
# Do Portuguese mutual funds display forecasting skills?

## A study of selectivity and market timing ability

**Nuno Neto**

110417013@fep.up.pt

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**Supervisor**

**Professor Júlio Fernando Seara Sequeira da Mota Lobão**

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# Biography

Nuno Manuel Veloso Neto was born in Vila Nova de Famalicão in 1986. In 2004 initiated a degree in Business Management at University of Minho which he concluded in 2008.

As part of his professional ambitions, in 2009 he initiated an international professional experience in Poland as Fixed Income Data Analyst at Thomson Reuters. The permanent interest to enhance the knowledge of capital markets led him to pursue a Master in Finance in 2011 at School of Economics and Management, University of Porto.

Currently he works in London at Thomson Reuters, as a Fixed Income Market Development for Middle East, Africa and Russia/CIS.

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# Abstract

This study extends the international empirical research of selectivity and market timing by evaluating the performance of 51 Portuguese mutual funds from June 2002 until March 2012. The estimation of the sample performance is measured by applying Jensen's (1968), Treynor and Mazuy's (1966) and Henriksson and Merton's (1981) models. Besides applying the unconditional version of the aforementioned models, we use European informational variables to estimate the conditional version of Treynor and Mazuy's (1966) and Henriksson and Merton's (1981) market timing models.

The results suggest that the Portuguese mutual funds in general do not possess selectivity nor timing skills. These components of performance present high negative correlation meaning that fund managers are not capable of identifying underpriced stocks and time the market simultaneously. However, regardless the model used, the domestic equity funds exhibit market timing ability, which is consistent with the distance effect. Funds investing locally present higher timing capabilities. Furthermore, the observable fund's characteristics and market cycles were used to try to predict their performance. We found some evidence that older funds are better stock pickers than younger funds while size effect seems not to play a clear role on the performance results. The market cycles present a stronger relationship with performance components as a sample of funds managed to time the market during bear markets and to select underpriced stocks during bull markets.



**Keywords:** Portuguese Mutual Funds, Performance Evaluation, Selectivity, Market Timing, Conditional Information.

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# Abbreviations

ADF – Augmented Dickey Fuller

APFIPP – Portuguese Association of Investment Funds, Pension Funds and Asset Management

CAPM – Capital Asset Pricing Model

CMVM – Portuguese Securities Market Commission

CWM – Conditional Weight Measure

EMH – Efficient Market Hypothesis

EMU – European Monetary Union

EU – European Union

EURIBOR – Euro Interbank Offered Rate

FED – Federal Reserve System

HM – Henriksson and Merton (1981)

MSCI – Morgan Stanley Capital International

OLS – Ordinary least-squares

PSI 20 – Portuguese Stock Index 20

TIB –Technical Indicator Benchmark

TM – Treynor and Mazuy (1966)

# 1. Introduction

The performance and strategy of mutual funds is probably one of the most interesting topics in Finance and has always been discussed by both academics and practitioners. Active versus passive investment management has generated countless discussions about which one generates superior returns, being still an open question. The active management strategy of investing aims to obtain abnormal returns, beating the index to which it relates by selecting stocks and anticipating changes in the market conditions.

The performance evaluation has progressed significantly since the first measures of performance developed by Treynor (1965), Sharpe (1966) and Jensen (1968) with "risk adjusted indicators". According to Fama (1972) performance measurement can be divided in two components: microforecasting (selectivity ability) and macroforecasting (market timing ability). Market timing refers to a strategy of trying to anticipate future market movements by adjusting funds' portfolio between risky and riskless assets. On the other hand selectivity refers to picking stocks undervalued that anticipate favourable price movements relative to stocks in general.

The majority of empirical research clearly states that in general fund managers performed poorly when compared to the market and do not possess either stock picking or timing skills. More recently an extension of those studies was created to address the importance of public information available on the performance measurement. Informational variables such as the dividend yield and interest rates permit expected returns and systematic risk to be time-varying thus allowing for a better assessment of performance based on public information.

In April 2014, the total assets managed by European investment funds ascended to 10,191.2 billion[1] euros whereas the Portuguese represented only 0.2% with 25.4 billion

[1] APFIPP – Informative note June 2014
http://www.apfipp.pt/backoffice/box/userfiles/file/Nota%20informativa%20FIM%20-%20Junho%202014.pdf

euros. The Portuguese mutual funds industry is relatively recent when compared to its peers however the number of funds has increased 24% in the last decade (from 221 to 273). In April 2014, the total assets managed by Portuguese mutual funds were 13.4 billion euros.

The existing literature about Portuguese evidence of selectivity and market timing is in line with international findings. The studies of Romacho and Cortez (2006), Oliveira (2010), Afonso (2010), Govan (2011) and Calé (2011) showed no positive timing or selectivity abilities moreover there was even evidence of some perverse timing. Additionally, results show a strong negative correlation between these two components of performance.

Despite the overall evidence of poor performance, the aim of this study is to contribute to the current literature with an extended and enhanced version of previous studies. Besides the traditional models (unconditional) to test market timing and selectivity skills, the conditional version of those models was also incorporated in this study to address the importance of public information on funds' performance.

A framework rarely studied by the existing literature is the relationship of funds' characteristics with the selectivity and timing skills. This approach can provide valuable insight on the overall results analysis therefore the funds' characteristics age, size and market cycles were added to the study. The incorporation of these variables improves the quality and robustness of our findings and differentiates this study from the current literature.

According to Jiang (2003), older funds outperform, on average, younger funds. Regarding size, smaller funds seem to perform better than their larger funds.

The subperiod analysis is commonly introduced in few studies such as Ferson and Schadt (1996) and Leite and Cortez (2006) to assess the selectivity and timing capacities are time varying. However those analysis haven't considered specifically the impact of different market cycles (bear and bull markets) on the overall performance.

Using the additional funds' characteristics we aim to answer the following questions:

- Do mutual funds anticipate market movements?
- Do mutual funds possess stock picking skills?
- Does experience matter?
- Do small mutual funds fare better?
- Do mutual funds anticipate market cycles?

In this study the performance of a sample of 51 Portuguese mutual funds are analysed from June 2002 until March of 2012. The sample of funds combines 5 categories of funds: 1 – Domestic equity funds; 2 – EU, Switzerland and Norway equity funds; 3 – North American equity funds; 4 – Other International equity funds and 5 – Sector equity funds. For this study several performance measures were implemented, unconditional and conditional versions. In a first phase the global performance of funds is measured by applying Jensen's (1968) model. In order to segregate the selectivity and timing ability both Treynor and Mazuy (1966) and Henriksson and Merton (1981) unconditional models were applied. Due to the importance of public information on the performance evaluation, this study provides some insights on the impact of using conditioning information by applying the conditional version of both models.

This study addresses the possible impact of survivorship bias on the overall results by analysing the universe of liquidated funds on a yearly basis which represents On average only 2% of total funds. Therefore the impact on the performance estimates is reduced. Additionally, the robustness of the data used is also tested, to prevent spurious regressions. Thus we tested stationarity, homoscedasticity and autocorrelation.

This study is organised in seven chapters using the following structure: Section 2 revises the literature of the subject covered, together with the respective evaluation models developed. Section 3 describes briefly the Portuguese capital market for the last decade with particular focus on the mutual funds industry. In section 4 the different

methodologies applied in this study are presented, while some of them will be analysed on unconditional and conditional context. Section 5 covers the specifics of the data set used, the benchmark selection method and the robustness tests applied to our data. In section 6 the empirical results are presented and discussed. The results are presented on a basis of unconditional and conditional measures of performance. Additional features such as funds' age, size and market cycles are also covered to analyse the stock returns predictability based on those characteristics. Finally, the 7$^{th}$ section ends the study with a summary of the main results and some suggestions for further research.

# 2. Literature review

## 2.1. Performance measurement

During the last decades numerous studies were undertaken on measuring funds' performance. Active versus passive management is one of the most debatable subjects on the investment management matter.

According to the EMH proposed by Fama (1965) the markets are informational efficient therefore investors cannot consistently achieve excess returns over the market. An active market includes well informed and rational investors, therefore the prices will reflect all available information.

If markets are indeed perfectly efficient, why would fund managers spend resources to try constantly beat the market? The debate about EMH has resulted in a wide range of research and empirical studies measuring fund managers performance to determinate whether they outperform the benchmark portfolio.

The early and traditional measures of performance go back to Treynor (1965), Sharpe (1966) and Jensen (1968). Treynor (1965) was the first to present a performance measure so called "risk adjusted indicator" or "reward-to-volatility ratio" that combines return and risk by measuring returns to a measure of risk (Beta). Treynor (1965) measures the portfolio's return by the systematic risk unit assumed by the investors.

Similar to Treynor´s measure, Sharpe's (1966) measure is also a "risk adjusted indicator" or "reward-to-volatility" however the author uses the standard deviation as a measure of risk. By applying a measure of volatility (standard deviation) the author shows to which degree of risk the portfolio is exposed.

Jensen's (1968) measure is a direct application of the CAPM that measures the ability of an investor to predict future security prices thus obtaining above market returns. This measure is also known as Jensen's Alpha:

> "*…it represents the average incremental rate of return on the portfolio per unit of time which is due solely to the manager's ability to forecast future security prices.*" Jensen (1968), pp. 394

Based on the proposed measure, Jensen (1968) has applied his model to a sample of U.S. funds. Based on a sample of 115 funds between 1945 and 1964 the author concluded that fund managers had no ability to present excess returns above a passive (buy-and-hold) investment strategy.

The above performance measures present a serious limitation due to the assumption of stationary risk levels over time and therefore, focusing only on the manager's security selection skills. Such assumption neglects the possibility of managers adjusting the portfolios risk levels as an anticipation of markets movements. Therefore, based on the above context the researchers developed new models to segregate the measure of performance in two components: selectivity and timing. The mentioned components are addressed in the following chapters.

## 2.2. The decomposition of performance: selectivity and timing

The active management strategy of investing aims to obtain abnormal returns by beating the index to which it relates. Forecasting skills are part of active investment and according to Fama (1972) can be divided in two components: microforecasting and macroforecasting. Microforecasting consists in price movements forecasts of individual stocks relative to stocks in general. This component can also be classified as security analysis or selectivity ability. The other component is macroforecasting that relates to forecasting price movements of general stock markets against fixed income securities. The latter is referred as market timing ability.

## 2.3. Methodologies and empirical evidence

As part of literature review we will provide an overview of the main methodologies that have been developed throughout the years to measure selectivity and timing skills and the main results from the respective methods.

### 2.3.1. Risk adjusted measures

**Treynor and Mazuy (1966)**

Following the CAPM approach, Treynor and Mazuy (1966) (hereafter TM) were the first to develop a model to separate market timing from selectivity ability. The authors defend that if the fund's manager can anticipate market movements then he should hold a greater portion of market portfolio when the market returns are expected to rise and decrease when the market is expected to decline.

For the period of 1953 to 1962, the authors concluded that funds managers had no market timing skills. Out of 57 mutual funds only 1 displayed market timing ability.

> "*This is not to say that a skilful fund management cannot provide the investor with a rate of return that is higher in both bad times and good than the return provided by the market averages, but it does suggest that the improvement in the rate of return will be due to the fund manager's ability to identify underpriced industries and companies, rather than to any ability to outguess turns in level of the market as a whole.*" (Treynor and Mazuy, 1966, p. 6)

Similar results were obtained in the following years by several authors while applying the same methodology in different markets. Nassir *et al* (1997) with a sample of Malaysian unit trusts, Nikolaos (2002) with a sample of Greek mutual funds, Drew *et al* (2005) analysed Australian mutual funds, Tripathy (2005) analysed Indian mutual funds, Kader and Qing (2007) analysed Hong Kong mutual funds, Casaccia (2009)

Brazilian mutual funds and Murhadi (2010) Indonesian mutual funds. All the mentioned authors found no evidence of market timing.

However, Bello and Janjigian (1997) obtained different results while using an extended version of TM's model that controls to include non-S&P500 assets in the mutual funds portfolios. The authors studied the timing and selectivity abilities of US domestic equity funds and found evidences of positive and significant market timing abilities in contrast with negative market timing results from the original TM model. The security selection skills are equally positive and significant.

Similar results were also obtained by Bollen and Busse (2001) for U.S. and Kaur (2013) for India while testing market timing and selectivity ability by using daily data. The authors found positive persistent market timing ability.

**Henriksson and Merton (1981)**

In 1972, Fama proposed a methodology to analyse the market timing paradigm although the methodology used the CAPM as main model thus could not be tested empirically. To overcome this problem, Merton (1981) developed a basic model and analysed a theoretical structure to assess the managers timing ability. It was assumed that the market timer's forecasts would be that either stocks would outperform bonds or vice-versa. Henriksson and Merton (1981) (hereafter HM) proposed a model that allows distinguishing managers' timing and selectivity skills proposing both a parametric and a nonparametric test to investigate the market timing abilities.

The usefulness of the nonparametric test is quite questionable as it requires the forecaster predictions to be observed. As this information is rarely available, such procedure is difficult to test empirically. On the other hand, the parametric test is created under the assumption that the assets are evaluated in accordance with the CAPM model. The authors assume that managers can choose between two targets levels of systematic risk: $\eta 1$ when he predicts $R_{m,t} \leq R_{f,t}$ and $\eta 2$ when he predicts $R_{m,t} > R_{f,t}$. If the manager is rational, the condition $\eta 1 < \eta 2$ has to be verified, as the risk assumed for

a bear market ($R_{m,t} \leq R_{f,t}$) has to be less than in the bull market ($R_{m,t} > R_{f,t}$). Since the managers' forecasts are not observable, the beta of the portfolio at time t ($\beta t$) should be a random variable for a market timer, assuming a value $\eta 1$ or $\eta 2$ depending on whether the manager forecasts a down-market or an up-market.

Based on the above model, Henriksson (1984) performed an empirical study applied to the American market between 1968 and 1980, with a sample of 116 mutual funds. The results obtained supported the hypothesis that fund managers are not able to apply a market timing strategy.

Similar results were obtained in several studies while applying the same model such as Chang and Lewellen (1984), Rao (2000), Romacho (2004), Wah and Ghazali (2005) and Oliveira (2010).

Chang and Lewellen (1984) analysed 67 mutual funds from 1971 to 1979 while Rao (2000) analysed 570 U.S. mutual funds from 1987 to 1996 whereas only four at 1% of significance level display selectivity skills. The study suggests that mutual funds managers do not possess good market timing ability during a 10 year bull market.

Both Romacho (2004) and Oliveira (2010) performed similar research on the Portuguese market from 1996 to 2001 and 2002 to 2009, respectively. No market timing skills were found in both studies, however Oliveira (2010) concludes that fund managers have little ability of selection (0.42%/year). In both studies a high negative correlation between the two components of performance is registered, meaning that fund managers are not capable of identifying underpriced stocks and time the market simultaneously. According to Henriksson (1984), the negative correlation between the two components can be either a possible misspecification of the benchmark portfolio and/or due to the omission of relevant factors.

Both TM and HM methodologies became market references while measuring market timing and selectivity ability of funds. Therefore, through the years most of the empirical research has been done by applying both models.

The studies are widespread in terms of markets covered. Nikolaos (2002) analysed 19 Greek mutual funds while Drew *et al* (2005) analysed 134 Australian mutual funds, Tripathy (2005) 31 Indian mutual funds, Casaccia (2009) 106 Brazilian mutual funds and Murhadi (2010) 55 Indonesian mutual funds. The results are in the same line of TM and HM findings. Silva and Silva (2010) performed a wider research by aggregating 14 markets and covering 9,929 funds from 1998 to 2007 nonetheless the number of markets covered, the results display weak market timing ability. The authors conclude that 2% of the funds seem to adopt a defensive strategy during bear markets while 22% increase their aggressiveness during such periods.

Govan (2011) and Calé (2011) performed similar studies in the Portuguese market and the results were in line with previous results that found no evidences of market timing or selectivity ability.

Most of the empirical studies on market timing show little or negative timing ability although those results should be considered with cautious due to data limitations (frequency). Bollen and Busse (2001) based on TM and HM model studied the timing ability using daily, weekly and monthly data for 230 US mutual funds. The results proved that there is a higher timing ability while using higher frequency data (daily). Moreover the persistence of market timing ability is statistically significant.

Chen (2006) and Chen and Liang (2006) replicated the study of TM and HM to a different class of funds: hedge funds. The authors found evidence of timing ability that seems quite significant in bear and volatile markets.

Chu (2007) and Wibowo (2009) found evidence of market timing ability as well, in aggregate analysis of 77 Hong Kong and 28 Indonesian mutual funds respectively.

**Pfleiderer and Bhattacharya (1983)**

Following the models developed by TM and HM, Pfleiderer and Bhattacharya (1983) presented an enhancement of TM model with a simple regression focusing on excess market return as an indication of timing skill. In this model, managers that have access

to specific information may be able to time the market therefore presenting excess market returns. This model requires only the returns earned on the fund and those earned on the market portfolio. Based on this model, several authors have performed empirical studies to assess the market timing ability: Lee and Rahman (1990) in the US, Armada (1992) in the UK and Armada and Cortez (1997) in Portugal. Even though some of these studies revealed some timing and selectivity ability, the results were constrained to be non-negative. Taking in consideration the non-negativity issue, Coggin *et al* (1993) allowed the model to obtain both positive and negative timing while applying this methodology to the US market. With such modification the results showed negative timing which was consistent with previous studies.

Imisiker (2004) and Imisiker and Ozlale (2008) applied the same methodology to a sample of 49 Turkish mutual funds during 2000 to 2003, however, using a shorter data frequency by employing weekly date. The authors found evidences of superior market timing ability and weak selection skills.

### 2.3.2. Nonparametric tests

More recently, Jiang (2003) developed a nonparametric test without the need to estimate α's and β's. The test which is considered to be complementary of TM and HM models is formed to proxy the probability that the manager will adjust the funds' portfolio with market exposure when the market return soars. The author observes the probability that beta is higher in up markets than in down markets.

The nonparametric test requires only post returns and funds benchmarks. It is not affected by manager's risk aversion as separates quality of timing information from the aggressiveness of the reaction and it's more robust to different information, incentive structure, timing frequencies and underlying distributions.

Jiang (2003) found no evidence of timing ability in a sample of 1827 US domestic funds during 1980 to 1999.

Cuthbertson *et al* (2010) in recent study applied the nonparametric methodology of Jiang (2003) in the UK market to test the market timing ability however controlling for publicly available information (conditional approach). Similar to most of the literature, they found very weak evidence of positive timing ability as only 1% of the funds demonstrated timing skills. On the other hand, 19% of the funds revealed negative timing and on average funds mistime the market.

Similar results were found by Hayat and Kraeussl (2011) while studying the risk and return of Islamic Equity Funds (IEFs). IEFs differ from conventional mutual funds on their investment approach nevertheless while studying a sample of 145 IEFs over the period 2000 to 2009 the authors confirmed that IEFs are underperformers and bad market timers.

### 2.3.3. Conditional models

The importance of public information while predicting both stock and bond returns have been underlined initially by Fama and French (1989), Ilmanen (1995), Pesaran and Timmermann (1995). Some public information variables, such as dividend yield and interest rates can be used to assess the state of economy consequently use this public information to adjust predictions on future returns.

The traditional methods presented previously do not consider aspects related to public information available thus do not consider the possibility that systematic risk and expected return may vary over time.

In order to address the impact of public information on the performance measurement, Farnsworth (1997) developed a conditional model whereas both expected returns and systematic risk vary over depending on the public information.

The initial empirical research was done by Ferson and Schadt (1996) and concluded that conditional models provide an improvement on the model specification and mutual fund

estimates although displaying no timing ability. Similar results were also found by Schill *et al* (1999) while studying a sample of 400 US mutual funds finding little evidence of market timing ability.

Leite and Cortez (2006) and more recently Afonso (2010) applied the conditional models to the Portuguese market. The results are in line with the previous studies. The authors demonstrate that by using conditional models they observe a slight improvement in the mutual fund performance estimates and in the explanatory power of the models. Moreover, Leite and Cortez (2006) confirm that mutual fund managers do not possess timing ability, exhibiting negative or neutral performance. Additionally, the authors suggest that there is existence of distance effect, since managers who invest locally appear to outperform those investing globally.

