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Assessing the performance of Greek mutual funds over the crisis period

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Abstract

This paper attempts to evaluate the performance of Greek mutual funds during the period of July 2002- June 2010. We then split this period into 2 shorter ones: the first (2002-2007) is considered a bull market or close to it while the second (2007-2010) covers the global financial crisis and marks the beginning of the Euro zone debt crisis. We do this in order to identify managers who achieved significant abnormal returns both in the whole test period and the two subperiods. The models employed are the Sharpe and Information ratio, Jensen's alpha, the Fama-French model and the Fama-French-Carhart model. Only one fund manager is found to generate significant positive abnormal returns in the period tested. No fund manages to realize significant increase in their alpha in the second period when the market return was considerably low. Furthermore, four funds are found to posses timing ability through the whole period. Lastly, we document evidence of some performance persistence among the 28 funds tested.

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1.Introduction

A mutual fund is an investment vehicle comprised of a pool of funds collected by a large number of individual investors for the purpose of investing in financial assets such as stocks, bonds, money market instruments and other similar securities. Mutual funds are operated by professional managers who use their expertise to produce capital gains and income for the fund's investors. Managers base their investment decisions on the objectives stated in the fund's prospectus, a legal document that also provides information about the issuer and the terms of the offer. Although the first mutual fund can be dated as back as 1822 in Belgium, the industry experienced a tremendous growth in the decades of 1980 and 1990 and has been extremely popular ever since.

By structure, a mutual fund can be either an open-end or a closed-end fund. An open-end fund does not have a set number of shares; on the contrary this number changes as investors buy or sell shares of the fund. On the other hand close-end funds have a fixed number of shares and only the value of the shares fluctuates with the market.

Another way of characterizing mutual funds is by the investment strategy they follow. This distinction creates many categories funds , each accommodating specific needs of various investors . The ten most popular categories of mutual funds nowadays are:

- Equity Funds
- Bond Funds
- Balanced/Mixed Funds
- Money Market Funds
- Fixed Income

- Specialty Funds
- Index Funds
- Funds of Funds
- ETF Funds
- Unit Linked Funds

1. Equity Funds

Equity funds invest a maximum part of their capital (over 65%) into equities holdings. Equity funds are considered risky investments as their returns are largely dependent on the fund's manager trading ability. Still, funds can be further classified as aggressive or defensive investors allowing for some limited diversification. Equity funds generally yield high returns in boom periods to compensate for the assumed risk but tend to do very poorly in bearish markets. Generally , equity funds with long term investment horizons realize higher returns than alternative investments.

2. Bond Funds

Bond funds invest in debt papers. Governments, private companies, banks and other financial institutions are the main issuers of debt papers. Debt funds are further classified as:

Government: These funds invest heavily in bonds issued by governments. They usually gain low returns , because they are considered the safest funds in the market.

Corporate: These funds invest in corporate bonds. These bonds are guaranteed by the issuing company and their risk depends on the ability of the corporation to fulfill their obligations at maturity. Some funds specialize in junk bonds , i.e. bonds issued by corporations with high credit risk and higher-than-usual promised returns.

Depending on the country in question many more bond fund categories can be spotted in the market , for example in the United States municipal bonds (issued by individual states) can be found co-existing with the treasury and corporate bonds.

3. Balanced Bonds

Balanced or mixed bonds, as the name suggests are a mixture of equity and bond funds, dividing their capital between equity and fixed income securities. These funds attempt to provide their shareholders with the best of both the worlds. Equity part provides growth and the debt part provides stability in returns.

4. Money Market Funds

Money market funds mainly invest in short-term debt instruments, such as treasury bills, commercial paper , repos and other money market funds. Money market funds are considered safe and quality investments that don't yield capital returns but still offer better returns than bank products while remaining highly liquid. They are preferred by conservative investors that appreciate short-and-long term stability of their capital.

5. Fixed Income Funds

Fixed income funds , like bond funds invest their capital in securities that offer fixed returns for short periods of time, mainly bonds and treasury bills. They are generally more conservative than bond funds, investing only in highest-quality government and corporate bonds. They generate fixed income payments for their investors depending on the investors level of participation to the fund.

6. Specialty Funds

Specialty funds are equity funds that invest in wide range of firms of the same economy sector. A great number of firms are utilized to attain some kind of diversification but naturally it can't be ignored the fact that being from the same sector there is bound to be a common variation among the fund's investments that will realize high returns in boom periods but leave the investor exposed to systemic risk in periods of market turmoil. A mixture with bonds or securities of other sectors can be employed to limit this exposure.

7. Index Funds

Index funds try to imitate various market indexes in terms of asset allocation and composition. The index can be the main market index of a country or indexes attuned to specific economy sectors. Index funds have lower costs of transaction meaning lower fees for their investors. Another practical use of these funds to their investors is that they need only look at the index in question to evaluate the fund's performance. The popular discussion of managers <beating the market> has led to great rise of popularity of these funds.

8. Funds of Funds

Funds of funds invest mainly in mutual funds of different categories , thus they are able to reap the benefits of others managers professional abilities and simultaneously enjoy a significant level of diversification. This strategy has been proved able to realize significant returns in the long term.

9. Exchange Traded Funds

An exchange-traded fund (ETF) is an investment fund traded on stock exchanges , much like stocks . An ETF holds assets such as stocks, commodities, or bonds, and trades close to it's net asset value over the course of the trading day. Most ETFs track a market index. ETFs may be attractive as investments because of their low costs, tax efficiency, and stock-like features. ETFs are the most popular type of exchange-traded products.

10. Unit Linked Funds

Unit linked funds are a combination of insurance products and mutual funds. In essence, they are a form of life insurance, the saving part of which is invested in mutual funds. The insurance company manages this portion of the client's money but the client can decide on which types of mutual funds his/her money is invested on. This means that the client assumes a great part of the investment risk himself.

2.Literature Review

Mutual fund evaluation is a part of external evaluation analysis. In this case portfolio returns are known, but no information is available on constituents like for example sector weights or stock-level returns. The most common approach followed in the case of mutual funds is risk-adjusted performance measures. These are metrics taking into account the risk and return characteristics of an investment and allowing to produce a ranking of investment opportunities in a consistent manner. A universal performance measure does not exist and will never exist because 'risk' and 'return' are highly context dependent concepts (the 'risk' of a mutual fund for the fund company is very different than the 'risk' of the fund to the client).

It is important to keep in mind that the measures presented in the following text are complements and not substitutes.

One of the first such measures that was employed in mutual fund evaluation is the Traynor ratio (Traynor 1965). The Treynor ratio (sometimes called the reward-to-volatility ratio or Treynor measure) is a measurement of the returns earned in excess of that which could have been earned on an investment that has no diversifiable risk (e.g., Treasury Bills or a completely diversified portfolio or mutual fund), per each unit of market risk assumed (the portfolio’s beta). It takes the following form:

$$TR = \frac{r_i - r_f}{\beta_i} \tag{1}$$

where r_i is the i portfolio’s return,

r_f is the risk free rate,

and β_i is the i portfolio’s beta as given by the CAPM.

Beta represents the portfolio's sensitivity to market movements; it quantifies the degree of benchmark-related risk inherent in the portfolio. Beta is calculated as the covariance between the portfolio returns and the benchmark returns divided by the variance of the benchmark. A beta of 1 indicates that the portfolio returns vary around their mean the same way the benchmark returns vary around theirs. It does not mean that the portfolio will have the same returns as the benchmark. Betas greater than 1 indicate greater sensitivity to market movements (and thus more risk) , while betas lower than 1 indicate less sensitivity to market movements.

The Treynor ratio relates excess return over the risk-free rate to the additional risk taken; however, systematic risk is used instead of total risk. The higher the Treynor ratio, the better the performance of the mutual fund under analysis. The incorporation of systematic risk rests on the CAPM assumption that the investor won't be compensated for assuming non systematic risk (the individual risk of a security) because non systematic risk can be diversified away. Because the Treynor ratio does not capture the effect of non systematic risk, it is most relevant when applied to a diversified portfolio. This means that the Treynor ratio should be applied only on well diversified portfolios.

Another problem of the Traynor ratio is the appropriateness of the benchmark index for the portfolio being evaluated. Roll (1978) shows that even small changes in the proxy used for the market have large effects on risk-adjusted ratios. If the proxy for the market is not suitable , then the ratio can't be trusted.

The Treynor ratio does not quantify the value added, if any, of the active management of the mutual fund. It is strictly a ranking criterion. Despite these problems, Treynor's very important contribution to investment management evaluation was that for the first time both returns and volatility were incorporated in a simple yet meaningful manner.

A very similar measure was developed by Sharpe (1966). Sharpe, in the mindset of Treynor, tried to use simultaneously a portfolio's returns and risk (measured by it's volatility) to asses it's manager performance. The incorporation of volatility is the distinction between the Treynor and Sharpe ratio: the former employs only the systematic component of risk of the portfolio while the latter uses the whole risk of the returns.

The Sharpe ratio is given by

$$SR = \frac{r_i - r_f}{\sigma_i} \qquad (2)$$

where r_i is the i portfolio's return,

r_f is the risk free rate,

and σ_i is the i portfolio's volatility.

The Sharpe ratio tells an investor what portion of a portfolio's performance is associated with risk taking. It measures a portfolio's added value relative to its total risk. A portfolio of risk free assets or one with an excess return of zero would have a Sharpe ratio of zero.

The Sharpe ratio does not depend on CAPM and thus manages to avoid the misspecification problems of the Treynor ratio. It is however based on the Markowitz mean–variance portfolio theory, which proposes that a portfolio can be described by just two measures: its mean and its standard deviation of returns. The Sharpe ratio measures only one dimension of risk: the variance. Thus, the Sharpe ratio is designed to be applied to investment strategies that have normal expected return distributions; it is not suitable for measuring investments that are expected to have asymmetric returns.

However, even when dealing with normally distributed returns, there are occasions when the Sharpe ratio gives no useful information. One such case is when dealing with negative Sharpe ratios, often arising during bear markets. Another problem is when the decision to expand the time series under evaluation: longer time periods result to lower volatility producing an unwanted bias in the results. For this problem, Sharpe (1994) recommended using short periods to measure risk and returns and then annualizing the data.

The Information Ratio (IF) is often referred to as a variation or generalized version of the Sharpe ratio. It evolved as users of the Sharpe ratio began substituting passive benchmarks for the risk-free rate. The information ratio tells an investor how much excess return is generated from the amount of excess risk taken relative to the benchmark. It is frequently used by investors to set portfolio constraints or objectives for their managers, such as tracking risk limits or attaining a minimum information ratio. The information ratio is calculated by dividing the portfolio's mean excess return relative to its benchmark by the variability of that excess return:

$$IR = \frac{r_i - r_b}{\sigma_{i-b}} \qquad (3)$$

where σ_{i-b} is the standard deviation of the difference in returns between the portfolio I and it's benchmark.

The Sharpe and Treynor Ratios discussed above can only be used in relative performance comparison between portfolios and between a portfolio and a benchmark. Jensen (1968) employed the Capital Asset Pricing model to measure the value added by selection activities. Specifically Jensen popularized CAPM's alpha (usually referred to as Jensen's alpha) as a measure of added value through selection activities. Alpha is defined as the difference between the average realized return of a portfolio manager with private information and the expected return of the passive strategy based upon public information only with equal systematic risk. A direct comparison of Alphas between different portfolios is only valid when they have equal systematic risk (equal beta). Algebraically Jensen's alpha is given by

$$a_i = (R_i - R_f) - \beta_i (R_m - R_f) \qquad (4)$$

where r_i is the i portfolio's return,

r_f is the risk free rate,

R_m is the return of the market proxy

and β_i is the i portfolio's beta.

Jensen’s alpha is the excess return over and above the expected return derived according to the CAPM. The alpha is expressed in basis points, so evidence of skill is readily observable. A positive alpha indicates manager skill; the higher the alpha, the better the manager performed on a risk-adjusted basis. A negative alpha indicates that the manager failed to generate the return that would be expected under the CAPM for the amount of market risk taken.

Jensen’s alpha shares along with the Treynor ratio the same limitations imposed by the CAPM. It takes into account only the systematic risk and is sensitive to the selection of the market proxy. Furthermore, the implementation of private selection information means overweighing securities which have positive Alphas. This means taking more unsystematic risk compared to the passive strategy and results in a higher total risk of the actively managed portfolio. Alpha does not capture this increase in risk.

A different approach to the mutual fund evaluation is the market timing puzzle. In brief, market timing means alternating funds between a market-index portfolio and a risk free asset depending on whether the stock market is expected to outperform the risk free asset.

Treynor and Mazuy (1966) were the first to consider this problem. They provided a simple and elegant method of determining the ability to forecast the market direction. They proposed , that if a manager anticipates a bull market, he will commit more funds to it than the risk free asset, effectively changing the slope and curving the market security line. To estimate the new curved line, they added a squared term to the usually linear CAPM to capture the convexity of the returns resulted from market timing. Thus, their model looks like this

$$r_{i,t} = a_i + \beta_i (R_m - R_f)_t + \gamma_i (R_{m,t} - R_{f,t})^2 + e_{i,t} \qquad (5)$$

where r_i is the i portfolio’s return,

r_f is the risk free rate,

R_m is the return of the market proxy,

β_i is the i portfolio's beta,

and γ_i measures timing ability.

