	DUCGITY	0.0272	ACITAA2	0.4205	COMSMCP	0.7952	DUCGITY	0.2435
FIDIMIT	-0.1657	ZENAZIO	0.7255	MEDRICR	-0.0509	DUCGITY	0.3571	ZENAZIO	0.7255	BPBAZIT	0.2382
BNAZITL	-0.1989	FIDIMIT	0.6051	DUCAZIT	-0.0946	SAIGALI	0.3521	FIDIMIT	0.6051	GESFEAC	0.1824
DUCAZIT	-0.2046	MEDRICR	0.4956	FIDIMIT	-0.0965	GESFEAC	0.2985	MEDRICR	0.4956	GEPIAZA	0.1445
ZENAZII	-0.2335	ACITAA2	0.4945	ARCAZIT	-0.1171	BPBAZIT	0.2449	ACITAA2	0.4945	DUCAZIT	0.1183
ARCAZIT	-0.2390	BIMAZI	0.4399	BIMAZI	-0.1871	DUCAZIT	0.2319	BIMAZI	0.4399	GESITAL	0.1140
INVAZIO	-0.2721	SAIGALI	0.4240	BPBAZIT	-0.2292	GESITAL	0.2198	SAIGALI	0.4240	BNAZITL	0.0890
ZENAZIO	-0.3006	DUCGITY	0.3954	ZENAZII	-0.2806	ZENAZII	0.1998	DUCGITY	0.3954	ARCAZIT	0.0745
MEDRICR	-0.3261	BPBAZIT	0.3655	GSEAFND	-0.3158	GEPIAZA	0.1966	BPBAZIT	0.3655	ALSTARS	-0.0017
BIMAZI	-0.3667	GEPIAZA	0.3163	SAIGALI	-0.3215	BIMAZI	0.1918	GEPIAZA	0.3163	INVAZIO	-0.0439
GESITAL	-0.3864	ARCAZIT	0.2759	BNAZITL	-0.3339	ARCAZIT	0.1357	ARCAZIT	0.2759	GSEAFND	-0.0859
BPBAZIT	-0.4828	DUCAZIT	0.2695	ZENAZIO	-0.3589	ZENAZIO	0.1250	DUCAZIT	0.2695	MEDRICR	-0.1273
GSEAFND	-0.6088	GESITAL	0.2653	GESITAL	-0.3718	BNAZITL	0.0858	GESITAL	0.2653	BIMAZI	-0.1930
ALSTARS	-0.7842	ALSTARS	0.1984	INVAZIO	-0.3911	ALSTARS	0.0773	ALSTARS	0.1984	SYSELIT	-0.2389
SAIGALI	-0.9030	BNAZITL	0.1584	ALSTARS	-0.5116	MEDRICR	0.0363	BNAZITL	0.1584	ZENAZII	-0.2528
COMSMCP	-0.9664	GSEAFND	0.1145	SYAZSCI	-1.1552	GSEAFND	-0.0722	GSEAFND	0.1145	MEDFITI	-0.2729
SYAZSCI	-1.0498	INVAZIO	-0.0226	COMSMCP	-1.2701	INVAZIO	-0.1734	INVAZIO	-0.0226	ZENAZIO	-0.3103
median	-0.3133		0.3954		-0.2806		0.2098		0.3954		0.1015

Table E.5 - 2-year Single-index alpha, S2

	alpha 07-08				alpha 08-09				alpha 09-10				alpha 10-11				alpha 11-12			
	coeff	std error	tstat	prob	coeff	std error	tstat	prob	coeff	std error	tstat	prob	coeff	std error	tstat	prob	coeff	std error	tstat	prob
SYAZSCI	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	-0.7286	0.5459	-1.3348	0.1977	-1.0498	0.4599	-2.2829	0.0325	-1.1552	0.4762	-2.4259	0.0239
BPBAZIT	-0.7972	1.7754	-0.4490	0.6578	-0.4298	0.2797	-1.5366	0.1386	0.1171	0.1766	0.6631	0.5141	-0.4828	0.1973	-2.4472	0.0228	-0.2292	0.2424	-0.9455	0.3547
COMSMCP	-1.0344	0.8765	-1.1801	0.2506	-0.8146	0.6370	-1.2788	0.2143	0.2743	0.3169	0.8657	0.3960	-0.9664	0.5165	-1.8709	0.0747	-1.2701	0.5484	-2.3162	0.0303
INVAZIO	-1.0130	0.3774	-2.6842	0.0135	-0.7470	0.3664	-2.0386	0.0537	0.0986	0.2192	0.4500	0.6571	-0.2721	0.2448	-1.1114	0.2784	-0.3911	0.2174	-1.7992	0.0857
GEPIAZA	-0.7781	0.2215	-3.5125	0.0020	-0.5820	0.2176	-2.6744	0.0139	-0.0577	0.1320	-0.4371	0.6663	-0.1557	0.1718	-0.9063	0.3746	0.0349	0.1823	0.1915	0.8499
FIDIMIT	-0.4552	0.2934	-1.5514	0.1351	-0.1512	0.2672	-0.5660	0.5771	0.3680	0.1528	2.4084	0.0248	-0.1657	0.2042	-0.8115	0.4258	-0.0965	0.2097	-0.4600	0.6501
DUCGITY	#N/A	#N/A	#N/A	#N/A	-0.2620	0.4511	-0.5808	0.5673	0.1937	0.1169	1.6574	0.1116	-0.0916	0.2062	-0.4443	0.6612	0.0272	0.2044	0.1328	0.8955
GESITAL	-0.8178	0.2355	-3.4727	0.0022	-0.5026	0.2485	-2.0226	0.0554	0.1155	0.1511	0.7645	0.4527	-0.3864	0.2100	-1.8401	0.0793	-0.3718	0.1904	-1.9531	0.0636
DUCAZIT	-0.6065	0.2998	-2.0227	0.0554	-0.5350	0.2639	-2.0268	0.0550	0.0974	0.1169	0.8330	0.4138	-0.2046	0.2069	-0.9891	0.3334	-0.0946	0.2040	-0.4635	0.6475
ARCAZIT	-0.8037	0.2024	-3.9717	0.0006	-0.5184	0.2095	-2.4741	0.0215	0.0476	0.1033	0.4610	0.6494	-0.2390	0.1613	-1.4823	0.1525	-0.1171	0.1678	-0.6976	0.4928
MEDRICR	-0.8868	0.3903	-2.2724	0.0332	-0.3964	0.3259	-1.2163	0.2368	0.2043	0.1889	1.0814	0.2913	-0.3261	0.3249	-1.0037	0.3264	-0.0509	0.3515	-0.1447	0.8862
BNAZITL	-0.5750	0.2864	-2.0075	0.0571	0.0560	2.7179	0.0206	0.9837	0.6227	2.5216	0.2470	0.8072	-0.1989	0.2017	-0.9859	0.3349	-0.3339	0.1839	-1.8157	0.0831
BIMAZI	-0.8312	0.3867	-2.1495	0.0428	-0.6327	0.2690	-2.3522	0.0280	-0.0988	0.2395	-0.4124	0.6840	-0.3667	0.2576	-1.4237	0.1686	-0.1871	0.2002	-0.9343	0.3603
GSEAFND	-0.6536	0.4493	-1.4547	0.1599	-0.5239	0.3830	-1.3679	0.1852	0.0476	0.2354	0.2023	0.8415	-0.6088	0.3664	-1.6616	0.1108	-0.3158	0.3856	-0.8188	0.4217
ZENAZII	#N/A	#N/A	#N/A	#N/A	-0.1079	0.6012	-0.1794	0.8599	0.2119	0.3474	0.6099	0.5482	-0.2335	0.3957	-0.5902	0.5611	-0.2806	0.3358	-0.8358	0.4122
ZENAZIO	-0.5132	0.4685	-1.0954	0.2852	-0.6612	0.4594	-1.4393	0.1641	0.1545	0.3492	0.4425	0.6625	-0.3006	0.3956	-0.7597	0.4555	-0.3589	0.3346	-1.0726	0.2951
ALSTARS	#N/A	#N/A	#N/A	#N/A	-0.7682	0.5732	-1.3402	0.1939	0.1882	0.3324	0.5663	0.5770	-0.7842	0.4627	-1.6949	0.1042	-0.5116	0.4087	-1.2519	0.2237
ACITAA2	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	0.0674	0.6877	0.0980	0.9231
SAIGALI	-0.7767	0.2716	-2.8592	0.0091	-0.7588	0.2409	-3.1498	0.0047	-0.2274	0.1465	-1.5527	0.1348	-0.9030	0.4402	-2.0516	0.0523	-0.3215	0.5339	-0.6021	0.5533

Coeff in percentage. Green colour for statistical significance at 5% level; yellow colour for statistical significance at 10% level

