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« Do the Greek mutual fund beat the market? »

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Abstract

The present paper deals with the institution of Mutual Funds (MF) in Greece, which has experienced rapid growth over the years and is one of the main choices of investors to invest their savings. This growth can be attributed to the unique benefits that mutual funds offer to individual investors.

Investing in mutual funds, in comparison with investing directly in stocks, offers the advantages of professional management, instant liquidity and portfolio diversification. Thus, mutual fund industry has become in the last decades a popular investment vehicle for low and middle - income investors.

In the first stage in the paper, the types of mutual funds will be presented and analyzed in a theoretical approach and the concepts of risk and return will be explained. In the next step, equity funds will be analyzed and valuated, using the Jensen (Jensen's Performance Index) method and the market timing methods, Treynor – Mazuy's model and Henriksson- Merton's model.

The examination period of mutual funds is from their beginning of their life until and 29/6/2020.

KEYWORDS

Returns of mutual funds
Jensen's alpha
Treynor Mazuy market timing model
Henriksson Merton market timing model

Contents

Definition, Historical Background, Operation of Mutual Funds

Mutual Funds are groups of assets that consist of cash and securities whose individual assets are indivisible to more than one person, their shares are purchased by individual investors, while their management is undertaken by a management company.

The rapid growth of the Mutual Funds has exceeded the expected limits and at the same time there is a constantly upward trend. For this reason, new categories of Mutual Funds are already being created, in order to cover most of the needs of the investing public. Such moves prove how positive the Mutual Fund market is and how much this market is supported by both specialist and institutional investors.

The main types of collective investments are the classic open funds, closed end funds, stock traded funds, exchange traded funds, mutual funds, fund funds, and hedge funds. The last three types of collective investments are the new generation of Mutual Funds and the open type is now the most important investment vehicle in the world for small and medium income investors (Filippas, 2010).

The key component of any successful product is its ability to meet specific purchasing needs so that its consumers reap specific benefits. This ability of each product is a function of a series of special features that make it unique. Even the same basic product is produced in many variations so that it can meet the specialized needs of its customers. This is the reason that justifies the existence of different categories of mutual funds (Karathanasis, 1992). The criterion for distinguishing the different mutual funds is the investment policy pursued by each mutual fund as well as the placement of the funds in different types of securities (Karathanasis, 1992).

The idea of mutual funds is based on the logic that many investors, who have the same investment philosophy, pool their cash to create a large, strong fund, which is divided into shares of equal value. The term "Capital" means the total amount raised by investors, while the term "Mutual" reflects the fact that all shareholders of a fund share the profits and losses that may arise according to their share.

Another classification of mutual funds is made according to the type of financial instruments in which they invest their assets. More specifically they are distinguished in (Mylonas, 1999 and Anthropelos, 2019):

- Cash management: if they invest mainly in deposits and money market instruments, while it is forbidden to invest in shares.
- Bonds: if they invest mainly in bonds, while it is allowed to invest in shares up to 10% of their net assets.
- Gross: provided they invest at least 10% of their net assets in shares and at least 10% of their net assets in bonds.
- Equity: if they invest mainly in shares.

When making an investment in a mutual fund, the investor's capital is accumulated together with those of other investors who have invested in the same fund. The total final amount is used to create or expand the investment portfolio.

The mutual fund portfolio may consist of various securities, the amount of which is determined by the mutual fund regulation, thus ensuring the dispersion of investments. Through the dispersion, the risk is distributed so that if a loss is caused in one of the securities of the portfolio, there is the possibility of balancing it with the profits of the other placements.

Several different definitions have been given for the Funds, but the official definition for Greece is described in article 12 of Law 3283/2004 “Asset group consisting of securities, money market instruments and cash and whose individual elements belong indivisibly to more than one shareholder ".

The first forms of mutual fund investment first developed in the Netherlands in the late 18th century and then in Britain in the late 19th century. As a popular investment, however, mutual funds were established in the United States in the 1920s, shortly before the 1929 recession, with total assets not exceeding 5% of $ 27 million in assets. When market confidence returned in the 1950s, the mutual fund industry began to grow again.

By 1970, there were approximately 360 M / Cs in the US market with total assets of $ 48 million and by the end of 2010 there were 7,581 total assets of $ 11.8 trillion.

In Greece, the Mutual Funds began to exist in 1970 with the enactment of Legislative Decree (ND) 608/70. At that time, two Mutual Funds were established, Hermes Potential (of the Emporiki Bank Group) and Delos Mixed (of the National Group Bank). These were the only Greek Mutual Funds for the next 15 years. A milestone for Mutual Funds in Greece was Law 1969/91 which abolished the N.D. 608/70 and was replaced relatively recently by Law 3283/2004. Today, mutual funds in Greece are considered as one of the most popular forms of investment with managed funds that exceeded at the end of 2012 € 5.49 billion.

This decrease in the net assets of Greek mutual funds is mainly due to the financial crisis that has affected Greece, as after 2007 the decline is very large. As we observe that the total assets were on 31/12/2007 at 24.5 billion. Euro and on 30/12/2016 has fallen to 7.2 billion. Euros we see that the financial crisis is constantly leading the assets of Greek Funds to a declining course.

The fact is that each Fund has been formed with the funds of a large number of investors and is managed professionally by a Mutual Fund Management Company - A.E.D.A.K. which has knowledge, information and experience. So, if we try to gather the main characteristics of a mutual fund, these are the following:

- Specific investment purpose.
- A specific way of calculating the value of investments on a daily basis.
- A group of people who exercise professional management of the above portfolio.
- A variety of stocks, bonds and other securities as well as cash.
- A specific way in which investors enter and leave the fund.
- A specific legal framework that will institutionalize the above.

During 1990, six new Mutual Funds were created. Four have already been created by ALPHA Credit Bank and two by the insurance companies Aspis Pronoia and European Credit, while the significant returns of the Mutual Funds during this year, gave impetus for an impressive continuation. In the years that followed, the institution experienced - except for some short-term regressions - significant prosperity (Filippas, 2010).

By placing its money in a mutual fund, each investor grants the right to the fund managers to invest on their behalf at will and provided that the conditions for achieving the maximum possible return on the risk of the investment are met. Otherwise, the investor has the option to redeem his shares from the fund that failed in his goal and allocate them to another fund that has a better chance of success.

A fund may contain short-term or long-term investments, more or less risk-free, fixed income or goodwill, interest rate character or shareholder, Greek or international. The type of investments selected by the mutual funds is known in advance, based on the purpose of each Fund and is maintained without substantial change and usually without conversion to another category in order to continue to meet the initial objectives of investors.

Mutual funds belong to the category of collective investments which are based on the raising of funds by the general investment community, with the aim of offering investment management and joint exploitation of opportunities that the individual investor could not take advantage of. If we wanted to be more specific we would say that mutual funds belong to the open type investments that have as their main feature liquidity, the ease with which one can buy and sell shares of a fund and the price of the share which depends from the market price of the securities and in general all the investment elements included in a mutual and the number of shares into which the specific mutual fund is divided.

The meaning of this "openness" lies in the fact that the number of circulating shares fluctuates daily, depending on whether there are investors who buy new shares or investors who decide to sell the shares they already hold and that the share price varies daily based on the two factors mentioned above.

The concept of mutual risk management lies in the fact that mutual funds are an expression of a common effort of many individuals to deal with the investment risks that surround them. The guarantee they achieve is the fact that any risk that arises, bears the burden of all investors and even the degree of participation of each in the common capital.

This risk management is not a current invention but is much older. It appears with the need of man to be protected from natural phenomena, hostile invasions and the economic consequences of natural disasters. Gathering in societies, the signing of treaties for the assistance of one society to another in case of war, natural disasters or lack of basic goods were the first forms of expression of solidarity and the pursuit of common goals.

Mutual Funds Legislation

On 2 November 2004, the new law 3283/2004 on mutual funds and mutual fund management companies in Greece was passed and implemented, which incorporates the relevant Directives of the European Union and replaces in its entirety the older repealed law 1969/1991 which was in force until then, as well as all its amendments.

The new law creates new dynamics and new opportunities for mutual funds and companies that manage mutual funds, facilitates the circulation of products and companies in the countries of the European Union, creates the conditions for the development of new products, enhances transparency in management, investor information is increased and at the same time their rights are better protected.

More specifically, the mutual fund management companies, A.E.D.A.K., as we will analyze below, now have the opportunity to expand their activities in the management of private portfolios and portfolios of insurance funds, in providing investment advisors, in managing mutual funds and other A.E.D.A.K..

In addition, they have the opportunity to sell their products in other European Union countries either through cross-border action or by setting up branches in those countries. In relation to the new products, funds of funds (Funds consisting of shares of other Funds) and Index Funds (Passive management funds that follow the course of an index) are introduced to the market. In the field of investor protection, new investment limits are set in investments aiming at the greater dispersion of risks and the smaller exposure to them, as well as to avoid the accumulation of investment funds in the parent company and the Group owned by A.E.D.A.K..

Important new 26 elements for investor protection are also the new conditions set for mutual fund regulations, the elements that must be contained in the prospectuses and the summary fund prospectuses distributed to prospective shareholders. Following the publication of the new law, the supervisory body of A.E.D.A.K., the Hellenic Capital Market Commission, whose role will be analyzed below, issued a number of regulatory decisions aimed at better operation of mutual funds and even greater protection of investors.

According to them:

- A new categorization of mutual funds is introduced, which are divided into Domestic and Foreign, and each of these categories consists of subcategories: Equity, Gross, Bond and Cash Management (will be analyzed below).
- It is determined that Index Funds fall into the above categories depending on the composition of their portfolio.
- It is prohibited for Cash Management Funds to be placed in shares.
- It is mandatory for the Mixed Funds to invest at least 10% of their assets in shares and 10% in bonds.
- A.E.D.A.K. is obliged at the end of each calendar quarter and within 10 calendar days from the end of it, to publish detailed and average percentage tables of the portfolios of the managed funds and to make them available to the shareholders and within the same deadline to publish them. on their websites.

- The categories of expenses and fees that are allowed to be borne by the Funds are precisely defined in the regulations of the Funds.
- The quarterly invoices sent to the shareholders must now state the management fee of A.E.D.A.K. as a percentage borne by the mutual fund as well as the commission of the Depositary (bank where the securities of the company investing in the Fund are kept).

If we wanted to define the roles that play in the circuit of the operation of mutual funds would be the following:

- the shareholders,
- the depositary,
- brokerage firms and
- the audit bodies.

Shares

The assets of a Fund are the sum of equal value or fractions of shares. The net price results from dividing the value of the assets of the Fund each day by the total number of shares of that day. The net price is used to calculate the return of the Mutual but also the sale and redemption prices.

Assets M/F is called the total assets of the Fund at current prices. The prices of bonds, shares, interest, cash, foreign currency deposits, etc. are calculated daily, and added together to generate assets. It is a given that the prices of shares, currencies, but also the interest rates on bonds change daily and so do the assets of the mutual. Also, the assets change as a result of the actions of the managers of the SA. M/F on the securities included in the portfolio of the Fund, as well as from the inflow or outflow of funds from it.

The offering and redemption prices of the shares of the Funds change daily, based on the performance and marketability of each Fund. The offering price of the share is the price that investors can buy the shares of the Fund they want and corresponds to the net price plus the current commission set by the management company.

Respectively, the redemption price of the share is the price that investors can liquidate the shares of the Fund they want and corresponds to the net price decreasing with the current commission set by the management company.

Depositary

The depositary essentially performs the duties of the funds of the Fund and is usually a public limited company (Greek or foreign) which operates legally in Greece, and takes care of the custody of the assets of the Fund, for the receipts and payments and for the proper execution of transactions. The depositary, who co-signs the regulation of the Fund, is authorized for each mutual fund and thus guarantees the transparency of the money transactions and the securing of the securities of the invested money, thus essentially guaranteeing the security of the shareholders' money.

It therefore assumes responsibility for the existence of interest and dividends as well as cash flows from the sale of shares or other securities while making payments for the purchase of securities.

In general, the custodian is responsible to A.E.D.A.K. and the shareholders for any negligence in fulfilling their obligations. The depositary is obliged to execute the orders of A.E.D.A.K. unless they are illegal or contrary to the fund regulation. At the same time, A.E.D.A.K. is obliged to monitor the depositary for the proper execution of its orders. With these obligations, the depositary and the A.E.D.A.K. they must operate independently of each other and in the interest of the shareholders.

If we wanted to group the tasks of the depositary we would end up with the following:

- The custody of the property of the mutual fund.
- The execution of the orders of A.E.D.A.K.
- Ensuring the legality of the procedures of sale, issue, redemption, redemption and cancellation of shares.
- Ensuring the legality of the way the value of the shares is calculated.
- Ensuring the proper distribution of profits.
- The co-signing, jointly with A.E.D.A.K, of the mutual fund reports.

The Mutual Fund Management Company S.A.

The A.E.D.A.K has the sole purpose of managing the fund and can manage more than one fund. More specifically, A.E.D.A.K collectively invests in securities funds that they collect from the public and whose operation is based on the principle of risk allocation, and their shares, at the request of the bearers, are repurchased or repaid, directly or indirectly, with assets of these companies. A.E.D.A.K as well as Portfolio Investment Companies (EEX) are among the institutional investors, as they raise and manage funds from many different investors. Their activities are directly controlled by the Hellenic Capital Market Commission.

A.E.D.A.K must provide solvency, broad capital base, objectivity and trust. The entire assets of the fund are deposited in one of the legally operating banks of the country, which assumes the duties of custodian to fully secure the capital.

In addition, A.E.D.A.K receives a fee for the management of the fund, a commission upon the redemption of the shares and a percentage, which varies depending on the management company, at the disposal of the shares. More specifically, the remuneration for the fund management services is a percentage of the average daily amount of the fund's assets (Charamis, 1998: 123)

According to law 3283/2004, the share capital is paid in cash and has a minimum amount of € 1,200,000. The law on investor protection stipulates that 2/5 at least of the share capital of A.E.D.A.K. belong to a company with a financial surface.

In order to obtain the permission to establish a Mutual Fund, A.E.D.A.K. submit to the Hellenic Capital Market Commission:

- Detailed list of assets of the Fund.
- Statement of a certificate of an institution operating in Greece that it accepts that the assets of the Fund be deposited in it and that it acts as a custodian.
- Regulation of the Mutual Fund signed by A.E.D.A.K. and by the depositary (Filippas, 2010).

Classification of Mutual Funds

Mutual funds are classified into two general categories. Thus, we have closed-end mutual funds, also known as closed-end funds, as well as open-ended or variable-based mutual funds.