Similar results were found by Afonso (2010) by analysing 33 Portuguese equity funds regardless the model applied.

In this chapter we covered the main methodologies to measure the selectivity and timing skills. The general evidence shows that regardless of the market studied the existence of timing and selectivity ability is rarely observed. The introduction of public information variables on unconditional models shows that those variables are statistically significant and provide an improvement on the mutual fund performance estimates and on the explanatory power of the models.

A negative correlation between the two components of performance is also observed.

# 3. Portuguese capital markets

The aim of this chapter is to provide a brief overview of the Portuguese capital markets as an introduction to a more comprehensive analysis of the mutual funds industry in Portugal. The global and domestic economic conjunctures play a crucial role on the performance of the capital markets and its attractiveness to capture investment.

In order to gain a better understanding of the mutual funds industry and its development, it becomes pertinent to cover the major events in the financial markets during the period of analysis (June 2002 to March 2012). Such examination will support the ultimate analysis on size of the mutual fund sector and the evolution of assets under management.

## 3.1. Overview

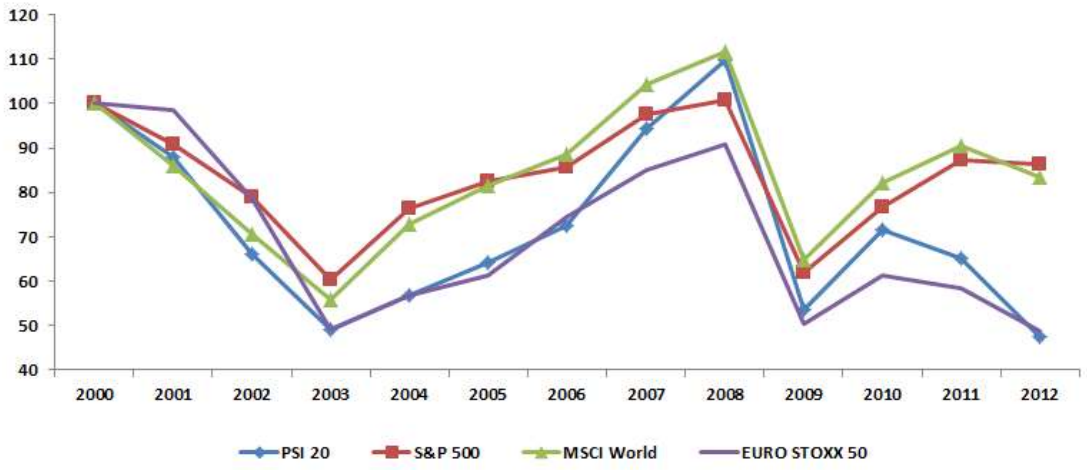
As aforementioned there have been several events that impacted significantly the performance of the most followed equity indices. The beginning of the 21$^{st}$ century was marked by the irrational exuberance of investors towards the information technology companies leading to dot-com bubble. As consequence to this event the major equity indices such as S&P 500, MSCI World and Euro STOXX 50 collapsed sharply. By the year of 2003 most of the indices had lost 40% to 50% of their value from previous highs as displayed in the Figure 1 below.

After the burst of dot-com bubble the United States were trying to avoid going into recession thus Federal Reserve System (Fed) changed the interest rates to historical lows (1%) leading to economy expansion. Its peer in Europe (European Central Bank) followed similar strategy lowering the interest rates to 2%.

The economies that we considered United States, European Union and Portugal recorded a significant growth until 2007. United States and European Union presented a

GDP annual average growth of 2.9% and 2.8% respectively while Portugal due to a slower consumption recovery recorded an average of 1.5%. (Table 1)

**Figure 1 – Equity indices performance**




Source: Thomson Reuters

**Table 1 – GDP annual growth rate**

This table presents the percentage of GDP annual growth from 2002 to 2012 for the following economies: European Union, Portugal, United States of America and Global.

| GDP growth (annual %) | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| **Economy** | **2002** | **2003** | **2004** | **2005** | **2006** | **2007** | **2008** | **2009** | **2010** | **2011** | **2012** |
| **European Union** | 1.3% | 1.5% | 2.6% | 2.2% | 3.4% | 3.2% | 0.4% | -4.5% | 2.1% | 1.6% | -0.4% |
| **Portugal** | 0.8% | -0.9% | 1.6% | 0.8% | 1.4% | 2.4% | 0.0% | -2.9% | 1.9% | -1.3% | -3.2% |
| **United States** | 1.8% | 2.8% | 3.8% | 3.4% | 2.7% | 1.8% | -0.3% | -2.8% | 2.5% | 1.8% | 2.8% |
| **World** | 2.1% | 2.8% | 4.1% | 3.6% | 4.1% | 4.0% | 1.4% | -2.1% | 4.1% | 2.9% | 2.4% |

Source: World Bank

The economic recovery was followed by the stock markets that registered a recover from the bear markets with an annual average growth above 10%. As displayed in the Figure 1 apart from Euro STOXX all the remaining indices reached or surpassed the levels previous to dot-com bubble burst.

The low interest rates in the United Stated led to economic expansion as both individuals and businesses could easily borrow money. This situation created great credit conditions during few years and proved to be a catalyst of subprime crisis. In 2007 the high risk mortgages caused massive defaults triggering major collapses within financial institutions in the following year.

The subprime crisis quickly spread worldwide distressing the financial markets globally. The major impact came in from 2008 to 2009 with the aforenamed indices registering drops above 38%. The Portuguese stock index (PSI 20) was significantly affected falling 51% from previous highs.

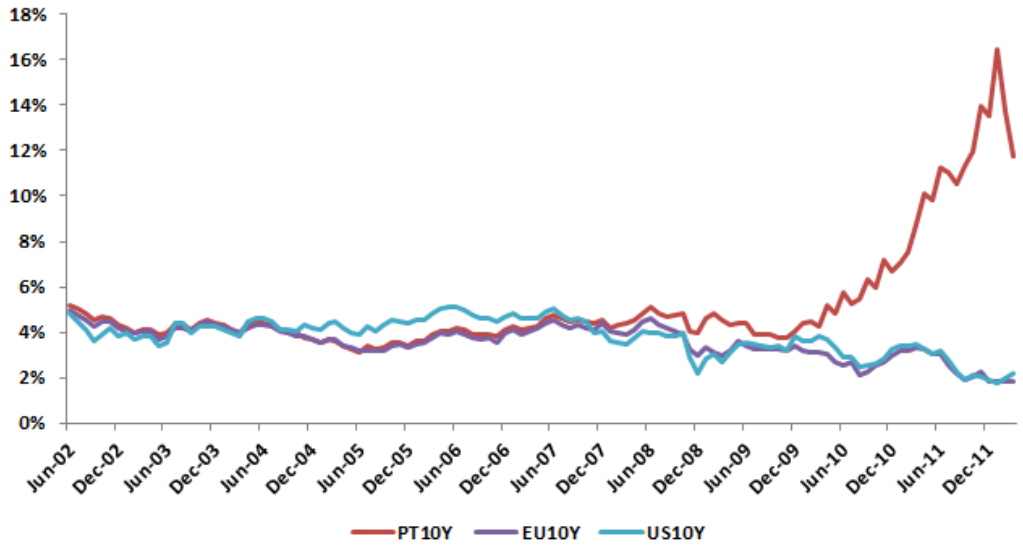
The year of 2010 was considered to be a breaking point to most of the economies coming back to economic growth (Table 1) thus the equity indices climbed between 21% (Euro STOXX 50) and 33% (PSI 20). Regardless the market expansion in 2010 there were signs of financial imbalance and economic fragilities in some countries. A combination of lack of competitiveness and growth with debt crisis in Europe led to the ongoing Eurozone debt crisis.

In May 2010 the Greek government secured one of its first bailout programs to sustain the government debt crisis. By the end of 2010 the Portuguese unemployment rate was at 10.8%[2], there was a significant contraction of internal and external consumption, the public debt rose from 70% of GDP in 2007 to above 90% in 2010[3], budget deficit was 9.1%, and the cost of issuing government debt (10 years) was close to the 7% hurdle (Figure 2).

[2] The Portuguese Economy in 2011 – Bank of Portugal bulletin

[3] Portuguese economy ensuring stability to support sustained growth. http://www.bportugal.pt/pt-PT/OBancoeoEurosistema/IntervencoesPublicas/Lists/FolderDeListaComLinks/Attachments/153/intervpub20120509.pdf

**Figure 2 – Debt market: 10Y benchmarks**




Source: Thomson Reuters

The growing risk of default and failure to issue government debt at sustainable interest rates motivated the Portuguese bailout request to secure government funding and provide capital to the domestic banks.

## 3.2. The mutual funds industry

The Portuguese mutual funds industry is relatively recent when compared to other most developed markets in Europe or to United States. The first fund was launched in 1964 although in 1975 due to the banking sector nationalization the capital markets activity was interrupted. The investment funds activity resumed in 1986 with the appearance of a new fund named INVEST[4]. According to CMVM, 4 new funds were launched in the following year and since then have recorded a fast growth and increasing magnitude.

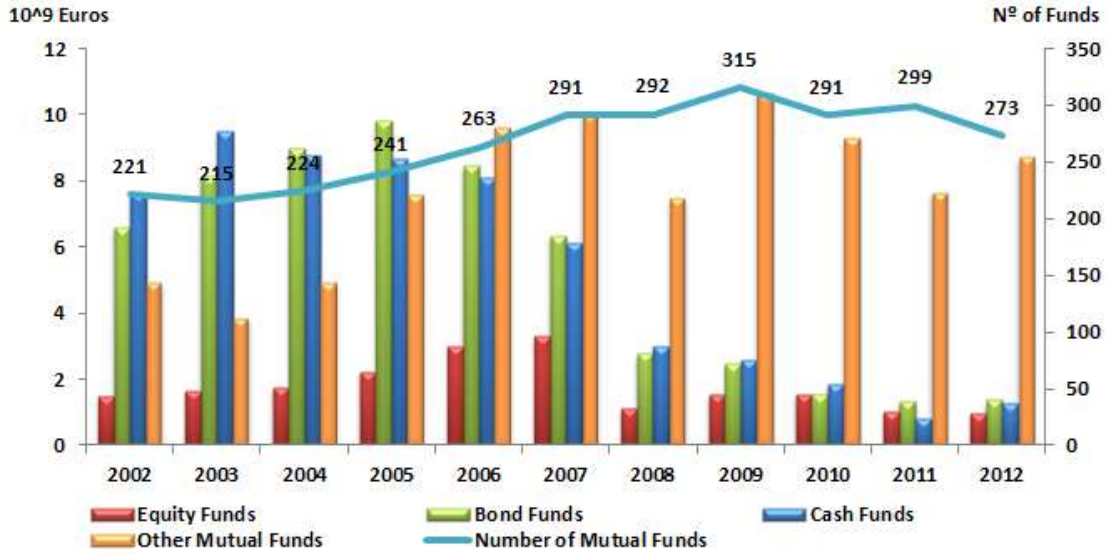
The investment funds sector can be segregated into mutual funds and real estate funds. According to APFIPP's (Portuguese Association of Investment Funds, Pension Funds

[4] CMVM - http://www.cmvm.pt/CMVM/Estudos/Pages/20020919_ifip_I3.aspx#I31

and Asset Management) classification system there are 45 different categories of funds[5]. In terms of mutual funds we can divide them into 4 main categories according to their investment strategies: equity funds, bond funds, cash funds and other mutual funds.

From 2002 to 2012 we have seen a significant change in the nature and size of Portuguese mutual funds. The number of active funds increased 24% in the mentioned period, from 221 to 273 as of 2012. Additionally, it's important to highlight that the prominence of each category changed over time as displayed in the figure 3.

**Figure 3 – Evolution of assets under management**



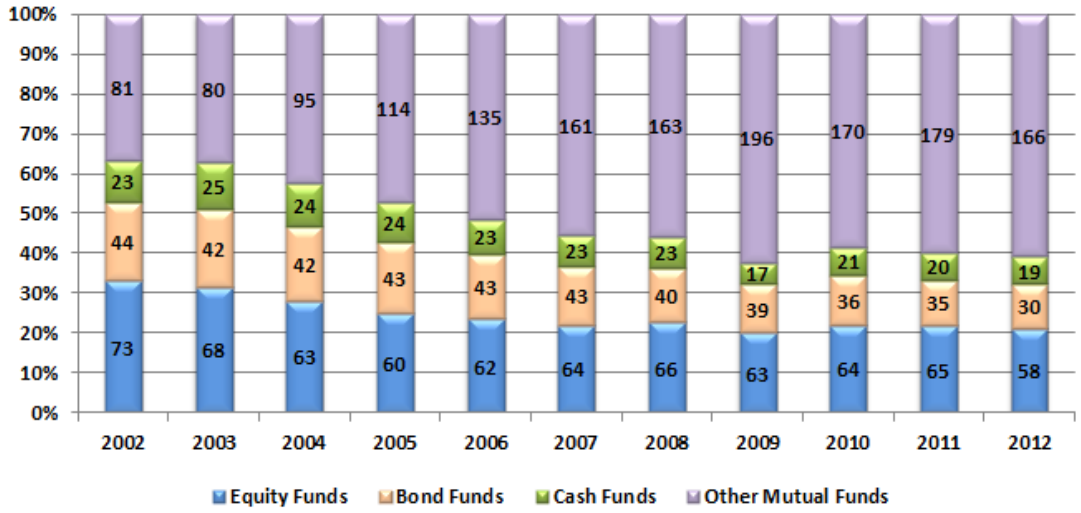

Source: APFIPP - Annual reports from 2002-2012

The weight of each category shifted significantly from equity oriented to a more diverse range of categories/strategies. As of 2002 the equity funds represented 33% of the total investment in mutual funds while bond funds, cash funds and other mutual funds represented 20%, 10% and 37% respectively. Throughout the years these weights changed considerably as the number of other mutual funds rose 66% accounting 61% of

[5] APFIPP Classification System – http://www.apfipp.pt//index2.aspx?MenuCode=AP&ItemCode=AP_CF&name=Self-Regulation#Parte5

the total number of mutual funds in 2012. The remaining categories equity funds, bond funds, cash funds represented then 21%, 11% and 7% of the total number of funds as shown in the figure 4.

**Figure 4 – Nº of mutual funds by category**




Source: APFIPP - Annual reports from 2002-2012

The economic and capital markets conjunctures play a key role in the investment attractiveness and in the amount of assets under management. The mentioned events in the overview chapter are expectable to have a significant impact on the value of assets under management. Based on the different business cycles (expansion and recession) there is a shift from riskier to risk free assets.

The Portuguese stock index registered a bull market from end of 2002 until mid of 2007[6] which led to an increase of 41% of assets under management (2006). With the subprime crisis emerging the value of assets under management decreased significantly and a significant amount of capital was transferred to risk free assets such as bank deposits.

[6] Following Pagan and Sossounov's (2002) methodology (eq. 6.1)

In the figure 5 it's visible that the total value of mutual funds when compared to bank deposits represented only 8% of its value, while during the bull market was 20%. The year of 2009 displayed a slight improvement nevertheless the Eurozone debt crisis had a huge impact on the performance of the Portuguese equity index with a loss of 54% of its value in the following years. As results of assets devaluation together with capital migration to riskless assets by 2012 the amount under management was 12,295 million of euros comparing to 207,500 million of euros in bank deposits.

**Figure 5 – Evolution of mutual funds vs bank deposits**


Source: APFIPP/APB

# 4. Methodology

In this chapter we will address the models that are applied to test empirically the performance of a sample of Portuguese mutual funds. The measurement of overall performance is based on Jensen's (1968) methodology. The selectivity and timing ability analysis is measured based on TM and HM models.

The importance of accounting public information while predicting stock returns have been highly emphasized, consequently, a conditional version of TM and HM are also presented to improve the explanatory capacity of these models.

The aim of presenting several models to test selectivity and timing is to validate the robustness of the results.

## 4.1. Measure of global performance

Jensen's (1968) measure of global performance takes in consideration not only the overall return of a portfolio but also the inherent risk.

Following the market equilibrium model (CAPM), the average return of a portfolio is the return of the market adjusted to its systematic risk. However the author assumes that due to market frictions or anomalies of the market a certain security may be under or overvalued on a certain period of time. Based on this assumption the author adds a parameter (α) to the CAPM regression to measure the excess return above the market return as result of selectivity ability (identifying underpriced assets). Jensen's (1968) model is calculated by the following expression:

$$R_{p,t} = \alpha_p + \beta(R_{m,t}) + e_{p,t} \quad (4.1)$$

Where,

$R_{p,t}$ – Excess return of portfolio *p* over the period *t*

$\alpha_p$ – Jensen's alpha

$\beta$ – Systematic risk as an estimated sensitivity to market portfolio

$R_{m,t}$ – Excess return of market portfolio *p* over the period *t*

$e_{p,t}$ – Residual variable

## 4.2.Measure of selectivity and timing

**Treynor and Mazuy (1966)**

The authors argue that if the funds' managers exhibit timing ability they would be able to anticipate market returns successfully thus adjusting their portfolios accordingly. In an event of market decline (rise) the fund managers should manage the portfolio by switching from more to less (less to more) volatile securities. Meaning, reducing (increasing) the portfolio's beta which can be considered the main hedging instrument of a portfolio.

Based on such assumption the authors developed a method based on a regression analysis that includes a quadratic term to the CAPM model. Therefore, the portfolio return is a nonlinear function of market return specified as:

$$R_{p,t} = \alpha_p + \beta(R_{m,t}) + \gamma(R_{m,t})^2 + e_{p,t} \quad (4.2)$$

where $R_{p,t}$ is the excess return of portfolio *p* in the period *t*; $R_{m,t}$ is the excess return of market index in the period *t*; $\alpha$ is Jensen's alpha and represents the selectivity ability; $\beta$ is the systematic risk as an estimated sensitivity to market portfolio; $\gamma$ is the measure of market timing and $e_{p,t}$ it's a residual variable.

A positive gamma (γ) represents a positive market timing ability while 0 indicates no ability and a negative gamma indicates negative timing skills.

**Henriksson and Merton (1981)**

The second model applied in this study is the HM approach which comes from Merton (1981) theoretical structure of the pattern returns from successful timing strategy. Merton (1981) then derived an equilibrium theory for market timing forecasting skills following the returns pattern of a protective put option strategy. The author assumes that there are only two possible predictions whereas either stocks will outperform bonds or bonds will outperform the stocks.

Based on the model mentioned above Henriksson and Merton developed statistical procedures, parametric and nonparametric, to test market timing and selectivity abilities of investment managers.

The nonparametric test is based on a forecast model that can be described in terms of conditional probabilities of accurate or inaccurate forecast. The investment manager forecast will be that either stocks outperform bonds $R_{m,t} > R_{f,t}$ or bonds will outperform stocks $R_{m,t} \leq R_{f,t}$ and it's represented by the variable$\gamma_t$. The market timer's forecast variable will be $\gamma_t$= 1 if the forecast made in the period *t* –1 for the period *t* is $R_{m,t} > R_{f,t}$ (bull market), and $\gamma_t$ = 0 if the forecast made in the period *t* –1 for the period *t* is $R_{m,t} \leq R_{f,t}$ (bear market). The conditional probabilities of an accurate forecast are:

$$\mathrm{P1}_t = Prob\left(\gamma_t = 0 \mid R_{m,t} \leq R_{f,t}\right) \quad (4.3)$$

$$\mathrm{P2}_t = Prob\left(\gamma_t = 1 \mid R_{m,t} > R_{f,t}\right) \quad (4.4)$$

It's assumed that the conditional probability (P1,*t* and P2,*t*) is not dependent on the magnitude of the performance ( $|R_{m,t} - R_{f,t}|$ ) but only on whether or not $R_{m,t} > R_{f,t}$ . Unlike other studies, such model allows to study the market timing subject without using the CAPM framework.