If γ_i is positive and statistically different from zero the manager posses timing ability. Treynor and Mazuy estimated this equation for 57 mutual funds, but found little evidence of timing ability.

Merton and Henriksson (1981) focused on whether portfolio managers forecast time periods in which the stock market will outperform the risk free asset disregarding the magnitude of the differences. They coined a term that captures the ability of the manager to anticipate whether $r_f > R_m$. After the introduction of this term, the CAPM looks like this

$$r_{i,t} = a_i + \beta_{i1}(R_m - R_f)_t + \gamma_i (I \bullet (R_{m,t} - R_{f,t})) + e_{i,t} \quad (6)$$

where I is a dummy variable that equals 1 if the market returns is positive and 0 if the market return is negative

If γ_i is negative or statistically insignificant, then the manager possesses no timing ability or just doesn't act on it.

Market timing models, like the ratios discussed earlier are very popular for their ease in use, but suffer from the same limitations the CAPM does.

Chang and Lewellen (1985) employed the Henriksson/Merton model to test jointly for the presence of either superior market timing or security selection ability in managed portfolios is employed to evaluate empirically the investment performance of a sample of mutual funds. Their findings posed a more favorable judgment about mutual fund security selection performance in the aggregate compared to previous studies , and altered the performance evaluations of various individual funds.

Nonetheless, few fund managers appeared to have displayed much market-timing skill, and the general conclusion that they have been unable collectively to outperform a passive investment strategy still stands.

Another contribution to the timing puzzle was the Bhattacharya/Pfleiderer model (1983). Conrary to Henriksson/Merton, the Bhattacharya/Pfleiderer model also evaluates whether the manager uses the information correctly, and not only focus on whether the manager has some correct information.

Connor and Korajczyk (1986) developed a econometric model of portfolio performance measurement using a competitive equilibrium version of the Arbitrage Pricing Theory. They showed that Jensen's alpha is compatible with the APT , establishing the latter as a potential performance measure.

Other theoretical papers on the discussion of performance evaluation and benchmark specification include Admati, Bhattacharya, Pfliederer, and Ross (1986), Dybvig and Ross (1985b), Dybvig and Ross (1985a). For example , Dybvig and Ross (1985a) showed that even if an efficient portfolio is used as a benchmark, both superior as well as inferior portfolios could produce positive Jensen's alpha values, thus casting doubt on the usefulness of this approach. In fact, Dybvig and Ross (1985b) showed that an uninformed observer may calculate a positive or a negative Jensen's alpha score even when evaluating a manager with superior information.

Lehman and Modest (1987) tested if performance measures commonly used are sensitive to the benchmark chosen to measure normal performance. Specifically they employed the CAPM as well as various APT benchmarks and found that mutual funds ranking changed according to the model used on occasion. They also found statistically significant abnormal returns using all APT benchmarks.

Another dimension to the benchmark estimation problem was the uncertainty as to whether the benchmark portfolio being estimated is itself efficient. If it is not efficient, does it still matter, which benchmark portfolio is used? On the last point a study by Grindblatt and Titman (1991a) concludes that it does matter and Baily (1992) reaches the same conclusion.

Grinblat and Titman (1989b) , to address this problem developed what they called the positive period weighting measure (PPWM), in an attempt to identify a better benchmark for the CAPM and also pinpoint the difference between the informed and uninformed investor in terms of positive performance . It has the following form

$$\alpha_i = sum(w_t * r_{i,t}) \quad (7)$$

where α_i is the performance measure,

w_t are the weights of period-by-period excess returns,

and $r_{i,t}$ are the excess returns

The weights can be chosen arbitrarily as long as they fulfill these conditions:

1. All weights must be non-negative. This solves the problem of assigning a negative performance to a market timer: the latter will have positive excess returns, and therefore (since the weights are also positive) will exhibit a positive α_i coefficient.
2. The weights must sum to one. This normalization ensures that the positive period weighting measure has the same units as $r_{m,t}$ and can therefore by interpreted as a value added in terms of returns.
3. To ensure that the PPWM for a non-informed investor simply investing in the market portfolio is zero, the weights must satisfy the following condition for the market portfolio over the observation period: $sum(w_t * r_{m,t}) = 0$.

Grinblatt/Titman showed that when these three conditions are fulfilled, the PPWM converges in probability to zero for an uninformed investor and to a positive number for an investor with selectivity and no timing, or selectivity and independently distributed timing information, provided that (i) the portfolio's beta is monotonically related to the forecast of the market return, and that (ii) returns are multivariate normal.

Most tests of performance evaluation do not support the hypothesis that managers have superior ability and performance. Ippolito (1989) found eviedence to the contrary. He found evidence of optimal trading in efficient markets, as risk-adjusted returns (namely Jensen's alpha) , net of fee s and expenses were positive and statistically significant. He found that portfolio turnover and management fees were unrelated to fund performance.

Elton, Gruber, Das, and Hlavka (1993) provide and point out some flaws in Ippolito (1989)'s test design. Their results are also shown to be sensitive to method of evaluation chosen. . Returns on S&P stocks, returns on non-S&P stocks, and returns on bonds are found to be significant factors in performance assessment. Correcting for the impact of non-S&P assets on mutual fund returns, they find that mutual funds do not earn returns that justify their information acquisition costs.

Grinblatt and Titman (1993) in the spirit of Cornell (1979) attempt to evaluate fund performance without having to employ an asset pricing model. The measure they used employs portfolio holdings and does not require the use of a benchmark portfolio. It finds that the portfolio choices of mutual fund managers, particularly those that managed aggressive growth funds, earned significantly positive risk-adjusted returns in the 1976-85 period.

A problem commonly related with performance evaluation is survivorship bias. Brown, Goetzmann, Ibbotson, and Ross (1992) analyzed the relationship between volatility and returns in a sample that is truncated by survivorship and showed that this relationship gives rise to the appearance of predictability. They presented numerical examples to show that this effect can be strong enough to account for the strength of the evidence favoring return predictability.

A topic that has received a lot of attention in the lest two decades is that of performance persistence. Hendricks, Patel, and Zeckhauser (1993) find that portfolios of recent poor performers do significantly worse than standard benchmarks; those of recent top performers do better, though not significantly so; the so called hot hands phenomenon.

Brown and Goetzmann (1995) explored persistence in mutual funds using absolute and relative benchmarks. They found that relative risk-adjusted performance persists; however, persistence is mostly due to funds that track the S&P 500. They also found that the relative performance pattern depends on the time period observed and is correlated across managers. As a result, it is due to common strategy that is not dependent on risk adjustment procedures.

Grinblatt and Titman (1992) also analyzed how mutual fund performance relates to past performance. They based their tests on a multiple portfolio benchmark that was formed on the basis of securities characteristics. Thye found evidence that differences in performance persist over time and that this persistence is consistent with the ability of managers to earn abnormal returns.

Elton,Gruber, and Blake (1996) find that past performance is predictive of future risk-adjusted performance. They also constructed a portfolio of funds that sign managed to realize small but statistically significant positive risk-adjusted returns during a period where mutual funds in general had negative risk-adjusted returns.

Carhart (1997) in his seminal work demonstrated that common risk factors in stock returns (the factors of the Fama-French model) almost completely explain persistence in equity funds risk-adjusted returns. Jegadeesh and Titman’s (1993) momentum effect is used to explain away the hot hands phenomenon of Hendricks, Patel, and Zeckhauser (1993), but individual funds do not earn higher returns from following the momentum strategy. The only significant persistence not explained is in the strong underperformance by the worst- return funds. This paper failed to support the existence of skilled or informed mutual fund managers.

Bollen and Buisse (2001,2004) focused again on market timing to analyze short term persistence. They used the Treynor-Mazuy and Henriksson-Merton’s models along with the model created by Carhart, and found that some small short term abnormal return disappears when funds are evaluated over long periods of time.

They concluded that superior performance is a short-lived phenomenon that is observable only when funds are evaluated several times a year.

Fama and French(2008) used both their three-factor model and Carhart's model to determine if managers produce enough abnormal returns to cover expenses and fees. Their bootstrap simulations suggest that few funds produce benchmark adjusted expected returns sufficient to cover their costs. Taking into account the costs in fund expense ratios , signs of over- and underperformance are found only in the extreme tails of the cross section of mutual fund alpha estimates.

The vast majority of articles investigating mutual fund performance are concerned with the U.S. market. A less comprehensive strand of literature concerned with the mutual fund sector of other countries also exists. Cai and Chan (1997) for example investigate the performance of Japanese mutual funds. Grinblatt and Keloharju (2000) study a unique data set from Finland. Otten and Bums (2002) carry out a comprehensive investigation of the European mutual fund industry using data from France, Italy, UK, Spain, Germany, and The Netherlands. Silva et al. (2003) investigate the performance of Bond funds in the European market, i.e. Portugal, Spain, Italy, France, Germany, and the UK. Blake and Timmermann (1998) and more recently Cuthbertson et al. (2006) among others study the performance of UK mutual funds. Otten and Bums (2007), are also concerned with UK funds investing in the US market. Bauer, Otten, and Rad (2006) use data from New Zealand. Matallín-Sáez (2006) is a recent study in the Spanish mutual fund sector. Bessler et al. (2007) are concerned with German funds. Walter and Weber also study the herding behaviour of German mutual fund managers.

This article focuses on the Greek mutual fund sector between the years of 2002 and 2010, thus encompassing both the economic boom after the stock market bubble of the previous decade as well as the financial crisis of 2008. Literature on the evaluation of Greek mutual funds is mostly based on the econometric models discussed so far. Philipas (1999, 2001), by using the main assessment indexes (Treynor, Sharpe, Jensen, Treynor-Mazuy and Henrikson-Merton), studied a sample of mutual funds for the period 1990-1997. He came to the conclusion that their managers do not have market timing ability. Philippas and Psoma (2004) evaluated the performance of 17 Greek equity mutual fund managers. Their findings did not reveal either stock selection ability or market timing. Only four mutual funds achieved a positive statistical coefficient of market timing. Artikis (2002) found that the performance of the Greek mutual funds outperforms the market index . Sorros (2003) evaluated the performance of sixteen equity mutual funds operating in the Greek financial market over the period 1/1/1995-31/12/1999. Four mutual funds achieved lower return than the General Index of the Athens Stock Exchange (ASE).

In two more recent studies Babalos et al. (2007) and Drakos and Zachouris (2007) discover only short term persistence. Robotis (2007) finds that funds do not produce significant abnormal risk-adjusted returns implying lack of stock selection ability from the manager's part. He also finds evidence of negative market timing performance, which he attributes to the failure to produce significant abnormal returns. He too finds evidence of short term persistence. Giamouridis and Sakelariou (2008) on the contrary find no evidence of short term persistence . They check for persistence over various short term horizons (monthly, bi-monthly and quarterly) using both parametric and non-parametric tests.

Data and Methodology

1.Data

The Greek equity market

The Athens Stock Exchange (ASE) was founded in 1876. The first mutual funds appeared in 1972, namely one equity and one hybrid fund. The institutional changes that took place in the early nineties gave a significant boost to the fund market. The extraordinary interest in the Greek stock market prior to the bubble of 1999 was another reason for the rapid growth of the equity funds.

The Greek financial system is oligopolistic with three large banks, namely the National Bank of Greece, Alpha Bank and Eurobank representing 25% of it's entire capitalization, as of December 2004. Their significance to the market and the real economy is demonstrated by the fact they are also part owners of various other listed firms through their mutual fund companies. They also play an important role in corporate financing by approving or rejecting business plans and loan applications of most Greek companies. Moreover, almost all initial public offerings (IPO's) are underwritten by one or more of these banks. For all these reasons hese banks are considered key market players and are able to influence corporate decisions though various sectors of the economy. Additionally, they can be safely considered to posses valuable insider information about various business prospects.

The access to this costless and quality information should theoretically give a significant advantage to the mutual funds operated by these banks against their competitors. It would be interesting however to determine whether these funds are found to persistently outperform their peers, both in stock selection and market timing. This particular oligopolistic market structure makes Greece an interesting field to analyze, though admittedly and in the light of the debt crisis of the last years, not for investment purposes.

The Dataset

This study will evaluate the performance of 28 individual Greek equity funds for the period of July 2002 to June 2010. We chose to evaluate the 28 biggest equity funds in terms of capitalization. We didn't consider bond or mixed funds due to the fact that we will use asset pricing models that employ risk factors directly connected to the stock market. Data of the funds come from the database of the Union of Greek Institutional Investors. We split our sample according to the different investment approaches and targets of the funds to highlight any possible common performance results between them.