- **Open type Mutual Funds**

Open-end mutual funds are divided into shares of equal value. Their designation as open type means that the fund has shares available for sale at any time, as well as that it has the ability to sell as many shares as the investors who choose to buy them.

The net worth of their shares changes according to changes in the value of their net assets. When new investors become shareholders of an open-end mutual fund, the number of its shares increases, and the fund's capital grows. Conversely, when a shareholder liquidates his shares, the number of shares in the fund decreases. In this way, the value of the shares remains proportional to the value of the capital of the open-end mutual fund.

- **Closed-end Mutual Funds**

Closed-end mutual funds issue a predetermined number of shares as their capital is defined. Their issued shares are available for purchase and sale either in a regulated market or through the Management Company, thus creating a secondary market that is subject to demand and supply.

As they can be bought and sold like any other stock, the services of a stockbroker are essential for the investors who choose them. Their trading prices are determined solely by investors' views on their value, while they are influenced by their respective expectations.

- **Mutual Fund Categories in Greece**

According to Law 3283/2004 and by decision of the Capital Market Commission, the categorization of mutual funds falls into two broad categories depending on the geographical distribution of their assets and depending on the type of financial instruments in which they invest their assets.

Each investor has different characteristics which are determined by the amount of risk he wants to take, the size of the funds he has for investment, his age, his needs, but also his financial goals. (Filippas, 1999) The characteristics of each person change over time, reflecting to a large extent the changes that occur in the various phases of his life.

Each Fund has full autonomy and independence even if the company that manages it manages others. The autonomy lies in the fact that any decisions taken will concern the assets of the Fund. There is a great variety of Mutual Funds and this is due to the investment policy pursued by each one, which becomes known to the public through the prospectuses issued by it to the investing public who wish to become shareholders (Mylonas, 1999).

Geographical Categorization

- **Domestic Mutual Funds**

In this category belong the mutual funds that have their registered office in Greece and invest at least 65% of their net assets in financial products issued by a publisher operating in Greece.

- **Foreign Mutual Funds**

It concerns the mutual funds that have their registered office outside Greece and invest at least 65% of their net assets in financial products issued by a issuer operating outside Greece.

Investment Categorization

- **Cash Management or Money Market**

They consist of short-term securities and certificates of deposit and are aimed at achieving the highest possible returns with maximum liquidity. Due to the stability they offer, they are often used as cash reserves or cash placements. Their performance depends on the interest rates that apply in the market. They are the safest class of mutual funds and are aimed at investors seeking capital security and a slightly better return than a simple savings or debit account. The average maturity of a cash management fund portfolio should be 90 days or less, so that there is interest rate hedging. Finally, it can be either internal or external.

Types of Mutual Funds

In the market today there are many different types of mutual funds that aim to attract investment interest since their range includes all types of potential investments. Based on their investment purpose, the Funds are classified into three main categories, which include several subcategories.

The main categories of Funds based on the purpose of investment are the following three:

- Equity (invest in stock market shares).
- Fixed income (invest in bonds).
- Money markets (invest in short-term bonds).

Cash Management Mutual Funds

The safest M / F but also with the lowest expected return are the cash management M / Fs, due to the investment in Treasury bills. The money market consists of short-term bonds, mostly interest-bearing Treasury bills. It is considered the safest category M / F with the lowest yield. A typical yield of such a Fund would be higher than the single deposit rate and lower than the time deposit rate.

Bonds / Income

Bond funds are likely to yield higher returns than time deposits and money market investments, but that does not mean that they have no risk. Because there are many different types of bonds, bond funds can vary considerably depending on where they invest. For example, a fund that specializes in high-yield and high-risk bonds is much riskier than a fund that invests in government securities. In addition, almost all bond mutual funds are subject to interest rate risk, which means that if the interest rate increases the value of the Fund decreases. An example is the Funds that invest in Greek bonds.

Income Funds are intended to provide a solid income on a fixed basis. When we talk about mutual funds, the terms "fixed income" and "bonds" are synonymous. These terms mean funds that invest mainly in government and corporate bonds. These types of funds are considered the most conservative and their primary goal is to provide a steady cash flow for investors. Of course, this does not mean that the total return of a Fund remains stable. On the contrary, the return derives from the goodwill or loss realized by the changes in the prices of investment securities, which come from changes in other factors, such as e.g. interest rates, inflation, unemployment, etc.

Some income funds may also invest in stocks, usually in small portions. However, investing in shares can be done at a higher rate. This, however, must be mentioned in the regulation or in the brochure.

Bond Mutual Funds invest more than 65% of their assets in bonds but are also allowed to invest up to 10% of their assets in shares. A bond is a long-term loan where the borrower agrees to pay the lender a certain interest during the loan and then repay the loan at maturity.

The Bond Mutual Funds specialize in medium and long term bond investments (longer than one year), issued by the state or government agencies as well as in Corporate Bonds, (Government Bonds, Government Bonds, Local Government Bonds, Local Bonds Bonds of Private Enterprises, Bonds of High Risk Companies). The risk in this category is very limited and their return comes from the collection of interest rates as well as the valuation of bonds at current prices (Filippas, 2010).

Mixed type

Mixed type mutual funds aim to provide a balanced mix of security, income and capital valuation. The strategy of mixed funds is to invest in a combination of fixed income and shares (there is a limit on investment in shares of 10-65%). A typically balanced gross fund could have a weighting ratio of 60% in shares and 40% in fixed income. The weighting may also be limited to a specific maximum or minimum price for each asset class.

Equity Mutual Funds

Equity is the Funds that invest in shares and represent the largest category of mutual funds. In general, the goal of investing in this category of capital is to increase capital with some income in the long run. There are, however, many different types of equity funds, because there are so many different types of equity.

The idea is to classify the funds based on the size of the business being invested in the style and the investment of the manager. The term value refers to a type of investment that seeks out high quality companies that have fallen out of favor with the market. These companies are characterized by a low P / E ratio (Price / Earnings, ie Price / Earnings) and its real price in relation to the nominal and high returns.

The opposite of value is growth, which refers to the companies that have had (and are expected to continue to have), strong sales growth, profits and cash flow. A compromise between value and growth is a combination, which simply refers to companies that do not represent either value or growth stocks and are classified somewhere in the middle.

For example, a mutual fund investing in high-capitalization companies that are in a strong financial position but have recently seen their stock prices fall will be placed in the upper left quarter of the box (large and value). The opposite of this will be an M/F that invests in newly established technology companies with excellent growth prospects. Such a fund will be located in the lower right quadrant (small and growth).

Equity funds must invest their funds in shares, at a rate of more than 70-80%. Investing in equity funds has a very high level of risk compared to fixed income investments, precisely because the shares do not offer a stable and secure dividend (unless

there are profits, in which case a minimum percentage of them will be due). If we take into account the fact that the performance of the mutual is affected to a very large extent by the course of the general stock market price index, then we conclude that the overall performance of the equity fund varies widely.

Equity funds are divided into income and development equities, depending on their investment nature. Thus, the income shareholders invest in companies that offer large dividends, while the development funds distribute their funds through companies that offer minimal dividend yield and at the same time continue to increase investments, thus fueling high growth expectations. There are also sectoral equities, which focus on one sector of the economy that managers consider to be dynamic (i.e. telecommunications or banking) but are subject to significant risk arising from fluctuations in the financial situation associated with the specific industry.

Global / International Mutual Funds

An international fund (or foreign capital) invests in markets only outside the country. Global mutual funds invest anywhere in the world, including their country of origin.

It is difficult to classify these Funds as either more risky or safer than domestic investments. They tend to be more volatile in political risks, but on the other hand, they cannot, as part of a well-balanced portfolio, substantially reduce the risk of increasing diversification. As the world's economies become more and more interconnected, it is possible for a country's economy to outgrow your country's economy.

Special Mutual Funds

Special type funds are a general category consisting of popular funds that do not necessarily belong to the categories I mentioned above. This type of fund usually focuses on a specific part of the economy.

The sectoral funds target specific sectors of the economy, such as banking, technology, health, etc. and are extremely volatile. There is a high probability of big profits, but there is also the risk of a possible collapse of the industry in which we invest.

Socially responsible funds (or ethical funds) invest only in companies that meet the criteria of certain guidelines or beliefs. Most corporations do not invest in industries such as tobacco, spirits, weapons or nuclear power. The idea is for the investor to get a competitive return, keeping his conscience healthy.

Composite Mutual Funds

The Composite Mutual Funds can invest in all the financial instruments provided in law 3283/2004. The Comprehensive Mutual Funds apply management that aims, based on a mathematical formula, to achieve a predetermined return at maturity, retaining throughout the assets required to achieve their goal. Their default performance refers to a

number of scenarios, which are based on the value of the underlying items and offer shareholders different returns per scenario.

Throughout the fund, shareholders may not be exposed to more than one return scenario. The maximum possible loss of the fund, when the return profile of its portfolio changes, may not exceed one hundred percent (100%) of the initial offering price of the share. The change brought about by the return of an underlying asset on the return profile of the fund during the transition from one return scenario to another must be within the investment limits of Law 3283/2004, as applied to the initial value of the fund's assets .

Index funds

The last but certainly not the least important category is the index funds. This type of mutual fund reproduces the performance of a broader market index, such as the S&P 500 and the Dow Jones Industrial Average (DJIA). An M / F index it simply reproduces market performance and offers little benefit to investors in the form of low wages.

Categorization and nomenclature of Funds

The Hellenic Capital Market Commission, in the context of the better understanding of the institution of Mutual Funds by the general investment public and the minimization of the arbitrariness in the naming of the Mutual Funds, proceeded to their nominal classification, as presented in the following table.

	Equity	**Bonds**	**Money Market**	**Hybrid**
	It mainly invests in shares	It invests mainly in long-term fixed income securities and not more than 10% in shares	It invests mainly in money market products, secondary in fixed income securities and not in shares	Combination of previous investments with limitation on equity securities 10-65%
Domestic	It mainly invests in domestic shares	It invests mainly in long-term fixed-income domestic securities	It invests mainly in money market products, secondary to fixed domestic income securities.	It mainly invests its assets domestic

Foreign	It mainly invests in foreign shares	It invests mainly in long-term fixed-income foreign securities	It invests mainly in money market products, secondary to fixed foreign income securities.	It mainly invests its assets abroad

Table 1: Categorization and nomenclature criteria of the Funds

Advantages and disadvantages of mutual funds

For all their advantages and disadvantages, mutual funds have become extremely popular over the last 20 years. What was once just another difficult investment tool is now part of our daily lives. More than 80 million people, or half of all households in America, invest in mutual funds today. This means that in the United States alone, trillions of dollars are invested in mutual funds.

Initially, mutual funds were a way for small and medium-sized investors to invest in instruments they did not know. Instead of wasting all of the investor's free time on researching the financial pages of newspapers and various websites, all he had to do was buy shares in a mutual fund. Understandably, mutual funds are a great idea in theory, but in reality, there are not just advantages.

Even for mutual fund investors, the advantage of having another professional manage your investments, take care of your account, and diversify your money into many different securities that practically could not be available or accessible with another way. Today the possible investment options in M /F are so many that even the smallest investor can start in mutual funds.

A mutual fund is diverse in nature, as its assets are invested in many different securities. As described above, there are many different types of mutual funds with different objectives and investment purposes, in order to increase their differentiation.

Advantages of the Mutual Funds

Professional Use of the Mutual Fund

The management of the M/Fs is done by specialized companies (A.E.D.A.K.), which are staffed by experienced and specialized people. The goal of the executives is the interest of the investors who have been entrusted with their money. For each fund, a group of analysts is appointed, whose responsibility is to monitor the market and the latest economic developments, to extract information, so that the most appropriate decision is selected at the most appropriate time. That is, either to make a sale or a purchase of a bond, but also a change in the percentage of participation of each investor in the M/F. Investing in an M/F is, in essence, an investment in a well-trained professional, responsible for managing that investment.

Risk Minimization-Differentiation

Due to the wide range of investments of M/Fs in financial products, a better diversification of the portfolio is achieved and consequently a reduction of the risk. In this way, the loss that will result from the bad course of one financial product can be offset by the gain of the good course of another financial product.

Instant Liquidity

By liquidity we mean the speed with which we can convert a product into money, without losing its value. Therefore, investors have the opportunity to liquidate the shares of the M/F in which they have invested at any time, receiving the corresponding share of the share within five (5) days from the day of its liquidation.

Flexibility of Investment Amount

There is great flexibility in the amount of money one can invest in a mutual fund. The minimum amount required most of the time is around one thousand (1000) euros.

Small Investors can Participate in the Stock Market

Mutual fund investments enable investors with small funds to invest in the stock market and achieve better returns than investing in bank deposits. This is because M/Fs due to their flexibility to achieve less risk due to the diversification of shares and the fact that not much capital is required to purchase such shares.

Transparency and information

The accuracy of the transactions and the way investment decisions are made through the complete information of the shareholders about the assets and the value of the shares cover the full transparency of the mutual funds. In addition, each investor,

future or not, is given the opportunity to monitor the progress of each M/F through the information published daily about it. The legal framework that has been formed around the M/Fs, whether it concerns the part of investments or the part of its operation, ensures the security of investments in them.

Disadvantages of the Mutual Funds

Open structure of Mutual Funds

The open structure of mutual funds can cause problems for the fund manager, especially in times of uncertainty and strong market fluctuations. It has been observed that, in times when the market tends to have an upward trend, investors tend to place their funds in equity shares. A direct result of this investment behavior is the investment of funds by managers by buying shares that are at high levels.

On the other hand, when the market is on a downward trend, the shareholders wanting immediate liquidation of their funds lead the managers to liquidate part of the portfolio early. This results in losses as they sell or discount the portfolio financial products at a lower market price.

Costs

Mutual funds do not exist just to make our lives easier. In the investment world, nothing is free and, of course, mutual funds are for profit. In some mutual funds, the acquisition and disposal costs may differ significantly from one another, which investors should be aware of before choosing a mutual fund.

By the word "cost" we mean all supplies that companies charge for their various investment products, as well as the "hidden costs" with which the products are charged.

It should be noted that supplies largely shape the final performance of a product. In fact, in case the returns are collected in a lump sum either at the "entry" or at the "exit" (as is done with the mutual funds), then, the longer the time horizon of the placement, the less the final performance is affected by the commissions. In fact, in some cases the commissions are large enough to affect the investor's length of stay in the mutual.

In the case, for example, that the "entry-exit" commission of a bond fund is set at 1.5%, and the expected average annual yield of the class does not exceed 5%, then the shareholder is forced to place a two-year horizon in order to achieve a higher return than a time deposit could offer him.

