ISCTE Business School
Instituto Universitário de Lisboa

# MARKET TIMING AND SELECTIVITY: AN EMPIRICAL INVESTIGATION OF EUROPEAN MUTUAL FUND PERFORMANCE

Tomás Coutinho Grosso de Oliveira Salen

Dissertation submitted as partial requirement for the conferral of

Master in Finance

Supervisor:

Prof. Doutor Nuno Ferreira, ISCTE-IUL Business School, Departamento de Métodos Quantitativos para Gestão e Economia

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**Abstract**

Mutual fund managers can enhance their returns by selecting assets with superior returns or by advantageously timing their portfolio allocation strategy to the stock market, or both. In the present study we examine the timing ability of mutual fund managers to denote the practice of these strategies as a way to achieve superior performance. Of the 193 European equity funds that followed active management strategies between January 2000 and December 2012, the results do not evidence that fund managers have denoted abilities to positively anticipate market movements (market timing). Nevertheless, the selectivity component of returns presents slightly positive results, despite the generally poor overall performance.

Keywords: Mutual funds; Performance evaluation; Selectivity; Market timing

JEL classification: G11, G14

**Resumo**

Os gestores de fundos de investimento podem aumentar as suas rendibilidades através da seleção dos melhores ativos ou da antecipação vantajosa do momento em que canalizam os fluxos de investimento para o mercado com risco, ou ambos. No presente estudo investigamos a capacidade que os gestores denotaram na utilização destas estratégias como forma de obterem uma performance superior. Dos 193 fundos europeus de ações que seguiram estratégias de gestão ativa entre Janeiro de 2000 e Dezembro de 2012, não obtivemos evidência de que os gestores destes fundos denotassem positivas capacidades de antecipação dos movimentos do mercado *(market timing)*. Já na componente seletividade, os resultados são ligeiramente mais favoráveis, não obstante a performance total evidenciada ser globalmente reduzida.

Palavras-chave: Fundos de investimento; Avaliação de *performance*; Seletividade; *Market timing*

Classificação JEL: G11, G14

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## 1. Introduction

Traditional finance assumes that market agents possess homogeneous beliefs and their actions on financial markets are a reflection of those beliefs. However, we can observe that several fund managers evidence the capacity to, repeatedly, achieve superior returns in relation to the stock market. This topic has been the subject of many studies and debate, with special relevance in the 80s and 90s of the last century. This question is of major importance since a relevant share of the rates of return generated by the funds is annually paid in management fees to fund managers.

The work of Jensen (1968) is considered to be a landmark regarding performance evaluation. However, while the Jensen (1968) model consists on a single factor equation, several developments to this measure have been proposed in order to capture distinct factors that influence the fund manager's performance. These models aim to study two specific components of fund returns. Indeed, the selection of the best assets with a similar risk profile (selectivity) is as important as the predictive power of market fluctuations and the consequent allocation of investments between different risk segments (market timing), that is, to the stock market and the risk-free market. Superior performance can be achieved if managers develop both selectivity and market anticipation strategies. While some authors evaluate their separate contributions through non-parametric tests, we focused on the parametric tests of Henriksson and Merton (1981) and Treynor and Mazuy (1966) since they are performed through publicly available information and they do not rely on the knowledge of the fund managers market forecast.

In order to carry out our study we retrieved a comprehensive data sample of European mutual funds from the Bloomberg database, consisting of the returns of 193 mutual funds from 2000 to 2012. Taking into account the effects of the financial crisis of 2007, which are still being felt today in Europe, we chose to separate the sample period into two specific subsets, the pre-crisis period, between January 2000 and July 2007 and the period of the financial crisis, ranging from August 2007 to December 2012.

Our research contributes to the literature from two angles: foremost, while a vast number of studies tend to focus on the US stock market, the performance of European fund managers has not been thoroughly examined. Therefore our work can aim to be a geographical reference. On the other hand, the great financial crisis of 2007 and the consequent European sovereign debt crisis are clear time frames with a sizable level of stock market volatility to that fund managers, in case they possess market timing ability, could profit on and achieve higher returns. By dividing the sample into these subsets we can check if the return dynamics differ over time in terms of selectivity and market timing skills.

The main findings of our work indicate that European fund managers lack market timing capacities and that the estimates for the coefficient are affecting negatively the selectivity component of the performance measured through single factor models. The selectivity and market timing components of returns also present a strong negative correlation between each other, which indicates that a mutual fund manager tends to focus on a particular skill from time to time. Both of the findings are similar to the conclusions from several previous studies on this topic, such as Treynor and Mazuy (1966), Henriksson (1984), Chang and Lewellen (1984), Fletcher (1995) and Fung, Xu and Yau (2002).

The remainder of this dissertation is organized as follows. Section 2 describes the literature review. We will describe the methodology in section 3 and the data sample in section 4. Section 5 presents the empirical results on the performance of mutual fund managers, while section 6 presents the robustness check. In section 7 we present the conclusions of our study.

## 2. Literature review

Jensen (1968) developed a model that is considered to be a reference in terms of performance evaluation. The model captures the excess return generated by the portfolio through the predictive ability of fund managers. In his study, which contemplated the examination of the performance of 115 actively managed mutual funds from 1944 to 1964, the author did not find evidence that mutual fund managers outperformed the market. Despite the results, Jensen's work had the capacity to motivate further studies on this subject, amongst them, Black, Jensen and Scholes (1972) and Blume and Friend (1973), who further enhanced the model by working with portfolios instead of individual securities.

Grinblatt and Titman (1989b) used the Jensen (1968) model to measure the performance of equity mutual funds from 1974 to 1984. A distinctive remark of their work is that gross returns were approximated through their quarterly portfolio holdings. Although they did find abnormal performance, particularly among the funds with the smallest net assets, these funds also had the highest expenses, which undermined their superior performance.

Despite the common use and widespread of the Jensen (1968) measure, several authors started questioning its capacity to properly evaluate mutual fund performance. One of the major issues highlighted was that the model did not distinctively capture the manager's ability to suitable select undervalued assets and his capability to interpret market movements as well as act on his forecast.[1] The distinction between these two measures of performance was outlined by Jensen (1972). In his work he demonstrated that if market timing activities of fund managers contribute to the returns the Jensen (1968) equation may be biased.[2]

Fama (1972) developed a theoretical model in which he allowed for the separate measurement of the selectivity and market timing components of fund returns. However, this model is hard to put in practice since it requires information that is not readily available: time series of the projections for the target risk level for the fund and expectations of market movements and market allocation strategies of fund managers.

Besides the work from Fama (1972), other authors developed models for that it was only required publicly available information to derive conclusions regarding the individual

[1] The concept of market timing has its foundation on the deliberate action of fund managers to change the risk levels of their portfolios by investing in risky or riskless securities or in higher or lower beta stocks. For an in depth analysis of this subject see for instance Klemkosky and Maness (1978) and Kon and Jen (1979).

