PERFORMANCE OF TURKISH MUTUAL FUNDS

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Abstract

This study focuses on the stock picking ability of Turkish fund managers and the persistence of their superior performance, if any. Equity focused pension and mutual funds existed through 2004 to 2009 in Turkey are analyzed. First, the effect of survivorship bias is calculated, then well known performance measurements models are applied and finally, persistence of superior performance is discussed. We have found that, Turkish fund managers poses a certain stock picking ability, but the timing inability is higher. Although there is no evidence of general performance persistence, the performance persists for certain outliers and this outlier persistence is higher in bad performing funds.

Özet

Bu çalışma, Türkiyedeki fon yöneticilerinin hisse senedi seçebilme kabiliyeti ve performanslarının sürekliliğini ölçmeye çalışmaktadır. 2004 – 2009 yılları arasında varolan hisse odaklı emeklilik ve yatırım fonları incelenmiştir. İlk adımda, sadece dönem sonuna kadar hayatta kalabilmiş fonlar ile çalışmanın etkisi ölçülmüş, ardından kabul görmüş performans ölçme modelleri uygulanmış ve son olarakta performansın sürekliliği tartışılmıştır. Bulgularımıza göre Türk fon yöneticilerinin belirli bir hisse seçme kabiliyeti olduğu söylenebilir. Ancak hatalı zamanlama kararlarının etkisi daha yüksek olmaktadır. Her ne kadar genel olarak bir performans kalıcılığından bahsetmek mümkün olmasada, dağılımın uçlarındaki fonlarda belli bir performans sürekliliği söz konusudur ve bu süreklilik kötü performans gösteren fonlarda daha yüksektir

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Abbrevations (In the order of appearance)

ISE	Istanbul Stock Exchange
NAV	Net Asset Value
CMB	Capital Markets Board
MITTX	MFS Massachusetts Investors Trust A Fund
USA	United States of America
AUM	Assets Under Management
EFAMA	European Fund and Asset Management Association
EUR	Euro
CAPM	Capital Assets Pricing Model
R/V	Reward-to-variablity ratio
SMB	Small Minus Big Sized Firms
HML	High Minus Low Book to Market Equity Ratio Firms
PR1YR	Difference of One Month Lagged 11 Month Return of Best and Worst %30 Firms' Average Return
CS	Charactristic Selectivity Measure
CT	Characteristic Timing Measure
AS	Average Style Measure
UK	United Kingdom
SCI	Small Cap Index
PPW	Positive Period Weighting Measure
NYSE	New York Stock Exchange
KYD30	Bond index with an average maturity of 30 days issued by Turkish Institutional Investment Managers
GPRI	Global Political Risk Index
FS	Ferson and Schadt
BT	Blake and Timmermann
CAPM_FS	Beta Conditional Single Index Model
HM_FS	Beta Conditional Henriksson and Merton Model
TM_FS	Beta Conditional Treynor and Mazuy Model
FF_FS	Beta Conditional Fama and French Three FactorModel

C_FS	Beta Conditional Carhart Four Factor model
CAPM_CFG	Alpha and Beta Conditional Single Index Model
HM_CFG	Alpha and Beta Conditional Henriksson and Merton Model
TM_CFG	Alpha and Beta Conditional Treynor and Mazuy Model
FF_CFG	Alpha and Beta Conditional Fama and French Three FactorModel
C_CFG	Alpha and Beta Conditional Carhart Four Factor model
HM	Henriksson and Merton Model
TM	Treynor and Mazuy Model
FF	Fama French Model
CPR	Cross Product Ratio

1. Introduction

This study examines stock picking ability and the persistence, if any, for Turkish mutual and pension fund market returns for the period of February 2004 to December 2009. The dataset used includes a total of 66 portfolios consist of 65 funds plus the equally weighted average portfolio of 65 funds included.

Our database is not the entire fund database in Turkey. We have excluded some funds that disappeared during our period. Furthermore, we have excluded funds that were not issued yet at February 2004. So, first we will test whether the funds that we have excluded generates any bias on our results or not.

We will estimate five generally accepted regression models used in order to measure the stock picking ability. The models used are the single index, Treynor – Mazuy, Henriksson – Merton, Fama – French and Carhart models. In the literature, it is discussed that fund performance should be conditioned on certain publicly available information due to the fact that fund managers adjust their positions accordingly. We will estimate first only beta conditional and then both alpha and beta conditional forms of the five models discussed.

Another discussion going over the fund industry is whether the performance persists or not. We will test any good or bad performance persistence in means of alpha for various models discussedand try to identify any good or bad persistence.

Section 2 summarizes the Turkish and global fund industry in means of history and current situation. Section 3 reviews the literature on fund performance measurement models. Section 4 describes the data we used in detail and section 5 discusses whether the data we used generates any bias due to survivorship or exclusion. Section 6 discusses performance measurement models and their conditional forms and compares the results in means of variables used and explanatory power. Section 7 calculates the persistence of performance for stock picking ability and section 8 concludes.

2. Developments in mutual fund industry

2.1 Turkish Mutual and Pension fund industry

Turkish Capital Markets Law article 37 defines mutual fund as an asset established to manage a portfolio of capital market instruments, real estate, gold and other precious metals by the money collected from investors backed by participation certificates with the diversification of risk and fiduciary ownership principals. Mutual funds are not legal entities but still, assets held within a mutual fund are separated from the founder of the Fund. Since the assets within the fund belong to the investors and not to the founder, the separation ensures that mutual fund assets are not affected from any implication of the founder like bankruptcy. To further strengthen the rights of the investor, according to article 38 clause b, assets of a fund cannot be pledged, used as a collateral, or seized by a third party.
Mutual funds in Turkey can be founded by banks, insurance and pension companies, intermediary institutions and eligible retirement and provident funds.

Mutual funds in Turkey are classified into two types: A type and B type funds. A type funds invest at least 25% of their total assets under management at all times into securities issued by Turkish companies. Other mutual funds are classified as B type.
According to article 42 of Fundamentals related to Mutual funds communiqué[i], mutual funds are subject to certain portfolio limitations to ensure proper diversification against various risks. Some significant limitations listed in the above mentioned regulation is as follows: Mutual

funds can not invest more than 10% of their assets under management into the securities of a single issuer. A mutual fund cannot invest into more than 9% of any issuers' total shares. Mutual funds can not invest more than 10% of their total assets under management into shares or debt instruments that are not quoted to a stock exchange. Mutual funds can not invest above a certain percentage into securities that are issued by the founder or the fund portfolio manager. Mutual funds cannot short-sell.

According to their investment objectives, mutual funds are classified into groups:

Note and bond fund: funds investing at least 51% of their assets into public or private note and bonds.

Shares fund: funds investing at least 51% of their assets into securities issued by Turkish companies.

Sector fund: funds investing at least 51% of their assets into the securities issued by companies operating in the same sector.

Subsidiary fund: funds investing at least 51% of their assets into securities issued by subsidiaries of the founder.

Group fund: funds investing at least 51% of their assets into securities issued by a certain group.

Foreign securities fund: funds investing at least 51% of their assets into securities issued by foreign private or government companies.

Precious metals fund: funds investing at least 51% of their assets into gold and other precious metals traded in local and international stock markets or capital market instruments backed by gold and other precious metals.

Gold fund: funds investing at least 51% of their assets into gold traded in local and international stock markets or capital market instruments backed by gold.

Composite fund: funds investing 100% of their assets into shares, debt securities, gold and other precious metals or assets backed by those. Mixed funds invest into at least two of the instruments counted above and the share of each instrument cannot be less than 20% of the total fund.

Liquid fund: funds investing 100% of their assets into capital market instruments with days to maturity less than 180 days and with average portfolio maturity of maximum 45 days.

Variable fund: funds that cannot be classified into one of the classes mentioned above in means of portfolio limitations.

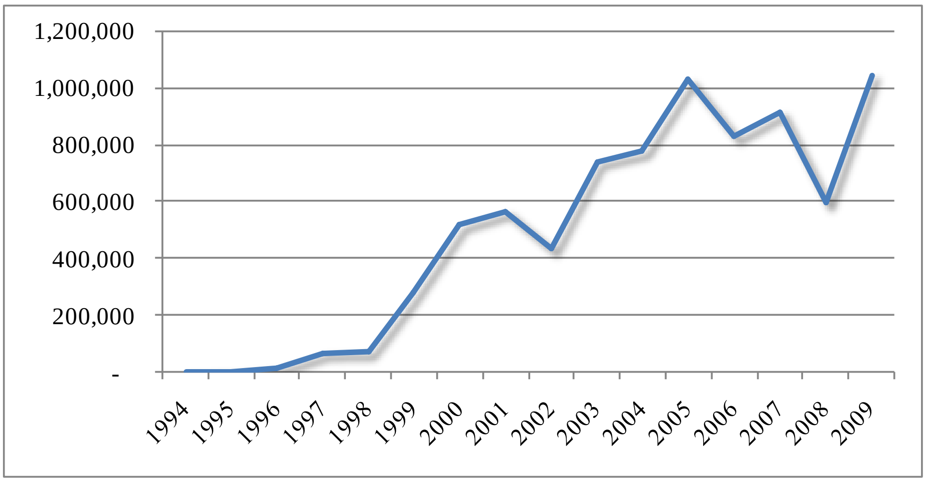
Index fund: funds investing at least 80% of their assets into an index of shares used within the index with correlation coefficient of at least 90% between the price of the fund and the index.

Funds of funds: funds investing at least 80% of their assets into other funds.

Protection funds: umbrella funds, aiming a return over the total or part of the startup investment within a certain horizon, with an eligible best effort investment strategy.

In 1980's, Turkey shifted to the liberalization in the economy, which can also be accepted as the first step in the development of Turkish capital markets. Early years of 1980's were more focused on constructing the necessary framework of regulations and bodies for healthy capital and money markets. In July 1981, Capital Markets Law was accepted. One year later, in January 1982, Capital Markets Board, the body responsible from the management and regulation of capital markets, established. In December 1985, Istanbul Stock Exchange (ISE) was founded and began trading on January 1986. Parallel to developments in capital markets and stock exchange, a communiqué regulating issuing and public offering of mutual funds[ii] was published in official gazette, and soon after this in July 1987 first mutual fund of Turkey (T. İş Bank, B type, Liquid fund) was offered to public and is still alive. 1997 was a year with important improvements for fund management community. First portfolio management company, Oyak portfolio management corp. (known as ING portfolio management corp. since June 2008), was founded in July 1997. Also first private mutual fund, foreign mutual fund and sector funds were issued in July, August and December 1997, respectively. In January 1999, daily fund price and portfolio allocation data has become public via internet and same year in July, first index fund issued. In 2002, the communiqué regulating issuing and managing pension funds[iii] was published in official gazette. Soon after the publication of communiqué, first pension funds were established in September 2003, and issued in October 2003.

Despite their rapid growth, A type funds are very sensitive to economic conditions. 2 major crisis Turkey faced during the 21. Century – first is local and the other is global - effected the development of the A type mutual funds. The effect is very clear in years 2002 and 2008 in the development of net asset value (NAV) for A type mutual funds shown in graph 1.



Source: CMB monthly statistical bulletin

Graph 1 - Development of A type mutual fund investments from 1994 to 2009 – 000,- TRL

As of December 2009, mutual fund industry has reached a net asset value of over 29.5 billion TL. Almost 96.75% - which amounts more than 28.5 billion TL- is invested into B type funds. B type funds invest almost 92% of their assets into public debt instruments and reverse repos and 5% into money market instruments. Percent of shares is even less than 1%. On the other hand, A type funds invest 63% of their assets into shares, 21% into public debt instruments and 16% into reverse repo. As a total, reverse repo investments amount for almost 59% of all mutual fund investments. 32.02% and 5.12% of the total net asset value of mutual funds are invested into public debt instruments and money market instruments, respectively. Share investments are only 2.68% of total mutual fund investments.

Table 1 - Allocation of Mutual fund assets into investment instruments – 31.12.2009

	A Type Mutual Funds	B Type Mutual Funds	Total
Shares	62.79%	0.48%	2.68%
Public debt instruments	20.65%	32.43%	32.02%
Reverse repo	16.28%	60.23%	58.67%
Money market instruments	0.16%	5.30%	5.12%
Foreign securities	0.10%	0.12%	0.12%
Other	0.03%	1.44%	1.39%

Source: CMB monthly statistical bulletin

From the point of investors, recent crisis increased the demand for B type funds for investors. By the end of 2009, only almost 190.000 investors invest in A type funds out of roughly 3.000.000 fund investors in Turkey.

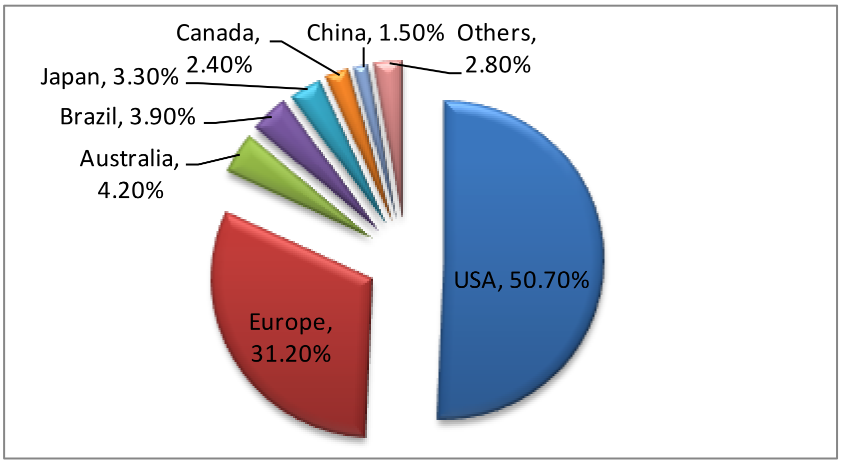
An important part of the mutual fund industry consists of pension funds. Although the pension fund industry has a history less than a decade, today, pension funds are major clients for fund management companies. By the end of 2009 total net asset value of fund industry amounts almost 39 billion TL where 9 billion consists of pension funds.

By the end of 2009, there are 457 active funds in Turkish market. 316 of those are classified as mutual funds where 114 is A type and 202 is B type. Number of pension funds is 130 where 62 is value oriented, 25 is growth oriented, 17 is money market, 1 is specialized and 25 is classified as other. Remained 11 consist of 3 funds of funds and 8 structured funds.

2.2 Global Mutual fund industry

Roots of funds in history go back to late 1700’s. In 1774, A Dutch merchant, Adriaan van Ketwich, formed a trust in order to provide diversification benefits to investors. First open ended mutual fund was started in 21.03.1924 by the Massachusetts Investment Trust. Fund went public in 1928. Fund, with the ticker of MITTX is still alive and managed by MFS investment corp.

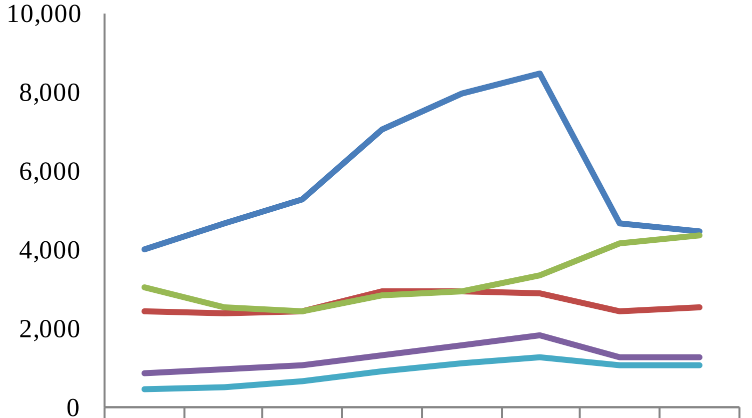
The fund management industry is dominated by USA with a market share of 50% and AUM of 13.6 Trillion Eur. Europe, is the second largest player with a market share of 31% and AUM of 4.4 Trillion Eur. Besides USA and Europe; Australia, Brazil, Japan, Canada and China are the other important players. Within Europe, Luxemburg and France are the biggest players. Of the total assets invested in funds in Europe, almost %30 is invested in Luxemburg and 26% is invested in France. Turkey has a market share of %0.29 within Europe and a market share of %0.09 within the World.



Source: EFAMA Quarterly International Statistical Release
Graph 2 - Market share of Countries – Percent

Contrary to the situation in Turkey, fund management industry in the world is dominated by Equity funds. In the period of 2002 to 1Q2009, equity funds reached %48 of the fund management industry for years 2006 and 2007 with 7.983 and 8.473 billion EUR assets under management respectively. After the 2008 crisis, the percentage of equity funds has declined to %33 in

1Q2009. Although it declined back to %33, equity funds is still the largest fund type



	2002	2003	2004	2005	2006	2007	2008	1Q09
Equity	4,009	4,657	5,266	7,064	7,983	8,473	4,688	4,444
Bond	2,412	2,383	2,413	2,922	2,939	2,901	2,443	2,542
Moneymarket	3,041	2,538	2,438	2,852	2,934	3,367	4,161	4,360
Mixed	880	951	1,051	1,329	1,575	1,809	1,276	1,254
Other	458	521	632	893	1,099	1,250	1,062	1,040

Source: EFAMA Quarterly International Statistical Release

Graph 3 - Assets Under Management by Fund type – Billion EUR

3. Review of Literature

3.1 History of Fund Performance Measurement

Efforts to measure the stock picking ability is pioneered by Jensen. Jensen (1967) in his work offers a risk adjusted measure of portfolio performance. This widely accepted measure is known as Jensen’s alpha, which is the prediction ability of the portfolio manager - the ability to earn more than expected through successful forecasts of the security prices. One important superiority is that, compared to other popular measures of the same decade, Jensen’s measure provides an absolute measure rather than a ranking as in

Treynor (1965) and Sharpe (1966) measures. Jensen uses CAPM as a starting point and arrives to the following equation of ex post returns (continuous form):

$$\widetilde{R}_{jt} - R_{ft} = \beta_j\left[\widetilde{R}_{Mt} - R_{ft}\right] + \tilde{e}_{jt} \quad (1)$$

where $\tilde{R}_{jt}$ is the return of the portfolio j, $\tilde{R}_{Mt}$ is the return of the market portfolio, R_{ft} is the risk free rate, $\tilde{e}_{jt}$ is the error term with expectation zero and t is the time interval considered. This equation indicates that risk premium earned on any asset is a linear function of the risk premium on the market portfolio. If the portfolio manager has superior forecasting ability of stock prices then he can earn more compared to the relation indicated by equation (1), which will result regular positive error terms. So by simply adding a constant term to equation (1) we can have a measure of prediction ability of the portfolio manager, which is α_j in equation (2).

$$\widetilde{R}_{jt} - R_{ft} = \alpha_j + \beta_j\left[\widetilde{R}_{Mt} - R_{ft}\right] + \tilde{u}_{jt} \quad (2)$$

First condition of having an unbiased alpha estimator depends on having an unbiased beta estimator. Jensen in his work proves that $E\left(\hat{\beta}_j\right)$ is downward biased with an amount proportional to portfolio manager's ability to forecast the market movements. So, as $\hat{\beta}$ is biased, because of the fact that the regression line passes through the sample means, $\hat{\alpha}$ will be biased in the opposite direction. Thus, in Jensen's alpha, the stock picking ability of the portfolio manager is overestimated with the upward bias resulting from the ability to forecast market movements.

Jensen practically investigated any evidence of stock picking ability throughout the alphas of 115 mutual funds for the period of 1945-1964. He concludes that there is little, even no evidence that the expenses made for picking the right stocks worth the effort. The reader should keep in mind that the overall portfolio management activities shouldn't be limited to stock picking ability.

Later, Grant (1977) showed in his work that $E(\hat{\beta}_j)$ is not downward but upward biased thus, the Jensen's alpha is actually downward biased.

Another popular measure of performance is developed by Treynor (1965). Treynor defines the problem that some part of the portfolio performance is solely depends on the market performance which the portfolio manager doesn't have any control over. The performance measure formed should eliminate the risk purely arising from market fluctuations and take into account the risk appetite of the investor. The measure Treynor uses for this purpose is an excess return over risk ratio. For defining the denominator of Treynor's measure (risk), he uses a so called "characteristic line" – a fitted line which has a market rate of return and portfolio rate of return in its axes. The risk is the slope of the characteristic line, which is the sensitivity of the portfolio return to the market. He defines another line, portfolio possibility line, which is the combination of expected return and risk. The intercept of the possibility line is the point where the risk is zero which is the risk free rate. Measure Treynor proposes is the slope of portfolio possibility line:

$$T = \frac{R_j - R_f}{\beta_j} \tag{3}$$

where, R_j is the return of the portfolio, R_f is the return where the portfolio invests totally in riskless assets and β_j is the slope of the characteristic line.

Sharpe (1966) in his work tried to broaden the work of Treynor and investigated any empirical prediction ability findings. Sharpe defines the expected return as a function of risk free rate and volatility escalated with a certain risk premium b which is positive for risk-averse investors:

$$E(\tilde{R}_j) = R_f + b\tilde{\sigma}_j \tag{4}$$

With allowance of borrowing and lending with the risk free rate, the investor can scale his position on a straight line defined by risk free rate and the risk premium.

$$E(\tilde{R}) = R_f + \left(\frac{\widetilde{R}_j - R_f}{\tilde{\sigma}_j}\right)\tilde{\sigma} \tag{5}$$

The slope of equation (5), after substituting ex ante measures with ex post ones gives us the desired performance measure "reward-to-variability ratio (R/V)" as defined by Sharpe (1966):

$$R/V = \frac{A_j - R_f}{V_j} \tag{6}$$

where, A_j is the average annual rate of return and V_j is the standard deviation of annual rate of return for fund j.

The main difference of Sharpe and Treynor measures is the way they define risk (which is the denominator of the rankings). For Sharpe, risk is the total volatility and for Treynor, risk is the beta which is the volatility explained by the movement of the market. When ex post measures are used Sharpe expects Treynor measure to be inferior since it doesn't include the unsystematic (lack of diversification) part of the risk. On the other hand, for the future predictions under the assumption of portfolios will manage to diversify away the unsystematic risks they have, Treynor can provide a better estimate by focusing on the permanent systematic risk component.

Fama (1972) made an effort to provide a finer component breakdown of investment performance. Fama split the return into two parts which are the selectivity (ability of selecting best performing securities for a certain level of risk) and timing (prediction of the general market behavior). Fama further divides selectivity into net selectivity (the selectivity component which is gained beyond diversification) and diversification (return gained due to concentration) and the timing into manager's (risk taken beyond the investor's risk with the initiative of the portfolio manager) and investor's risk (the level of risk defined by the investor, target risk).

According to Treynor and Mazuy (1966), assuming that the markets move together, outguessing the market is simply adjusting the volatility of the portfolio according to general behavior of the markets- high volatility for bull and low volatility for bear markets. Then, it is not possible to define a single characteristic line (as defined earlier by Treynor (1965)) and for a successful portfolio manager, the characteristic line will be relatively flat (steep) for bear (bull) markets. In other words, as the markets rise, the portfolio manager will increase the volatility of his portfolio (and vice versa) which will make the characteristic line concave upwards. Treynor and Mazuy added a quadratic term to the fitting formulation of the characteristic line:

$$\widetilde{R}_{jt} = R_{ft} + \beta_j\left[\widetilde{R}_{Mt} - R_{ft}\right] + C_j\left[\widetilde{R}_{Mt} - R_{ft}\right]^2 + \tilde{e}_{jt} \qquad (7)$$

Any statistical evidence of a positive C_j is also a proof of convexity which is the ability of the portfolio manager to outguess the market. They also investigated this convexity in 57 funds over 1953-1962 period data and found that there is only 1 fund with statistically significant curvature which of course can be an error assuming the %5 significance level.

Another effort to explain the slope difference of the characteristic line is the Henriksson and Merton (1981) model. Instead of the squared term of Treynor and Mazuy (1966) model which ensures the convexity of the characteristic line, they have solved the problem linearly.

$$\widetilde{R}_{jt} - R_{ft} = \alpha_j + \beta_{1j}x_{1j}(t) + \beta_{2j}x_{2j}(t) + \tilde{e}_{jt} \qquad (8)$$

$x_{1j}(t) = min\left(0, \tilde{R}_{Mt} - R_{ft}\right)$ and $x_{2j}(t) = max\left(0, \tilde{R}_{Mt} - R_{ft}\right)$ which means β_{1j} represents the bear market beta (which represents the more flat part of the characteristic line) and β_{2j} is the bull market beta (which represents the steep part of the characteristic line).