Of course, until recently, when yields were higher, commissions did not play such a decisive role in shaping the final yield. Today, however, with the shrinking of yields, the supply regime is of the utmost importance.

Practically for the investor, this means that a mutual that seemed very attractive to him based on the increase in the "net worth" of his shares over a period of time, may prove to be less attractive than others, once the entry (purchase) commissions are taken into account and output (redemption) for the reciprocal in comparison!

More specifically, the net share price of a mutual fund can be calculated by dividing the value of the mutual fund by the number of its shares outstanding.

However, this valuation is not enough to determine whether investing in the mutual fund is "expensive" or "cheap" or rather whether it is profitable compared to other mutual funds.

In the mutual fund price tables given to the public, anyone can find the net price of the share of the fund in which he would be interested in investing.

However, when the interested party in question contacts the A.E.D.A.K., which manages the specific mutual fund, he will find that the shares he wishes to buy are not "available" at the price indicated in the net price tables, but do not correspond exactly to the usual entry and exit prices. What exactly is going on?

A.E.D.A.K. charges the unitholders with commissions either during the purchase of units or during their acquisition by the unit-holders, when they liquidate their investment to receive the funds they have invested. For this very reason, in the tables published in the press, apart from the net price, both the selling price of the share and its redemption price are indicated.

For example, a mutual fund shareholder whose net worth has changed by 9% in one year believes that its performance is satisfactory. The “management” commission of A.E.D.A.K. has already been calculated and withheld at the net price, on an annual basis.

However, this shareholder has not calculated the purchase commission he paid to A.E.D.A.K. during the purchase of the shares, as well as the redemption commission that he will be asked to pay when he wants to liquidate his shares.

It is easy to see that the commissions that will be withheld will significantly reduce his returns, since in some categories of mutual funds the average commission charged by the shareholder can reach up to 4%, depending on the amount of his total placement.

The "entry-exit" commissions from a mutual fund vary depending on the type and the market in which it invests.

The "entry-exit" commissions from a mutual fund vary depending on the type and the market in which it invests.

In particular, it is good to know that cash management funds charge the lowest commission, followed by bond, gross and equity mutual funds, which charge the highest commissions.

The average amount of the total commission in the cash management mutual funds amounts to approximately 1.5% and in the bond mutual funds to approximately 2%. In the most "expensive" equity and mixed mutual funds the average commission amount is between 4% and 5%.

You should also be aware that the offering and redemption prices announced by the management companies refer to the maximum commission amount that they are able to charge and which is remarkably determined by the A.E.D.A.K. themselves, after of course the consent of the Hellenic Capital Market Commission.

Mutual fund management companies apply different commission policies, but most of them take care to reduce the commissions as the total placement increases.

This is the reason why the commissions listed for the purchase and redemption of shares are the highest and not the ones that you will negotiate depending on the amount of your capital, with each company.

In general, however, when completing the application for a fund, you should always ask the seller to list the exact disposal and redemption fees as required by law.

Dilution

It is possible to have a big difference. But because mutual funds usually have a small investment stake in many different companies based on their destination, the high returns from a few different investments often do not make much difference to the overall return. Dilution is also the result we see in the case of an extremely successful mutual fund that has greatly increased its assets. When money continues to be invested in this fund, the manager often has trouble finding new investments for all new invested funds.

Non-guaranteed performance

When we talk about mutual funds we are not talking about guaranteed returns since they are investments of indefinite duration and no such investment has a guaranteed return except for some forms of savings and deposits.

Dispersion costs

Usually, the greater the risk, the greater the expected return or even potential loss without this relationship being absolute. The greater the spread, the lower the risk. Excessive dispersion means very little risk and therefore very little expected return (dispersion reduces our investment risk but excludes us from extreme returns).

Mutual Fund Assessment

Cash Management Mutual Funds invest mainly (over 65% of their assets) in money market products that have high liquidity and are fixed in fixed income securities. Law 3283/2004 abolished the possibility of investing the Cash Management Funds in shares (Filippas, 2010).

Cash Management products are defined as investment products that have a duration of up to one year. Such products are promissory notes, repos, time deposits and the interbank lending and foreign exchange market. Money market products are considered the safest investments, as they offer a stable and usually known advance performance, especially when the market is not fluctuating.

In general, they do not yield capital gains but are an attractive solution compared to bank deposit products because they usually offer higher returns and higher liquidity.

Money Market Funds are mainly aimed at highly conservative investors who want high capital stability, satisfactory income return and immediate liquidity as well as investors with a short-term investment horizon (Mylonas, 1999).

The main risks of a portfolio are:

- Market risk:

It is the risk of a decline in the price level of the market, in total or of a certain category of assets of the Fund and the consequent influence of the price of the shares of the fund.

- Credit risk:

It is the risk of default by a issuer of securities or a counterparty when conducting transactions.

- Settlement risk:

There is a risk that the settlement of transactions on financial instruments will not be completed smoothly, especially if the 19 counterparties does not pay money or deliver securities on time in fulfillment of its obligations.

- Liquidity risk:

It is the risk of inability to liquidate the assets of the Fund in a timely manner and at a reasonable price.

- Currency risk:

It is the risk that comes from the different type of currency that each Fund can invest.

- Custody Risk:

It is the risk of loss of assets due to acts or omissions or insolvency of the depositary.

- Dispersion Risk:

It is the risk arising from the limited dispersion of the assets of the Fund.

- Performance Risk:

It is related to the fluctuation of the return on the assets of the Fund.

- Inflation Risk:

What is the risk associated with the reduction of the return of the Fund at constant prices due to the rise of the general consumer price index.

- State Danger:

Which risk is related to the institutional and regulatory framework of the state. (Filippas, 2010)

Mutual Fund Evaluation Methods

The efficiency of the mutual funds reflects the ability of the respective managers in making their decisions but also in the composition of that portfolio that will be able to successfully respond to the potential changes that the economic environment entails. With this in mind, mutual fund valuation takes on two dimensions: return and risk. According to Markowitz (1952-59) and Sharpe (1963-64), investors need to consider both of these dimensions in the mutual fund valuation process.

The concept of profitability is inextricably linked to that of return, which in the case of mutual funds you measure in relation to the return on similar ratios and mutual funds in the same category. But beyond measuring profitability, risk assessment is just as important, as the investor needs to know if the risk, they are willing to take is commensurate with the risk involved in the mutual fund they will eventually choose to invest their funds in.

Regarding the risk of mutual funds, according to the international literature, two risk measures are used, that of the total risk of a mutual fund, which is calculated from the fluctuation of its returns or from the standard deviation, as well as the systematic risk of the mutual fund. which measures a portion of the total volatility of the fund.

The systematic calculation of a mutual fund is of utmost importance for investors as it enables them to understand the risk-return relationship in the mutual fund market, to evaluate the mutual funds but also to choose the most effective mutual fund according to the investment profile. who want to adopt.

The role of the beta factor in the modern measurement of investment risk. The modern measurement of investment risk is based on two main axes. The first is that, with risk, most investors mean the possibility of capital loss, through a downward movement of the stock price. The higher the volatility of a share price, the greater this probability, so the «riskier» the stock is.

We can quantify the risk of each stock by measuring the standard deviation of its returns. The values of the standard deviation are useful in two important ways: First, we can briefly say at what point in the "spectrum of investment risk "is the share. The larger the standard deviation, the «riskier» the stock.

Secondly, the standard deviation is a direct measure of the downside risk of correcting the share price. Every six years, we should expect that the return on a share (dividend and capital return) will be less than its average return (expected return) by at least the amount corresponding to its standard deviation. In other words, once every six years, the same stock will return more than its average return, at least equal to the standard deviation of its returns.

Turning now to the second axis, it has to do with distinguishing the standard deviation into two parts: systemic risk and non-systemic risk. Systematic risk is related to market movements, while non-systematic risk concerns a specific stock and perhaps related shares (i.e. the same sector). Regarding the systemic risk, the shares correspond to some extent to the market movements.

The beta measures the sensitivity of the stock price to market movements. For example, a stock with a rate of 1.5 will change its price by an average of 1.5% for every 1% change in the stock index. A diversified portfolio with such stocks would have 1.5 times greater volatility than the stock index. As a result, it would be more aggressive, performing very well in the upward phases of the market, but on the other hand, causing significant losses in the downward phases of the market.

Conversely, a portfolio with a rate of 0.5 will change its value by an average of 0.5% for every 1% change in the stock index. A diversified portfolio with such shares would have 0.5 times the volatility of the stock index. It would be defensive by performing less than the stock index in upward phases of the market, but on the other hand, limiting losses in downward phases. Finally, it is understood that a stock with a rate equal to 1 on average will move like the market. (Charamis, 1998: 19).

Non-systematic risk is the second of the two components of variability. While in systemic risk, we saw that stock volatility depended on a more general factor, that of the market, in non-systemic risk there are more specific factors that affect it. For example, a successful acquisition of another company, the announcement of a significant increase in its profitability, the achievement of a significant strategy cooperation, entry into new domestic or foreign markets, the efficiency of the company's management, are reasons that generally favor the rise in price.

Like the standard deviation, non-systematic risk is measured as an annual percentage change (return positive or negative). The higher this value, the greater the non-systematic risk. So far, the price range for non-systematic risk in the Greek stock market is from 100% to 25%. These prices express the percentage volatility that is not due to changes in the general stock market index. In other words, even if the market remains static, the return on a stock may be less than the non-systemic risk, with a frequency of once every six years.

Calculation of the Coefficient b

The coefficient b is the slope in the equation of the linear regression between the returns of the share and the returns of the market, i.e. of the General ATHEX Index. or the FTSE / ATHEX Large Cap, which results from using historical data and is called an estimated or historical b. This price differs from the rates given as forecasts usually for a fee, by commercial companies or educational institutions (mainly abroad). It has been observed that at the time we make a forecast, the factor b is closer to the unit than the historical b. This is because the historical factor b is only an estimate. The historical factor b calculated for a stock is, in part, a function of the actual subject (but unknown) factor b and, in part, of the sampling error. If we estimate a very high value for the factor b, we have an increased probability that we have a positive sampling error, while if we estimate

a very low value, we have an increased probability that we have a negative sampling error. (Charamis, 1998: 21)

Return on Mutual Funds

If the share was bought at time t (beginning of the year) and sold at time t + 1 (end of the year), the net return (R) is calculated as follows:

$$KT_t + \Pi_\Delta = \frac{KT_{t+1} - KT_t + M_{t+1} - \Pi_{\Delta T} - \Pi E_{\tau+1}}{KT_t + \Pi_{\Delta T}}$$

where:
R_{t+1} = the net return at the end of the year
KT_{t+1} = the net price at the end of the year
KT_t = the net price at the beginning of the year
M_{t+1} = the amount of the dividend at the end of the year
$\Pi_{\Delta t}$ = the amount of the disposal commission at the beginning of the year
ΠE_{t+1} = the amount of the dividend at the end of the year

Performance and systemic risk

The calculation of the systemic risk is calculated according to relation (3.6), ie with the coefficient b. Using historical data the calculation of the beta can be done with the market model:

$$R_f = a + B\,R_m + e_j$$

Where:
R_f = the average return on the fund j
R_m = market portfolio yield (General Index yield)
a, B = parameters for calculation
e_j = the regression error

Parameter b expresses the relationship between the average return R_j and the return on the market portfolio Rm:

- If B > 1 then the changes in the fund are greater than those of the General Index.
- If B <1 then the changes in the fund are smaller than those of the General Index.

Methods of Measuring the Performance of a Mutual Fund

Jensen Method

A fund manager is someone who has a high level of educational background and professional investment management experience. To qualify for this position, the manager must always be able to enhance portfolio efficiency. The portfolio with satisfactory returns depends on the fluctuation of the market and the selection skills of each manager.

The question is whether he is able to manage capital efficiently and contribute to its optimal performance, and it must also be clarified whether this optimal choice is the result of the appropriate choices on his part, with the appropriate configuration of the portfolio, or is a factor that is subject to randomness and is shaped according to the fluctuations shown by the market.

The term "Jensen's Alpha" was first coined by Michael C. Jensen in 1968 and prevailed as a measure of the average return on an asset under the Capital Asset Pricing Model (CAPM), given its beta portfolio and average market performance (Jensen, 1968). The following sections explore the existing relationship between returns.

The well-known and well-used CAPM model evaluates Jensen's alpha, the model term constant, as a measure used to determine the portfolio configuration capacity of each administrator.

CAPM Theoretical Model

Jensen's CAPM model can be written as follows:

$$R_{i,\,t} - R_f = a_i + B_i\,(R_{m,\,t} - R_f)$$

Where

$R_{i,\,t}$ is the return on the string or portfolio during period t,

R_f is the return on Euribor

$R_{m,\,t}$ is the return on the market over the same period.

Beta (Bi) is a measure of the performance of a fund's returns in response to market changes or systemic market risk.

Alpha (ai) is the measure of administrator performance after eliminating systemic risk.

The pseudo-variable (D) is chosen because it is a way to investigate whether two mean values are different. Since not only the fixed terms but also the slope coefficients vary between each chapter, an additional variable Dn (Rm, t-Rf) is added to the model.

The CAPM model relates to the performance of a series or portfolio, the difference between the performance of a particular series and the risk-free rate (Ri,t - Rf) as a

dependent variable, and the market risk premium, the difference between the expected market performance and the risk-free rate (Rm, t-Rf), as an independent variable.

Jensen's Alpha - Risk Assessment

In 1967, Jensen introduced his model based on the Capital Valuation Model (CAPM). He considered that the potential existence of managers' ability to identify stocks that are undervalued would lead to a residual Capital Valuation Model at therefore positive prices. Therefore, in order to detect this extra normal performance of administrators, they added an additional fixed term, also known as Jensen alpha.

A positive and statistically significant alpha, shows the talent and ability of the manager to achieve additional returns, based on the risk he has taken. On the other hand, negative values indicate that the administrator has successfully maintained additional performance data given the level of risk it has maintained. At first glance, this may seem impossible, that is, to produce lower returns than randomly selected stocks. However, this may be due to their inability to produce enough efficiency to cover their operating costs. The type of this model is as follows:

$$\text{Jensen's a} = R_{(i)} - (R_{(f)} + B \times (R_{(m)} - R_{(f)})$$

where:

$$(R_i - R_f) = \text{Jensen's a} + B\,(R_m - R_f) + e_i$$

- $R_{(i)}$ = the realized return on the portfolio or investment
- $R_{(m)}$ = the realized performance of the appropriate market index
- $R_{(f)}$ = the risk-free rate of return for the period
- B = the beta of the investment portfolio in relation to the selected market index
- e_i = the error term

Next this approach requires considering the value of alpha, so we have the following hypotheses:

- If a positive and statistically significant, the return on the portfolio is greater than the market portfolio. Thus, the manager achieved better performance than he expected based on the systemic risk he assumed.
- If a negative and statistically significant, the return on the portfolio is lower than that of the market. The administrator has failed management.
- If a is not statistically significant (when a = 0), the portfolio yield is the same as that of the market.