[2] See Admati *et al.* (1986) and Grinblatt and Titman (1989a) for other relevant contributions on the distinction of the selection and market timing abilities in terms of the performance evaluation of fund managers.

contributions of selectivity and market timing to fund returns. Treynor and Mazuy (1966) proposed a model to which they added a quadratic term to the Jensen (1968) equation, the square of the market risk premium, in order to capture the effects of market timing decisions. The results, considering 57 open-end funds domiciled in the US market between 1953 and 1962, revealed no evidence that managers had been able, through their forecasts, to beat the market. Lee and Rahman (1990) using the Pfleiderer and Bhattacharya (1983) model found some evidence of positive and significant market timing capacities from US mutual fund managers from 1977 to 1984. Nevertheless, it should be noted that, although this measure is similar to that of Treynor and Mazuy (1966), market timing activity is constrained to be non-negative.

Following on the work from Treynor and Mazuy (1966), Merton (1981) and Henriksson and Merton (1981) proposed a similar model in order to individually assess the contributions of selectivity and market timing. However, instead of a quadratic term, their model incorporates a dummy variable that aims to capture the market timing skill of fund managers when the manager predicts that the stock market will outperform the bond market and when he forecasts that the bond market will provide better returns than the stock market. Henriksson (1984), based on their landmark study, examined the returns and performance of 116 US mutual funds between 1968 and 1980 and found no evidence that fund managers had taken advantage of market timing strategies. However, the results showed that for most of the funds in the study, attempts to predict the market had negative effects on the performance of the portfolios under management. Also that year and applying the same methodology, Chang and Lewellen (1984) evaluated the performance of 67 US mutual funds from 1971 to 1979, and reached similar results as Henriksson.

Several authors have also examined the performance of mutual funds on other markets. Regarding the Greek mutual fund market, Philippas (2002), through the methodologies proposed by Henriksson and Merton (1981) and Treynor and Mazuy (1966), found no evidence of market timing strategies and even reached statistically significant negative estimations for the parameter disclosing this skill. Tripathy (2005) also used both models to empirically assess the performance of Indian mutual funds. Nonetheless, his work did not indicate that managers were engaged in market timing strategies.

In relation to the Portuguese market, Romacho and Cortez (2006) studied the selectivity and market timing skills of managers from a sample of 21 mutual funds from 1996 to 2001. In order to better assess the consistency of their results, the authors used two models to test the two components of the returns: a nonparametric model proposed by Merton (1981), and a parametric model, similar to that used by Henriksson (1984). Based on the empirical results, the authors could not conclude that fund managers exhibited either selectivity or market timing capabilities. They also found a negative market timing coefficient regarding domestic portfolios.

Other investment vehicles than mutual funds have been studied, in particular hedge funds. Hedge funds possess distinct characteristics from mutual funds since they are subject to a lower level of regulation than mutual funds, and, as such, can invest in a wider range of securities and incur in higher leverage levels. They are also less liquid than mutual funds since most of them have a "lockup period" during which they aim to generate returns and investors cannot redeem their investment.

Fung, Xu and Yau (2002) studied a sample of 115 hedge funds covering the period comprised between 1994 and 2000. The authors reached interesting results, which highlighted the reduced capacity of managers of such funds to develop market timing strategies, despite exhibiting excellent selectivity capabilities. They also showed that larger funds managed to reach higher returns, which seemed to indicate that they could be benefiting from economies of scale. However, these findings seem contradictory to the work of Grinblatt and Titman (1989b).

Using both the Henriksson and Merton (1981) and the Treynor and Mazuy (1966) models, Klein *et al.* (2015) examined a sample of 198 Canadian hedge funds from 1998 to 2011. Their work was supported in the idea that Canadian hedge fund managers shall be conscious and have a great deal of knowledge regarding commodity markets since Canada's economy is highly dependent on energy sources. Therefore, they examined the capacity of managers to forecast the movements of the commodity index and reached positive estimates for this parameter. Nevertheless, most of the fund managers displayed a negative market timing skill.

Studies using more robust and complex models have been developed as a testing tool for market timing capabilities. In order to evaluate the market timing capacity of fund managers, Friesen and Sapp (2007) measured the performance of 7,125 US mutual funds from 1991 to 2004 through the Fama and French (1993) three factor model and the model proposed by Carhart (1997)[3], which extends the first measure to four factors. The findings revealed a lower performance when the managers tried to develop market timing strategies against the potential performance they would obtain if they followed a passive strategy to manage their portfolios.

[3] Fama and French (1993) incorporate two parameters in addition to the market factor, the size coefficient consisting on the difference between the returns of small and big capitalization stocks (SMB) and the book-to-market coefficient comprised on the difference between the returns of high and low book-to-market stocks (HML). Carhart (1997) also incorporates an additional parameter, the difference between the past 12-month winners and the past 12-month losers, labelled the momentum factor. (MOM)

The authors quantified that market timing decisions, on average, reduced the annual rate of return at about 1.56%. More recently, He, Cao and Baker (2015) applied the four factor model to examine the performance of 170 actively managed Chinese open-end stock mutual funds between 2001 and 2011. Using the Jensen (1968), Henriksson and Merton (1981) and Treynor and Mazuy (1966) equations they found a higher evidence of negative than positive estimates for the market timing parameter, despite the fact that most of the funds did not display a statistically significant estimate for this coefficient.

Non-parametric models have also been used to test the evidence of market timing skills. For these types of tests it is essential to know the forecasts of managers or, at least, to have a reliable approximation to them. Jiang (2003), by examining the US mutual fund market from 1980 to 1999, found no evidence showing that fund managers incurred into market timing strategies. Cuthbertson, Nitzsche and O'Sullivan (2010) also used a non-parametric test to study the behavior of the returns obtained by UK equity and balanced mutual funds from January 1988 to December 2002 and concluded that, in general, fund managers were bad market timers.

There are other studies that have also made significant contributions to the literature. Bollen and Busse (2001) measured the performance of 230 mutual funds through the use of the models proposed by Henriksson and Merton (1981) and the Treynor and Mazuy (1966). Using both monthly and daily data, the authors found some evidence of the display of market timing abilities by fund managers, which was higher in shorter periods of analysis. Later on, Bollen and Busse (2004) decided to evaluate the returns of mutual funds in shorter periods of analysis. Their findings indicate that abnormal performance was evidenced in shorter periods of time and that it elapsed in longer time frames. Their conclusion was that if a fund exhibits high returns then it generates an inflow of cash which may pose an investment challenge in order to achieve similar rates of return. This would mean that the dynamics associated with the investor cash flows can interfere with mutual fund performance. Other approach has been to incorporate public information. In their work, Ferson and Shadt (1996) labelled these models as conditional models of evaluation. Studying a sample of 67 mutual funds from 1968 to 1990, they found evidence that fund managers alter their portfolio risk levels in response to public information. Controlling for public information suggested that the fund manager’s selectivity abilities are centered on zero and they did not find evidence of negative market timing skills as most studies in the field.

An issue that has also been addressed in this line of research has been the benchmark choice. Using the Henriksson and Merton (1981) and the Chen and Stockum (1986)[4] models to study a sample of 101 UK unit trusts[5], Fletcher (1995) concluded that fund managers exhibited negative market timing skills, despite being good stock pickers. However, although the general findings did not alter due to the choice of benchmark, the results were slightly different depending on the portfolio against which the funds returns were evaluated. Dellva (2001) decided to measure the performance of sector funds since a great number of investors were using them as an investment vehicle. The author intended to verify if the market timing skill of sector fund managers could be captured through general market benchmarks and stated that, while the market timing estimate was negative for most funds irrespective of the benchmark, the selectivity estimates were positively affected by benchmarks that were more closely related with the funds strategy. These results could be related with the findings in the work of Klein *et al.* (2015).