All the other data needed come from DataStream. We use monthly and daily returns and accounting data of the whole Worldscope universe for Greece of DataStream .Returns are defined as a theoretical growth value index that assumes that dividends are reinvested and is adjusted for capital changes, stock splits and reversals . The only requirement a stock has to satisfy to be included in the sample is to be traded continuously during a whole yearly period. This way the sample is free of survivorship bias as firms that were no longer active by the end of the test period are still included. Unlike Fama and French (1993) we use financial firms , which play large role in the movements of the Greek stock market (Babalos et al., 2007). A subtle selection bias is the omission of firms with negative book values, necessary in order to avoid any distortion of results. In summary, to construct the FF mimicking portfolios we use a firm's monthly and daily returns, market value defined as the price of a stock times stocks outstanding and the book value of stocks outstanding. The market return proxy is the FTSE/ASE 20 Index and the risk free rate is the three month Euribor, as Greek government bonds are no longer considered risk free and the Greek banking system faces considerable liquidity issues also excluding intra-banking lending rates.

2. Methodology

Measuring mutual fund performance

The two most common approaches to the manager's decision making assessment involve their stock picking ability and their timing ability. Stock picking or 'selectivity' is the manager's ability in selecting the higher returns yielding stocks. Market timing is the ability to increase their exposure to equities prior to a bullish market and decrease it prior to a bearish market. Both approaches are based on multifactor econometrics models playing a the most important role in asset pricing theory.

a) Stock picking performance

Raw Returns

In order to use the various ratios and models we first have to compute monthly and daily returns of each fund. We use logarithmic returns form the following type

$$R_{i,t} = \ln(\frac{NAV_{i,t}}{NAV_{i,t-1}}) \quad (8)$$

where $NAV_{i,t}$ is the net asset value of fund i at time t. Income of associated dividends is assumed to be reinvested on the fund.

Sharpe Ratio-Information Ratio

Using equations (2) and (3) we compute the Sharpe and Information ratios for the 28 funds.

Table 1-Sharpe Ratio – Information Ratio

Panel A- Whole Period

Fund	Sharpe Ratio	Information Ratio
Alico	-11,26	-1,29
Allianz	-9,64	-0,40
Alpha Athens Index	-8,47	-0,25
Alpha Blue Chips	-10,96	-1,45
HSBC TOP 20	-10,00	-0,93
ING	-7,49	-0,34
Interamerican Dynamic	-10,33	-0,08
Millennium - Blue Chips	-7,03	0,87
ATE	-13,46	-0,62
Delos Blue Chips	-11,26	-1,15
Delos Top-30	-7,23	0,39
Ermis Dynamic	-11,75	-1,62
European Reliance Growth	-10,02	-1,01
Kyprou	-11,24	-0,29
Geniki Epilegmenon Axion	-11,80	-0,51
Allianz Aggressive Stategy	-11,04	-0,85
Citifund	-11,07	-1,31
Marfin Olympia	-9,65	-0,11
Millennium - Mid Cap	-4,99	0,79
Alpha Trust New Enterprises	-9,49	-0,03
ING Dynamic	-7,95	-0,16
Interamerican Growth	-11,53	-1,07
Delos Small-Cap	-10,10	-0,23
Alpha Trust Growth	-13,88	-0,57
Eurobank	-8,49	-0,78
HSBC Growth	-12,30	-0,34
International	-10,46	-0,21
Piraeus	-6,14	-0,35

This table presents monthly annualized Sharpe and Information ratios for the 28 funds. Sharpe ratio is given by $SR = \frac{r_i - r_f}{\sigma_i}\sqrt{12}$ while the information ratio by $IR = \frac{r_i - r_b}{\sigma_{i-b}}\sqrt{12}$.

$r_i - r_f$ is the excess return of fund i over the risk free rate, σ_i is the funds volatility, $r_i - r_b$ is the excess return of the fund over the benchmark return (here the ASE main index) and σ_{i-b} is the is the standard deviation of the difference in returns between the fund and the benchmark.

Panel B- Subperiods

	Sharpe Ratio		Information Ratio	
Fund	2002-2007	2007-2010	2002-2007	2007-2010
Alico	-12,69	-11,59	-1,99	0,44
Allianz	-15,11	-9,61	-2,25	-0,20
Alpha Athens Index	-12,06	-11,24	-1,17	-0,60
Alpha Blue Chips	-9,40	-10,83	-0,43	-0,35
HSBC TOP 20	-8,52	-8,92	-0,30	-0,12
ING	-14,56	-9,45	-2,38	-0,44
Interamerican Dynamic	-14,80	-13,49	-2,37	0,63
Millennium - Blue Chips	-8,25	-13,20	-0,15	0,29
ATE	-13,56	-9,75	-2,69	0,01
Delos Blue Chips	-9,53	-8,27	-0,66	-1,01
Delos Top-30	-9,58	-11,42	-0,98	-0,84
Ermis Dynamic	-13,25	-12,19	-1,06	0,33
European Reliance Growth	-6,91	-10,76	-0,20	-0,04
Kyprou	-6,48	-10,15	-0,39	-0,41
Geniki Epilegmenon Axion	-13,85	-10,65	-1,64	-0,48
Allianz Aggressive Stategy	-11,40	-10,44	-0,05	-0,19
Citifund	-14,94	-8,54	-1,62	0,18
Marfin Olympia	-14,14	-7,47	-1,53	0,83
Millennium - Mid Cap	-6,51	-8,21	0,59	2,04
Alpha Trust New Enterprises	-4,02	-7,73	0,95	0,45
ING Dynamic	-15,50	-12,48	-2,19	0,56
Interamerican Growth	-14,41	-10,24	-2,22	-0,64
Delos Small-Cap	-13,18	-8,66	-1,36	0,16
Alpha Trust Growth	-7,42	-7,73	0,62	0,04
Eurobank	-14,04	-10,43	-3,58	0,17
HSBC Growth	-11,25	-9,30	-1,56	0,20
International	-12,06	-10,79	-1,11	0,84
Piraeus	-5,16	-9,06	-0,43	-0,23

This panel presents the Sharpe and Information ratio for the two subperiods 2002-2007 and 2007-2010.

We observe that all Sharpe ratios are negative. This means that no fund managed to have an average return over the 8-year period than the risk free rate. Unfortunately, negative Sharpe ratios are usually considered anti-intuitive and not eligible to be ranking criteria. An interesting finding is presented in Panel B- most funds have actually higher Sharpe ratios during the crisis than in the years before them. The Sharpe ratio alone can't explain the cause for this, but it is likely that it is the rapid decrease of the Euribor that followed the decrease in ECB rates as a result of the crisis-driven shift in the monetary policy. If that is the case then we don't have conclusive findings that managers managed to weather the financial crisis any better than the years before it.

The information ratio paints a marginally hopeful picture for the fund industry. Only 3 managers appear to have performed better than the passive strategy throughout the sample period. Two of them trade in large cap stocks (Dilos Top 30, Millenium Blue Chips) and the other in middle capitalization (Millenium mid-cap). That is surprising given the fact that the passive benchmark is largely influenced by the large cap stocks itself. We would expect funds targeting small cap stocks to realize bigger deviations (positive or negative) from the benchmark but this is not collaborated by the data. The good news for managers comes in Panel B, where we see many funds largely improving their information ratios during the crisis. This can be considered evidence that active management during the crisis had better results than the passive strategy.

Jensen's Alpha

The Capital Asset Pricing model (CAPM) ,developed independently by Sharpe Linter and Mossin marks the beginning of the asset pricing theory. For the last 40 years CAPM and variations of it has been used extensively in the evaluation of stock selection and portfolio management performance.

Capm is a general equilibrium model that relies on certain strong assumptions and tries to explain the movement of individual equities in relation to a common factor , i.e. a proxy for market return. This relationship is given by

$$r_{i,t} = a_i + \beta_{i1}(R_m - R_f)_t + e_{i,t} \tag{9}$$

where $r_{i,t}$ is the return of an individual equity in excess of the risk free rate

R_m is the proxy for the market return and

R_f is the risk free rate.

However, even if one dismisses the inherent problems that emerge from the strong and unattainable assumptions this model is based on , Capm even from the first years of its practical application was found greatly lacking in explanatory power of the movement of individual stocks.

Fama and French's (1993) three factor model has for the most part replaced CAPM in the asset pricing theory in the last twenty years.

Nevertheless we begin our econometric approach to mutual fund evaluation with the CAPM and then examine the proposed alternatives to examine the explanatory power each model has over the Greek stock market. As already mentioned we first classify the funds according to their investment strategy

Table 2-Jensen'a Alpha

Panel A- Whole Period

Fund	a	b	$adj.R^2$
Millennium - Blue Chips	0,0188	1,00**	0,8
Delos Top-30	0,0151	1,03**	0,79
Alpha Athens Index	0,0016	1,02**	0.86
Interamerican Dynamic	-0,0026	0,99**	0,93
European Reliance Growth	-0,0073	1,01**	0.96
Alpha Blue Chips	-0,0074	1,01**	0,98
Allianz	-0,0099	0,98**	0,9
Delos Blue Chips	-0,0117**	0,98**	0,98
ING	-0,0136	0,98**	0,71
Alico	-0,0140**	0,98**	0,97
Kyprou	-0,0177*	0,94**	0,92
HSBC Top 20	-0,0199*	0,97**	0,89
Ermis Dynamic	-0,0207**	0,95**	0,98
ATE	-0,0249**	0,91**	0,96
Millennium - Mid Cap	0,0527**	1,13**	0,71
Citifund	-0,0109*	0,99**	0,97
Allianz Aggressive Stategy	-0,0150**	0,97**	0,96
Marfin Olympia	-0,0151	0,94**	0,88
Geniki Epilegmenon Axion	-0,0202**	0,93**	0,96
ING Dynamic	-0,0122	0,96**	0,75
Delos Small-Cap	-0,0137	0,96**	0,86
Alpha Trust New Enterprises	-0,0173	0,93**	0,82
Interamerican Growth	-0,0194**	0,96**	0,95
Eurobank	0,0110	1,10**	0,9
Piraeus	-0,0078	1,02**	0,61
HSBC Growth	-0,0270**	0,90**	0,93
Alpha Trust Growth	-0,0325**	0,88**	0,94
International	-0,0346**	0,87**	0,79

This table presents the results of the regressions run according to CAPM:

$$r_{i,t} = a_i + \beta_{i1}(R_m - R_f)_t + e_{i,t}$$

a_i is the average monthly abnormal return of fund i, β_{i1} is the beta coefficient of fund i, $R_m - R_f$ is the excess market return. $r_{i,t}$, the dependent variable is the excess return of the fund over the risk free rate. Funds are classified according to investment strategy and the ranked on abnormal returns.

*signifies statistical significance at the 0,05 level while ** at the 0,01 level

Panel B- Subperiods

Fund	Monthly 2002-2007	2007-2010
Alico	-0,0214**	-0,0043
Allianz	0,0147	-0,0178
Alpha Athens Index	0,0077	0,0043
Alpha Blue Chips	-0,0152	0,0021
HSBC TOP 20	0,0191	-0,0311**
ING	-0,0118	-0,0079
Interamerican Dynamic	0,0045	-0,0062
Millennium - Blue Chips	0,0376	0,0188
ATE	-0,0206**	-0,0173
Delos Blue Chips	-0,0130**	-0,0106
Delos Top-30	0,0186	0,0063
Ermis Dynamic	-0,0203**	-0,0094
European Reliance Growth	0,0049	0,0004
Kyprou	-0,0169	-0,0051
Geniki Epilegmenon Axion	-0,0072	-0,0169
Allianz Aggressive Stategy	0,0040	-0,0226*
Citifund	-0,0057	-0,0021
Marfin Olympia	-0,0254	0,0072
Millennium - Mid Cap	0,1051**	0,0192
Alpha Trust New Enterprises	0,0059	-0,0238*
ING Dynamic	-0,0137	-0,0096
Interamerican Growth	-0,0449	-0,0067
Delos Small-Cap	-0,0211**	-0,0040
Alpha Trust Growth	-0,0324	-0,0204
Eurobank	0,0107	0,0121
HSBC Growth	-0,0170	-0,0249*
International	-0,0272**	-0,0317
Piraeus	-0,0103	0,0055

This panel shows average abnormal returns of the funds during the subperiods July 2002-June 2007 and July 2007-June 2010, according to CAPM.

*signifies statistical significance at the 0,05 level while ** at the 0,01 level

Starting with Panel A, the only fund that appears to have statistically significant positive abnormal return is the Millenium Mid cap- we remind the reader that it was one of the few with positive information ratios as well as the higher Sharpe ratio in absolute terms. It's also worth mentioning that 3 out of the rest 4 funds that are classified as mid-cap have statistically significant negative abnormal returns, a fact that underlines the success of the active management of the Millenium mid-cap. Also worthy of mention is the fact that it has the higher beta of all 28 funds, meaning it assumed more market exposure relative to the other funds. We also observe that the other 2 funds that had positive information ratios realize the highest abnormal returns among all the other funds, albeit not statistically significant. Since both the information ratio and the Jensen's alpha measure the ability of the manager to "beat" the market it's expected that these two measures would agree.