The viability of the nonparametric test described above requires observable manager's forecasts which are hardly available. Therefore to test the market timing ability the authors had to make additional assumptions about the equilibrium structure theory.

To overcome the absence of observable manager's forecasts, HM developed a parametric test assuming the CAPM framework and using a proxy for the unavailable forecasts. The authors assume as a function of forecast the different levels of systematic risk for the portfolio chosen by the forecaster.

Based on the above it's assumed that there are two targets of risk level that depends on whether the investment managers predicts that the market portfolio return will exceed the riskless securities return. Thus η1 denotes the target beta ($\beta_t$) when investment manager forecasts $R_{m,t} \leq R_{f,t}$; and η2 when investment manager forecasts $R_{m,t} > R_{f,t}$. The target beta ($\beta t$) will assume the η1 value on a bear market and η2 value on a bull market. On a rational market, the investment manager forecast shall be η2 > η1.

Since beta is not observable, ($\beta_t$) will be a random variable that will assume the value of η1 or η2 depending on the investment manager's expectations of a bear or bull market. The return of portfolio in the period t is represented as:

$$R_{p,t} = (b + \theta_t)x_t + \gamma + e_{p,t} \qquad (4.5)$$

where, $b$ = unconditional expected value of $\beta_t$; $\theta_t = \beta_t - b$, representing the unanticipated expected value of $\beta_t$ depending on the forecast value; $x_t = R_{m,t} - R_{f,t}$; $\gamma$ represents the excess return from selectivity; $e_{p,t}$ it's a residual variable with such characteristics: $E(\varepsilon_{p,t}) = 0$; $E(\varepsilon_{p,t}, x_t) = 0$; $E(\varepsilon_{p,t}, \varepsilon_{p,t-1}) = 0$ $(i = 1,2,3, \dots)$.

Following the suggested return process (4.5), a least-square regression analysis is used to identify and measure the contribution of both timing and selectivity components individually:

$$R_{p,t} = \alpha_p + \beta_1(x_t) + \beta_2(\gamma_t) + e_{p,t} \qquad (4.6)$$

where,

$$\gamma_t = \max(0, R_{f,t} - R_{m,t}) = \max(0, -x_t)$$

As mentioned previously, the returns from a timing strategy would be similar to a protective put option strategy. The previous equation shows that α measures the contribution of selectivity ability to the portfolio performance, $\beta_1$ represents the proportion invested in the market portfolio while $\beta_2$ expresses the number of put options on the market due to the investment manager's timing ability.

## 4.3. Conditional models selectivity and timing

The predictability of returns using predetermined public information has been widely discussed concluding that conditional models provide an improvement on the model specification and mutual fund estimates. The conditional approach was firstly brought by Farnsworth (1997) and supported by empirical evidences presented by Ferson and Schadt (1996) and Schill *et al* (1999).

As the public information changes over time the conditional models will allow estimating time-varying expected returns and risk (conditional betas).

Ferson and Schadt (1996) assuming the market efficiency in the semi-strong form[7] modified the market timing models to incorporate the conditional information. The idea behind such model is to distinguish market timing based on public information from market timing that is superior to the public information. Meaning, "that a managed portfolio strategy that can be replicated using readily available public information should not be judged as having superior performance". (Ferson and Schadt, 1996, pp. 426)

[7] Fama (1970) - Efficient Capital Markets: A Review of Theory and Empirical Work

Ferson and Schadt (1996) modified the traditional market timing models (equations 4.2 and 4.6) by adding a vector of lagged public information. The conditioning information is represented by three lagged[8] variables: benchmark dividend yield (DY), short-term interest rate level (EUR) and the slope of the term structure (TS).

**TM – Conditional Model**

$$R_{p,t} = \alpha + \beta(R_{m,t}) + \beta'_p(Z_{t-1}R_{m,t}) + \gamma(R_{m,t}) + e_{p,t} \quad (4.7)$$

**HM – Conditional Model**

$$R_{p,t} = \alpha + \beta_1(x_t) + \beta'_p(Z_{t-1}R_{m,t}) + \beta_2(\gamma_t) + e_{p,t} \quad (4.8)$$

Where, $\beta'_p$ represents the response of manager's beta to the public information, $Z_t$, available at $t-1$ for predicting returns. The vector $\beta'_p(Z_{t-1}R_{m,t})$ in the equations (4.7) and (4.8) controls the public information effect. Thus in conditional models, "the correlation of mutual fund betas with the future market return, which can be attributed to the public information, is not considered to reflect market timing ability." (Ferson and Schadt, 1996, pp. 435)

[8] The variables are demeaned and lagged 1-month.

# 5. Data sample analysis

## 5.1. Data description

Based on APFIPP classification system there are 45 different categories[9] although for this study the following 5 categories of funds that invest in equity were selected. Equity funds tend to have more active strategies that include stock picking and timing the market therefore are more relevant for this study. The following categories will be considered:

I. Domestic equity funds

II. European Union, Switzerland and Norway equity funds

III. North American equity funds

IV. Sector equity funds

V. Other international equity funds

In the last decades the markets have become more internationalized and globalized thus increasing the range of investments. Due to this diversity it has been considered beneficial to extend the analysis from the domestic investment focused mutual funds to a wider scope.

The sample of funds used on this study comprises 51 Portuguese mutual funds (Appendix 1) with historical monthly returns from June 2002 to March 2012, corresponding to a total of 118 monthly observations per fund. Taking in consideration the statistical significance we considered only mutual funds with at least one third (39) of the total number of observations (118).

[9] See footnote number 4.

In table 2 it's observed that the investment categories selected represent on average at least 50% of the total universe of Portuguese funds during the period of analysis. Regarding the funds' age, the domestic equity funds are on average the oldest funds in the sample (15 years of existence). Nevertheless, the age average of whole sample is 13 years which is in line with the comments in the chapter 3.2 stating that the Portuguese mutual fund industry is recent. The oldest fund is Postal Acções managed by Caixagest[10] with 26 years of existence. On the subject of size, similar to age, domestic equity funds are on average the biggest of the equity funds with a size of 47 million euros. The significance of size on the domestic equity funds is mainly due to the contribution of Caixagest Acções Portugal (€ 86 million), Millennium Acções Portugal (€ 88 million) and Santander Acções Portugal (€ 103 million). Millennium Eurocarteira from the EU, Switzerland and Norway Equity Funds investment category is the biggest fund of the sample studied with an average of 150 million euros of net asset value.

**Table 2 – Fund sample features**

This table aggregates the funds characteristics age, size and market share categorized by its investment category (APFIPP). The average of the funds characteristics age, size and market share were calculated for the period of June 2002 to March 2012. Investment categories are: DM - Domestic equity funds; EU - EU, Switzerland and Norway equity funds; NA - North American equity funds; OI - Other Int. equity funds; SE - Sector equity funds.

| Category | Nº of Funds | Age | Size | Market Share |
|---|---|---|---|---|
| DM | 7 | 15.4 | 46,690,495 | 13.0 |
| EU | 14 | 14.2 | 28,179,783 | 4.9 |
| NA | 6 | 13.7 | 23,561,340 | 17.0 |
| SE | 12 | 10.2 | 13,483,608 | 9.5 |
| OI | 12 | 12.2 | 22,394,500 | 6.0 |

The market share is the average of weight of each fund in their specific investment category. It is interesting to mention that during the 10 year period of study only few funds managed to keep a considerable position in the market with a market shares above

[10] http://www.caixagest.pt/Default.aspx

25%[11] (Appendix 2). The main descriptive statistics of each fund are represented in Appendix 3.

One of the main aspects to take in consideration on aggregated mutual funds performance is the survivorship bias. The universe of funds analysed is subject to mergers and liquidations that do not survive to the whole period of analysis.

The survivorship bias was firstly analysed by Brown *et al* (1992) that argued that the funds that survive will have higher ex post returns than the ones that did not survived. Furthermore, it is expected that the survivorship bias effect is not significant. There are other studies such as Grinblatt and Titman (1989) and Goetzmann *et al* (2000) that support the same view. Grinblatt and Titman (1989) indicate that the survivorship account on average between 0.1% and 0.4% per year thus having a reduced impact on the analysis.

The survivorship bias concerning the Portuguese market has been studied by Romacho and Cortez (2006) concluding that during the sample period only 4.8% of funds were liquidated which could come down to 2.2% if the effect of mergers was excluded. Therefore the impact on the performance estimates would be minimum.

Regardless the general evidence of the limited impact of survivorship bias on the performance analysis, it's still relevant to measure the universe of liquidated funds over the period of analysis. The table 3 highlights the number of mergers and liquidated funds in the 10 years of analysis. The results are consistent with previous studies whereas the liquidated funds represent a small percentage[12] of funds.

Our sample is subject to survivorship bias although, as mentioned above, the number of liquidated funds represents a small percentage of the total universe and therefore has a

[11] Santander Acções Portugal: 29%; Millennium Eurocarteira: 26%; Caixagest Acções EUA: 31%; Millennium Eurofinanceiras: 28%.

[12] 2.34% on average.

limited impact on our analysis. Nevertheless we may take in consideration that the aggregated results may be slightly upward biased by using only surviving timing funds.

**Table 3 – Number of active and liquidated funds from 2002 until 2012**

This table displays historical progress of active funds from 2002 until 2012. *a)* represents the percentage of merged funds per year while *b)* represents the percentage of liquidated funds per year.

| Year | 2002 | 2003 | 2004 | 2005 | 2006 | 2007 | 2008 | 2009 | 2010 | 2011 | 2012 | Average |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Nº Equity Funds | 62 | 57 | 52 | 49 | 51 | 53 | 55 | 52 | 53 | 56 | 58 | 54 |
| *Launched* | 0 | 0 | 1 | 2 | 2 | 4 | 1 | 0 | 1 | 3 | 0 | 1 |
| *Merged* | 9 | 4 | 0 | 3 | 0 | 0 | 0 | 1 | 1 | 0 | 7 | 2 |
| *Liquidated* | 4 | 1 | 6 | 2 | 0 | 1 | 0 | 0 | 0 | 0 | 0 | 1 |
| *Transferred* | 0 | 0 | 0 | 0 | 0 | 1 | 1 | 2 | 1 | 0 | 0 | 0 |
| *a)* | 15% | 7% | 0% | 6% | 0% | 0% | 0% | 2% | 2% | 0% | 12% | 4% |
| *b)* | 6% | 2% | 12% | 4% | 0% | 2% | 0% | 0% | 0% | 0% | 0% | 2% |

Source: APFIPP

## 5.2. Benchmarks

There are several studies that suggest that superior portfolio managers consistently outperform the market although the persistence performance may be attributed to survivorship bias (Malkiel 1995) or benchmark selecting errors (Grinblatt and Titman 1989b).

The importance of selecting the appropriate benchmark portfolio has been reinforced by Grinblatt and Titman (1989b) and Elton *et al* (1996) therefore this was taken in consideration while selecting the most suitable equity indices.

In contrast to Romacho and Cortez's (2006) approach that selected one benchmark per investment category, we decided to select one benchmark per fund to reduce the chance of having funds with a low fitted benchmark and low explanatory power.

The investment strategies used in the sample of our study are wide by aggregating five different mutual funds categories. The access to each portfolio's holdings information is

very limited therefore we trusted on a better informed source, Lipper[13], to select the benchmark. Lipper products contain two different benchmark classifications: *Fund Manager Benchmark*, which is self-selected by the fund's manager, and *Technical Indicator Benchmark* (TIB), which is assigned by Lipper based on the fund's investment strategy and asset holdings.

For this study TIB was selected to avoid concerns regarding the conflict of interest of self-selecting a benchmark by the funds' managers. Due to data access limitations whenever the TIB (monthly price values and dividend yields) were not available it was replaced by a competitor index with similar investment strategy.

Following Elton *et al* (1996) approach, an additional rule was implemented to eliminating certain funds whereas the selected benchmark had low explanatory power (Adjusted R-Square) on the selected period.

Therefore, a formula was developed to remove funds with low explanatory benchmarks. Only funds with a high adjusted R-Square were considered while applying the following formula:

$$R^2{}_{adj\,f,p} > \mu_{c,p} - 2\sigma_{c,p} \qquad (5.1)$$

where, $R^2{}_{adj\,f,p}$ represents the explanatory power of a benchmark used by the fund $_{f,p}$; $\mu$ represents the average of adjusted R-Square of each fund within the investment category ($_{c,p}$) and $\sigma_{c,p}$ the standard deviation of adjusted R-Square within the investment category ($_{c,p}$).

**Risk-Free Rate**

In order to calculate the excess return of portfolio *p* in the period *t* ($R_{p,t}$) and the excess return of market index in the period *t* ($R_{m,t}$) we used the risk-free rate proxied by the 1

[13] **Lipper**, a Thomson Reuters company, is a global leader in supplying mutual fund information and fund ratings, fund analytical tools and fund commentary. www.lipperweb.com/

month Euro Interbank Offered Rate (EURIBOR) collected from Thomson Reuters platform[14]. As the EURIBOR is an annual interest rate it's required to calculate the equivalent monthly rate. The proportionality calculations were performed as follows:

$$R_{f,t} = \left(\frac{1}{12}\right) \times EUR_t \qquad (5.2)$$

where, $R_{f,t}$represents the risk-free rate of return and $EUR_t$ is the 1 month EURIBOR rate.

**Mutual Funds Returns**

For the mutual funds returns calculations we have used the units' price of funds obtained from CMVM. The sample funds selected for this study are capitalization funds therefore the dividends are reinvested and incorporated on the units' price.

The monthly funds' returns were calculated based on the following logarithmic expression:

$$R_{p,t} = LN\left(\frac{UP_{p,t}}{UP_{p,t-1}}\right) \qquad (5.3)$$

where, $R_{p,t}$ is the monthly return of portfolio *p* in the period *t*, $UP_{p,t}$ is the fund's (*p*) unit price in the period *t*, and $UP_{p,t-1}$ is the fund's (*p*) unit price in the preceding period $t\text{-}_1$.

**Market Returns**

The equity indices (benchmarks) assigned to each fund were used to calculate the market monthly market returns. As mentioned previously, the TIB used were assigned by Lipper while the equity indices prices were retrieved from Datastream database[15].

[14] http://thomsonreuters.com/thomson-reuters-eikon/

[15] http://thomsonreuters.com/datastream-professional/

Taking in consideration the nature of the underlying funds (capitalization), the equity indices selected are total return[16].

$$R_{m,t} = LN\left(\frac{BMK_{m,t}}{BMK_{m,t-1}}\right) \quad (5.4)$$

where, $R_{m,t}$ is the monthly return of the mark in the period *t*, $BMK_{m,t}$ is the equity index (*m*) in the period *t*, and $BMK_{m,t-1}$ is the Equity Index (*m*) in the preceding period $t$-$_1$.

## 5.3. Conditional variables

We use three public information variables with one month lag: *dividend yield* (DY), slope of the *term structure* (TS) and a proxy of the *risk-free rate of return* (EUR). The selected variables are in line with major of empirical studies using the same approach such as Ferson and Schadt (1996), Schill *et al* (1999), Cortez and Silva (2002) and Leite and Cortez (2006).

Similar to Leite and Cortez (2006) we use European information variables instead of local ones due to the establishment of the European Monetary Union (EMU) and the increased integration of the European stock markets.

The dividend yield variable was equally obtained from Datastream database[17] and refers to the amount of dividend payments in the preceding 12 months divided by the current equity indices prices. The slope of the term structure is the spread between a 10 year

[16] TR - Equity index that tracks the capital gains and assumes that any cash distributions, such as dividends, are reinvested back into the index.

[17] http://thomsonreuters.com/datastream-professional/

*bund*[18] yield and the 1 month Euribor rate, also used as short term interest rate (EUR). Both instruments were obtained from Thomson Reuters platform[19].

Table 4 displays a statistics summary of the informational variables.

**Table 4 – Informational variables statistics summary**

This table displays the informational variables statistics and computed for the period of analysis (June 2002 to March 2012). The informational variables used are: dividend yield (DY), short term interest rate (EUR) and slope of the term structure (TS).

| | DY | EUR | TS |
|---|---|---|---|
| **Mean** | 3.1300 | 3.0286 | 3.0251 |
| **Median** | 2.9259 | 2.9800 | 2.9090 |
| **Maximum** | 5.5872 | 3.7300 | 5.3170 |
| **Minimum** | 2.0220 | 2.2800 | 2.2330 |
| **Std. Dev.** | 0.7880 | 0.4875 | 0.5723 |
| **Skewness** | 1.1424 | 0.2208 | -0.3269 |
| **Kurtosis** | 4.8987 | 2.0310 | 2.3794 |
| | | | |
| **Jarque-Bera** | 113.4031 | 5.6224 | 4.0287 |
| **P-Value** | 0.0611 | 0.0601 | 0.1334 |

## 5.4. Robustness tests

In order to test the robustness of our data a few tests were performed to test stationarity, homoscedasticity and autocorrelation.

The first test performed was the Augmented Dickey Fuller (ADF) (1981), to test the null hypothesis (H0) of a unit root. Apart from the fund Orey Acções Europa (EUSTOXX.F04) all other funds rejected H0 with a 95% confidence level meaning that the data series is stationary. The fund EUSTOXX.F04 will hereafter be excluded from the funds sample as according to equation (5.2) the fund's benchmark has low

[18] A bond issued by Germany's federal government.

[19] http://thomsonreuters.com/thomson-reuters-eikon/

explanatory power. The remaining data series is considered not spurious. The detailed results can be found in the Appendix 4.

As part of the robustness data test, after implementing the ordinary least-squares (OLS) regressions of equations: 4.1, 4.2, 4.6, 4.7 and 4.8 to estimate the parameters, additional tests were implemented regarding homoscedasticity and autocorrelation. To test homoscedasticity property the White (1980) heteroskedasticity test was implemented whenever the null hypothesis (H0: there is homoscedasticity) was violated. Regarding the autocorrelation property the Newey–West (1987) test was used to overcome either autocorrelation or autocorrelation and heteroskedasticity together whenever the null hypothesis (H0: no autocorrelation) was violated.

Hereafter all the results presented and analysed are respectively corrected for heteroskedasticity and autocorrelation.

# 6. Empirical research results

In this chapter the results of Portuguese mutual funds' performance for the selected sample are presented and discussed. Firstly we will analyse the estimates and how much a manager's forecasting skill contributes to the mutual fund's return by applying Jensen's (1968) risk-adjusted measure of portfolio performance.

Jensen's model measures solely the selectivity ability therefore we will present two additional models to segregate and measure both selectivity and timing abilities of fund's managers. We will use Treynor and Mazuy (1966) and Henriksson and Merton (1981) models on both unconditional and conditional versions to understand the impact of public information on overall mutual funds' performance.

## 6.1. Unconditional models

The following table provides a summary of Jensen's (1968) measure of performance ($\alpha_p$) and systematic risk ($\beta$) using the equation (4.1).