As we have outlined, most of the studies have reached the conclusion that fund managers exhibit negative market timing abilities. We will check if European fund managers have evidenced this skill from 2000 to 2012 and aim to draw conclusions on the results.

[4] The Chen and Stockum (1986) model is similar to Treynor and Mazuy (1966) except that it allows for a time-varying beta parameter.
[5] UK unit trusts have similar characteristics as US open-end mutual funds.

## 3. Methodology

In line with single factor models, we estimated the risk-adjusted performance for each of the funds in the sample through a similar equation than that proposed by Jensen (1968, 1969),

$$Rp(t) - Rf(t) = \alpha p + \beta p\, x(t) + \varepsilon p(t), \tag{1}$$

where *Rp (t)* refers to the monthly rate of return of the *p-th* mutual fund, *Rf (t)* is the risk-free rate, *αp* is the component of the rates of return separate from the systematic risk level, *βp*. The *αp* parameter captures the manager's contribution to the performance of the fund in terms of both his asset selection ability and his foresight and action on market fluctuations.

The possibility of the fund manager to have a conscious action on the management of the *βp* parameter over time is not assessed individually. The variable *x(t)* is the risk premium of the passive portfolio, calculated by the difference between the monthly rates of return of the market benchmark, *Rm(t)* and the risk free rate, so that, *x(t) = [Rm(t) – Rf(t)]*.

*εp (t)* is the residual term of the model for which the following characteristics shall be assumed:

$$E[\varepsilon p(t)] = 0$$

$$E[\varepsilon p(t)|x(t)] = 0$$

$$E[\varepsilon p(t)|\varepsilon p(t-i)] = 0, \qquad i = 1,2,3, \ldots$$

The vast majority of the literature on the evaluation of the relative performance of mutual fund managers are based on models such as the one represented in equation 1, in which only one risk/return benchmark is considered. Due to its simplicity, this model has drawn positive interest in performance measurement terms. Yet, although the single factor model specified in equation 1 evidences a reasonable ability to isolate excess returns given by *αp*[6], it cannot capture the return component resulting from market timing strategies put in place by fund managers.

Merton (1981) and Henriksson and Merton (1981) developed a model that allows the separate and simultaneous estimation of selectivity and market timing abilities exhibited by mutual fund managers. This model considers the managers capacity to anticipate that the stock market will

[6] Chang and Lewellen (1984, p. 60-61) show that if the market timing component is captured, estimates for the value of the *αp* parameter produced by equation 1 incorporate biases, which can overestimate the timing abilities of the most able fund managers to predict the evolution of the market or, instead, underestimate the capacities of the less able managers to forecast market movements.

offer higher returns than the bond market [$x(t) > 0$] or the opposite, that is, to predict that the investment in the bond market will, at least, provide an equivalent return as the stock market [$x(t) \leq 0$], regardless of the magnitude of the differentials.

The authors showed that the sum of the conditional probabilities, $P1(t)$ and $P2(t)$, of an accurate prediction of the market in the next period would be given by,

$P1(t) \equiv$ Prob [prediction $x(t) \leq 0 \mid x(t) \leq 0$]

$P2(t) \equiv$ Prob [prediction $x(t) > 0 \mid x(t) > 0$]

The sufficient condition for the manager's forecasting abilities to add value to the portfolio is that $P1(t) + P2(t) > 1$. In this case, the manager follows a funding allocation strategy to both the stock market and the risk-free market according to the following notion: if at the end of the *t-1* period he expects that $x(t) \leq 0$, then a fraction $\eta_1$ of the asset value under management is invested in the stock market and $(1 - \eta_1)$ in the bond market; inversely, if the manager predicts that $x(t) > 0$, then he affects a fraction $\eta_2$ to the stock market and $(1 - \eta_2)$ to the bond market. Thus, the variable that captures the effect of the management/decision skills of the portfolio manager will be the systematic risk level, $\beta(t)$, and $\eta_1$ and $\eta_2$ are the investment proportion in stocks depending on the evolution of the market, that is, if the market is rising (bull market) or falling (bear market), respectively. Rationally, it is expected that for the perfect market timer $\eta_1 < \eta_2$.

Merton (1981) showed that the return of an investment strategy based on the perfect timing of the market is equivalent to the return from an investment strategy in which the manager affects [$P2\ \eta_2 + (1-P2)\ \eta_1$] percent of the funds to the market portfolio and simultaneously acquires $(P1+P2-1)\ (\eta_2-\eta_1)$ "protective puts" on the market portfolio with an exercise price equal to the risk free rate, $Rf$ and a premium of 0. The remainder of the asset value under management is invested in the bond market.

Based on this framework, Henriksson and Merton (1981) introduced as an innovation the possibility of jointly estimate the asset selectivity and market timing capacities through the following parametric model:

$$Rp(t) - Rf(t) = \alpha p + \beta 1p\ x(t) + \beta 2p\ y(t) + \varepsilon p(t), \tag{2}$$

In equation 2, $\alpha p$ is the excess return of the fund resulting from the selection ability of portfolio managers.

The market timing ability is captured by $\beta 2$ and $y(t)$ = max[0, $Rf(t) - Rm(t)$] = max[0, $-x(t)$]. For samples with a large number of observations *(large-samples),* the probability limits for the estimates of $\beta 1$, $\beta 2$ and $\alpha$, correspond to,

$plim\ \hat{\beta}1$ = P2 $\eta_2$ + (1–P2) $\eta_1$

$plim\ \hat{\beta}2$= (P1+P2–1)($\eta_2$–$\eta_1$)

$plim\ \hat{\alpha} = \bar{R}p - \bar{R}f(t) - plim\ \hat{\beta}1\ \bar{x} - plim\ \hat{\beta}2\ \bar{y},$

The $plim\ \hat{\beta}2$ = (P1+P2–1) ($\eta_2$–$\eta_1$), estimated via Ordinary Least Squares (OLS), appropriately measures the timing capacity of the portfolio manager: $\beta 2$=0 if the manager did not evidence market timing abilities ($P1$+$P2$=1) or did not adjust the components related to the allocation of funds to the portfolio ($\eta_1$=$\eta_2$) according with his forecast, for which the null hypothesis to be tested is defined by H0: $\beta 2$=0. In turn, $plim\ \hat{\alpha} = \bar{R}p - \bar{R}f(t) - plim\ \hat{\beta}1\ \bar{x} - plim\ \hat{\beta}2\ \bar{y},$ allows the test of the stock selection ability through the null hypothesis defined as H0: $\alpha$=0.

Treynor and Mazuy (1966) were the first authors to propose a model that captures market timing activity. The main difference compared between this model and the one proposed by Merton (1981) and Henriksson and Merton (1981), is that it tries to capture the effects of market timing decisions by adding a quadratic term to Jensen's equation. Equation 3 depicts the model specified by Treynor and Mazuy (1966),

$$Rp(t) - Rf(t) = \alpha p + \beta 1p\ x(t) + \beta 2p\ [x(t)]^2 + \varepsilon p(t), \tag{3}$$

Admitting that mutual fund managers can anticipate market movements, then they can hold a greater or lesser proportion of the market portfolio in their assets, depending on the trend of the stock market. A positive and statistically significant value for the estimation of the coefficient associated with the quadratic term ($\beta 2$), indicates that the fund manager added value to the portfolio through the development of a successful market timing strategy. The estimate for $\alpha p$ holds the same properties and shall be interpreted as in equation 2.