Turning our attention on Panel B, we attempt to identify which funds managed better their exposure to the financial crisis of 2007-2010, as compared to their peers and to the earlier period as well. Looking at the monthly regressions, though the Millenium mid cap is still the only fund with significant abnormal returns during the first period, we observe that a lot more funds have positive alphas in the 2002-2007 years compared to the whole period. We consequently observe a decrease in most of the funds alphas in the second sub period of our testing though most of them are still insignificant. If we bypass this for a second and examine the absolute values of alphas we could say that the active management strategies of the funds fared worse in the second period compared to the market.

Table 11 , in the appendix presents the results of the daily regressions. According to them ,no fund manages to achieve average daily significant abnormal returns; what's more only two can claim that they didn't actually realize negative ones. We also observe a significant drop in the betas figures compared to Panel A. Generally, the amount of negative alphas doesn't allow us to exact safe conclusions in this case.

As far as the regressions diagnostics, we observe very high values of the adjusted R^2 in the monthly regressions panel. This means that the CAPM explain a lot of the variation of returns in the time continuum. In the daily regressions though, there is a significant drop of the R^2 values, suggesting a lot less of the returns variation is captured by the market index. We also examine the regressions residuals for heteroscedacity using Engle's test and find no evidence in most cases of heteroscedacity (23 out of 28 namely). We also look for autocorrelation using both the Ljung-Box Q-test and the Durbin-Watson statistic and again find no significant evidence of autocorrelation across the sample of funds.

The Fama-French three factor model

In 1993 Eugene Fama and Kenneth French (from now on FF) proposed a three factor model in the place of CAPM to better explain stock market movements. The foundations of the model had been set a year earlier, when in the process of evaluating the explanatory power of CAPM'S beta found that firm size and book-to-market equity proxy for underlying risk factors that capture the cross-section of average returns. The contribution of size and book-to-market equity to the model is realized through the title factors SMB (small-minus-big) and HML (high-minus-low). SMB is the difference in the returns of a portfolio consisting of the stocks of firms with the smallest market capitalization and a portfolio consisting of stocks of firms with big market capitalization. The intuition behind this procedure is that small firms are riskier and thus must compensate investors with higher rates of return. HML is the difference between a portfolio of 'value' stocks (high book-to-market ratio) and a portfolio of growth stocks (low book-to-market ratio).

The model proposed by FF is the following equation

$$r_{i,t} = a_i + \beta_{i1}(R_m - R_f)_t + \beta_{i2}SMB_t + \beta_{i3}HML_t + e_{i,t} \tag{10}$$

where SMB and HML are the risk factors.

The construction of SMB and HML

In constructing the explanatory variables SMB and HML we follow closely the procedure proposed by FF (1992,1993). Every June of year t all the stocks in our sample are ranked on size, defined by market value. The firms with market value above the median of the sample are categorized as Big (B) while those below as Small (S). We then use the book value of December of t-1 along with the market value of June of year t to obtain the book-to-market equity (BM). We again, then, rank the stocks in June of year t but this time different breakpoints are used for the categorization of the firms. Specifically we split the sample on the the 30 and 70 percentiles. Firms in the bottom percentile (30%) are defined as having low (L) BM , while those in the upper (over 70%) are considered having high (H) BM. The middle 40% of the firms is the middle (M) pack. The decision on the different breakpoints of MV and BM stems from the evidence in FF (1992) that book-to-market equity plays a stronger role in explaining stock returns than size. The exact definition of those breakpoints is nevertheless considered even by them as arbitrary but without any impact on interpreting the model's results. Babalos et al. (2007) have confirmed that is indeed the case for the Greek market as well.

After this categorization the intersection between the S and B groups of market value with the H,M and L groups of book-to-market equity is used to construct the Fama and French mimicking portfolios , namely S/H,S/M,S/L,B/H,B/M,B/L). Then monthly value-weighted returns are calculated on the six portfolios until the end of the period t , when the portfolios are broken and constructed again. FF propose the use of market value as the portfolio weights as being in the spirit of minimizing the variance, the latter being negatively related to size. The simple average of the monthly returns of the three small portfolios (S/H,S/M,S/L) minus the simple average of the three big portfolios (B/H,B/M,B/L) constitutes the SMB factor . Due to the way the portfolios are constructed this factor should be largely free of the book-to-market equity influence, focusing instead on difference between the returns of small and big stocks. Similarly, the simple average of the returns of the two-high BM portfolios (B/H, S/H) minus the returns of the two-low BM portfolios (B/L, S/L) constitutes the HML factor. Again, due to the procedure followed, this factor should be free of any size influence while accounting for the behavior of the returns of stocks with drastically different book-to-market equity.

We now present descriptive statistics of the risk factors in Table 3. Means of the factors are given in percentage terms and for both SMB and HML have positive values in their monthly and daily returns, in line with FF findings. In simple words, the Greek stock market appears to have a small firm and a value effect.

Skewness is positive for the monthly versions of both SMB and HML , confirming these portfolios realize positive returns most of the time. This changes for the daily version of SMB, which has apparently a negative value. The explanation of this phenomenon is given by kurtosis. Kurtosis measures how much the distribution of a series is dominated by it's outliers. The kurtosis value of the normal distribution is 3.

That means that a series with a kurtosis value of more than 3 is more outlier-prone than the normal distribution. Kurtosis for the monthly versions are near 3 , meaning outliers don't affect the mean so much. However kurtosis of the daily series is far greater than 3. This perhaps explains why SMB is skewed negatively and still has appositive mean; more of it's outliers may be positive than negative.

Furthermore we perform Augmented Dickey-Fuller test on the factors and find no evidence of unit root at the 5% level. Lastly, the Jarque-Bera test shows that the factors are not normally distributed at the 5% significance level.

Lastly, graph 1 and 2 in the appendix present the factors in percentage along with the American respective ones for comparison, mainly in terms of relative size of returns. We don't expect and we shouldn't for that matter, for the slopes of the returns to coincide , however integrated global stock markets are nowadays; there are still fundamental differences between the American and the Greek stock exchange.

Table 3-Diagnostics for FF model

Panel A-Descriptive Statistics

	Monthly Factors		Daily Factors	
Statistics	SMB	HML	SMB	HML
Mean	0,0145	0,098	0,0005	0,0044
S.D.	0,016	0,023	0,0035	0,0053
Skewness	0,64	0,55	-0,21	0,01
Kurtosis	3,11	3,44	5,77	5,69

This panel shows descriptive statistics for the factors used in the FF model.

Panel B –Correlation Table

	Monthly Factors			Daily Factors		
	RM-RF	SMB	HML	RM-RF	SMB	HML
RM-RF	1,00	-0,28	-0,30	1,00	-0,30	-0,13
SMB	-0,28	1,00	0,86	-0,30	1,00	0,89
HML	-0,30	0,86	1,00	-0,13	0,89	1,00

This panel shows autocorrelation figures between the factors used in the FF model.

Table 4-Augmented Jensen's Alpha- Fama and French model

Panel A-Whole Period

Fund	a	b	SMB	HML	$adj.R^2$
Millennium - Blue Chips	0,0272	1,04**	0,75	0,31	0,8
Delos Top-30	0,0208	1,05**	1,22	-0,29	0,79
Alpha Athens Index	0,0003	1,02**	-0,18	0,01	0,86
Interamerican Dynamic	-0,0039	0,98**	0,61	-0,56	0,93
European Reliance Growth	-0,0057	1,01**	0,40	-0,12	0,96
Alpha Blue Chips	-0,0064	1,01**	0,74**	-0,43*	0,98
Allianz	-0,0087	0,98**	1,65**	-1,05**	0,91
Delos Blue Chips	-0,0099*	0,99**	0,84**	-0,41*	0,98
ING	-0,0100	0,99**	1,43	-0,65	0,71
Alico	-0,0127**	0,98**	0,63*	-0,31	0,98
Kyprou	-0,0130	0,96**	1,29**	-0,44	0,93
HSBC Top 20	-0,0156	0,99**	0,14	0,33	0,9
Ermis Dynamic	-0,0189**	0,96**	0,62*	-0,26	0,98
ATE	-0,0235**	0,92**	0,93**	-0,51*	0,97
Millennium - Mid Cap	0,0768**	1,24**	0,74	1,89*	0,78
Citifund	-0,0092	1,00**	0,61*	-0,27	0,97
Allianz Aggressive Stategy	-0,0119*	0,98**	1,20**	-0,54*	0,96
Marfin Olympia	-0,0126	0,95**	0,28	0,05	0,88
Geniki Epilegmenon Axion	-0,0151*	0,95**	0,75**	-0,02	0,96
Delos Small-Cap	-0,0030	1,00**	2,78**	-0,90*	0,9
ING Dynamic	-0,0048	0,99**	2,53**	-1,05	0,77
Interamerican Growth	-0,0127*	0,99**	1,90**	-0,67**	0,97
Alpha Trust New Enterprises	-0,0167	0,93**	1,65*	-1,10*	0,82
Eurobank	0,0131	1,11**	0,58	-0,20	0,9
Piraeus	-0,0032	1,04**	1,16	-0,36	0,6
HSBC Growth	-0,0240**	0,91**	1,18**	-0,54	0,93
International	-0,0248*	0,91**	2,11**	-0,51	0,81
Alpha Trust Growth	-0,0274**	0,91**	1,51**	-0,56*	0,95

This table presents the results of the regressions run according to the FF model.

$$r_{i,t} = a_i + \beta_{i1}(R_m - R_f)_t + \beta_{i2}SMB_t + \beta_{i3}HML_t + e_{i,t}$$

a_i is the average monthly abnormal return of fund I, SMB_t is the return on the mimicking portfolio for the size factor and HML_t the return on the mimicking portfolio for the book-to-market factor. Funds are classified according to investment strategy and the ranked on abnormal returns.

*signifies statistical significance at the 0,05 level while ** at the 0,01 level

Panel B- Subperiods

Fund	Monthly 2002-2007	2007-2010
Alico	-0,0218**	-0,0012
Allianz	0,0186	-0,0131
Alpha Athens Index	0,0033	0,0054
Alpha Blue Chips	-0,0161*	0,0053
HSBC TOP 20	0,0206	-0,0277**
ING	-0,0047	-0,0043
Interamerican Dynamic	-0,0011	-0,0028
Millennium - Blue Chips	0,0460	0,0229*
ATE	-0,0211**	-0,0125
Delos Blue Chips	-0,0127**	-0,0078
Delos Top-30	0,0193	0,0187
Ermis Dynamic	-0,0194**	-0,0070
European Reliance Growth	0,0046	0,0037
Kyprou	-0,0136	0,0007
Geniki Epilegmenon Axion	-0,0031	-0,0108
Allianz Aggressive Stategy	0,0062	-0,0162
Citifund	-0,0069	0,0012
Marfin Olympia	-0,0252	0,0122
Millennium - Mid Cap	0,1362**	0,0235
Alpha Trust New Enterprises	0,0038	-0,0136
ING Dynamic	-0,0014	-0,0039
Interamerican Growth	-0,0381**	0,0001
Delos Small-Cap	-0,0142*	0,0122
Alpha Trust Growth	-0,0296**	-0,0106
Eurobank	0,0162	0,0128
HSBC Growth	-0,0181	-0,0171
International	-0,0247**	-0,0103
Piraeus	-0,0001	0,0079

This panel shows average abnormal returns of the funds during the subperiods July 2002-June 2007 and July 2007-June 2010, according to the FF model.

*signifies statistical significance at the 0,05 level while ** at the 0,01 level

First of all, we notice that betas retain their statistical significance. SMB is statistically significant about half of the time, while HML does much worse. We tend to conclude that the value effect is not statistically significant in our sample. The other bad news for the FF model is that there doesn't seem to be much improvement in the adj. R squares compared to the CAPM.

A picture that does stay the same is the one of the abnormal returns. We still have a few funds (mostly in the large capitalization group) that have positive but insignificant alphas. The exception again is the Millennium Midcap fund that presents a little higher abnormal return as well as a little higher beta.

We next turn our attention to daily regressions to see if the results will hold in Table 12 in the appendix. As with the case of CAPM no fund manages to realize positive abnormal returns, significant or otherwise, and once again the betas are lower as well.

As mentioned earlier there doesn't seem to be a big increase of the adjusted R squared that would point that the FF model explains stock market movements better than the CAPM. In most cases we find no evidence of heteroscedacity or autocorrelation, both in monthly and daily regressions.

The Carhart model

Carhart(1997) introduced Jegadeesh and Titman's (1993) momentum factor to the classic FF model to help explain the hot hands phenomenon Jegadeesh and Titman had observed.

Under this model performance is estimated as

$$r_{i,t} = a_i + \beta_{i1}(R_m - R_f)_t + \beta_{i2}SMB_t + \beta_{i3}HML_t + \beta_{i4}MOM_t + e_{i,t} \quad (11)$$

where $r_{i,t}$ is the excess return of mutual fund i at time t over the risk free rate

SMB is the size-mimicking factor ,

HML the book-to-market mimicking factor

and MOM the momentum factor.