Grinblatt and Titman (1989) in their work showed that measures like Jensen or Treynor and Mazuy are sensitive to the benchmark chosen. They have shown that, traditional industry indices can be beaten by passive investment strategies depending on firm characteristics like investing in small firms, high dividend yield firms or low beta firms. This reality of passive investment strategies beating industry indices can either be diminished by using appropriate benchmarks or adding factors representing the effect of those firm characteristics. Solution of Grinblatt and Titman (1989) was to use more appropriate benchmarks.

Fant and Peterson (1995), investigated the effect of size, book to equity ratio, past returns and market beta on stock market returns and also searched for any seasonality in the relations. Fant and Peterson, depending on their findings of positive skewness in book to equity ratios and prior studies showing relation between return and logarithm of size, suggests the following cross-sectional regression model:

$$\widetilde{R}_{jt} - R_{ft} = \alpha_{jt} + \beta_{1j} ln(ME)_{jt} + \beta_{2j} ln(ME/BE)_{jt} + \beta_{3j} PRIOR_{jt} + \beta_{4j} BETA_{jt} + \tilde{e}_{jt} \quad (9)$$

where ME stands for the size of the firm, ME/BE for book to market ratio, $PRIOR$ for return over the three prior years and $BETA$ for the beta of the security in relevant period forecasted over 100 days. Fant and Peterson concluded that despite strong seasonality, prior returns, size and book to market ratios are significant variables.

Fama and French (1993 and 1996), in their search for a model that can be used to predict future returns, suggests a 3-factor model:

$$\widetilde{R}_{jt} - R_{ft} = \alpha_j + \beta_{1j}\left[\widetilde{R}_{Mt} - R_{ft}\right] + \beta_{2j}(SMB_t) + \beta_{3j}(HML_t) + \tilde{e}_{jt} \quad (10)$$

where, SMB stands for small minus big sized firms and HML stands for high minus low book to market ratio firms’ simple average return. SMB is the variable used to identify strategies depending on market capitalization and HML is the variable used to identify strategies depending on valuation. Fama and French in their work proves that with the addition of variables SMB and HML, 3-factor model can also capture anomalies related to certain firm characteristics that cannot be captured by CAPM. As a result, 3-factor model gives us a more refined α for predicting the stock picking ability since most of the return arising from passive investment strategies related to fund characteristics can now be captured by SMB and HML.

Gruber (1996) tried to measure the performance of mutual funds with a 4-index model.

$$R_{jt} - R_{ft} = \alpha_j + \beta_{1j}\left[R_{mt} - R_{ft}\right] + \beta_{2j}[R_{st} - R_{lt}] + \beta_{3j}\left[R_{gt} - R_{vt}\right] + \beta_{4j}\left[R_{dt} - R_{ft}\right] + e_{jt} \quad (11)$$

$[R_{st} - R_{lt}]$ stands for the difference between a small cap and a large cap portfolio, which is comparable to Fama and French 3-factor model variable SMB. $\left[R_{gt} - R_{vt}\right]$ stands for the difference between a growth portfolio and a value portfolio, which is comparable to Fama and French 3-factor model variable HML. $\left[R_{dt} - R_{ft}\right]$ stands for the difference between corporate and government bond index. Working over the period of 1985 to 1994, Gruber concluded that there is some value added by portfolio management activities, but it is not enough to cover the expenses. Contrary to the expected, Gruber indicated that a single factor model understates the portfolio performance compared to a 4-index model. Gruber also found that there is persistence in performance and investors use this persistency information in their investment decisions.

One important lack of the models discussed above is that they cannot explain the continuity of short term performance. Hendricks, Patel and Zeckhauser (1990) found strong evidence of short term persistence and defined it as “hot (icy) hands” in good (bad) performance – short term superior (inferior) stock picking ability. Hendricks et al also stated that the persistence is stronger in bad performance. Grinblatt and Titman (1992) argued that the persistence in mutual funds is not due to passive investment strategies related to certain firm characteristics. They also stated that although part of the persistence can be explained by expenses of the fund, past performance is an important indicator of future performance. Later, Jegadeesh and Titman (1993) concluded that it is possible to generate excess return by buying good performing funds and selling bad performing funds.

Daniel, Grinblatt, Titman and Wermers (1997) also suggested that there is persistence. Daniel et al affirms that the persistence is due to the momentum effect in stocks, not due to the superior stock picking ability. In other words, the persistence is explained by the momentum strategies used by portfolio managers instead of the hot hands phenomenon. Ibbotson and Patel (2002), investigated whether the persistence of good performing funds still exists after the fund performance is adjusted according to the style of the fund. They have analyzed domestic equity funds in the period of 1975 to 2002 and found that, good performance persists and the level of persistence increases as the definition of good performance becomes tighter.

The continuity of short term performance anomaly is captured by Carhart's (1997) 4-factor model. Carhart adds a momentum factor to the 3-factor model of Fama and French:

$$\widetilde{R}_{jt} - R_{ft} = \alpha_j + \beta_{1j}\left[\widetilde{R}_{Mt} - R_{ft}\right] + \beta_{2j}(SMB_t) + \beta_{3j}(HML_t) + \beta_{4j}(PR1YR_t) + \tilde{e}_{jt} \tag{12}$$

where, PR1YR stands for a momentum variable to explain the continuity of short term performance which is calculated as the difference of one month lagged 11 month return of best and worst %30 firms' average. PR1YR, a significant variable for momentum effect, further refines the stock picking ability-α- from another common passive investment strategy of buying last year's good and selling last year's bad performing funds. Carhart analyzed a data of 1892 funds from 1962 to 1993 – including funds which disappeared during that period. Although momentum is a statistically significant variable in explaining the variations in returns, he concluded that, funds applying momentum strategies of buying last year's good performing stocks, does not gain from this strategy since transaction costs are higher than the benefits.

Daniel, Grinblatt, Titman and Wermers (1997) suggested easy-to-calculate performance measures relative to the benchmarks chosen due to the characteristics of securities held within the fund. Benchmarks are chosen among 125 alternatives, combinations of market capitalization, book to market ratio and prior year return each consist of 5 classes. The idea of choosing among different benchmark alternatives is using the appropriate benchmark that will represent the investment style of the portfolio manager. Daniel et al suggested three components for portfolio performance measurement: Characteristic selectivity (CS) measures the stock picking ability of the portfolio manager,

$$CS = \sum_{j=1}^{N} \tilde{w}_{j,t-1}\left(\tilde{R}_{j,t} - \tilde{R}_{t}^{bj,t-1}\right) \tag{13}$$

where $\tilde{w}_{j,t-1}$ is portfolio weight of stock j at time $t-1$, $\tilde{R}_{j,t}$ is the return of stock j at time t, $\tilde{R}_{t}^{bj,t-1}$ is the month t return of the benchmark matched to stock j in time $t-1$. Characteristic timing (CT) measures the timing ability of the portfolio manager,

$$CT = \sum_{j=1}^{N} \tilde{w}_{j,t-1}\, \tilde{R}_{t}^{bj,t-1} - \tilde{w}_{j,t-13}\, \tilde{R}_{t}^{bj,t-13} \tag{14}$$

where $\tilde{w}_{j,t-1}$ is portfolio weight of stock j at time $t-1$, $\tilde{R}_{t}^{bj,t-1}$ is the month t return of the benchmark matched to stock j in time $t-1$, $\tilde{w}_{j,t-13}$ is portfolio weight of stock j at time $t-13$, $\tilde{R}_{t}^{bj,t-13}$ is the month t return of the benchmark matched to stock j in time $t-13$. Average style (AS) measures the performance due to the tendency of holding stocks with certain characteristics.

$$AS = \sum_{j=1}^{N} \tilde{w}_{j,t-13}\, \tilde{R}_{t}^{bj,t-13}. \tag{15}$$

AS component captures long term strategies which can also be called the style of the fund. Then, the total performance is measured as

$$CS + CT + AS. \tag{16}$$

Daniel et al investigated any stock picking ability (represented by CS) for 2500 funds in 1975 to 1994. They concluded that with appropriate benchmarks and measurement tools, there is stock picking ability. But this ability is not enough to generate extra profit and can only cover the administrative costs of the fund.

Ferson and Schadt (1996) argued that the unconditional measures developed recently are not adequate to capture the dynamic and changing investment decisions and thus suggested a conditional performance measure that incorporates the information publicly known. Ferson and Schadt is a form more than a model and can be implemented into different performance models. Ferson and Schadt studied the conditional form of Jensen, Treynor and Mazuy, Henriksson and Merton models. Basic form of the model is as follows:

$$r_{jt+1} = \alpha_j + \beta_{1j} r_{mt+1} + \beta_{2j}^{'}(z_t r_{mt+1}) + e_{jt}. \quad (17)$$

β_{1j} can be interpreted as average beta, z_t is the vector deviations from average information available, which the beta is conditioned, r_{jt+1}, r_{mt+1} are the excess return of portfolio and market over the risk free rate, respectively. Ferson and Schadt empirically demonstrated that using a conditional model is more effective on alphas compared to the four factor CAPM relative to one factor model. Another important empirical result of Ferson and Schadt is the fact that conditioning the model increases the average alpha from negative to zero.

Christopherson, Ferson and Glassman (1998) investigated corporate investor specific differences compared to mutual fund management industry and further developed the model of Ferson and Schadt (1996) with conditioning the alpha:

$$r_{jt+1} = \alpha_{0j} + A_j^{'} z_t + \beta_{1j} r_{mt+1} + \beta_{2j}^{'}(z_t r_{mt+1}) + e_{jt} \quad (18)$$

They found that alphas for certain portfolio managers are time varying mostly responding to information about treasury bill yield and dividend yield. Furthermore the concept of time varying alphas is used for measuring persistency and Christopherson, Ferson and Glassman concluded that there is a time decaying persistency in the alphas, mainly concentrated in bad performing managers.

3.2 Evidence From Different Countries

Blake and Timmerman (1998) investigated the effects of survivorship bias, evidence of over-performance and searched for performance patterns in UK with a survivorship bias free data including 2300 mutual funds over the period of 1972 to 1995. Differing in certain aspects, they have used a model for performance measurement based on the four index model of Gruber (1996) both in unconditional and conditional form. The unconditional model is as follows:

$$\widetilde{R}_{jt} - R_{ft} = \alpha_j + \beta_{1j}\left[\widetilde{R}_{Mt} - R_{ft}\right] + \beta_{2j}\left[R_{St} - \widetilde{R}_{Mt}\right] + \beta_{3j}\left[R_{5t} - R_{ft}\right] + \tilde{e}_{jt} \qquad (19)$$

where R_{St} stands for small cap stocks proxied by Hoare-Govett Small-Cap index and R_{5t} stands for return of five year UK government bond. They have found that, performance persists for good and bad performing funds over a 24 month of horizon, on average UK portfolio managers underperform -1.8% annually. However, only the underperformance of general equity funds was statistically significant. Blake and Timmerman also investigated the effect of survivorship bias on mutual fund performance and concluded that the survivorship bias, bias from excluding non surviving funds, is 0.8% annually.

Dahlquist, Engström, Söderlind (2000) analyzed Swedish funds in search for a relation between attributes and the performance of funds. They have also investigated the effect of survivorship bias and if any, persistency in performance. They have classified Swedish equity funds into 2 sub classes: equity I for regular equity funds and equity II for special fund group offering tax benefits. They have analyzed the performance of 80 equity I funds and 46 equity II funds over the period of 1992 to 1997. They have used both a unconditional and conditional model for evaluating performance of funds with two independent variables of market index and a small cap index. The conditional model is as follows:

$$\tilde{R}_{jt} - R_{ft} = \alpha_j + \beta_{1j}\left[\tilde{R}_{Mt} - R_{ft}\right] + \beta'_{2j} z_{t-1}\left[\tilde{R}_{Mt} - R_{ft}\right] + \beta_{3j}(SCI) + \tilde{e}_{jt} \qquad (20)$$

Where SCI stands for the small cap index. Conditional information used in the model is lagged market return and the level of the yield curve. They have found that equity I funds have an average alpha of 0.5% -fairly well performance since it is computed over net returns including an average annual management fee of 1.4% against costless benchmarks. Dahlquist et al. also indicated that the equity II funds underperform almost equal to the fees charged. They have found a survivorship bias of 0.7% in alpha, very similar to UK experience.

Abdel-Kader and Qing (2007) have investigated the ability of portfolio managers in Hong Kong, second largest market of Asia. They have applied one factor model (equation (2)), Fama and French three factor model (equation (10)) and Treynor-Mazuy quadratic model (equation (7)) to 30 funds in the period of 1995 to 2005. They found that single factor model underestimates the portfolio managers' performance compared to three factor model. They also compared the Treynor-Mazuy model with single factor model and concluded that there is no bias in alpha estimates due to ignored market timing ability. Abdel-Kader and Qing (2007) concluded that for all of the models tested, Hong Kong mutual fund managers underperformed the market.

Christensen (2005) investigated any stock picking ability, market timing ability and performance persistence over 47 Danish funds in the time period of January 1996 to June 2003. Christensen first searched for stock picking ability in a single factor and a multi factor model, where he concluded that although Danish funds' charges are one of the lowest in the world, stock picking ability of Danish portfolio managers on average over net returns is neutral and so it's only enough to cover their fees. Christensen then investigated market timing ability. He measured market timing ability by using Treynor and Mazuy model and Henriksson and Merton model, equation (7) and (8), respectively. Although, arguing that the investment restrictions force portfolio managers to be good timers, he found neutral performance on average. Christensen also looked for persistence in Danish mutual funds. Contrary to the U.S. findings, he found no evidence of persistence.

Cai, Chan and Yamada (1997) analyzed the performance of Japanese mutual funds in the period of 1981 to 1992. They have found significant and considerably low underperformance ranging from -6% to -11% per annum on different categories they have examined with Jensen's alpha. Cai et al also searched for the effect of passive strategies on alpha by using the Fama and French model and also conditioned it to separate any investment strategy depending on the information available to market. They also calculated the positive period weighting measure (PPW). Japanese portfolio managers significantly underperform with all these performance measures. Cai et al also investigated market timing ability using Treynor and Mazuy model and found significantly negative timing ability. They have also searched for any persistence and opposed to most of the research done on US mutual funds, they found little or no persistence for Japanese funds. Cai et al relates some of the underperformance to the taxation of Japanese mutual funds causing a dilution effect.

Gökgöz (2008) analyzed whether the Fama and French 3 factor model has additional explanatory power compared to standard CAPM model over certain Istanbul Stock Exchange (ISE) indices. The study is interesting since it applies the 3 factor model in a developing market which is not mature yet. Gökgöz found that additional factors of SMB and HML have also explanatory power over ISE stocks.

Doğanay (2004) applied CAPM both in unconditional and conditional (on both alpha and beta) sense over 14 stock funds in the period of July 2000 to August 2002. Publicly available information used in conditioning is US dollar monthly return rate, industrial production index monthly variation and 30 days Government bond performance index. Doğanay found that the hypothesis that unconditional alpha and long term expected value of conditional alpha (α_{0j} in eq. 18)) are equal and cannot be rejected. Doğanay also found that alpha is a meaningful variable of future performance prediction and conditional alpha has more prediction power compared to unconditional alpha.

4. Data

4.1 Definition of Data

Our data consists of monthly returns of funds in the February 2004 to December 2009 period. 46 mutual and19 pension funds are included in the study. List of funds used is provided in appendix B. The risk free rate is the 30 days bond index issued by Turkish Institutional Investment Managers Association. Market index is the ISE100 issued by Istanbul Stock Exchange.

Returns for funds used in analysis are obtained by dividing the change in the price of the fund by previous month-end price. All the funds taken into account are unit linked, with daily prices announced:

$$r_t = \frac{P_t - P_{t-1}}{P_{t-1}} \tag{21}$$

Where, r_t is the return for month t, P_t is the price at the end of month t, P_{t-1} is the price at the end of month $t-1$.

Prices are published after the deduction of fees and other expenses. A fund manager can be performing better, but his rank may change due to the level of fees and other expenses. So, some argue that, to measure the performance of a fund manager, gross returns before fee and expenses are more appropriate. On the other hand, some argue that net return is more appropriate since net return is what the investor receives. It might be interesting to measure the performance over both the net and gross returns and look for any significant difference, but our study measures the performance over net returns due to data limitations.

46 mutual funds included in the study are A type funds. A type funds invest at least 25% of their total assets under management at all times into securities issued by Turkish companies. A type funds with an investment objective of an ISE index or foreign securities are excluded. Those funds are excluded since they have different investment objectives. Compared to the mutual funds included in the study, the “market” that they will be compared should be different.

Out of 19 pension funds included, according to Capital Markets Board (CMB) reports, 10 are classified as growth oriented, 1 is classified as income oriented and 8 are classified as other. Other category consists of pension funds which hold at least 15% of its assets as stocks on average from January 2004 to December 2009. Consistent with the mutual funds excluded, funds that heavily invest in foreign securities are excluded.

There are 139 funds which are not included in the study though they meet our criteria. Those funds are the funds that do not have an observation for the whole January 2004 to December 2009 period. In other words, our data does not contain neither the funds issued after January 2004 nor the funds closed or merged before 2009. Especially the exclusion of non surviving funds can create a survivorship bias: One can argue that, funds that could not survive, usually don’t survive due to bad performance and hence, the exclusion of those funds and working with only surviving, successful funds can result in overestimated alphas. This issue will be analyzed separately.

Data is obtained from CMB’s monthly bulletins. CMB began issuing monthly fund prices with fund codes in January 2004. The reason to use the CMB monthly bulletins to create our own price series instead of any time series of fund prices available is, the CMB monthly bulletins includes all the funds available during that month while time series available in other sources include only the funds which are available today. So, CMB bulletins provide us a very important information that will be used in the calculation of survivorship bias: the price information of funds that could not manage to survive until December 2009.

4.2 Errors corrected

The data used are obtained from monthly CMB bulletins. The bulletins are prepared and distributed in MS excel. Since the data used in the study is gathered from considerable amount of monthly reports held in excel, it can be exposed to 3 different potential errors

1. Errors made by us during the consolidation of monthly reports
2. Errors made by CMB specialists during the preparation of the monthly bulletins
3. Changes in the codes in time that can go unnoticed

Main corrections made in the data are as follows:

1. Mutual fund prices in the February 2009 bulletin were incorrect so the February 2009 data was obtained from historical fund prices statistics page of CMB
2. Fund "EV1" price data was missing in the monthly bulletin for February and march 2005 and was obtained from historical fund prices
3. Fund "FYD" price data was missing in the monthly bulletin for June and July 2005 and was obtained from historical fund prices
4. Fund "IGH" price data was missing in the monthly bulletin for June 2008 was obtained from www.fonbul.com

5. Fund “TAD” price data was missing in the monthly bulletin for December 2006 and October 2007 was obtained from www.fonbul.com
6. Funds “TZD” and “YAD” price data were missing in the monthly bulletin for December 2008 and were obtained from www.fonbul.com
7. Fund “SMA” price data was missing in the monthly bulletin for January 2006 and was obtained from www.fonbul.com
8. Fund “MAD” price data was missing in the monthly bulletin for July 2007 and was obtained from www.fonbul.com
9. Fund “GPR” was coded as “BYD” in the monthly bulletin for months march, April and may 2004
10. Fund “YKA” was coded as “YHO” in the monthly bulletin for January, February, march, April and may 2004
11. Oyak Pension fund codes were mapped to appropriate ING pension fund codes until December 2008
12. Doğan Pension fund codes were mapped to appropriate Fortis Pension fund codes until October 2005
13. Commercial Union fund codes were mapped to appropriate Aviva fund codes until august 2004
14. Koç Allianz fund codes were mapped to appropriate Allianz fund codes until December 2008
15. Dışbank fund codes were mapped to appropriate Fortis Bank fund codes until November 2005
16. Oyakbank fund codes were mapped to appropriate ING Bank fund codes until may 2008
17. Bankeuropa fund codes were mapped to appropriate Millennium Bank fund codes until October 2007
18. C Bank fund codes were mapped to appropriate Bankpozitif fund codes until January 2006

5. Survivorship Bias

It is argued that, funds with bad performance disappear in time since the demand for those funds will decrease. It is expected that, funds that manage to survive a certain period tend to perform better than funds which could not manage to survive and disappeared. So, any analysis that only includes the surviving funds will overestimate the average performance.

Our data contains 80 funds that disappeared during the time period of January 2004 to December 2009. Some of those funds disappeared simply because the portfolio management company disappeared, some merged with others, some changed the investment objective and the code and some suspended due to performance or other reasons. Since we are working with only surviving funds, we should be aware of any possible bias that can rise due to exclusion of those non-surviving funds.

Blake and Timmermann (1998) has analyzed the survivorship bias for UK equity funds and found that there is 0.8% per annum survivorship bias on average. Gruber (1996) examines the US data for 1985 to 1994 and argues that non surviving funds underperform the market almost 5% per annum while all funds underperform only 2% per annum. Malkiel (1995) analyzed 1982 to 1991 period and calculated that the average yearly return for all equity funds existed (including non surviving funds) during the period was 15.69% while funds survived until 1994 was 17.09% indicating a survivorship bias of almost 1.5% return per annum. However, Grinblatt and Titman found very minor survivorship bias ranging from 0.1% to 0.4% per annum in alphas of US funds in the period of 1975 to 1984.

Blake and Timmermann (1998) had developed a measure for survivorship bias. They have simply calculated the difference between the average surviving funds return and the average return of all funds returns weighted with the number of surviving and non surviving funds, and divide it into number of observations to come up with a average survivorship bias:

$$Bias = \frac{1}{T}\sum_{t}\left(r_{s,t} - \frac{r_{n,t}n_{n,t} + r_{s,t}n_{s,t}}{n_{n,t} + n_{s,t}}\right) \quad (22)$$

where r stands for return, n stands for number of funds, t stands for number of time periods, and the subscripts n stands for non surviving and s stands for surviving funds. In this manner, $r_{n,t}$ means the average return for non surviving funds in time period t

We have calculated the Blake and Timmermann bias for our data. Funds taken into account (we will call the funds taken into analysis surviving funds from now on) performs on average 0.86% per annum better than the non surviving funds, consistent with the evidence of UK funds in means of both sign and level. Taking into account the high volatility in Turkish markets, the bias is very minor but still, indicates that the surviving funds performed slightly better than the non surviving funds.

We can also measure the survivorship bias by regression analysis and the alpha. Comparable to Jensen alpha, if there is a bias which indicates that the surviving funds perform better than non surviving ones consistently, we should receive statistically significant and positive alphas from the following equation:

$$r_{s,t} - r_{f,t} = \alpha + \beta(r_{n,t} - r_{f,t}) \quad (23)$$

where $r_{s,t}$ stands for the average return of surviving funds and $r_{n,t}$ stands for the average return of the non surviving funds and r_f is the risk free rate. The advantage is, while the Blake and Timmermann methodology provides us an survivorship bias, the regression provides an estimate of both the bias and its probability of significance. We have estimated the regression over 69 observations since for the last two periods (November and December 2009, there is no non-surviving fund data).

Table 2 - Survivorship bias results with non surviving funds as independent variable

Dependent Variable: SURVIVING-RF
Method: Least Squares
Date: 03/21/10 Time: 14:29
Sample (adjusted): 2004M02 2009M10
Included observations: 69 after adjustments
Newey-West HAC Standard Errors & Covariance (lag truncation=3)

Variable	Coefficient	Std. Error	t-Statistic	Prob.
NON_SURVIVING-RF	0.791756	0.112055	7.065794	0.0000
C	0.000117	0.002352	0.049862	0.9604

R-squared	0.838327	Mean dependent var	0.001100
Adjusted R-squared	0.835914	S.D. dependent var	0.050955
S.E. of regression	0.020641	Akaike info criterion	-4.894555
Sum squared resid	0.028544	Schwarz criterion	-4.829798
Log likelihood	170.8622	F-statistic	347.4174
Durbin-Watson stat	1.040930	Prob(F-statistic)	0.000000

The regression results in table 2 presents us two important information: First of all, the significant beta might indicate that, non surviving funds are less volatile than the surviving funds due to a beta of less than 1. This issue can be further analyzed thoroughly, however, since the volatility differences of surviving and non surviving funds is not our focus point, we do not. Second, and the more valuable information for us in means of survivorship bias is that, the p-value of the intercept (alpha) is 96%, which means that with 5% confidence, we cannot reject the hypothesis that the alpha is not different from zero. We can say that, according to the regression results, we can confidently decide that there is not any statistically significant survivorship bias.