As noted by Henriksson and Merton (1981, p. 530) estimates for the coefficients derived through the OLS method are consistent since, for sufficiently large samples,

$$\lim_{N\to\infty}\left[\frac{\sum \varepsilon p(t)}{N}\right] = 0..$$

However, considering the non-stationarity of the $\beta$ parameters reported in equations 1, 2 and 3, the OLS procedure is inefficient due to the potential presence of heteroscedasticity, that is, the standard deviation of the estimation error ($\varepsilon p$) is an increasing function of the independent variable(s) $|\, x(t) \,|$. To detect the presence of heteroscedasticity and first-order autocorrelation of the estimation errors, we used the test proposed by White (1980) and the Lagrange multiplier of Breusch (1978) – Godfrey (1978), respectively. Although we do not report the results of the tests in our work, they showed evidence that residuals are mostly heteroscedastic and autocorrelated, a problem that originates an efficiency loss on the OLS estimators, which could undermine the value of the statistical inferences that were reached. Therefore, we will use the procedures proposed by Newey and West (1987) to correct any autocorrelation and/or heteroscedasticity problems which may arise in the residual terms of the regressions.

## 4. Data

The sample of funds used in this study was obtained from the Bloomberg database, which provides monthly values, in euros, for the participation units of a significant number of mutual funds domiciled in Europe between 2000 and 2012. However, we have not taken into account in our sample the funds that disappeared or were merged/integrated into other funds. Thereby, our sample is not completely free from the survivorships bias since it only considers the funds with uninterrupted rates of return between December 1999 and December 2012 in order to derive monthly rates of return for every month in each of the years, resulting in a total of 156 monthly rates of return.

While there may be multiple investment classes that present the same characteristics and are managed by the same fund managers within the same mutual fund, we removed these classes from the sample in order to avoid possible biases due to the calculation of multiple returns that refer to the same background. Consequently, we kept only the main asset class (typically the asset class with an average asset value under management of at least 80% of the total asset value of the fund). Consequently, the sample was comprised of 193 actively managed open-end mutual funds classified according to the following asset classes: value (35), growth (69) and mixed (89) funds, according to the Fama and French (1992, 1993) Book-to-Market (BtM) classification. On the other hand, taking into account the funds strategy in terms of the target company size, the sample is divided in small or mid-cap (63) and large cap (130) funds. The classification that was followed was proposed by Morningstar. At the end of December 2012, the net asset value (NAV) of the funds in the sample amounted to 79.5 billion euros. The regional extent of the investment policies for the selected funds was the greater Europe.

We excluded from our sample closed-end mutual funds, funds of funds and funds that focus on index trading. Since we only consider actively managed open-end mutual funds in our study, our sample of funds allows for the consistently examination of the economical and statistical significance of the selectivity and market timing abilities exhibited by fund managers.

After applying the described filters, on the 31st of December of 2012, our sample covered 68% of the total funds with similar characteristics available in the Bloomberg database and 80% of the net asset value under management. Growth funds are more represented in terms of the number of funds in the sample (81%), while if we take into account the net asset value, value funds have a higher stake in the sample (88%). Considering the funds strategy in relation to the target company size, we verify that small and mid-cap funds are more relevant in the sample, since they represent 87% of the total of funds in the sample. The sample stratification is detailed in Table 1.

**Table 1. Investment funds sample stratification**

| | Total | Value Funds | Growth Funds | Mixed Funds | Samll and Mid-cap Funds | Large cap Funds |
|---|---|---|---|---|---|---|
| Number of funds | 193 | 35 | 69 | 89 | 63 | 130 |
| % of the sample | 68% | 81% | 72% | 62% | 68% | 68% |
| NAV ($10^6$ €) | 79,486 | 9,163 | 27,745 | 42,579 | 14,028 | 65,458 |
| % of the sample | 80% | 76% | 88% | 76% | 87% | 78% |
| Age (years) | 18.0 | 19.8 | 18.6 | 16.9 | 16.8 | 18.6 |

NAV refers to the net asset value of the funds considered in the samples after applying the filters to the Bloomberg database. The percentage in relation to the sample (% of the sample) refers to the weight of the funds with the outlined characteristics in relation to the filtered Bloomberg database. Age accounts for the number of years that the funds have been in activity.

The average age of the funds included in the sample is 18 years ranging from a maximum of 56 to a minimum of 12. Half of the funds in the sample have over 15 years of activity. Value and growth funds are amongst the oldest funds. In what concerns the target company's size, large cap stock funds present the highest average age. Funds that cross the attributes value/large cap and growth/large cap report an average age of 21 and 20 years, respectively. In opposition, growth/small and mid- cap funds possess the lowest average age, 16 years.

Once we obtained the monthly net value of the participation units of each fund through Bloomberg's database, we proceeded with the calculation of the respective returns. In order to use gross rates of return we calculated, for each month, the logarithmic differences of the value of the participation units added to one-twelfth of the annual expenditure incurred the funds.[7]

After the outburst of the international financial crisis in the United States and Great Britain in mid-2007, we observed the proliferation of its effects on other European markets. With the start of the sovereign debt crisis, financial markets have been through a period with a high level of uncertainty that, given the volatility levels, reflect distinct investment conditions than in previous periods. Therefore, we decided to split the total observation period into two subsets: the pre-crisis period, between January 2000 and July 2007 and the period of the international economic and financial crisis after August 2007. Table 2 illustrates, in Panel A, the monthly average rates of return for both the entire observation period and the two subsets in the sample.

[7] The total expense ratio, or in other terms, the ratio between the total amount of fees and the net asset value of the funds, was used to estimate the management fees. This information was retrieved through the *Lipper for Investment Management* (*Lipper IM*) database. The commission fees were taken into account when it was not possible to retrieve this information. Both for the *total expense ratio* as for the commission fees, the value assumed for each fund was the historical mean value disclosed through the database for each of the funds in the sample.

**Table 2. Monthly average rates of return**

| | 2000-2012 | 2000-2007:7 | 2007:8-2012 |
|---|---|---|---|
| *Panel A*: Monthly rates of return | | | |
| Mean | 0.0461% | 0.2496% | -0.2388% |
| 1st quartile | -0.1096% | 0.0352% | -0.3749% |
| Median | 0.0441% | 0.2489% | -0.2362% |
| 3rd quartile | 0.2171% | 0.4428% | -0.0799% |
| Minimum | -0.6251% | -1.0045% | -1.3045% |
| Maximum | 0.8193% | 1.9489% | 0.5614% |
| Std deviation | 0.2498% | 0.3963% | 0.2692% |
| *Panel B*: Two tail test to the mean differences (*t-stat*) | | | |
| 2000-2012 | | -6.0348 | 10.7758 |
| 2000-2007:7 | | - | 14.1620 |