Table E.6 - Mutual funds ranked based on 2-year single-index alphas, S2

Year	2007-2008		2009-2010		2008-2009		2010-2011		2009-2010		2011-2012
SYAZSCI	#N/A	ACITAA2	#N/A	SYAZSCI	#N/A	ACITAA2	#N/A	ACITAA2	#N/A	ACITAA2	0.0674
DUCGITY	#N/A	BNAZITL	0.6227	ACITAA2	#N/A	DUCGITY	-0.0916	BNAZITL	0.6227	GEPIAZA	0.0349
ZENAZII	#N/A	FIDIMIT	0.3680	BNAZITL	0.0560	GEPIAZA	-0.1557	FIDIMIT	0.3680	DUCGITY	0.0272
ALSTARS	#N/A	COMSMCP	0.2743	ZENAZII	-0.1079	FIDIMIT	-0.1657	COMSMCP	0.2743	MEDRICR	-0.0509
ACITAA2	#N/A	ZENAZII	0.2119	FIDIMIT	-0.1512	BNAZITL	-0.1989	ZENAZII	0.2119	DUCAZIT	-0.0946
FIDIMIT	-0.4552	MEDRICR	0.2043	DUCGITY	-0.2620	DUCAZIT	-0.2046	MEDRICR	0.2043	FIDIMIT	-0.0965
ZENAZIO	-0.5132	DUCGITY	0.1937	MEDRICR	-0.3964	ZENAZII	-0.2335	DUCGITY	0.1937	ARCAZIT	-0.1171
BNAZITL	-0.5750	ALSTARS	0.1882	BPBAZIT	-0.4298	ARCAZIT	-0.2390	ALSTARS	0.1882	BIMAZI	-0.1871
DUCAZIT	-0.6065	ZENAZIO	0.1545	GESITAL	-0.5026	INVAZIO	-0.2721	ZENAZIO	0.1545	BPBAZIT	-0.2292
GSEAFND	-0.6536	BPBAZIT	0.1171	ARCAZIT	-0.5184	ZENAZIO	-0.3006	BPBAZIT	0.1171	ZENAZII	-0.2806
SAIGALI	-0.7767	GESITAL	0.1155	GSEAFND	-0.5239	MEDRICR	-0.3261	GESITAL	0.1155	GSEAFND	-0.3158
GEPIAZA	-0.7781	INVAZIO	0.0986	DUCAZIT	-0.5350	BIMAZI	-0.3667	INVAZIO	0.0986	SAIGALI	-0.3215
BPBAZIT	-0.7972	DUCAZIT	0.0974	GEPIAZA	-0.5820	GESITAL	-0.3864	DUCAZIT	0.0974	BNAZITL	-0.3339
ARCAZIT	-0.8037	GSEAFND	0.0476	BIMAZI	-0.6327	BPBAZIT	-0.4828	GSEAFND	0.0476	ZENAZIO	-0.3589
GESITAL	-0.8178	ARCAZIT	0.0476	ZENAZIO	-0.6612	GSEAFND	-0.6088	ARCAZIT	0.0476	GESITAL	-0.3718
BIMAZI	-0.8312	GEPIAZA	-0.0577	INVAZIO	-0.7470	ALSTARS	-0.7842	GEPIAZA	-0.0577	INVAZIO	-0.3911
MEDRICR	-0.8868	BIMAZI	-0.0988	SAIGALI	-0.7588	SAIGALI	-0.9030	BIMAZI	-0.0988	ALSTARS	-0.5116
INVAZIO	-1.0130	SAIGALI	-0.2274	ALSTARS	-0.7682	COMSMCP	-0.9664	SAIGALI	-0.2274	SYAZSCI	-1.1552
COMSMCP	-1.0344	SYAZSCI	-0.7286	COMSMCP	-0.8146	SYAZSCI	-1.0498	SYAZSCI	-0.7286	COMSMCP	-1.2701
median	-0.7876		0.1163		-0.5239		-0.3133		0.1163		-0.2806

All values in percentages. Green colour for above (or equal to) median values; red colour for below median values

Table E.7 - 2-year Single-index alpha, S3

	alpha 07-08				alpha 08-09				alpha 09-10				alpha 10-11				alpha 11-12			
	coeff	std error	tstat	prob	coeff	std error	tstat	prob	coeff	std error	tstat	prob	coeff	std error	tstat	prob	coeff	std error	tstat	prob
SYAZSCI	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	-0.2573	0.5704	-0.4511	0.6570	-0.4735	0.3227	-1.4676	0.1564	-0.5174	0.3525	-1.4676	0.1564
BPBAZIT	-0.1715	1.2822	-0.1338	0.8948	-0.3496	0.2522	-1.3862	0.1796	0.0867	0.1672	0.5183	0.6094	-0.1191	0.1487	-0.8009	0.4317	0.1224	0.2059	0.5944	0.5583
COMSMCP	-0.3880	0.5382	-0.7211	0.4785	-0.4697	0.5145	-0.9130	0.3711	0.4378	0.2754	1.5899	0.1261	-0.4420	0.3823	-1.1563	0.2600	-0.7402	0.4346	-1.7034	0.1026
INVAZIO	-0.3719	0.1944	-1.9131	0.0688	-0.5158	0.3165	-1.6297	0.1174	0.1388	0.2943	0.4715	0.6420	-0.0118	0.2307	-0.0511	0.9597	-0.1498	0.2121	-0.7065	0.4873
GEPIAZA	-0.0847	0.0961	-0.8815	0.3876	-0.3568	0.1999	-1.7852	0.0880	-0.0420	0.1921	-0.2186	0.8290	0.1399	0.1286	1.0879	0.2884	0.2781	0.1375	2.0226	0.0554
FIDIMIT	-0.0476	0.1297	-0.3672	0.7170	-0.1051	0.1790	-0.5870	0.5632	0.3085	0.1368	2.2547	0.0344	0.1048	0.1627	0.6440	0.5263	0.1538	0.1656	0.9289	0.3630
DUCGITY	#N/A	#N/A	#N/A	#N/A	0.0461	0.4267	0.1080	0.9150	0.2161	0.1498	1.4426	0.1632	0.2086	0.1475	1.4141	0.1713	0.2757	0.1455	1.8948	0.0713
GESITAL	-0.2112	0.0956	-2.2098	0.0378	-0.3372	0.2064	-1.6340	0.1165	0.1105	0.1966	0.5620	0.5798	-0.1262	0.1647	-0.7660	0.4518	-0.1123	0.1614	-0.6958	0.4938
DUCAZIT	0.0118	0.1660	0.0712	0.9439	-0.3356	0.2086	-1.6087	0.1219	0.1195	0.1507	0.7932	0.4361	0.0960	0.1477	0.6499	0.5225	0.1548	0.1451	1.0669	0.2976
ARCAZIT	-0.1259	0.0759	-1.6601	0.1111	-0.3222	0.1710	-1.8845	0.0728	0.0467	0.1700	0.2748	0.7860	0.0279	0.1221	0.2284	0.8214	0.1241	0.1249	0.9937	0.3312
MEDRICR	-0.1936	0.1872	-1.0341	0.3123	-0.1600	0.2591	-0.6175	0.5432	0.2745	0.2118	1.2963	0.2083	0.0524	0.2585	0.2027	0.8412	0.3059	0.2857	1.0705	0.2960
BNAZITL	-0.0556	0.1359	-0.4093	0.6863	0.2220	2.5293	0.0878	0.9308	0.6041	2.5185	0.2399	0.8126	0.0348	0.1508	0.2308	0.8196	-0.0704	0.1560	-0.4514	0.6561
BIMAZI	-0.1692	0.2068	-0.8180	0.4221	-0.3871	0.2414	-1.6036	0.1231	-0.0656	0.2224	-0.2951	0.7707	-0.0722	0.1827	-0.3950	0.6966	0.0691	0.1306	0.5289	0.6022
GSEAFND	-0.1656	0.2745	-0.6031	0.5526	-0.2606	0.3146	-0.8283	0.4164	0.1053	0.2459	0.4282	0.6727	-0.3144	0.3059	-1.0281	0.3151	-0.0109	0.3315	-0.0328	0.9741
ZENAZII	#N/A	#N/A	#N/A	#N/A	-0.1256	0.5383	-0.2333	0.8185	0.2169	0.3363	0.6449	0.5256	0.1485	0.3475	0.4273	0.6733	0.2022	0.3008	0.6721	0.5085
ZENAZIO	-0.3670	0.2694	-1.3622	0.1869	-0.6058	0.3778	-1.6035	0.1231	0.1585	0.3379	0.4692	0.6436	0.0806	0.3474	0.2319	0.8187	0.1245	0.2997	0.4153	0.6819
ALSTARS	#N/A	#N/A	#N/A	#N/A	-0.0471	0.4941	-0.0953	0.9250	0.4682	0.3196	1.4653	0.1570	-0.1934	0.3639	-0.5313	0.6005	-0.0967	0.3517	-0.2750	0.7859
ACITAA2	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	0.1229	0.6107	0.2013	0.8428
SAIGALI	-0.1708	0.1116	-1.5299	0.1403	-0.5320	0.2116	-2.5138	0.0198	-0.2038	0.1824	-1.1172	0.2760	-0.6393	0.3086	-2.0719	0.0502	-0.2302	0.4606	-0.4998	0.6222

Coeff in percentage. Green colour for statistical significance at 5% level; yellow colour for statistical significance at 10% level