We can also, test the equality of averages and the variances of surviving and the non surviving funds. If the test results indicate that both time series are equal on means of average and variances, we can assert that there is no significant bias resulting from excluding the non surviving funds. Panel 1 of table3 shows the result of equality test for means. Panel1 indicates that we cannot reject the null hypothesis that the two time series are equal with 98% probability. Panel 2 shows the results for equality of variances with various tests. All of the tests provide a p-value more than %10 which means that none of them provides us any evidence of differences of variances for surviving and non surviving funds.

Table 3 - Test of equality for surviving and non surviving funds for means and standard deviations

Panel1: Test for equality of means between series

Sample (adjusted): 2004M02 2009M10
Included observations: 69 after adjustments

Method	df	Value	Probability
t-test	136	0.015237	0.9879
Anova F-statistic	(1, 136)	0.000232	0.9879

Panel2: Test of equality of variances between series

Sample (adjusted): 2004M02 2009M10
Included observations: 69 after adjustments

Method	df	Value	Probability
F-test	(68, 68)	1.329617	0.2427
Siegel-Tukey		0.813331	0.4160
Bartlett	1	1.365091	0.2427
Levene	(1, 136)	0.936117	0.3350
Brown-Forsythe	(1, 136)	0.844639	0.3597

Turkish banking and insurance sector has gone through a serious consolidation process within our time frame. Due to changing managements and mergers, some funds could not manage to survive. We have tried to calculate the impact of survivorship bias on our data. Our first step was to calculate the Blake and Timmermann bias which provided us with an average %0.8 per annum return difference between surviving and non surviving funds, a minor difference compared to Turkish volatile stock markets. We have further tried to develop our own parametric test for survivor ship bias and the result was with %96 probability, surviving funds do not over perform non surviving counterparts. We further checked the equality of surviving and non surviving fund time series. Overall, with all the tests and measures taken into account, the results indicate that, Although it is minor, there is some survivorship bias yet, we do not have enough of evidence to prove it statistically.

Furthermore, Blake and Timmermann (1998) argue that funds slightly over perform after their issuance. Since we also do not include the funds that are issued after January 2004, besides the survivor ship bias due to exclusion of non surviving funds, we might be creating another bias due to exclusion of funds issued during the period. This bias can be called the exclusion bias – bias arising from exclusion of funds from our study and can be calculated with same tests used in survivorship bias calculations. So we have also repeated the tests argued above with all the funds excluded instead of only non surviving funds.

When the analysis is repeated with all excluded funds instead of non surviving funds, the average bias calculated with Blake and Timmermann tests decreases to %0.32 per annum and the equality tests still does not provide enough of evidence to affirm that means or variances of two series are different. the p-value of equation(23) is almost 30% and the value of the intercept is 0.0005. As a result we can still say that the data excluded does not create any economically or statistically significant bias on the results. Furthermore, the fact that there is no significant bias between included and excluded data is also important in the sense that any data excluded mistakenly during our consolidation efforts does not bias the results.

We have focused our calculations in this section on whether the data that we have included contains any bias compared to excluded or non surviving funds and concluded that even if there is any bias, it is small and ignorable.

We have also estimated regressions as described by Gruber (96) and compared the performance of included or excluded funds to test survivorship bias. Since the results are parallel with the results presented above, for simplicity, we did not present them. Untill this point we have discussed whether our data has any bias or not. But we also have enough of data to discuss whether there is any survivorship bias in Turkish fund management industry: All surviving funds versus the non surviving funds. Since this is not related to our current work, we will discuss the issue in appendix A.

6. Performance Measurement Models and Results

We will try to identify any stock picking ability for portfolio managers with various models. First model we will apply is the single index model. Then we will shift to market timing models of Henriksson - Merton and Treynor - Mazuy. Those models add a market timing component into the equation with the assumption that portfolio managers adjust their beta according to market expectations. Then, we will discuss multi factor models of Fama - French and Carhart. Those models argue that there are certain stock characteristics portfolio managers take into account during stock selection. Hence, any additional return over the market index due to passive strategies constructed on those characteristics should be eliminated from alpha by adding them as additional factors into the single index model. Models discussed until this point are unconditional models. Then we will apply the Ferson - Schadt framework to the models discussed above. Ferson – Schadt argues that beta is not constant and the fund managers adjust their betas according to publicly available information. Finally, we will also condition the alphas discussed above as described by Christopherson, Ferson and Glassman (1998)

Models that will be estimated for 65 funds and 1 equally weighted portfolio are discussed below:

6.1 Single Index Model

Single index model is developed by Jensen and is the most basic form. Jensen argues that, if a portfolio manager has any stock picking ability he will be constantly performing better than the market. That is, a regression between the excess returns of the fund and market will generate positive error terms. Jensen added a constant term to the regression, which we call the Jensen alpha, and created the equation (2).

The intercept of the equation (2) is the Jensen's alpha. The strength and the popularity of Jensen's alpha is because it provides an easy to calculate and absolute measure. A positive alpha of x% estimated over monthly data means, on average the fund manager beats the market by x% per month.

The exact definition of variables used in equation (2) is as follows:

$R_{ft} = \frac{P_{KYD30,t} - P_{KYD30,t-1}}{P_{KYD30,t-1}}$ Where $P_{KYD30,t}$ is the level of 30 days bond index issued by Turkish Institutional Investment Manager's Association at the end of month t

$\tilde{R}_{Mt} = \frac{P_{ISE100,t} - P_{ISE100,t-1}}{P_{ISE100,t-1}}$ Where $P_{ISE100,t}$ is the level of ISE100 index issued by Istanbul Stock Index at the end of month t

$\tilde{R}_{jt} = \frac{P_{j,t} - P_{j,t-1}}{P_{j,t-1}}$ Where $P_{j,t}$the price of the fund j as is published in the monthly bulletin of CMB at the end of month t. As discussed before, the prices used are after fees and expenses and thus the returns are net of fee and expenses.

There is a wide variety of Jensen's alpha applications throughout the world in different time periods. Jensen (1967) calculated the alpha for 115 equity funds in the period of 1945 to 1964. He found that on average funds underperform the market by 1.1% per annum. Jensen also stated that the histogram of alphas is skewed to the left where 76 of the funds have negative alphas. Later, Ippolito (1989) estimated the alphas for the fallowing 20 years – from 1965 to 1984 for 143 funds and found that, on average funds over performed the market by 0.81% per annum. Contrary to Jensen, Ippolito also found that 12 of the funds have significant positive alphas, while 4 have significant negative alphas. Malkiel (1995) estimated the single index model for surviving U.S. general equity funds in the period of 1972 to 1991 and found that on average the alpha is slightly negative but indifferent from zero with 5% confidence. He also analyzed the funds individually and found that almost same amount of funds are significantly positive and negative, 23 and 26 respectively. Cai, Chan and Yamada (1997) applied the single index model to 64 Japanese mutual funds in the period of 1981 to 1992. According to their results, out of 64 funds, 61 have negative alphas where 30 of them are significant with 5% significance. Christensen (2005) applied the single index model, to 47 Danish funds in the time period of January 1996 to June 2003. He concluded that mainly, alphas are negative but insignificant. There are only 6 funds with alphas different form zero with 5% significance, where all of them are negative. Later, Abdel-Kader and Qing (2007) applied the single index to 30 funds in the period of 1995 to 2005. They have grouped 30 funds into 5 types. They have found that, all fund types generated negative alphas where 4 of them are significant with %5 confidence.

According to our single index results, the monthly average alpha is -0.22%. which can be interpreted as that on average, the fund managers underperform the market by almost %2.64 per annum. Out of 66, there are 48 funds with negative alphas. The alphas change from 1.38% to -1.74%. Out of 66 alphas estimated only 22 of them are significantly different from zero with %90 probability. Out of those 22 only 2 are positive. Positively significant funds are AH0 and ST1. On average, single index model explains %72 of the fluctuations in equity funds.

Table 4 - Single Index Model Results – Equation (2)

	Adjusted R^2	α		β	
AVERAGE	86.24%	-0.23%		52.16%	+++
AAK	58.06%	-0.41%		32.10%	+++
ACD	68.99%	-0.87%	+++	32.65%	+++
ADD	44.00%	-0.07%		43.12%	+++
ADF	84.79%	-0.24%		50.14%	+++
AE3	85.41%	-0.02%		33.69%	+++
AH0	69.91%	0.68%	++	43.50%	+++
AH5	87.13%	0.32%		85.94%	+++
AH9	77.45%	0.14%		28.00%	+++
AK3	87.49%	-0.16%		74.90%	+++
AN1	70.57%	-0.29%		60.70%	+++
ANE	74.82%	-0.13%		33.58%	+++
ANS	86.62%	0.21%		87.29%	+++
ASA	75.15%	-0.30%		65.61%	+++
AVD	68.85%	-0.10%		28.32%	+++
AVE	61.97%	-0.03%		25.16%	+++
AZB	73.36%	0.04%		29.30%	+++
BEE	59.16%	-0.09%		22.54%	+++
BEH	84.26%	-0.24%		78.84%	+++
DAH	72.20%	-0.35%		58.53%	+++
DZA	69.09%	-0.35%		40.41%	+++
DZK	67.75%	-0.07%		23.49%	+++
EC2	77.63%	-0.90%	+++	48.62%	+++
EV1	52.69%	0.49%		54.11%	+++
FAF	83.75%	0.44%		78.00%	+++
FEE	69.76%	-0.31%	++	34.14%	+++
FI2	77.53%	-0.25%		58.87%	+++
FYD	77.87%	0.36%		64.40%	+++
FYK	73.04%	0.00%		35.59%	+++
GAF	67.43%	-0.92%	+	66.87%	+++
GAK	62.74%	-0.65%	++	38.03%	+++
GBK	61.91%	-0.82%	+++	39.04%	+++
GEH	87.98%	-0.07%		85.15%	+++
GL1	53.18%	-1.12%	+++	34.78%	+++
HLK	65.34%	-0.11%		31.78%	+++
HSA	83.70%	-0.22%	+	42.46%	+++
IEH	75.47%	0.09%		82.36%	+++
IEK	75.39%	0.22%		38.62%	+++
IGH	74.31%	-0.61%	++	55.94%	+++
IYD	78.33%	-0.41%		58.87%	+++
MAD	54.75%	-1.74%	+++	49.29%	+++

Table 4 (cont.)

SAD	76.07%	-0.82%	+++	43.25%	+++
SMA01	52.18%	-0.59%	+	44.42%	+++
ST1	66.76%	1.38%	++	83.08%	+++
TAD	61.35%	-0.74%	+++	23.39%	+++
TAH	71.53%	0.33%		64.77%	+++
TCD	79.73%	-0.84%	+++	49.72%	+++
TE3	80.93%	-0.38%	++	48.01%	+++
TI2	84.97%	-0.20%		70.23%	+++
TI3	69.94%	0.01%		73.30%	+++
TI7	72.39%	-0.36%		47.24%	+++
TKF	67.45%	-0.07%		39.22%	+++
TKK	79.85%	-0.02%		37.44%	+++
TUD	37.64%	-0.41%		76.67%	+++
TYH	84.15%	-0.25%		78.60%	+++
TZD	75.75%	-0.46%	+++	37.96%	+++
TZK	79.85%	-0.28%		40.78%	+++
VAF	79.21%	-0.35%	++	46.30%	+++
VEE	60.73%	0.01%		17.71%	+++
VEH	82.72%	0.23%		79.86%	+++
YAD	64.53%	-0.68%	++	45.23%	+++
YAF	79.59%	-0.28%	+	41.25%	+++
YAK	80.73%	-0.19%		42.32%	+++
YEE	48.13%	0.13%		18.56%	+++
BZA	71.16%	-0.85%	+	74.23%	+++
YEH	86.00%	0.11%		85.99%	+++
Average	72.11%	-0.22%		50.55%	
Max	87.98%	1.38%		87.29%	
Min	37.64%	-1.74%		17.71%	

+ significant at %90 confidence

++ significant at %95 confidence

+++ significant at %99 confidence

As discussed before, $E(\hat{\beta}_j)$ is upward biased thus, the Jensen's alpha is actually downward biased. The regression results show significant and positive betas so we might be underestimating the alpha of Turkish fund managers. The details of the results are presented below.

6.2 Henriksson – Merton Model

Henriksson – Merton model was developed in order to identify any market timing ability. The beta of the single index model provides us with a measure for market sensitivity. If the beta is high, the fund will be affected from the market fluctuations more and vice versa. If the fund manager has timing ability, then he will increase his beta in good times and decrease it in bad times. Henriksson and Merton assume that, fund managers can predict the direction of the market, but not the magnitude. In other words, fund managers receive a signal for the state of the market in a binary form: either good or bad. The form of the equation (8) estimated is as follows:

$$\widetilde{R}_{jt} - R_{ft} = \alpha_j + \beta_{1j}(\widetilde{R}_{Mt} - R_{ft}) + \beta_{2j}[D(\widetilde{R}_{Mt} - R_{ft})] + \tilde{e}_{jt} \qquad (24)$$

Where, $D = \begin{cases} 0, & \tilde{R}_{Mt} - R_{ft} < 0 \\ 1, & \tilde{R}_{Mt} - R_{ft} \geq 0 \end{cases}$

Henriksson and Merton argues that, while alpha provides us a stock picking ability, a positive and significant β_2 means that the fund manager can change his market exposure so that he can time the market.

Henriksson (1984) analyzed 116 open end mutual funds within the period of 1968 to 1980. Henriksson states that the alpha is slightly lower when the market timing component is ignored and single index model is used. Henriksson also found out that only 3 funds have significantly positive β_2 which means U.S. fund managers does not have any timing ability – a result in line with our findings. Christensen (2005) applied the Henriksson – Merton model to 47 Danish funds in the time period of January 1996 to June 2003. He found that; although the alphas do not change much, the average alpha slightly decreases from -0.58 to -1.02. He also concluded that the Danish market does not have any timing ability.

With the addition of a market timing component to the single index model, the average alpha has increased to 0.65% which means a yearly over performance of almost 7.8%. contrary to the single index model results, 36 of the funds generated significant alphas where half of them are significantly positive. And the alphas ranged from -0.70% to 3.55%. Market timing results show that on average, the market timing is negative. There are 38 funds with significant timing variable where all of them are negative. The results indicate that, Turkish mutual funds have stock picking ability. But they lack timing. Due to a missing timing component the alpha seems negative in CAPM, but with the addition of timing component in Henriksson – Merton model, alpha shifts to positive while the timing ability is negative. In other words, we can say that with the addition of a market timing component, the number of significantly negative alphas has declined dramatically. This can be due to market timing inefficiencies decomposed from alpha with the addition of a market timing component. The results for Henriksson – Merton model are presented in table (5)

Table 5 - Henriksson - Merton Model Results – Equation (24)

	Adjusted R^2	α		β_1		β_2	
AVERAGE	87.78%	0.63%	+	63.52%	+++	-22.50%	+++
AAK	64.24%	0.90%		49.38%	+++	-34.21%	+++
ACD	76.78%	0.53%	+	51.17%	+++	-36.69%	+++
ADD	46.29%	0.96%		56.82%	+++	-27.12%	
ADF	85.87%	0.42%		58.97%	+++	-17.49%	++
AE3	85.71%	0.12%		35.56%	+++	-3.68%	
AH0	70.38%	0.83%		45.42%	+++	-3.80%	
AH5	87.40%	0.68%		90.71%	+++	-9.43%	
AH9	77.81%	0.05%		26.86%	+++	2.26%	
AK3	87.81%	0.23%		80.12%	+++	-10.33%	
AN1	75.01%	1.61%	++	85.87%	+++	-49.84%	+++
ANE	76.09%	0.36%	+	40.01%	+++	-12.74%	++
ANS	87.72%	1.39%	+++	102.86%	+++	-30.83%	+++
ASA	78.82%	1.51%	++	89.58%	+++	-47.45%	+++
AVD	69.37%	0.03%		30.02%	+++	-3.37%	
AVE	62.73%	0.17%		27.74%	+++	-5.10%	
AZB	74.12%	0.31%		32.96%	+++	-7.25%	
BEE	62.17%	0.50%	+	30.45%	+++	-15.67%	+
BEH	85.82%	1.06%	+	96.09%	+++	-34.17%	++
DAH	73.32%	0.42%		68.72%	+++	-20.18%	
DZA	70.12%	0.14%		46.89%	+++	-12.82%	
DZK	68.50%	-0.27%		20.81%	+++	5.31%	
EC2	78.38%	-0.42%		54.93%	+++	-12.50%	
EV1	58.71%	2.74%	+++	84.00%	+++	-59.17%	+++
FAF	83.98%	0.46%		78.23%	+++	-0.46%	
FEE	73.31%	0.63%		46.67%	+++	-24.82%	++
FI2	79.43%	0.85%		73.50%	+++	-28.97%	+
FYD	78.28%	0.64%		68.12%	+++	-7.37%	
FYK	74.84%	0.65%	+	44.22%	+++	-17.08%	+
GAF	70.82%	0.90%		91.07%	+++	-47.92%	+++
GAK	67.29%	0.61%		54.73%	+++	-33.08%	+++
GBK	66.94%	0.56%		57.29%	+++	-36.13%	+++
GEH	88.73%	0.84%		97.20%	+++	-23.87%	++
GL1	63.85%	0.85%		60.92%	+++	-51.77%	+++
HLK	69.89%	0.93%	++	45.55%	+++	-27.26%	+++
HSA	84.60%	0.27%		49.07%	+++	-13.09%	
IEH	76.42%	1.05%		95.09%	+++	-25.21%	
IEK	75.88%	0.00%		35.74%	+++	5.71%	
IGH	75.26%	0.05%		64.61%	+++	-17.17%	++
IYD	79.93%	0.58%		72.02%	+++	-26.03%	++

Table 5 (Cont.)

MAD	56.82%	-0.70%		63.10%	+++	-27.35%	+
SAD	78.01%	0.00%		54.15%	+++	-21.58%	
SMA01	58.76%	1.36%	++	70.29%	+++	-51.22%	+++
ST1	69.90%	3.55%	+++	111.90%	+++	-57.07%	+
TAD	63.25%	-0.29%		29.41%	+++	-11.93%	+
TAH	73.93%	1.74%	++	83.59%	+++	-37.26%	++
TCD	81.80%	0.13%		62.67%	+++	-25.63%	+++
TE3	83.37%	0.65%		61.72%	+++	-27.14%	++
TI2	85.54%	0.40%		78.16%	+++	-15.69%	
TI3	71.74%	1.36%		91.15%	+++	-35.34%	++
TI7	73.98%	0.43%		57.81%	+++	-20.93%	
TKF	69.29%	0.66%		48.94%	+++	-19.25%	+
TKK	81.33%	0.58%	++	45.43%	+++	-15.83%	
TUD	40.40%	1.81%		106.09%	+++	-58.25%	
TYH	84.56%	0.22%		84.85%	+++	-12.37%	
TZD	77.97%	0.32%		48.35%	+++	-20.58%	++
TZK	83.76%	0.86%	+++	55.90%	+++	-29.95%	+++
VAF	80.92%	0.46%		57.06%	+++	-21.32%	++
VEE	62.99%	0.40%	++	22.85%	+++	-10.18%	++
VEH	83.23%	0.82%		87.76%	+++	-15.64%	
YAD	70.42%	1.03%	+	67.92%	+++	-44.94%	+++
YAF	80.44%	0.17%		47.23%	+++	-11.84%	
YAK	81.01%	-0.13%		43.15%	+++	-1.63%	
YEE	49.17%	0.32%		21.08%	+++	-4.98%	
BZA	74.64%	1.17%		101.02%	+++	-53.04%	+++
YEH	86.55%	0.84%		95.62%	+++	-19.05%	+
Average	74.31%	0.65%		62.13%		-22.93%	
Max	88.73%	3.55%		111.90%		5.71%	
Min	40.40%	-0.70%		20.81%		-59.17%	

+ significant at %90 confidence

++ significant at %95 confidence

+++ significant at %99 confidence

6.3 Treynor – Mazuy Model

Main difference of Treynor - Mazuy model compared to Henriksson – Merton model is that the Treynor – Mazuy assumes the fund manager can not only predict the direction, but also predicts the magnitude of the market. They argue that, the fund manager adjusts his beta according to the market return thus, he will increase his beta in good times and decrease it in bed times. They formulae the relation as follows:

$$\beta = \beta_1 + \beta_2\left(\tilde{R}_{Mt} - R_{ft}\right) \quad (25)$$

Where, the β consists of two components; one constant and one changing according to market return. Adding equation (25) into the equation (2) provides us the Treynor Mazuy model as in equation (7).

Cai, Chan and Yamada (1997) had applied the Treynor – Mazuy model to the Japanese mutual funds. They have found that, compared to the single index model, alphas increased with the addition of a timing component. In other words, they indicated that part of the negative alpha performance is actually due to the negative timing ability. On the other hand, Dahlquist, Engström and Söderlind (2000) for Swedesh fund market and Christensen (2005) for Danish fund market did not find any significant effect of timing component on the alphas.

Table 6 - Treynor - Mazuy Model Results – Equation (7)

	Adjusted R^2	α		β_1		β_2	
AVERAGE	87.37%	0.20%		52.23%	+++	-48%	+++
AAK	64.66%	0.33%		32.22%	+++	-84%	+++
ACD	76.49%	-0.15%		32.76%	+++	-83%	+++
ADD	43.98%	0.30%		43.18%	+++	-43%	
ADF	85.29%	0.06%		50.19%	+++	-35%	++
AE3	85.23%	0.02%		33.70%	+++	-5%	
AH0	69.50%	0.62%	++	43.49%	+++	7%	
AH5	86.94%	0.36%		85.95%	+++	-5%	
AH9	77.30%	0.05%		27.98%	+++	10%	
AK3	87.44%	0.03%		74.93%	+++	-22%	
AN1	75.28%	0.77%	+	60.87%	+++	-122%	+++
ANE	75.10%	0.08%		33.61%	+++	-23%	++
ANS	87.12%	0.72%	++	87.37%	+++	-59%	+++
ASA	79.22%	0.73%	+	65.79%	+++	-119%	+++
AVD	68.43%	-0.06%		28.33%	+++	-5%	
AVE	61.55%	0.05%		25.18%	+++	-9%	
AZB	73.59%	0.21%		29.33%	+++	-20%	
BEE	60.11%	0.14%		22.58%	+++	-27%	
BEH	85.21%	0.37%		78.94%	+++	-69%	+
DAH	72.06%	-0.12%		58.57%	+++	-27%	
DZA	69.12%	-0.13%		40.45%	+++	-25%	
DZK	67.71%	-0.19%		23.47%	+++	14%	
EC2	77.61%	-0.70%	+++	48.65%	+++	-23%	
EV1	58.94%	1.76%	+++	54.32%	+++	-146%	+++
FAF	83.53%	0.37%		77.99%	+++	8%	
FEE	73.62%	0.24%		34.23%	+++	-63%	+++
FI2	79.16%	0.36%		58.97%	+++	-70%	++
FYD	77.56%	0.41%		64.41%	+++	-6%	
FYK	74.54%	0.38%		35.65%	+++	-43%	++
GAF	70.24%	0.03%		67.03%	+++	-110%	+++
GAK	66.47%	-0.01%		38.13%	+++	-74%	+++
GBK	67.40%	-0.03%		39.17%	+++	-91%	+++
GEH	88.39%	0.38%		85.23%	+++	-52%	++
GL1	65.47%	-0.01%		34.96%	+++	-128%	+++
HLK	70.13%	0.48%		31.88%	+++	-67%	+++
HSA	84.09%	0.01%		42.50%	+++	-27%	
IEH	75.23%	0.30%		82.39%	+++	-24%	
IEK	75.33%	0.06%		38.60%	+++	18%	
IGH	74.53%	-0.28%		56.00%	+++	-38%	++
IYD	79.05%	0.03%		58.95%	+++	-51%	+

Table 6 (Cont.)