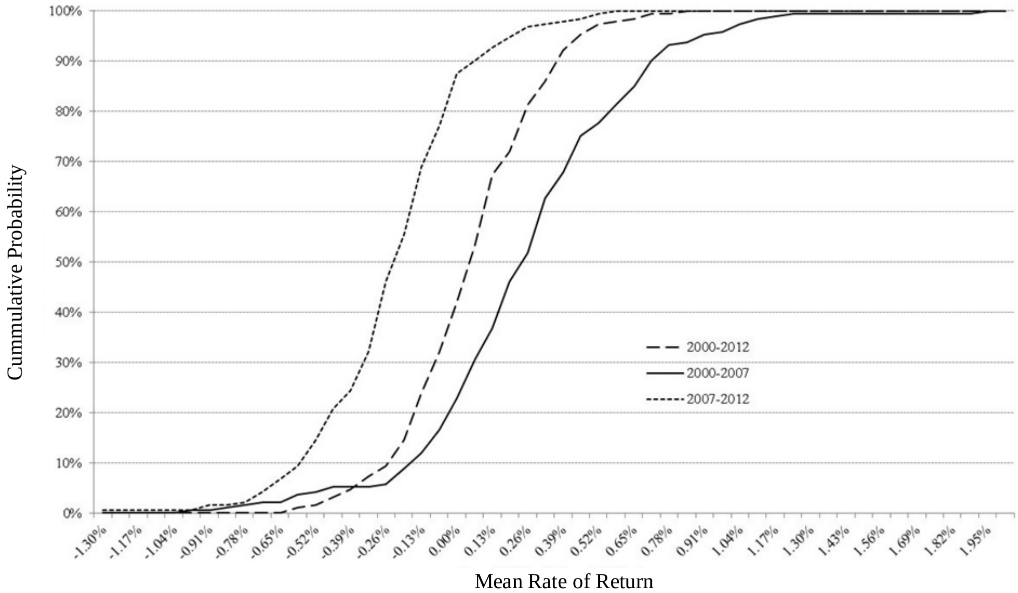
Panel A depicts the distribution of the monthly average rates of return from 2000 to 2012 and for each of the subsets examined: the pre-crisis period, between January 2000 and July 2007 (2000-2007:7), and the period of the financial crisis, after August 2007 (2007:8-2012). Panel B outlines the t-stat of the mean differences between the monthly average rates of return considered for each period, assuming dissimilar variance values. The null hypothesis considers that the mean difference is equal to 0.

As it is documented in Panel B of Table 2, the differences between the monthly average rates of return are statistically significant for both subsets subject of study which indicates that a structural change has occurred between the observations in the two subsets. As expected, higher average rates of return were observed in the pre-crisis than those observed in the period of the financial crisis. The lower dispersion of the average rates of return in the crisis period points out to the fact that most of the funds in the sample achieved negative returns between August 2007 and December 2012.

Figure 1 shows the cumulative distribution of the rates of return. This figure allows us to compare, by the first order stochastic differences, the monthly average rates of return of the funds in the sample for each of the subsets.

It is clear to see the difference of performances presented in relation to the pre-crisis period and the period of the international crisis. The rates of return that were possible for investors to reach were higher between January 2000 and July 2007 than those after that period.

**Figure 1. Comparison of the monthly average rates of return using the first order stochastic dominance**




In Figure 1, 2000-2007:7 refers to the pre-crisis period, which is comprised between January 2000 and July 2007, while 2007:8-2012 refers to the period of the international economic and financial crisis, after August 2007.

The calculation of the monthly returns of the benchmark used as the market portfolio followed the same methodology that was applied to the calculation of the returns for each of the funds. The benchmark that was chosen was the MSCI-TGR stock index for three reasons. First, it is an index that consists of the weighted average of stock prices. Second, it is a benchmark that incorporates the income from dividend payments. Monthly rates of return calculated for the funds and the benchmark include, consistently, dividends and capital gains. At last, it is sufficiently comprehensive in geographic terms as it is comprised of stock from companies scattered throughout Europe.

Since the rates of government bonds are specific for each European country, the risk-free rate was derived from the one-month Euribor rate. The implied one-month Euribor rates were transformed into discount factors, $B_0$. For consistency purposes related to the calculation of the returns of the funds and the market portfolio, the monthly risk-free interest rate was derived from the logarithmic differences between the monthly discount factors so that,

$$Rf(t) = lnB_0(t) - lnB_0(t-1), \quad (4)$$

## 5. Results

In this section we report the risk-adjusted performance evidenced by European investment funds between January 2000 and December 2012. Foremost, the model specified in equation 1 will enable us to estimate the performance of the mutual fund managers of the sample assuming the absence of market timing activity. Then we will examine the effects of market timing decisions of mutual fund managers by isolating the selectivity and market timing components of the performance of the funds through the model proposed by Henriksson and Merton (1981) as it is described in equation 2. At last, we measured the separate contributions of the selectivity capabilities and market timing skill of mutual fund managers through the Treynor and Mazuy (1966) model as described in equation 3.

### 5.1. Performance assuming the absence of market timing activity

Table 3 displays the regression statistics obtained through the estimation of equation 1. As pointed out in previous studies, if we ignore that managers exhibit market timing skills, the estimates obtained for the $\alpha$ coefficient tend, on average, to be negative and statistically significant for the entire period of the sample and for the period of the financial crisis.

**Table 3. Results assuming the absence of market timing activity**

| | 2000-2012 | | 2000-2007:7 | | 2007:8-2012 | |
|---|---|---|---|---|---|---|
| Mean: | | | | | | |
| $\alpha$ (*p-value*) | -0.00038 | (0.0429) | -0.00008 | (0.3829) | -0.00077 | (0.0001) |
| $\beta$ (*p-value*) | 0.997 | (0.0000) | 0.989 | (0.0000) | 1.003 | (0.0000) |
| $R^2$ | 0.777 | | 0.749 | | 0.834 | |
| Number of funds: | 193 | | 193 | | 193 | |
| Rejects $\alpha$=0 at 5% | 7 + | 15 - | 12 + | 18 - | 3 + | 8 - |
| Rejects $\alpha$=0 at 1% | 1 + | 10 - | 7 + | 8 - | 0 + | 3 - |
| $\alpha > 0$ | 79 | | 93 | | 71 | |

Table 3 presents the estimates for the coefficients of the model specified in equation 1, for the entire period of the sample, from 2000 to 2012, and for each of the subsets examined: the pre-crisis period, between January 2000 and July 2007 (2000-2007:7), and the period of the financial crisis, after August 2007 (2007:8-2012). Rows 5 and 6 indicate the number of estimated coefficients that present either a positive or negative sign, and for which it was possible to reject the null hypothesis. For example, 7 funds presented a positive estimate for the $\alpha$ parameter from 2000 to 2012, which was statistically significant with a confidence level equal or greater than 95%. The last row presents the percentage of funds with $\alpha > 0$ in comparison with the total number of funds. The *p-values* refer to the statistical significance of the mean values presented.

In the period before the crisis, the mean value for $\alpha$ is not statistically different from zero. For the period comprised between 2000 and 2012, we can see that 79 out of 193 funds present a positive selectivity ability. However, it should be noted that the estimate of $\alpha > 0$ is statistically significant at the 5% level for only 7 of these funds. As expected, the performance of mutual fund managers was better in the pre-crisis period where 93 funds display a positive $\alpha$ estimate, among whom 12 are statistically significant at the 5% level (this value decreases to 7 if we lower the significance level to 1%). After August 2007, only 3 funds displayed a positive and statistically significant selectivity estimate.