Table E.8 - Mutual funds ranked based on 2-year single-index alphas, S3

Year	2007-2008		2009-2010		2008-2009		2010-2011		2009-2010		2011-2012
SYAZSCI	#N/A	ACITAA2	#N/A	SYAZSCI	#N/A	ACITAA2	#N/A	ACITAA2	#N/A	MEDRICR	0.3059
DUCGITY	#N/A	BNAZITL	0.6041	ACITAA2	#N/A	DUCGITY	0.2086	BNAZITL	0.6041	GEPIAZA	0.2781
ZENAZII	#N/A	ALSTARS	0.4682	BNAZITL	0.2220	ZENAZII	0.1485	ALSTARS	0.4682	DUCGITY	0.2757
ALSTARS	#N/A	COMSMCP	0.4378	DUCGITY	0.0461	GEPIAZA	0.1399	COMSMCP	0.4378	ZENAZII	0.2022
ACITAA2	#N/A	FIDIMIT	0.3085	ALSTARS	-0.0471	FIDIMIT	0.1048	FIDIMIT	0.3085	DUCAZIT	0.1548
DUCAZIT	0.0118	MEDRICR	0.2745	FIDIMIT	-0.1051	DUCAZIT	0.0960	MEDRICR	0.2745	FIDIMIT	0.1538
FIDIMIT	-0.0476	ZENAZII	0.2169	ZENAZII	-0.1256	ZENAZIO	0.0806	ZENAZII	0.2169	ZENAZIO	0.1245
BNAZITL	-0.0556	DUCGITY	0.2161	MEDRICR	-0.1600	MEDRICR	0.0524	DUCGITY	0.2161	ARCAZIT	0.1241
GEPIAZA	-0.0847	ZENAZIO	0.1585	GSEAFND	-0.2606	BNAZITL	0.0348	ZENAZIO	0.1585	ACITAA2	0.1229
ARCAZIT	-0.1259	INVAZIO	0.1388	ARCAZIT	-0.3222	ARCAZIT	0.0279	INVAZIO	0.1388	BPBAZIT	0.1224
GSEAFND	-0.1656	DUCAZIT	0.1195	DUCAZIT	-0.3356	INVAZIO	-0.0118	DUCAZIT	0.1195	BIMAZI	0.0691
BIMAZI	-0.1692	GESITAL	0.1105	GESITAL	-0.3372	BIMAZI	-0.0722	GESITAL	0.1105	GSEAFND	-0.0109
SAIGALI	-0.1708	GSEAFND	0.1053	BPBAZIT	-0.3496	BPBAZIT	-0.1191	GSEAFND	0.1053	BNAZITL	-0.0704
BPBAZIT	-0.1715	BPBAZIT	0.0867	GEPIAZA	-0.3568	GESITAL	-0.1262	BPBAZIT	0.0867	ALSTARS	-0.0967
MEDRICR	-0.1936	ARCAZIT	0.0467	BIMAZI	-0.3871	ALSTARS	-0.1934	ARCAZIT	0.0467	GESITAL	-0.1123
GESITAL	-0.2112	GEPIAZA	-0.0420	COMSMCP	-0.4697	GSEAFND	-0.3144	GEPIAZA	-0.0420	INVAZIO	-0.1498
ZENAZIO	-0.3670	BIMAZI	-0.0656	INVAZIO	-0.5158	COMSMCP	-0.4420	BIMAZI	-0.0656	SAIGALI	-0.2302
INVAZIO	-0.3719	SAIGALI	-0.2038	SAIGALI	-0.5320	SYAZSCI	-0.4735	SAIGALI	-0.2038	SYAZSCI	-0.5174
COMSMCP	-0.3880	SYAZSCI	-0.2573	ZENAZIO	-0.6058	SAIGALI	-0.6393	SYAZSCI	-0.2573	COMSMCP	-0.7402
median	-0.1692		0.1292		-0.3289		0.0080		0.1292		0.1224

All values in percentages. Green colour for above (or equal to) median values; red colour for below median values

Table E.9 - 2-year Fama-French alpha, S3

	alpha 07-08				alpha 08-09				alpha 09-10				alpha 10-11				alpha 11-12			
	coeff	std error	tstat	prob	coeff	std error	tstat	prob	coeff	std error	tstat	prob	coeff	std error	tstat	prob	coeff	std error	tstat	prob
SYAZSCI	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	0.0527	0.5766	0.0914	0.9283	-0.2666	0.3240	-0.8227	0.4204	-0.1634	0.3177	-0.5143	0.6127
BPBAZIT	-0.0708	1.3065	-0.0542	0.9573	-0.3736	0.2438	-1.5324	0.1411	0.0076	0.1491	0.0513	0.9596	-0.1112	0.1738	-0.6401	0.5294	0.0842	0.2280	0.3690	0.7160
COMSMCP	-0.6306	0.4310	-1.4632	0.1590	-0.2105	0.4784	-0.4401	0.6646	0.3871	0.2781	1.3917	0.1793	-0.2985	0.3991	-0.7480	0.4632	-0.4086	0.4385	-0.9317	0.3626
INVAZIO	-0.3751	0.2018	-1.8589	0.0778	-0.4796	0.3367	-1.4243	0.1698	0.1111	0.2908	0.3819	0.7065	-0.1258	0.2633	-0.4777	0.6380	-0.2497	0.2300	-1.0853	0.2907
GEPIAZA	-0.1123	0.1020	-1.1013	0.2838	-0.3523	0.2156	-1.6344	0.1178	-0.0797	0.1932	-0.4127	0.6842	0.0135	0.1342	0.1005	0.9210	0.2124	0.1451	1.4635	0.1589
FIDIMIT	-0.0999	0.1333	-0.7492	0.4625	-0.0589	0.1878	-0.3137	0.7570	0.2730	0.1298	2.1039	0.0482	0.0439	0.1876	0.2341	0.8173	0.1810	0.1840	0.9832	0.3372
DUCGITY	#N/A	#N/A	#N/A	#N/A	-0.0147	0.4489	-0.0328	0.9742	0.1849	0.1454	1.2718	0.2180	0.1080	0.1605	0.6731	0.5086	0.2887	0.1508	1.9142	0.0700
GESITAL	-0.2368	0.0995	-2.3803	0.0274	-0.2970	0.2194	-1.3535	0.1910	0.0840	0.1999	0.4200	0.6789	-0.2027	0.1862	-1.0885	0.2893	-0.1658	0.1703	-0.9736	0.3419
DUCAZIT	0.0139	0.1804	0.0773	0.9392	-0.2885	0.2173	-1.3276	0.1993	0.0858	0.1445	0.5938	0.5593	-0.0038	0.1607	-0.0237	0.9813	0.1682	0.1499	1.1215	0.2753
ARCAZIT	-0.1196	0.0825	-1.4493	0.1627	-0.3059	0.1806	-1.6933	0.1059	0.0284	0.1618	0.1754	0.8626	-0.0519	0.1369	-0.3791	0.7086	0.0837	0.1358	0.6160	0.5448
MEDRICR	-0.2300	0.1913	-1.2024	0.2432	-0.1069	0.2747	-0.3891	0.7013	0.2430	0.2200	1.1045	0.2825	0.0574	0.2551	0.2248	0.8244	0.4295	0.2728	1.5745	0.1310
BNAZITL	-0.0524	0.1479	-0.3544	0.7267	0.8747	2.3999	0.3645	0.7193	-0.4532	2.4651	-0.1838	0.8560	-0.0794	0.1618	-0.4906	0.6290	-0.1782	0.1502	-1.1866	0.2493
BIMAZI	-0.2174	0.2198	-0.9891	0.3344	-0.2871	0.2314	-1.2411	0.2289	-0.0202	0.2329	-0.0869	0.9316	-0.1515	0.2076	-0.7300	0.4739	0.0729	0.1376	0.5302	0.6018
GSEAFND	-0.2151	0.2679	-0.8031	0.4313	-0.1062	0.3071	-0.3458	0.7331	0.1217	0.2620	0.4644	0.6474	-0.4150	0.3268	-1.2699	0.2187	0.0291	0.3498	0.0833	0.9345
ZENAZII	#N/A	#N/A	#N/A	#N/A	0.1240	0.5448	0.2276	0.8232	0.0900	0.3258	0.2763	0.7851	0.1123	0.3231	0.3474	0.7319	0.3750	0.2974	1.2608	0.2219
ZENAZIO	-0.4260	0.2548	-1.6720	0.1101	-0.4201	0.3690	-1.1385	0.2684	0.0308	0.3272	0.0941	0.9260	0.1123	0.3231	0.3474	0.7319	0.2922	0.2963	0.9861	0.3359
ALSTARS	#N/A	#N/A	#N/A	#N/A	0.0109	0.5298	0.0206	0.9837	0.3729	0.3143	1.1866	0.2493	0.0462	0.3233	0.1430	0.8878	0.0682	0.3814	0.1787	0.8600
ACITAA2	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	0.8466	0.4403	1.9226	0.0737
SAIGALI	-0.1936	0.1135	-1.7052	0.1036	-0.4844	0.2152	-2.2508	0.0358	-0.2244	0.1824	-1.2303	0.2328	-0.1984	0.2491	-0.7964	0.4352	0.4689	0.2763	1.6972	0.1052

Coeff in percentage. Green colour for statistical significance at 5% level; yellow colour for statistical significance at 10% level