**Table 5 – Performance measure through Jensen´s (1968) model**

This table presents the mutual funds performance results for the period from June 2002 to March 2012 based on the estimates of the regression $R_{p,t} = \alpha_p + \beta(R_{m,t}) + e_{p,t}$, where $R_{p,t}$ is the excess return of portfolio $p$ in the period $t$; $R_{m,t}$ is the excess return of market index in the period $t$; α is Jensen's Alpha and represents the selectivity ability; $\beta$ is the systematic risk as an estimated sensitivity to market portfolio and $e_{p,t}$ it's a residual variable.The funds estimates are aggregated by investment category and adjusted for autocorrelation and heteroskedasticity according to Newey & West (1987) and White (1980). Investment categories are: DM - Domestic equity funds; EU - EU, Switzerland and Norway equity funds; NA - North American equity funds; OI - Other Int. equity funds; SE - Sector equity funds.

| Fund | Selectivity | | Systematic Risk | | | Model | |
|---|---|---|---|---|---|---|---|
| Type | α | t-estat | Prob. | β | t-estat | R-Sq adj | F-estat. |
| DM | -0.0036 | -1.712 | 0.199 | 0.954 | 25.234 | 0.872 | 750.832 |
| EU | -0.0019 | -1.021 | 0.350 | 0.937 | 22.504 | 0.827 | 610.572 |
| NA | -0.0062 | -2.624 | 0.025 | 0.749 | 15.625 | 0.627 | 317.788 |
| OI | -0.0056 | -2.127 | 0.151 | 0.753 | 13.878 | 0.697 | 299.205 |
| SE | -0.0050 | -1.544 | 0.180 | 0.682 | 13.048 | 0.627 | 217.180 |
| **Weighted Average** | **-0.0043** | **-1.715** | **0.198** | **0.809** | **17.623** | **0.728** | **422.164** |

| | Total Selectivity | | Significance Level 1% | | 5% | | 10% | |
|---|---|---|---|---|---|---|---|---|
| Jensen's Alpha | nº | % | nº | % | nº | % | nº | % |
| Positive | 3 | 6% | 0 | 0% | 0 | 0% | 0 | 0% |
| Negative | 46 | 94% | 11 | 22% | 9 | 18% | 4 | 8% |
| **Total** | **49** | **100%** | **11** | **22%** | **9** | **18%** | **4** | **0** |

The overall funds' relative[20] performance is negative displaying an average of -5.16%[21] a year. Performing a more detailed analysis, the North American equity funds category display the worst performance by exhibiting an alpha of -7.44% a year while EU, Switzerland and Norway equity funds reveal better performance though negative (-2.28 %/year). From a universe of 49 Portuguese mutual funds, 46 displayed negative alphas, 11 being statistically significantly at the 1% level, 9 at 5% level while 4 are statistically

[20] Relative return/performance is the difference between the absolute return and the performance of the market, which is measured by a benchmark.

[21] Annual Weighted Average (%): -0.0043 * 12 * 100 = -5.16%

significantly at the 10% level. The only funds displaying selectivity ability belong to EU, Switzerland and Norway Equity Funds category (Montepio Acções, Montepio Acções Europa and Postal Acções) however none of them have statistically significant alphas.

On the systematic risk ($\beta$) sphere, Domestic and EU, Switzerland and Norway equity funds reveal high levels of systematic risk (above 0.9) which is justified by the funds strategy with a high proportion of stocks in the portfolios. The remaining investment categories display significant lower levels of systematic risk ($\beta$) when compared to the mean (0.809) which can be explained by less aggressive investment strategies.

On average 73% of funds performance can be explained by the selected benchmark index indicating a good fitted model. The Sector and North American equity funds display a lower explanatory power which can be easily explained by the difficulty to find a better fitted index due to the diversity sectors and investment scope.

Overall the results suggest that Portuguese mutual funds do not possess selectivity ability. The results are consistent with international empirical evidence such as Jensen (1968), Ferson and Schadt (1996) and Rao (2000).

We now segregate the performance results by estimating both selectivity and timing coefficients by applying the TM (Eq. 4.2) and HM (Eq. 4.6) regression models. The empirical results from the TM regression model of Portuguese mutual funds are presented in the table 6. From the initial sample of 51 mutual funds, 2 funds were excluded[22] due to the low explanatory benchmarks according to equation 5.1. These 2 funds were equally excluded in the HM measurement that is presented in the table 7.

[22] **EUSTOXX.F04** – Orey Acçoes Europa: (Eq. 9) R-Sq adj 0.2836 ≯ 0.32701; **STOXXEU.F03** – Millennium Eurocarteira: (Eq. 9) R-Sq adj 0.2213 ≯ 0.32701

## Table 6 – Measure of selectivity and timing using TM model

This table presents the selectivity and timing performance from June 2002 to March 2012 based on the Treynor and Mazuy (1966) regression $R_{p,t} = \alpha_p + \beta(R_{m,t}) + \gamma(R_{m,t})^2 + e_{p,t}$, where $R_{p,t}$ is the excess return of portfolio $p$ in the period $t$; $R_{m,t}$ is the excess return of market index in the period $t$; α is Jensen's Alpha and represents the selectivity ability; $\beta$ is the systematic risk as an estimated sensitivity to market portfolio, γ is the measure of market timing and $e_{p,t}$ it's a residual variable. The funds estimates are aggregated by investment category and adjusted for autocorrelation and heteroskedasticity according to Newey & West (1987) and White (1980). α/γ > 0 (< 0) represents the number of funds statistically significant with positive (negative) selectivity (α) and positive (negative) timing (γ) at 1%, 5% and 10% level. Investment categories are: DM - Domestic equity funds; EU - EU, Switzerland and Norway equity funds; NA - North American equity funds; OI - Other Int equity funds; SE - Sector equity funds.

**Market Timing: Treynor and Mazuy**

| Fund type | Nº Funds / Nº observations | Correlation (α,γ) | Weighted average α | β | R-Sq adj. | Weighted average Y | α/γ >0 significant at 1% | α/γ <0 significant at 1% | α/γ >0 significant at 5% | α/γ <0 significant at 5% | α/γ >0 significant at 10% | α/γ <0 significant at 10% |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| *Panel D: fund type (APFIPP category)* | | | | | | | | | | | | |
| DM | 7 | -0.663 | -0.0042 | 0.9710 | 0.8722 | **0.2092** | 0/0 | 1/0 | 0/0 | 2/0 | 0/1 | 1/0 |
| UE | 12 | -0.802 | -0.0009 | 0.9198 | 0.8272 | -0.4004 | 0/0 | 0/0 | 0/0 | 1/0 | 0/0 | 2/1 |
| NA | 6 | -0.894 | -0.0067 | 0.7568 | 0.6253 | **0.2008** | 0/0 | 2/0 | 0/0 | 3/0 | 0/0 | 0/0 |
| OI | 12 | -0.783 | -0.0048 | 0.7505 | 0.7073 | -0.1328 | 0/1 | 2/1 | 0/1 | 3/2 | 0/0 | 3/0 |
| SE | 12 | -0.750 | -0.0043 | 0.6753 | 0.6301 | -0.2637 | 0/0 | 0/0 | 0/0 | 4/1 | 0/0 | 0/2 |
| **Weighted Average** | | -0.7757 | -0.0039 | 0.8058 | 0.7313 | -0.1407 | | | | | | |

Similar to Jensen's (1968) estimates the overall results from TM model confirm that funds managers have no selectivity skills. From the universe of funds that displayed positive (8) selectivity skills none of the estimates are statistically significant. From the universe of 41 funds with negative selectivity skills, 5 are significant at 1% level, 13 at 5% significant level and 6 are statistically significant at 10% level.

Regarding the timing skills, both Domestic and North American investment categories display considerable timing capacity with coefficients of 0.20 although when considering the whole sample the average of timing capacity is negative (-0.14). Out of 49 funds studied, 19 presented positive market timing but only 3 with a statistically significant level (1% - 1; 5% - 1; 10% - 1). From the negative market timers, 7 funds presented statistically significant levels (1% - 1; 5% - 3; 10% - 3).

The systematic risk ($\beta$) levels are in similar levels to Jensen's (1968) estimation although it's relevant to mention the increment of systematic risk on the Domestic equity funds to 0.97.

The importance of selecting an appropriate benchmark has been expressively cited thus worth mentioning the high explanatory power of the selected indices (73%).

It is also interesting to assess the relation between selectivity and timing skills. Similar to other studies the results are conclusive with a high negative correlation. Regardless of the investment category both components of performance are highly negative correlated. The Domestic equity funds present the lower negative correlation (-0.66) in contrast with North American equity funds (-0.89). In a more depth analysis, the fund with highest selectivity skills displays one of the worst timing performances and vice versa. Therefore it is clear that whenever a fund manager is focus in picking underpriced securities neglects the market movements and vice versa. Hence funds managers do not possess both skills simultaneously.

The second model applied in this study is the HM approach to measure the selectivity and timing skills of Portuguese mutual funds. The consolidated results are presented in the Table 7, below.

## Table 7 – Measure of selectivity and timing using HM model

This table presents the selectivity and timing performance from June 2002 to March 2012 based on the Henriksson and Merton (1981) regression $R_{p,t} = \alpha_p + \beta_1(x_t) + \beta_2(\gamma_t) + e_{p,t}$; where $\gamma_t$ = Max (0, $R_{f,t}$ - $R_{m,t}$). $R_{p,t}$ is the excess return of portfolio *p* in the period *t*; α is Jensen's Alpha and represents the selectivity ability; $\beta_1$ is the systematic risk as an estimated sensitivity to market portfolio, $\beta_2$ represents the number of free put options on the market due to the manager's timing skills, γ is the measure of market timing and $e_{p,t}$ it's a residual variable. The funds estimates are aggregated by investment category and adjusted for autocorrelation and heteroskedasticity according to Newey & West (1987) and White (1980). α/γ > 0 (< 0) represents the number of funds statistically significant with positive (negative) selectivity (α) and positive (negative) timing (γ) at 1%, 5% and 10% level. Investment categories are: DM - Domestic equity funds; EU - EU, Switzerland and Norway equity funds; NA - North American equity funds; OI - Other Int. equity funds; SE - Sector equity funds.

**Market Timing: Henriksson and Merton**

| Fund type | Nº Funds / Nº observations | Correlation (α,γ) | Weighted average α | β | R-Sq adj. | Weighted average Y | α/γ >0 significant at 1% | α/γ <0 significant at 1% | α/γ >0 significant at 5% | α/γ <0 significant at 5% | α/γ >0 significant at 10% | α/γ <0 significant at 10% |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| *Panel D: fund type (APFIPP category)* | | | | | | | | | | | | |
| DM | 7 | -0.871 | -0.0044 | 0.9418 | 0.8713 | **0.0396** | 0/0 | 0/0 | 0/0 | 1/0 | 0/0 | 1/0 |
| UE | 12 | -0.834 | 0.0007 | 0.9877 | 0.8279 | -0.1384 | 0/0 | 0/0 | 0/0 | 0/1 | 1/0 | 1/2 |
| NA | 6 | -0.686 | -0.0043 | 0.7921 | 0.6253 | **-0.1057** | 0/0 | 0/0 | 0/0 | 0/0 | 0/0 | 1/0 |
| OI | 12 | -0.920 | -0.0033 | 0.7906 | 0.7037 | -0.0888 | 0/1 | 1/0 | 0/0 | 1/2 | 0/0 | 1/0 |
| SE | 12 | -0.914 | -0.0026 | 0.7357 | 0.6407 | -0.1208 | 0/0 | 0/0 | 0/0 | 1/2 | 0/0 | 3/0 |
| **Weighted Average** | | -0.8618 | -0.0024 | 0.8472 | 0.7349 | -0.0925 | | | | | | |

In relation to selectivity, only EU, Switzerland and Norway equity funds category presents a positive selectivity estimates with 0.84% a year. We observe 14 funds with positive selectivity, and only 1 is statistically significant at 10% level. The HM model provides an improvement on funds displaying selectivity (+5) when compared to TM model. On the contrary, 35 funds present negative alphas being 11 statistically significant.

In contrast to Romacho and Cortez (2006) findings, the Domestic equity funds present the worst selectivity estimates -5.3% a year in contrast to positive 2.3% presented by the authors. The results presented here are in line with recent empirical studies on the Portuguese market developed by Oliveira (2000) and Govan (2011).

With respect to market timing, the contribution to overall fund performance is worse than presented by TM model as only one investment category presents positive timing

ability. The Domestic equity funds timing coefficient estimate is 0.04 in contrast to the worse timing estimate -0.14 from EU, Switzerland and Norway equity funds. There are 13 positive timers out of 49 funds and only one with a statistically significant (of 1%)[23]. From the funds with negative timing, there are 5 funds statistically significant at 5% level and 2 at 10% level.

With regards to systematic risk, in general, funds present higher estimated betas when compared to both Jensen's (1968) and TM models.

Similar to what is represented in Table 6, the HM model also shows a strong negative correlation between selectivity and timing skills. In contrast to TM estimates, the Domestic equity funds present now a higher negative correlation (-0.871). It's worth emphasizing that Other International equity funds and Sector equity funds display almost a negative perfect correlation between both skills. Thus as expected the funds with better selectivity skills show the worst timing estimated coefficients and vice versa[24].
Unsurprisingly none of the funds was able to excel in both picking underpriced securities and timing the market simultaneously.

With regards to the adjusted R-squared, on average the selected indices explain 73% of the fund's returns in line with the TM estimates.

[23] Millennium Acções Japão

[24] Postal Acções: $\alpha = 8.75\%$ (year) / $\gamma = -0.378$; Millennium Acções Japão:$\gamma = 0.660$ / $\alpha = -22\%$ (year)

## 6.2. Conditional models

The importance of public information in predicting stock returns has been well covered in the previous chapters. With the purpose of perceiving the contribution of informational variables to evaluation of fund's performance we will firstly test the significance and robustness of the informational variables used.

As public informational variables, we used the following instruments: dividend yield (DY), short term interest rate (EUR) and slope of the term structure (TS). The benchmarks dividend yields monthly rates refers to the amount of dividend payments in the preceding 12 months divided by the current equity indices prices. Due to the considerable amount of equity indices used as market proxies, we will only analyse the most representative benchmarks per investment category while the remaining results will be added to the appendices for further analysis (Appendix 5). The slope of the term structure is the spread between a 10 year *bund*[25] and the 1 month Euribor rate also used as short term interest rate (EUR). All these variables are demeaned, lagged 1 month and subtracted by its average.

These variables were also used in previous relevant studies such as Ferson and Schadt (1996) and Leite and Cortez (2006 and 2009) however, instead of using a 2 month moving average, we used the sample average to gain a better understanding how deviations from long term period averages differ from short term moving averages.

To test the statistical significance of the selected variables both simple and multiple regressions were ran, whereas the dependent variable is the monthly excess return of the benchmarks and the conditional information variables are used as independent variables. With regards to the simple regressions, the variables are almost all significant

[25] A bond issued by Germany's federal government.

at 1% or 5% levels apart from the short term interest in the context of PSI 20 and MSCI Europe Telecom Services in the Table 8. From the whole universe of 21 simple regressions per informational variables 7 are not statistical significance in the context of short term interest rate (EUR), 5 in the in the context of dividend yield (DY) and 2 of the term structure (TS).

In line with Leite and Cortez (2009) the sign of short term interest rate coefficient is negative in all regressions. As expected lower interest rates predicts higher market returns. The negative sign of dividend yield is contrary to general expectation that higher dividend yield predict higher stock returns. However, as explained by the authors, the negative sign can be explained by using a stochastic detrend (subtracting the average from the variable's value).

On the multiple regressions, the dividend yield (DY) continues to display high levels of significance by exhibiting statistical significance of 1% or 5% for 70% of the regressions. The 3 informational variables together possess a considerable high explanatory power of 15% on average of the whole universe. This result has an explanatory power higher than obtained by Leite and Cortez (2009). The importance of informational variables on the expected excess stock returns is confirmed by the Wald Test as we rejected the null hypothesis, with 5% significant level.

Having said this, the public information represented by the information variables selected has a direct influence to explain or predict the funds' performance.

## Table 8 – Regressions of the benchmarks excess returns on lagged informational variables

This table exibits a sample of the most representive benchmarks per investment category in relation with the lagged informational variables. The dependent variable in the simple and multiple regressions is the monthly excess return of the benchmarks. The information variables (independent variables) are the deviations from average lagged 1 month: dividend yield (DY), short term interest (EUR) and the slope of the term structure (TS). The funds estimates are adjusted for autocorrelation and heteroskedasticity according to Newey & West (1987) and White (1980). The asterisks are used to denote the statistically significance at 1% (***), 5% (**) and 10% (*) level.

| Indices / Variables | PSI 20 | STOXX Europe | S&P 500 | MSCI World | MSCI Europe Telecom Services |
|---|---|---|---|---|---|
| **DY** | | | | | |
| Coef. | -1.765 | -2.879 | -5.402 | -3.623 | -0.634 |
| t-estat | -3.727 *** | -3.574 *** | -2.450 ** | -2.699 *** | -2.100 ** |
| prob | 0.000 | 0.001 | 0.016 | 0.008 | 0.038 |
| R-Sq adj. | 10.46% | 9.05% | 10.80% | 11.86% | 3.61% |
| **EUR** | | | | | |
| Coef. | -0.584 | -0.925 | -0.853 | -1.034 | -0.421 |
| t-estat | -1.472 | -2.743 *** | -2.622 *** | -2.954 *** | -0.948 |
| prob | 0.144 | 0.007 | 0.010 | 0.004 | 0.345 |
| R-Sq adj. | 1.65% | 5.21% | 5.31% | 6.92% | 0.74% |
| **TS** | | | | | |
| Coef. | 1.443 | 1.520 | 1.474 | 1.847 | 1.232 |
| t-estat | 2.639 *** | 3.242 *** | 3.270 *** | 3.839 *** | 1.997 ** |
| prob | 0.009 | 0.002 | 0.001 | 0.000 | 0.048 |
| R-Sq adj. | 5.46% | 7.43% | 8.14% | 11.17% | 3.27% |
| **DY** | | | | | |
| Coef. | -2.348 | -3.198 | -6.101 | -4.096 | -0.675 |
| t-estat | -3.617 *** | -3.420 *** | -2.595 ** | -4.227 *** | -1.554 |
| prob | 0.000 | 0.001 | 0.011 | 0.000 | 0.123 |
| **EUR** | | | | | |
| Coef. | -1.461 | -1.227 | -1.023 | -1.061 | -0.249 |
| t-estat | -1.548 | -1.813 * | -1.400 | -1.606 | -0.216 |
| prob | 0.124 | 0.073 | 0.164 | 0.111 | 0.830 |
| **TS** | | | | | |
| Coef. | -0.563 | -0.411 | 0.073 | 0.439 | 0.876 |
| t-estat | -0.440 | -0.416 | 0.072 | 0.479 | 0.577 |
| prob | 0.661 | 0.678 | 0.943 | 0.633 | 0.565 |
| R-Sq adj. | 14.88% | 14.53% | 17.92% | 21.86% | 5.01% |
| **Wald** | 0.000 | 0.000 | 0.001 | 0.000 | 0.042 |

By analysing the conditional model of TM displayed in the table 9, we can affirm that the use of public information led to slight improvements in both mutual fund betas and the explanatory power of the models. This is consistent with the findings from Ferson and Schadt (1996). However when we account for the overall funds performance we register a slight decrease in both selectivity and timing estimates contrasting Ferson and Schadt (1996) findings.

**Table 9 – Measure of selectivity and timing using unconditional and conditional TM model**

This table presents the selectivity and timing performance from June 2002 to March 2012 based on the unconditional and conditional versions of Treynor and Mazuy (1966) regression model. The funds estimates are aggregated by investment category and adjusted for autocorrelation and heteroskedasticity according to Newey & West (1987) and White (1980). Investment categories are: DM - Domestic equity funds; EU - EU, Switzerland and Norway equity funds; NA - North American equity funds; OI - Other Int. equity funds; SE - Sector equity funds.

| Market Timing | | Unconditional Treynor & Mazuy | | | | | Conditional Treynor & Mazuy | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| Fund | Nº Funds | Correlation (α,γ) | Weighted average α | β | R-Sq adj. | Weighted average Y | Correlation (α,γ) | Weighted average α | β | R-Sq adj. | Weighted average Y |
| DM | 7 | -0.663 | -0.0042 | 0.9710 | 0.8722 | **0.2092** | -0.713 | -0.0042 | 0.9676 | 0.8731 | **0.1442** |
| UE | 12 | -0.802 | -0.0009 | 0.9198 | 0.8272 | -0.4004 | -0.841 | -0.0055 | 0.9704 | 0.8031 | -0.3564 |
| NA | 6 | -0.894 | -0.0067 | 0.7568 | 0.6253 | **0.2008** | -0.943 | -0.0061 | 0.7517 | 0.6362 | -0.0341 |
| OI | 12 | -0.783 | -0.0048 | 0.7505 | 0.7073 | -0.1328 | -0.107 | -0.0062 | 0.7658 | 0.7134 | -0.3704 |
| SE | 12 | -0.750 | -0.0043 | 0.6753 | 0.6301 | -0.2637 | -0.614 | -0.0032 | 0.6496 | 0.6383 | -0.2089 |
| **Overall** | | -0.778 | -0.0039 | 0.8058 | 0.7313 | -0.1407 | -0.6434 | -0.005 | 0.8177 | 0.7318 | -0.2156 |

| nº | α | Y |
|---|---|---|
| **Positive** | 8 | 19 |
| **Negative** | 41 | 30 |
| **Total** | **49** | **49** |

| nº | α | Y |
|---|---|---|
| **Positive** | 6 | 17 |
| **Negative** | 44 | 33 |
| **Total** | **50** | **50** |

A deeper selectivity analysis indicates that the number of funds displaying positive selectivity coefficients decrease from 8 to 6 (none statistically significant) while the positive timing coefficients decrease from 19 to 17 although the funds statistically significant increased from 3 to 4, in line with the model improvement conclusions. On the Domestic equity funds the selectivity ability remains the same regardless the model. On EU, Switzerland and Norway equity funds and Other International equity funds the

selectivity coefficients decreased from -1.08% to -6.6% and -5.76% to -7.44% (a year) respectively. On the other hand the North American equity funds and Sector equity funds registered slight improvements, from -8.04% to -7.32% and -5.16% to -3.84% (a year) respectively.