MAD	55.90%	-1.16%	+	49.38%	+++	-67%	+
SAD	78.04%	-0.33%		43.33%	+++	-56%	+
SMA01	58.50%	0.47%		44.59%	+++	-121%	+++
ST1	68.55%	2.37%	+++	83.25%	+++	-114%	
TAD	62.50%	-0.49%	++	23.43%	+++	-29%	++
TAH	73.58%	1.11%	+	64.90%	+++	-90%	++
TCD	81.06%	-0.38%	+	49.80%	+++	-53%	+++
TE3	82.89%	0.14%		48.10%	+++	-60%	++
TI2	85.10%	0.09%		70.28%	+++	-34%	
TI3	70.75%	0.65%		73.41%	+++	-73%	++
TI7	73.18%	0.03%		47.30%	+++	-45%	
TKF	68.56%	0.32%		39.28%	+++	-45%	++
TKK	80.65%	0.27%		37.49%	+++	-33%	
TUD	39.89%	1.02%		76.90%	+++	-164%	
TYH	84.03%	-0.06%		78.63%	+++	-21%	
TZD	76.52%	-0.16%		38.01%	+++	-35%	
TZK	83.03%	0.28%		40.87%	+++	-63%	+++
VAF	80.59%	0.09%		46.37%	+++	-50%	+++
VEE	61.52%	0.18%		17.74%	+++	-20%	+
VEH	82.64%	0.46%		79.90%	+++	-27%	
YAD	70.45%	0.25%		45.38%	+++	-106%	+++
YAF	79.82%	-0.06%		41.28%	+++	-25%	+
YAK	80.45%	-0.16%		42.33%	+++	-3%	
YEE	47.92%	0.26%		18.59%	+++	-15%	+
BZA	73.16%	0.04%		74.38%	+++	-102%	++
YEH	86.05%	0.42%		86.05%	+++	-35%	
Average	73.72%	0.21%		50.62%		-49.56%	
Max	88.39%	2.37%		87.37%		18.25%	
Min	39.89%	-1.16%		17.74%		-164.16%	

+ significant at %90 confidence

++ significant at %95 confidence

+++ significant at %99 confidence

Results are consistent with Henriksson Merton model. The timing component has explanatory power with 90% significance for 37 funds. However, for all the significant funds, the timing component is negative indicating that the Turkish fund managers do not have any timing ability. The average alpha significantly increases from -0.22% per month to 0.21%. Out of 67 funds, only 11 have alphas significantly different from zero where 7 of them are positive and 4 of them are negative. Consistent with the Henriksson – Merton results, According to Treynor – Mazuy model results, it seems like Turkish fund managers actually have positive alphas. But, the timing inability masks this and the exclusion of timing component in the model results a negative alpha.

6.4 Fama – French Three Factor Model

Fama and French (1993) argues that fund managers can create passive investment strategies depending on certain fund characteristics and those should be added to the model as variables in order to decompose their effect from the alpha. For this purpose, Fama and French adds two additional variables to the single index model: SMB and HML. SMB stands for "small minus big" and identifies strategies based on firm size. HML stands for "High minus low" and stands for strategies depending on the valuation.

Fama and French, calculates the market equity (price times number of shares) for all NYSE securities. Then, according to the median, stocks are split into "big" and "small" (B for big and S for small). Then, stocks are also divided into three groups according to their book to market equity ratio (BE/ME). The %30 highest firms are called high group (denoted with H), next %40 of the firms are called medium group (denoted with M) and the last %30 of the firms are called low group (denoted with L). Book equity (BE) is calculated as the book value of the equity plus deferred taxes plus the investment tax credit minus the preferred stocks. Firms with negative book to market equity are excluded. Fama and French constructs six portfolios which are the combinations of groups formed according to market equity and book to market equity: B/H, B/M, B/L, S/H, S/M, and S/L. For example the group S/M consist of securities which are classified as "S" according to market equity and classified as "M" according to book to market equity. BE and BE/ME are calculated year end for the year $t-1$ but the portfolios are formed in june of year t. The six month lag (BE and ME is calculated year end, but the portfolios are formed in June) is due to the fact that the information is meant to be used by investors with a certain lag. The returns are calculated for each portfolio as value weighted.

SMB and HML are combinations of simple differences of the average return of certain portfolios and are formulated as follows:

$$HML = \frac{(S/H + B/H)}{2} - \frac{(S/L + B/L)}{2} \qquad (26)$$

$$SMB = \frac{(S/L + S/M + S/H)}{3} - \frac{(B/L + B/M + B/H)}{3} \qquad (27)$$

Fama and French (1996) compared the three factor model and the single index model for the period of July 1963 to December 1993 for various different portfolios formed. They have found that the addition of SMB and HML significantly increases the R^2. They have also found that the addition of the SMB and HML variables significantly converge the alpha to zero. Cai, Chan and Yamada (1997) compared the single index model and the three factor model for the Japanese market and concluded that, the underperformance of alpha in the single index model cannot be explained by the addition of SMB and HML variables. However, Cai at al. also indicated that both the coefficient of SMB and HML has a negative sign indicating that the Japanese fund managers prefer Big and low book to market equity firms. Malin and Veeraraghavan (2004) searched the robustness of the three factor model for French, German and UK for the period of 1992 (For UK, 1991) to 2001. Malin et al. found that the SMB and HML has explanatory power on stock returns and hence, the performance of portfolio managers should be evaluated with three factor model compared to single index model. Abdel-Kader and Qing (2007) applied the three factor model to 30 funds in the period of 1995 to 2005 for Hong Kong market. They have found that both the average alpha and explanatory power of the model improves with the addition of HML and SMB variables compared to the single index model. But, even with the three factor model, the average alphas are negative. Abdel-Kader and Qing also found that the coefficient of SMB is positive and the coefficient of HML is negative. Indicating the Hong Kong mutual fund managers prefer small stocks to large ones and low BE/ME stocks to higher ones. Gökgöz (2008) searched for explanatory evidence of SMB and HML over various ISE indexes. He studied the period of 2001 to 2006 and found that both the SMB and HML have explanatory power over the returns on the ISE indexes and thus can be used for various passive investment strategies by investors. He also found that the coefficients of HML and SMB are both positive.

We have calculated the HML and SMB for Turkish stock market in a way very similar to Fama and French methodology. Both the market equity and the book to market equity ratios for firms that have stocks trading in ISE are publicly available from the web site of ISE on a yearly basis for year end. The steps of calculating SMB and HML for Turkish stock market are as follows:

1. We have downloaded the market equity and book to market equity ratios for the year ends from 2003 to 2009 from the web site of ISE for all stocks.
2. For yearend 2003, from the database constructed in step 1, we call the market equity figures for stocks that were available at 2003 year end.
3. Then we calculate the median for the array generated in step 2
4. We have assigned “B” for stocks with a market equity which is higher than the median and “S” for the stocks with a market equity which is lower than the median.

5. We repeat the step 2, but instead of market equity, this time we call the book to market equity ratio.
6. For the array generated in step 5, we have calculated the 0.70th and 0.30th percentiles.
7. For stocks with a book to market ratio higher than the 0.70th percentile, we assign "H", for stocks with a book to market equity between the 0.70th and .30th percentiles, we assign "M", for stocks with a book to market equity lower than the 0.30th percentile, we assign "L".
8. So, every fund is assigned to one of six portfolios constructed from the letters indicating either the size or the book to market equity groups: S/H, S/M, S/L, B/H, B/M, and B/L. For example, if a certain stock is assigned "S" in step 4 and "H" in step 8, then this stock is assigned into the portfolio of "S/H" for yearend 2003.
9. Within each portfolio, we calculated the weight of each fund included in the portfolio according to market equity. For example, if the market equity of stock ABC, which is assigned into the portfolio "S/H" is 100 TL, and the total market value of stocks assigned into "S/H" portfolio is 150.000 TL, than, the weight of stock ABC will be $100/150.000\ = 0.067\%$
10. For yearend 2003, a matrix with 3 columns is created with stock name in column 1, assigned portfolio in column 2 and the weight in column 3.
11. We repeated the above process (steps 2 to 10) for each year.
12. Price data for every stock trading in ISE for month ends are downloaded from the ISE web site and monthly returns are calculated between February 2004 and December 2009.
13. Returns between July of year t to june of year $t + 1$ are assigned into portfolios according to the portfolios formed in step 11 for year end $t - 1$. Six month lag is due to the fact that the information is available to investors with a certain lag.

14. Also, the returns are multiplied by the column 3 of the array constructed in step11 for weighting purposes.
15. Then the weighted average return for every portfolio is calculated by summing the results of step14 for the stocks included in the relevant portfolio.
16. SMB and HML for the month is calculated by using equations (26) and (27).
17. Steps 12 to 16 are repeated for every month from February 2004 to December 2009

We have found that the average alpha slightly decreases from -0.22% to -0.19%. There are 21 funds with an alpha significantly different from zero and 19 of them are negative. The only significantly positive alpha generating funds are AH0 and ST1. Also, the adjusted R^2 of the model slightly increases to 73.74%. Out of 66 funds, the SMB is significant for 27 and the HML is significant for 21funds, indicating that the strategies depending on firms size and the value are used by a certain amount of Turkish portfolio managers. The average coefficient for SMB is 3.63% while it is -4.88% for HML. The coefficient for SMB variable is negative for only 8 funds while it is negative for 52 funds. Those results indicate that the Turkish fund managers favor small and low book to market equity funds.

Table 7 - Fama - French Model Results – Equation (10)

	Adjusted R^2	α		β_1		β_2		β_3	
AVERAGE	87.20%	-0.20%		53.55%	+++	3%	+++	-5%	+
AAK	63.21%	-0.36%		33.97%	+++	5%	+++	-9%	++
ACD	75.15%	-0.83%	+++	35.51%	+++	6%	+++	-4%	
ADD	43.19%	-0.06%		44.98%	+++	4%		1%	
ADF	85.04%	-0.22%		50.82%	+++	2%		-4%	
AE3	85.11%	-0.03%		33.49%	+++	-1%		1%	
AH0	69.43%	0.68%	++	44.39%	+++	2%		3%	
AH5	86.77%	0.32%		86.19%	+++	1%		-1%	
AH9	77.62%	0.13%		28.04%	+++	0%		3%	
AK3	87.69%	-0.14%		75.90%	+++	3%		-5%	
AN1	75.37%	-0.22%		64.43%	+++	9%	+++	-12%	++
ANE	74.76%	-0.13%		34.47%	+++	2%		2%	
ANS	86.87%	0.24%		89.08%	+++	4%		-5%	
ASA	79.04%	-0.23%		69.08%	+++	8%	+++	-12%	++
AVD	67.95%	-0.10%		28.35%	+++	0%		1%	
AVE	60.88%	-0.03%		24.98%	+++	0%		0%	
AZB	72.85%	0.03%		29.54%	+++	0%		2%	
BEE	58.50%	-0.10%		21.87%	+++	-1%		-1%	
BEH	86.16%	-0.18%		80.19%	+++	4%	++	-14%	+++
DAH	72.95%	-0.31%		59.08%	+++	2%		-10%	++
DZA	69.30%	-0.33%		39.82%	+++	-1%		-6%	
DZK	67.15%	-0.07%		23.24%	+++	0%		-2%	
EC2	77.05%	-0.90%	+++	48.98%	+++	1%		2%	
EV1	70.43%	0.62%		61.94%	+++	18%	+++	-19%	+++
FAF	83.33%	0.45%		78.30%	+++	1%		-2%	
FEE	70.41%	-0.29%	+	35.18%	+++	3%	++	-4%	
FI2	80.08%	-0.20%		61.76%	+++	7%	++	-7%	
FYD	78.59%	0.39%		64.65%	+++	1%		-10%	+
FYK	72.83%	0.01%		36.56%	+++	2%		0%	
GAF	73.31%	-0.83%	++	70.07%	+++	8%	+++	-20%	+++
GAK	64.98%	-0.61%	++	39.35%	+++	3%	+	-8%	++
GBK	63.66%	-0.79%	++	41.32%	+++	5%	++	-3%	
GEH	87.79%	-0.06%		85.18%	+++	0%		-4%	
GL1	56.90%	-1.08%	+++	37.30%	+++	6%	++	-7%	++
HLK	73.60%	-0.06%		34.64%	+++	7%	+++	-7%	++
HSA	84.60%	-0.20%		43.86%	+++	3%	+++	-3%	
IEH	75.25%	0.11%		82.18%	+++	0%		-8%	
IEK	75.50%	0.23%		38.04%	+++	-1%		-5%	
IGH	74.40%	-0.58%	+	57.47%	+++	3%	++	-3%	
IYD	79.56%	-0.38%		61.31%	+++	5%	++	-4%	

Table 7 (Cont.)

MAD	57.13%	-1.69%	+++	51.92%	+++	6%	+	-10%	++
SAD	76.89%	-0.79%	+++	44.41%	+++	3%		-5%	
SMA01	59.32%	-0.53%	+	49.71%	+++	11%	+++	-3%	
ST1	80.92%	1.54%	+++	90.40%	+++	18%	+++	-33%	+++
TAD	60.53%	-0.74%	+++	23.70%	+++	1%		-1%	
TAH	74.51%	0.39%		66.37%	+++	5%		-16%	+++
TCD	79.46%	-0.84%	+++	50.56%	+++	2%		3%	
TE3	80.52%	-0.37%	++	48.53%	+++	1%		-1%	
TI2	84.60%	-0.19%		70.29%	+++	0%		-2%	
TI3	73.62%	0.09%		77.33%	+++	10%	+++	-13%	+
TI7	72.28%	-0.34%		48.28%	+++	2%		-3%	
TKF	67.60%	-0.05%		40.71%	+++	3%		-1%	
TKK	79.78%	-0.02%		38.15%	+++	1%		3%	
TUD	38.85%	-0.39%		83.04%	+++	12%	++	12%	
TYH	84.43%	-0.22%		79.41%	+++	2%		-8%	
TZD	77.64%	-0.43%	+++	39.02%	+++	3%	++	-7%	++
TZK	80.60%	-0.25%		41.24%	+++	1%		-6%	++
VAF	79.51%	-0.34%	+	47.80%	+++	3%	++	-1%	
VEE	59.88%	0.02%		18.10%	+++	1%		0%	
VEH	83.76%	0.28%		82.15%	+++	5%	++	-8%	+
YAD	66.12%	-0.65%	++	48.06%	+++	6%	++	1%	
YAF	79.09%	-0.28%	+	40.86%	+++	-1%		-1%	
YAK	81.19%	-0.18%		42.14%	+++	0%		-6%	
YEE	47.18%	0.13%		19.10%	+++	1%		2%	
BZA	80.70%	-0.73%	+	80.36%	+++	15%	+++	-20%	+++
YEH	86.61%	0.15%		87.18%	+++	3%		-9%	++
Average	73.74%	-0.19%		52.09%		3.63%		-4.88%	
Max	87.79%	1.54%		90.40%		18.06%		12.18%	
Min	38.85%	-1.69%		18.10%		-1.34%		-32.70%	

+ significant at %90 confidence
++ significant at %95 confidence
+++ significant at %99 confidence

6.5 Carhart Four Factor Model

Carhart (1997) improves the Fama – French model with a fourth factor used to explain momentum related strategies. The variable used for this purpose is called PR1YR indicating "prior one year". Carhart, concluded that the PR1YR has explanatory power over the variations in fund returns. Fant – Peterson (1995) also investigated the effect of prior returns and consistent with Carhart, concluded that the prior returns have explanatory power over return variations.

We have calculated the PR1YR as it is described by Carhart. The steps are described below:

1. First, for every stock, we have calculated the prior 11 month return with the following equation:

$$r_{j,prior} = \left[\prod_{n=1}^{11}(1 + r_{j,t-n})\right] - 1 \qquad (28)$$

where $r_{j,t-n}$ is the return of the stock j for the month $t - n$.

2. Then, we ranked the stocks according to their 11 month returns which is $r_{j,prior}$ and calculated above.
3. we formed two portfolios consist of stocks with best 30% and worst 30% $r_{j,prior}$
4. we calculated the return of both portfolios as the simple average return of the stocks included in portfolios for month t
5. we take the difference of the returns for two portfolios calculated above to reach the PR1YR for month t

According to our results, average alpha for the four – index model is -0.19% similar to 3 factor model of Fama and French. Out of 21 significant alphas, 2 are positive and 19 are negative. Positive alphas are ST1 and AH0. Out of 66 funds, SMB has explanatory power for 29, HML has explanatory power for 21 and PR1YR has explanatory power for only 9 of them. The average coefficient of SMB and HML are very similar to three factor model of Fama – French, 3.63% and -4.85% respectively. PR1YR is economically insignificant with an average coefficient of only -0.30%.

Table 8 - Carhart 4 Factor Model Results – Equation (12)

	Adjusted R^2	α		β_1		β_2		β_3		β_4	
AVERAGE	87.00%	-0.20%		53.50%	+++	3.31%	+++	-4.74%	+	-0.32%	
AAK	64.75%	-0.33%		35.89%	+++	5.43%	+++	-10.32%	+++	10.82%	++
ACD	74.99%	-0.82%	+++	36.10%	+++	6.60%	+++	-4.29%	+	3.27%	
ADD	42.76%	-0.04%		46.32%	+++	4.38%		0.20%		7.52%	
ADF	84.85%	-0.22%		51.14%	+++	1.92%		-4.50%		1.79%	
AE3	84.93%	-0.03%		33.26%	+++	-0.63%		1.39%		-1.30%	
AH0	71.23%	0.65%	++	41.91%	+++	0.67%		4.19%		-13.93%	++
AH5	86.93%	0.30%		84.43%	+++	-0.08%		-0.11%		-9.90%	
AH9	77.78%	0.12%		27.33%	+++	-0.46%		3.90%		-4.00%	
AK3	87.67%	-0.15%		74.85%	+++	2.13%		-4.72%		-5.93%	
AN1	75.14%	-0.20%		65.29%	+++	9.19%	+++	-12.63%	++	4.83%	
ANE	74.83%	-0.11%		35.30%	+++	2.03%	+	1.74%		4.67%	
ANS	86.74%	0.23%		88.31%	+++	3.84%		-4.17%		-4.32%	
ASA	78.91%	-0.21%		70.10%	+++	8.66%	+++	-12.38%	+++	5.70%	
AVD	69.91%	-0.13%		26.67%	+++	-0.66%		1.77%		-9.49%	++
AVE	61.57%	-0.05%		23.84%	+++	-0.84%		0.83%		-6.43%	
AZB	72.97%	0.04%		30.33%	+++	0.64%		1.60%		4.45%	
BEE	62.27%	-0.07%		23.81%	+++	-0.58%		-2.00%		10.91%	+++
BEH	85.95%	-0.18%		80.31%	+++	4.00%	++	-13.91%	+++	0.67%	
DAH	72.56%	-0.31%		59.42%	+++	2.07%		-9.81%	++	1.91%	
DZA	71.88%	-0.37%		37.14%	+++	-1.82%		-4.37%		-15.09%	+++
DZK	67.23%	-0.08%		22.55%	+++	-0.66%		-1.49%		-3.86%	
EC2	76.73%	-0.90%	+++	48.66%	+++	0.51%		1.74%		-1.82%	
EV1	70.15%	0.61%		60.97%	+++	17.66%	+++	-18.59%	+++	-5.43%	
FAF	83.87%	0.41%		75.90%	+++	-0.14%		-0.57%		-13.49%	++
FEE	70.24%	-0.28%	+	35.87%	+++	2.77%	+++	-4.24%		3.86%	
FI2	79.86%	-0.19%		62.38%	+++	6.91%	++	-7.45%		3.46%	
FYD	79.84%	0.35%		61.75%	+++	0.17%		-8.06%		-16.30%	+++
FYK	72.63%	0.02%		37.17%	+++	2.31%	+	-0.64%		3.39%	
GAF	73.12%	-0.85%	++	68.86%	+++	7.86%	+++	-19.14%	+++	-6.80%	
GAK	65.23%	-0.59%	++	40.69%	+++	3.97%	++	-9.02%	++	7.54%	
GBK	63.73%	-0.77%	++	42.56%	+++	5.57%	+++	-4.17%	+	6.95%	
GEH	87.61%	-0.06%		85.06%	+++	0.36%		-4.31%		-0.65%	
GL1	56.58%	-1.06%	+++	38.17%	+++	6.19%	+++	-7.25%	+++	4.89%	
HLK	73.21%	-0.06%		34.75%	+++	6.64%	+++	-7.28%	++	0.62%	
HSA	84.39%	-0.21%	+	43.63%	+++	3.08%	+++	-2.61%		-1.28%	
IEH	75.14%	0.09%		80.64%	+++	-0.35%		-7.08%		-8.66%	
IEK	75.99%	0.21%		36.73%	+++	-1.38%		-3.85%		-7.33%	
IGH	74.04%	-0.58%	+	57.80%	+++	3.60%	++	-3.31%		1.83%	
IYD	80.12%	-0.35%		63.28%	+++	6.22%	+++	-5.14%		11.09%	++
MAD	56.52%	-1.69%	+++	51.49%	+++	6.16%	+	-9.36%	++	-2.43%	

Table 8 (Cont.)

SAD	76.75%	-0.80%	+++	43.70%	+++	2.56%		-4.56%		-4.01%	
SMA01	59.58%	-0.55%	+	47.89%	+++	10.69%	+++	-2.08%		-10.21%	
ST1	80.67%	1.55%	+++	91.05%	+++	18.31%	+++	-33.10%	+++	3.67%	
TAD	60.53%	-0.72%	+++	24.43%	+++	1.06%		-1.91%		4.11%	
TAH	74.55%	0.41%		67.96%	+++	5.25%		-16.51%	+++	8.96%	
TCD	79.45%	-0.83%	+++	51.52%	+++	1.94%		2.02%		5.43%	
TE3	80.49%	-0.39%	++	47.66%	+++	0.85%		-0.78%		-4.89%	
TI2	84.43%	-0.18%		70.87%	+++	0.55%		-2.80%		3.30%	
TI3	73.72%	0.12%		79.29%	+++	10.34%	+++	-14.58%	++	11.02%	
TI7	71.97%	-0.33%		48.87%	+++	2.69%		-3.53%		3.30%	
TKF	67.12%	-0.05%		40.57%	+++	3.16%		-0.81%		-0.77%	
TKK	79.83%	-0.01%		38.93%	+++	1.57%		2.38%		4.43%	
TUD	39.80%	-0.47%		77.66%	+++	10.32%	+	15.51%		-30.24%	
TYH	84.34%	-0.23%		78.38%	+++	1.90%		-7.02%		-5.78%	
TZD	77.34%	-0.44%	+++	38.75%	+++	2.66%	++	-6.42%	++	-1.51%	
TZK	80.71%	-0.24%		42.16%	+++	1.81%		-6.26%	++	5.18%	
VAF	79.42%	-0.32%	+	48.58%	+++	3.52%	++	-1.06%		4.38%	
VEE	59.66%	0.02%		18.55%	+++	1.01%		-0.39%		2.50%	
VEH	83.94%	0.25%		80.34%	+++	4.75%	+	-6.99%		-10.15%	
YAD	69.17%	-0.60%	++	51.42%	+++	7.21%	+++	-0.97%		18.89%	+++
YAF	79.20%	-0.27%		41.81%	+++	-0.33%		-1.91%		5.35%	
YAK	80.92%	-0.18%		41.98%	+++	0.02%		-5.61%		-0.91%	
YEE	46.61%	0.14%		19.50%	+++	1.16%		1.38%		2.25%	
BZA	80.73%	-0.70%	+	81.94%	+++	15.16%	+++	-21.06%	+++	8.88%	
YEH	86.48%	0.14%		86.39%	+++	2.94%		-8.89%	++	-4.47%	
Average	73.93%	-0.19%		52.04%		3.61%		-4.85%		-0.30%	
Max	87.67%	1.55%		91.05%		18.31%		15.51%		18.89%	
Min	39.80%	-1.69%		18.55%		-1.82%		-33.10%		-30.24%	

+ significant at %90 confidence

++ significant at %95 confidence

+++ significant at %99 confidence

6.6 Ferson – Schadt Conditional Models

Models discussed above do not take certain publicly available information into account. However, fund managers can adjust their positions and betas according to some publicly available information. Ferson – Schadt argues that portfolio strategies based on publicly available information should not be judged as superior performance.

Ferson – Schadt defines the beta with the following equation:

$$\beta_j = b_{0,j} + \sum_{info=1}^{i} b_{info,j}\ z_{info,t} \tag{29}$$

$z_{info,t}$ stands for the deviation from the expected value for the publicly information "$info$" for time t and is defined as $z_{info,t} = Z_{info,t} - E\left(Z_{info}\right)$ where $Z_{info,t}$ is the value of the information at time t and $E\left(Z_{info}\right)$ is its expected value. As can be seen from the equation (29), the conditional beta, consist of two parts: $b_{0,j}$, is the unconditional, average constant beta and $\sum_{info=1}^{i} b_{info,j}\ z_{info,t}$ is the conditinal beta which responses to the changes in public information

Ferson and Schadt (1996) conditioned the beta on 5 publicly available information. 1. lagged level of risk free yield, 2. lagged dividend yield for stock exchange index, 3. lagged measure of the slope which is the difference of 10 year and 3 month t-bill yields, 4. lagged quality spread for corporate bond index which is the difference of lower investment grade and higher investment grade rating corporate bond yield and 5. a dummy for January effect. During their tests, Ferson and Schadt found that, the quality spread (variable 4) and the January dummy (variable 5) has little evidence of significance compared to other variables. They have concluded that the use of conditional information is both statistically and economically significant. Furthermore, with conditioning, the alphas increase: although the average alpha is negative for unconditional models, it converges to zero with the addition of conditional information.