Table E.10 - Mutual funds ranked based on 2-year Fama-French alphas, S3

Year	2007-2008		2009-2010		2008-2009		2010-2011		2009-2010		2011-2012
SYAZSCI	#N/A	ACITAA2	#N/A	SYAZSCI	#N/A	ACITAA2	#N/A	ACITAA2	#N/A	ACITAA2	0.8466
DUCGITY	#N/A	COMSMCP	0.3871	ACITAA2	#N/A	ZENAZII	0.1123	COMSMCP	0.3871	SAIGALI	0.4689
ZENAZII	#N/A	ALSTARS	0.3729	BNAZITL	0.8747	ZENAZIO	0.1123	ALSTARS	0.3729	MEDRICR	0.4295
ALSTARS	#N/A	FIDIMIT	0.2730	ZENAZII	0.1240	DUCGITY	0.1080	FIDIMIT	0.2730	ZENAZII	0.3750
ACITAA2	#N/A	MEDRICR	0.2430	ALSTARS	0.0109	MEDRICR	0.0574	MEDRICR	0.2430	ZENAZIO	0.2922
DUCAZIT	0.0139	DUCGITY	0.1849	DUCGITY	-0.0147	ALSTARS	0.0462	DUCGITY	0.1849	DUCGITY	0.2887
BNAZITL	-0.0524	GSEAFND	0.1217	FIDIMIT	-0.0589	FIDIMIT	0.0439	GSEAFND	0.1217	GEPIAZA	0.2124
BPBAZIT	-0.0708	INVAZIO	0.1111	GSEAFND	-0.1062	GEPIAZA	0.0135	INVAZIO	0.1111	FIDIMIT	0.1810
FIDIMIT	-0.0999	ZENAZII	0.0900	MEDRICR	-0.1069	DUCAZIT	-0.0038	ZENAZII	0.0900	DUCAZIT	0.1682
GEPIAZA	-0.1123	DUCAZIT	0.0858	COMSMCP	-0.2105	ARCAZIT	-0.0519	DUCAZIT	0.0858	BPBAZIT	0.0842
ARCAZIT	-0.1196	GESITAL	0.0840	BIMAZI	-0.2871	BNAZITL	-0.0794	GESITAL	0.0840	ARCAZIT	0.0837
SAIGALI	-0.1936	SYAZSCI	0.0527	DUCAZIT	-0.2885	BPBAZIT	-0.1112	SYAZSCI	0.0527	BIMAZI	0.0729
GSEAFND	-0.2151	ZENAZIO	0.0308	GESITAL	-0.2970	INVAZIO	-0.1258	ZENAZIO	0.0308	ALSTARS	0.0682
BIMAZI	-0.2174	ARCAZIT	0.0284	ARCAZIT	-0.3059	BIMAZI	-0.1515	ARCAZIT	0.0284	GSEAFND	0.0291
MEDRICR	-0.2300	BPBAZIT	0.0076	GEPIAZA	-0.3523	SAIGALI	-0.1984	BPBAZIT	0.0076	SYAZSCI	-0.1634
GESITAL	-0.2368	BIMAZI	-0.0202	BPBAZIT	-0.3736	GESITAL	-0.2027	BIMAZI	-0.0202	GESITAL	-0.1658
INVAZIO	-0.3751	GEPIAZA	-0.0797	ZENAZIO	-0.4201	SYAZSCI	-0.2666	GEPIAZA	-0.0797	BNAZITL	-0.1782
ZENAZIO	-0.4260	SAIGALI	-0.2244	INVAZIO	-0.4796	COMSMCP	-0.2985	SAIGALI	-0.2244	INVAZIO	-0.2497
COMSMCP	-0.6306	BNAZITL	-0.4532	SAIGALI	-0.4844	GSEAFND	-0.4150	BNAZITL	-0.4532	COMSMCP	-0.4086
median	-0.1566		0.0849		-0.2488		-0.0656		0.0849		0.0842

All values in percentages. Green colour for above (or equal to) median values; red colour for below median values

Table E.11- 2-year Carhart alpha, S3

	alpha 07-08				alpha 08-09				alpha 09-10				alpha 10-11				alpha 11-12			
	coeff	std error	tstat	prob	coeff	std error	tstat	prob	coeff	std error	tstat	prob	coeff	std error	tstat	prob	coeff	std error	tstat	prob
SYAZSCI	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	-0.0250	0.3605	-0.0695	0.9455	-0.5777	0.2520	-2.2925	0.0335	-0.1400	0.3328	-0.4206	0.6787
BPBAZIT	-0.0745	1.3195	-0.0564	0.9556	-0.4109	0.2718	-1.5115	0.1471	0.0162	0.1496	0.1082	0.9150	-0.1658	0.1819	-0.9113	0.3736	0.0603	0.2382	0.2529	0.8030
COMSMCP	-0.6310	0.4416	-1.4290	0.1692	0.0681	0.5105	0.1335	0.8952	0.4180	0.2594	1.6115	0.1236	-0.6000	0.3602	-1.6660	0.1121	-0.3867	0.4601	-0.8403	0.4112
INVAZIO	-0.3757	0.2028	-1.8531	0.0795	-0.1346	0.3200	-0.4206	0.6788	0.1679	0.2016	0.8328	0.4153	-0.2746	0.2585	-1.0621	0.3015	-0.2795	0.2396	-1.1667	0.2578
GEPIAZA	-0.1123	0.1046	-1.0733	0.2966	-0.1333	0.2055	-0.6487	0.5243	-0.0386	0.1177	-0.3275	0.7468	-0.0438	0.1372	-0.3191	0.7531	0.1927	0.1510	1.2764	0.2172
FIDIMIT	-0.1002	0.1353	-0.7405	0.4680	0.1108	0.1859	0.5963	0.5580	0.2965	0.0973	3.0482	0.0066	-0.0813	0.1768	-0.4600	0.6508	0.1886	0.1932	0.9764	0.3412
DUCGITY	#N/A	#N/A	#N/A	#N/A	-0.0754	0.5009	-0.1505	0.8820	0.2138	0.0984	2.1728	0.0427	-0.0061	0.1482	-0.0413	0.9675	0.2844	0.1584	1.7953	0.0885
GESITAL	-0.2371	0.1003	-2.3644	0.0289	-0.0651	0.2059	-0.3159	0.7555	0.1239	0.1348	0.9194	0.3694	-0.3387	0.1703	-1.9889	0.0613	-0.1623	0.1789	-0.9075	0.3755
DUCAZIT	0.0134	0.1816	0.0737	0.9420	-0.0815	0.2119	-0.3847	0.7048	0.1146	0.0976	1.1738	0.2550	-0.1178	0.1486	-0.7932	0.4375	0.1643	0.1575	1.0435	0.3098
ARCAZIT	-0.1201	0.0782	-1.5352	0.1412	-0.0721	0.1507	-0.4787	0.6376	0.0633	0.0960	0.6596	0.5174	-0.1489	0.1266	-1.1762	0.2541	0.0888	0.1426	0.6225	0.5410
MEDRICR	-0.2304	0.1945	-1.1847	0.2507	0.1389	0.2727	0.5093	0.6164	0.2787	0.1786	1.5611	0.1350	-0.1075	0.2428	-0.4427	0.6629	0.4241	0.2865	1.4803	0.1552
BNAZITL	-0.0523	0.1516	-0.3451	0.7338	1.5343	2.6574	0.5774	0.5705	-0.4301	2.5320	-0.1699	0.8669	-0.1757	0.1572	-1.1175	0.2777	-0.1283	0.1485	-0.8639	0.3984
BIMAZI	-0.2169	0.2229	-0.9731	0.3427	-0.1814	0.2515	-0.7213	0.4795	0.0161	0.1933	0.0834	0.9344	-0.2594	0.2069	-1.2533	0.2253	0.0394	0.1401	0.2815	0.7814
GSEAFND	-0.2154	0.2743	-0.7854	0.4419	0.0865	0.3252	0.2661	0.7931	0.1648	0.2109	0.7814	0.4442	-0.6473	0.3019	-2.1440	0.0452	0.0527	0.3667	0.1438	0.8872
ZENAZII	#N/A	#N/A	#N/A	#N/A	0.9253	0.6248	1.4809	0.1625	0.1386	0.2766	0.5010	0.6221	0.0184	0.3396	0.0541	0.9574	0.4350	0.3059	1.4222	0.1712
ZENAZIO	-0.4248	0.2492	-1.7051	0.1045	-0.2283	0.3977	-0.5742	0.5726	0.0793	0.2785	0.2847	0.7790	-0.0498	0.3394	-0.1468	0.8848	0.3531	0.3045	1.1595	0.2606
ALSTARS	#N/A	#N/A	#N/A	#N/A	0.0069	0.5926	0.0117	0.9908	0.4159	0.2766	1.5035	0.1491	-0.3975	0.3229	-1.2312	0.2333	0.0358	0.3992	0.0898	0.9294
ACITAA2	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	0.6372	0.4756	1.3399	0.2016
SAIGALI	-0.1947	0.0925	-2.1051	0.0488	-0.1659	0.1559	-1.0639	0.3007	-0.1884	0.1246	-1.5114	0.1471	-0.3666	0.2340	-1.5669	0.1337	0.4095	0.2833	1.4457	0.1645

Coeff in percentage. Green colour for statistical significance at 5% level; yellow colour for statistical significance at 10% level