It should be noted that either for the entire period of the sample and for both of the subsets considered, the number of funds that present a negative performance ($\alpha < 0$) is considerably higher than those that present a positive performance ($\alpha > 0$), regardless of whether the respective estimates are statistically significant.

These results are in line with those presented by several authors, in particular, Henriksson (1984), Romacho and Cortez (2006) and Ferreira *et al*. (2013)[8]-which have also reported, for different markets and periods of time, very low performance estimates in their studies. In summary, the estimates found for the $\alpha$ parameter from 2000 to 2012 period seem to suggest that European mutual fund managers revealed a poor performance in terms of their asset selection ability.

### 5.2. Performance assuming the presence of selectivity and market timing activity using the Henriksson and Merton (1981) model

As described in section 3, Henriksson and Merton (1981) developed an alternative model to that proposed by Jensen (1968) for measuring the performance of mutual funds. This model is specified in equation 2 and, although similar, allows for the decomposition between the selectivity ability, $\alpha$, and the market timing capacity, $\beta 2$.

Table 4 summarizes the results achieved for the estimates for the coefficients through equation 2. Comparing the results presented in Table 4 with the results of equation 1 we can observe that, on average, the selectivity ability measured by the $\alpha$ parameter estimate is slightly higher, which suggests that the ability to time the market has been the main reason for the poor performance. In fact, if fund managers are in general poor market timers, equation 1 will tend to underestimate the return component influenced by the selection of undervalued assets, which, in that case, shall be considered to be the solemn responsible for the negative performance. Therefore, equation 2, by allowing the breakdown of the excess return into two components, is more appropriate to evaluate the selectivity ability of mutual fund managers.

[8] Ferreira *et al*. (2013) have found a monthly average estimate of -0.01% for the $\alpha$ parameter for the period between 1997 and 2007 regarding investment funds from 14 European countries through the Carhart (1997) four factor model.

**Table 4. Results assuming the presence of selectivity and market timing activity using the Henriksson and Merton (1981) model**

| | 2000-2012 | | 2000-2007:7 | | 2007:8-2012 | |
|---|---|---|---|---|---|---|
| Mean | | | | | | |
| $\alpha$ (*p-value*) | 0.00023 | (0.3187) | -0.00072 | (0.1367) | 0.00125 | (0.0014) |
| $\beta 1$ (*p-value*) | 0.977 | (0.0000) | 1.011 | (0.0000) | 0.944 | (0.0000) |
| $\beta 2$ (*p-value*) | -0.033 | (0.0000) | 0.036 | (0.0432) | -0.100 | (0.0000) |
| Adj. $R^2$ | 0.776 | | 0.747 | | 0.832 | |
| Number of funds: | 193 | | 193 | | 193 | |
| Rejects $\alpha$=0 at 5% | 11 + | 15 - | 11 + | 20 - | 8 + | 4 - |
| Rejects $\alpha$=0 at 1% | 6 + | 6 - | 4 + | 7 - | 2 + | 2 - |
| Rejects $\beta 2$=0 at 5% | 5 + | 12 - | 10 + | 8 - | 6 + | 12 - |
| Rejects $\beta 2$=0 at 1% | 2 + | 3 - | 5 + | 3 - | 2 + | 4 - |
| $\alpha > 0$ | 92 | | 83 | | 107 | |
| $\beta 2 > 0$ | 82 | | 118 | | 61 | |
| Correl ($\alpha$, $\beta 2$) | -0.87 | | -0.82 | | -0.86 | |

Table 4 presents the estimates of the coefficients of the model specified in equation 2 for the entire period of the sample, from 2000 to 2012, and for each of the subsets examined: the pre-crisis period, between January 2000 and July 2007 (2000-2007:7), and the period of the financial crisis, after August 2007 (2007:8-2012). Rowa 6 to 9 indicate the number of estimated coefficients that present either a positive or negative sign, and for which it was possible to reject the null hypothesis. For example, 11 funds presented a positive estimate for the $\alpha$ parameter from 2000 to 2012, which was statistically significant with a confidence level equal or greater than 95%. The last two rows presents the percentage of funds with $\alpha > 0$ and $\beta 2 > 0$ in comparison with the total number of funds. The *p-values* refer to the statistical significance of the mean values presented.

The results of the estimation of equation 2 show that, on average, mutual fund managers lack the capacity to anticipate market movements. As we can observe, 112 funds (58%) present negative market timing estimates. Assuming that fund returns follow a normal distribution alongside market returns, only 5 funds exhibit a positive estimate for $\beta 2$ with a maximum significance level of 5% (this value drops to 2 funds if we consider a 1% significance level). However, it should be noted that in the pre-crisis period the number of funds with $\beta 2 > 0$ rose to 118, from which 10 reject the null hypothesis with a significance level of 5%. In this period, the number of funds with $\beta 2 > 0$ is higher than the number of funds with $\beta 2 < 0$, both for the entire period of the sample as for the subset for which the null hypothesis, $\beta 2 = 0$ is rejected (10 and 8 with a positive and negative $\beta 2$, respectively).

In the financial crisis period, the effect of the selectivity component on the performance of the funds was the highest in the sample since 106 funds denote a positive value for the $\alpha$ coefficient and, on average, this parameter holds a positive and statistically significant value of approximately 0.125% per month. Only 1 fund presents a positive and statistically significant (with a 1% significance level) estimate for $\beta 2$ for both the subsets. None of the 5 funds whose estimates for a positive $\beta 2$ with a significance level of 5% in the first subset achieved a positive performance in the period of the financial crisis.

The correlation between the $\alpha$ and the $\beta 2$ coefficients is negative, both for the entire period of the sample as for the two subsets. From 2000 to 2012, of the 92 funds that reached a positive estimate for the $\alpha$ coefficient, 83 exhibited a negative estimate for the $\beta 2$ coefficient, while 73 of the 101 funds with negative estimates for the $\alpha$ coefficient also had positive estimates for $\beta 2$. For the subset between January 2000 and July 2007, from the 83 funds that presented a positive estimate for the $\alpha$ parameter, 27 revealed a positive estimate for the $\beta 2$ parameter and from the 110 funds with a negative estimate for $\alpha$, 91 presented a positive $\beta 2$. On the other hand, for the subset between August 2007 and December 2012 from the 107 funds with a positive estimate for the $\alpha$ coefficient, only 3 had a positive estimate for $\beta 2$ and from the 86 funds with a negative estimate for $\alpha$, there were 58 positive estimates for $\beta 2$.

In summary, the results reported in Table 2 suggest that, on average, the performance of managers is poor. Nevertheless, in the period before the crisis, mutual fund managers seemed to have a better ability to predict market movements while in the period of the international financial crisis they revealed better asset selection skills. The strong negative correlation between the $\alpha$ and $\beta 2$ estimates suggest that the forecast of market movements and market anticipation skills have been the primary driver of the poor performance exhibited.

### 5.3. Performance assuming the presence of selectivity and market timing activity using the Treynor and Mazuy (1966) model

Treynor and Mazuy (1966) conceived a model that extends the one developed by Jensen (1968) by adding a quadratic term to measure the contribution of market timing strategies developed by mutual fund managers. The results obtained through the estimation of the Treynor and Mazuy (1966) equation seem to reinforce the idea that mutual fund managers lack selectivity and market timing skills. Table 5 reports the results for the estimates obtained for the parameters of equation 3.