Marketing Timing Models

Merton-Henriksson Method

In 1981, Henriksson and Merton introduced new models for managing mutual funds to predict general market movements. They have shown the widest interest around the question of whether managers can actually be placed in the market correctly over time to anticipate their general movements and take advantage of them. Initially, they pointed out that the predictive capacity extended to two parameters. The ability to predict individual stock price movements in relation to equities generally refers to micro forecasting. On the contrary, the ability to predict general market price movements in relation to debt-stable income, e.g. bonds, refers to macro forecasting.

In their study they followed a more qualitative approach since they assume that the managers either predict a bull market ($R_{mt} > R_f$) or a downward ($R_{mt} < R_f$). However, they did not address the magnitude of these forecasts. They created a double test, one non-parametric and one parametric. It did not have the advantage of not adopting the CAPM hypotheses. However, it was a prerequisite for the existence of observable forecast managers.

However, because these data are difficult to observe directly, parametric tests were suggested. This assumes that current CAPM assumptions, however, could be adapted to any multifactorial valuation model. It also enabled models to distinguish the ability to place time from the ability to select suitable stocks. If the administrators are still assuming an upward or downward market, they have made the appropriate adjustments to their portfolio to take advantage of their forecasts.

In the event of an increase forecast, they will withdraw resources from the fixed income (and low risk) assets and increase their resources in shares, thus increasing their rate of return. Otherwise, it would withdraw stocks and invest in less risky securities to reduce their risk exposure, thus beta. In order to capture these changes, they added to the parametric tests, in the CAPM model, a condition for checking the statistical existence of market predictability.

This term was the maximum difference between the return on the purchase of the lower interest rate of the asset with zero risk and zero. The coefficient of this condition in regression, if it appears positive and statistically significant, then there is the ability to place managers in time.

The type of this model is as follows:

$$R_{it} - R_{ft} = \alpha + \beta\left(R_{tt} - R_{ft}\right) + \delta D_t\left(R_{tt} - R_{ft}\right)$$

where all variables are known from the CAPM model, except market performance D = max (0, R_{tt} - R_{ft}) and market timing capabilities δ.

Treynor and Mazuy Method

Treynor and Mazuy (1966) were the first to lay the foundations for a model to control the ability of managers to predict general market movements (marketing- timing-model). Apply their various tests to 57 mutual funds to test the administrators' temporal placement ability. Certainly, the market has periods when stocks move up or down. However, not all managers were able to anticipate or take advantage of them.

More specifically, in the general expectation of declining stock prices, they change the composition of the portfolio from more volatile to more stable assets (eg from shares to bonds). On the contrary, it acted in case of an expected rising market. This has the effect of changing the portfolio variability. So, the question of time-placement capacity will be answered by answering the question: "has there been an increase in portfolio volatility in upward markets and vice versa?".

The Treynor-Mazuy test result showed that relation between market risk and market return is not always linier. Whenever the manager correctly predicts the upward markets, he chooses the appropriate high-risk composition, while when the manager correctly predicts the downward markets, he prefers a composition in his portfolio and consequently in his M/F less risky.

For this reason, Treynor and Mazuy (1966) presented diagrammatically the way in which the characteristic line of MF changes according to its composition. If the manager does not change the risk of his portfolio in either the uptrend or the downtrend, then the slope of the line is constant for the whole examined period and the characteristic line is straight. (Chart 1)

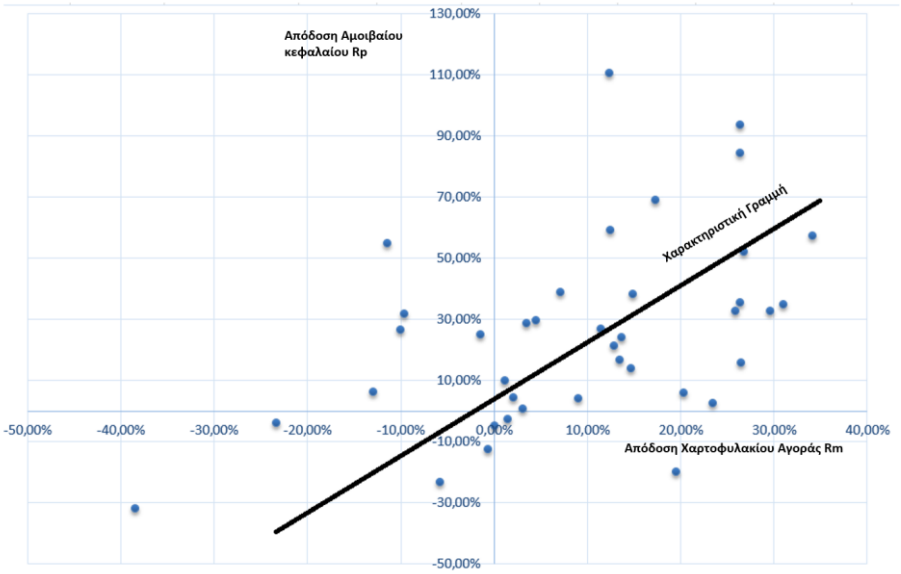

Chart 1: The slope of the line MF is straight.

But it is possible that the administrator's predictions are not always perfect. In this case, the performance of the Fund touches the wrong forecasts. For this reason, because no manager can always have excellent forecasts, we can accept that a manager will be effective and useful to his shareholders if his predictions regarding market movements

are in the majority correct. Then the feature line will no longer be straight, but curve. The degree of curvature depends on the degree to which the portfolio risk is adjusted according to market forecasts, which do not all have to be in the right direction (Chart 2 and Chart 3).

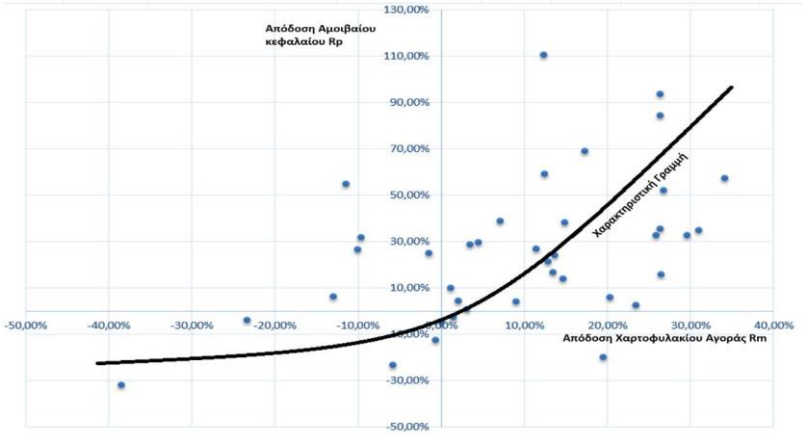

Chart 2: When the manager makes good predictions in the composition of his MF.

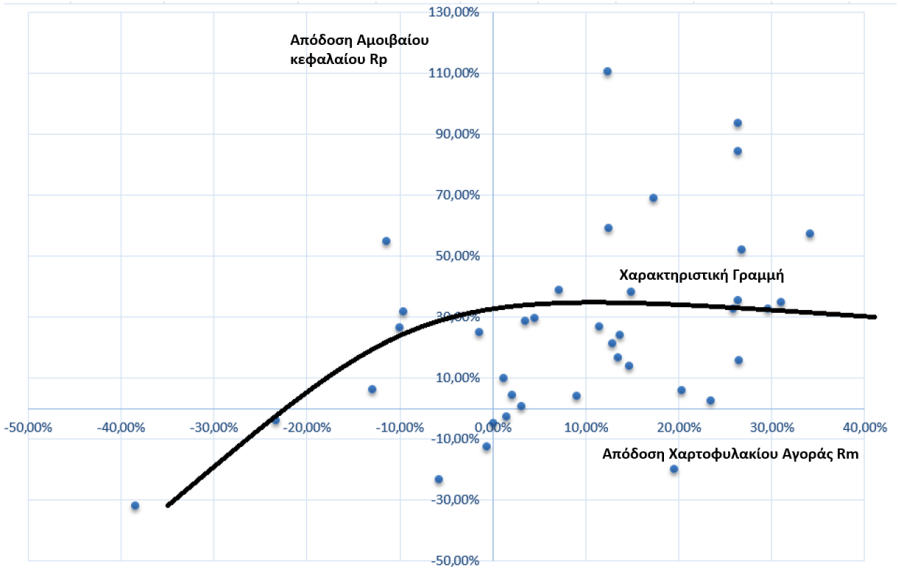

Chart 3: When the manager does not make good predictions in the composition of his MF.

The type of this model is as follows:

$$R_{pt}-R_{ft} = \alpha_p + \beta_p (R_{mt}-R_{ft}) + \gamma_p (R_{mt}-R_{ft})^2$$

Where:

R_{pt} is the return on equity p over time t,
R_{mt} is the stock market performance during period t,

R_{ft} is the return on the zero-risk investment over time t, and
α_p, β_p and γ_p are parameters to be estimated by the model

Value αp and γp in the equation above, reflects the performance of mutual funds. The value of αp reflects the stock selection ability that demonstrates the ability of investment managers in selecting the right stocks in a portfolio of mutual funds. If αp is positive, it means that the investment manager is able to establish an optimal portfolio, and ot herwise if αp is negative, it means the investment manager is not able to establish an optimal portfolio.The value γp reflects market timing abilities that demonstrate the ability of investment managers to make adjustments to the asset portfolio for anticipate changes market price movements in general. If γp is positive and significant, it indicates that the investment manager has the ability to market timing. Likewise, if γp is negative and significant, it indicates that the investment manager does not have the ability to market timing.

Mutual Fund Assets in Greece

In recent years in Greece, the development and investment of mutual funds has shown a stagnation, whether it concerns the part of the investment in them or the returns that the shareholders-investors receive from them in relation to the risk they undertake. This, of course, is a consequence of the difficult financial situations that our country has been experiencing in recent years and have consequently affected the stock market.

Initially, the AKs in Greece appeared in the early 1970s, after the establishment of the N.D. 608/1970. The first 2 AKs that existed as mentioned in previous paragraphs were Hermes from Emporiki Bank and Delos from the National Bank. After a period of fifteen years of inactivity in the civil sector, in 1989 appears the third mutual fund in our country by the company Intertrust, named Elliniko. The custodian of this AK was the National Bank. Shortly afterwards, around 1990, six more mutual funds entered the stock market. Four of them are from Alpha Credit Bank and the other two from the insurance companies European Credit and Aspis Pronoia respectively. In the period that follows, the AKs have a continuous upward trend, while in 1999 you observe the largest in value assets until then for the Greek data, amounting to thirty five (35) billion euros.

With the entry of 2000, the path set for mutual funds does not look any better, as they follow a continuous downward trend. More specifically, the table below (see Table 2.4) shows the course of the value of the assets of the mutual funds, with particular interest being presented in the year 2011, where the lowest value is noted at approximately five (5) million euros. In the course, however, until 2015, it seems that there is a small recovery of this situation, while from this year until the end of 2019, there seems to be another drop in the assets of AK.

Empirical Analysis

In this chapter will be analyzed separately the evaluation of the 41 equity funds from the beginning of their creation. In addition, these mutual funds are compared with their benchmarks as they appear in funds' factsheet.

Table 2 below presents the mutual funds with their benchmark that will be examined.

	Mutual Funds	**Benchmarks**		
1	3K DOMESTIC EQUITY FUND R	ATHEX		
2	3K GREEK VALUE DOMESTIC EQUITY I	ATHEX		
3	3K GREEK VALUE DOMESTIC EQUITY R	ATHEX		
4	ALLIANZ AGGRESSIVE STRATEGY DOMESTIC EQUITY	ATHEX		
5	ALLIANZ DOMESTIC EQUITY	ATHEX		
6	ALLIANZ MILLENNIUM EMEA EM MKTS EQUITIES	MSCI EM EUROPE		
7	ALPHA ETF FTSE ATHEX LARGE CAP EQUITY UCITS	FTSE/ATHEX LARGE CAP		
8	ALPHA (LUX) GLOBAL EQUITY FOF EUR DIS	MSCI ALL COUNTRY WORLD PRICE RETURN USD INDEX		
9	ALPHA TRUST GLOBAL LEADERS FOREIGN EQUITY-R	MSCI WORLD INDEX(EUR)		
10	ALPHA TRUST HELLENIC EQUITY-R	ATHEX		
11	ALPHA TRUST NEW STRATEGY	FTSE/ATHEX LARGE CAP (ATF)		
12	DELOS BLUE CHIPS DOMESTIC EQUITY	ATHEX		
13	DELOS SMALL CAP DOMESTIC EQUITY	FTSE/ATHEX MID CAP		
14	DELOS SYNTHESIS BEST RED EQUITY FO FS	MSCI AC WORLD ALL COUNTRY		
15	EQUITY EMERGING EUROPE EUROBANK	MSCI EM EUROPE		
16	EQUITY GLOBAL EQUITIES EUROBANK	50% OF DOW JONES INDUSTRIAL AVERAGE	40% OF EUROSTOXX 50 INDEX	10% of NIKKEI 225 STOCK AVERAGE - PRICE INDEX

17	EQUITY GLOBAL EQUITIES PRIVATE BANKING	50% OF DOW JONES INDUSTRIAL AVERAGE	40% of EUROSTOXX 50 INDEX	10% of NIKKEI 225 STOCK AVERAGE - PRICE INDEX
18	EQUITY GREEK EQUITIES EUROBANK	ATHEX		
19	EQUITY GREEK EQUITIES PRIVATE BANKING	ATHEX		
20	EUROBANK (LF) FUND OF FUNDS - ESG FOCUS	MSCI AC WORLD ALL COUNTRY		
21	EUROPEAN RELIANCE GROWTH DOMESTIC EQUITY FUND	ATHEX		
22	FOF EQUITY BLEND EUROBANK	MSCI AC WORLD ALL COUNTRY		
23	FOF GLOBAL EMERGING MARKETS EUROBANK	MSCI EM		
24	GF EQUITY BLEND FUND OF FUNDS EQUITY - EUROBANK	MSCI AC WORLD ALL COUNTRY		
25	GF GLBL EQUITIES FORGN EQTY FD-EURBANK	50% OF DOW JONES INDUSTRIAL AVERAGE	40% OF EUROSTOXX 50 INDEX	10% of NIKKEI 225 STOCK AVERAGE - PRICE INDEX
26	GF GREEK EQTIES.DMS. EQ. EUROBANK CL.	ATHEX		
27	INTERAMERICAN DEVELOPED MARKETS FOREIGN EQUITY	50% OF DOW JONES INDUSTRIAL AVERAGE	40% OF EUROSTOXX 50 INDEX	10% of NIKKEI 225 STOCK AVERAGE - PRICE INDEX
28	INTERAMERICAN GROWTH DOMESTIC EQUITY	FTSE/ATHEX MID CAP		
29	INTERAMERICAN NEW EUROPE FOREIGN EQUITY	MSCI EM EUROPE		
30	NBG INTL.FUNDS EUR. ALLSTARS A CAP	FTSE W EUROPE		
31	PIRAEUS DYN COS DOMESTIC EQTY FD R	ATHEX		
32	PIRAEUS EMERGING MARKETS EQUITY FUND OF FUNDS R	MSCI EM		
33	PIRAEUS EQUITY FUND OF FUNDS R	MSCI WORLD		

34	PIRAEUS INSTITUTION PFOLIO DOMESTIC EQTY (I)	ATHEX
35	PIRAEUS INVEST EUROPEAN EQUITY RETAIL	FTSE W EUROPE
36	PIRAEUS US EQUITY FUND R	S&P 500
37	S&B PENSION GLOBAL EQUITY FUND OF FUNDS	MSCI AC WORLD ALL COUNTRY
38	THETIS HELLENIC EQUITY	ATHEX
39	TRITON AMERICAN EQUITY INTERNATIONAL FUND	S&P 500
40	TRITON GROWTH GREEK EQUITY FUND	ATHEX
41	TRITON PANEUROPEAN INTL EQ FD	FTSE W EUROPE

Table 2: Mutual Funds with their Benchmarks

For the evaluation of the performance of the 41 mutual funds and the stock market indices, the closing prices were collected on a monthly and weekly basis. As far as the risk-free rate is concerned, a 3month Euribor was taken into account for the respective periods. The data were extracted from Thomson from Thomson Reuters database.