Table E.12 - Mutual funds ranked based on 1-year Carhart alphas, S3

Year	2007-2008		2009-2010			2008-2009		2010-2011			2009-2010		2011-2012
SYAZSCI	#N/A	ACITAA2	#N/A		SYAZSCI	#N/A	ACITAA2	#N/A		ACITAA2	#N/A	ACITAA2	0.6372
DUCGITY	#N/A	COMSMCP	0.4180		ACITAA2	#N/A	ZENAZII	0.0184		COMSMCP	0.4180	ZENAZII	0.4350
ZENAZII	#N/A	ALSTARS	0.4159		BNAZITL	1.5343	DUCGITY	-0.0061		ALSTARS	0.4159	MEDRICR	0.4241
ALSTARS	#N/A	FIDIMIT	0.2965		ZENAZII	0.9253	GEPIAZA	-0.0438		FIDIMIT	0.2965	SAIGALI	0.4095
ACITAA2	#N/A	MEDRICR	0.2787		MEDRICR	0.1389	ZENAZIO	-0.0498		MEDRICR	0.2787	ZENAZIO	0.3531
DUCAZIT	0.0134	DUCGITY	0.2138		FIDIMIT	0.1108	FIDIMIT	-0.0813		DUCGITY	0.2138	DUCGITY	0.2844
BNAZITL	-0.0523	INVAZIO	0.1679		GSEAFND	0.0865	MEDRICR	-0.1075		INVAZIO	0.1679	GEPIAZA	0.1927
BPBAZIT	-0.0745	GSEAFND	0.1648		COMSMCP	0.0681	DUCAZIT	-0.1178		GSEAFND	0.1648	FIDIMIT	0.1886
FIDIMIT	-0.1002	ZENAZII	0.1386		ALSTARS	0.0069	ARCAZIT	-0.1489		ZENAZII	0.1386	DUCAZIT	0.1643
GEPIAZA	-0.1123	GESITAL	0.1239		GESITAL	-0.0651	BPBAZIT	-0.1658		GESITAL	0.1239	ARCAZIT	0.0888
ARCAZIT	-0.1201	DUCAZIT	0.1146		ARCAZIT	-0.0721	BNAZITL	-0.1757		DUCAZIT	0.1146	BPBAZIT	0.0603
SAIGALI	-0.1947	ZENAZIO	0.0793		DUCGITY	-0.0754	BIMAZI	-0.2594		ZENAZIO	0.0793	GSEAFND	0.0527
GSEAFND	-0.2154	ARCAZIT	0.0633		DUCAZIT	-0.0815	INVAZIO	-0.2746		ARCAZIT	0.0633	BIMAZI	0.0394
BIMAZI	-0.2169	BPBAZIT	0.0162		GEPIAZA	-0.1333	GESITAL	-0.3387		BPBAZIT	0.0162	ALSTARS	0.0358
MEDRICR	-0.2304	BIMAZI	0.0161		INVAZIO	-0.1346	SAIGALI	-0.3666		BIMAZI	0.0161	BNAZITL	-0.1283
GESITAL	-0.2371	SYAZSCI	-0.0250		SAIGALI	-0.1659	ALSTARS	-0.3975		SYAZSCI	-0.0250	SYAZSCI	-0.1400
INVAZIO	-0.3757	GEPIAZA	-0.0386		BIMAZI	-0.1814	COMSMCP	-0.6000		GEPIAZA	-0.0386	GESITAL	-0.1623
ZENAZIO	-0.4248	SAIGALI	-0.1884		ZENAZIO	-0.2283	SYAZSCI	-0.5777		SAIGALI	-0.1884	INVAZIO	-0.2795
COMSMCP	-0.6310	BNAZITL	-0.4301		BPBAZIT	-0.4109	GSEAFND	-0.6473		BNAZITL	-0.4301	COMSMCP	-0.3867
median	-0.2051		0.1192			-0.0686		-0.1707			0.1192		0.0888

All values in percentages. Green colour for above (or equal to) median values; red colour for below median values

Appendix F – R code, False Discoveries Simulation

H_0: α=0. Significance level: γ=0.05.

```
set.seed(77) # set the seed for reproducible results

sims<-1000 # number of funds

n<-100 # number of observations (time steps) for each fund

alpha.1<-numeric(sims) # empty vector for storing the

# simulated intercepts for each fund

B.1<-numeric(sims) # empty vector for storing the

# simulated slopes for each fund

pv<-numeric(sims) # empty vector for storing fund pvalues

tstat<-numeric(sims) # empty vector for storing fund pvalues

a<-0 # true value for the intercept

b<-rnorm(1,0.796300556,0.153067769) # true value for the slope,
drawn from a normal

# distribution with mean and sd equal to the sample mean and sample
sd

Y<-matrix(0,n,sims) # empty vector for storing the dependent
variable (fund returns)

X<-rnorm(n,-1.532663333,6.576151565) # create a sample of n
observations on the

# variable X (excess market returns)

for (i in 1:sims) {

  for (t in 1:n){

  Y[t,i]<-a+b*X[t]+rnorm(1,0,1)} # the true DGP, with N(0,1) error

  model<-lm(Y[,i]~X) # Estimate OLS Model

  alpha.1[i]<-model$coef[1] # Put the estimate for the intercept in
the vector

  B.1[i]<-model$coef[2] # Put the estimate for the slope in the
vector B.1

  pv[i]<-summary(model)$coef[1,4]

  tstat[i]<-summary(model)$coef[1,3]

}

# par(mfrow = c(1, 2))

# hist(alpha.1)

# hist(B.1)

# pstat.alpha
```

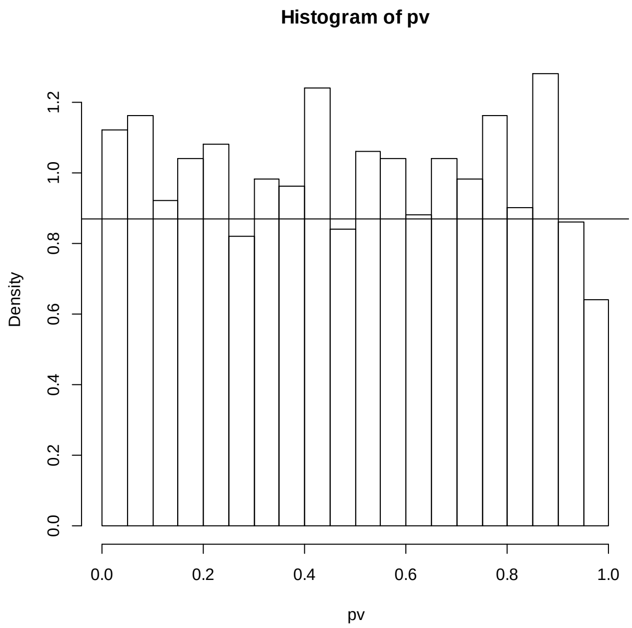
```
sign<-(sum(pv<0.05)) # no. sign funds

library(fdrtool)

pi0<-pval.estimate.eta0(pv, method=c("smoother", "bootstrap",
"conservative", "adaptive", "quantile"),

                           lambda=seq(0,0.9,0.05),
diagnostic.plot=TRUE, q=0.1)

# pop proportion of null funds

hist(pv,breaks=seq(0,1,0.05),freq=FALSE)

abline(h=pi0)

nplus<-sum(tstat>1.984) # no. sign positive funds

nminus<-sign-nplus # no. sign negative funds

false<-pi0*sims*(0.05/2) # no. false discoveries

skilled<-nplus-false # no. skilled funds

unskilled<-nminus-false # no. unskilled

pplus<-nplus/sims

pminus<-nminus/sims

pfalse<-false/sims

pskilled<-skilled/sims

punskilled<-unskilled/sims
```

H_0: α=0. Significance level: γ=0.1.

```
set.seed(77) # set the seed for reproducible results

sims<-1000 # number of funds

n<-100 # number of observations (time steps) for each fund

alpha.1<-numeric(sims) # empty vector for storing the

# simulated intercepts for each fund

B.1<-numeric(sims) # empty vector for storing the

# simulated slopes for each fund

pv<-numeric(sims) # empty vector for storing fund pvalues

tstat<-numeric(sims) # empty vector for storing fund pvalues

a<-0 # true value for the intercept

b<-rnorm(1,0.796300556,0.153067769) # true value for the slope,
drawn from a normal

# distribution with mean and sd equal to the sample mean and sample
sd
```

```
Y<-matrix(0,n,sims) # empty vector for storing the dependent
variable (fund returns)

X<-rnorm(n,-1.532663333,6.576151565) # create a sample of n
observations on the

# variable X (excess market returns)

for (i in 1:sims) {

  for (t in 1:n){

  Y[t,i]<-a+b*X[t]+rnorm(1,0,1)} # the true DGP, with N(0,1) error

  model<-lm(Y[,i]~X) # Estimate OLS Model

  alpha.1[i]<-model$coef[1] # Put the estimate for the intercept in
the vector

  B.1[i]<-model$coef[2] # Put the estimate for the slope in the
vector B.1

  pv[i]<-summary(model)$coef[1,4]

  tstat[i]<-summary(model)$coef[1,3]

}

# par(mfrow = c(1, 2))

# hist(alpha.1)

# hist(B.1)

# pstat.alpha

sign<-(sum(pv<0.1)) # no. sign funds

library(fdrtool)

pi0<-pval.estimate.eta0(pv, method=c("smoother", "bootstrap",
"conservative", "adaptive", "quantile"),

                           lambda=seq(0,0.9,0.05),
diagnostic.plot=TRUE, q=0.1)

# pop proportion of null funds

hist(pv,breaks=seq(0,1,0.05),freq=FALSE)

abline(h=pi0)

nplus<-sum(tstat>1.661) # no. sign positive funds

nminus<-sign-nplus # no. sign negative funds

false<-pi0*sims*(0.1/2) # no. false discoveries

skilled<-nplus-false # no. skilled funds

unskilled<-nminus-false # no. unskilled

pplus<-nplus/sims

pminus<-nminus/sims

pfalse<-false/sims
```

```
pskilled<-skilled/sims

punskilled<-unskilled/sims
```



H_1: 5% of the alphas are different from zero; 95% of the alphas are equal to zero. Significance level: γ=0.05.