**Table 5: Performance assuming the presence of selectivity and market timing activity using the Treynor and Mazuy (1966) model**

| | 2000-2012 | | 2000-2007:7 | | 2007:8-2012 | |
|---|---|---|---|---|---|---|
| Mean | | | | | | |
| $\alpha$ (*p-value*) | 0.00043 | (0.1018) | -0.00011 | (0.3820) | 0.00109 | (0.0001) |
| $\beta 1$ (*p-value*) | 0.985 | (0.0000) | 0.990 | (0.0000) | 0.981 | (0.0000) |
| $\beta 2$ (*p-value*) | -0.354 | (0.0000) | 0.012 | (0.0000) | -0.694 | (0.0000) |
| Adj. $R^2$ | 0.777 | | 0.747 | | 0.835 | |
| Number of funds: | 193 | | 193 | | 193 | |
| Rejects $\alpha$=0 at 5% | 17 + | 17 - | 14 + | 20 - | 8 + | 5 - |
| Rejects $\alpha$=0 at 1% | 7 + | 7 - | 6 + | 9 - | 3 + | 1 - |
| Rejects $\beta 2$=0 at 5% | 4 + | 20 - | 11 + | 7 - | 7 + | 36 - |
| Rejects $\beta 2$=0 at 1% | 1 + | 6 - | 5 + | 3 - | 2 + | 15 - |
| $\alpha > 0$ | 97 | | 85 | | 113 | |
| $\beta 2 > 0$ | 61 | | 102 | | 46 | |

Table 5 presents the estimates of the coefficients of the model specified in equation 3 for the entire period of the sample, from 2000 to 2012, and for each of the subsets examined: the pre-crisis period, between January 2000 and July 2007 (2000-2007:7), and the period of the financial crisis, after August 2007 (2007:8-2012). Rowa 6 to 9 indicate the number of estimated coefficients that present either a positive or negative sign, and for which it was possible to reject the null hypothesis. For example, 17 funds presented a positive estimate for the $\alpha$ parameter from 2000 to 2012, which was statistically significant with a confidence level equal or greater than 95%. The last two rows presents the percentage of funds with $\alpha > 0$ and $\beta 2 > 0$ in comparison with the total number of funds. The *p-values* refer to the statistical significance of the mean values presented.

In fact, between January 2000 and December 2012, 97 funds displayed positive selectivity, of which only 17 were statistically significant considering a significance level of 5%. The expectation that mutual fund managers were more successful in the selection of undervalued assets at the time of the crisis (113 funds displayed a positive $\alpha$ estimate) than in the pre-crisis period (85 funds evidenced a positive $\alpha$ estimate) was confirmed, regardless of whether the number of funds with a statistically significant and positive $\alpha$ parameter being lower in the crisis, of 8 and 14 funds, respectively.

As for the ability to predict market movements, the results are very similar to those obtained through the Henriksson and Merton (1981) model, that is, from the 193 funds in the sample only 61 present a positive estimate for $\beta 2$ and this number is higher (102) in the pre-crisis period than in the period of the crisis, confirming that it is more difficult to predict the market in times of greater uncertainty.

## 6. Robustness check

We performed a robustness check of the results presented in Tables 3, 4 and 5 through the development of a test that aimed to qualitatively confirm the absence of market timing strategies put in place for most of the 193 European mutual funds from January 2000 to December 2012. We carried this test by examining the consistency of the results in our study through a model that checks the impact of an additional factor in the Henriksson and Merton (1981) model.

It has been defended that the results may incorporate errors arising from the process that generates rates of return—through equations 2 and 3—and present specification issues. Thereby, it is likely that we omitted relevant factors in this process. If we could identify these factors and incorporate them in the models we expect the decrease of the possible bias of our estimates.

Henriksson (1984) suggested the use of a multifactor model which consists of adding a variable to equation 2. This variable would allow to test the influence of the omission of a relevant factor in the results of the model on the influence of the market factor. So, we built up a factor representing the risk premium of a theoretical portfolio consisting of the aggregate of all funds present in the sample. Formally, the factor added to the equation 2, *w(t)*, is defined by,

$$w(t) = z_{ew}(t) - \beta_{ew} x(t), \tag{5}$$

where $z_{ew}(t)$ is the risk premium of the theoretical portfolio consisting of the equitable weighted representation of the 193 funds, for the $t$ period and $\beta_{ew}$ is the estimate of the coefficient associated with the market risk premium, derived through the OLS method using the following regression,

$$z_{ew}(t) = \alpha_{ew} + \beta_{ew}\, x(t) + \epsilon_{ew}(t), \tag{6}$$

The estimates for the coefficients of equation 6, $\alpha_{ew}$ and $\beta_{ew}$, obtained through the OLS procedure, are summarized in Table 6. $w(t)$, as defined in equation 5, is used as a proxy of the relevant factor(s) possibly omitted in the Henriksson and Merton (1981) model. The regression specification used for the omission test of relevant factor (s) using a multiple-factor model was the following:

$$Rp(t) - Rf(t) = \alpha p + \beta 1p\, x(t) + \beta 2p\, y(t) + \gamma 1p\, w(t) + \gamma 2p\, v(t) + \varepsilon p(t), \tag{7}$$

where, $v(t) = \max[0, -w(t)]$. The specification of equation 7 allows the identification of the presence of market timing strategies associated with the common factor ($\gamma 2$) or the market portfolio ($\beta 2$).

**Table 6: Results of the estimation of the parameter of equation 6**

| | 2000-2012 | 2000-2007:7 | 2007:8-2012 |
|---|---|---|---|
| $\alpha_{ew}$ | -0.0004 | -0.00008 | -0.0077 |
| Standard error | 0.00123 | 0.00170 | 0.00179 |
| $\beta_{ew}$ | 0.9966 | 0.9892 | 1.0034 |
| Standard error | 0.0258 | 0.0384 | 0.0341 |

This table illustrates the estimates for the coefficients of equation 6,

$$z_{ew}(t) = \alpha_{ew} + \beta_{ew}\, x(t) + \epsilon_{ew}(t),$$

for the entire period of the sample, from 2000 to 2012, and for each of the subsets examined: the pre-crisis period, between January 2000 and July 2007 (2000-2007:7), and the period of the financial crisis, after August 2007 (2007:8-2012).

The results of the estimation of equation 7 are reported in Table 7. Both for the entire period of the sample as for the two subsets, the common factor seems to be an important driver in order to explain the returns of most of the funds in the sample.