The assessment of the return of the mutual funds is made based on the models mentioned in the previous chapter (chapter 2). More specifically, for the evaluation of the mutual funds, the criteria of return and the average return of the MF, the Jensen alpha coefficient and the Beta coefficient are evaluated.

For the implementation of the present empirical analysis, the data processing was done through the computer package Microsoft EXCEL and the statistical analysis was performed with the econometric program R studio.

Performance estimation

In the first stage, both the return and the average return of the mutual funds are assessed. For its calculation, the closing prices were used on a monthly basis for the entire examined period of time. Thus, their final yield was obtained through the formula

$$R_{t+1}= \frac{TE_{t+1}-TE_{t+1}+M_{t+1}}{T\Delta_t}$$

while for the average yield through the application of the formula: .

$$R_{jt}= \frac{\Sigma R_{jt}}{N}$$

Application

At this point, our analysis will examine the results of the analysis of the Jensen model. As mentioned in Chapter 2, the Jensen model is one of the most well-known methods for evaluating portfolio performance and was proposed by Jensen (Jensen's Performance Index). Jensen relied on the CAPM asset valuation model and analyzed the non-systematic risk that may be involved in an investment. Jensen's model is as follows:

$$R_{pt} - R_{ft}= \alpha + \beta_p (R_{mt} - R_{ft}) + \varepsilon_{pt}$$

The R studio was used to complete the conclusions for the period under review. The regression data included the monthly and the weekly returns for both the mutual funds and their examined indices.

The following tables give the estimates for the required quantities, ie alpha and beta, at the level of daily data, while the quantities R (i) = the realized return of the portfolio or the investment have been calculated, R (m) = the realized return of R (f) = the risk-free rate of return for the relevant period, through which, in order to estimate the beta and alpha parameters, the quantities Ri - Rf and Rm - Rf have subsequently been determined [with use of R statistical program]. Using the ready-made R procedure for estimating a regression model [lm] the results are determined, and the results are as follows:

```
Call:
        lm(formula = Ri_Rf ~ Rm_Rf)

        Residuals:
         Min       1Q   Median       3Q      Max
        -0.056845 -0.002195 -0.000084  0.002133  0.047532

        Coefficients:
        Estimate                  Std. Error          t value     Pr(>|t|)
        (Intercept) 8.598e-05     7.876e-05           1.092       0.275
        Rm_Rf       7.617e-01     3.933e-03           193.666     <2e-16 ***
        ---
        Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1

        Residual standard error: 0.004807 on 3724 degrees of freedom
         (1 observation deleted due to missingness)
        Multiple R-squared:  0.9097,      Adjusted R-squared:  0.9097
        F-statistic: 3.751e+04 on 1 and 3724 DF,  p-value: < 2.2e-16
```

Table 3. Jensen's Alpha (Model 1)

The estimate for Jensen alpha seems to be equal to 0.07617 or 7.617%, while the estimate for the beta of the portfolio was equal to 0.008598. According to the above output, alpha was not statistically significant at the 5% level, while respectively beta was statistically significant at the 5% level, as determined based on the significant codes provided by R. Overall, the model is considered statistically significant based on the p - value value rendered by p-value:

<2.2e-16 and the relevant criterion F for checking the significance of the model.

```
Call:
lm(formula = Ri_Rf ~ Rm_Rf)

Residuals:
      Min        1Q    Median        3Q       Max
-0.034609 -0.002652 -0.000233  0.002561  0.026721

Coefficients:
             Estimate   Std. Error  t value Pr(>|t|)
(Intercept) 0.0003753  0.0001581    2.374   0.0178 *
Rm_Rf       0.6497632  0.0097851   66.403   <2e-16 ***
---
Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1

Residual standard error: 0.004688 on 877 degrees of freedom
  (1 observation deleted due to missingness)
Multiple R-squared:  0.8341,    Adjusted R-squared:  0.8339
F-statistic:  4409 on 1 and 877 DF,  p-value: < 2.2e-16
```

Table 4. Jensen's Alpha (Model 2)

The estimate for Jensen alpha appears to be 0.0003753 or 0.03753%, while the estimate for the portfolio beta was 0.6497632 or 64.97632%. As can be seen from the above output, alpha was statistically significant at the level of 10%, while respectively beta was statistically significant at the level of 5%. and the relevant criterion F for checking the significance of the model. The test for the statistical significance of alpha can be determined by formulating the following two hypotheses:

H_0 : a=0	The manager is not achieve overperformance.
H1 : a > 0	The manager achieves overperformance.

Table 5. Survey Submission Jensen's Alpha

If the p-value is statistically significant and the calculated a is positive then the manager achieves overperformance, while on the contrary if it is negative then he achieves lower returns.

As observed in this model, the estimate for alpha has a positive sign and the coefficient is considered statistically significant at a significance level of 5%, when the null hypothesis H0 can be rejected: a = 0. The model is considered statistically significant overall (p-value: <2.2e-16) and based on the results and what has been theoretically stated, it can be concluded that overperformance is finally achieved.

The results are commented in a similar way for the other data under examination and the results of the audits are summarized in Table 6 below:

Daily data

Mutual Funds	Percentage Estimation of Jensen's Alpha	Percentage Estimation of alpha (p-value)	Decision Rule	Conclusion
3K DOMESTIC EQUITY FUND R	76%	0,275	Do not reject	Lower Yields
3K GREEK VALUE DOMESTIC EQUITY I	0,04%	0,0178 *	Reject	Overperformance
3K GREEK VALUE DOMESTIC EQUITY R	0,04%	0,0202 *	Reject	Overperformance
ALLIANZ AGGRESSIVE STRATEGY DOMESTIC EQUITY	10,95%	0,135	Do not reject	Lower Yields
ALLIANZ DOMESTIC EQUITY	5,39%	0,456	Do not reject	Lower Yields
ALLIANZ MILLENNIUM EMEA EM MKTS EQUITIES	-1,52%	0,887	Do not reject	Lower Yields
ALPHA ETF FTSE ATHEX LARGE CAP EQUITY UCITS	0,30%	0,29	Do not reject	Lower Yields

ALPHA (LUX) GLOBAL EQUITY FOF EUR DIS	0,02%	0,536	Do not reject	Lower Yields
ALPHA TRUST GLOBAL LEADERS FOREIGN EQUITY-R	0,02%	0,117	Do not reject	Lower Yields
ALPHA TRUST HELLENIC EQUITY-R	0,01%	0,139	Do not reject	Lower Yields
ALPHA TRUST NEW STRATEGY	0,01%	0,31	Do not reject	Lower Yields
DELOS BLUE CHIPS DOMESTIC EQUITY	-3,49%	0,474	Do not reject	Lower Yields
DELOS SMALL CAP DOMESTIC EQUITY	-0,12%	0,991	Do not reject	Lower Yields
DELOS SYNTHESIS BEST RED EQUITY FO FS	5,30%	0,628	Do not reject	Lower Yields
EQUITY EMERGING EUROPE EUROBANK	5,97%	0,721	Do not reject	Lower Yields
EQUITY GLOBAL EQUITIES EUROBANK	0,03%	0,132	Do not reject	Lower Yields
EQUITY GLOBAL EQUITIES PRIVATE BANKING	0,03%	0,326	Do not reject	Lower Yields
EQUITY GREEK EQUITIES EUROBANK	6,05%	0,908	Do not reject	Lower Yields
EQUITY GREEK EQUITIES PRIVATE BANKING	0,02%	0,663	Do not reject	Lower Yields
EUROBANK (LF) FUND OF FUNDS - ESG FOCUS	6,38%	0,59	Do not reject	Lower Yields
EUROPEAN RELIANCE GROWTH	6,42%	0,321	Do not reject	Lower Yields

DOMESTIC EQUITY FUND				
FOF EQUITY BLEND EUROBANK	0,03%	0,141	Do not reject	Lower Yields
FOF GLOBAL EMERGING MARKETS EUROBANK	8,45%	0,598	Do not reject	Lower Yields
GF EQUITY BLEND FUND OF FUNDS EQUITY - EUROBANK	5,89%	0,518	Do not reject	Lower Yields
GF GLBL EQUITIES FORGN EQTY FD-EURBANK	0,03%	0,102	Do not reject	Lower Yields
GF GREEK EQTIES.DMS. EQ. EUROBANK CL.	4,70%	0,443	Do not reject	Lower Yields
INTERAMERICAN DEVELOPED MARKETS FOREIGN EQUITY	-0,01%	0,813	Do not reject	Lower Yields
INTERAMERICAN GROWTH DOMESTIC EQUITY	5,09%	0,622	Do not reject	Lower Yields
INTERAMERICAN NEW EUROPE FOREIGN EQUITY	1,26%	0,953	Do not reject	Lower Yields
NBG INTL.FUNDS EUR. ALLSTARS A CAP	9,42%	0,354	Do not reject	Lower Yields
PIRAEUS DYN COS DOMESTIC EQTY FD R	2,18%	0,907	Do not reject	Lower Yields
PIRAEUS EMERGING	7,50%	0,475	Do not reject	Lower Yields

MARKETS EQUITY FUND OF FUNDS R				
PIRAEUS EQUITY FUND OF FUNDS R	1,61%	0,891	Do not reject	Lower Yields
PIRAEUS INSTITUTION PFOLIO DOMESTIC EQTY (I)	-2,07%	0,92	Do not reject	Lower Yields
PIRAEUS INVEST EUROPEAN EQUITY RETAIL	-1,54%	0,85	Do not reject	Lower Yields
PIRAEUS US EQUITY FUND R	5,50%	0,598	Do not reject	Lower Yields
S&B PENSION GLOBAL EQUITY FUND OF FUNDS	9,32%	0,322	Do not reject	Lower Yields
THETIS HELLENIC EQUITY	-0,90%	0,934	Do not reject	Lower Yields
TRITON AMERICAN EQUITY INTERNATIONAL FUND	6,24%	0,316	Do not reject	Lower Yields
TRITON GROWTH GREEK EQUITY FUND	-0,30%	0,974	Do not reject	Lower Yields
TRITON PANEUROPEAN INTL EQ FD	-1.36%	0,875	Do not reject	Lower Yields

Table 6. Daily Data Estimate Jensen's alpha

Weekly data

Mutual Funds	Percentage Estimation of Jensen's Alpha	Percentage Estimation of alpha (p-value)	Decision Rule	Conclusion
3K DOMESTIC EQUITY FUND R	0,05%	0.168	Do not reject	Lower Yields
3K GREEK VALUE DOMESTIC EQUITY I	0,19%	0.0136 *	Reject	Overperformance
3K GREEK VALUE DOMESTIC EQUITY R	0,20%	0.00508 **	Reject	Overperformance
ALLIANZ AGGRESSIVE STRATEGY DOMESTIC EQUITY	0,06%	0.0986 .	Do not reject	Lower Yields
ALLIANZ DOMESTIC EQUITY	0,03%	0.346	Do not reject	Lower Yields
ALLIANZ MILLENNIUM EMEA EM MKTS EQUITIES	-0,01%	0.723	Do not reject	Lower Yields
ALPHA ETF FTSE ATHEX LARGE CAP EQUITY UCITS	1,04%	0.3761	Do not reject	Lower Yields
ALPHA (LUX) GLOBAL EQUITY FOF EUR DIS	0,10%	0.570	Do not reject	Lower Yields
ALPHA TRUST GLOBAL LEADERS FOREIGN EQUITY-R	2,11%	0.967	Do not reject	Lower Yields
ALPHA TRUST HELLENIC EQUITY-R	0,05%	0.102	Do not reject	Lower Yields
ALPHA TRUST NEW STRATEGY	0,05%	0.353	Do not reject	Lower Yields

DELOS BLUE CHIPS DOMESTIC EQUITY	-0,01%	0.561	Do not reject	Lower Yields
DELOS SMALL CAP DOMESTIC EQUITY	-5,25%	0.914	Do not reject	Lower Yields
DELOS SYNTHESIS BEST RED EQUITY FO FS	5,30%	0.628	Do not reject	Lower Yields
EQUITY EMERGING EUROPE EUROBANK	0,01%	0.825	Do not reject	Lower Yields
EQUITY GLOBAL EQUITIES EUROBANK	0,02%	0.693	Do not reject	Lower Yields
EQUITY GLOBAL EQUITIES PRIVATE BANKING	0,03%	0.8	Do not reject	Lower Yields
EQUITY GREEK EQUITIES EUROBANK	-0,03%	0.871	Do not reject	Lower Yields
EQUITY GREEK EQUITIES PRIVATE BANKING	3,61%	0.947	Do not reject	Lower Yields
EUROBANK (LF) FUND OF FUNDS - ESG FOCUS	33,88%	0.310	Do not reject	Lower Yields
EUROPEAN RELIANCE GROWTH DOMESTIC EQUITY FUND	0,03%	0.464	Do not reject	Lower Yields
FOF EQUITY BLEND EUROBANK	0,04%	0.575	Do not reject	Lower Yields
FOF GLOBAL EMERGING MARKETS EUROBANK	8,45%	0.757	Do not reject	Lower Yields
GF EQUITY BLEND FUND OF FUNDS EQUITY - EUROBANK	8,19%	0.757	Do not reject	Lower Yields