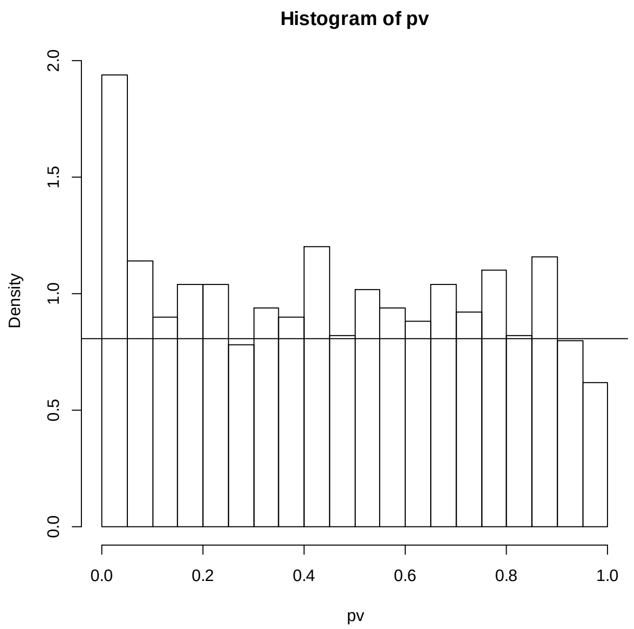
```
set.seed(77) # set the seed for reproducible results

sims<-1000 # number of funds

n<-100 # number of observations (time steps) for each fund

alpha.1<-numeric(sims) # empty vector for storing the

# simulated intercepts for each fund

B.1<-numeric(sims) # empty vector for storing the

# simulated slopes for each fund

pv<-numeric(sims) # empty vector for storing fund pvalues

tstat<-numeric(sims) # empty vector for storing fund pvalues

a<-numeric(sims) # true value for the intercept

a[1:50]<-0.3

b<-rnorm(1,0.796300556,0.153067769) # true value for the slope,
drawn from a normal

# distribution with mean and sd equal to the sample mean and sample
sd

Y<-matrix(0,n,sims) # empty vector for storing the dependent
variable (fund returns)

X<-rnorm(n,-1.532663333,6.576151565) # create a sample of n
observations on the

# variable X (excess market returns)
```

```
for (i in 1:sims) {
  for (t in 1:n){
  Y[t,i]<-a[i]+b*X[t]+rnorm(1,0,1)} # the true DGP, with N(0,1)
error
  model<-lm(Y[,i]~X) # Estimate OLS Model
  alpha.1[i]<-model$coef[1] # Put the estimate for the intercept in
the vector
  B.1[i]<-model$coef[2] # Put the estimate for the slope in the
vector B.1
  pv[i]<-summary(model)$coef[1,4]
  tstat[i]<-summary(model)$coef[1,3]
}
# par(mfrow = c(1, 2))
# hist(alpha.1)
# hist(B.1)
# pstat.alpha
sign<-(sum(pv<0.05)) # no. sign funds
library(fdrtool)
pi0<-pval.estimate.eta0(pv, method=c("smoother", "bootstrap",
"conservative", "adaptive", "quantile"),
                           lambda=seq(0,0.9,0.05),
diagnostic.plot=TRUE, q=0.1)
# pop proportion of null funds
hist(pv,breaks=seq(0,1,0.05),freq=FALSE)
abline(h=pi0)
nplus<-sum(tstat>1.984) # no. sign positive funds
nminus<-sign-nplus # no. sign negative funds
false<-pi0*sims*(0.05/2) # no. false discoveries
skilled<-nplus-false # no. skilled funds
unskilled<-nminus-false # no. unskilled
pplus<-nplus/sims
pminus<-nminus/sims
pfalse<-false/sims
pskilled<-skilled/sims
punskilled<-unskilled/sims
```

H_1: 5% of the alphas are different from zero; 95% of the alphas are equal to zero. Significance level: γ=0.1.

```
set.seed(77) # set the seed for reproducible results

sims<-1000 # number of funds

n<-100 # number of observations (time steps) for each fund

alpha.1<-numeric(sims) # empty vector for storing the

# simulated intercepts for each fund

B.1<-numeric(sims) # empty vector for storing the

# simulated slopes for each fund

pv<-numeric(sims) # empty vector for storing fund pvalues

tstat<-numeric(sims) # empty vector for storing fund pvalues

a<-numeric(sims) # true value for the intercept

a[1:50]<-0.3

b<-rnorm(1,0.796300556,0.153067769) # true value for the slope,
drawn from a normal

# distribution with mean and sd equal to the sample mean and sample
sd

Y<-matrix(0,n,sims) # empty vector for storing the dependent
variable (fund returns)

X<-rnorm(n,-1.532663333,6.576151565) # create a sample of n
observations on the

# variable X (excess market returns)

for (i in 1:sims) {

  for (t in 1:n){

  Y[t,i]<-a[i]+b*X[t]+rnorm(1,0,1)} # the true DGP, with N(0,1)
error

  model<-lm(Y[,i]~X) # Estimate OLS Model

  alpha.1[i]<-model$coef[1] # Put the estimate for the intercept in
the vector

  B.1[i]<-model$coef[2] # Put the estimate for the slope in the
vector B.1

  pv[i]<-summary(model)$coef[1,4]

  tstat[i]<-summary(model)$coef[1,3]

}

# par(mfrow = c(1, 2))

# hist(alpha.1)

# hist(B.1)

# pstat.alpha
```

```
sign<-(sum(pv<0.1)) # no. sign funds

library(fdrtool)

pi0<-pval.estimate.eta0(pv, method=c("smoother", "bootstrap",
"conservative", "adaptive", "quantile"),

                           lambda=seq(0,0.9,0.05),
diagnostic.plot=TRUE, q=0.1)

# pop proportion of null funds

hist(pv,breaks=seq(0,1,0.05),freq=FALSE)

abline(h=pi0)

nplus<-sum(tstat>1.661) # no. sign positive funds

nminus<-sign-nplus # no. sign negative funds

false<-pi0*sims*(0.1/2) # no. false discoveries

skilled<-nplus-false # no. skilled funds

unskilled<-nminus-false # no. unskilled

pplus<-nplus/sims

pminus<-nminus/sims

pfalse<-false/sims

pskilled<-skilled/sims

punskilled<-unskilled/sims
```



Bibliography

Academlib, n.d. *Academlib.* [Online]
Available at:
http://academlib.com/501/business˙finance/security˙market˙line
[Accessed 17 November 2016].

Agarwal, V. & Naik, N., 2000. Multi-Period Performance Persistence Analysis of Hedge Funds. *The Journal of Financial and Quantitative Analysis,* 35(3), pp. 327-342.

Anderson, S. & Ahmed, P., 2005. *Mutual Funds: Fifty Years of Research Findings.* 1st ed. s.l.:Springer.

Aragon, G. & Ferson, W., 2007. *Portfolio Performance Evaluation.* s.l.:now Publishers.

Babalos, V., Caporale, G., Kostakis, A. & Philippas, N., 2008. Testing for Persistence in Mutual Fund Performance and the ex post Verification Problem: Evidence from the Greek Market. *European Journal of Finance,* 14(8), pp. 735-753.

Banz, R., 1981. The Relationship Between Return and Market Value of Common Stocks. *Journal of Financial Economics,* 9(1), pp. 3-18.

Barras, L., Scaillet, O. & Wermers, R., 2005. False Discoveries in Mutual Fund Performance: Measuring Luck in Estimated Alphas. pp. 1-51.

Barras, L., Scaillet, O. & Wermers, R., 2010. False Discoveries in Mutual Fund Performance: Measuring Luck in Estimated Alphas. *The Journal of Finance,* 65(1), pp. 179-216.

Barucci, E., 2007. Raccolta e Performance dei Fondi Comuni di Investimento in Italia. *Assogestioni Working Paper,* Volume 1.

Basu, S., 1977. Investment Performance of Common Stocks in Relation to Their Price-Earnings Ratios: A Test of the Efficient Market Hypothesis. *The Journal of Finance,* 32(3), pp. 663-682.

Benjamini, Y. & Hochberg, Y., 1995. Controlling the False Discovery Rate: A Practical and Powerful Approach to Multiple Testing. *Journal of the Royal Statistical Society. Series B (Methodological),* 57(1), pp. 289-300.

Berk, J. B. & Green, R. C., 2004. Mutual Funds Flows and Performance in Rational Markets. *Journal of Political Economy,* 112(6).

Bernstein, W., 2001. *Efficient Frontier.* [Online]
Available at: http://www.efficientfrontier.com/ef/101/roll101.htm
[Accessed 7 January 2017].

Blake, C. R. & Morey, M. R., 2000. Morningstar Ratings and Mutual Fund Performance. *The Journal of Financial and Quantitative Analysis,* 35(3), pp. 451-483.

Bloomberg, 2016. *FTSE MIB Index.* [Online]
[Accessed 18 December 2016].

Bodie, Z., Kane, A. & Marcus, A., 2011. *Investments.* 9th ed. New York: McGraw-Hill.

Bollen, N. P. B. & Busse, J. A., 2001. On The Timing Ability of Mutual Fund Managers. *The Journal of Finance,* LVI(3).