This model without the momentum factor is the classic FF model (1993). Market return is the return on the FTSE/ASE 20 index and for risk free rate we use the three-month Euribor properly adjusted.

The momentum factor (MOM) is obtained through a process similar to that of the HML factor, only in this case the book-to-market ratio is replaced by past returns. More specifically, all stocks are again split on the 30 and 70 percentiles with the bottom 30% defined as losers and the top 70% as winners. The stocks are ranked on past one month lagged yearly returns (these eleventh month returns are common in the momentum literature-see for example FF(2008)). These portfolios however are reformed every month instead of annually. Then , much like the previous process the W and L portfolios are combined with the small and big portfolios (again, ranked on size-annually) to created four new portfolios each month : W/B,W/S,L/B,L/S. The simple average of the two winners minus two losers is the momentum factor.

Carhart uses a slightly different process in constructing the momentum factor: he doesn't combine the winning and losing portfolios with those formed on size ranking but computes the difference between the former directly. Although most recent literature focuses only on the process we described above , we found no significant difference in our results when we employed Carhart's process too.

The momentum factor has a positive mean over the period we examine, but contrary to SMB and HML is negatively skewed in both monthly and daily versions. This is again possibly alleviated by the high kurtosis value; again the mean seems to be dominated by outliers. As in the case of SMB and HML, when performing the Augment Dickey Fuller test we find no evidence of unit root, while the Jacque-Brea test indicates that MOM doesn't follow the normal distribution. Graph 3 in the appendix shows the returns of the momentum strategy for the American and the Greek stock market. There are considerably more deviations in the slopes of this factor compared to the other two.

We now present the monthly regressions utilizing Carhart's model. First of all, the role of the momentum factor isn't satisfactorily strong; only in 9 out of 28 regressions it is statistically significant. Likewise we don't see a large improvement of the adjusted r squares compared to the previous models. No significant changes appear in the abnormal returns as well, Millennium mid cap is still the only fund with significant positive abnormal returns.

The same conclusions can be drawn from the Table 13 in the appendix presenting the daily regressions; the incorporation of the momentum factor in the FF model doesn't appear to provide any further information for the Greek stock market movements.

Table 5-Diagnostics for Carhart's model

Panel A-Descriptive Statistics

	Monthly Factors			Daily Factors		
Statistics	SMB	HML	MOM	SMB	HML	MOM
Mean	0,0145	0,098	0,0235	0,0005	0,0044	0,01
S.D.	0,016	0,023	0,0169	0,0035	0,0053	0,0033
Skewness	0,64	0,55	-1,29	-0,21	0,01	-0,39
Kurtosis	3,11	3,44	6,34	5,77	5,69	6,84

This panel shows descriptive statistics for the factors used in Carhart's model.

Panel B –Correlation Table

	Monthly Factors				Daily Factors			
	RM-RF	SMB	HML	MOM	RM-RF	SMB	HML	MOM
RM-RF	1,00	-0,28	-0,30	-0,30	1,00	-0,30	-0,13	0,01
SMB	-0,28	1,00	0,86	-0,17	-0,30	1,00	0,89	-0,36
HML	-0,30	0,86	1,00	-0,08	-0,13	0,89	1,00	-0,24
MOM	-0,30	-0,17	-0,08	1,00	0,01	-0,36	-0,24	1,00

This panel shows autocorrelation figures between the factors used in Carhart's model.

Table 6-Carhart

Panel A-Whole Period

Fund	a	b	SMB	HML	MOM	$adj.R^2$
Delos Top-30	0,0296	1,09**	1,63	-0,41	0,90	0,8
Millennium - Blue Chips	0,0231	1,02**	0,56	0,37	-0,42	0,8
Interamerican Dynamic	0,0022	1,01**	0,89	-0,65*	0,62**	0,94
Alpha Athens Index	-0,0036	1,00**	-0,36	0,06	-0,40	0,86
Allianz	-0,0039	1,00**	1,87**	-1,11**	0,49	0,91
Alpha Blue Chips	-0,0059	1,01**	0,77**	-0,43*	0,06	0,98
Delos Blue Chips	-0,0065	1,00**	0,99**	-0,45**	0,34**	0,98
European Reliance Growth	-0,0078	1,00**	0,30	-0,09	-0,22	0,96
ING	-0,0083	1,00**	1,50	-0,67	0,17	0,71
Kyprou	-0,0117	0,96**	1,35**	-0,46	0,14	0,93
Alico	-0,012**	0,98**	0,64*	-0,32	0,03	0,98
HSBC Top 20	-0,0154	0,99**	0,15	0,33	0,03	0,89
Ermis Dynamic	-0,021**	0,95**	0,54*	-0,23	-0,19	0,98
ATE	-0,024**	0,92**	0,90**	-0,50*	-0,06	0,97
Millennium - Mid Cap	0,0747**	1,23**	0,64	1,92	-0,22	0,78
Allianz Aggressive Stategy	-0,0076	1,00**	1,40**	-0,60*	0,44*	0,96
Citifund	-0,0095	1,00**	0,60	-0,26	-0,03	0,97
Marfin Olympia	-0,0115	0,96**	0,33	0,04	0,11	0,88
Geniki Epilegmenon Axion	-0,014**	0,96**	0,80*	-0,03	0,11	0,96
Delos Small-Cap	0,0003	1,01**	2,93**	-0,94**	0,33	0,9
ING Dynamic	-0,0002	1,01**	2,74**	-1,11	0,48	0,77
Alpha Trust New Enterprises	-0,0060	0,97**	2,13**	-1,24*	1,08**	0,83
Interamerican Growth	-0,0097	1,00**	2,04**	-0,71**	0,30	0,97
Eurobank	0,0142	1,11**	0,63	-0,21	0,10	0,9
Piraeus	-0,0027	1,04**	1,18	-0,37	0,05	0,6
HSBC Growth	-0,0185*	0,94**	1,43**	-0,61*	0,56*	0,93
International	-0,0198	0,93**	2,34**	-0,57	0,51	0,81
Alpha Trust Growth	-0,026**	0,91**	1,57**	-0,58**	0,13	0,95

This table presents the results of the regressions run according to Carhart's model:

$$r_{i,t} = a_i + \beta_{i1}(R_m - R_f)_t + \beta_{i2}SMB_t + \beta_{i3}HML_t + \beta_{i4}MOM_t + e_{i,t}$$

a_i is the average monthly abnormal return of fund I, SMB_t is the return on the mimicking portfolio for the size factor and HML_t the return on the mimicking portfolio for the book-to-market factor and MOM_t the return on a portfolio following the momentum strategy . Funds are classified according to investment strategy and the ranked on abnormal returns.

Panel B- Subperiods

	Monthly	
Fund	2002-2007	2007-2010
Alico	-0,0192*	-0,0022
Allianz	0,0278	-0,0072
Alpha Athens Index	-0,0139	0,0077
Alpha Blue Chips	-0,0137*	0,0047
HSBC TOP 20	0,0154	-0,0195*
ING	0,0009	-0,0019
Interamerican Dynamic	0,0115	0,0010
Millennium - Blue Chips	0,0466	0,0168
ATE	-0,0244**	-0,0111
Delos Blue Chips	-0,0107*	-0,0016
Delos Top-30	0,0354	0,0238
Ermis Dynamic	-0,0220**	-0,0072
European Reliance Growth	0,0017	0,0036
Kyprou	-0,0043	0,0004
Geniki Epilegmenon Axion	-0,0039	-0,0046
Allianz Aggressive Stategy	0,0112	-0,0098
Citifund	-0,0067	0,0024
Marfin Olympia	-0,0210	0,0163
Millennium - Mid Cap	0,1447**	0,0219
Alpha Trust New Enterprises	0,0273	-0,0059
ING Dynamic	0,0155	-0,0030
Interamerican Growth	-0,0335**	0,0028
Delos Small-Cap	-0,0113	0,0156
Alpha Trust Growth	-0,0285**	-0,0073
Eurobank	0,0142	0,0183
HSBC Growth	-0,0126	-0,0076
International	-0,0260**	-0,0013
Piraeus	0,0099	0,0076

This panel shows average abnormal returns of the funds during the subperiods July 2002-June 2007 and July 2007-June 2010, according to Carhart's model.

In order to better illustrate the last point- that the incorporation of the risk factors doesn't alter much the results of CAPM, table 7 presents abnormal returns estimated by all of the 3 models for a better examination.

Table 7- Comparison of alphas between all models

Fund	CAPM	FF	CARHART
Alico	-0,0140**	-0,0127**	-0,0124**
Allianz	-0,0099	-0,0087	-0,0039
Alpha Athens Index	0,0016	0,0003	-0,0036
Alpha Blue Chips	-0,0074	-0,0064	-0,0059
HSBC Top 20	-0,0199*	-0,0156	-0,0154
ING	-0,0136	-0,0100	-0,0083
Interamerican Dynamic	-0,0026	-0,0039	0,0022
Millennium - Blue Chips	0,0188	0,0272	0,0231
ATE	-0,0249**	-0,0235**	-0,0241**
Delos Blue Chips	-0,0117**	-0,0099*	-0,0065
Delos Top-30	0,0151	0,0208	0,0296
Ermis Dynamic	-0,0207**	-0,0189**	-0,0208**
European Reliance Growth	-0,0073	-0,0057	-0,0078
Kyprou	-0,0177*	-0,0130	-0,0117
Geniki Epilegmenon Axion	-0,0202**	-0,0151*	-0,0141**
Allianz Aggressive Stategy	-0,0150**	-0,0119*	-0,0076
Citifund	-0,0109*	-0,0092	-0,0095
Marfin Olympia	-0,0151	-0,0126	-0,0115
Millennium - Mid Cap	0,0527**	0,0768**	0,0747**
Alpha Trust New Enterprises	-0,0173	-0,0167	-0,0060
ING Dynamic	-0,0122	-0,0048	-0,0002
Interamerican Growth	-0,0194**	-0,0127*	-0,0097
Delos Small-Cap	-0,0137	-0,0030	0,0003
Alpha Trust Growth	-0,0325**	-0,0274**	-0,0261**
Eurobank	0,0110	0,0131	0,0142
HSBC Growth	-0,0270**	-0,0240**	-0,0185*
International	-0,0346**	-0,0248*	-0,0198
Piraeus	-0,0078	-0,0032	-0,0027

The only noticeable change as we add risk factors to the original CAPM is that some funds with negative statistically significant alphas no longer retain their significance. Apart from that , Millenium Mid Cap is the only fund with significant positive returns across all three models.

The Fama-Macbeth regressions

As another set of diagnostics run and in order to establish if there is in fact a positive relationship of risk pertaining to the factors use so far and fund returns, we use the Fama-Macbeth two-step cross sectional regressions.

Fama and Macbeth (1973) employed cross sectional regressions to test the explanatory power of CAPM , namely whether the market proxy can explain individual asset returns. We perform the same tests here to identify the explanatory power of each od the risk factors of Carhart's model.

In the first step we run rolling time series regressions with a time window of 24 months to estimate the risk factors. Usually windows of 60 months are utilized but considering the size of our sample (96 variables) that would be moot. Of course this decision introduces more variability in the betas than we'd like but this is a necessary evil. We then use the coefficients of those factors as independent variables of the cross section regressions. The dependent variables are the excess returns of the funds at each point in time. The new regressions are given by

$$r_{i,t} = \gamma_{0,t} + \gamma_{1,t}\beta_{i1} + \gamma_{2,t}\beta_{i2} + \gamma_{3,t}\beta_{i3} + \gamma_{4,t}\beta_{i4} + e_{i,t} \quad (12)$$

where $r_{i,t}$ the excess asset returns at time t

β_{i1} the time series regressions beta

β_{i2} the time series coefficient of SMB

β_{i3} the time series coefficient of HML

β_{i4} the time series coefficient of MOM

We then compute the time-series average of every new coefficient

$$\overline{\gamma}_j = \frac{1}{T}\sum_{t=1}^{T}\gamma_{j,t} \qquad (13)$$

where j is each risk factor's coefficient

Each factor has explaining power if it's coefficient is positive and statistically different from zero. To test this we compute it's variance through

$$\sigma^2_{\gamma_j} = \frac{1}{T(T-1)}\sum_{t=1}^{T}(\gamma_{j,t} - \overline{\gamma_j})^2 \qquad (14)$$

which gives an unbiased estimation of variance. Variance is needed to identify each factors t-statistic through

$$t(\overline{\gamma_j}) = \frac{\overline{\gamma_j}}{\sigma_{\gamma_j}} \ . \qquad (15)$$

Each factor j for which we can reject $t(\overline{\gamma_j})<0$ at 95% confidence level is assumed to have real explanatory power. Table 10 presents the t-statistics of each risk factor.