GF GLBL EQUITIES FORGN EQTY FD-EURBANK	8,19%	0.757	Do not reject	Lower Yields
GF GREEK EQTIES.DMS. EQ. EUROBANK CL.	8,19%	0.757	Do not reject	Lower Yields
INTERAMERICAN DEVELOPED MARKETS FOREIGN EQUITY	-0,04%	0.481	Do not reject	Lower Yields
INTERAMERICAN GROWTH DOMESTIC EQUITY	0,03%	0.525	Do not reject	Lower Yields
INTERAMERICAN NEW EUROPE FOREIGN EQUITY	-0,12%	0.307	Do not reject	Lower Yields
NBG INTL.FUNDS EUR. ALLSTARS A CAP	0,05%	0.294	Do not reject	Lower Yields
PIRAEUS DYN COS DOMESTIC EQTY FD R	3,51%	0.967	Do not reject	Lower Yields
PIRAEUS EMERGING MARKETS EQUITY FUND OF FUNDS R	0,02%	0.587	Do not reject	Lower Yields
PIRAEUS EQUITY FUND OF FUNDS R	8,04%	0.891	Do not reject	Lower Yields
PIRAEUS INSTITUTION PFOLIO DOMESTIC EQTY (I)	-0,03%	0.66	Do not reject	Lower Yields

PIRAEUS INVEST EUROPEAN EQUITY RETAIL	-0,02%	0.531	Do not reject	Lower Yields
PIRAEUS US EQUITY FUND R	-7,65%	0.782	Do not reject	Lower Yields
S&B PENSION GLOBAL EQUITY FUND OF FUNDS	48,73%	0.310	Do not reject	Lower Yields
THETIS HELLENIC EQUITY	-0,02%	0.693	Do not reject	Lower Yields
TRITON AMERICAN EQUITY INTERNATIONAL FUND	31,18%	0.316	Do not reject	Lower Yields
TRITON GROWTH GREEK EQUITY FUND	-0,30%	0.974	Do not reject	Lower Yields
TRITON PANEUROPEAN INTL EQ FD	-1,45%	0.973	Do not reject	Lower Yields

Table 7. Weekly Data Estimate Jensen's alpha

Jensen's Alpha	**Frequency**	**Number of significant Alpha estimates per category**
a≤ -0,024	8	0
-0,024≤ a≤ -0,022	0	0
-0,022≤ a≤ -0,020	0	0
-0,020≤ a≤ -0,018	0	0
-0,018≤ a≤ -0,016	0	0
-0,016≤ a≤ -0,014	1	0

-0,014≤ a≤ -0,012	0	0
-0,012≤ a≤ -0,010	0	0
-0,010≤ a≤ -0,08	7	0
-0,08≤ a≤ -0,06	1	0
-0,06≤ a≤ -0,04	1	0
-0,04≤ a≤- 0,02	0	0
-0,02≤ a≤ 0,00	10	0
0,00≤ a≤0,02	1	0
0,02≤ a≤ -0,04	3	0
a>0.04	9	2
Σύνολο:	41	2

Table 8. Jensen's Alpha Frequency Table

According to the results of the above table, only 2 mutual funds show statistical significance at the level of 5%, while at the same time their estimates were found to be positive. All other estimates did not differ statistically significantly from zero (non-rejection of the null hypothesis), which suggests that the returns on these funds are similar to those on the returns in the diversified portfolio. An overall assessment of the results is that the funds were more likely to underestimate the reference model than to lead to overperformance.

Market Timing Models

Merton-Henriksson Model

Allows you to estimate the Treynor-Mazuy or Merton-Henriksson market timing model. The Treynor-Mazuy model is essentially a square extension of the basic CAPM model. The basic idea of the Merton-Henriksson test is to perform a multiple regression in which the dependent variable is a portfolio yield and a second variable is encoded according to the yield in a selection. This second variable is 0 when the market overperformance is at zero or below zero and is 1 when it is above zero. If the coefficient γ in the regression is positive, then the estimated equation describes a convex "line" of upward slope. If δ is positive, this would indicate that the manager's investment strategy shows the ability to timing the market.

$$R_{it} - R_{ft} = \alpha + \beta\left(R_{tt} - R_{ft}\right) + \delta D_t\left(R_{tt} - R_{ft}\right)$$

where all variables are known from the CAPM model, except market performance $D = \max(0, R_{tt} - R_{ft})$ and market timing capabilities c.

α>0	Superior ability of the portfolio manager in selecting under-valued securities.
α<0	No ability of the portfolio manager in selecting under-valued securities.

Table 9. Survey Submission M/H's α

δ>0	Superior macro forecasting skill. Ability to timing the market.
δ<0	Inability of the fund manager to time the market.

Table 10. Survey Submission M/H's δ

Daily data

Mutual Funds	Estimation of Alpha	Estimation of β	Estimation of γ	Conclusion
3K DOMESTIC EQUITY FUND R	0,000	0,793	0,000	Market timing ability
3K GREEK VALUE DOMESTIC EQUITY I	0,002	0,698	-0,003	No market timing ability
3K GREEK VALUE DOMESTIC EQUITY R	0,001	0,512	-0,001	No market timing ability
ALLIANZ AGGRESSIVE STRATEGY DOMESTIC EQUITY	0,000	0,842	0,000	Market timing ability
ALLIANZ DOMESTIC EQUITY	0,000	0,921	-0,001	No market timing ability
ALLIANZ MILLENNIUM EMEA EM MKTS EQUITIES	0,000	0,600	0,001	Market timing ability
ALPHA ETF FTSE ATHEX LARGE CAP EQUITY UCITS	0,001	1,267	-0,006	No market timing ability
ALPHA (LUX) GLOBAL EQUITY FOF EUR DIS	0,000	-0,028	0,000	Market timing ability

ALPHA TRUST GLOBAL LEADERS FOREIGN EQUITY-R	0,000	0,131	0,000	No market timing ability
ALPHA TRUST HELLENIC EQUITY-R	0,000	0,751	-0,000	No market timing ability
ALPHA TRUST NEW STRATEGY	0,000	0,544	0,000	Market timing ability
DELOS BLUE CHIPS DOMESTIC EQUITY	0,000	0,925	0,000	No market timing ability
DELOS SMALL CAP DOMESTIC EQUITY	-0,000	0,342	0,001	Market timing ability
DELOS SYNTHESIS BEST RED EQUITY FO FS	0,000	0,857	-0,001	No market timing ability
EQUITY EMERGING EUROPE EUROBANK	0,000	0,141	0,000	No market timing ability
EQUITY GLOBAL EQUITIES EUROBANK	0,000	0,140	0,000	No market timing ability
EQUITY GLOBAL EQUITIES PRIVATE BANKING	-0,001	0,848	0,002	Market timing ability
EQUITY GREEK EQUITIES EUROBANK	-0,001	0,822	0,002	Market timing ability
EQUITY GREEK EQUITIES PRIVATE BANKING	0,000	0,464	0,001	Market timing ability
EUROBANK (LF) FUND OF FUNDS - ESG FOCUS	0,095	-1,894	-0,062	No market timing ability
EUROPEAN RELIANCE GROWTH DOMESTIC EQUITY FUND	-0,001	0,151	0,002	Market timing ability
FOF EQUITY BLEND EUROBANK	0,001	0,741	-0,001	No market timing ability
FOF GLOBAL EMERGING	0,000	0,696	0,001	Market timing ability

MARKETS EUROBANK				
GF EQUITY BLEND FUND OF FUNDS EQUITY - EUROBANK	0,000	0,142	0,000	No market timing ability
GF GLBL EQUITIES FORGN EQTY FD-EURBANK	0,000	0,931	0,000	No market timing ability
GF GREEK EQTIES.DMS. EQ. EUROBANK CL.	0,001	0,126	-0,002	No market timing ability
INTERAMERICAN DEVELOPED MARKETS FOREIGN EQUITY	0,006	0,840	-0,001	No market timing ability
INTERAMERICAN GROWTH DOMESTIC EQUITY	0,000	0,762	0,001	Market timing ability
INTERAMERICAN NEW EUROPE FOREIGN EQUITY	0,000	-0,022	0,001	Market timing ability
NBG INTL.FUNDS EUR. ALLSTARS A CAP	0,001	0,730	-0,001	No market timing ability
PIRAEUS DYN COS DOMESTIC EQTY FD R	0,000	8,573	0,000	No market timing ability
PIRAEUS EMERGING MARKETS EQUITY FUND OF FUNDS R	0,000	0,639	0,000	No market timing ability
PIRAEUS EQUITY FUND OF FUNDS R	0,000	0,665	0,000	No market timing ability
PIRAEUS INSTITUTION PFOLIO DOMESTIC EQTY (I)	0,000	-0,031	0,001	Market timing ability

PIRAEUS INVEST EUROPEAN EQUITY RETAIL	0,000	0,635	0,000	No market timing ability
PIRAEUS US EQUITY FUND R	0,000	0,585	0,000	No market timing ability
S&B PENSION GLOBAL EQUITY FUND OF FUNDS	0,137	-3,1740	-0,088	No market timing ability
THETIS HELLENIC EQUITY	0,000	0,738	0,000	Market timing ability
TRITON AMERICAN EQUITY INTERNATIONAL FUND	0,171	4,721	-0,221	No market timing ability
TRITON GROWTH GREEK EQUITY FUND	0,000	0,601	-0,000	No market timing ability
TRITON PANEUROPEAN INTL EQ FD	-0,001	0,528	0,001	Market timing ability

Table 11. Daily Data Estimate Merton-Henriksson Model

Weekly data

Mutual Funds	**Estimation of Alpha**	**Estimation of β**	**Estimation of γ**	**Conclusion**
3K DOMESTIC EQUITY FUND R	0,000	0,794	0,000	Market timing ability
3K GREEK VALUE DOMESTIC EQUITY I	0,005	0,701	-0,005	No market timing ability

3K GREEK VALUE DOMESTIC EQUITY R	0,002	0,541	0,000	Market timing ability
ALLIANZ AGGRESSIVE STRATEGY DOMESTIC EQUITY	0,000	0,876	0,000	Market timing ability
ALLIANZ DOMESTIC EQUITY	0,001	0,947	0,001	Market timing ability
ALLIANZ MILLENNIUM EMEA EM MKTS EQUITIES	0,006	1,267	-0,001	No Market timing ability
ALPHA ETF FTSE ATHEX LARGE CAP EQUITY UCITS	-0,002	0,675	0,003	Market timing ability
ALPHA (LUX) GLOBAL EQUITY FOF EUR DIS	-0,008	0,237	0,035	Market timing ability
ALPHA TRUST GLOBAL LEADERS FOREIGN EQUITY-R	0,002	-0,062	-0,001	No market timing ability
ALPHA TRUST HELLENIC EQUITY-R	-0,001	0,705	0,000	Market timing ability
ALPHA TRUST NEW STRATEGY	0,001	0,772	-0,001	No Market timing ability
DELOS BLUE CHIPS DOMESTIC EQUITY	0,000	0,531	0,001	Market timing ability
DELOS SMALL CAP DOMESTIC EQUITY	0,000	0,940	0,000	No Market timing ability
DELOS SYNTHESIS BEST RED EQUITY FO FS	0,001	0,802	-0,002	No market timing ability
EQUITY EMERGING EUROPE EUROBANK	-0,001	0,863	0,002	Market timing ability

EQUITY GLOBAL EQUITIES EUROBANK	0,003	0,497	-0,005	No market timing ability
EQUITY GLOBAL EQUITIES PRIVATE BANKING	0,003	0,485	-0,004	No Market timing ability
EQUITY GREEK EQUITIES EUROBANK	-0,002	0,899	0,004	Market timing ability
EQUITY GREEK EQUITIES PRIVATE BANKING	-0,002	0,853	0,003	Market timing ability
EUROBANK (LF) FUND OF FUNDS - ESG FOCUS	-0,001	0,633	0,002	Market timing ability
EUROPEAN RELIANCE GROWTH DOMESTIC EQUITY FUND	-0,038	-0,282	0,695	Market timing ability
FOF EQUITY BLEND EUROBANK	-0,001	0,831	0,002	Market timing ability
FOF GLOBAL EMERGING MARKETS EUROBANK	0,002	0,775	-0,002	No Market timing ability
GF EQUITY BLEND FUND OF FUNDS EQUITY - EUROBANK	-0,001	0,825	0,002	Market timing ability
GF GLBL EQUITIES FORGN EQTY FD-EURBANK	0,003	0,475	-0,004	No market timing ability
GF GREEK EQTIES.DMS.EQ. EUROBANK CL.	0,001	0,958	-0,001	No market timing ability
INTERAMERICAN DEVELOPED MARKETS FOREIGN EQUITY	0,003	0,486	-0,004	No market timing ability

INTERAMERICAN GROWTH DOMESTIC EQUITY	0,001	0,001	-0,002	No Market timing ability
INTERAMERICAN NEW EUROPE FOREIGN EQUITY	-0,002	0,787	0,005	Market timing ability
NBG INTL.FUNDS EUR. ALLSTARS A CAP	-0,006	0,441	0,008	Market timing ability
PIRAEUS DYN COS DOMESTIC EQTY FD R	0,075	0,732	0,001	Market timing ability
PIRAEUS EMERGING MARKETS EQUITY FUND OF FUNDS R	0,002	0,824	-0,004	No market timing ability
PIRAEUS EQUITY FUND OF FUNDS R	0,001	0,756	-0,001	No market timing ability
PIRAEUS INSTITUTION PFOLIO DOMESTIC EQTY (I)	0,000	0,656	0,001	Market timing ability
PIRAEUS INVEST EUROPEAN EQUITY RETAIL	-0,002	0,398	0,003	Market timing ability
PIRAEUS US EQUITY FUND R	-0,001	0,680	0,001	Market timing ability
S&B PENSION GLOBAL EQUITY FUND OF FUNDS	-0,001	0,765	0,001	Market timing ability
THETIS HELLENIC EQUITY	-0,056	-0,739	100302,000	Market timing ability

TRITON AMERICAN EQUITY INTERNATIONAL FUND	-0,001	0,808	0,001	Market timing ability
TRITON GROWTH GREEK EQUITY FUND	1,033	11,494	-1,358	No market timing ability
TRITON PANEUROPEAN INTL EQ FD	-0,001	0,635	0,000	Market timing ability

Table 12. Weekly Data Estimate Merton-Henriksson Model

We observe the appearance of statistically significant positive abnormal performance (alpha). However, the negative alpha is equivalent to the positive ones in those that show statistical significance (2) and in their entirety, which leads us to conclude again the lack of selectivity of managers' securities. In terms of the timing of the managers, their inability to take advantage of their forecasts for market movements still prevails, due again to the predominance of Treynor Mazuy's negative gamma ratios, both in total and in the number of statistically significant prices. We therefore conclude that under the Henriksson Merton measure, both throughout the period and periodically, there is an inability to predict the market by fund managers.