Regarding the timing skills, even though the positive coefficients don't decrease significantly in number, we register a change on the timing capacity of North American equity funds. When taking in consideration the public information variables, the funds manifest negative timing ability.

Overall, it's clear that the Domestic equity funds exhibit market timing skills and as expected no stock picking skills due to the negative correlation of both skills. The evidence of timing skills on domestic market is in line with the distance effect paradigm as managers who invest locally seem to better time the market then the ones investing globally. For the remaining investment categories there is no particular evidence of positive selectivity or market timing ability on average.

By performing a similar thorough analysis on the conditional model of HM, table 10, we achieve similar results to the conditional TM model with slight improvements in mutual fund betas however the explanatory power of the models remains almost unchanged (Δ -0.002). When accounting for the overall funds performance we observe also a decrease in both selectivity and timing capacity.

**Table 10 – Measure of selectivity and timing using unconditional and conditional HM model**

This table presents the selectivity and timing performance from June 2002 to March 2012 based on the unconditional and conditional versions of Henriksson and Merton (1981) regression model. The funds estimates are aggregated by investment category and adjusted for autocorrelation and heteroskedasticity according to Newey & West (1987) and White (1980). Investment categories are: DM - Domestic equity funds; EU - EU, Switzerland and Norway equity funds; NA - North American equity funds; OI - Other Int equity funds; SE - Sector equity funds.

| Market Timing | | Unconditional Henriksson & Merton | | | | | Conditional Henriksson & Merton | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| Fund | Nº Funds | Correlation (α,γ) | Weighted average α | β | R-Sq adj. | Weighted average Y | Correlation (α,γ) | Weighted average α | β | R-Sq adj. | Weighted average Y |
| DM | 7 | -0.871 | -0.0044 | 0.9418 | 0.8713 | **0.0396** | -0.737 | -0.0041 | 0.9510 | 0.8724 | **0.0181** |
| UE | 12 | -0.834 | **0.0007** | 0.9877 | 0.8279 | -0.1384 | -0.909 | -0.0037 | 1.0384 | 0.8035 | -0.1400 |
| NA | 6 | -0.686 | -0.0043 | 0.7921 | 0.6253 | -0.1057 | -0.592 | -0.0024 | 0.8475 | 0.6395 | -0.2117 |
| OI | 12 | -0.920 | -0.0033 | 0.7906 | 0.7037 | -0.0888 | -0.922 | -0.0039 | 0.8538 | 0.7121 | -0.1757 |
| SE | 12 | -0.914 | -0.0026 | 0.7357 | 0.6407 | -0.1208 | -0.845 | -0.0012 | 0.7120 | 0.6417 | -0.1230 |
| Overall | | -0.845 | -0.0024 | 0.8472 | 0.735 | -0.0925 | -0.801 | -0.0030 | 0.8806 | 0.733 | -0.1310 |

| nº | α | Y |
|---|---|---|
| Positive | 14 | 13 |
| Negative | 35 | 36 |
| Total | 49 | 49 |

| nº | α | Y |
|---|---|---|
| Positive | 19 | 10 |
| Negative | 31 | 40 |
| Total | 50 | 50 |

Even though the average selectivity capacity decreases from -2.92% a year to -3.66%, the actual numbers of funds with stock picking skills increases from 14 to 19. Meaning that despite the number of funds with selectivity skills, the funds with negative coefficients are aggravated.

The evidence shows that once again for EU, Switzerland and Norway equity funds and Other International equity funds the selectivity coefficients decreased -5.30% and -0.68% when compared to the unconditional model. While the remaining categories increase (DM: 0.38%; NA: 2.28% and SE: 1.66%). It's important to highlight that the category with positive selectivity capacity in the unconditional display now negative coefficients.

When controlling for the predetermined information variables, a decrease on the timing capacity is revealed. The positive timers shrink from 13 to 10 in the conditional model.

This trend applies to all investment categories with no exception, nevertheless the Domestic Equity Funds still display positive timing capacity even though in a reduced format. From the positive timers only one fund[26] is statistically significance (1%).

### 6.2.1. 'Deep dive' analysis

This chapter of the empirical results analysis aims to provide an extensive analysis of mutual funds performance based on its characteristics such as age, size and market cycle in addition to the results presented by investment category.

**Tercile analysis**

In order to analyse the funds performance based on their age and size the data sample was divided in terciles. Each tercile composed of 17 funds however due to the exclusion of Millennium Eurocarteira to meet explanatory power criteria measured by equation (5.1), one tercile has only 16 funds.

The first characteristic considered, age, aims to answer the following question: Does experience matter? Longer established funds are more likely to have experienced managers thus more likely to better forecast the market. In both TM and HM conditional models the selectivity coefficients are negative in all terciles however it decreases monotonically with the age of funds. Therefore, on average, older funds are better stock pickers than younger funds. This results need to be assumed with cautious due to the lack of managers' tenure information which could be used as proxy of fund management experience.

When it comes to market timing the results are not as clear as do not follow a monotonically pattern. On average none of the terciles display positive timing capacity

[26] Millennium Acções Japão

however the middle tercile displays the less perverse timing in both models. Overall the older funds present worse timing results however these results need to be cautiously reflected due to the survivorship bias.

The second characteristic studied, size, aims to answer the following question: Do small funds fare better? Smaller funds are more likely to time the market due to their nature, it may be easier to enter or exit positions without affecting market prices. The average size of the sample is 23 million euros while the first tercile is 49 million, the middle and bottom terciles are 13 and 6 million euros respectively.

When we analyse the selectivity coefficients the middle tercile presents the better results in both models even though none of them show evidence of positive selectivity skills. It's worth highlighting that from the terciles studied, no funds presented positive statistically significance selectivity in TM model and only 2 in the HM model. The negative coefficients demonstrate clearly higher levels of statistically significance with 4 funds at 1% level, 11 at 5% and 4 at 10% level in the TM model. In the HM model we register a decrease in statistic significance with 2 funds statistically significance at 1%, 1 at 5% and 2 at 10% level.

With respect to the timing contribution to the overall funds performance the results are quite conclusive as none of the terciles in both models display timing skills. In the HM model the results are in line with our expectations as the bottom tercile (smaller size amount) displays less perverse timing coefficient. Interestingly the TM model produces a contrarian result as the top tercile (bigger size amount) shows less perverse timing coefficient. In both models the middle tercile exhibits the worst timing results. Overall there is no consistent pattern in the obtained results whereas in theory the smaller funds will be in a better position to time the market without affecting the market prices.

The analysis of funds' size needs to be considered cautiously due to the considerable small average size of each tercile. The top tercile exhibits a mean size amount of 54

million euros with only 2 funds above 100 million euros. If we consider Jiang's (2003) similar approach to the US market, the author divided her sample into four groups[27]: micro, small, big and huge, distributed almost equally. If we would consider a similar classification only 5 funds would be classified as big funds while 20 would be small and the remaining 26 micro. Thus 90% of our sample is constituted of small and micro funds.

**Market cycle analysis**

This section aims to answer the following question: Do funds manage to anticipate market cycles?

The subperiod analysis is commonly introduced in few studies such as Ferson and Schadt (1996) and Leite and Cortez (2006) to assess if the selectivity and timing capacities are time varying. The period of analysis is usually broken down in 2 or 3 equal periods, however this methodology does not accurately measure the funds skills in different market cycles as each period can easily contain more than one market cycle.

Castro (2011), studying the Portuguese stock market cycles, has identified six bull markets and five bear markets in the last two decades. Three of the bear markets do actually coincide with world crises. We believe that it is important to perceive if mutual funds exhibit capacity to anticipate such market movements and adjust their portfolios accordingly in periods of high volatility.

To determine the Portuguese bull and bear cycles we used the methodology developed by Pagan and Sossounov (2002) to identify the turning point from a bull to a bear market and vice versa. The method aims to identify the "peaks" and "troughs" during

[27] Micro (under US$20 million), small (up to US$100 million), big (up to US$500 million), and huge (US$500 million or more). Jiang (2003), pp. 422

the period of analysis. A turning point "peak" takes place if at the time *t* the Ln of the equity index price is the highest than the previous ($P_{t-8}$) and 8 months ahead ($P_{t+8}$).

$$Peak = [ln\, P_{t-8}, \ldots, \ln P_{t-1} < \ln P_t > Ln\, P_{t+1}, \ldots, \ln P_{t+8}] \quad (6.1)$$

On the other hand the turning point "trough" takes place if at the time *t* the Ln of equity index price is the lowest than the previous ($P_{t-8}$) and 8 months ahead ($P_{t+8}$).

$$Trough = [ln\, P_{t-8}, \ldots, \ln P_{t-1} > \ln P_t < Ln\, P_{t+1}, \ldots, \ln P_{t+8}] \quad (6.2)$$

Additional restriction criteria applied by the authors are specified in the Appendix 6.

For the subperiod analysis the market cycles were calculated for the Domestic equity funds using PSI 20 Index, EU, Switzerland and Norway equity funds using Euro STOXX 50 Index and North American equity funds using S&P 500 Index. For the remaining categories the market cycles were not calculated as there is no individual equity index suitable to majority of funds due to their diversity. The market cycles are displayed in the below Table 11.

**Table 11 – Market cycles from 2002 to 2012**

This table presents the different market cycles (bull and bear) from 2002 to 2012 for the following stock indices: PSI 20, EURO STOXX 50 and S&P 500. The market cycles were determined by applying the methodology developed by Pagan and Sossounov (2002).

| **PSI 20** | | | | *Bear* | *Bull* | | |
|---|---|---|---|---|---|---|---|
| Period | | Months | | Peak-Trough | Trough-Peak | Months | Business Cycle |
| Nov-02 | Jul-07 | *57* | *Peak* | | *57* | | |
| Aug-07 | Mar-09 | *19* | *Trough* | *19* | | | |
| Apr-09 | Oct-09 | *6* | *Peak* | | 6 | *27* | Peak-Peak |
| Nov-09 | Mar-12 | *28* | *Trough* | 28+ | | *37* | Trough-Trough |
| | | | **Average** | **24** | **31** | | |

| EURO STOXX 50 | | | | *Bear* | *Bull* | | |
|---|---|---|---|---|---|---|---|
| Period | | Months | | Peak-Trough | Trough-Peak | Months | Business Cycle |
| Jun-02 | Apr-03 | *9* | *Trough* | *9+* | | | |
| May-03 | Mar-04 | *10* | *Peak* | | 10 | | |
| Apr-04 | Sep-04 | *5* | *Trough* | 5 | | *17* | Trough-Trough |
| Oct-04 | Jun-07 | *32* | *Peak* | | *32* | *40* | Peak-Peak |
| Jul-07 | Mar-09 | *20* | *Trough* | 20 | | *55* | Trough-Trough |
| Apr-09 | May-11 | *25* | *Peak* | | *25* | *48* | Peak-Peak |
| Jun-11 | Mar-12 | *9* | *Trough* | 9 | | *37* | Trough-Trough |
| | | | **Average** | **11** | **23** | | |

| S&P 500 | | | | *Bear* | *Bull* | | |
|---|---|---|---|---|---|---|---|
| Period | | Months | | Peak-Trough | Trough-Peak | Months | Business Cycle |
| Jun-02 | Mar-03 | *8* | *Trough* | 8+ | | | |
| Apr-03 | Mar-04 | *11* | *Peak* | | 11 | | |
| Apr-04 | Sep-04 | *5* | *Trough* | 5 | | *18* | Trough-Trough |
| Oct-04 | Oct-07 | *37* | *Peak* | | *37* | *44* | Peak-Peak |
| Nov-07 | Jul-10 | *32* | *Trough* | 32 | | *71* | Trough-Trough |
| Aug-10 | Mar-12 | *19* | *Peak* | | *19* | *54* | Peak-Peak |
| | | | **Average** | **15** | **22** | | |

As corroborated before, the inclusion of public information improves the measurement of funds performance therefore on the following analysis of market cycles we accounted the predetermined public informational variables.

Regarding the selectivity analysis the funds investing in the domestic market present positive selectivity ability but only during the bull markets although none of them statistically significant. Both Domestic and North American equity funds are better stock pickers during the bull markets than during the bear markets. The opposite results are exhibited by EU, Switzerland and Norway equity funds. With respect to the timing ability, interestingly Domestic and North American equity funds display positive timing ability during bear markets therefore are able to anticipate major market crashes. Then again EU, Switzerland and Norway equity funds does not display any positive timing

ability in any market cycle displaying even a perverse timing capacity in the bear markets.

It is also interesting to compare the systematic risk levels between the two market cycles. Contrary to what expected, Domestic and North American equity funds seem to load more systematic risk in the bear periods yet able to time the market positively. On the other hand, EU, Switzerland and Norway equity funds seem to pick more "defensive" stocks on bear markets and more "aggressive" stocks in the bull market. Even though the timing coefficients improve during the bull markets the results are yet perverse.

Table 12 provides us with TM model analysis by funds characteristics while table 13 displays similar content but using the conditional version of HM model. Contrary to TM results we now found evidence of selectivity ability in the three investment categories even though in different market cycles. Similar to the results from table 12 both Domestic and North American equity funds display better stock picking results during the bull markets while EU, Switzerland and Norway equity funds exhibits the contrary evidence. With respect to market timing the Domestic equity funds display evidence of positive timing both during bull and bear markets, in line with the overall results of both models. Using the HM model, the North American equity funds timing coefficients are brought down to a negative timing ability in the bear market compared to the positive coefficient displayed in TM model.

When it comes to the systematic risk the Domestic equity funds still load more risk during bear markets in contrast to North American and EU, Switzerland and Norway equity funds which increased they exposure to the market during the bull markets to benefit from the momentum.

## Table 12 – Measure of selectivity and timing by the conditional version of TM model with break down by funds' characteristics

This table presents the selectivity and timing performance from June 2002 to March 2012 based on the conditional version of Treynor and Mazuy (1966) regression $R_{p,t} = \alpha_p + \beta(R_{m,t}) + \beta'_p (Z_{(t-1)} R_{m,t}) + \gamma(R_{m,t})^2 + e_{p,t}$, where $R_{p,t}$ is the excess return of portfolio $p$ in the period $t$; $R_{m,t}$ is the excess return of market index in the period $t$; α is Jensen's Alpha and represents the selectivity ability; $\beta$ is the systematic risk as an estimated sensitivity to market portfolio, $\beta'_p (Z_{(t-1)} R_{m,t})$ represents the response of manager's beta to the public information, $Z_t$, available at *t-1* for predicting returns, γ is the measure of market timing and $e_{p,t}$ it's a residual variable. The funds estimates are aggregated by investment category and adjusted for autocorrelation and heteroskedasticity according to Newey & West (1987) and White (1980). α/γ > 0 (< 0) represents the number of funds statistically significant with positive (negative) selectivity (α) and positive (negative) timing (γ) at 1%, 5% and 10% statistically significance level. Investment categories are: DM - Domestic equity funds; EU - EU, Switzerland and Norway equity funds; NA - North American equity funds; OI - Other Int. equity funds; SE – Sector equity funds.

**Market Timing: Treynor and Mazuy**

| Fund characteristics | Nº Funds / Nº observations | Average Age/Size | Correlation (α,γ) | Weighted average (α) | β | R-Sq adj. | Weight average (γ) | α/γ >0 significant at 1% | α/γ <0 significant at 1% | α/γ >0 significant at 5% | α/γ <0 significant at 5% | α/γ >0 significant at 10% | α/γ <0 significant at 10% |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| ***Panel A: fund age (years since inception)*** | | | | | | | | | | | | | |
| Top Tercile (oldest) | 17 | 18 | -0.696 | -0.0029 | 0.8429 | 0.7658 | -0.3754 | 0/0 | 1/1 | 0/0 | 2/1 | 0/0 | 2/2 |
| Middle Tercile | 17 | 13 | -0.783 | -0.0042 | 0.8921 | 0.7668 | -0.0594 | 0/1 | 2/1 | 1/0 | 3/0 | 1/0 | 2/0 |
| Bottom Tercile (newest) | 16 | 8 | -0.382 | -0.0081 | 0.7118 | 0.6584 | -0.2118 | 0/0 | 1/0 | 0/1 | 5/1 | 0/0 | 0/3 |
| ***Panel B: fund size (€ millions)*** | | | | | | | | | | | | | |
| Top Tercile (biggest) | 16 | 49 | -0.510 | -0.0048 | 0.8334 | 0.7384 | -0.0181 | 0/0 | 1/0 | 0/0 | 5/0 | 0/0 | 2/0 |
| Middle Tercile | 17 | 13 | 0.143 | -0.0033 | 0.8054 | 0.7640 | -0.5743 | 0/0 | 0/2 | 0/1 | 4/1 | 0/0 | 1/3 |
| Bottom Tercile (smallest) | 17 | 6 | -0.610 | -0.0069 | 0.8151 | 0.6933 | -0.0427 | 0/1 | 3/0 | 0/0 | 2/0 | 0/1 | 1/2 |
| ***Panel C: Market cycle*** | | | | | | | | | | | | | |
| DM Bear | 7 / 343 | | 0.153 | -0.0102 | 1.0095 | 0.8565 | 0.2204 | 0/0 | 1/0 | 0/1 | 3/0 | 0/0 | 2/0 |
| DM Bull | 6 /384 | | -0.693 | 0.0026 | 0.8890 | 0.8245 | -0.0107 | 0/0 | 0/0 | 0/0 | 0/0 | 0/0 | 0/0 |
| UE Bear | 13 / 590 | | -0.404 | -0.0015 | 0.8601 | 0.8116 | -0.9162 | 0/0 | 0/0 | 0/0 | 0/1 | 0/0 | 0/1 |
| UE Bull | 13 / 852 | | 0.858 | -0.0237 | 1.0323 | 0.7475 | -0.3542 | 0/0 | 0/0 | 0/0 | 1/1 | 0/0 | 1/0 |
| NA Bear | 6 / 294 | | -0.891 | -0.0046 | 0.8215 | 0.7034 | 0.7759 | 0/0 | 0/0 | 0/0 | 0/0 | 0/1 | 0/0 |
| NA Bull | 6 / 414 | | -0.836 | -0.0004 | 0.7291 | 0.4480 | -2.1992 | 0/0 | 0/0 | 0/0 | 1/0 | 0/0 | 0/2 |
| ***Panel D: fund type (APFIPP category)*** | | | | | | | | | | | | | |
| DM | 7 | | -0.713 | -0.0042 | 0.9676 | 0.8731 | 0.1442 | 0/0 | 1/0 | 0/0 | 1/0 | 0/1 | 0/0 |
| UE | 14 | | -0.841 | -0.0055 | 0.9704 | 0.8031 | -0.3564 | 0/0 | 1/0 | 0/0 | 1/0 | 0/0 | 1/2 |
| NA | 6 | | -0.943 | -0.0061 | 0.7517 | 0.6362 | -0.0341 | 0/0 | 1/0 | 0/0 | 3/0 | 0/0 | 1/1 |
| OI | 12 | | -0.107 | -0.0062 | 0.7658 | 0.7134 | -0.3704 | 0/1 | 1/2 | 0/1 | 3/1 | 0/0 | 2/0 |
| SE | 12 | | -0.614 | -0.0032 | 0.6496 | 0.6383 | -0.2089 | 0/0 | 0/0 | 0/1 | 3/1 | 0/0 | 0/2 |

## Table 13 - Measure of selectivity and timing by the conditional version of HM model with break down by funds' characteristics

This table presents the selectivity and timing performance from June 2002 to March 2012 based on the conditional version of Henriksson and Merton (1981) regression $R_{p,t} = \alpha_p + \beta 1(xt) + \beta' p\ (Z_{(t-1)}\ R_{m,t}) + \beta 2(\gamma_t) + e_{p,t}$; where $\gamma_t = \text{Max}\ (0, R_{f,t} - R_{m,t})$. $R_{p,t}$ is the excess return of portfolio *p* in the period *t*; α is Jensen's Alpha and represents the selectivity ability; β1 is the systematic risk as an estimated sensitivity to market portfolio, $\beta' p\ (Z_{(t-1)}\ R_{m,t})$ represents the response of manager's beta to the public information, Z*t*, available at *t-1* for predicting returns, β2 represents the number of free put options on the market due to the manager's timing skills, γ is the measure of market timing and $e_{p,t}$ it's a residual variable. The funds estimates are aggregated by investment category and adjusted for autocorrelation and heteroskedasticity according to Newey & West (1987) and White (1980). ). α/γ > 0 (< 0) represents for the number of funds statistically significant with positive (negative) selectivity (α) and positive (negative) timing (γ) at 1%, 5% and 10% statistically significance level.. Investment categories are: DM - Domestic equity funds; EU - EU, Switzerland and Norway equity funds; NA - North American equity funds; OI - Other Int. equity funds; SE - Sector equity funds.