Table 8-Fama-MacBeth Regressions

Model	Factor	Means	Test statistic
CAPM	beta	0,02	0,67
Fama-French	beta	0,01	0,27
	SMB	0,01	6,50
	HML	0,01	5,09
Carhart	beta	0,00	-0,07
	SMB	0,01	6,31
	HML	0,01	6,17
	MOM	0,00	3,93

This table presents the t-statistic for each risk factor obtained through the cross sectional regressions.

We observe that the betas in all three models have values close to zero as collaborated by their t-statistics. This means that we can't accept the existence of a positive relationship between systematic risk and returns, a fact that opposes the fundamental principle of the capital asset pricing model. However, the risk factors used in the Fama-French and Carhart models have large t-statistics which means that there exists a relationship between them and returns.

b) Market Timing Ability

Studies on the timing ability of mutual fund managers typically involve a standard risk factor regression model combined with a term that captures the convexity of fund returns resulting from market timing. Notable examples include Treynor&Mazuy's paper (1966) and Henriksson &Merton's (1981). Bollen and Buisse (2004) combined these models , based on CAPM , with the Carhart's model four-factor model.

Treynor and Mazuy-TM hereafter, in order to evaluate the ability of a manager in anticipating a turn in the market introduced a term that captures convexity of returns that result from market timing. This term , i.e. the squared market return transformed the original CAPM to the following expression

$$r_{i,t} = a_i + \beta_i (R_m - R_f)_t + \gamma_i (R_{m,t} - R_{f,t})^2 + e_{i,t} \qquad (16)$$

where γ_i measures timing ability.

If the manager increases (decreases) fund exposure to equities prior to a bullish (bearish) market the funds returns become a convex function of the market returns meaning γ_i is positive and statistically different from zero. Bollen and Buisse added the remaining risk factors from the Carhart's model obtaining the following result

$$r_{i,t} = a_i + \beta_{i1}(R_m - R_f)_t + \beta_{i2} SMB_t + \beta_{i3} HML_t + \beta_{i4} MOM_t + \gamma_i (R_{m,t} - R_{f,t})^2 + e_{i,t} \qquad (17)$$

Henriksson and Merton (HM herein) follow a similar way of thinking in establishing a convex relationship between fund returns and excess market returns provided the latter are significant in size . Specifically , the abnormal return realized by the manager alternates as result of his stock picking ability should he prove to posses no timing ability and his timing ability depending on the existence of excess market returns. Carhart's model after the introduction of the HM term becomes

$$r_{i,t} = a_i + \beta_{i1}(R_m - R_f)_t + \beta_{i2}SMB_t + \beta_{i3}HML_t + \beta_{i4}MOM_t + \gamma_i(I \bullet R_{m,t}) + e_{i,t} \qquad (18)$$

where I is a dummy variable that equals 1 if the market returns is positive and 0 if the market return is negative.

In both cases a fund manager posses market timing ability if the hypothesis γ_i <0 is rejected by the historical data. The abnormal returns realized by the manager is obtained through

$$r_{i,\gamma} = \frac{1}{N}\sum_{t=1}^{N}[a_i + \gamma_i f(R_{m,t})] \qquad (19)$$

where N is the number of trading days each period , a_i , γ_i are taken through equations (13,14) and $f(R_{m,t}) = R_{m,t}^2$ or $I \bullet R_{m,t}$ in the TM and HM case respectively.

Intuitively, the manager's timing ability (if it exists) is improving his stock picking evaluation. Results for both TM and HM models are presented below. No fund is found to have market timing ability according to the HM, while 4 funds have statistically significant timing ability according to the TM model. We note that Millenium Mid cap, the only fund with positive Jensen's alpha has no timing ability.

Table 9- Market Timing Models

Fund	Stock Selection	Market Timing TM	Market Timing HM	Mixed TM	Mixed HM
Millennium - Blue Chips	-0,0003	-0,00038	-0,00027	-0,0003	-0,0003
Alpha Athens Index	-0,0004	-0,00038	-0,00034	-0,0004	-0,0004
Delos Top-30	-0,0006	-0,00052	-0,00067	-0,0006	-0,0006
European Reliance Growth	-0,0010**	-0,00115	-0,00089	-0,0010	-0,0010
Allianz	-0,0012**	-0,00113*	-0,00124	-0,00113	-0,0012
Alico	-0,0013**	-0,00128	-0,00124	-0,0013	-0,0013
ING	-0,0013**	-0,0013	-0,00125	-0,0013	-0,0013
Alpha Blue Chips	-0,0013**	-0,00144	-0,00127	-0,0013	-0,0013
Delos Blue Chips	-0,0014**	-0,00136	-0,00131	-0,0014	-0,0014
Interamerican Dynamic	-0,0014**	-0,00142	-0,00131	-0,0014	-0,0014
Ermis Dynamic	-0,0016**	-0,0015**	-0,00168	-0,0015	-0,0016
Kyprou	-0,0017**	-0,00157	-0,00173	-0,0017	-0,0017
HSBC TOP 20	-0,0019**	-0,00186	-0,00177	-0,0019	-0,0019
ATE	-0,0020**	-0,0019*	-0,00197	-0,0019	-0,0020
Millennium - Mid Cap	-0,0002	-0,00041	0,000128	-0,0002	-0,0002
Marfin Olympia	-0,0011**	-0,00112	-0,00111	-0,0011	-0,0011
Citifund	-0,0013**	-0,00122	-0,00128	-0,0013	-0,0013
Allianz Aggressive Stategy	-0,0016**	-0,0016	-0,00147	-0,0016	-0,0016
Geniki Epilegmenon Axion	-0,0016**	-0,0015*	-0,00147	-0,0015	-0,0016
ING Dynamic	-0,0014**	-0,00142	-0,00133	-0,0014	-0,0014
Delos Small-Cap	-0,0018**	-0,0018	-0,00174	-0,0018	-0,0018
Interamerican Growth	-0,0019**	-0,00197	-0,0017	-0,0019	-0,0019
Alpha Trust New Enterprises	-0,0023**	-0,0023	-0,00202	-0,0023	-0,0023
Eurobank	-0,0007**	-0,0008	-0,00064	-0,0007	-0,0007
Piraeus	-0,0011	-0,00107	-0,00116	-0,0011	-0,0011
International	-0,0018**	-0,00176	-0,0018	-0,0018	-0,0018
HSBC Growth	-0,0024**	-0,00232	-0,00229	-0,0024	-0,0024
Alpha Trust Growth	-0,0027**	-0,00262	-0,00254	-0,0027	-0,0027

This table presents results of timing models. Stock selection is the abnormal return estimated by Carhart's model: $r_{i,t} = a_i + \beta_{i1}(R_m - R_f)_t + \beta_{i2}SMB_t + \beta_{i3}HML_t + \beta_{i4}MOM_t + e_{i,t}$. TM is the Treynor-Mazuy model:

$$r_{i,t} = a_i + \beta_{i1}(R_m - R_f)_t + \beta_{i2}SMB_t + \beta_{i3}HML_t + \beta_{i4}MOM_t + \gamma_i(R_{m,t} - R_{f,t})^2 + e_{i,t}$$ Whereas

HM the Henriksson-Merton model:

$$r_{i,t} = a_i + \beta_{i1}(R_m - R_f)_t + \beta_{i2}SMB_t + \beta_{i3}HML_t + \beta_{i4}MOM_t + \gamma_i(I \bullet R_{m,t}) + e_{i,t}$$. The market

timing for each model is obtained though $r_{i,\gamma} = \frac{1}{N}\sum_{t=1}^{N}[a_i + \gamma_i f(R_{m,t})]$, where $f(R_{m,t})$ is $(R_{m,t} - R_{f,t})^2$ for the TM model and $I \bullet R_{m,t}$ for the HM model. The mixed models use market timing if γ_i is statistically significant, otherwise they use Carhart's abnormal retun.

c) Non parametric tests

In order to check for persistence on mutual fund returns non parametric tests are usually employed. Most common of these are 1) the Malkiel test (1995), 2)the cross-product ratio of Brown and Goetzman (1995) and 3) the χ-squared test of Kahn and Rudd(1995). All three of these tests start by classifying funds as winners(W) and losers (L) depending on whether their performance (as indicated by raw returns, Sharpe ratio or Jensen's alpha) is higher or lower than the median of the universe of funds for each period. It goes without saying that if the previous regression's alpha is used as performance criterion the non parametric tests become biased to the possible shortcoming of these models.

Malkiel(1995) hypothesized that there should be equal probability for a fund to become a winner or loser the following period regardless of the fund's standing the current period, meaning this probability follows the binomial distribution. His Z-test statistic is obtained through

$$M = \frac{WW - (WW + WL) \times 0.5}{\sqrt{(WW + WL) \times 0.5 \times 0.5}} \qquad (20)$$

where WW is the number of winners funds across two consecutive periods , LL the number of losing funds and so on. A value around 0.5 would support Malkiel's hypothesis and reject the persistence one.

Brown and Goetzman (1995) suggest that dismissing any relation between performances across consecutive periods should result in an equal number of funds that manage to retain their winning status and those losing it. To test their suggestion, they compute a cross-product ratio (CPR)

$$CPR = \frac{WW \times LL}{WL \times LW} \quad (21)$$

A value of CPR greater than 1 indicates persistence , while smaller values indicate reversal. To check for persistence the following Z-test is used

$$Z = \frac{\ln(CPR)}{\sqrt{\frac{1}{WW} + \frac{1}{LL} + \frac{1}{WL} + \frac{1}{LW}}} \quad (22)$$

Kahn and Rudd (1995) relate persistence to the difference between the realized placement of funds in each category and the expected one. The null hypothesis of no persistence is checked through the following statistic

$$x^2 = \frac{(WW - N/4)^2 + (WL - N/4)^2 + (LW - N/4)^2 + (LL - N/4)^2}{N/4} \quad (23)$$

We check for persistence performance using yearly returns to classify funds as winners and losers. Babalos et al (2008) find that after employing risk factors such as market return or size evidence of performance persistence found with this method disappears, however we can’t use Jensen’s alpha as performance criterion since ,as we saw there is only one fund with positive abnormal return.

Table 9 presents the results of the non-parametric tests. According to all three measures we have evidence of strong performance persistence in at least 2 out of 7 periods (2&5) and possible persistence in period 7.

Table 10-Non Parametric Tests

Panel A-Contingency Table

Period	WW	LL	WL	LW
2	10	10	4	4
3	5	5	9	9
4	7	7	7	7
5	10	10	4	4
6	8	8	6	6
7	9	9	5	5
8	7	6	7	8

This panel shows the number of funds that belong in each category according to their performance relative to the median fund for each period. WW is the number of funds that had yearly returns above the median for two consecutive periods, LL the number of funds that had returns below the median and so on.

Panel B- Non Parametric tests

Period	Malkiel	Brown & Goetzmann		Kahn & Rudd
		CPR	Z-test	
2	1,60	6,25	2,19	5,14
3	-1,07	0,31	-1,49	2,29
4	0,00	1,00	0,00	0,00
5	1,60	6,25	2,19	5,14
6	0,53	1,78	0,75	0,57
7	1,07	3,24	1,49	2,29
8	0,00	0,75	-0,38	0,29

This panel presents the results of the non-parametric tests for persistence. The Malkiel statistic is given by $M = \frac{WW - (WW + WL) \times 0.5}{\sqrt{(WW + WL) \times 0.5 \times 0.5}}$. Values above 0,5 indicate persistence while lower values indicate reversal. The CPR statistic by B&G is given by $CPR = \frac{WW \times LL}{WL \times LW}$. CPR values greater than 1 indicate persistence, while the Z-test measures statistical significance. Kahn &Rudd statistic is given by $x^2 = \frac{(WW - N/4)^2 + (WL - N/4)^2 + (LW - N/4)^2 + (LL - N/4)^2}{N/4}$, which follows chi-square distribution.

4.Conclusions

This paper tried to evaluate mutual fund performance in Greece during the period of 2002-2010. Our data show that only one fund, Millenium Mid Cap realized significant abnormal returns throughout the test period, while 4 funds displayed market timing ability according to at least one model. We also found evidence of some performance persistence , when taking into account the same funds we evaluated independently. Furthermore, no fund managed to realize significant increases in their abnormal returns during the crisis period (2007-2010 in our sample) compared to the previous bullish period (2002-2010). However, since the end of our test period , the sovereign crisis in this country has worsened to the effect that investors deem it insolvent. In this environment , with the FTSE/Athens Stock Exchange 20 Index declining by more than 60% in the last year alone, it seems pointless to search for funds who managed to 'beat' the market.

If the purpose of a paper of this type is to give advice to potential investors about the market it focused on , then it surely seems at least out of date. The question of investing or not in Greece can only be viewed under the perspective of political risk; after all the valuation of most Greek securities already reflect primarily an enormous amount of this particular risk. With the short-selling ban still standing as these lines are written, that option too is still out of the table. The absence of liquidity in the Athens stock exchange also reflects the unwillingness of traditionally risky investors to invest in an otherwise considered default country.

To return to the purpose of the paper ,we reiterate our disapproval of Greek mutual funds for an additional reason; we didn't take into account management fees and transaction costs; should these too come to play , we expect the performance of mutual funds during the test period to be even worse. And for this to happen even in the first sub period tested (2002-2007, a bull market), the late crisis is not a valid excuse.