Blake and Timmermann (1998) analyzed UK funds and used 1. lagged short term yields, 2. lagged long term yields and 3. lagged dividend yield of the stock market index as conditional variables. Blake at al indicated that conditioning the single index model does not create any difference in the alphas estimated where the average performance is negative in both cases.

Later, Doğanay (2004) applied the single index conditional model to 14 Turkish equity funds between the periods of 2000 to 2002. He used 1. lagged monthly change in the DIBS30 performance index issued by ISE, 2. lagged monthly return of USD and 3. monthly change in industrial production index as the conditional variables. He concluded that, the conditional alpha is not different from the unconditional alpha.

In our analysis we have tried 6 different publicly available information to condition our models: 1. JANUARY - a dummy to control the January effect, 2. INDUSTRY – lagged percent change in the industrial production index, 3. USD – lagged return of USD, 4. KYD30 – lagged return of the KYD30 index issued by Turkish Institutional Investment Managers Association, 5. SLOPE – lagged difference between the returns of KYD365 and KYD 30 indexes issued by Turkish Institutional Investment Managers Association and finally 6. GPRI – a dummy to measure the political environment taking the value of +1 if the political stability increased from month $t-2$ to $t-1$; -1 if the political stability decreases from month $t-2$ to $t-1$ and 0 if it remained constant. The political stability index used is the index published by Eurasia Group monthly for emerging markets including Turkey. Index evaluates political, social, economic and security related indicators. For the expected values of variables, we have used the average value from February 2004 to December 2009.

How the conditioning done has small differences as described in Ferson – Schadt (1996) and Blake and Timmermann (1998). Ferson – Schadt (FS) conditions all the variables while Blake and Timmermann (BT) conditions only the access market return. Our analysis show that, both approaches give similar results. For CAPM and Treynor – Mazuy models, the results are exactly equal. For Henriksson – Merton model, adjusted R^2 for FS approach is 75.65% while it is 74.85% for BT approach. For Fama and French model, the adjusted R^2 for FS approach is 74.64% while it is 74.48% for BT. For Carhart model are 75.08% and 74.67% respectively for FS and BT approach. In our analysis, we will use BT approach since the results are very similar. But still, we will call it Ferson Schadt since conditioning the independent variables of fund performance model was originally their idea.

The conditional single index model is derived by replacing β_j in equation (2) with equation (29):

$$\widetilde{R}_{jt} - R_{ft} = \alpha_j + \left[b_{0,j} + \sum_{info=1}^{i} b_{info,j}\ z_{info,t}\right]\left[\widetilde{R}_{Mt} - R_{ft}\right] + \tilde{u}_{jt} \tag{30}$$

By distributing $\left[b_{0,j} + \sum_{info=1}^{i} b_{info,j}\ z_{info,t}\right]$ we receive the beta conditional single index model:

$$\widetilde{R}_{jt} - R_{ft} = \alpha_j + b_{0,j}\left[\widetilde{R}_{Mt} - R_{ft}\right] + \sum_{info=1}^{i} b_{info,j}\ z_{info,t}\left[\widetilde{R}_{Mt} - R_{ft}\right] + \tilde{u}_{jt} \tag{31}$$

The beta conditional versions of the other models can be generalized as follows:

$$\widetilde{R}_{jt} - R_{ft} = \alpha_j + b_{0,j}\left[\widetilde{R}_{Mt} - R_{ft}\right] + \sum_{info=1}^{i} b_{info,j}\ z_{info,t}\left[\widetilde{R}_{Mt} - R_{ft}\right] + \sum_{k=1}^{l} \beta_{k,j}\ F_{k,t} + \tilde{u}_{jt} \tag{32}$$

Where $F_{k,t}$is the kth factor and l is the number of additional factors. For the Carhart model discussed in section 6.5, in the generalized conditional model given as equation (32), l will be 3 and F_1, F_2, F_3 will be SMB, HML and PR1YR, respectively. For all the unconditional models discussed from section 6.1 to 6.5, we have estimated the beta conditional versions. For the sake of simplicity, we will only present summary results, the detailed results for every fund is available upon request.

Table 9 - Beta Conditional Results Step 1 – # of significant variables – 90% significance

	CAPM_FS	HM_FS	TM_FS	FF_FS	C_FS
Alpha	25	36	15	27	26
ISE100	66	66	66	66	66
(ISE100 -rf)xDUMMY		57			
(ISE100 -rf)^2			53		
SMB				33	33
HML				32	33
PR1YR					10
(ISE100-RF) X JANUARY	12	9	14	12	12
(ISE100-RF) X KYD30	18	39	40	18	20
(ISE100-RF) X GPRI	5	16	7	7	7
(ISE100-RF) X INDUSTRY	7	14	14	12	11
(ISE100-RF) X SLOPE	4	6	5	11	13
(ISE100-RF) X USD	10	14	14	19	20

Table (9) presents the aggregated results for beta conditional models. The row headers (first column) stand for the variables used. Column headers (first row) stands for the models estimated. CAPM_FS is the conditional single index model, HM_FS is conditional Henriksson - Merton model, TM_FS is the conditional Treynor – Mazuy model, FF_FS is the conditional Fama – French model and finally, C_FS is the conditional Carhart model. Figures are the number of significant variables with 90% probability out of 66 funds (65 funds plus equally weighted average).For example, the number 32 at the intersection of HML and FF_FS indicate that, HML is significantly different than zero for 32 of the funds in the conditional Fama – French model. Grey shaded fields means that the variable listed in the first column is not relevant for the model listed on the first row. For example, the intersection of SMB and TM_FS is grey shaded since SMB is not a variable used in the Treynor - Mazuy model.

We have examined the conditioning variables according to results presented in table (9). The conditioning variable (ISE100 – RF) X GPRI is significant for only 5 funds in single index, 16 funds in Henriksson – Merton models and is significant for only 7 funds in the other 3 models. Hence, excluding the HM_FS, the political index does not have as much effect on beta decisions as the other conditioning variables. This result is not in line with our expectations that the Turkish fund managers adjust their betas according to the political environment. Besides the political index GPRI, Slope of the yield curve is an other variable that fund managers do not take into account in their portfolio decisions. The results indicate that, although limited, there is a January effect in Turkish mutual fund industry. Furthermore, the portfolio managers take into account the variations in risk free rate in their portfolio decisions. USD and the industry production index are other variables that have an effect on portfolio beta decisions to a certain extent.

6.7 Christopherson, Ferson, Glassman Conditional Models

In the conditional sense, there is always a possibility that a portfolio manager adjusts his position according to a broader set of publicly available variables compared to the set z_{info} defined either in equation (31) or (32). In this case, an abnormal performance can be created. Since this abnormal performance is due to the difference of variables in our z_{info} set and the added unknown variables used by the portfolio manager, then it can also be defined as a function of z_{info}. According to the reasoning discussed above, Christopherson et al allowed the alpha to be a function of z_{info}:

$$\alpha_j = \alpha_{0j} + A_j^{'} \sum_{info=1}^{i} z_{info,t} \tag{33}$$

Adding the equation (33) into equation (31) gives us the alpha and beta conditional single index model.

$$\begin{aligned}\tilde{R}_{jt} - R_{ft} = \alpha_{0j} + A_j^{'} \sum_{info=1}^{i} z_{info,t} + b_{0,j}\left[\tilde{R}_{Mt} - R_{ft}\right] \\ + \sum_{info=1}^{i} b_{info,j}\ z_{info,t}\left[\tilde{R}_{Mt} - R_{ft}\right] + \tilde{u}_{jt}\end{aligned} \tag{34}$$

Also, by adding the equation (33) into equation (32) we get the generalized form of alpha and beta conditional form of other models discussed

$$\begin{aligned}\tilde{R}_{jt} - R_{ft} = \alpha_{0j} + A_j^{'} \sum_{info=1}^{i} z_{info,t} + b_{0,j}\left[\tilde{R}_{Mt} - R_{ft}\right] \\ + \sum_{info=1}^{i} b_{info,j}\ z_{info,t}\left[\tilde{R}_{Mt} - R_{ft}\right] \\ + \sum_{k=1}^{l} \beta_{k,j}\ F_{k,t} + \tilde{u}_{jt}\end{aligned} \tag{35}$$

The results of alpha and beta conditional models are presented in table (10).

The "_CFG" at the end of model names stands for alpha and beta conditional model. Political stability index, as a conditional variable both for alpha and beta has an explanatory power over only one fund. Main variables that portfolio managers follow in adjusting their betas are JANUARY and KYD30. On the conditional alpha, besides JANUARY and KYD30, the INDUSTRY is significant for a certain amount of funds.

Table 10 - Alpha and Beta Conditional Results Step 1 – # of significant variables – 90% significance

	CAPM_CFG	HM_CFG	TM_CFG	FF_CFG	C_CFG
Alpha	13	39	15	14	14
JANUARY	19	16	17	18	15
KYD30	12	13	11	11	13
GPRI	1	1	1	1	1
INDUSTRY	29	28	20	30	25
SLOPE	12	9	8	4	5
USD	13	13	10	14	15
ISE100	66	66	66	66	66
(ISE100 -rf)xDUMMY		53			
(ISE100 -rf)^2			53		
SMB				19	18
HML				37	34
PR1YR					13
(ISE100-RF) X JANUARY	29	17	14	31	31
(ISE100-RF) X KYD30	14	35	40	16	15
(ISE100-RF) X GPRI	6	16	7	7	8
(ISE100-RF) X INDUSTRY	14	12	14	11	8
(ISE100-RF) X SLOPE	3	7	5	8	9
(ISE100-RF) X USD	4	3	14	7	8

6.8 Comparison of models discussed

R^2, Adjusted R^2 and F probabilities as a whole are summarized in table (11). Panel 1 gives us the equally weighted average adjusted R^2 for all 66 funds. The panel1 adjusted R^2 figures provide us some insights. Adjusted R^2 of unconditional CAPM is 72.11%. After conditioning beta and the alpha, it remains slightly constant with a level of 72.57%. The results are more or less the same for all models since for none of the models adjusted R^2 did not increased even more than %2 after conditioning. Secondly, compared to CAPM, the adjusted R^2 increases both in Henriksson – Merton model (HM) and Treynor – Mazuy (TM) model. The main difference of two timing models is how the timing ability is modeled. While HM argues that portfolio managers can only time the direction of the market, TM argues that fund managers can also time the level of volatility. Thus, our results can be seen as evidence that either the quadratic function of TM or the dummy of HM generates very similar results. Thirdly, compared to CAPM, the adjusted R^2 increases for Fama – French (FF) model. Carhart cannot add any additional explanatory power compared to FF. This indicates that the characteristic based variables of SMB and HML has some explanatory power. But the addition of momentum variable PR1YR does not add much. The average F p-values for the equally weighted average of all 66 funds are presented in panel 3. The F probabilities are all zero indicating that even with %99.99 confidence; all the models are significant as a whole. However this could be used with caution since on average more than 70% of the variation in fund excess returns is explained by the excess market return. Although the adjusted R^2 figures are very close, Conditional (alpha or alpha and beta) HM models generate the highest adjusted R^2 for conditional models. For conditional models, TM has the second place indicating that the timing models are more appropriate to use. Comparing the HM and TM, since there is no significant difference both models are appropriate to use. Comparing unconditional models, although not much explanation is added by the momentum variable, still, for unconditional models, Carhart model is the best choice for explaining fund performance.

Table 11 - Summary statistics of models estimated

Panel 1: Average Adjusted R^2

	CAPM	HM	TM	FF	Carhart
Unconditional	72.11%	73.55%	73.72%	73.74%	73.93%
Beta conditional	72.40%	74.85%	74.81%	74.48%	74.67%
Alpha and beta conditional	72.57%	74.87%	74.52%	74.30%	74.38%

Panel 2: Average R^2

	CAPM	HM	TM	FF	Carhart
Unconditional	72.51%	74.31%	74.47%	74.87%	75.42%
Beta conditional	75.16%	77.72%	77.69%	77.77%	78.28%
Alpha and beta conditional	77.66%	79.89%	79.61%	79.81%	80.24%

Panel 3: Average F probability

	CAPM	HM	TM	FF	Carhart
Unconditional	0.00%	0.00%	0.00%	0.00%	0.00%
Beta conditional	0.00%	0.00%	0.00%	0.00%	0.00%
Alpha and beta conditional	0.00%	0.00%	0.00%	0.00%	0.00%

Table (12) presents the results for alpha and timing coefficients. Panel 1 introduces equally weighted average alpha in column one, number of significant alphas for 90% confidence in column two and out of those significant alphas, ones that are positive and negative respectively in column three and four. Second panel introduces the timing results for timing models in the same order. According to results presented in panel 2, all unconditional and conditional timing models have a negative coefficient of timing. This result seems in line with our expectations given the high volatility and the uncertainity in the economic environment of Turkey compared to developed countries. This further strengthens our view that Turkish fund managers do not have market timing ability. An interesting result is the fact that the alphas in panel 1 are positive for two timing models HM and TM although they are negative for other models. In panel 2, the sign of timing coefficient for HM and TM is negative and is statistically significant for more than 35 funds in any case. In other words, on average the predictions of Turkish fund managers for timing the market fails. So, according to HM and TM results, Turkish fund managers have positive alpha, but not as much positive as to cover the negative timing. The negative alpha for other models is due to the fact that they do not take into account the timing ability.

Table 12 - Alpha and timing coefficients of the models estimated

Panel 1: Average Alpha and number of significant Alphas

	Average Monthly Alpha	# of significant Alpha	# of significant (+) Alpha	# of significant (-) Alpha
CAPM	-0.22%	22	2	20
HM	0.65%	18	18	0
TM	0.21%	11	7	4
FF	-0.19%	21	2	19
Carhart	-0.19%	21	2	19
CAPM_FS	-0.30%	25	2	23
HM_FS	0.94%	36	36	0
TM_FS	0.27%	15	12	3
FF_FS	-0.30%	27	2	25
C_FS	-0.30%	26	2	24
CAPM_CFG	-0.16%	13	3	10
HM_CFG	0.96%	39	39	0
TM_CFG	0.29%	13	10	3
FF_CFG	-0.17%	14	4	10
C_CFG	-0.17%	14	4	10

Panel 2: Average timing and Number of significant timing coefficients

	Average Monthly timing	# of significant Timers	# of significant (+) Timers	# of significant (-) Timers
HM	-22.93%	38	0	38
TM	-49.56%	37	0	37
HM_FS	-35.11%	57	0	57
TM_FS	-75.60%	53	0	53
HM_CFG	-33.65%	53	0	53
TM_CFG	-67.36%	49	0	49

7. Persistence of Performance in Turkish Fund Market

An important point in searching for persistence is the point that, if any, one should be cauotius whether there is really a persistency in performance or it is due to simply the momentum strategies followed by the fund manager.

Malkiel (1995) analyzed the persistence of performance over periods with a binomial test. They have defined one period as one year. First, for every year they have defined "winners" who performed better than the median and "losers" who performed worse than the median. They have constructed a hypothesis test with the null hypothesis that there is no winning persistence. Their test statistic is as follows:

$$Z_{calc} = \frac{(Y - np)}{\sqrt{np\,(1-p)}} \tag{36}$$

Where Y is the number of persistently winning funds, p is the test probability of winning which is 0.5 and n is the total number of funds which won in the first year. If the Z calculated from the equation is higher than the Z value form the Z table with the appropriate confidence, we can say that we have enough evidence to believe that there is persistency. But, if the $Z_{calc} < Z_{table}$ than we cannot reject the null hypothesis that there is no persistence. We have applied the Malkiel test for Carhart and Treynor – Mazuy unconditional models. We have chosen an unconditional model since using only 12 months of data, the conditional models with more than 6 variables at a minimum generate inconsistent results. We have chosen Carhart model due to the fact that it is the unconditional model with the momentum factor. By applying the Carhart, we will be calculating the real persistence after any momentum effect, if any. We have chosen Treynor Mazuy since a timing model is more appropriate due to the fact that missing a timing component masks the true performance of alphas.

Table 13 - Malkiel Persistency Results

Panel 1: unconditional TM Results

	2004-2005	2005-2006	2006-2007	2007-2008	2008-2009
WW	19	22	18	15	23
WL	14	11	15	18	10
LW	14	11	15	18	10
LL	19	22	18	15	23
y	19	22	18	15	23
n	33	33	33	33	33
P	0.5	0.5	0.5	0.5	0.5
z	0.87	1.91	0.52	(0.52)	2.26

Panel 2: Unconditional Carhart results

	2004-2005	2005-2006	2006-2007	2007-2008	2008-2009
WW	20	18	18	13	17
WL	13	15	15	20	16
LW	13	15	15	20	16
LL	20	18	18	13	17
y	20	18	18	13	17
n	33	33	33	33	33
P	0.5	0.5	0.5	0.5	0.5
z	1.22	0.52	0.52	(1.22)	0.17

The table (13) presents the persistency test results for Malkiel. Panel 1 is the Treynor Mazuy and panel 2 is the Carhart results. Row WW indicates the number of funds performed better than the median in both years. WL indicates the number of funds that performed better than the median in the first year, but worse in the second year. LW indicates the number of funds that performed worse than the median in first year but better in the second year. LL indicates the number of funds performed worse than the median in both years. Y, n, p, Z are the components of equation (36). Our Z_{calc} values are on the last row of table (13). The Z_{table} that we will use is 1.645. If the $Z_{calc} < Z_{table}$ than we cannot reject the null hypothesis that there is no persistence with 95% confidence.

In panel 1e, except 2005-2006 and 2008-2009, the Z_{calc} values are smaller than 1.645 for the TM model. For Carhart, z values range from 1.22 to -1.22 indicating no sign of persistence for all pairs of years. For years 2005-2006 and 2008-2009, the persistence in TM model is significant for 95% confidence but not for 99% confidence. Even though TM and Carhart models present different results for two year pairs, Generally speaking, the results indicate that there is no performance persistence for alphas.

Brown and Goetzmann (1995) also developed a non parametric persistency test. Brown and Goetzmann define winners and losers in the same way as Malkiel. The main difference from Malkiel's model is, while Malkiel tests the persistence of good performance, Brown at al tests the persistence of performance in both good and bad sense. Brown at al defines cross product ratio (CPR) as the odds ratio of number of funds with persisting performance divided by the number of non performers. This can be formulated as follows:

$$CPR = \frac{WW * LL}{WL * LW} \tag{37}$$

The null hypothesis is that if the performance in both years is unrelated, it is expected that the CPR should be equal to one. The test statistic used is the logarithm of the CPR. Divided by the standard deviation.

$$Z_{calc} = \frac{\log(CPR)}{\sigma_{\log(CPR)}} \tag{38}$$

The standard deviation of the CPR is defined as follows:

$$\sigma_{\log(cpr)} = \sqrt{\frac{1}{WW} + \frac{1}{WL} + \frac{1}{LW} + \frac{1}{LL}} \tag{39}$$

The calculated statistics for the persistency z statistic calculated according to Brown and Goetzmann are presented in table (14). For the Carhart model results presented in panel 2, with 95% confidence, there is some positive persistence in years 2004 – 2005 and negative persistence in 2007-2008. But the significance parishes with 99% confidence. For the rest of the year pairs, the Z_{calc} is smaller than the Z_{table} (which is 1.645 for 95% confidence). Looking at the TM results presented in panel 1, for none of the year pairs there is evidence of persistence. So, even though there is a sign of persistence for 2004-2005, looking at the overall, once again we cannot reject the null hypothesis that there is no performance persistence in Turkish mutual fund market.

Table 14 - Brown and Goetzmann Persistency Results of Unconditional Carhart Model

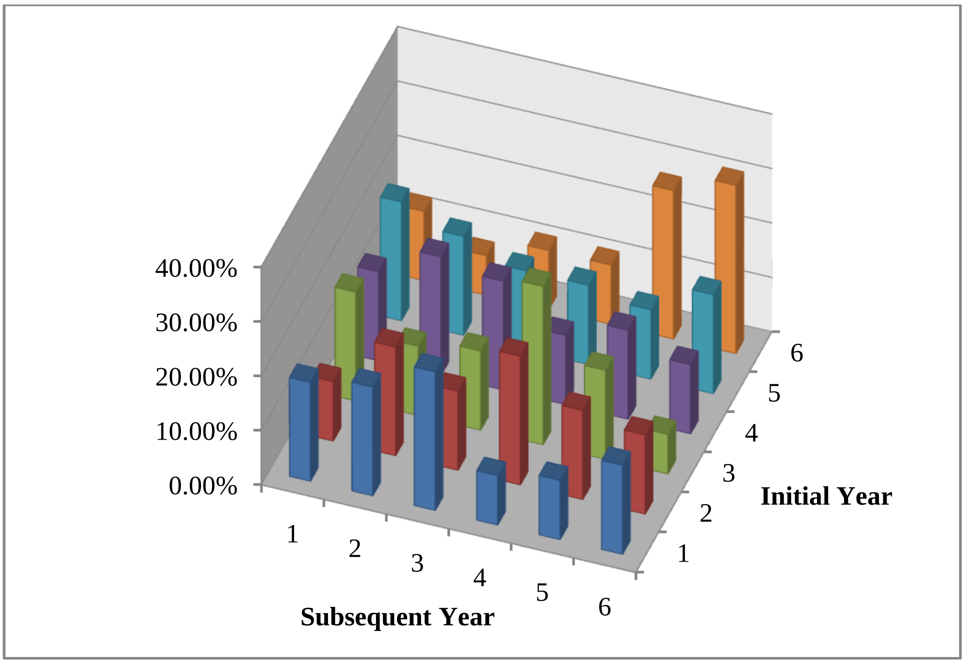
Panel 1: unconditional TM Results

	2004-2005	2005-2006	2006-2007	2007-2008	2008-2009
CPR	1.36	2.00	1.20	0.83	2.30
sigma log (cpr)	0.50	0.52	0.49	0.49	0.54
z	0.61	1.33	0.37	(0.37)	1.55

Panel 2: Unconditional Carhart results

	2004-2005	2005-2006	2006-2007	2007-2008	2008-2009
CPR	2.37	1.44	1.44	0.42	1.13
sigma log (cpr)	0.50	0.49	0.49	0.50	0.49
z	1.71	0.74	0.74	(1.71)	0.25

If any, to visualize the persistency we have also constructed the contingency table for initial and subsequent one year performance table as described by Carhart (1997). Following the methodology described by Carhart, we have divided the funds into 6 groups according to their alphas. 1 is the best performing, 6 is the worst performing group. Funds, according to their alpha ranking, are assigned into the relevant group every year. Every group consists of equal number of funds. Then, from 2004 to 2009, the conditional probabilities of achieving a certain group in subsequent year are calculated given the initial year group. Graph (4) shows us the contingency table. The results seem like randomly distributed and there is no significant persistency except group 6. Funds initially in group 6, subsequently appear in group 5 or 6 with almost 60% probability indicating the persistency of bad performance.



Graph 4 -. Contingency Table for Carhart Model pairs of years

Finally, we have analyzed the persistency of best and worst performing 15 funds individually. We have defined our periods as one year. We have called the first year "observation period" and the second year "holding period" then, we have calculated the alphas for each year. For the best performing funds, we have assigned a score of "1" if both period alphas are greater than zero and "0" otherwise. For worst performing funds, we have assigned "1" if both period alphas are smaller than zero, and "0" otherwise. Then, we have moved the two years of data one month and repeated the procedure again. Since the time period used in calculations is 24 months and our data consist of 71 months, and we move the data monthly, at max, Best (worst) 15 funds can get a score of 48 points if it performs over (below) zero for all periods. The results are presented in table (15)

Table 15 - Persistency in fund Level

TM Model				Carhart Model			
Rank	Fund	Score	Percent Score	Rank	Fund	Score	Percent Score
1	ST1	48	100%	1	ST1	37	77%
2	EV1	33	69%	2	AH0	25	52%
3	TAH	21	44%	3	EV1	20	42%
4	TUD	21	44%	4	FAF	23	48%
5	AN1	36	75%	5	TAH	17	35%
6	ASA	24	50%	6	FYD	21	44%
7	ANS	38	79%	7	AH5	18	38%
8	TI3	22	46%	8	VEH	11	23%
9	AH0	44	92%	9	ANS	23	48%
10	HLK	16	33%	10	IEK	5	10%
11	SMA01	26	54%	11	YEH	21	44%
12	VEH	32	67%	12	YEE	23	48%
13	YEH	34	71%	13	TI3	0	0%
14	FYD	30	63%	14	AH9	20	42%
15	GEH	29	60%	15	IEH	21	44%
....	....	....	....	....	....	....	....
52	AVD	7	15%	52	TUD	21	44%
53	TYH	1	2%	53	SMA01	22	46%
54	YAF	3	6%	54	IGH	33	69%
55	DAH	14	29%	55	GAK	35	73%
56	DZA	6	13%	56	YAD	29	60%
57	ACD	28	58%	57	BZA	34	71%
58	TZD	6	13%	58	TAD	42	88%
59	YAK	17	35%	59	GBK	30	63%
60	DZK	4	8%	60	SAD	41	85%
61	IGH	21	44%	61	ACD	46	96%
62	SAD	33	69%	62	TCD	37	77%
63	TCD	21	44%	63	GAF	28	58%
64	TAD	35	73%	64	EC2	31	65%
65	EC2	25	52%	65	GL1	26	54%
66	MAD	25	52%	66	MAD	20	42%

Percent score column indicates score divided by highest score available (which is 48). So the percent score provides us a score to use for good persistence (or bad persistence in case of worst funds). We see that, the results of Carhart model and the Treynor Mazuy model are completely different from each other. For the Carhart model, within best performing 15 funds, there is only 1 fund, ST1, who resulted with a percent score adequately higher than 50%. Out of 15 good performing funds, 13 have a percent score lower than 50% indicating that their performance will not persist. Percent scores are higher for worst performing funds indicating that bad performance persists more compared to good performance. On the other hand, the Treynor Mazuy model indicates that although good performance persists, bad performance of alpha does not.