**Market Timing: Henriksson and Merton**

| | Fund characteristics | Nº Funds / Nº observations | Average Age/Size | Correlation (α,γ) | Weighted average (α) | β | R-Sq adj. | Weight average (Y) | α/γ >0 significant at 1% | α/γ <0 significant at 1% | α/γ >0 significant at 5% | α/γ <0 significant at 5% | α/γ >0 significant at 10% | α/γ <0 significant at 10% |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| ***Panel A: fund age (years since inception)*** | | | | | | | | | | | | | | |
| | Top Tercile (oldest) | 17 | 18 | -0.694 | -0.0005 | 0.9300 | 0.7667 | -0.1730 | 0/0 | 0/0 | 0/0 | 0/4 | 2/0 | 1/3 |
| | Middle Tercile | 17 | 13 | -0.921 | -0.0032 | 0.9175 | 0.7652 | -0.0621 | 0/1 | 1/1 | 0/0 | 1/0 | 0/0 | 1/1 |
| | Bottom Tercile (newest) | 16 | 8 | -0.460 | -0.0056 | 0.7889 | 0.6620 | -0.1595 | 0/0 | 0/0 | 0/0 | 0/1 | 0/0 | 0/4 |
| ***Panel B: fund size (€ millions)*** | | | | | | | | | | | | | | |
| | Top Tercile (biggest) | 16 | 49 | -0.726 | -0.0024 | 0.8863 | 0.7385 | -0.1187 | 0/0 | 0/0 | 0/0 | 0/1 | 0/0 | 2/2 |
| | Middle Tercile | 17 | 13 | -0.083 | -0.0012 | 0.9063 | 0.7646 | -0.1902 | 0/0 | 0/1 | 0/0 | 0/3 | 1/0 | 0/3 |
| | Bottom Tercile (smallest) | 17 | 6 | -0.631 | -0.0055 | 0.8496 | 0.6953 | -0.0833 | 0/1 | 2/0 | 0/0 | 1/1 | 1/0 | 0/3 |
| ***Panel C: Market cycle*** | | | | | | | | | | | | | | |
| DM | Bear | 7 / 343 | | -0.291 | -0.0104 | 0.9777 | 0.8547 | 0.0298 | 0/0 | 0/0 | 0/0 | 1/0 | 0/0 | 3/0 |
| | Bull | 6 /384 | | -0.721 | 0.0011 | 0.8241 | 0.8251 | 0.0938 | 0/0 | 0/0 | 0/0 | 0/0 | 0/0 | 0/0 |
| UE | Bear | 13 / 590 | | -0.690 | 0.0013 | 1.0055 | 0.8130 | -0.2927 | 0/0 | 0/0 | 0/0 | 0/0 | 0/0 | 1/2 |
| | Bull | 13 / 852 | | 0.892 | -0.0202 | 1.1520 | 0.7494 | -0.2140 | 0/0 | 0/1 | 0/0 | 1/0 | 0/0 | 1/0 |
| NA | Bear | 6 / 294 | | -0.937 | -0.0021 | 0.7982 | 0.6933 | -0.0434 | 0/0 | 0/0 | 0/0 | 0/0 | 0/0 | 0/0 |
| | Bull | 6 / 414 | | -0.909 | 0.0029 | 0.9895 | 0.4648 | -0.4988 | 0/0 | 0/1 | 0/0 | 1/1 | 0/0 | 0/1 |
| ***Panel D: fund type (APFIPP category)*** | | | | | | | | | | | | | | |
| | DM | 7 | | -0.737 | -0.0041 | 0.9510 | 0.8724 | 0.0181 | 0/0 | 0/0 | 0/0 | 1/0 | 0/0 | 1/0 |
| | UE | 14 | | -0.909 | -0.0037 | 1.0384 | 0.8035 | -0.1400 | 0/0 | 1/0 | 0/0 | 0/1 | 2/0 | 0/3 |
| | NA | 6 | | -0.592 | -0.0024 | 0.8475 | 0.6395 | -0.2117 | 0/0 | 0/0 | 0/0 | 0/0 | 0/0 | 0/1 |
| | OI | 12 | | -0.922 | -0.0039 | 0.8538 | 0.7121 | -0.1757 | 0/1 | 1/1 | 0/0 | 0/2 | 0/0 | 1/3 |
| | SE | 12 | | -0.845 | -0.0012 | 0.7120 | 0.6417 | -0.1230 | 0/0 | 0/0 | 0/0 | 0/2 | 0/0 | 0/1 |

# 7. Conclusion and recommendations for further research

This study examined the performance of Portuguese mutual funds by measuring their forecasting skills, using monthly data from June 2002 to March 2012 for a sample 51 Portuguese mutual funds. To measure the funds' performance several models were used to increase the robustness of the findings. Specifically traditional methods based on unconditional returns and conditional models. The objective was to explore the effects of incorporating public information through lagged informational variables.

The empirical evidence when applying Jensen (1968) methodology shows that, on average, all investment categories studied present negative relative performance. From the total universe only 6% of the funds presented positive selectivity skills however none statistically significant.

With the intention of measuring the contribution of both selectivity and timing to the funds' performance the Treynor and Mazuy (1966) and Henriksson and Merton (1981) methodologies were applied. Overall both models show that the Portuguese mutual funds on average are not skilful to identify underpriced stocks or to time the market successfully. However, while applying Henriksson and Merton (1981) model the EU, Switzerland and Norway equity funds display a positive selectivity although with little statistical significance. Regarding market timing, despite the general evidence of perverse timing ability, the Domestic equity funds show evidence of positive market timing in both models. In the Treynor and Mazuy (1966) model the North American equity funds also exhibit positive timing skills although not statistically significant. The fact that only Domestic equity funds show evidence of positive market timing is consistent with the distance effect phenomenon. As funds go more international on their investment approach, funds timing ability will be lower.

Furthermore, the results from both models reveal a strong negative correlation between selectivity and timing abilities, a fact more obvious in the Henriksson and Merton (1981) model. This evidence supports the view of Bello and Janjigian (1997) and is

consistent with most of the international studies, also in line with Romacho and Cortez (2006).

The importance of taking into account public information available while measuring funds performance is a very important development in portfolio evaluation therefore in this study we used informational variables such as dividend yield, short term interest and the slope of the term structure; such approach is called conditional performance evaluation. Instead of assuming for granted the importance of those informational variables, simple and multiple regressions were performed to test their ability in predicting stock excess returns. Overall the variables are useful predictors and the dividend yields showed the highest explanatory power.

The conditional models led to slight improvements in both mutual fund betas and the explanatory power, especially on the TM model. The results for the overall funds performance register a slight decrease in both selectivity and timing estimates contrasting Ferson and Schadt (1996) findings. The results indicate once again that only Domestic equity funds exhibit market timing skills regardless the decrease on overall estimates. As expected, no positive selectivity skills are observed on this category due to the negative correlation of both skills. Overall, a weighted average of mutual funds in the sample shows clearly that the Portuguese mutual funds display neither stock picking skills nor timing abilities. This is consistent with the findings from Ferson and Schadt (1996).

The relationship of mutual funds performance and fund characteristics such as age and size were also studied. We found evidence that older funds are better stock pickers than younger funds. Regarding timing ability there is no monotonically pattern however older funds display perverse timing which is in line with the negative correlation of both components. The size effect seems not to play a clear role on the performance results. The middle tercile exhibit better selectivity skills while timing results are inconsistent between the two models. Overall, the relation between funds performance and its characteristics is weak. The results are in line with Jiang (2003).

The relationship between market cycles and funds' performance in the other hand seems to be stronger than the funds' characteristics. Both Domestic and North American equity funds are better stock pickers during the bull markets while during the bear markets those funds display positive market timing skills. The opposite results is exhibited by EU, Switzerland and Norway equity funds. Overall, the funds manage to anticipate market crashes and are able to identify underpriced stocks during bull markets. This result is in line with Chen and Liang's (2006) findings on US hedge funds as market timing ability is quite significant in bear and volatile markets.

Selecting an appropriate benchmark portfolio has been reinforced by Elton *et al* (1996) and Dellva *et al* (2001) therefore individual benchmarks were selected rather than picking one benchmark per investment category which could have led to inaccurate performance results.

With respect to survivorship bias, based on our research the liquidated funds represent a small percentage of funds therefore with limited impact on our analysis. The aggregated results may be slightly upward biased by using only surviving funds in line with Brown *et al* (1992).

This study has certain limitations such as the data availability or survivorship bias. In order to overcome the limitations on further research the use of daily data is recommended. As proven by Bollen and Busse (2001), and more recently by Kaur (2013) the use of higher frequency data may lead to higher frequency of timing ability. Even though the survivorship bias has been proven to have lower impact on the overall results, it would be worth studying a market where complete funds' data is available for both active and inactive funds.

For further research, would be interesting to use Jiang's (2003) nonparametric test, as this would overcome some of the limitations of traditional models. It is not affected by manager's risk aversion as it separates quality of timing information from the aggressiveness of the reaction and it's more robust to different information, incentive structure, timing frequencies and underlying distributions.

Another interesting consideration for further research is the conditional performance evaluation using portfolios holdings (weights) data from Ferson and Khang (2002). The conditional weight measure (CWM) present some advantages as can control an interim trading bias which is not controlled on returns-based measures if managers trade between valuation dates. This measure assumes that "the covariance between the change in a portfolio's weights and subsequent abnormal security returns may be used to measure performance." (Ferson and Khang, 2002, pp. 251)

# Appendices

## Appendix 1 – Mutual funds sample

This table shows ths list of funds analysed in this study. The list of funds are categorized by its investment category (APFIPP), the identifier used hereafter and the respective Equity Index (Benchmark) assigned to each fund for the period of June 2002 to March 2012.

| Category APFIPP | Identifier | Mutual Funds | Benchmark |
|---|---|---|---|
| Domestic Equity Funds | PSI.F01 | Alves Ribeiro M. Empresas PT | Portugal PSI 20 |
| | PSI.F02 | Banif Acções Portugal | Portugal PSI 20 |
| | PSI.F03 | Barclays Premier Acções PT | Portugal PSI 20 |
| | PSI.F04 | Caixagest Acções Portugal | Portugal PSI 20 |
| | PSI.F05 | Espirito Santo Portugal Acções | Portugal PSI 20 |
| | PSI.F06 | Millennium Acções Portugal | Portugal PSI 20 |
| | PSI.F07 | Santander Acções Portugal | Portugal PSI 20 |
| European Union, Switzerland and Norway Equity Funds | EUSTOXX.F01 | Banif Euro Acções | EURO STOXX 50 EUR |
| | EUSTOXX.F02 | BBVA Bolsa Euro | EURO STOXX 50 EUR |
| | EUSTOXX.F03 | BPN Acções Europa | EURO STOXX 50 EUR |
| | EUSTOXX.F04 | Orey Acções Europa | EURO STOXX 50 EUR |
| | IBERIA.F01 | Montepio Capital | MSCI Spain/MSCI Portugal (80:20) |
| | STOXXEU.F01 | Caixagest Acções Europa | STOXX Europe 50 EUR |
| | STOXXEU.F02 | Espirito Santo Acções Europa | STOXX Europe 50 EUR |
| | STOXXEU.F03 | Millennium Eurocarteira | STOXX Europe 50 EUR |
| | STOXXEU.F04 | Montepio Acções | STOXX Europe 50 EUR |
| | STOXXEU.F05 | Montepio Acções Europa | STOXX Europe 50 EUR |
| | STOXXEU.F06 | Popular Acções | STOXX Europe 50 EUR |
| | STOXXEU.F07 | Postal Acções | STOXX Europe 50 EUR |
| | STOXXEU.F08 | Raiz Europa | STOXX Europe 50 EUR |
| | STOXXEU.F09 | Santander Acções Europa | STOXX Europe 50 EUR |

| Category APFIPP | Identifier | Mutual Funds | Benchmark |
|---|---|---|---|
| North American Equity Funds | US.F01 | BPI America D | S&P 500 |
| | US.F02 | Caixagest Acções EUA | S&P 500 |
| | US.F03 | Espirito Santo Acções America | S&P 500 |
| | US.F04 | Millennium Acções America | S&P 500 |
| | US.F05 | Santander Acções America | S&P 500 |
| | US.F06 | Santander Acções USA | S&P 500 |
| Sector Equity Funds | CONS.F01 | Santander Euro Futuro Ciclico | MSCI Europe Consumer Disc, |
| | CONSTP.F01 | Santander E. Futuro Acções Def. | MSCI Europe Consumer Staples |
| | FIN.F01 | Millennium Eurofinanceiras | MSCI Int. ACWI Financials USD |
| | HC.F01 | Montepio Euro Healthcare | MSCI Europe Health Care |
| | MSCIACUT.F01 | Millennium Global Utilities | MSCI Int ACWI Utilities Sector USD |
| | MSCIFS.F01 | Santander E. Futuro Banca e Seg. | MSCI Int AC Europe Financials USD |
| | MSCIIT.F01 | BPI Tecnologias | MSCI Europe IT |
| | MSCITS.F01 | Montepio Euro Telcos | MSCI Europe Telecom Services |
| | MSCITS.F02 | Santander Euro Futuro Teleco. | MSCI Europe Telecom Services |
| | MSCIUT.F01 | Montepio Euro Utilities | MSCI World Utilities USD |
| | STOXXFS.F01 | Montepio Euro Financial Services | STOXX® Europe 600 Financial S. |
| | STOXXOG.F01 | Montepio Euro Energy | STOXX® Europe 600 Oil & Gas |
| Other International Equity Funds | AFR.F01 | BPI Africa | S&P Pan Africa |
| | ASIAEXJ.F01 | Caixagest Acções Oriente | MSCI AC Asia Pacific ex Japan USD |
| | EM.F01 | Caixagest Acções Emergentes | MSCI EM (Emerging Markets) USD |
| | EM.F02 | Espirito Santo Mercados EM. | MSCI EM (Emerging Markets) USD |
| | EM.F03 | Millennium Mercados EM. | MSCI EM (Emerging Markets) USD |
| | JP.F01 | Caixagest Acções Japao | Topix |
| | JP.F02 | Millennium Acções Japao | Topix |
| | WRD.F01 | BPN Acções Global | MSCI World USD |
| | WRD.F02 | Espirito Santo Acções Global | MSCI World USD |
| | WRD.F03 | Espirito Santo Momentum | MSCI World USD |
| | WRD.F04 | Millennium Acções Mundiais | MSCI World USD |
| | WRD.F05 | Montepio Acções Intern. | MSCI World USD |

## Appendix 2 – Fund sample features

This table displays the list of funds analysed in this study together with the funds' characteristics: age, size and market share. The list of funds are categorized by its investment category (APFIPP), the identifier and the respective Equity Index (Benchmark) assigned to each fund for the period of June 2002 to March 2012.

| Category | Fund | Asset Status | Age | Size | Market Share |
|---|---|---|---|---|---|
| Domestic Equity Funds | PSI.F01 | Active | 13.68 | 9,012,654 | 2.67 |
| | PSI.F02 | Active | 15 | 7,055,736 | 2.04 |
| | PSI.F03 | Merged | 15.75 | 13,454,224 | 3.74 |
| | PSI.F04 | Active | 16.54 | 86,308,952 | 21.87 |
| | PSI.F05 | Active | 15.3 | 19,649,520 | 5.43 |
| | PSI.F06 | Active | 17.55 | 88,140,470 | 25.9 |
| | PSI.F07 | Active | 14.01 | 103,211,908 | 29.07 |
| EU, Switzerland and Norway Equity Funds | EUSTOXX.F01 | Active | 12.64 | 17,440,903 | 3.21 |
| | EUSTOXX.F02 | Active | 12.58 | 9,751,776 | 1.7 |
| | EUSTOXX.F03 | Active | 6.75 | 5,785,578 | 1.21 |
| | STOXXEU.F01 | Active | 19.15 | 77,571,222 | 12.23 |
| | STOXXEU.F02 | Active | 18.96 | 26,390,039 | 4.93 |
| | STOXXEU.F03 | Active | 10.59 | 149,998,113 | 26.27 |
| | STOXXEU.F04 | Active | 18.93 | 18,148,243 | 3.33 |
| | STOXXEU.F05 | Active | 12.56 | 8,687,417 | 1.65 |
| | IBERIA.F01 | Active | 15.73 | 10,104,562 | 1.98 |
| | EUSTOXX.F04 | Liquidated | 5.26 | 1,954,748 | 0.21 |
| | STOXXEU.F06 | Active | 13.25 | 5,995,663 | 0.99 |
| | STOXXEU.F07 | Active | 25.53 | 3,961,166 | 0.5 |
| | STOXXEU.F08 | Active | 13.87 | 9,154,589 | 1.59 |
| | STOXXEU.F09 | Active | 13.61 | 49,572,937 | 8.71 |

| Category | Fund | Asset Status | Age | Size | Market Share |
|---|---|---|---|---|---|
| North American Equity Funds | US.F01 | Active | 19.39 | 27,213,926 | 18.16 |
| | US.F02 | Active | 11.6 | 45,980,123 | 31.47 |
| | US.F03 | Active | 13.45 | 17,075,322 | 11.23 |
| | US.F04 | Active | 12.96 | 28,257,115 | 23.3 |
| | US.F05 | Active | 14.01 | 7,717,586 | 5.34 |
| | US.F06 | Merged | 10.99 | 15,123,968 | 12.39 |
| Sector Equity Funds | MSCIIT.F01 | Merged | 10.27 | 13,821,264 | 10.03 |
| | FIN.F01 | Active | 13.98 | 45,786,646 | 27.57 |
| | MSCIACUT.F01 | Merged | 14.98 | 13,523,812 | 10.59 |
| | STOXXOG.F01 | Active | 5.65 | 12,117,621 | 9.22 |
| | STOXXFS.F01 | Active | 5.65 | 5,537,094 | 4.09 |
| | HC.F01 | Active | 5.65 | 6,406,282 | 4.95 |
| | MSCITS.F01 | Active | 7.76 | 6,827,652 | 4.43 |
| | MSCIUT.F01 | Active | 7.76 | 21,968,105 | 13.71 |
| | CONSTP.F01 | Merged | 12.15 | 6,618,237 | 5.65 |
| | MSCIFS.F01 | Merged | 12.88 | 11,019,528 | 8.87 |
| | CONS.F01 | Merged | 12.88 | 10,914,632 | 9.16 |
| | MSCITS.F02 | Merged | 12.88 | 7,262,424 | 6.11 |
| Other International Equity Funds | AFR.F01 | Active | 4.08 | 20,372,840 | 5.26 |
| | WRD.F01 | Active | 11.32 | 6,364,017 | 1.82 |
| | EM.F01 | Active | 8.24 | 48,941,053 | 10.84 |
| | JP.F01 | Active | 13.30 | 29,617,756 | 8.94 |
| | ASIAEXJ.F01 | Active | 18.85 | 31,687,865 | 9.01 |
| | WRD.F02 | Merged | 13.00 | 21,141,151 | 6.23 |
| | EM.F02 | Active | 18.96 | 31,274,544 | 8.31 |
| | WRD.F03 | Active | 5.21 | 26,594,328 | 6.25 |
| | JP.F02 | Liquidated | 12.73 | 9,712,921 | 3.24 |
| | WRD.F04 | Merged | 7.54 | 8,502,419 | 1.96 |
| | EM.F03 | Active | 18.87 | 24,133,358 | 7.55 |
| | WRD.F05 | Active | 14.05 | 10,391,753 | 2.76 |

## Appendix 3 – Descriptive statistics

This table exibits the descriptive statistics for all benchmarks and mutual funds organised by investemnt category. Investment categories are: DM - Domestic equity funds; EU - EU, Switzerland and Norway equity funds; NA - North American equity funds; OI - Other Int. equity funds; SE - Sector equity funds.