Bollen, N. P. & Busse, J. A., 2004. Short-Term Persistence in Mutual Fund Performance. *The Review of Financial Studies,* 18(2).

Brown, K. C., Harlow, W. & Starks, L. T., 1996. On Tournaments and Temptations: An Analysis of Managerial Incentives in the Mutual Fund Industry. *The Journal of Finance,* 51(1), pp. 85-110.

Brown, S. J., Goetzmann, W., Ibbotson, R. G. & Ross, S. A., 1992. Survivorship Bias in Performance Studies. *The Review of Financial Studies,* 5(4), pp. 553-580.

Brown, S. J. & Goetzmann, W. N., 1995. Performance Persistence. *The Journal of Finance,* 50(2), pp. 679-698.

Brown, S. J., Goetzmann, W. N. & Park, J., 2001. Careers and Survival: Competition and Risk in the Hedge Fund and CTA Industry. *The Journal of Finance,* LVI(5).

Busse, J. A., 1999. Volatility Timing in Mutual Funds: Evidence from Daily Returns. *The Review of Financial Studies,* 12(5), pp. 1009-1041.

Carhart, M. M., 1997. On Persistence in Mutual Fund Performance. *The Journal of Finance,* 52(1), pp. 57-82.

Carlson, R., 1970. Aggregate Performance of Mutual Funds, 1948-1967. *The Journal of Financial and Quantitative Analysis,* 5(1), pp. 1-32.

Casarin, R., Lazzarin, M., Pelizzon, L. & Sartore, D., 2003. Relative Benchmark Rating and Persistence Analysis: Evidence from Italian Equity Funds. *Greta,* 3(10).

Casarin, R., Pelizzon, L. & Piva, A., 2008. Italian Equity Funds: Efficiency and Performance Persistence. *Working Paper, Department of Economics, Ca' Foscari University of Venice,* 12(2008).

Cesari, R. & Panetta, F., 1998. Style, Fees and Performance of Italian Equity Funds. *Temi di discussione del Servizio Studi, Banca d'Italia,* Volume 325.

Cesari, R. & Panetta, F., 2002. The Performance of Italian Equity Funds. *Journal of Banking & Finance,* 26(1), pp. 99-126.

Chang, E. & Lewellen, W., 1984. Market Timing and Mutual Fund Investment Performance. *The Journal of Business,* 57(1), pp. 57-72.

Chan, K., Chen, H. & Lakonishok, J., 2002. On Mutual Fund Investment Styles. *Review of Financial Studies,* 15(5), pp. 1407-1437.

Chen, D., 2013. *An Empirical Study on Mutual Funds Performance and Performance Persistence in China,* Christchurch: Lincoln University.

Chen, H.-L., Jegadeesh, N. & Wermers, R., 2000. The Value of Active Mutual Fund Management: An Examination of the Stockholdings and Trades of Fund Managers. *The Journal of Financial and Quantitative Analysis,* 35(3), pp. 343-368.

Chevalier, J. & Ellison, G., 1999. Career Concerns of Mutual Fund Managers. *The Quarterly Journal of Economics.*

Clarke, J., Jandik, T. & Mandelker, G., 2001. The Efficient Markets Hypothesis. *Expert Financial Planning: Investment Strategies from Industry Leaders,* pp. 126-141.

Columbia University Mailman School of Pub, 2017. *False Discovery Rate.* [Online]
Available at: https://www.mailman.columbia.edu/research/population-health-methods/false-discovery-rate
[Accessed 17 January 2017].

Connor, G. & Woo, M., 2003. An Introduction to Hedge Funds. *London School of Economics - Financial Markets Group.*

Cooper, M. J., Gulen, H. & Raghavendra Rau, P., 2003. Changing Names With Style: Mutual Fund Name Changes and Their Effects on Fund Flows.

Cremers, K. J. M. & Petajisto, A., 2009. How Active Is Your Fund Manager? A New Measure That Predicts Performance. *Yale School of Management, International Center for Finance.*

Cremers, M., Driessen, J., Maenhout, P. & Weinbaum, D., 2009. Does Skin in the Game Matter? Director Incentives and Governance in the Mutual Fund Industry. *Journal of Financial and Quantitative Analysis,* 44(6), pp. 1345-1373.

Cremers, M., Ferreira, M. A., Matos, P. & Starks, L., 2015. Indexing and Active Fund Management: International Evidence.

Cuthbertson, K. & Nitzsche, D., 2013. Performance, Stock Selection and Market Timing of the German Equity Mutual Fund Industry. *Journal of Empirical Finance,* Volume 21, pp. 86-101.

Cuthbertson, K., Nitzsche, D. & O'Sullivan, N., 2010. Mutual Fund Performance: Measurement and Evidence. *Journal of Financial Markets, Instruments and Institutions,* 19(2), pp. 95-187.

Cuthbertson, K., Nitzsche, D. & O'Sullivan, N., 2010. The Market Timing Ability of UK Mutual Funds. *Journal of Business Finance & Accounting,* 31(1), pp. 270-289.

Cuthbertson, K., Nitzsche, D. & O'Sullivan, N., 2011. False Discoveries in UK Mutual Fund Performance. *European Financial Management,* 18(3), pp. 1-11.

Davis, J., 2001. Mutual Fund Performance and Manager Style. *Financial Analysts Journal,* 57(1), pp. 19-27.

Del Guercio, D., Dann, L. Y. & Partch, M. M., 2003. Governance and Boards of Directors in Closed-end Investment Companies. *Journal of Financial Economics,* Volume 69, pp. 111-152.

Ding, B. & Wermers, R., 2012. Mutual Funds Performance and Governance Structure: The Role of Portfolio Managers and Boards of Directors.

Drew, M. E., Veeraraghavan, M. & Wilson, V., 2005. Market Timing, Selectivity and Alpha Generation: Evidence from Australian Equity Superannuation Funds. *Investment Management and Financial Innovations,* Volume 2, pp. 111-127.

Edelen, R., Evans, R. & Kadlec, G., 2013. Shedding Light on "Invisible" Costs: Trading Costs and Mutual Fund Performance. *Financial Analysts Journal,* 69(1).

Elton, E. J. & Gruber, M. J., 2011. Mutual Funds.

Elton, E. J., Gruber, M. J. & Blake, C. R., 1996. The Persistence of Risk-Adjusted Mutual Fund Performance. *The Journal of Business,* 69(2), pp. 133-157.

Elton, E. J., Gruber, M. J. & Blake, C. R., 2001. A First Look at the Accuracy of the CRSP Mutual Fund Database and a Comparison of the CRSP and Morningstar Mutual Fund Databases. *The Journal of Finance,* LVI(6).

Elton, E. J., Gruber, M. J. & Blake, C. R., 2003. Incentive Fees and Mutual Funds. *The Journal of Finance,* LVIII(2).

Elton, E. J., Gruber, M. J., Das, S. & Hlavka, M., 1993. Efficiency with Costly Information: A Reinterpretation of Evidence from Managed Portfolios. *The Review of Financial Studies,* 6(1), pp. 1-22.

Fama, E., 1970. Efficient Capital Markets: A Review of Theory and Empirical Work. *The Journal of Finance,* 25(2), pp. 383-417.

Fama, E. & French, K., 1992. The Cross-Section of Expected Stock Returns. *The Journal of Finance,* XLVII(2), pp. 427-465.

Fama, E. & French, K., 1993. Common Risk Factors in the Returns on Stocks and Bonds. *Journal of Financial Economics,* Volume 33, pp. 3-56.

Fama, E. & French, K., 2010. Luck versus Skill in the Cross-Section of Mutual Fund Returns. *The Journal of Finance,* 65(5).

Ferreira, M. A., Keswani, A., Miguel, A. F. & Ramos, S. B., 2011. The Determinants of Mutual Fund Performance: A Cross-Country STudy.

Ferris, S. P. & Yan, X., 2007. Agency Conflicts in Delegated Portfolio Management: Evidence from Namesake Mutual Funds. *The Journal of Financial Research,* XXX(4), pp. 473-494.

Ferson, W. E. & Schadt, R. W., 1996. Measuring Fund Strategy and Performance in Changing Economic Conditions. *The Journal of Finance,* 51(2), pp. 425-461.

Finke, M. S., Nanigan, D. & Waller, W., 2012. Redemption Fees: Reward for Punishment.

Friedman, M., 1953. The Case for Flexible Exchange Rates. In: *Essays in Positive Economics.* Chicago: University of Chicago Press, pp. 157-203.

Gil-Bazo, J. & Ruiz-Verdu, P., 2009. The Relation between Price and Performance in the Mutual Fund Industry. *The Journal of Finance,* LXIV(5).

Giles, T., Wildson, T. & Worboys, T., 2002. *Performance Persistence in UK Equity Funds - A Literature Review,* s.l.: Charles River Associates.

Goetzmann, W. & Ibbotson, R., 1994. Do Winners Repeat? Patterns in Mutual Fund Performance. *The Journal of Portfolio Management,* 20(2), pp. 9-18.

Golec, J. H., 1996. The Effects of Mutual Fund Managers' Characteristics on Their Portfolio Performance, Risk and Fees. *Financial Services Review,* 5(2), pp. 133-148.