There is a possibility that Treynor Mazuy model overestimates and Carhart model underestimates the alpha performance persistence: Since there is no momentum factor in Treynor Mazuy model, part of the persistence might be due to the momentum of the stocks included in the funds. However, since there is no timing ability in Carhart model, part of the bad persistence found by Carhart might be due to the inability of timing. To take into account the effect of both timing and momentum, we have added the Treynor Mazuy model into the Carhart model and estimated the following equation which we called the 5 factor model:

$$\widetilde{R}_{jt} = R_{ft} + \beta_j\left[\widetilde{R}_{Mt} - R_{ft}\right] + C_j\left[\widetilde{R}_{Mt} - R_{ft}\right]^2 + \beta_{2j}(SMB_t) + \beta_{3j}(HML_t) + \beta_{4j}(PR1YR_t) + \tilde{e}_{jt} \qquad (40)$$

The results of Carhart Timing model are presented in Table (16)

Table 16 - Persistency in fund Level

5 Factor Model			
Rank	Fund	Score	Percent Score
1	ST1	33	69%
2	TUD	0	0%
3	EV1	28	58%
4	TAH	18	38%
5	AH0	28	58%
6	ANS	24	50%
7	AN1	24	50%
8	ASA	15	31%
9	FYD	18	38%
10	FAF	22	46%
11	AH5	19	40%
12	GEH	15	31%
13	SMA01	11	23%
14	IEH	18	38%
15	VEH	13	27%
....	....	....	....
52	GBK	29	60%
53	GAK	20	42%
54	DZK	21	44%
55	YAK	12	25%
56	TZD	17	35%
57	DAH	18	38%
58	IYD	14	29%
59	ACD	35	73%
60	SAD	35	73%
61	TCD	15	31%
62	IGH	31	65%
63	TAD	35	73%
64	BZA	20	42%
65	EC2	31	65%
66	MAD	29	60%

Our 5 factor model indicates that there are only 3 funds ST1, EV1, AH0 with a percent score over 50%. On the other hand, for bad performing funds, there are seven funds with a percent score over 50%. As a result we do not have enough evidence to say that there is persistence as a whole in Turkish mutual fund management industry. Our analysis over individual funds is consistent with the generalization above in means of good performance. We see few funds, performing persistently good. However for the worst funds, there is some persistence indicating that investors investing in bad performing funds are likely to perform bad in subsequent year.

8. Conclusion

First of all we have searched for two different biases in our data: the survivorship bias and the exclusion bias. Survivorship bias is due to funds closed during the period and exclusion bias is due to funds excluded from our dataset. According to Blake and Timmermann methodology, the survivorship bias is 0.80% and the exclusion bias is on average 0.32% per annum, both ignorable amounts for the volatile Turkish market. Furthermore, we have developed our own test: We have regressed the funds included to the funds excluded. If there is any bias in favor of funds included in the study, the alpha of the regression should be over zero and significant. The alpha estimated for either the exclusion or the survivorship bias was both statistically (p value of 0.30 and 0.96 respectively) and economically insignificant (value of 0.0005 and 0.0001) meaning there is no bias within our data. The survivorship bias results are in line with our expectations: There is no significant bias since the funds disappeared recently closed due to the consolidation in Banking industry, not due to performance.

We have estimated the single index model (CAPM), two different timing models (TM and HM) and two multi factor models (FF, Carhart). The average alpha for single index and multifactor models is negative (CAPM, FF, Carhart respectively -0.22%, -0.19% and – 0.19%). Number of significant alphas are 22,21 and 21 where only 2 of them are significantly positive. For the timing models the average alpha is positive (HM and TM respectively 0.65% and 0.21%).Contrary to the single index and multi factor models, most of the significant alphas are positive (HM ad TM respectively 18 and 11 significant alphas where 18 and 7 are positive). Furthermore, according to timing models, the average timing ability of Turkish mutual funds is negative and this timing inability is significant for 38 funds according to HM and 37 funds according to TM. We can conclude that, Turkish fund managers cannot time the market but they can generate positive alphas. However, the positive alpha generated is not enough to cover the timing inability. The negative alpha for single index or multi factor models is due to the missing timing component.

We have also searched for any persistency in both good and bad performance. Non parametric tests for the persistence indicate that for the funds that we have analyzed, there is no evidence of persistency. Then we have deeper analyzed best and good performing funds. We have found persistent good performance in TM model and persistent bad performance in Carhart model. Since the Carhart model ignores the negative timing and TM model ignores any possible momentum, Carhart results can be underestimated and TM model results can be overestimated. We have developed a 5 factor model, Carhart with timing component in order to make sure both the momentum and timing factors are included. Our 5 factor model indicates that the even though there are few good funds persists, bad performance persists more.

Our study adds contribution to the literature in several ways. As far as we know, our 5 factor model is the first model where momentum and timing components are included in the same model. Furthermore, our survivorship bias test provides a parametric test with a certain significance. We have also used political index as an conditional variable in order to test whether the political environment has any effect on the level of risk taken in performance models.

For future research, it might be interesting to apply our 5 factor model for various markets and in conditional forms or testing the positive alphas whether they are luck or due to skill with bootstrapping. An other field needs further research is whether the unconditional or conditional alphas are significantly different from each other. Also it is discussed that fund performance should be calculated over gross returns – return calculated after adding the fund management fees back to the price. Since we do not have access to gross returns for the whole period studied, we did not have the chance to compare the survivorship bias, performance or persistence results calculated over gross and net returns. A study over gross returns can help us understand the true performance and dynamics of fund management.

9. Appendix

9.1 Appendix A: The effect of Survivorship bias in Turkish fund industry for 2004 – 2009 period

As discussed, the survivorship bias results discussed until now are related to whether the data we included in the study has any bias compared to the data excluded. In this section, we will try to discuss whether the Turkish mutual fund industry has any survivorship bias or not.

In this section, our definitions of surviving and non surviving funds are slightly different. Surviving funds include all the funds that are still active by December 2009. Non surviving funds include all the funds that were either active by January 2004 or issued after January 2004 but closed before December 2009.

Survivorship bias calculations are done over 69 observations ending at October 2009 since there is no non surviving fund data for the November and December 2009.

Our first step is to calculate the average bias by equation (21). The result for Turkish market is %0.68. This result is somewhat less than what Blake and Timmermann (1998) found for UK markets. But taking into account the volatility of UK and Turkish markets our results indicates a very minor bias.

Furthermore, as Gruber (1997) did, we regress both all the funds existed in the period and non surviving funds excess returns to the excess return of the market and check whether there is any difference in the alphas.

Table 17 - Regression results for all funds and non surviving funds excess returns over excess market return

	Alpha	St. Error	t-Statistic
Non Surviving funds	-0.0021	0.00358	-0.5775
All funds	-0.0024	0.00153	-1.5705

As can be seen from table (17), the alphas are very small and insignificant with 5% confidence. Contrary to expected, the alpha is slightly better for the average of non surviving funds, compared to the average of all funds.

Two tests above indicate that there is no survivorship bias economically, but the drawback is, we cannot decide whether the bias calculated above is significant in statistical terms. So, we further investigate any bias with the equation (22). Main advantage of regressing the surviving funds' excess return to non surviving funds' excess return is that besides any consistent skill difference between two groups which can be observed in alpha, we also have a parametric test result of whether this bias is different than zero or not.

The regression result show that surviving funds over perform non surviving funds on average 0.45% per annum. But, we cannot reject the null hypothesis that this over performance is actually zero with %87 probability.

We have also done equality tests between surviving and non surviving funds. If there is any significant survivorship bias, it is expected that the average return of surviving funds will be more than the non surviving funds which will result the inequality of two series. The equality test for means of surviving and non surviving funds results that we cannot reject the null hypothesis of equality of means by 95% confidence. We have also applied equality of variance tests which as expected and consistent with previous findings, does not reject the null hypothesis that both series have equal variance.

Table 18 - Survivorship bias results with non surviving funds as independent variable

Dependent Variable: ALL_SURVIVING-RF
Method: Least Squares
Sample (adjusted): 2004M02 2009M10
Included observations: 69 after adjustments
Newey-West HAC Standard Errors & Covariance (lag truncation=3)

Variable	Coefficient	Std. Error	t-Statistic	Prob.
NON_SURVIVING-RF	0.801892	0.113426	7.069728	0.0000
C	0.000378	0.002384	0.158415	0.8746

R-squared	0.837777	Mean dependent var	0.001373
Adjusted R-squared	0.835356	S.D. dependent var	0.051624
S.E. of regression	0.020947	Akaike info criterion	-4.865059
Sum squared resid	0.029399	Schwarz criterion	-4.800302
Log likelihood	169.8445	F-statistic	346.0119
Durbin-Watson stat	1.043619	Prob(F-statistic)	0.000000

The average bias calculated from the Blake and Timmermann equation is only 0.68% per annum. Moreover, the alphas generated from all funds and non surviving funds differ only 0.36% per annum which is economically insignificant. Furthermore we have regressed the surviving funds over non surviving funds in search for a significant alpha and also tested the equality of two series where in both, we do not have enough evidence to conclude that there is survivorship bias. This is very in line with our expectations since we believe that the funds closed are due to mergers and strategy shifts rather than bad performance. As a result, we conclude that the survivorship bias, if any, is economically and statistically insignificant for Turkish mutual fund industry.

9.2 Appendix B: List of 65 Funds used in estimations

Code	Name of Fund
AAK	Ata Yatirim Menkul Kiymetler A.Ş. A Tipi Karma Fon
ACD	Acar Yatirim Menkul Değerler A.Ş. A Tipi Değişken Fonu
ADD	Anadolubank A.Ş. A Tipi Değişken Fon
ADF	Akbank T.A.Ş. A Tipi Değişken Fon
AE3	Avivasa Emeklilik Ve Hayat A.Ş. Büyüme Amaçli Esnek Eyf
AH0	Anadolu Hayat Emeklilik A.Ş. Büyüme Amaçli Esnek Eyf
AH5	Anadolu Hayat Emeklilik A.Ş. Büyüme Amaçli Hisse Senedi Eyf
AH9	Anadolu Hayat Emeklilik A.Ş. Esnek Eyf
AK3	Akbank T.A.Ş. A Tipi Hisse Senedi Fonu
AN1	Alternatifbank A.Ş. A Tipi Değişken Yatirim Fonu
ANE	Aegon Emeklilik Ve Hayat A.Ş. Dengeli Eyf
ANS	Aegon Emeklilik Ve Hayat A.Ş. Gelir Amaçli Hisse Senedi Eyf
ASA	Alternatifbank A.Ş. A Tipi Hisse Senedi Fonu
AVD	Avivasa Emeklilik Ve Hayat A.Ş. Dengeli Eyf
AVE	Avivasa Emeklilik Ve Hayat A.Ş. Esnek Eyf
AZB	Allianz H.E.A.Ş. Büyüme Amaçli Esnek Eyf
BEE	Başak Groupama Emeklilik A.Ş. Esnek Emeklilik Yatirim Fonu
BEH	Başak Groupama Emeklilik A.Ş. Büyüme Amaçli Hisse Senedi Eyf
DAH	Denizbank A.Ş. A Tipi Hisse Senedi Fonu
DZA	Denizbank A.Ş. A Tipi Değişken Fon
DZK	Denizbank A.Ş. A Tipi Karma Fon
EC2	Eczacibaşi Menkul Değerler A.Ş. A Tipi Değişken Fon
EV1	Evgin Yatirim Menkul Değerler Ticaret A.Ş. A Tipi Karma Fon
FAF	Finansbank A.Ş. A Tipi Hisse Senedi Fonu
FEE	Fortis Emeklilik Ve Hayat A.Ş. Esnek Eyf
FI2	Finansbank A.Ş. A Tipi Değişken Fon
FYD	Finans Yatirim Menkul Değerler A.Ş. A Tipi Değişken Fonu
FYK	Finans Yatirim Menkul Değerler A.Ş. A Tipi Karma Fon
GAF	Gedik Yatirim Menkul Değerler A.Ş. A Tipi Hisse Senedi Fonu

GAK Gedik Yatirim Menkul Değerler A.Ş. A Tipi Karma Fon

GBK Global Menkul Değerler A.Ş. A Tipi Karma Fon

GEH Garanti Emeklilik Ve Hayat A.Ş. Büyüme Amaçli Hisse Senedi Eyf

GL1 Global Menkul Değerler A.Ş. A Tipi Değişken Yatirim Fonu

HLK T.Halk Bankasi A.Ş. A Tipi Karma Fon

HSA Hsbc Bank A.Ş. A Tipi Değişken Fon

IEH Ing Emeklilik A.Ş. Büyüme Amaçli Hisse Senedi Eyf

IEK Ing Emeklilik A.Ş. Büyüme Amaçli Karma Eyf

IGH Ing Bank A.Ş. A Tipi Hisse Senedi Yatirim Fonu

IYD Iş Yatirim Menkul Değerler A.Ş. A Tipi Değişken Fon

MAD Meksa Yatirim Menkul Değerler A.Ş. A Tipi Değişken Fon

SAD Şekerbank T.A.Ş. A Tipi Değişken Fon

SMA01 Sanko Menkul Değerler A.Ş. A Tipi Değişken Yatirim Fonu

ST1 Strateji Menkul Değerler A.Ş. A Tipi Değişken Fon

TAD Taib Yatirim A.Ş. A Tipi Değişken Fonu

TAH Tekstil Bankasi A.Ş. A Tipi Hisse Senedi Fonu

TCD Tacirler Menkul Değerler A.Ş. A Tipi Değişken Fon

TE3 Türk Ekonomi Bankasi A.Ş. A Tipi Karma Fon

TI2 T.Iş Bankasi A.Ş. A Tipi Hisse Senedi Fonu

TI3 T.Iş Bankasi A.Ş. A Tipi Iştirak Fonu

TI7 T.Iş Bankasi A.Ş. A Tipi Değişken Fonu

TKF Tacirler Menkul Değerler A.Ş. A Tipi Karma Fon

TKK T.Iş Bankasi A.Ş. A Tipi Karma Kumbara Fonu

TUD Turkish Yatirim A.Ş. A Tipi Değişken Fonu

TYH Teb Yatirim Menkul Değerler A.Ş. A Tipi Hisse Senedi Fonu

TZD Ziraat Yatirim Menkul Değerler A.Ş. A Tipi Değişken Fon

TZK T.C.Ziraat Bankasi A.Ş. A Tipi Karma Fonu

VAF Türkiye Vakiflar Bankasi T.A.O. A Tipi Değişken Fonu

VEE Vakif Emeklilik A.Ş. Esnek Eyf

VEH Vakif Emeklilik A.Ş. Büyüme Amaçli Hisse Senedi Eyf

YAD Yatirim Finansman Menkul Değerler A.Ş. A Tipi Değişken Fon

YAF Yapi Kredi Yatirim Menkul Değerler A.Ş. A Tipi Değişken Fonu

YAK	Yapi Ve Kredi Bankasi A.Ş. A Tipi Karma Fonu
YEE	Yapi Kredi Emeklilik A.Ş. Esnek Eyf
BZA	Bizim Menkul Değerler A.Ş. A Tipi Hisse Senedi Fonu
YEH	Yapi Kredi Emeklilik A.Ş. Büyüme Amaçli Hisse Senedi Eyf