**Table 7: Performance assuming the presence of selectivity and market timing activity using a multifactor model**

| | 2000-2012 | | 2000-2007:7 | | 2007:8-2012 | |
|---|---|---|---|---|---|---|
| Mean | | | | | | |
| $\alpha$ (*p-value*) | 0.00048 | (0.0057) | 0.00051 | (0.0077) | 0.00047 | (0.0047) |
| $\beta$1 (*p-value*) | 0.9840 | (0.1910) | 0.9770 | (0.2645) | 0.9923 | (0.2245) |
| $\beta$2 (*p-value*) | -0.0564 | (0.1702) | -0.0430 | (0.2130) | -0.0676 | (0.2271) |
| γ1 *(p-value)* | 1.01138 | (0.7651) | 1.00142 | (0.8990) | 1.0256 | (0.6631) |
| γ2 *(p-value)* | 0.0173 | (0.5167) | -0.0017 | (0.6056) | 0.0370 | (0.5803) |
| Number of funds: | 193 | | 193 | | 193 | |
| Rejects $\alpha$=0 at 5% | 29 + | 25 - | 35 + | 39 - | 8 + | 12 - |
| Rejects $\alpha$=0 at 1% | 12 + | 11 - | 16 + | 17 - | 0 + | 4 - |
| Rejects $\beta$2=0 at 5% | 2 + | 12 - | 7 + | 18 - | 8 + | 13 - |
| Rejects $\beta$2=0 at 1% | 1 + | 2 - | 3 + | 7 - | 3 + | 4 - |
| Rejects γ1=0 at 5% | 162 + | 0 - | 160 + | 0 - | 162 + | 1 - |
| Rejects γ1=0 at 1% | 148 + | 0 - | 144 + | 0 - | 148 + | 1 - |
| Rejects γ2=0 at 5% | 9 + | 13 - | 18 + | 15 - | 8 + | 3 - |
| Rejects γ2=0 at 1% | 2 + | 1 - | 9 + | 5 - | 3 + | 0 - |
| $\alpha > 0$ | 95 | | 96 | | 96 | |
| $\beta 2 > 0$ | 67 | | 83 | | 74 | |
| γ1 > 0 | 189 | | 188 | | 180 | |
| γ2 > 0 | 118 | | 116 | | 111 | |

Table 7 presents the estimates of the coefficients of the model specified in equation 7 for the entire period of the sample, from 2000 to 2012, and for each of the subsets examined: the pre-crisis period, between January 2000 and July 2007 (2000-2007:7), and the period of the financial crisis, after August 2007 (2007:8-2012). Rowa 7 to 14 indicate the number of estimated coefficients that present either a positive or negative sign, and for which it was possible to reject the null hypothesis. For example, 29 funds presented a positive estimate for the $\alpha$ parameter from 2000 to 2012, which was statistically significant with a confidence level equal or greater than 95%. The last four rows presents the percentage of funds with $\alpha > 0$, $\beta 2 > 0$, $\gamma 1 > 0$ and $\gamma 2 < 0$, in comparison with the total number of funds. The *p-values* refer to the statistical significance of the mean values presented.

Effectively, for the three periods reported in Table 7, the number of funds with a positive estimate for the $\gamma 1$ coefficient is of 190 (162 are statistically significant), 188 (160 are statistically significant) and 180 (162 are statistically significant), respectively. On the other hand, considering a significance level of 1%, only 1 fund displays a negative estimate for the $\gamma 1$ coefficient (this estimate refers to the period of the financial crisis). These results suggest that the majority of European mutual fund managers follow similar portfolio management strategies. This phenomenon, named in the behavioral finance literature as 'herd behaviour' by Shiller (2000, pp. 148-168), has been identified in several financial markets, notably in the mutual fund industry in Portugal—Romacho and Cortez (2006) and Lobão and Serra (2002)—or in the stock market in Spain—Agudo, Sarto and Vicente (2008).

Considering the entire period of the sample, only 9 of the 193 funds in the sample achieved a significant and positive estimate for the $\gamma 1$ coefficient, while 13 evidenced a significant and negative estimate, which denotes reduced market timing skills in relation to the common factor. In the pre-crisis period we found statistically significant positive and negative estimates in 18 and 15 funds, respectively, while in the period of the crisis, 8 and 3 funds exhibited statistically positive estimates.

The results of the test to the specification and/or omission of relevant factor(s) allow one to draw conclusions that are in line with those reported in similar tests used by Henriksson (1984) or Romacho and Cortez (2006), regarding the North-American and Portuguese mutual fund industry, respectively. In fact, in the present study the regression of the multifactor model given by equation 7, also altered the estimates for the $\alpha$ e and the $\beta 2$ parameters reached through the regression of the single-factor model specified in equation 2. This finding may indicate that the benchmark employed is not sufficiently representative of the universe of European mutual funds[9] and/or that other relevant factors, in addition to the market portfolio, have been omitted.

[9] The choice of benchmark has been identified as a possible cause for the poor market timing estimates presented in most studies. For more details on this subject check Grinblatt and Titman (1989a).

## 7. Conclusion

The empirical results reached through the use of the models proposed by Merton (1981), Henriksson and Merton (1981) and Treynor and Mazuy (1966) do not support the hypothesis that European fund managers have successfully developed strategies that would anticipate market movements. Considering the period comprised between January 2000 and December 2012, only five funds denoted a positive and statistically significant estimate regarding the parameter disclosing the market timing ability. Only one fund confirmed the positive estimate for the market timing parameter in the two subsets that resulted from the partition of the entire period of the sample. The division of the sample into two subsets aimed to isolate the effects of the international economic and financial crisis and we show that mutual fund managers exhibited negative selectivity capacities and positive market timing skills in the pre-crisis period and the opposite in the period of the financial crisis. This is consistent with the notion that managers have an harder task in terms of forecasting the market in periods of higher volatility in financial markets.

The results of our study also evidenced that abnormal returns depicted by the Jensen (1968) model are negatively affected by the action of fund managers on their predictions of market movements. This statement is valid for estimates with the Henriksson and Merton (1981) and the Treynor and Mazuy (1966) models and is akin to research from other authors such as Chang and Lewellen (1984), Henriksson (1984) and Lee and Rahman (1990).

The negative performance exhibited by mutual fund managers may raise questions since it seems to indicate that fund managers should not incur in actions to time the market in order to achieve superior returns and should, therefore, follow a simple buy-and-hold strategy. One of the issues that has been debated concerns the appropriateness of the frequency of data used in the study. Bollen and Busse (2001) verified that the use of daily data improved the number of funds with positive and statistically significant market timing coefficient. Accordingly, the use of daily or high frequency data on European mutual fund returns could retrieve different results than the ones presented in our work.

Another possible explanation for the results that we reached could be related with the choice of benchmark. Dellva *et al.* (2010) reached quite different results through the analysis of the selectivity and market timing estimates with respect to three distinct indexes which can indicate that the selection of the benchmark has the potential to incorporate biases in the estimates. Therefore, it could be interesting to use other indexes as the market portfolio, particularly if we take into account that although the funds in our sample are domiciled in Europe, we are not aware that they suffer from geographical investment constraints.

Overall our results are in line with those presented by other authors, including the studies from Henriksson (1984), Chang and Lewellen (1984), Treynor and Mazuy (1966), or more recently, Fletcher (1995), Fung, Xu and Yau (2002), Philippas (2002), Tripathy (2005), Romacho and Cortez (2006) and Cuthbertson, Nitzsche and O'Sullivan (2010). Since a strong correlation factor was observed between $\alpha$ and $\beta 2$, we performed a robustness check to the specification and/or omission of relevant explanatory variables in the model specified in equation 2. The test allowed for the validation of the hypothesis of a common risk factor to all funds, that is, the estimates for the market timing ability of fund managers should be interpreted with caution since they were based on a single factor model to capture simultaneously the market timing and selectivity effects. This task is left out for further developments on this subject.

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