Another direction we couldn't follow is that of checking for persistence using the abnormal returns as criterion of performance; again , as previously stated the lack of significant positive alphas prohibited it. As a final note, the approach employed here is common in evaluating Greek mutual funds. It would be interesting to see some other method used to evaluate these funds, like Sharpe's style analysis, if only to try discover other factors that would perhaps have more bearings in explaining the Athens stock exchange movements than the ones employed here.

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Appendix

Table 11 - Jensen's alpha- Daily Regressions

Fund	a	b	$adj.R^2$
Alpha Athens Index	-0,0004	0,98**	0,75
Millennium - Blue Chips	-0,0005*	0,83**	0,67
Delos Top-30	-0,0006	0,87**	0,3
European Reliance Growth	-0,0012**	0,90**	0,74
Alico	-0,0014**	0,87**	0,94
ING	-0,0015**	0,87**	0,35
Allianz	-0,0015**	0,84**	0,68
Alpha Blue Chips	-0,0015**	0,86**	0,95
Interamerican Dynamic	-0,0015**	0,81**	0,63
Delos Blue Chips	-0,0015**	0,85**	0,87
Ermis Dynamic	-0,0017**	0,85**	0,94
Kyprou	-0,0019**	0,78**	0,68
HSBC Top 20	-0,0020**	0,82**	0,78
ATE	-0,0021**	0,76**	0,94
Millennium - Mid Cap	-0,0008**	0,75**	0,45
Citifund	-0,0013**	0,88**	0,94
Marfin Olympia	-0,0014**	0,83**	0,57
Geniki Epilegmenon Axion	-0,0018**	0,80**	0,69
Allianz Aggressive Stategy	-0,0019**	0,81**	0,84
ING Dynamic	-0,0021**	0,76**	0,33
Delos Small-Cap	-0,0023**	0,72**	0,53
Interamerican Growth	-0,0024**	0,75**	0,82
Alpha Trust New Enterprises	-0,0027**	0,66**	0,4
Eurobank	-0,0008**	0,98**	0,71
Piraeus	-0,0013*	0,90**	0,26
International	-0,0020**	0,77**	0,52
HSBC Growth	-0,0027**	0,68**	0,78
Alpha Trust Growth	-0,0029**	0,66**	0,84

This table presents the results of the regressions run according to CAPM:

$$r_{i,t} = a_i + \beta_{i1}(R_m - R_f)_t + e_{i,t}$$

a_i is the average daily abnormal return of fund i, β_{i1} is the beta coefficient of fund i, $R_m - R_f$ is the excess market return. $r_{i,t}$, the dependent variable is the excess return of the fund over the risk free rate. Funds are classified according to investment strategy and the ranked on abnormal returns.

Table 12-Augmented Jensen's alpha-Fama and French model- Daily Regressions

Fund	a	b	SMB	HML	$adj.R^2$
Alpha Athens Index	-0,0004	0,98**	0,04	-0,01	0,75
Millennium - Blue Chips	-0,0004	0,84**	0,31*	-0,21*	0,67
Delos Top-30	-0,0006	0,87**	-0,14	0,10	0,3
European Reliance Growth	-0,0010**	0,92**	0,52**	-0,27**	0,75
Alico	-0,0013**	0,88**	0,24**	-0,13**	0,94
Allianz	-0,0013**	0,87**	0,63**	-0,39**	0,68
ING	-0,0013**	0,89**	0,27	0,06	0,35
Alpha Blue Chips	-0,0014**	0,88**	0,41**	-0,20**	0,95
Delos Blue Chips	-0,0014**	0,86**	0,30**	-0,11*	0,87
Interamerican Dynamic	-0,0014**	0,82**	0,30*	-0,16	0,63
Ermis Dynamic	-0,0016**	0,85**	0,08	0,01	0,63
Kyprou	-0,0017**	0,80**	0,35**	-0,10	0,68
HSBC Top 20	-0,0019**	0,83**	0,12	0,08	0,78
ATE	-0,0020**	0,78**	0,35**	-0,20**	0,94
Millennium - Mid Cap	-0,0002	0,82**	1,49**	-0,51**	0,47
Marfin Olympia	-0,0012**	0,86**	0,55**	-0,17	0,57
Citifund	-0,0013**	0,89**	0,20**	-0,07	0,94
Geniki Epilegmenon Axion	-0,0016**	0,82**	0,48**	-0,09	0,69
Allianz Aggressive Stategy	-0,0016**	0,84**	0,70**	-0,33**	0,84
ING Dynamic	-0,0015**	0,83**	1,43**	-0,44**	0,35
Delos Small-Cap	-0,0018**	0,78**	1,31**	-0,47**	0,56
Interamerican Growth	-0,0019**	0,81**	1,35**	-0,53**	0,85
Alpha Trust New Enterprises	-0,0023**	0,71**	1,01**	-0,23	0,42
Eurobank	-0,0007**	0,98**	0,31*	-0,29**	0,71
Piraeus	-0,0011	0,93**	0,37	0,04	0,26
International	-0,0018**	0,79**	0,35	-0,13	0,52
HSBC Growth	-0,0024**	0,71**	0,56**	-0,17**	0,79
Alpha Trust Growth	-0,0027**	0,69**	0,60**	-0,19**	0,85

This table presents the results of the regressions run according to the FF model.

$$r_{i,t} = a_i + \beta_{i1}(R_m - R_f)_t + \beta_{i2}SMB_t + \beta_{i3}HML_t + e_{i,t}$$

a_i is the average daily abnormal return of fund I, SMB_t is the return on the mimicking portfolio for the size factor and HML_t the return on the mimicking portfolio for the book-to-market factor. Funds are classified according to investment strategy and the ranked on abnormal returns.

Table 13 -Augmented Jensen'a alpha-Carhart model-Daily Regressions

Fund	a	b	SMB	HML	MOM	$adj.R^2$
Millennium - Blue Chips	-0,0003	0,85**	0,42**	-0,25**	0,13	0,67
Alpha Athens Index	-0,0004	0,98**	-0,03	0,01	-0,09	0,75
Delos Top-30	-0,0006	0,87**	-0,05	0,06	0,11	0,3
European Reliance Growth	-0,001**	0,92**	0,54	-0,27**	0,02**	0,74
Allianz	-0,0012**	0,87**	0,78**	-0,45**	0,19**	0,69
Alico	-0,0013**	0,88**	0,34**	-0,17**	0,12**	0,94
ING	-0,0013**	0,89**	0,30	0,04	0,04	0,35
Alpha Blue Chips	-0,0013**	0,88**	0,44	-0,21**	0,04**	0,95
Delos Blue Chips	-0,0014**	0,87**	0,42**	-0,15**	0,15**	0,87
Interamerican Dynamic	-0,0014**	0,83**	0,41**	-0,20*	0,13	0,63
Ermis Dynamic	-0,0016**	0,85**	0,09	0,01	0,01	0,94
Kyprou	-0,0017**	0,80**	0,47**	-0,15	0,15*	0,68
HSBC Top 20	-0,0019**	0,83**	0,14	0,07	0,03	0,78
ATE	-0,0020**	0,78**	0,39**	-0,22**	0,04	0,94
Millennium - Mid Cap	-0,0002	0,83**	1,70**	-0,59**	0,25**	0,48
Marfin Olympia	-0,0011**	0,86**	0,55**	-0,17	0,01	0,57
Citifund	-0,0013**	0,90**	0,24**	-0,09*	0,06*	0,94
Allianz Aggressive Stategy	-0,0016**	0,84**	0,77**	-0,36**	0,09*	0,85
Geniki Epilegmenon Axion	-0,0016**	0,82**	0,47**	-0,09	-0,02	0,69
ING Dynamic	-0,0014**	0,84**	1,74**	-0,56**	0,39**	0,35
Delos Small-Cap	-0,0018**	0,79**	1,44**	-0,52**	0,17*	0,56
Interamerican Growth	-0,0019**	0,82**	1,59**	-0,62**	0,29**	0,85
Alpha Trust New Enterprises	-0,0023**	0,71**	0,91**	-0,20	-0,12	0,42
Eurobank	-0,0007**	0,98**	0,18	-0,24*	-0,16	0,71
Piraeus	-0,0011	0,93**	0,42	0,02	0,06	0,26
International	-0,0018**	0,79**	0,34	-0,13	-0,01	0,52
HSBC Growth	-0,0024**	0,72**	0,82**	-0,27**	0,31**	0,8
Alpha Trust Growth	-0,0027**	0,69**	0,61**	-0,20**.	0,01	0,85

This table presents the results of the regressions run according to Carhart's model:

$$r_{i,t} = a_i + \beta_{i1}(R_m - R_f)_t + \beta_{i2}SMB_t + \beta_{i3}HML_t + \beta_{i4}MOM_t + e_{i,t}$$

a_i is the average monthly abnormal return of fund I, SMB_t is the return on the mimicking portfolio for the size factor and HML_t the return on the mimicking portfolio for the book-to-market factor and MOM_t the return on a portfolio following the momentum strategy . Funds are classified according to investment strategy and the ranked on abnormal returns.

Table 14- Subperiod Analysis- Daily Regressions

Panel A- Jensen's alpha

Fund	2002-2007	2007-2010
Alico	-0,0017**	-0,0011**
Allianz	-0,0008*	-0,0020**
Alpha Athens Index	-0,0005	-0,0002
Alpha Blue Chips	-0,0017**	-0,0014**
HSBC TOP 20	-0,0012**	-0,0025**
ING	-0,0019*	-0,0012**
Interamerican Dynamic	-0,0017**	-0,0017**
Millennium - Blue Chips	-0,0007	-0,0004
ATE	-0,0020**	-0,0020**
Delos Blue Chips	-0,0014**	-0,0017**
Delos Top-30	-0,0009	-0,0008
Ermis Dynamic	-0,0015**	-0,0015**
European Reliance Growth	-0,0014**	-0,0008*
Kyprou	-0,0015**	-0,0019**
Geniki Epilegmenon Axion	-0,0002	-0,0026**
Allianz Aggressive Stategy	-0,0010**	-0,0025**
Citifund	-0,0012**	-0,0012**
Marfin Olympia	-0,0015**	-0,0009
Millennium - Mid Cap	0,0006	-0,0025**
Alpha Trust New Enterprises	-0,0018**	-0,0034**
ING Dynamic	-0,0017*	-0,0025**
Interamerican Growth	-0,0021**	-0,0028**
Delos Small-Cap	-0,0016**	-0,0028**
Alpha Trust Growth	-0,0022**	-0,0032**
Eurobank	-0,0007*	-0,0009*
HSBC Growth	-0,0020**	-0,0031**
International	-0,0018**	-0,0020**
Piraeus	-0,0023*	-0,0005*

This panel shows daily average abnormal returns of the funds during the subperiods July 2002-June 2007 and July 2007-June 2010, according to CAPM.

Panel B- Augmented Jensen's alpha-Fama and French model

Fund	2002-2007	2007-2010
Alico	-0,0017**	-0,0009**
Allianz	-0,0006	-0,0019**
Alpha Athens Index	-0,0005	-0,0001
Alpha Blue Chips	-0,0016**	-0,0010**
HSBC TOP 20	-0,0013**	-0,0024**
ING	-0,0019*	-0,0010**
Interamerican Dynamic	-0,0017**	-0,0013**
Millennium - Blue Chips	-0,0006	-0,0003
ATE	-0,0019**	-0,0018**
Delos Blue Chips	-0,0013**	-0,0016**
Delos Top-30	-0,0009	-0,0010
Ermis Dynamic	-0,0015**	-0,0016**
European Reliance Growth	-0,0014**	-0,0004
Kyprou	-0,0015**	-0,0017**
Geniki Epilegmenon Axion	-0,0002	-0,0023**
Allianz Aggressive Stategy	-0,0009**	-0,0021**
Citifund	-0,0012**	-0,0010**
Marfin Olympia	-0,0015**	-0,0003
Millennium - Mid Cap	0,0006	-0,0016**
Alpha Trust New Enterprises	-0,0018**	-0,0027**
ING Dynamic	-0,0016*	-0,0018**
Interamerican Growth	-0,0020**	-0,0019**
Delos Small-Cap	-0,0015**	-0,0020**
Alpha Trust Growth	-0,0021**	-0,0028**
Eurobank	-0,0007*	-0,0007
HSBC Growth	-0,0020**	-0,0026**
International	-0,0018**	-0,0019*
Piraeus	-0,0023*	-0,0004

This table shows average abnormal returns of the funds during the subperiods July 2002-June 2007 and July 2007-June 2010, according to the FF model.