9.3 Appendix C: Matlab codes developed for regression estimations

The main code, used for regression analysis is follows. For the code to run, it is expected that you have a matrix called "data_ham" consist of months in rows and variables in columns. The code is designed for a matrix consist of 71 monthly observations with 79 variables (65 funds, 1 average, 13 variables used in regressions). The code requires "regstats2[iv]" developed by Oleg Komarov.

```
data = data_ham

rf = data(:,1); % this is the risk free rate
xtemp = data(:,2);     % this is the market index
xtemp = xtemp-rf;
xtemp(:,2) = data(:,73); % this is the SMB variable
xtemp(:,3) = data(:,74); % this is the HML variable
xtemp(:,4) = data(:,78); % this is the PR1YR variable
xtemp(:,5) = data(:,69).*xtemp(:,1); % this is the dummy for
HM
xtemp(:,6) = xtemp(:,1).*xtemp(:,1);
xtemp(:,7) = xtemp(:,1).*data(:,71);
xtemp(:,8) = xtemp(:,1).*data(:,72);
xtemp(:,9) = xtemp(:,1).*data(:,75);
xtemp(:,10) = xtemp(:,1).*data(:,76);
xtemp(:,11) = xtemp(:,1).*data(:,77);
xtemp(:,12) = xtemp(:,1).*data(:,79);
xtemp(:,13) = data(:,71); % this is the january dummy
xtemp(:,14) = data(:,72); % this is the KYD30
xtemp(:,15) = data(:,75); % GPRI political risk index
xtemp(:,16) = data(:,76); % this is the idustrial production
index
xtemp(:,17) = data(:,77); % this is the slope of the yield
curve
xtemp(:,18) = data(:,79); % this is the USD exchange rate

X_CAPM = xtemp(:,1);
X_HM = xtemp(:,[1,5]);
X_TM = xtemp(:,[1,6]);
X_FF = xtemp(:,[1,2,3]);
X_C = xtemp(:,[1,2,3,4]);
X_CAPM_FS = xtemp(:,[1,7,8,9,10,11,12]);
X_HM_FS = xtemp(:,[1,5,7,8,9,10,11,12]);
X_TM_FS = xtemp(:,[1,6,7,8,9,10,11,12]);
X_FF_FS = xtemp(:,[1,2,3,7,8,9,10,11,12]);
X_C_FS = xtemp(:,[1,2,3,4,7,8,9,10,11,12]);
X_CAPM_CFG = xtemp(:,[1,7,8,9,10,11,12,13,14,15,16,17,18]);
X_HM_CFG = xtemp(:,[1,5,7,8,9,10,11,12,13,14,15,16,17,18]);
X_TM_CFG = xtemp(:,[1,6,7,8,9,10,11,12,13,14,15,16,17,18]);
X_FF_CFG = xtemp(:,[1,2,3,7,9,8,10,11,12,13,14,15,16,17,18]);
X_C_CFG =
xtemp(:,[1,2,3,4,7,8,9,10,11,12,13,14,15,16,17,18]);
```

```
for k = 3:68

j = 1

y = data(:,k);

    % unconditional_CAPM

whichstats = {'beta','rsquare','adjrsquare','hac','fstat'};

Stats= regstats2(y-rf,X_CAPM,'linear',whichstats);
Stats_CAPM(1,k)  = Stats.rsquare;
Stats_CAPM(2,k)  = Stats.adjrsquare;
Stats_CAPM(3,k)  = Stats.fstat.f;
Stats_CAPM(4,k)  = Stats.fstat.pval;
Stats_CAPM(5,k)  = Stats.beta(1);
Stats_CAPM(6,k)  = Stats.hac.t(1);
Stats_CAPM(7,k)  = Stats.hac.pval(1);
Stats_CAPM(8,k)  = Stats.beta(2);
Stats_CAPM(9,k)  = Stats.hac.t(2);
Stats_CAPM(10,k)  = Stats.hac.pval(2);
% unconditional Henriksson_merton

Stats= regstats2(y-rf,X_HM,'linear',whichstats);
Stats_HM(1,k)  = Stats.rsquare;
Stats_HM(2,k)  = Stats.adjrsquare;
Stats_HM(3,k)  = Stats.fstat.f;
Stats_HM(4,k)  = Stats.fstat.pval;
Stats_HM(5,k)  = Stats.beta(1);
Stats_HM(6,k)  = Stats.hac.t(1);
Stats_HM(7,k)  = Stats.hac.pval(1);
Stats_HM(8,k)  = Stats.beta(2);
Stats_HM(9,k)  = Stats.hac.t(2);
Stats_HM(10,k)  = Stats.hac.pval(2);
Stats_HM(11,k)  = Stats.beta(3);
Stats_HM(12,k)  = Stats.hac.t(3);
Stats_HM(13,k)  = Stats.hac.pval(3);

% unconditional Treynor_Mazuy

Stats= regstats2(y-rf,X_TM,'linear',whichstats);
Stats_TM(1,k)  = Stats.rsquare;
Stats_TM(2,k)  = Stats.adjrsquare;
Stats_TM(3,k)  = Stats.fstat.f;
Stats_TM(4,k)  = Stats.fstat.pval;
Stats_TM(5,k)  = Stats.beta(1);
Stats_TM(6,k)  = Stats.hac.t(1);
Stats_TM(7,k)  = Stats.hac.pval(1);
Stats_TM(8,k)  = Stats.beta(2);
Stats_TM(9,k)  = Stats.hac.t(2);
Stats_TM(10,k)  = Stats.hac.pval(2);
Stats_TM(11,k)  = Stats.beta(3);
Stats_TM(12,k)  = Stats.hac.t(3);
Stats_TM(13,k)  = Stats.hac.pval(3);

% unconditional Fama_French
```

```
Stats= regstats2(y-rf,X_FF,'linear',whichstats);
Stats_FF(1,k) = Stats.rsquare;
Stats_FF(2,k) = Stats.adjrsquare;
Stats_FF(3,k) = Stats.fstat.f;
Stats_FF(4,k) = Stats.fstat.pval;
Stats_FF(5,k) = Stats.beta(1);
Stats_FF(6,k) = Stats.hac.t(1);
Stats_FF(7,k) = Stats.hac.pval(1);
Stats_FF(8,k) = Stats.beta(2);
Stats_FF(9,k) = Stats.hac.t(2);
Stats_FF(10,k) = Stats.hac.pval(2);
Stats_FF(11,k) = Stats.beta(3);
Stats_FF(12,k) = Stats.hac.t(3);
Stats_FF(13,k) = Stats.hac.pval(3);
Stats_FF(14,k) = Stats.beta(4);
Stats_FF(15,k) = Stats.hac.t(4);
Stats_FF(16,k) = Stats.hac.pval(4);

    % unconditional Carhart

Stats= regstats2(y-rf,X_C,'linear',whichstats);
Stats_C(1,k) = Stats.rsquare;
Stats_C(2,k) = Stats.adjrsquare;
Stats_C(3,k) = Stats.fstat.f;
Stats_C(4,k) = Stats.fstat.pval;
Stats_C(5,k) = Stats.beta(1);
Stats_C(6,k) = Stats.hac.t(1);
Stats_C(7,k) = Stats.hac.pval(1);
Stats_C(8,k) = Stats.beta(2);
Stats_C(9,k) = Stats.hac.t(2);
Stats_C(10,k) = Stats.hac.pval(2);
Stats_C(11,k) = Stats.beta(3);
Stats_C(12,k) = Stats.hac.t(3);
Stats_C(13,k) = Stats.hac.pval(3);
Stats_C(14,k) = Stats.beta(4);
Stats_C(15,k) = Stats.hac.t(4);
Stats_C(16,k) = Stats.hac.pval(4);
Stats_C(17,k) = Stats.beta(5);
Stats_C(18,k) = Stats.hac.t(5);
Stats_C(19,k) = Stats.hac.pval(5);

    % Beta conditional CAPM

Stats= regstats2(y-rf,X_CAPM_FS,'linear',whichstats)
Stats_CAPM_FS(1,k) = Stats.rsquare;
Stats_CAPM_FS(2,k) = Stats.adjrsquare;
Stats_CAPM_FS(3,k) = Stats.fstat.f;
Stats_CAPM_FS(4,k) = Stats.fstat.pval;
Stats_CAPM_FS(5,k) = Stats.beta(1);
Stats_CAPM_FS(6,k) = Stats.hac.t(1);
Stats_CAPM_FS(7,k) = Stats.hac.pval(1);
Stats_CAPM_FS(8,k) = Stats.beta(2);
Stats_CAPM_FS(9,k) = Stats.hac.t(2);
Stats_CAPM_FS(10,k) = Stats.hac.pval(2);
Stats_CAPM_FS(11,k) = Stats.beta(3);
Stats_CAPM_FS(12,k) = Stats.hac.t(3);
Stats_CAPM_FS(13,k) = Stats.hac.pval(3);
```

```
Stats_CAPM_FS(14,k) = Stats.beta(4);
Stats_CAPM_FS(15,k) = Stats.hac.t(4);
Stats_CAPM_FS(16,k) = Stats.hac.pval(4);
Stats_CAPM_FS(17,k) = Stats.beta(5);
Stats_CAPM_FS(18,k) = Stats.hac.t(5);
Stats_CAPM_FS(19,k) = Stats.hac.pval(5);
Stats_CAPM_FS(20,k) = Stats.beta(6);
Stats_CAPM_FS(21,k) = Stats.hac.t(6);
Stats_CAPM_FS(22,k) = Stats.hac.pval(6);
Stats_CAPM_FS(23,k) = Stats.beta(7);
Stats_CAPM_FS(24,k) = Stats.hac.t(7);
Stats_CAPM_FS(25,k) = Stats.hac.pval(7);
Stats_CAPM_FS(26,k) = Stats.beta(8);
Stats_CAPM_FS(27,k) = Stats.hac.t(8);
Stats_CAPM_FS(28,k) = Stats.hac.pval(8);

% beta conditional Henriksson_Merton

Stats= regstats2(y-rf,X_HM_FS,'linear',whichstats);
Stats_HM_FS(1,k) = Stats.rsquare;
Stats_HM_FS(2,k) = Stats.adjrsquare;
Stats_HM_FS(3,k) = Stats.fstat.f;
Stats_HM_FS(4,k) = Stats.fstat.pval;
Stats_HM_FS(5,k) = Stats.beta(1);
Stats_HM_FS(6,k) = Stats.hac.t(1);
Stats_HM_FS(7,k) = Stats.hac.pval(1);
Stats_HM_FS(8,k) = Stats.beta(2);
Stats_HM_FS(9,k) = Stats.hac.t(2);
Stats_HM_FS(10,k) = Stats.hac.pval(2);
Stats_HM_FS(11,k) = Stats.beta(3);
Stats_HM_FS(12,k) = Stats.hac.t(3);
Stats_HM_FS(13,k) = Stats.hac.pval(3);
Stats_HM_FS(14,k) = Stats.beta(4);
Stats_HM_FS(15,k) = Stats.hac.t(4);
Stats_HM_FS(16,k) = Stats.hac.pval(4);
Stats_HM_FS(17,k) = Stats.beta(5);
Stats_HM_FS(18,k) = Stats.hac.t(5);
Stats_HM_FS(19,k) = Stats.hac.pval(5);
Stats_HM_FS(20,k) = Stats.beta(6);
Stats_HM_FS(21,k) = Stats.hac.t(6);
Stats_HM_FS(22,k) = Stats.hac.pval(6);
Stats_HM_FS(23,k) = Stats.beta(7);
Stats_HM_FS(24,k) = Stats.hac.t(7);
Stats_HM_FS(25,k) = Stats.hac.pval(7);
Stats_HM_FS(26,k) = Stats.beta(8);
Stats_HM_FS(27,k) = Stats.hac.t(8);
Stats_HM_FS(28,k) = Stats.hac.pval(8);
Stats_HM_FS(29,k) = Stats.beta(9);
Stats_HM_FS(30,k) = Stats.hac.t(9);
Stats_HM_FS(31,k) = Stats.hac.pval(9);

    % Beta conditional treynor mazuy

Stats= regstats2(y-rf,X_TM_FS,'linear',whichstats);
Stats_TM_FS(1,k) = Stats.rsquare;
Stats_TM_FS(2,k) = Stats.adjrsquare;
Stats_TM_FS(3,k) = Stats.fstat.f;
Stats_TM_FS(4,k) = Stats.fstat.pval;
```

```
Stats_TM_FS(5,k) = Stats.beta(1);
Stats_TM_FS(6,k) = Stats.hac.t(1);
Stats_TM_FS(7,k) = Stats.hac.pval(1);
Stats_TM_FS(8,k) = Stats.beta(2);
Stats_TM_FS(9,k) = Stats.hac.t(2);
Stats_TM_FS(10,k) = Stats.hac.pval(2);
Stats_TM_FS(11,k) = Stats.beta(3);
Stats_TM_FS(12,k) = Stats.hac.t(3);
Stats_TM_FS(13,k) = Stats.hac.pval(3);
Stats_TM_FS(14,k) = Stats.beta(4);
Stats_TM_FS(15,k) = Stats.hac.t(4);
Stats_TM_FS(16,k) = Stats.hac.pval(4);
Stats_TM_FS(17,k) = Stats.beta(5);
Stats_TM_FS(18,k) = Stats.hac.t(5);
Stats_TM_FS(19,k) = Stats.hac.pval(5);
Stats_TM_FS(20,k) = Stats.beta(6);
Stats_TM_FS(21,k) = Stats.hac.t(6);
Stats_TM_FS(22,k) = Stats.hac.pval(6);
Stats_TM_FS(23,k) = Stats.beta(7);
Stats_TM_FS(24,k) = Stats.hac.t(7);
Stats_TM_FS(25,k) = Stats.hac.pval(7);
Stats_TM_FS(26,k) = Stats.beta(8);
Stats_TM_FS(27,k) = Stats.hac.t(8);
Stats_TM_FS(28,k) = Stats.hac.pval(8);
Stats_TM_FS(29,k) = Stats.beta(9);
Stats_TM_FS(30,k) = Stats.hac.t(9);
Stats_TM_FS(31,k) = Stats.hac.pval(9);

% beta conditional Fama_French

Stats= regstats2(y-rf,X_FF_FS,'linear',whichstats);
Stats_FF_FS(1,k) = Stats.rsquare;
Stats_FF_FS(2,k) = Stats.adjrsquare;
Stats_FF_FS(3,k) = Stats.fstat.f;
Stats_FF_FS(4,k) = Stats.fstat.pval;
Stats_FF_FS(5,k) = Stats.beta(1);
Stats_FF_FS(6,k) = Stats.hac.t(1);
Stats_FF_FS(7,k) = Stats.hac.pval(1);
Stats_FF_FS(8,k) = Stats.beta(2);
Stats_FF_FS(9,k) = Stats.hac.t(2);
Stats_FF_FS(10,k) = Stats.hac.pval(2);
Stats_FF_FS(11,k) = Stats.beta(3);
Stats_FF_FS(12,k) = Stats.hac.t(3);
Stats_FF_FS(13,k) = Stats.hac.pval(3);
Stats_FF_FS(14,k) = Stats.beta(4);
Stats_FF_FS(15,k) = Stats.hac.t(4);
Stats_FF_FS(16,k) = Stats.hac.pval(4);
Stats_FF_FS(17,k) = Stats.beta(5);
Stats_FF_FS(18,k) = Stats.hac.t(5);
Stats_FF_FS(19,k) = Stats.hac.pval(5);
Stats_FF_FS(20,k) = Stats.beta(6);
Stats_FF_FS(21,k) = Stats.hac.t(6);
Stats_FF_FS(22,k) = Stats.hac.pval(6);
Stats_FF_FS(23,k) = Stats.beta(7);
Stats_FF_FS(24,k) = Stats.hac.t(7);
Stats_FF_FS(25,k) = Stats.hac.pval(7);
Stats_FF_FS(26,k) = Stats.beta(8);
Stats_FF_FS(27,k) = Stats.hac.t(8);
```

```
Stats_FF_FS(28,k) = Stats.hac.pval(8);
Stats_FF_FS(29,k) = Stats.beta(9);
Stats_FF_FS(30,k) = Stats.hac.t(9);
Stats_FF_FS(31,k) = Stats.hac.pval(9);
Stats_FF_FS(32,k) = Stats.beta(10);
Stats_FF_FS(33,k) = Stats.hac.t(10);
Stats_FF_FS(34,k) = Stats.hac.pval(10);

    % beta conditional Carhart

Stats= regstats2(y-rf,X_C_FS,'linear',whichstats);
Stats_C_FS(1,k) = Stats.rsquare;
Stats_C_FS(2,k) = Stats.adjrsquare;
Stats_C_FS(3,k) = Stats.fstat.f;
Stats_C_FS(4,k) = Stats.fstat.pval;
Stats_C_FS(5,k) = Stats.beta(1);
Stats_C_FS(6,k) = Stats.hac.t(1);
Stats_C_FS(7,k) = Stats.hac.pval(1);
Stats_C_FS(8,k) = Stats.beta(2);
Stats_C_FS(9,k) = Stats.hac.t(2);
Stats_C_FS(10,k) = Stats.hac.pval(2);
Stats_C_FS(11,k) = Stats.beta(3);
Stats_C_FS(12,k) = Stats.hac.t(3);
Stats_C_FS(13,k) = Stats.hac.pval(3);
Stats_C_FS(14,k) = Stats.beta(4);
Stats_C_FS(15,k) = Stats.hac.t(4);
Stats_C_FS(16,k) = Stats.hac.pval(4);
Stats_C_FS(17,k) = Stats.beta(5);
Stats_C_FS(18,k) = Stats.hac.t(5);
Stats_C_FS(19,k) = Stats.hac.pval(5);
Stats_C_FS(20,k) = Stats.beta(6);
Stats_C_FS(21,k) = Stats.hac.t(6);
Stats_C_FS(22,k) = Stats.hac.pval(6);
Stats_C_FS(23,k) = Stats.beta(7);
Stats_C_FS(24,k) = Stats.hac.t(7);
Stats_C_FS(25,k) = Stats.hac.pval(7);
Stats_C_FS(26,k) = Stats.beta(8);
Stats_C_FS(27,k) = Stats.hac.t(8);
Stats_C_FS(28,k) = Stats.hac.pval(8);
Stats_C_FS(29,k) = Stats.beta(9);
Stats_C_FS(30,k) = Stats.hac.t(9);
Stats_C_FS(31,k) = Stats.hac.pval(9);
Stats_C_FS(32,k) = Stats.beta(10);
Stats_C_FS(33,k) = Stats.hac.t(10);
Stats_C_FS(34,k) = Stats.hac.pval(10);
Stats_C_FS(35,k) = Stats.beta(11);
Stats_C_FS(36,k) = Stats.hac.t(11);
Stats_C_FS(37,k) = Stats.hac.pval(11);

    % Beta and alpha conditional CAPM

Stats= regstats2(y-rf,X_CAPM_CFG,'linear',whichstats)
Stats_CAPM_CFG(1,k) = Stats.rsquare;
Stats_CAPM_CFG(2,k) = Stats.adjrsquare;
Stats_CAPM_CFG(3,k) = Stats.fstat.f;
Stats_CAPM_CFG(4,k) = Stats.fstat.pval;
Stats_CAPM_CFG(5,k) = Stats.beta(1);
Stats_CAPM_CFG(6,k) = Stats.hac.t(1);
```

```
Stats_CAPM_CFG(7,k) = Stats.hac.pval(1);
Stats_CAPM_CFG(8,k) = Stats.beta(2);
Stats_CAPM_CFG(9,k) = Stats.hac.t(2);
Stats_CAPM_CFG(10,k) = Stats.hac.pval(2);
Stats_CAPM_CFG(11,k) = Stats.beta(3);
Stats_CAPM_CFG(12,k) = Stats.hac.t(3);
Stats_CAPM_CFG(13,k) = Stats.hac.pval(3);
Stats_CAPM_CFG(14,k) = Stats.beta(4);
Stats_CAPM_CFG(15,k) = Stats.hac.t(4);
Stats_CAPM_CFG(16,k) = Stats.hac.pval(4);
Stats_CAPM_CFG(17,k) = Stats.beta(5);
Stats_CAPM_CFG(18,k) = Stats.hac.t(5);
Stats_CAPM_CFG(19,k) = Stats.hac.pval(5);
Stats_CAPM_CFG(20,k) = Stats.beta(6);
Stats_CAPM_CFG(21,k) = Stats.hac.t(6);
Stats_CAPM_CFG(22,k) = Stats.hac.pval(6);
Stats_CAPM_CFG(23,k) = Stats.beta(7);
Stats_CAPM_CFG(24,k) = Stats.hac.t(7);
Stats_CAPM_CFG(25,k) = Stats.hac.pval(7);
Stats_CAPM_CFG(26,k) = Stats.beta(8);
Stats_CAPM_CFG(27,k) = Stats.hac.t(8);
Stats_CAPM_CFG(28,k) = Stats.hac.pval(8);
Stats_CAPM_CFG(29,k) = Stats.beta(9);
Stats_CAPM_CFG(30,k) = Stats.hac.t(9);
Stats_CAPM_CFG(31,k) = Stats.hac.pval(9);
Stats_CAPM_CFG(32,k) = Stats.beta(10);
Stats_CAPM_CFG(33,k) = Stats.hac.t(10);
Stats_CAPM_CFG(34,k) = Stats.hac.pval(10);
Stats_CAPM_CFG(35,k) = Stats.beta(11);
Stats_CAPM_CFG(36,k) = Stats.hac.t(11);
Stats_CAPM_CFG(37,k) = Stats.hac.pval(11);
Stats_CAPM_CFG(38,k) = Stats.beta(12);
Stats_CAPM_CFG(39,k) = Stats.hac.t(12);
Stats_CAPM_CFG(40,k) = Stats.hac.pval(12);
Stats_CAPM_CFG(41,k) = Stats.beta(13);
Stats_CAPM_CFG(42,k) = Stats.hac.t(13);
Stats_CAPM_CFG(43,k) = Stats.hac.pval(13);
Stats_CAPM_CFG(44,k) = Stats.beta(14);
Stats_CAPM_CFG(45,k) = Stats.hac.t(14);
Stats_CAPM_CFG(46,k) = Stats.hac.pval(14);

    % beta and alpha conditional Henriksson Merton

Stats= regstats2(y-rf,X_HM_CFG,'linear',whichstats);
Stats_HM_CFG(1,k) = Stats.rsquare;
Stats_HM_CFG(2,k) = Stats.adjrsquare;
Stats_HM_CFG(3,k) = Stats.fstat.f;
Stats_HM_CFG(4,k) = Stats.fstat.pval;
Stats_HM_CFG(5,k) = Stats.beta(1);
Stats_HM_CFG(6,k) = Stats.hac.t(1);
Stats_HM_CFG(7,k) = Stats.hac.pval(1);
Stats_HM_CFG(8,k) = Stats.beta(2);
Stats_HM_CFG(9,k) = Stats.hac.t(2);
Stats_HM_CFG(10,k) = Stats.hac.pval(2);
Stats_HM_CFG(11,k) = Stats.beta(3);
Stats_HM_CFG(12,k) = Stats.hac.t(3);
Stats_HM_CFG(13,k) = Stats.hac.pval(3);
Stats_HM_CFG(14,k) = Stats.beta(4);
```

```
Stats_HM_CFG(15,k) = Stats.hac.t(4);
Stats_HM_CFG(16,k) = Stats.hac.pval(4);
Stats_HM_CFG(17,k) = Stats.beta(5);
Stats_HM_CFG(18,k) = Stats.hac.t(5);
Stats_HM_CFG(19,k) = Stats.hac.pval(5);
Stats_HM_CFG(20,k) = Stats.beta(6);
Stats_HM_CFG(21,k) = Stats.hac.t(6);
Stats_HM_CFG(22,k) = Stats.hac.pval(6);
Stats_HM_CFG(23,k) = Stats.beta(7);
Stats_HM_CFG(24,k) = Stats.hac.t(7);
Stats_HM_CFG(25,k) = Stats.hac.pval(7);
Stats_HM_CFG(26,k) = Stats.beta(8);
Stats_HM_CFG(27,k) = Stats.hac.t(8);
Stats_HM_CFG(28,k) = Stats.hac.pval(8);
Stats_HM_CFG(29,k) = Stats.beta(9);
Stats_HM_CFG(30,k) = Stats.hac.t(9);
Stats_HM_CFG(31,k) = Stats.hac.pval(9);
Stats_HM_CFG(32,k) = Stats.beta(10);
Stats_HM_CFG(33,k) = Stats.hac.t(10);
Stats_HM_CFG(34,k) = Stats.hac.pval(10);
Stats_HM_CFG(35,k) = Stats.beta(11);
Stats_HM_CFG(36,k) = Stats.hac.t(11);
Stats_HM_CFG(37,k) = Stats.hac.pval(11);
Stats_HM_CFG(38,k) = Stats.beta(12);
Stats_HM_CFG(39,k) = Stats.hac.t(12);
Stats_HM_CFG(40,k) = Stats.hac.pval(12);
Stats_HM_CFG(41,k) = Stats.beta(13);
Stats_HM_CFG(42,k) = Stats.hac.t(13);
Stats_HM_CFG(43,k) = Stats.hac.pval(13);
Stats_HM_CFG(44,k) = Stats.beta(14);
Stats_HM_CFG(45,k) = Stats.hac.t(14);
Stats_HM_CFG(46,k) = Stats.hac.pval(14);
Stats_HM_CFG(47,k) = Stats.beta(15);
Stats_HM_CFG(48,k) = Stats.hac.t(15);
Stats_HM_CFG(49,k) = Stats.hac.pval(15);

    % beta and alpha conditional Treynor mazuy

Stats= regstats2(y-rf,X_TM_CFG,'linear',whichstats);
Stats_TM_CFG(1,k) = Stats.rsquare;
Stats_TM_CFG(2,k) = Stats.adjrsquare;
Stats_TM_CFG(3,k) = Stats.fstat.f;
Stats_TM_CFG(4,k) = Stats.fstat.pval;
Stats_TM_CFG(5,k) = Stats.beta(1);
Stats_TM_CFG(6,k) = Stats.hac.t(1);
Stats_TM_CFG(7,k) = Stats.hac.pval(1);
Stats_TM_CFG(8,k) = Stats.beta(2);
Stats_TM_CFG(9,k) = Stats.hac.t(2);
Stats_TM_CFG(10,k) = Stats.hac.pval(2);
Stats_TM_CFG(11,k) = Stats.beta(3);
Stats_TM_CFG(12,k) = Stats.hac.t(3);
Stats_TM_CFG(13,k) = Stats.hac.pval(3);
Stats_TM_CFG(14,k) = Stats.beta(4);
Stats_TM_CFG(15,k) = Stats.hac.t(4);
Stats_TM_CFG(16,k) = Stats.hac.pval(4);
Stats_TM_CFG(17,k) = Stats.beta(5);
Stats_TM_CFG(18,k) = Stats.hac.t(5);
Stats_TM_CFG(19,k) = Stats.hac.pval(5);
```

```
Stats_TM_CFG(20,k) = Stats.beta(6);
Stats_TM_CFG(21,k) = Stats.hac.t(6);
Stats_TM_CFG(22,k) = Stats.hac.pval(6);
Stats_TM_CFG(23,k) = Stats.beta(7);
Stats_TM_CFG(24,k) = Stats.hac.t(7);
Stats_TM_CFG(25,k) = Stats.hac.pval(7);
Stats_TM_CFG(26,k) = Stats.beta(8);
Stats_TM_CFG(27,k) = Stats.hac.t(8);
Stats_TM_CFG(28,k) = Stats.hac.pval(8);
Stats_TM_CFG(29,k) = Stats.beta(9);
Stats_TM_CFG(30,k) = Stats.hac.t(9);
Stats_TM_CFG(31,k) = Stats.hac.pval(9);
Stats_TM_CFG(32,k) = Stats.beta(10);
Stats_TM_CFG(33,k) = Stats.hac.t(10);
Stats_TM_CFG(34,k) = Stats.hac.pval(10);
Stats_TM_CFG(35,k) = Stats.beta(11);
Stats_TM_CFG(36,k) = Stats.hac.t(11);
Stats_TM_CFG(37,k) = Stats.hac.pval(11);
Stats_TM_CFG(38,k) = Stats.beta(12);
Stats_TM_CFG(39,k) = Stats.hac.t(12);
Stats_TM_CFG(40,k) = Stats.hac.pval(12);
Stats_TM_CFG(41,k) = Stats.beta(13);
Stats_TM_CFG(42,k) = Stats.hac.t(13);
Stats_TM_CFG(43,k) = Stats.hac.pval(13);
Stats_TM_CFG(44,k) = Stats.beta(14);
Stats_TM_CFG(45,k) = Stats.hac.t(14);
Stats_TM_CFG(46,k) = Stats.hac.pval(14);
Stats_TM_CFG(47,k) = Stats.beta(15);
Stats_TM_CFG(48,k) = Stats.hac.t(15);
Stats_TM_CFG(49,k) = Stats.hac.pval(15);

    % beta and alpha conditional fama french

Stats= regstats2(y-rf,X_FF_CFG,'linear',whichstats);
Stats_FF_CFG(1,k) = Stats.rsquare;
Stats_FF_CFG(2,k) = Stats.adjrsquare;
Stats_FF_CFG(3,k) = Stats.fstat.f;
Stats_FF_CFG(4,k) = Stats.fstat.pval;
Stats_FF_CFG(5,k) = Stats.beta(1);
Stats_FF_CFG(6,k) = Stats.hac.t(1);
Stats_FF_CFG(7,k) = Stats.hac.pval(1);
Stats_FF_CFG(8,k) = Stats.beta(2);
Stats_FF_CFG(9,k) = Stats.hac.t(2);
Stats_FF_CFG(10,k) = Stats.hac.pval(2);
Stats_FF_CFG(11,k) = Stats.beta(3);
Stats_FF_CFG(12,k) = Stats.hac.t(3);
Stats_FF_CFG(13,k) = Stats.hac.pval(3);
Stats_FF_CFG(14,k) = Stats.beta(4);
Stats_FF_CFG(15,k) = Stats.hac.t(4);
Stats_FF_CFG(16,k) = Stats.hac.pval(4);
Stats_FF_CFG(17,k) = Stats.beta(5);
Stats_FF_CFG(18,k) = Stats.hac.t(5);
Stats_FF_CFG(19,k) = Stats.hac.pval(5);
Stats_FF_CFG(20,k) = Stats.beta(6);
Stats_FF_CFG(21,k) = Stats.hac.t(6);
Stats_FF_CFG(22,k) = Stats.hac.pval(6);
Stats_FF_CFG(23,k) = Stats.beta(7);
Stats_FF_CFG(24,k) = Stats.hac.t(7);
```

```
Stats_FF_CFG(25,k) = Stats.hac.pval(7);
Stats_FF_CFG(26,k) = Stats.beta(8);
Stats_FF_CFG(27,k) = Stats.hac.t(8);
Stats_FF_CFG(28,k) = Stats.hac.pval(8);
Stats_FF_CFG(29,k) = Stats.beta(9);
Stats_FF_CFG(30,k) = Stats.hac.t(9);
Stats_FF_CFG(31,k) = Stats.hac.pval(9);
Stats_FF_CFG(32,k) = Stats.beta(10);
Stats_FF_CFG(33,k) = Stats.hac.t(10);
Stats_FF_CFG(34,k) = Stats.hac.pval(10);
Stats_FF_CFG(35,k) = Stats.beta(11);
Stats_FF_CFG(36,k) = Stats.hac.t(11);
Stats_FF_CFG(37,k) = Stats.hac.pval(11);
Stats_FF_CFG(38,k) = Stats.beta(12);
Stats_FF_CFG(39,k) = Stats.hac.t(12);
Stats_FF_CFG(40,k) = Stats.hac.pval(12);
Stats_FF_CFG(41,k) = Stats.beta(13);
Stats_FF_CFG(42,k) = Stats.hac.t(13);
Stats_FF_CFG(43,k) = Stats.hac.pval(13);
Stats_FF_CFG(44,k) = Stats.beta(14);
Stats_FF_CFG(45,k) = Stats.hac.t(14);
Stats_FF_CFG(46,k) = Stats.hac.pval(14);
Stats_FF_CFG(47,k) = Stats.beta(15);
Stats_FF_CFG(48,k) = Stats.hac.t(15);
Stats_FF_CFG(49,k) = Stats.hac.pval(15);
Stats_FF_CFG(50,k) = Stats.beta(16);
Stats_FF_CFG(51,k) = Stats.hac.t(16);
Stats_FF_CFG(52,k) = Stats.hac.pval(16);

% beta and alpha conditional Carhart

Stats= regstats2(y-rf,X_C_CFG,'linear',whichstats);
Stats_C_CFG(1,k) = Stats.rsquare;
Stats_C_CFG(2,k) = Stats.adjrsquare;
Stats_C_CFG(3,k) = Stats.fstat.f;
Stats_C_CFG(4,k) = Stats.fstat.pval;
Stats_C_CFG(5,k) = Stats.beta(1);
Stats_C_CFG(6,k) = Stats.hac.t(1);
Stats_C_CFG(7,k) = Stats.hac.pval(1);
Stats_C_CFG(8,k) = Stats.beta(2);
Stats_C_CFG(9,k) = Stats.hac.t(2);
Stats_C_CFG(10,k) = Stats.hac.pval(2);
Stats_C_CFG(11,k) = Stats.beta(3);
Stats_C_CFG(12,k) = Stats.hac.t(3);
Stats_C_CFG(13,k) = Stats.hac.pval(3);
Stats_C_CFG(14,k) = Stats.beta(4);
Stats_C_CFG(15,k) = Stats.hac.t(4);
Stats_C_CFG(16,k) = Stats.hac.pval(4);
Stats_C_CFG(17,k) = Stats.beta(5);
Stats_C_CFG(18,k) = Stats.hac.t(5);
Stats_C_CFG(19,k) = Stats.hac.pval(5);
Stats_C_CFG(20,k) = Stats.beta(6);
Stats_C_CFG(21,k) = Stats.hac.t(6);
Stats_C_CFG(22,k) = Stats.hac.pval(6);
Stats_C_CFG(23,k) = Stats.beta(7);
Stats_C_CFG(24,k) = Stats.hac.t(7);
Stats_C_CFG(25,k) = Stats.hac.pval(7);
Stats_C_CFG(26,k) = Stats.beta(8);
```

```
Stats_C_CFG(27,k) = Stats.hac.t(8);
Stats_C_CFG(28,k) = Stats.hac.pval(8);
Stats_C_CFG(29,k) = Stats.beta(9);
Stats_C_CFG(30,k) = Stats.hac.t(9);
Stats_C_CFG(31,k) = Stats.hac.pval(9);
Stats_C_CFG(32,k) = Stats.beta(10);
Stats_C_CFG(33,k) = Stats.hac.t(10);
Stats_C_CFG(34,k) = Stats.hac.pval(10);
Stats_C_CFG(35,k) = Stats.beta(11);
Stats_C_CFG(36,k) = Stats.hac.t(11);
Stats_C_CFG(37,k) = Stats.hac.pval(11);
Stats_C_CFG(38,k) = Stats.beta(12);
Stats_C_CFG(39,k) = Stats.hac.t(12);
Stats_C_CFG(40,k) = Stats.hac.pval(12);
Stats_C_CFG(41,k) = Stats.beta(13);
Stats_C_CFG(42,k) = Stats.hac.t(13);
Stats_C_CFG(43,k) = Stats.hac.pval(13);
Stats_C_CFG(44,k) = Stats.beta(14);
Stats_C_CFG(45,k) = Stats.hac.t(14);
Stats_C_CFG(46,k) = Stats.hac.pval(14);
Stats_C_CFG(47,k) = Stats.beta(15);
Stats_C_CFG(48,k) = Stats.hac.t(15);
Stats_C_CFG(49,k) = Stats.hac.pval(15);
Stats_C_CFG(50,k) = Stats.beta(16);
Stats_C_CFG(51,k) = Stats.hac.t(16);
Stats_C_CFG(52,k) = Stats.hac.pval(16);
Stats_C_CFG(53,k) = Stats.beta(17);
Stats_C_CFG(54,k) = Stats.hac.t(17);
Stats_C_CFG(55,k) = Stats.hac.pval(17);

end

clear X_CAPM;
clear X_HM;
clear X_TM;
clear X_FF;
clear X_C;
clear X_CAPM_FS;
clear X_HM_FS;
clear X_TM_FS;
clear X_FF_FS;
clear X_C_FS;
clear X_CAPM_CFG;
clear X_HM_CFG;
clear X_TM_CFG;
clear X_FF_CFG;
clear X_C_CFG;

clear j;
clear k;
clear rf;
clear xtemp;
clear y;
clear Stats;
clear whichstats;
clear data;
```