The following two pictures show how good the model fits. The greater the scatter of observations around the regression line, the "worse" the model. The closer the observations to the regression line, the better fit it has. The observations shown represent the error estimates. The greater the distance (vertical distance) from the line of regression the worse things are because the greater the distance large errors.

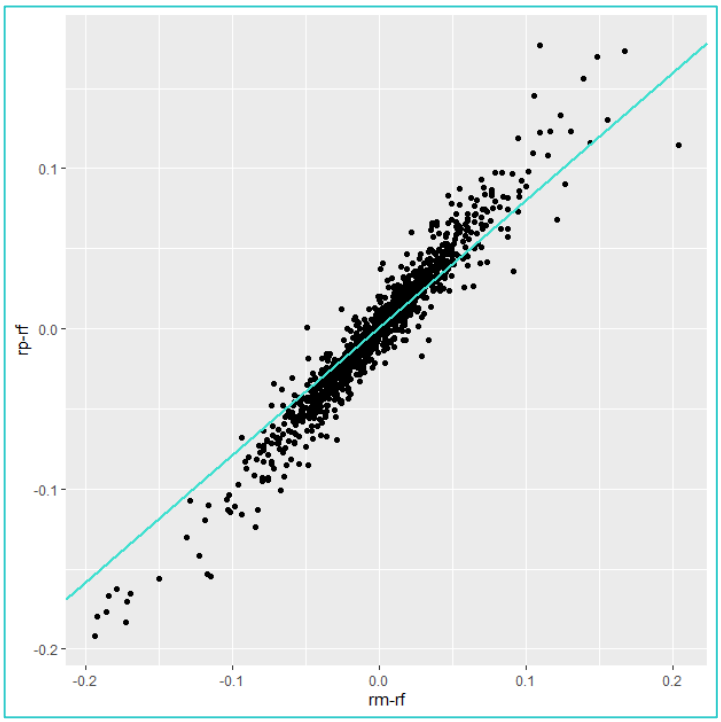

Chart 4. Characteristic Lines – Market Timing – Daily Data-3K DOMESTIC EQUITY FUND R

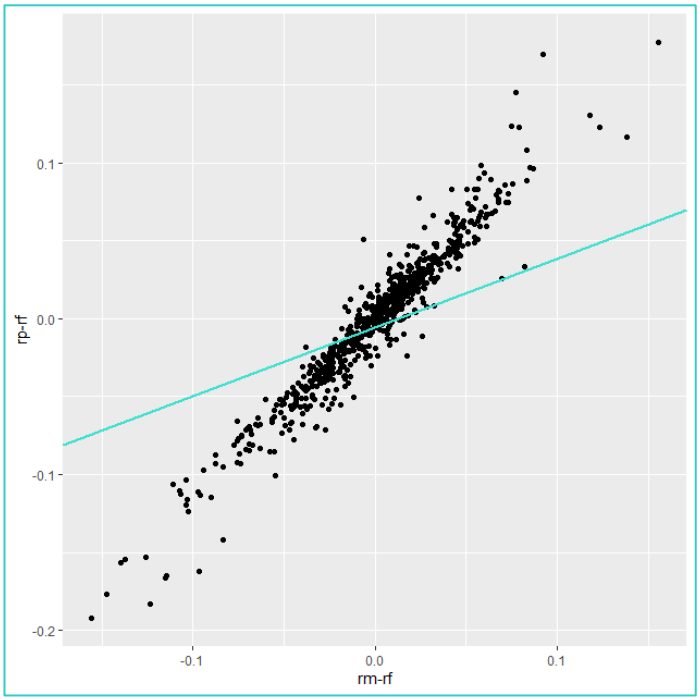

Chart 5. Characteristic Lines – Market Timing – Weekly Data - 3K DOMESTIC EQUITY FUND R

Treynor – Mazuy Model

Treynor and Mazuy added a quadratic term to the above equation to test market timing, arguing that if a manager can predict market performance, he will hold a larger percentage of the market portfolio when market performance is high and a lower percentage when the yield is low. Thus, portfolio return will be a non-linear return market function of the following form:

$$R_{pt}-R_{ft} = \alpha_p + \beta_p (R_{mt} - R_{ft}) + \gamma_p (R_{mt} - R_{ft})^2$$

If αp is positive, it means that the investment manager is able to create an optimal portfolio otherwise, if αp is negative, it means that the investment manager is not able to create an optimal portfolio. The price reflects market timing capabilities that demonstrate the ability of investment managers to make adjustments to the asset portfolio to anticipate changes in market prices in general. If γp is positive and statistically significant, the investment manager has the ability to set the market timeline. Similarly, if γp is negative and statistically significant, the investment manager does not have the option to purchase timing.

The case under consideration and the expected results for the majority of the mutual funds are provided in the table below:

α>0	The investment manager is able to create an optimal portfolio.
α<0	The investment manager is not able to create an optimal portfolio.

Table 13. Survey Submission T/M α

γ>0	The investment manager has the ability to set the market timeline.
γ<0	The investment manager does not have the option to purchase timing.

Table 14. Survey Submission T/M γ

The following table lists the results for this model

Daily Data

Mutual Funds	**Estimation of α**	**Estimation of γ**	**Conclusion**
3K DOMESTIC EQUITY FUND R	0,212	-316,500	Ability to establish an optimal portfolio-No Market timing ability
3K GREEK VALUE DOMESTIC EQUITY I	0,001	-1,101	Ability to establish an optimal portfolio- No Market timing ability
3K GREEK VALUE DOMESTIC EQUITY R	0,001	-1,101	Ability to establish an optimal portfolio- No Market timing ability
ALLIANZ AGGRESSIVE STRATEGY DOMESTIC EQUITY	0,000	-0,592	Ability to establish an optimal portfolio- No Market timing ability
ALLIANZ DOMESTIC EQUITY	0,195	-0,408	Ability to establish an optimal portfolio-No Market timing ability
ALLIANZ MILLENNIUM EMEA EM MKTS EQUITIES	0,000	-0,455	Ability to establish an optimal portfolio- No Market timing ability
ALPHA ETF FTSE ATHEX LARGE CAP EQUITY UCITS	0,002	2,016	Ability to establish an optimal portfolio- Market timing ability
ALPHA (LUX) GLOBAL EQUITY FOF EUR DIS	0,001	-3,087	Ability to establish an optimal portfolio- No Market timing ability
ALPHA TRUST GLOBAL LEADERS FOREIGN EQUITY-R	0,001	-0,538	Ability to establish an optimal portfolio- No

			Market timing ability
ALPHA TRUST HELLENIC EQUITY-R	0,380	-844,600	Ability to establish an optimal portfolio- No Market timing ability
ALPHA TRUST NEW STRATEGY	0,001	-0,925	Ability to establish an optimal portfolio- No Market timing ability
DELOS BLUE CHIPS DOMESTIC EQUITY	0,061	-290,400	Ability to establish an optimal portfolio- No Market timing ability
DELOS SMALL CAP DOMESTIC EQUITY	0,000	-0,502	Ability to establish an optimal portfolio- No Market timing ability
DELOS SYNTHESIS BEST RED EQUITY FO FS	0,000	-1,622	Ability to establish an optimal portfolio- No Market timing ability
EQUITY EMERGING EUROPE EUROBANK	0,000	-0,501	Ability to establish an optimal portfolio- No Market timing ability
EQUITY GLOBAL EQUITIES EUROBANK	0,000	0,134	Ability to establish an optimal portfolio- Market timing ability
EQUITY GLOBAL EQUITIES PRIVATE BANKING	0,000	0,156	Ability to establish an optimal portfolio- Market timing ability
EQUITY GREEK EQUITIES EUROBANK	-0,049	543,800	Ability to establish an optimal portfolio- Market timing ability
EQUITY GREEK EQUITIES PRIVATE BANKING	0,000	1,068	Ability to establish an optimal portfolio- Market timing ability

EUROBANK (LF) FUND OF FUNDS - ESG FOCUS	0,000	-0,796	Ability to establish an optimal portfolio- No Market timing ability
EUROPEAN RELIANCE GROWTH DOMESTIC EQUITY FUND	0,065	-2,655	Ability to establish an optimal portfolio- No Market timing ability
FOF EQUITY BLEND EUROBANK	0,000	13960	Ability to establish an optimal portfolio- Market timing ability
FOF GLOBAL EMERGING MARKETS EUROBANK	0,000	-27810	Ability to establish an optimal portfolio- No Market timing ability
GF EQUITY BLEND FUND OF FUNDS EQUITY - EUROBANK	0,000	-0,480	Ability to establish an optimal portfolio- No Market timing ability
GF GLBL EQUITIES FORGN EQTY FD-EURBANK	0,000	0,130	Ability to establish an optimal portfolio- Market timing ability
GF GREEK EQTIES.DMS. EQ. EUROBANK CL.	0,176	-0,373	Ability to establish an optimal portfolio- No Market timing ability
INTERAMERICAN DEVELOPED MARKETS FOREIGN EQUITY	0,000	-0,018	Ability to establish an optimal portfolio- No Market timing ability
INTERAMERICAN GROWTH DOMESTIC EQUITY	0,081	-0,416	Ability to establish an optimal portfolio- No Market timing ability
INTERAMERICAN NEW EUROPE FOREIGN EQUITY	0,080	-0,105	Ability to establish an optimal portfolio- No Market timing ability

NBG INTL.FUNDS EUR. ALLSTARS A CAP	0,000	-1,968	Ability to establish an optimal portfolio- No Market timing ability
PIRAEUS DYN COS DOMESTIC EQTY FD R	0,000	-0,740	Ability to establish an optimal portfolio- No Market timing ability
PIRAEUS EMERGING MARKETS EQUITY FUND OF FUNDS R	0,058	-0,352	Ability to establish an optimal portfolio- No Market timing ability
PIRAEUS EQUITY FUND OF FUNDS R	0,000	-0,990	Ability to establish an optimal portfolio- No Market timing ability
PIRAEUS INSTITUTION PFOLIO DOMESTIC EQTY (I)	0,000	-0,701	Ability to establish an optimal portfolio- No Market timing ability
PIRAEUS INVEST EUROPEAN EQUITY RETAIL	0,000	-16300	Ability to establish an optimal portfolio- No Market timing ability
PIRAEUS US EQUITY FUND R	0,048	-0,365	Ability to establish an optimal portfolio- No Market timing ability
S&B PENSION GLOBAL EQUITY FUND OF FUNDS	0,000	-127800	Ability to establish an optimal portfolio- No Market timing ability
THETIS HELLENIC EQUITY	0,095	-405800	Ability to establish an optimal portfolio- No Market timing ability
TRITON AMERICAN EQUITY	0,000	-101500	Ability to establish an optimal portfolio- No

INTERNATIONAL FUND			Market timing ability
TRITON GROWTH GREEK EQUITY FUND	0,070	-213600	Ability to establish an optimal portfolio- No Market timing ability
TRITON PANEUROPEAN INTL EQ FD	0,084	-0,846	Ability to establish an optimal portfolio- No Market timing ability

Table 15. Daily Data estimate Treynor-Mazuy Model

Weekly Data

Mutual Funds	**Estimation of α**	**Estimation of γ**	**Conclusion**
3K DOMESTIC EQUITY FUND R	0,001	-0,138	Ability to establish an optimal portfolio- No Market timing ability
3K GREEK VALUE DOMESTIC EQUITY I	0,003	-1,076	Ability to establish an optimal portfolio- No Market timing ability
3K GREEK VALUE DOMESTIC EQUITY R	0,002	-0,291	Ability to establish an optimal portfolio- No Market timing ability
ALLIANZ AGGRESSIVE STRATEGY DOMESTIC EQUITY	0,001	-0,123	Ability to establish an optimal portfolio- No Market timing ability
ALLIANZ DOMESTIC EQUITY	0,001	-0,098	Ability to establish an optimal portfolio- No Market timing ability

ALLIANZ MILLENNIUM EMEA EM MKTS EQUITIES	0,000	-0,237	Ability to establish an optimal portfolio- No Market timing ability
ALPHA ETF FTSE ATHEX LARGE CAP EQUITY UCITS	-0,001	3,850	Ability to establish an optimal portfolio- Market timing ability
ALPHA (LUX) GLOBAL EQUITY FOF EUR DIS	0,000	1,209	Ability to establish an optimal portfolio- Market timing ability
ALPHA TRUST GLOBAL LEADERS FOREIGN EQUITY-R	0,001	-1,040	Ability to establish an optimal portfolio- No Market timing ability
ALPHA TRUST HELLENIC EQUITY-R	0,001	-0,336	Ability to establish an optimal portfolio- No Market timing ability
ALPHA TRUST NEW STRATEGY	0,002	-0,516	Ability to establish an optimal portfolio- No Market timing ability
DELOS BLUE CHIPS DOMESTIC EQUITY	0,000	-0,158	Ability to establish an optimal portfolio- No Market timing ability
DELOS SMALL CAP DOMESTIC EQUITY	0,001	-0,282	Ability to establish an optimal portfolio- No Market timing ability
DELOS SYNTHESIS BEST RED EQUITY FO FS	0,001	-0,565	Ability to establish an optimal portfolio- No Market timing ability
EQUITY EMERGING EUROPE EUROBANK	-0,053	0,276	Ability to establish an optimal portfolio- Market timing ability