**Domestic Funds**

| | PSI_B | PSI_F01 | PSI_F02 | PSI_F03 | PSI_F04 | PSI_F05 | PSI_F06 | PSI_F07 |
|---|---|---|---|---|---|---|---|---|
| **Mean** | -0.00229 | -0.02119 | -0.00528 | -0.00601 | -0.00732 | -0.00459 | -0.00294 | -0.00368 |
| **Median** | 0.00739 | -0.01584 | 0.00139 | 0.00044 | -0.00169 | 0.00380 | 0.00211 | 0.00289 |
| **Maximum** | 0.10652 | 0.15641 | 0.13324 | 0.13101 | 0.13232 | 0.14450 | 0.09953 | 0.14106 |
| **Minimum** | -0.23348 | -0.20630 | -0.24377 | -0.25149 | -0.22250 | -0.19483 | -0.20374 | -0.21973 |
| **Std. Dev.** | 0.05609 | 0.06907 | 0.05554 | 0.05819 | 0.05495 | 0.05505 | 0.05636 | 0.05883 |
| **Skewness** | -1.16528 | -0.36924 | -1.10003 | -1.19819 | -0.97843 | -0.86532 | -0.93739 | -1.04038 |
| **Kurtosis** | 5.63656 | 3.74188 | 5.69447 | 5.98692 | 4.98836 | 4.54205 | 4.19603 | 5.03300 |
| **Jarque-Bera** | 60.88287 | 2.693648 | 59.49346 | 71.48837 | 38.26569 | 26.1935 | 24.31432 | 41.60812 |
| **Probability** | 0.00 | 0.26 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 |
| **Sum** | -0.270173 | -1.250293 | -0.622842 | -0.703363 | -0.863475 | -0.536536 | -0.347352 | -0.434477 |
| **Sum Sq. Dev.** | 0.368049 | 0.276666 | 0.36084 | 0.392802 | 0.353243 | 0.351469 | 0.371585 | 0.404908 |
| **Observations** | 118 | 59 | 118 | 117 | 118 | 117 | 118 | 118 |

**European Union, Switzerland and Norway Equity Funds**

| | EUSTOXX_B | EUSTOXX_F01 | EUSTOXX_F02 | EUSTOXX_F03 | EUSTOXX_F04 | IBERIA_B | IBERIA_F01 | STOXXEU_B | STOXXEU_F01 |
|---|---|---|---|---|---|---|---|---|---|
| Mean | -0.004656 | -0.009690 | -0.006361 | -0.006640 | -0.062296 | -0.001800 | -0.003148 | -0.004550 | -0.008745 |
| Median | 0.005429 | 0.003499 | 0.004868 | -0.002200 | -0.017098 | 0.005592 | 0.008781 | 0.005171 | 0.003569 |
| Maximum | 0.136260 | 0.125695 | 0.131180 | 0.101994 | 0.099182 | 0.132204 | 0.119189 | 0.109125 | 0.118039 |
| Minimum | -0.209002 | -0.235489 | -0.194416 | -0.153070 | -0.623910 | -0.183631 | -0.225199 | -0.160119 | -0.169183 |
| Std. Dev. | 0.059650 | 0.059783 | 0.058165 | 0.047979 | 0.123367 | 0.055988 | 0.055617 | 0.048577 | 0.052191 |
| Skewness | -0.735582 | -0.795833 | -0.637008 | -0.523972 | -2.166090 | -0.719902 | -0.968677 | -0.704263 | -0.573931 |
| Kurtosis | 4.217878 | 4.192603 | 4.003043 | 3.638049 | 9.059255 | 4.239166 | 4.541835 | 3.994271 | 3.488879 |
| Jarque-Bera | 17.93379 | 19.44888 | 12.92698 | 4.453154 | 145.6412 | 17.59178 | 30.14211 | 14.61488 | 7.65323 |
| Probability | 0.00 | 0.00 | 0.00 | 0.11 | 0.00 | 0.00 | 0.00 | 0.00 | 0.02 |
| Sum | -0.549437 | -1.143416 | -0.750638 | -0.471418 | -3.924637 | -0.21056 | -0.371453 | -0.536922 | -1.031916 |
| Sum Sq. Dev. | 0.416295 | 0.41816 | 0.395833 | 0.161138 | 0.943601 | 0.363625 | 0.361907 | 0.276085 | 0.318692 |
| Observations | 118 | 118 | 118 | 71 | 63 | 117 | 118 | 118 | 118 |

| | STOXXEU_F02 | STOXXEU_F03 | STOXXEU_F04 | STOXXEU_F05 | STOXXEU_F06 | STOXXEU_F07 | STOXXEU_F08 | STOXXEU_F09 |
|---|---|---|---|---|---|---|---|---|
| Mean | -0.006543 | -0.005188 | -0.003468 | -0.004159 | -0.007157 | -0.003190 | -0.007273 | -0.007756 |
| Median | 0.000387 | 0.008006 | 0.007714 | 0.005710 | 0.007213 | 0.005234 | -0.001989 | 0.004086 |
| Maximum | 0.109733 | 0.113370 | 0.120657 | 0.123961 | 0.111735 | 0.113666 | 0.108778 | 0.148581 |
| Minimum | -0.150280 | -0.233168 | -0.206120 | -0.190985 | -0.201763 | -0.175074 | -0.131885 | -0.218093 |
| Std. Dev. | 0.046001 | 0.056270 | 0.052126 | 0.055799 | 0.057025 | 0.050432 | 0.042886 | 0.060529 |
| Skewness | -0.636559 | -1.275833 | -1.072674 | -0.801265 | -0.871873 | -0.772229 | -0.530626 | -0.717163 |
| Kurtosis | 3.989696 | 5.823651 | 4.976127 | 4.238437 | 4.172255 | 4.046599 | 3.892854 | 4.438928 |
| Jarque-Bera | 12.78495 | 70.60952 | 41.82899 | 20.16732 | 21.70626 | 17.11353 | 9.456932 | 20.29504 |
| Probability | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.01 | 0.00 |
| Sum | -0.772071 | -0.607035 | -0.409235 | -0.490787 | -0.844532 | -0.376429 | -0.858174 | -0.91523 |
| Sum Sq. Dev. | 0.24758 | 0.367287 | 0.317906 | 0.364284 | 0.380464 | 0.29758 | 0.215186 | 0.428656 |
| Observations | 118 | 117 | 118 | 118 | 118 | 118 | 118 | 118 |

**North American Equity Funds**

| | US_B | US_F01 | US_F02 | US_F03 | US_F04 | US_F05 | US_F06 |
|---|---|---|---|---|---|---|---|
| **Mean** | 0.00235 | -0.00708 | -0.00444 | -0.00323 | -0.00339 | -0.00616 | -0.00235 |
| **Median** | 0.01027 | -0.00260 | -0.00052 | -0.00107 | 0.00452 | -0.00635 | 0.00211 |
| **Maximum** | 0.10231 | 0.11938 | 0.08315 | 0.09601 | 0.09392 | 0.08030 | 0.10826 |
| **Minimum** | -0.18564 | -0.11866 | -0.12892 | -0.16831 | -0.14063 | -0.12410 | -0.16944 |
| **Std. Dev.** | 0.04690 | 0.04441 | 0.04427 | 0.04418 | 0.04972 | 0.04174 | 0.04336 |
| **Skewness** | -0.88568 | -0.39313 | -0.55866 | -0.74605 | -0.77291 | -0.48853 | -0.78562 |
| **Kurtosis** | 4.69700 | 3.36052 | 3.37592 | 5.05209 | 3.45451 | 3.25140 | 4.93024 |
| **Jarque-Bera** | 29.5861 | 3.6785 | 6.8329 | 31.6505 | 12.7644 | 5.0044 | 30.4569 |
| **Probability** | 0.00 | 0.16 | 0.03 | 0.00 | 0.00 | 0.08 | 0.00 |
| **Sum** | 0.27752 | -0.83595 | -0.52386 | -0.38068 | -0.40041 | -0.72690 | -0.27667 |
| **Sum Sq. Dev.** | 0.25732 | 0.23071 | 0.22929 | 0.22832 | 0.28918 | 0.20383 | 0.21996 |
| **Observations** | 118 | 118 | 118 | 118 | 118 | 118 | 118 |

**Sector Equity Funds**

| | CONS_B | CONS_F01 | CONSTP_B | CONSTP_F01 | FIN_B | FIN_F01 | HC_B | HC_F01 | MSCIACUT_B | MSCIACUT_F01 | MSCIFS_B | MSCIFS_F01 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **Mean** | 0.00172 | -0.00346 | 0.00457 | -0.00223 | -0.00300 | -0.00997 | -0.00324 | -0.00387 | 0.00133 | -0.00238 | -0.00514 | -0.01105 |
| **Median** | 0.01027 | 0.00614 | 0.00952 | 0.00603 | 0.00708 | -0.00041 | 0.00209 | -0.00290 | 0.00690 | 0.00649 | 0.00708 | -0.00440 |
| **Maximum** | 0.16869 | 0.13043 | 0.11988 | 0.06219 | 0.19658 | 0.23467 | 0.09954 | 0.05558 | 0.07379 | 0.08397 | 0.27212 | 0.24003 |
| **Minimum** | -0.16705 | -0.15073 | -0.17351 | -0.09646 | -0.30980 | -0.33348 | -0.13372 | -0.10651 | -0.15569 | -0.12827 | -0.38284 | -0.31075 |
| **Std. Dev.** | 0.06865 | 0.04938 | 0.04527 | 0.03087 | 0.06958 | 0.08062 | 0.05133 | 0.03654 | 0.04263 | 0.04177 | 0.08950 | 0.07599 |
| **Skewness** | -0.33037 | -0.61811 | -0.72968 | -0.98327 | -0.92094 | -0.77205 | -0.31565 | -0.75061 | -1.27820 | -1.02368 | -0.66962 | -0.41813 |
| **Kurtosis** | 3.28710 | 3.69770 | 4.59080 | 3.89732 | 6.10392 | 5.28485 | 2.91822 | 3.51203 | 5.12777 | 4.32837 | 5.59853 | 5.45697 |
| **Jarque-Bera** | 2.55178 | 9.90719 | 22.91343 | 22.97288 | 64.04877 | 37.39005 | 0.99616 | 6.18468 | 54.39083 | 29.28480 | 42.01738 | 33.11892 |
| **Probability** | 0.28 | 0.01 | 0.00 | 0.00 | 0.00 | 0.00 | 0.61 | 0.05 | 0.00 | 0.00 | 0.00 | 0.00 |
| **Sum** | 0.20345 | -0.40853 | 0.53950 | -0.26332 | -0.35432 | -1.17610 | -0.19094 | -0.22804 | 0.15705 | -0.28030 | -0.60703 | -1.30371 |
| **Sum Sq. Dev.** | 0.55136 | 0.28531 | 0.23975 | 0.11149 | 0.56648 | 0.76046 | 0.15281 | 0.07745 | 0.21262 | 0.20409 | 0.93711 | 0.67563 |
| **Observations** | 118 | 118 | 118 | 118 | 118 | 118 | 59 | 59 | 118 | 118 | 118 | 118 |

| | MSCIIT_B | MSCIIT_F01 | MSCITS_B | MSCITS_F01 | MSCITS_F02 | MSCIUT_B | MSCIUT_F01 | STOXXFS_B | STOXXFS_F01 | STOXXOG_B | STOXXOG_F01 |
|---|---|---|---|---|---|---|---|---|---|---|---|
| **Mean** | -0.00202 | -0.00631 | 0.00097 | -0.00344 | -0.00587 | 0.00156 | -0.00293 | -0.01380 | -0.02071 | -0.00454 | -0.00847 |
| **Median** | 0.00141 | -0.00101 | -0.00139 | 0.00385 | 0.00041 | 0.01032 | 0.00120 | -0.00601 | -0.02217 | 0.00125 | -0.00562 |
| **Maximum** | 0.29845 | 0.10911 | 0.19547 | 0.07535 | 0.18851 | 0.07546 | 0.09334 | 0.18925 | 0.23348 | 0.14502 | 0.11292 |
| **Minimum** | -0.25501 | -0.19014 | -0.20068 | -0.10506 | -0.20184 | -0.14701 | -0.15174 | -0.24626 | -0.30431 | -0.16889 | -0.18978 |
| **Std. Dev.** | 0.09078 | 0.05049 | 0.06257 | 0.03886 | 0.05339 | 0.04285 | 0.04733 | 0.09301 | 0.08957 | 0.06326 | 0.06130 |
| **Skewness** | -0.23785 | -0.74280 | -0.29505 | -0.66623 | -0.58444 | -1.26188 | -0.81815 | -0.37230 | -0.19112 | -0.34692 | -0.58924 |
| **Kurtosis** | 4.11436 | 4.48105 | 4.03014 | 3.25381 | 5.80525 | 4.86971 | 3.67604 | 2.91839 | 4.24654 | 3.26041 | 3.58472 |
| **Jarque-Bera** | 7.21806 | 21.63578 | 6.92957 | 6.51628 | 45.40885 | 34.52824 | 10.97070 | 1.37934 | 4.17906 | 1.35016 | 4.25470 |
| **Probability** | 0.03 | 0.00 | 0.03 | 0.04 | 0.00 | 0.00 | 0.00 | 0.50 | 0.12 | 0.51 | 0.12 |
| **Sum** | -0.23884 | -0.74446 | 0.11459 | -0.29203 | -0.69215 | 0.13138 | -0.24589 | -0.81427 | -1.22202 | -0.26762 | -0.49992 |
| **Sum Sq. Dev.** | 0.96415 | 0.29824 | 0.45799 | 0.12687 | 0.33347 | 0.15241 | 0.18595 | 0.50170 | 0.46536 | 0.23207 | 0.21793 |
| **Observations** | 118 | 118 | 118 | 85 | 118 | 84 | 84 | 59 | 59 | 59 | 59 |

**Other Int. Equity Funds**

| | AFR_B | AFR_F01 | ASIAEXJ_B | ASIAEXJ_F01 | EM_B | EM_F01 | EM_F02 | EM_F03 | JP_B |
|---|---|---|---|---|---|---|---|---|---|
| **Mean** | 0.01150 | 0.00237 | 0.00492 | 0.00185 | 0.00742 | -0.00287 | -0.00222 | -0.00164 | -0.00420 |
| **Median** | 0.01856 | 0.00494 | 0.01046 | 0.00649 | 0.00886 | 0.00472 | 0.00897 | 0.01072 | 0.00142 |
| **Maximum** | 0.15674 | 0.06291 | 0.13876 | 0.14142 | 0.15329 | 0.14121 | 0.13576 | 0.11581 | 0.10977 |
| **Minimum** | -0.13089 | -0.12702 | -0.29274 | -0.18287 | -0.32528 | -0.22138 | -0.26203 | -0.27091 | -0.23007 |
| **Std. Dev.** | 0.06741 | 0.04309 | 0.06518 | 0.05347 | 0.07306 | 0.06209 | 0.06480 | 0.06742 | 0.05309 |
| **Skewness** | -0.16884 | -1.25369 | -1.10394 | -0.65703 | -1.06178 | -0.86968 | -1.05963 | -1.09559 | -0.71175 |
| **Kurtosis** | 2.47844 | 4.93907 | 6.44580 | 4.19447 | 5.78766 | 4.35384 | 4.79204 | 4.75187 | 4.94805 |
| **Jarque-Bera** | 0.64342 | 16.74489 | 82.34577 | 15.50477 | 60.37924 | 18.21853 | 37.87132 | 38.69580 | 28.62107 |
| **Probability** | 0.72 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 |
| **Sum** | 0.46010 | 0.09470 | 0.58022 | 0.21799 | 0.87586 | -0.25803 | -0.26167 | -0.19352 | -0.49608 |
| **Sum Sq. Dev.** | 0.17721 | 0.07240 | 0.49712 | 0.33454 | 0.62448 | 0.34306 | 0.49136 | 0.53175 | 0.32972 |
| **Observations** | 40 | 40 | 118 | 118 | 118 | 90 | 118 | 118 | 118 |

| | JP_F01 | JP_F02 | WRD_B1 | WRD_F01 | WRD_F02 | WRD_F03 | WRD_F04 | WRD_F05 |
|---|---|---|---|---|---|---|---|---|
| **Mean** | -0.00641 | -0.00839 | 0.00080 | -0.00438 | -0.00592 | -0.00712 | -0.00863 | -0.00538 |
| **Median** | -0.00261 | -0.00597 | 0.00780 | 0.00062 | -0.00136 | -0.00239 | 0.00305 | 0.00597 |
| **Maximum** | 0.12020 | 0.12948 | 0.10566 | 0.12509 | 0.09097 | 0.07341 | 0.08015 | 0.14050 |
| **Minimum** | -0.19338 | -0.15307 | -0.21730 | -0.21082 | -0.22643 | -0.16468 | -0.15539 | -0.29319 |
| **Std. Dev.** | 0.05248 | 0.05225 | 0.05088 | 0.04751 | 0.04701 | 0.04639 | 0.04819 | 0.06341 |
| **Skewness** | -0.33981 | -0.02946 | -1.00093 | -0.61035 | -1.41218 | -1.20507 | -1.06812 | -1.20627 |
| **Kurtosis** | 4.11619 | 3.29459 | 5.33069 | 5.95515 | 7.67216 | 5.60327 | 3.91969 | 6.48671 |
| **Jarque-Bera** | 8.39649 | 0.44376 | 46.41141 | 50.26319 | 146.54680 | 28.31788 | 20.28511 | 88.38967 |
| **Probability** | 0.02 | 0.80 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 |
| **Sum** | -0.75576 | -0.98948 | 0.09473 | -0.51652 | -0.69840 | -0.38452 | -0.77659 | -0.63439 |
| **Sum Sq. Dev.** | 0.32218 | 0.31937 | 0.30288 | 0.26414 | 0.25856 | 0.11407 | 0.20665 | 0.47048 |
| **Observations** | 118 | 118 | 118 | 118 | 118 | 54 | 90 | 118 |

## Appendix 4 – ADF test (Augmented Dickey Fuller)

This table shows the results of ADF test for a unit root in the time series sample. The null hypothesis (H0) means that the data series has a unit root against the alternative hypothesis (H1) having no unit root. P-val is represented by *Prob.* therefore H0 is rejected with 95% confidence level when p-val < 0.05.