9.4 Appendix D: Regression Results for 5 factor model

We have also estimated our 5 factor model as described in equation (40). The average adjusted R^2 of 5 factor model is 74.69%, highest of all unconditional models. According to our 5 factor model, the average alpha is 0.15%, higher than zero strengthening our view about positive stock picking and negative timing ability in Turkish fund management industry. Out of 10 significant alphas, 6 are positive and 4 are negative, a more balanced performance close to zero with almost equal tails. As we believe that ignoring the timing underestimates, and ignoring the momentum overestimates fund performance, with the 5 factor model both momentum and timing effects cancel each out for a average alpha very close to zero. Furthermore, with the 5 factor model, we have alpha estimates separated from both the timing effects and the effects due to passive investment strategies. The details of 5 factor model are presented in table (19)

Table 19 - 5 Factor Model Results – Equation (40)

	Adjusted R^2	α		β_1		β_2		β_3		β_4		β_5	
AVERAGE	87.58%	0.14%		52.43%	+++	1.85%		-3.38%		-3.62%		-41.49%	++
AAK	66.76%	0.13%		34.45%	+++	3.46%		-8.47%	++	6.35%		-56.27%	+
ACD	78.58%	-0.27%	+	34.41%	+++	4.30%	+++	-2.13%		-1.94%		-65.66%	+++
ADD	42.10%	0.17%		45.67%	+++	3.49%		1.02%		5.51%		-25.25%	
ADF	84.99%	0.01%		50.42%	+++	0.94%		-3.58%		-0.43%		-27.94%	
AE3	84.87%	0.08%		32.92%	+++	-1.08%		1.81%		-2.33%		-12.91%	
AH0	70.84%	0.73%	+++	41.65%	+++	0.32%		4.53%		-14.73%	++	-10.19%	
AH5	86.80%	0.46%		83.91%	+++	-0.78%		0.55%		-11.49%		-20.08%	
AH9	77.44%	0.11%		27.36%	+++	-0.43%		3.87%		-3.93%		0.94%	
AK3	87.57%	0.01%		74.36%	+++	1.46%		-4.09%		-7.45%		-19.17%	
AN1	77.06%	0.56%		62.93%	+++	5.97%	++	-9.61%	+	-2.47%		-91.89%	+++
ANE	74.71%	0.02%		34.87%	+++	1.45%		2.29%		3.34%		-16.63%	
ANS	87.08%	0.71%	++	86.82%	+++	1.81%		-2.26%		-8.92%		-57.97%	++
ASA	80.57%	0.53%		67.79%	+++	5.53%	+++	-9.44%	++	-1.41%		-89.55%	+++
AVD	70.18%	0.08%		26.03%	+++	-1.52%		2.58%		-11.44%	+++	-24.61%	
AVE	61.87%	0.16%		23.19%	+++	-1.73%		1.66%		-8.44%	+	-25.26%	
AZB	73.02%	0.21%		29.82%	+++	-0.04%		2.24%		2.89%		-19.62%	+
BEE	62.52%	0.12%		23.24%	+++	-1.36%		-1.27%		9.13%	+++	-22.31%	
BEH	86.27%	0.25%		78.95%	+++	2.16%		-12.17%	++	-3.52%		-52.76%	
DAH	72.17%	-0.23%		59.17%	+++	1.73%		-9.50%	+	1.15%		-9.64%	
DZA	73.39%	0.10%		35.68%	+++	-3.80%		-2.50%		-19.60%	+++	-56.71%	++
DZK	66.97%	-0.18%		22.86%	+++	-0.24%		-1.88%		-2.91%		12.02%	
EC2	76.86%	-0.64%	++	47.83%	+++	-0.61%		2.79%		-4.37%		-32.19%	
EV1	71.57%	1.32%	+++	58.78%	+++	14.67%	+++	-15.79%	+++	-12.20%		-85.35%	+++
FAF	83.63%	0.47%		75.71%	+++	-0.40%		-0.33%		-14.08%	+	-7.41%	
FEE	72.74%	0.21%		34.35%	+++	0.71%		-2.31%		-0.82%		-58.89%	++
FI2	80.14%	0.16%		61.27%	+++	5.41%	+	-6.04%		0.05%		-42.89%	
FYD	79.61%	0.50%		61.28%	+++	-0.46%		-7.47%		-17.73%	++	-18.02%	
FYK	73.49%	0.35%		36.15%	+++	0.92%		0.66%		0.24%		-39.65%	+
GAF	74.42%	-0.11%		66.56%	+++	4.73%		-16.20%	+++	-13.90%		-89.41%	+++
GAK	66.65%	-0.13%		39.24%	+++	2.00%		-7.18%		3.08%		-56.11%	++
GBK	66.63%	-0.13%		40.57%	+++	2.86%		-1.64%		0.81%		-77.24%	++
GEH	88.08%	0.46%		83.46%	+++	-1.82%		-2.26%		-5.60%		-62.35%	+
GL1	65.21%	-0.06%		35.04%	+++	1.93%		-3.26%		-4.76%		-121.55%	++
HLK	74.65%	0.32%		33.59%	+++	5.07%	+++	-5.81%	+	-2.94%		-44.87%	+
HSA	84.38%	-0.05%		43.15%	+++	2.42%	++	-1.99%		-2.77%		-18.78%	
IEH	74.96%	0.39%		79.70%	+++	-1.62%		-5.89%		-11.54%		-36.25%	
IEK	75.73%	0.10%		37.05%	+++	-0.94%		-4.26%		-6.34%		12.52%	
IGH	73.84%	-0.37%		57.16%	+++	2.74%		-2.50%		-0.13%		-24.66%	
IYD	79.88%	-0.23%		62.92%	+++	5.73%	+++	-4.68%		9.98%		-14.00%	
MAD	56.59%	-1.30%	++	50.26%	+++	4.49%		-7.80%		-6.22%		-47.69%	
SAD	78.52%	-0.30%		42.14%	+++	0.44%		-2.56%		-8.84%	++	-60.78%	+
SMA01	64.03%	0.40%		44.92%	+++	6.64%	+++	1.72%		-19.39%	++	-115.64%	+++
ST1	80.39%	1.63%	+++	90.80%	+++	17.97%	+++	-32.78%	+++	2.90%		-9.71%	
TAD	60.95%	-0.51%	++	23.77%	+++	0.17%		-1.08%		2.09%		-25.39%	++
TAH	75.00%	0.90%	+	66.45%	+++	3.18%		-14.57%	++	4.27%		-58.96%	+

Table 19 (Cont.)

TCD	80.56%	-0.37%		50.09%	+++	-0.02%		3.86%		0.99%		-55.90%	++
TE3	83.37%	0.28%		45.61%	+++	-1.94%		1.84%		-11.23%	++	-79.85%	+++
TI2	84.47%	0.10%		70.00%	+++	-0.63%		-1.69%		0.61%		-33.83%	
TI3	73.34%	0.21%		79.02%	+++	9.98%	+++	-14.24%	++	10.20%		-10.33%	
TI7	72.18%	-0.03%		47.91%	+++	1.39%		-2.31%		0.34%		-37.24%	
TKF	67.76%	0.30%		39.47%	+++	1.65%		0.60%		-4.18%		-42.94%	+
TKK	80.38%	0.26%		38.09%	+++	0.42%		3.45%		1.84%		-32.68%	
TUD	43.49%	1.38%	+	71.93%	+++	2.52%		22.83%		-47.95%		-223.05%	++
TYH	84.15%	-0.09%		77.95%	+++	1.32%		-6.47%		-7.11%		-16.75%	
TZD	77.49%	-0.22%		38.09%	+++	1.76%		-5.57%	+	-3.56%		-25.74%	
TZK	82.87%	0.26%		40.62%	+++	-0.30%		-4.29%		0.41%		-60.04%	+++
VAF	80.01%	0.02%		47.51%	+++	2.06%		0.31%		1.08%		-41.61%	++
VEE	59.86%	0.17%		18.10%	+++	0.41%		0.18%		1.12%		-17.28%	
VEH	83.73%	0.38%		79.95%	+++	4.22%		-6.49%		-11.36%		-15.26%	
YAD	71.44%	0.04%		49.41%	+++	4.47%	++	1.60%		12.69%	+	-78.13%	++
YAF	79.31%	-0.06%		41.16%	+++	-1.22%		-1.08%		3.33%		-25.42%	
YAK	80.62%	-0.19%		42.02%	+++	0.07%		-5.66%		-0.80%		1.45%	
YEE	46.09%	0.24%		19.18%	+++	0.73%		1.79%		1.26%		-12.43%	
BZA	80.50%	-0.55%		81.46%	+++	14.52%	+++	-20.45%	+++	7.41%		-18.49%	
YEH	86.38%	0.36%		85.71%	+++	2.02%		-8.03%	+	-6.55%		-26.18%	
Average	74.69%	0.15%		50.98%		2.17%		-3.50%		-3.57%		-41.21%	
Max	88.08%	1.63%		90.80%		17.97%		22.83%		12.69%		12.52%	
Min	42.10%	-1.30%		18.10%		-3.80%		-32.78%		-47.95%		-223.05%	

+ significant at %90 confidence

++ significant at %95 confidence

+++ significant at %99 confidence

9.5 Difference of Gross and net returns.

Gross return of a fund is the return gained from the assets included in the fund. From the gross return, mutual funds have certain expenses and management fees deducted. Net return is defiend as the return after management fees and expenses. So, net return is called the return that the investor gains. Investors measure the performance of a fund over the net returns since this is what they get. However, fund managers argue that, the return which the fund manager generates is the gross return. The difference between the gross and the net return is an administrative issue due to the amount of the expenses and as nothing to do with the performance of the fund manager himself.

Malkiel (1995) has analysed the results calculated over both the gross and returns for the period of 1982 to 1991. He has found that while the average alpha was negative when calculated over the net returns, it shifts to positive when calculated over the gross returns. Malkiel further indicated that although it shifts to positive, number of significant alphas merely changes.

Our analysis is done over the net returns due to data limitations. Although we do not have detailed data for the whole period, we do have access to the management fees of funds for the 2004 – 2007 period for 38 of the funds.So, we have the chance to compare the results over gross and net returns for the subsample of 38 funds. The comparison of results are presented in table (20).

Panel I of Table (20) presents the average alphas, number of significantly negative and positive alphas for various models calculated over gross returns. Panel II presents the same results calculated over net returns. Panel III is the difference between the average alpha calculated over gross and net returns. It is obvious from the Panel III of table (20) that the average alpha changes on average 4% to 5% between gross and net returns. Moreover, the number of significant alphas increases for every model. Our results are somewhat consistent with the findings of Malkiel. Similar to his findings, the alphas increases when calculated over gross returns. But contrary to Malkiel we have found that the number of significant alphas increase when calculated over the gross returns. As a resut we can say that the Turkish fund managers can generate a considerable excess return, but this return is used to compensate the costs of the fund manager.

Table 20 - Performance comparison of Gross and Net returns

Panel I - Gross Returns	TM	FF	TM_FS	FF_FS	TM_CFG	FF_CFG
Average Alpha	4.8%	4.5%	4.9%	4.6%	4.7%	4.3%
# of significantly positive alphas	8	11	12	12	18	16
# of significantly negative alphas	2	5	1	2	-	3
Total	10	16	13	14	18	19

Panel 2 - Net Returns	TM	FF	TM_FS	FF_FS	TM_CFG	FF_CFG
Average Alpha	-0.2%	-0.3%	0.1%	-0.1%	0.4%	0.0%
# of significantly positive alphas	1	1	1	2	8	3
# of significantly negative alphas	8	12	4	10	1	11
Total	9	13	5	12	9	14

Panel 3						
Difference in Alphas	5.0%	4.8%	4.8%	4.7%	4.2%	4.4%

10. References

Abdel-Kader, M. & Qing, K.Y. 2007, `Risk adjusted performance, selectivity, timing ability and performance persistence of Hong Kong mutual funds`, *Journal of Asia-Pacific Business*, Vol. 8, No. 2, pp. 25-58.

Blake, D. & Timmermann, A. 1998, `Mutual fund performance: evidence from the UK`, *European Finance Review*, Vol. 2, pp. 57-77.

Brown, S. J. & Goetzmann, W. N. 1995, `Performance persistence`, *The Journal of Finance*, Vol. 50, No. 2, pp. 679-698.

Cai, J., Chan, K. C. & Yamada, T. 1997, `The performance of japanese mutual funds`, *The Review of Financial Studies*, Vol. 10, No. 2, pp. 237-273.

Capital Markets Board of Turkey, 1996, *Yatırım Fonlarına İlişkin Esaslar Tebliği*, Retrieved from: http://www.spk.gov.tr/mevzuat/pdf/Bolum_4/4_7_1_1_SeriVII_No10.pdf

Capital Markets Board of Turkey, 2001, *Bireysel Emeklilik Tasarruf ve Yatırım Sistemi Kanunu*, Retrieved from: http://www.spk.gov.tr/displayfile.aspx?action=displayfile&pageid=288&fn=288.pdf

Capital Markets Board of Turkey, 2002, *Emeklilik Yatırım Fonlarının Kuruluş ve Faaliyetlerine İlişkin Esaslar Hakkında Yönetmelik*, Retrieved from: http://www.spk.gov.tr/mevzuat/pdf/Bolum_4/4_7_1_EYF_Yon.pdf

Capital Markets Board of Turkey, 2008, *Sermaye Piyasası Kanunu*, Retrieved from: http://www.spk.gov.tr/displayfile.aspx?action=displayfile&pid=0&menuid=5&subid=0

Carhart, M. M. 1997, `On persistence in mutual fund performance`, *Journal of Finance*, Vol. 52, No. 1, pp. 57-82.

Christensen, M. 2005, `Danish mutual fund performance selectivity, market timing and persistence`, *Finance Research Group Working Papers*, F-2005-01, University of Aarhus, Aarhus School of Business, Department of Business Studies.

Christopherson, J. A., Ferson, W. E. & Glassman, D. A. 1998, `Conditioning manager alphas on economic information: another look at the persistence of performance`, *The Review of Financial Studies*, Vol. 11, No. 1, pp. 111-142.

Dahlquist, M., Engström, S. & Söderlind, P. 2000, `Performance and characteristics of Swedish mutual funds`, *The Journal of Financial and Quantitative Analysis*, Vol. 35, No. 3, pp. 409-423.

Daniel, K., Grinblatt, M., Titman, S. & Wermers, R. 1997, `Measuring mutual fund performance with characteristic-based benchmarks`, *Journal of Finance*, Vol. 52, No. 3, pp. 1035-1058.

Doğanay, M. F., 2004, `Hisse senedi yatırım fonlarının şartlı performans değerlendirmesi`, *Gazi Üniversitesi İİBF Dergisi*, Vol. 1, pp. 165-179.

EFAMA, 2009, *International quarterly statistics q4 2009 supplementary tables*, Retrieved from: http://www.efama.org/index2.php?option=com_docman&task=doc_view&gid=1173&Itemid=-99 (03.03.2010)

EFAMA, 2009, *International quarterly statistics*, Retrieved from: http://www.efama.org/index2.php?option=com_docman&task=doc_view&gid=1174&Itemid=-99 (03.03.2010)

Fama, E. F. 1972, `Components of investment performance`, *Journal of Finance*, Vol. 27, No. 3, pp. 551-567.

Fama, E.F. & French, K. R. 1993, `Common risk factors in the returns on stocks and bonds`, *Journal of Financial Economics*, Vol. 33, No. 1, pp. 3-56.

Fama, E.F. & French, K. R. 1996, `Multifactor explanations of asset pricing anomalies`, *Journal of Finance*, Vol. 51, No. 1, pp. 55-84.

Fant, L. F. & Peterson, D. L. 1995, `The effect of size, book-to-market equity, prior returns, and beta on stock returns: January versus the remainder of the year`, *Journal of Financial Research*, Vol. 43, No. 2, pp. 129-142.

Ferson, W. E. & Schadt, R.W. 1996, `Measuring fund strategy and performance in changing economic conditions`, *Journal of Finance*, Vol. 51, No. 2, pp. 425-461.

Gökgöz, F. , 2008, ` The Viability of the three-factor asset pricing model for the Istanbul stock exchange`, *Ankara Üniversitesi SBF Dergisi*, Vol. 63, No. 2, pp. 43-64.

Gökgöz, F., 2008, `Üç faktörlü varlık fiyatlandırma modelinin Istanbul menkul kıymetler borsasında uygulanabilirliği`, *Ankara Üniversitesi SBF Dergisi*, Vol. 63, No. 2, pp. 43-64.

Grant, D. 1977, `Portfolio performance and the "cost" of timing decisions`, *Journal of Finance*, Vol. 32, No. 3, pp. 837-846.

Grinblatt, M & Titman, S. 1989, `Mutual fund performance: an analysis of quarterly portfolio holdings`, *Journal of Business*, Vol. 62, No. 3, pp. 393-416.

Grinblatt, M. & Titman, S. 1992, `The persistence of mutual fund performance`, *The Journal of Finance*, Vol. 47, No. 5, pp. 1977-1984.

Grinblatt, M. 1989, 'A comparison of measures of abnormal performance on a sample of monthly mutual fund returns, formerly titled; the evaluation of mutual fund performance: an analysis of monthly returns', UC. Los Angeles: Anderson Graduate School of Management. Retrieved from: http://escholarship.org/uc/item/6s07x008

Gruber, M. J. 1996, `Another puzzle: the growth in actively managed funds`, *Journal of Finance*, Vol. 51, No. 3, pp. 783-810.

Hendricks, D., Patel, J. & Zeckhauser, R. 1993, `Hot hands in mutual funds: short run persistence of relative performance`, *Journal of Finance*, Vol. 48, No. 1, pp. 93-130.

Henriksson, R. D. & Merton, R. C. 1981, `On market timing and investment performance. II. statistical procedures for evaluating forecasting skills`, *Journal of Business*, Vol. 54, No. 4, pp. 513-533.

Henriksson, R. D., 1984, `Market timing and mutual fund performance: an empirical investigation`, *Journal of Business*, Vol. 57, No. 1, pp. 73-96.

Ibbotson, R. G.. & Patel, A. K. 2002, `Do winners repeat with style?`, *Yale IFC working Paper*, 00-70. Retrieved from: http://papers.ssrn.com/abstract=292866

Ippolito, R. A., 1989, `Efficiency with costly information: A study of mutual fund performance, 1965 - 1984`, *The Quarterly Journal of Economics*, Vol. 104, No. 1, pp. 1-23.

Jegadeesh, N. & Titman, S. 1993, `Returns to buying winners and selling losers: implications for stock market efficiency`, *Journal of Finance*, Vol. 48, No. 1, pp. 65-91.

Jensen, M. C. 1967, `The performance of mutual funds in the period 1945-1964`, *Journal of Finance*, Vol. 23, No. 2, pp. 389-416.

Malin, M. & Veeraraghavan, M. 2004, `On the robustness of the Fama and French multifactor model: Evidence from France, Germany, and the united Kingdom`, *International Journal of Business and Economics*, Vol. 3, No. 2, pp. 155-176.

Malkiel, B. G. 1995, `Returns from investing in equity mutual funds 1971 to 1991`, *The Journal of Finance*, Vol. 50, No. 2, pp. 549-572.

Mazuy, K. K. & Treynor, J. L. 1966, `Can mutual funds outguess the market?`, *Harvard Business Review*, Vol. 44, No. 4, pp. 131-136.

Sharpe, W. F. 1966, `Mutual fund performance`, *Journal of Business*, Vol. 39, No. 1, pp. 119-138.

Treynor, J. L. 1965, `How to rate management of investment funds`, *Harvard Business Review*, Vol. 43, No. 1, pp. 63-75.

---

[i] Yatırım Fonlarına İlişkin Esaslar Tebliği, Official Gazette, Date: 19.12.1996, Number: 22852

[ii] Menkul Kıymetler Yatırım Fonu Katılma Belgelerinin İhracına ve Halka Arzına Dair Esaslar Tebliği, Official Gazette, Date: 12.12.1986, Number: 19310

[iii] Emeklilik yatırım fonlarının kuruluş ve faaliyetlerine ilişkin esaslar hakkında yönetmelik, Official Gazette, Date:28.02.2002, Number: 24681

[iv] Regstats2 is available from the following web site: http://www.mathworks.com/matlabcentral/fileexchange/26169-regstats2