Panel C- Augmented Jensen'a alpha-Carhart model

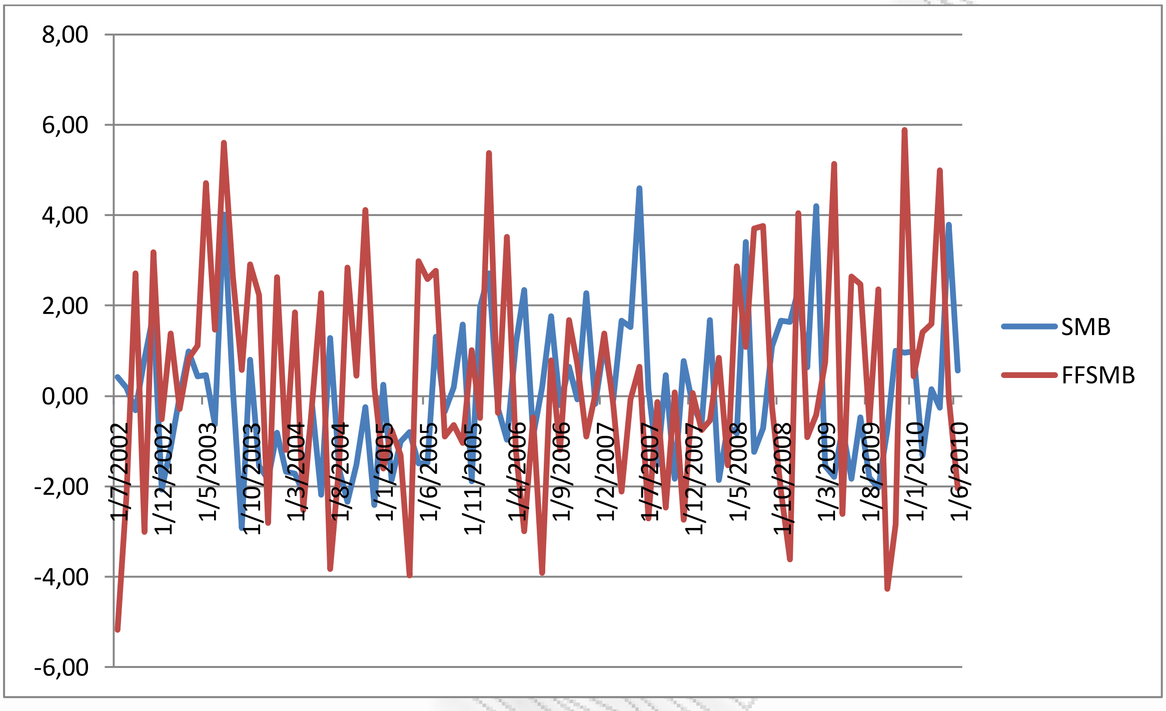
Fund	2002-2007	2007-2010
Alico	-0,0017**	-0,0008**
Allianz	-0,0006	-0,0018**
Alpha Athens Index	-0,0005	-0,0001
Alpha Blue Chips	-0,0016**	-0,0010**
HSBC TOP 20	-0,0013**	-0,0023**
ING	-0,0019*	-0,0009**
Interamerican Dynamic	-0,0017**	-0,0012**
Millennium - Blue Chips	-0,0006	-0,0002
ATE	-0,0019**	-0,0018**
Delos Blue Chips	-0,0013**	-0,0015**
Delos Top-30	-0,0009	-0,0009
Ermis Dynamic	-0,0015**	-0,0015**
European Reliance Growth	-0,0014**	-0,0004
Kyprou	-0,0015**	-0,0017**
Geniki Epilegmenon Axion	-0,0002	-0,0022**
Allianz Aggressive Stategy	-0,0009**	-0,0021**
Citifund	-0,0012**	-0,0010**
Marfin Olympia	-0,0015**	-0,0003
Millennium - Mid Cap	0,0006	-0,0016**
Alpha Trust New Enterprises	-0,0018**	-0,0026**
ING Dynamic	-0,0016*	-0,0017**
Interamerican Growth	-0,0020**	-0,0018**
Delos Small-Cap	-0,0015**	-0,0020**
Alpha Trust Growth	-0,0021**	-0,0028**
Eurobank	-0,0007*	-0,0008
HSBC Growth	-0,0020**	-0,0024**
International	-0,0018**	-0,0020*
Piraeus	-0,0023*	-0,0004

This table shows average abnormal returns of the funds during the subperiods July 2002-June 2007 and July 2007-June 2010, according to Carhart's model.

Table 15-Comparison of alphas between all models -Daily Regressions

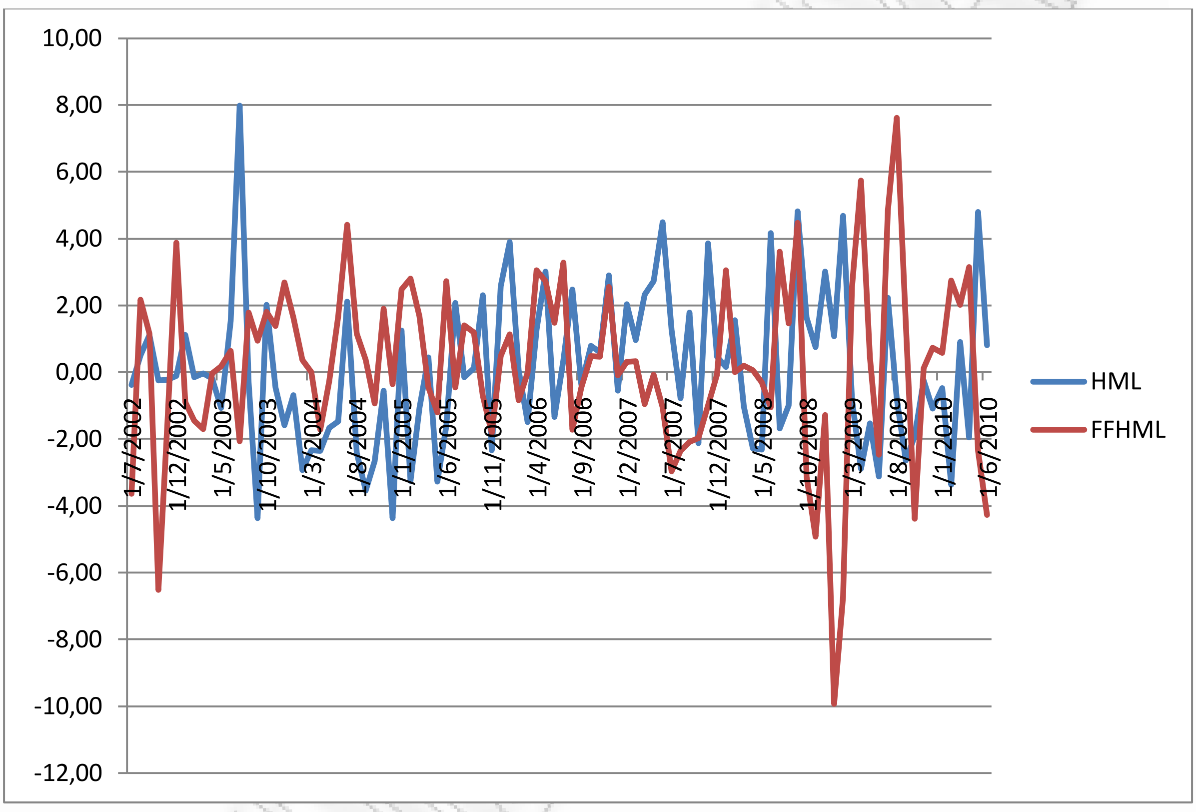
Fund	CAPM	FF	Carhart
Alico	-0,0014**	-0,0013**	-0,0013**
Allianz	-0,0015**	-0,0013**	-0,0012**
Alpha Athens Index	-0,0004	-0,0004	-0,0004
Alpha Blue Chips	-0,0015**	-0,0014**	-0,0013**
HSBC Top 20	-0,0020**	-0,0019**	-0,0019**
ING	-0,0015**	-0,0013**	-0,0013**
Interamerican Dynamic	-0,0015**	-0,0014**	-0,0014**
Millennium - Blue Chips	-0,0005*	-0,0004	-0,0003
ATE	-0,0021**	-0,0020**	-0,0020**
Delos Blue Chips	-0,0015**	-0,0014**	-0,0014**
Delos Top-30	-0,0006	-0,0006	-0,0006
Ermis Dynamic	-0,0017**	-0,0016**	-0,0016**
European Reliance Growth	-0,0012**	-0,0010**	-0,0010**
Kyprou	-0,0019**	-0,0017**	-0,0017**
Geniki Epilegmenon Axion	-0,0018**	-0,0016**	-0,0016**
Allianz Aggressive Stategy	-0,0019**	-0,0016**	-0,0016**
Citifund	-0,0013**	-0,0013**	-0,0013**
Marfin Olympia	-0,0014**	-0,0012**	-0,0011**
Millennium - Mid Cap	-0,0008*	-0,0002	-0,0002
Alpha Trust New Enterprises	-0,0027**	-0,0023**	-0,0023**
ING Dynamic	-0,0021**	-0,0015**	-0,0014**
Interamerican Growth	-0,0024**	-0,0019**	-0,0019**
Delos Small-Cap	-0,0023**	-0,0018**	-0,0018**
Alpha Trust Growth	-0,0029**	-0,0027**	-0,0027**
Eurobank	-0,0008**	-0,0007**	-0,0007**
HSBC Growth	-0,0027**	-0,0024**	-0,0024**
International	-0,0020**	-0,0018**	-0,0018**
Piraeus	-0,0013*	-0,0011	-0,0011

Graph 1-Greek and American small-minus-big factors



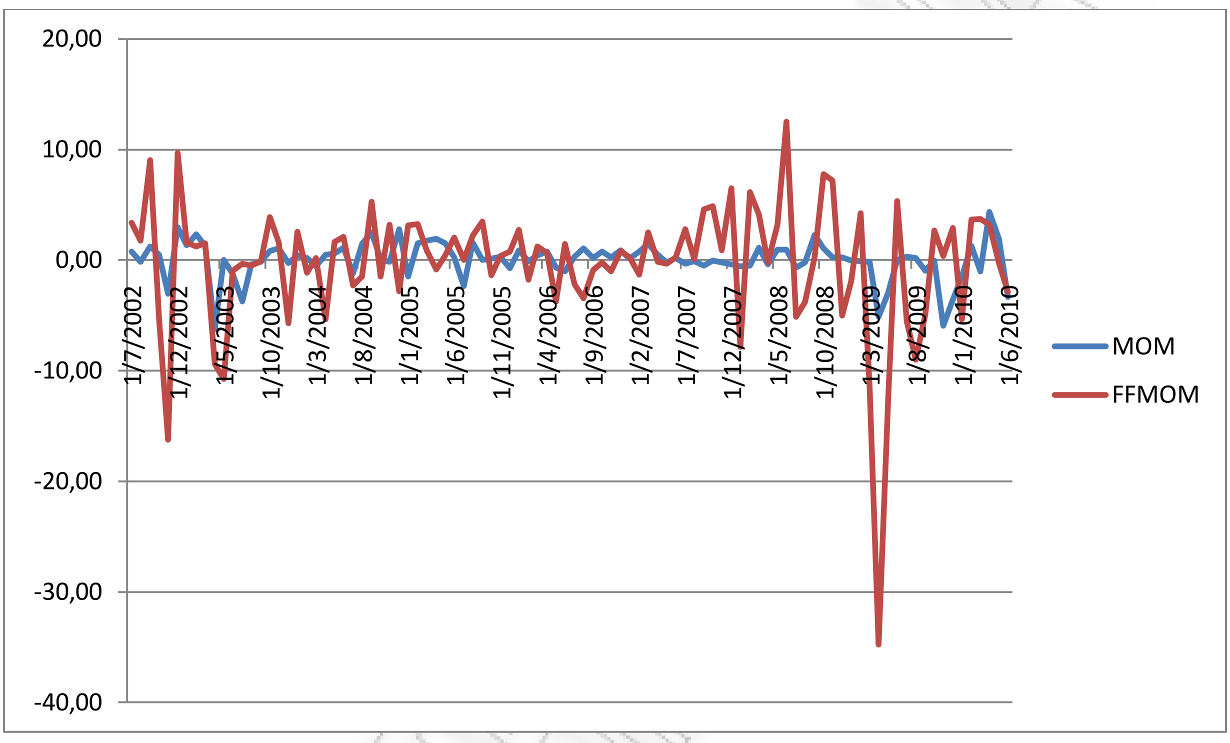
This graph shows the returns of the small-minus-big portfolio for the period of July2002- June 2010. The blue line is the Greek portfolio we constructed , while the red the one obtained from Kenneth's French website and is about the American market for the same period for comparison. Returns are in percentage.

Graph 2- Greek and American high-minus-low factors



This graph shows the returns of the high-minus-low portfolio for the period of July2002- June 2010. The blue line is the Greek portfolio we constructed , while the red the one obtained from Kenneth's French website and is about the American market for the same period for comparison. Returns are in percentage.

Graph 3- Greek and American momentum factors



This graph shows the returns of a portfolio following the momentum strategy; buying past winners and selling past losers. Returns are in percentage. The blue line is the factor we constructed while the red the factor from the USA market.