EQUITY GLOBAL EQUITIES EUROBANK	0,003	-4,113	Ability to establish an optimal portfolio- No Market timing ability
EQUITY GLOBAL EQUITIES PRIVATE BANKING	0,003	-4,096	Ability to establish an optimal portfolio- No Market timing ability
EQUITY GREEK EQUITIES EUROBANK	0,000	0,274	Ability to establish an optimal portfolio- Market timing ability
EQUITY GREEK EQUITIES PRIVATE BANKING	-0,001	0,504	Ability to establish an optimal portfolio- Market timing ability
EUROBANK (LF) FUND OF FUNDS - ESG FOCUS	0,000	-0,239	Ability to establish an optimal portfolio- No Market timing ability
EUROPEAN RELIANCE GROWTH DOMESTIC EQUITY FUND	0,367	-15,195	Ability to establish an optimal portfolio- No Market timing ability
FOF EQUITY BLEND EUROBANK	0,000	0,063	Ability to establish an optimal portfolio- Market timing ability
FOF GLOBAL EMERGING MARKETS EUROBANK	0,001	-1,386	Ability to establish an optimal portfolio- No Market timing ability
GF EQUITY BLEND FUND OF FUNDS EQUITY - EUROBANK	0,000	-0,058	Ability to establish an optimal portfolio- No Market timing ability
GF GLBL EQUITIES FORGN EQTY FD-EURBANK	0,002	-3,748	Ability to establish an optimal portfolio- No Market timing ability

GF GREEK EQTIES.DMS. EQ. EUROBANK CL.	0,000	0,046	Ability to establish an optimal portfolio- Market timing ability
INTERAMERICAN DEVELOPED MARKETS FOREIGN EQUITY	0,002	-3,774	Ability to establish an optimal portfolio- No Market timing ability
INTERAMERICAN GROWTH DOMESTIC EQUITY	0,001	-0,498	Ability to establish an optimal portfolio- No Market timing ability
INTERAMERICAN NEW EUROPE FOREIGN EQUITY	0,001	-0,332	Ability to establish an optimal portfolio- No Market timing ability
NBG INTL.FUNDS EUR. ALLSTARS A CAP	0,000	-0,981	Ability to establish an optimal portfolio- No Market timing ability
PIRAEUS DYN COS DOMESTIC EQTY FD R	0,002	-0,559	Ability to establish an optimal portfolio- No Market timing ability
PIRAEUS EMERGING MARKETS EQUITY FUND OF FUNDS R	0,000	-0,575	Ability to establish an optimal portfolio- No Market timing ability
PIRAEUS EQUITY FUND OF FUNDS R	0,001	-1,064	Ability to establish an optimal portfolio- No Market timing ability
PIRAEUS INSTITUTION PFOLIO DOMESTIC EQTY (I)	0,001	-0,437	Ability to establish an optimal portfolio- No Market timing ability
PIRAEUS INVEST EUROPEAN EQUITY RETAIL	0,000	-0,547	Ability to establish an optimal portfolio- No

			Market timing ability
PIRAEUS US EQUITY FUND R	0,058	-0,285	Ability to establish an optimal portfolio- No Market timing ability
S&B PENSION GLOBAL EQUITY FUND OF FUNDS	0,000	-0,327	Ability to establish an optimal portfolio- No Market timing ability
THETIS HELLENIC EQUITY	0,527	-21,825	Ability to establish an optimal portfolio- No Market timing ability
TRITON AMERICAN EQUITY INTERNATIONAL FUND	0,000	-0,862	Ability to establish an optimal portfolio- No Market timing ability
TRITON GROWTH GREEK EQUITY FUND	0,388	-38,233	Ability to establish an optimal portfolio- No Market timing ability
TRITON PANEUROPEAN INTL EQ FD	0,001	-0,692	Ability to establish an optimal portfolio- No Market timing ability

Table 16. Weekly Data estimate Treynor-Mazuy Model

In the analysis of this model, in order to find a possible ability to select the appropriate securities (micro forecasting) or ability of correct time placement (macro forecasting), positive alpha values are obtained. However, 2 of them are not statistically significant.

Autocorrelation check

One of the key assumptions in linear regression is that there is no correlation between residues.

One way to determine if this hypothesis is met is the Durbin-Watson test, which is used to detect the presence of autocorrelation in the remnants of a regression. This test uses the following hypotheses:

H0: There is no correlation between the residues
H1: Residues are correlated

The operative term $\boldsymbol{ut}$ includes the effect of all factors which may not be included in the models. Many times, however, the effect of many factors may not refer to the current time period, but to future ones.

Consequences of Heteroscedasticity

- The least squares estimators are impartial and consistent. Impartiality and consistency do not depend on the case being violated.
- The least squares estimators will be inefficient (they do not have the greatest possible variation) and therefore will no longer be the best linear estimators.
- Estimated regression rate fluctuations will be biased and inconsistent, and therefore case control is no longer valid. In most cases, $\mathbf{R^2}$ will be overestimated and $\boldsymbol{t}$ statistics will tend to be higher.

In this case, the Durbin - Watson control has been used through R's car package, both for the total daily data and for the total weekly data. The relevant statistical control, as well as the corresponding p - values, showed the existence of autocorrelation [rejection of the null hypothesis] for the data. Indicatively, some of the respective controls and the corresponding p - values are listed:

lag Autocorrelation D-W Statistic p-value
1 -0.4427775 2.883519 0
lag Autocorrelation D-W Statistic p-value
1 -0.1870901 2.368541 0
lag Autocorrelation D-W Statistic p-value
1 -0.3313845 2.661668 0
lag Autocorrelation D-W Statistic p-value
1 -0.0009226969 2.001845 0.852
lag Autocorrelation D-W Statistic p-value
1 -0.09999303 2.198672 0
lag Autocorrelation D-W Statistic p-value
1 -0.3503218 2.668462 0

Table 17. Autocorrelation Checks

Heterosecondensity test

One of the most important assumptions when adapting a regression model is that there should be no heterosexuality of the residues. In short, it must be ensured that the variance does not increase, with adjusted values to predict the variable response.

Consequences of Heteroscedasticity

1. OLS appraisers remain impartial and consistent. This is because none of the interpretive variables is associated with the error term. Thus, a well-defined equation will give us values of the estimated coefficients that are very close to the actual parameters.

2. The distribution of the estimated rates is affected by increasing the variations of the distributions and therefore making the OLS estimators inefficient.

3. Estimator fluctuations are underestimated, leading to higher values of t and F statistics.

In general, there are two ways to locate:

The first is the informal way, which is done through diagrams and so is called the graphical method.

The second is through official tests for heterosexuality, such as the following:

1. To Breusch-Pagan LM Test
2. To Glesjer LM Test
3. To Harvey-Godfrey LM Test
4. To Park LM Test
5. To Goldfeld-Quandt Tets
6. To White Test

In the present research work the Breusch-Pagan LM Test has been used, both for the total daily data and for the total weekly data through the lmtest package of R. In most cases the variation of the residues was constant. Indicatively, some of the results are listed in the following table:

studentized Breusch-Pagan test

data: model

BP = 0.44777, df = 1, p-value = 0.5034

data: model

BP = 6.0882, df = 1, p-value = 0.01361

data: model

BP = 3.0916, df = 1, p-value = 0.0787

data: model

BP = 0.9818, df = 1, p-value = 0.3218

data: model

BP = 1.4684, df = 1, p-value = 0.2256

Table 18. Heteroscedasticity test

Conclusion

In this section, a summary of the analysis of our study will be presented.

The purpose of this dissertation was to analyze the return on equity mutual funds from their beginning to 29/6/2020. In the range of analysis, the Treynor-Mazuy model, Merton-Henriksson model and Jensen's Performance Index were applies.

The scope of the analysis included every stock index that have been reported to the mutual funds' factsheets. The mutual funds that were analyzed belong to the category of equity mutual funds and for the calculation of their returns we also took into account the interest rate of the 3month Euribor. The prices of the mutual funds, stock indices and 3 Month Euribor were obtained from Thomson- Reuters Platform. The data of the analysis are in weekly and monthly basis.

From the empirical study conducted for daily and weekly data, we conclude that according to the Jensen model overperformance is found only in reciprocal 3K GREEK VALUE DOMESTIC EQUITY I - 3K GREEK VALUE DOMESTIC EQUITY R in which the statistical significance of alpha is 0,0178 and 0,0202, in the daily data, and 0.0136 and 0.00508 in the weekly data, respectively. In the other mutual funds, there are lower returns with Non-Rejection outcome.

In the study of the Merton- Henriksson test we observe, examining the daily data, the appearance for 36 positive abnormal returns (alpha). However, 11 of them show market timing ability while there are, also, 5 with negatives alpha that also show market timing ability. In terms of the timing of the managers, their inability to take advantage of their forecasts for market movements still prevails, due again to Daithe predominance of Treynor Mazuy's negative γ factors, both in total and in the number of statistically significant prices. In fact, the only statistically significant positive alpha value resulted in the statistically significant value of γ, which may have been biased in favor of the first result. On the other hand, during the examination of the weekly data, 13 mutual funds acquired market timing ability while 4 mutual funds lost their Market timing ability. We therefore conclude that under the Henriksson Merton measure, both throughout the period and periodically, there is an inability to predict the market by fund managers.

In the Treynor Mazuy test, when analyzing daily data, we observe the appearance for positive 40 abnormal returns (alpha). However, 6 of them show market timing ability while there is 1 with negative alpha that also show market timing ability. In terms of the timing of the managers, their inability to take advantage of their forecasts for market movements still prevails, due again to the predominance of Treynor Mazuy's negative γ factors, both in total and in the number of statistically significant prices. On the other hand, during the analysis of the weekly data, we observe 38 positive abnormal returns (alpha), with 4 reciprocal ones that show market timing ability while there are 3 with negative a that also show market timing ability. We therefore conclude that under the Treynor Mazuy measure, both throughout the period and periodically, there is an inability to predict the market by mutual fund managers.

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Internet resources

- https://www.euro2day.gr/
- https://www.helex.gr/el/
- https://www.ici.org/
- https://www.kathimerini.gr/227905/article/oikonomia/epixeirhseis/to-kryfo-kai-fanero-kostos-twn-amoivaiwn-kefalaiwn
- https://www.statista.com/statistics/630524/number-of-regulated-open-end-funds-worldwide/

Appendices

Daily Data
Jensen's alpha – Parameter Estimation –Market Timing - Used Code

1	install.packages("readxl")
	library(readxl)
	capm=read_excel(file.choose(), sheet = 1)#choose the proper sheet
	capm <- capm[2:7]
		Data input

2	str(capm) dim(capm) summary(capm)	Data Diagnostics
3	colnames(capm)[colnames(capm)=="…3"]="Ri" colnames(capm)[colnames(capm)=="…5"]="Rm" colnames(capm)[colnames(capm)=="…7"]="Rf"	Change Column Names for more comprehensible results
4	#create differences to be used in model capm$Ri_Rf=capm$Ri-capm$Rf capm$Rm_Rf=capm$Rm-capm$Rf	Create Differences for Parameter Estimation
5	attach(capm)	Attach the data set

6	#estimate a & b
	summary(lm(Ri_Rf~Rm_Rf))
		Parameter Estimation by applying the lm ()
		procedure to R

7	capm$D=ifelse(capm$Rm>capm$Rf,1,0)	Creating a False Variable for Market Timing Model
8	summary(lm(Ri_Rf~Rm_Rf+D))	Market Timing Model

9	#plots
	library(ggplot2)
	sp=ggplot(capm,aes(x=Ri_Rf,y=Rm_Rf))
	a=sp+geom_point()+geom_abline(intercept=…,slope=…,col="turquoise",size=0.8)
	a+scale_x_continuous(name="rm-rf")+scale_y_continuous(name="rp-rf")
		Charts

10	library(car) durbinWatsonTest(model)	Heterosecondensity test
11	library(lmtest) bptest(model)	Autocorrelation check

Result Tables – Jensen's alpha

Rated Model	Data
Call: lm(formula = Ri_Rf ~ Rm_Rf) Residuals: Min 1Q Median 3Q Max -0.034609 -0.002652 -0.000233 0.002561 0.026721 Coefficients: Estimate Std. Error t value Pr(>|t|) (Intercept) 0.0003753 0.0001581 2.374 0.0178 * Rm_Rf 0.6497632 0.0097851 66.403 <2e-16 *** --- Signif. codes: 0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1 Residual standard error: 0.004688 on 877 degrees of freedom (1 observation deleted due to missingness) Multiple R-squared: 0.8341, Adjusted R-squared: 0.8339 F-statistic: 4409 on 1 and 877 DF, p-value: < 2.2e-16	3K DOMESTIC EQUITY FUND R

Weekly Data
Jensen's alpha – Parameter Estimation –Market Timing - Used Code

1	install.packages("readxl")
	library(readxl)
	capm=read_excel(file.choose(), sheet = 1)#choose the proper sheet
	capm <- capm[2:7]
		Data input

2	str(capm) dim(capm) summary(capm)	Data Diagnostics
3	colnames(capm)[colnames(capm)=="…3"]="Ri" colnames(capm)[colnames(capm)=="…5"]="Rm" colnames(capm)[colnames(capm)=="…7"]="Rf"	Change Column Names for more comprehensible results
4	#create differences to be used in model capm$Ri_Rf=capm$Ri-capm$Rf capm$Rm_Rf=capm$Rm-capm$Rf	Create Differences for Parameter Estimation
5	attach(capm)	Attach the data set

6	#estimate a & b
	summary(lm(Ri_Rf~Rm_Rf))
		Parameter Estimation by applying the lm () procedure to R

7	capm$D=ifelse(capm$Rm>capm$Rf,1,0)	Creating a False Variable for Market Timing Model
8	summary(lm(Ri_Rf~Rm_Rf+D))	Market Timing Model

9	#plots
	library(ggplot2)
	sp=ggplot(capm,aes(x=Ri_Rf,y=Rm_Rf))
	a=sp+geom_point()+geom_abline(intercept=…,slope=…,col="turquoise",size=0.8)
	a+scale_x_continuous(name="rm-rf")+scale_y_continuous(name="rp-rf")
		Charts

10	library(car) durbinWatsonTest(model)	Heterosecondensity test
11	library(lmtest) bptest(model)	Autocorrelation check

Results – Jensen's alpha

Rated Model	Data
Call: lm(formula = Ri_Rf ~ Rm_Rf) Residuals: Min 1Q Median 3Q Max -0.047261 -0.005220 -0.000263 0.004923 0.054931 Coefficients: Estimate Std. Error t value Pr(>|t|) (Intercept) 0.0005067 0.0003675 1.379 0.168 Rm_Rf 0.7946312 0.0078764 100.888 <2e-16 *** --- Signif. codes: 0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1 Residual standard error: 0.01002 on 743 degrees of freedom (1 observation deleted due to missingness) Multiple R-squared: 0.932, Adjusted R-squared: 0.9319 F-statistic: 1.018e+04 on 1 and 743 DF, p-value: < 2.2e-16	3K DOMESTIC EQUITY FUND R