Grande, G. & Panetta, F., 2001. Why Does Performance Persist? Evidence from Italian Equity Funds. *Banca d'Italia Research Department.*

Grinblatt, M. & Titman, S., 1989. Mutual Fund Performance: An Analysis of Quarterly Portfolio Holdings. *The Journal of Business,* 62(3), pp. 393-416.

Grinblatt, M. & Titman, S., 1992. The Persistence of Mutual Fund Performance. *The Journal of Finance,* 47(5), pp. 1977-1984.

Grossman, S. & Stiglitz, J., 1980. On the Impossibility of Informationally Efficient Markets. *American Economic Review,* 70(3), pp. 393-408.

Gruber, M. J., 1996. Another Puzzle: The Growth in Actively Managed Mutual Funds. *The Journal of Finance,* 51(3), pp. 783-810.

Haslem, J. A., Kent Baker, H. & Smith, D. M., 2008. Performance and Characteristic of Actively Managed Retail Equity Mutual Funds With Diverse Expense Ratios. *Financial Services Review,* Volume 17, pp. 49-68.

Hendricks, D., Patel, J. & Zeckhauser, R., 1993. Hot Hands in Mutual Funds: Short-Run Persistence of Relative Performance, 1974-1988. *The Journal of Finance,* 48(1), pp. 93-130.

Henriksson, R., 1984. Market Timing and Mutual Fund Performance: An Empirical Investigation. *The Journal of Business,* 57(1), pp. 73-96.

Henriksson, R. & Merton, R., 1981. On Market Timing and Investment Performance. II. Statistical Procedures for Evaluating. *The Journal of Business,* 54(4), pp. 513-533.

Ippolito, R. A., 1989. Efficiency with Costly Information: A Study of Mutual Fund Performance. *The Quarterly Journal of Economics,* 104(1), pp. 1-23.

Ippolito, R. A., 1989. Efficiency with Costly Information: A Study of Mutual Fund Performance, 1965-1984. *The Quarterly Journal of Economics,* 104(1), pp. 1-23.

Ismailescu, I. & Morey, M., 2012. Redemption Fees and The Risk-Adjusted Performance of International Equity Mutual Funds. *Journal of Investment Management,* 10(3), pp. 21-33.

Jegadeesh, N. & Titman, S., 1993. Returns to Buying Winners and Selling Losers: Implications for Stock Market Efficiency. *The Journal of Finance,* 48(1), pp. 65-91.

Jensen, M., 1968. The Performance of Mutual Funds in the Period 1945-1964. *The Journal of Finance,* 23(2), pp. 389-416.

Kacperczyk, M., Sialm, C. & Zheng, L., 2007. Unobserved Actions of Mutual Funds. *The Society for Financial Studies.*

Kaizoji, T. & Sornette, D., 2008. Market Bubbles and Crashes. *MPRA,* Volume 40798, pp. 1-25.

Khorana, A., Tufano, P. & Wedge, L., 2007. Board Structure, Mergers, and Shareholder Wealth: A Study of the Mutual Fund Industry. *Journal of Financial Economics,* Volume 85, pp. 571-598.

Kosowski, R., Timmermann, A. & Wermers, R. W. H., 2006. Can Mutual Fund "Stars" Really Pick Stocks? New Evidence from a Bootstrap Analysis. *The Journal of Finance,* LXI(6).

Mains, N. E., 1977. Risk, The Pricing of Capital Assets, and the Evaluation of Investment Portfolios: Comment. *The Journal of Business,* 50(3), pp. 371-384.

Malkiel, B. G., 1995. Returns from Investing in Equity Mutual Funds. *The Journal of Finance,* 50(2), pp. 549-572.

Marmi, S., 2012. *Stefano Marmi Data Library.* [Online]
Available at: http://homepage.sns.it/marmi/Data˙Library.html#Italy
[Accessed 18 December 2016].

Mason, A., Agyei-Ampomah, S. & Skinner, F., 2016. Realism, Skill & Incentives: Current and Future Trends in Investment Management and Investment Performance.

McDonald, J. G., 1974. Objectives and Performance of Mutual Funds, 1960-1969. *The Journal of Financial and Quantitative Analysis,* 9(3), pp. 311-333.

Merton, R., 1981. On Market Timing and Investment Performance. I. An Equilibrium Theory of Value for Market Forecasts. *The Journal of Business,* 54(3), pp. 363-406.

Morey, M. R. & Gottesman, A., 2002. Morningstar Mutual Fund Ratings Index.

Morningstar, 2017. *Rating & Risk.* [Online]
Available at:
https://performance.morningstar.com/RatingRiskWeb/ratingsRiskDefi

nation.action
[Accessed 30 January 2017].

MSCI, 2016. *MSCI Italy Index.* [Online]
Available at: https://www.msci.com/documents/10199/2dc35216-2876-47b2-bf55-cd8706f53f2b
[Accessed 18 December 2016].

Musah, A., Senyo, D. B. & Nuhu, E., 2014. Market Timing and Selectivity Performance of Mutual Funds in Ghana. *Management Science Letters,* 4(7), pp. 1361-1368.

Newey, W. & West, K., 1987. A Simple, Positive Semi-Definite, Heteroskedasticity and Autocorrelation Consistent Covariance Matrix. *Econometrica,* 55(3), pp. 703-708.

Osborne, J., 2006. Estimating the False Discovery Rate using SAS. *Proceedings of the Thirty-first Annual SUGI Conference,* 190(31), pp. 1-10.

Otten, R. & Bams, D., 2002. European Mutual Fund Performance. *European Financial Management,* 8(1), pp. 75-101.

Petajisto, A., 2013. Active Share and Mutual Fund Perfromance.

Pilkington, P., 2013. *The CAPM and the Non-Ergodic Axiom.* [Online]
Available at:
https://fixingtheeconomists.wordpress.com/2013/10/18/the-capm-and-the-non-ergodic-axiom/
[Accessed 27 January 2017].

Portfolio Performance: Comparing Portfolio Returns using the Sharpe Ratio, T. R. a. J. A., 2017. *This Matter.* [Online]
Available at: http://thismatter.com/money/investments/portfolio-performance.htm
[Accessed 30 January 2017].

Redford, C., 2014. *Redford on Rugby.* [Online]
Available at: http://redfordonrugby.blogspot.it/
[Accessed 17 November 2016].

Schlanger, T., Philips, C. B. & Peterson LaBarge, K., 2012. The Search For Outperformance: Evaluating 'Active Share'. *Vanguard Investment Perspectives,* Volume 12.

Sewell, M., 2007. Fund Performance. pp. 1-4.

Sharpe, W., 1965. Risk-Aversion in the Stock Market: Some Empirical Evidence. *The Journal of Finance,* 20(3), pp. 416-422.

Sharpe, W., 1966. Mutual Fund Performance. *The Journal of Business,* 39(1), pp. 119-138.

Shleifer, A., 2000. *Inefficient Markets: An Introduction to Behavioural Finance.* 1st ed. s.l.:Oxford University Press.

Sirri, E. R. T. P., 1998. Costly Search and Mutual Fund Flows. *The Journal of Finance,* 53(5), pp. 1589-1622.

Storey, J., 2002. A Direct Approach to False Discovery Rates. *Journal of the Royal Statistical Society: Series B (Statistical Methodology),* 64(3), p. 479–498.

Storey, J. & Tibshirani, R., 2003. Statistical Significance for Genomewide Studies. *Proceedings of the National Academy of Sciences,* 100(16), p. 9440–9445.

Suppa-Aim, T., 2010. *Mutual Fund Performance in Emerging Markets,* s.l.: University of Birmingham.

Sutton, T., 2000. *Corporate Financial Accounting and Reporting.* 1st ed. s.l.:Financial Times Management.

Treynor, J., 1965. How to Rate Management of Investment Funds. *Harvard Business Review,* 43(1), pp. 63-75.

Treynor, J. & Mazuy, K., 1966. Can Mutual Funds Outguess the Market?. *Harvard Business Review,* Volume 44, pp. 131-136.

Tufano, P. & Sevick, M., 1997. Board Structure and Fee-setting in the U.S. Mutual Fund Industry. *Journal of Financial Economics,* Volume 46, pp. 321-355.

VanderWeele, T., 2015. *Explanation in Causal Inference: Methods for Mediation and Interaction.* 1st ed. s.l.:Oxford University Press.

Wellman, J. & Zhou, J., 2008. Corporate Governance and Mutual Fund Performance: A First Look at the Morningstar Stewardship Grades.

Wermers, R., 2000. Mutual Fund Performance: An Empirical Decomposition into Stock-Picking Talent, Style, Transactions Costs, and Expenses. *The Journal of Finance,* LV(4).

Wermers, R., 2003. Is Money Really "Smart"? New EvIdence on the Relation Between Mutual Fund Flows, Manager Behavior, and Performance Persistence.

White, H., 1980. A Heteroskedasticity-Consistent Covariance Matrix Estimator and a Direct Test for Heteroskedasticity. *Econometrica,* 48(4), pp. 817-838.

Wooldridge, J., 2013. *Introductory Econometrics: A Modern Approach.* 5th ed. s.l.:South-Western.

Zheng, L., 1999. Is Money Smart? A Study of Mutual Fund Investors' Fund Selection Ability. *The Journal of Finance,* 54(3), pp. 901-933.

Zulehner, C., 2008. *Omitted Variable Bias, Heteroscedasticity and Autocorrelation.* [Online]
Available at:
http://homepage.univie.ac.at/Christine.Zulehner/autocorrelation.pdf
[Accessed 16 December 2016].