| | Fund | ADF t-Statistic | Prob. |
|---|---|---|---|
| Domestic Funds | PSI.B | -8.861723 | 0.00 |
| | PSI.F01 | -6.376413 | 0.00 |
| | PSI.F02 | -8.451894 | 0.00 |
| | PSI.F03 | -3.430588 | 0.01 |
| | PSI.F04 | -8.240812 | 0.00 |
| | PSI.F05 | -8.619996 | 0.00 |
| | PSI.F06 | -8.660914 | 0.00 |
| | PSI.F07 | -8.582200 | 0.00 |

| | Fund | ADF t-Statistic | Prob. |
|---|---|---|---|
| EU, Switzerland and Norway Equity Funds | EUSTOXX.B | -9.735108 | 0.00 |
| | EUSTOXX.F01 | -5.606635 | 0.00 |
| | EUSTOXX.F02 | -5.586711 | 0.00 |
| | EUSTOXX.F03 | -6.726482 | 0.00 |
| | EUSTOXX.F04 | 0.213898 | 0.97 |
| | IBERIA.B | -9.943112 | 0.00 |
| | IBERIA.F01 | -8.876659 | 0.00 |
| | STOXXEU.B | -9.066623 | 0.00 |
| | STOXXEU.F01 | -9.457435 | 0.00 |
| | STOXXEU.F02 | -9.257756 | 0.00 |
| | STOXXEU.F03 | -8.298683 | 0.00 |
| | STOXXEU.F04 | -8.988399 | 0.00 |
| | STOXXEU.F05 | -9.605281 | 0.00 |
| | STOXXEU.F06 | -5.028599 | 0.00 |
| | STOXXEU.F07 | -4.374702 | 0.00 |
| | STOXXEU.F08 | -9.791941 | 0.00 |
| | STOXXEU.F09 | -5.076873 | 0.00 |

| | Fund | ADF t-Stati: | Prob. |
|---|---|---|---|
| Other Int. Equity Funds | AFR.B | -6.563365 | 0.00 |
| | AFR.F01 | -5.864326 | 0.00 |
| | ASIAEXJ.B | -8.598072 | 0.00 |
| | ASIAEXJ.F01 | -9.537368 | 0.00 |
| | EM.B | -8.714347 | 0.00 |
| | EM.F01 | -7.708077 | 0.00 |
| | EM.F02 | -8.901408 | 0.00 |
| | EM.F03 | -9.298342 | 0.00 |
| | JP.B | -7.990697 | 0.00 |
| | JP.F01 | -9.902259 | 0.00 |
| | JP.F02 | -9.683115 | 0.00 |
| | WRD.B1 | -8.267454 | 0.00 |
| | WRD.F01 | -4.536143 | 0.00 |
| | WRD.F02 | -9.243375 | 0.00 |
| | WRD.F03 | -5.152232 | 0.00 |
| | WRD.F04 | -7.806965 | 0.00 |
| | WRD.F05 | -9.575501 | 0.00 |

| | Fund | ADF t-Stati: | Prob. |
|---|---|---|---|
| North American Equity Funds | US.B | -8.771149 | 0.00 |
| | US.F01 | -10.13434 | 0.00 |
| | US.F02 | -10.37183 | 0.00 |
| | US.F03 | -9.731025 | 0.00 |
| | US.F04 | -9.503369 | 0.00 |
| | US.F05 | -9.729596 | 0.00 |
| | US.F06 | -5.570671 | 0.00 |

| | Fund | ADF t-Statistic | Prob. |
|---|---|---|---|
| Sector Equity Funds | CONS.B | -9.239626 | 0.00 |
| | CONS.F01 | -10.25999 | 0.00 |
| | CONSTP.B | -9.002989 | 0.00 |
| | CONSTP.F01 | -9.594704 | 0.00 |
| | FIN.B | -8.185577 | 0.00 |
| | FIN.F01 | -4.721410 | 0.00 |
| | HC.B | -6.862605 | 0.00 |
| | HC.F01 | -6.168058 | 0.00 |
| | MSCIACUT.B | -8.275830 | 0.00 |
| | MSCIACUT.F01 | -9.791600 | 0.00 |
| | MSCIFS.B | -4.842299 | 0.00 |
| | MSCIFS.F01 | -5.134315 | 0.00 |
| | MSCIIT.B | -10.29296 | 0.00 |
| | MSCIIT.F01 | -11.25208 | 0.00 |
| | MSCITS.B | -9.723059 | 0.00 |
| | MSCITS.F01 | -6.994316 | 0.00 |
| | MSCITS.F02 | -5.616145 | 0.00 |
| | MSCIUT.B | -6.681038 | 0.00 |
| | MSCIUT.F01 | -6.887833 | 0.00 |
| | STOXXFS.B | -5.727808 | 0.00 |
| | STOXXFS.F01 | -3.047361 | 0.04 |
| | STOXXOG.B | -7.610643 | 0.00 |
| | STOXXOG.F01 | -6.424997 | 0.00 |

## Appendix 5 – Regressions of the benchmarks excess returns on lagged informational variables

This table exibits the benchmarks per investment category in relation to the lagged informational variables. The dependent variable in the simple and multiple regressions is the monthly excess return of the benchmarks. The information variables (independent variables) are the deviations from average lagged 1 month: dividend yield (DY), short term interest (EUR) and the slope of the term structure (TS). The funds estimates are adjusted for autocorrelation and heteroskedasticity according to Newey & West (1987) and White (1980). The asterisks are used to denote the statistically significance at 1% (***), 5% (**) and 10% (*) level.

| Indices / Variables | MSCIIT | MSCITS | MSCIUT | STOXXFS | STOXXOG | AFR | ASIAEXJ | EM | JP | WRD |
|---|---|---|---|---|---|---|---|---|---|---|
| **DY** | | | | | | | | | | |
| Coef. | -3.560 | -0.634 | -0.669 | -3.297 | -1.281 | -4.853 | -3.878 | 0.854 | -1.720 | -3.623 |
| t-estat | -2.919 *** | -2.100 ** | -1.106 | -2.122 ** | -1.225 | -1.502 | -2.262 ** | 0.418 | -2.160 ** | -2.699 *** |
| prob | 0.004 | 0.038 | 0.272 | 0.038 | 0.225 | 0.150 | 0.026 | 0.677 | 0.033 | 0.008 |
| R-Sq adj. | 6.74% | 3.61% | 1.26% | 5.12% | 2.01% | 10.80% | 11.09% | -0.72% | 3.23% | 11.86% |
| **EUR** | | | | | | | | | | |
| Coef. | -1.091 | -0.421 | -0.234 | -1.461 | -0.648 | -1.042 | -1.085 | -1.130 | -1.003 | -1.034 |
| t-estat | -1.706 * | -0.948 | -0.588 | -2.091 ** | -1.347 | -1.619 | -2.384 ** | -2.203 ** | -2.216 ** | -2.954 *** |
| prob | 0.091 | 0.345 | 0.558 | 0.041 | 0.183 | 0.114 | 0.019 | 0.030 | 0.029 | 0.004 |
| R-Sq adj. | 2.38% | 0.74% | 0.55% | 4.93% | 2.53% | 2.35% | 4.09% | 2.98% | 5.37% | 6.92% |
| **TS** | | | | | | | | | | |
| Coef. | 2.139 | 1.232 | 0.697 | 3.139 | 1.384 | 2.426 | 2.240 | 2.276 | 1.742 | 1.847 |
| t-estat | 2.406 ** | 1.997 ** | 1.548 | 3.204 *** | 1.995 * | 2.234 ** | 2.929 *** | 2.609 ** | 2.524 ** | 3.839 *** |
| prob | 0.018 | 0.048 | 0.125 | 0.002 | 0.051 | 0.031 | 0.004 | 0.010 | 0.013 | 0.000 |
| R-Sq adj. | 4.67% | 3.27% | 2.68% | 13.13% | 5.93% | 8.70% | 9.46% | 7.21% | 8.52% | 11.17% |
| **DY** | | | | | | | | | | |
| Coef. | -4.959 | -0.675 | -4.531 | -5.335 | -2.096 | -4.965 | -3.375 | 0.594 | -3.648 | -4.096 |
| t-estat | -3.202 *** | -1.554 | -3.005 *** | -2.731 *** | -1.949 * | -0.812 | -2.107 ** | 0.354 | -2.978 *** | -4.227 *** |
| prob | 0.002 | 0.123 | 0.004 | 0.008 | 0.056 | 0.429 | 0.037 | 0.724 | 0.004 | 0.000 |
| **EUR** | | | | | | | | | | |
| Coef. | -2.344 | -0.249 | -1.564 | -1.579 | 0.469 | -0.674 | 0.148 | 0.847 | -1.929 | -1.061 |
| t-estat | -1.618 | -0.216 | -1.657 | -0.874 | 0.480 | -0.459 | 0.161 | 0.893 | -1.957 * | -1.606 |
| prob | 0.108 | 0.830 | 0.101 | 0.386 | 0.633 | 0.652 | 0.872 | 0.374 | 0.053 | 0.111 |
| **TS** | | | | | | | | | | |
| Coef. | -0.883 | 0.876 | 1.110 | 1.666 | 2.452 | -0.196 | 2.103 | 3.234 | -0.187 | 0.439 |
| t-estat | -0.451 | 0.577 | 1.139 | 0.701 | 1.730 * | -0.038 | 1.646 | 2.158 ** | -0.170 | 0.479 |
| prob | 0.653 | 0.565 | 0.258 | 0.486 | 0.089 | 0.970 | 0.103 | 0.033 | 0.865 | 0.633 |
| R-Sq adj. | 11.16% | 5.01% | 16.35% | 22.93% | 9.75% | 1.34% | 16.94% | 6.29% | 16.69% | 21.86% |
| Wald | 0.001 | 0.042 | 0.011 | 0.000 | 0.035 | **0.510** | 0.003 | **0.058** | 0.003 | 0.000 |

**Appendix 6 – Rules used to establish the turning points of the series**

(a) Elimination of turns within 8 months of beginning and end of series;

(b) Elimination of peaks or troughs at both ends of series which are lower or higher than end values;

(c) Elimination of market cycles whose duration is less than 16 months;

(d) Elimination of phases whose duration is less than 4 months (unless the variation exceeds 20% in a single month).

# References


Afonso, O. (2010), "Aplicação de modelos de informação condicionada na avaliação do desempenho de fundos de investimento mobiliários em Portugal: A selectividade e o market timing (Análise diária vs Análise Mensal)", Universidade do Algarve.

Armada, M. (1992), "On the investigation of timing and selectivity in portfolio management". Unpublished PhD Dissertation. Manchester Business School.

Armada, M. and M. Cortez (1997), "On mutual fund performance evaluation", *Estudos de Gestão*, Vol.3, Nº 3, pp. 145-163.

Bello, Z. and V. Janjigian (1997), "A re-examination of the market-timing and security-selection performance of mutual funds", *Financial Analysts Journal*, Vol. 53 Issue: 5 pp. 24-30.

Bollen, N. and J. Busse (2001), "On the Timing Ability of Mutual Fund Managers", *The Journal of Finance*, 56(3), pp. 1075-1094.

Brown, S., W. Goetzmann, R. G. Ibbotson and S. A. Ross (1992), "Survivorship bias in Performance Studies", *The Review of Financial Studies*, Vol.5, N. º 4, pp.553-580.

Calé, A. (2011), "Efeitos de Timing na Gestão dos Fundos de Investimento em Portugal Teoria da Eficiência dos Mercados", CMVM, 39 (3).

Casaccia, M. (2009), "Análise do desempenho de fundos de investimento em acções brasileiros", Unpublished Graduation Dissertation, Universidade Federal do Rio Grande do Sul.

Castro, V. (2011), "The Portuguese Stock Market Cycle: Chronology and Duration Dependence", Universidade de Coimbra, Faculty of Economics.

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

Chen, Y. (2006), "Timing Ability in the Focus Market of Hedge Funds", Unpublished PhD Dissertation in Finance, Carroll School of Management, Boston College.

Chen, Y. and B. Liang (2006), "Do Market Timing Hedge Funds Time the Market?", *The Journal of Financial and Quantitative Analysis*, 42(4), pp. 827-856.

Chu, P. (2007), "A Study on Stock-selection and Market-timing Performance: Evidence from Hong Kong Mandatory Provident Funds (MPF)", *20th Australasian Finance and Banking Conference*.

Coggin, T., F. Fabozzi and S. Rahman (1993), "The Investment Performance of U.S. Equity Pension Fund Managers: An Empirical Investigation", *The Journal of Finance*. 48(3), pp. 1039-1055.

Cortez, M. and F. Silva (2002), "Conditioning Information on Portfolio Performance Evaluation: A Reexamination of Performance Persistence in the Portuguese Mutual Fund Market", *Finance India*, 16, pp. 1393-1408.

Cuthbertson, K., D. Nitzsche and N. O'Sullivan (2010), "The Market Timing Ability of UK Mutual funds", *Journal of Business Finance & Accounting*, 37(1-2), pp. 270-289.

Dellva, W., A. L.DeMaskey and C. A. Smith (2001), "Selectivity and market timing performance of fidelity sector mutual funds", *The Financial Review*, 36, pp. 39-54.

Drew. M. E., M. Veeraraghavan and V. Wilson (2005), "Market Timing, Selectivity and Alpha Generation: Evidence from Australian Equity Superannuation Funds", *Investment Management and Financial Innovations*, 2/2005.

Elton, E., M. J. Gruber and C. R. Blake (1996), "The Persistence of Risk-Adjusted Mutual Fund Performance", *Journal of Business*, Vol. 69, No. 2, pp. 133-157.

Fama, E. (1965), `The Behavior of Stock Market Prices", *Journal of Business*, Vol. 38, pp. 34-105.

Fama, E. (1970), "Efficient capital markets: A review of theory and empirical work", *Journal of Finance*, Vol. 25, pp. 383-417.

Fama, E. (1972), "Components of Investment Performance", *The Journal of Finance*, 1972. 27(3), pp. 551-568.

Fama, E. and K. French (1989), "Business Conditions and Expected Returns on Stocks and Bonds", *Journal of Financial Economics*. Vol. 25. n.º 1, pp. 23-49.

Farnsworth, H. (1997), "Conditional Performance Evaluation", *Blackwell Encyclopedic Dictionary of Finance*, Blackwell Business, pp. 23-24.

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

Ferson, W. and K. Khang (2002), "Conditional performance measurement using portfolio weights: evidence for pension funds", *Journal of Financial Economics*, 65, pp. 249-282.

Goetzmann, W., J.Ingersoll Jr. and Z. Ivkovic (2000), "Monthly measurement of daily timers", *Journal of Finance Quantitative Analysis*, Vol. 35, pp. 257-290.

Govan, C. (2011), "Market Timing and Selectivity: evaluating both contributions towards the performance of Portuguese Equity Funds", Unpublished Msc Dissertation. ISCTE Business School.

Grinblatt, M. and S. Titman (1989b), "Mutual Fund Performance: an analysis of quarterly portfolio holdings", *Journal of Business*, July, Vol. 62, N. º 3, pp.393-416.

Hayat, R. and R. Kraeussl (2011), "Risk and return characteristics of Islamic equity funds", *Emerging Markets Review*, 12 (2011), pp. 189–203.

Henriksson, R. (1984), "Market Timing and Mutual Fund Performance: An Empirical Investigation", *The Journal of Business*, 57(1), pp. 73-96.

Henriksson, R. and R. Merton (1981), "On Market Timing and Investment Performance. II. Statistical Procedures for Evaluating Forecasting Skills", *The Journal of Business*, 54(4), pp. 513-533.

Ilmanen, A. (1995), "Time-Varying Expected Returns in International Bond Markets", *The Journal of Finance (June)*, Vol. 50, Nº 2, pp. 481-506.

Imisiker, S. (2004), "Market Timing and Selectivity Performance of A-Type Mutual Funds in Turkey", Unpublished Msc Dissertation, Bilkent University.

Imisiker, S. and U. Ozlale (2008), "Assessing Selectivity and Market Timing Performance of Mutual Funds for an Emerging Market", *Emerging Markets Finance & Trade*, Vol. 44, No. 2, pp. 87–99.

Jensen, M. (1968), "The Performance of Mutual funds in the period 1945–1964", *The Journal of Finance*, 23(2), pp. 389-416.

Jiang, W. (2003), "A nonparametric test of market timing", *Journal of Empirical Finance*, 10(4), pp. 399-425.

Kader, M. and K. Qing (2007), "Risk-Adjusted Performance, Selectivity, Timing Ability and Performance Persistence of Hong Kong Mutual Funds", *Journal of Asia-Pacific Business*, Vol. 9, Nº. 2, pp. 25-58.

Kaur, I. (2013), "Performance, Timing and Selectivity Skills of Indian Equity Mutual Funds: An Empirical Approach", *International Refereed Research Journal*, Vol. IV, Issue 4.

Lee, C. and S. Rahman (1990), "Market Timing, Selectivity, and Mutual Fund Performance: An Empirical Investigation", *The Journal of Business*. 63(2), pp. 261-278.

Leite, P. and M. Cortez (2006), "Conditional Performance Evaluation: Evidence for the Portuguese Mutual Fund Market", Portuguese Finance Network 2006, Porto.

Leite, P. and M. Cortez (2009), "Conditioning information in mutual fund performance evaluation: Portuguese evidence", *The European Journal of Finance*, 15:5-6, pp. 585-605.

Malkiel, B. (1995), "Returns from investing in equity mutual funds 1971 to 1991", *Journal of Finance*, Vol. 50(2), pp. 549-572.

Merton, R. (1981), "On Market Timing and Investment Performance. I. An Equilibrium Theory of Value for Market Forecasts", *The Journal of Business*. 54(3), pp. 363-406.

Murhadi, W. (2010), "Mutual Funds Performance Evaluation Based on Selectivity and Market Timing", Unpublished Paper. Faculty of Economics Airlangga University.

Nassir, A. S. Mohamed and N. M. Hua (1997), "Selectivity and Timing: Evidence from the Performance of Malaysian Unit trust", *Pertanika Journal of Social Sciences & Humanities*, 5(1), pp. 45-57.

Newey, W. and K. West (1987), "A simple positive semidefinite, heteroscedasticity and autocorrelation consistent covariance matrix", Econometrica, Vol. 55, pp. 703–708.

Nikolaos P. (2002), "Market Timing and selectivity: An empirical investigation into the features of Greek mutual fund managers", *The Journal of Business Research*, Vol.18, Nº3, pp. 97-108.

Oliveira, E. (2010), "Capacidades de Timing e Selectividade dos Gestores de Fundos de Investimento Mobiliário: Evidência Empírica para o caso Português", Unpublished Msc Dissertation, Faculdade de Economia, Universidade do Porto.

Pagan, A. and K. Sossounov (2002), "A Simple Framework for Analysing Bull and Bear Markets", *Journal of Applied Econometrics*, Vol. 18, Nº. 1, pp. 23-46.

Pesaran, M. and A. Timmermann (1995), "Predictability of Stock Returns: Robustness and Economic Significance", *The Journal of Finance*, Vol. 50, No. 4, pp. 1201-1228.

Pfleiderer, P. and S. Bhattacharya (1983), "A note on performance evaluation", Technical Report No 714, Stanford University, Graduate School of Business, pp. 23.

Rao. S. (2000), "Market timing and mutual fund performance", *American Business Review*, Vol. 18, Nº2, pp.75-79.

Romacho, J. (2004), *Selectividade e Timing na avaliação do desempenho de fundos de Investimento Mobiliário em Portugal*, Editora: Almedina.

Romacho, J. and M. Cortez (2006), "Timing and selectivity in Portuguese mutual fund performance", *Research in International Business and Finance*, 20(3), pp. 348-368.

Schill, M. (1999), "Conditional market timing with benchmark investors", *Journal of Financial Economics*, 52 (1999), pp. 119-148.

Sharpe, W. (1966), "Mutual Fund Performance", *The Journal of Business*, 39(1), pp. 119-138.

Silva, P. and F. Silva (2010), "São os gestores de Fundos de Investimentos de acções capazes de antecipar os movimentos do mercado?", CMVM, 2010, 36 (4).

Treynor, J. (1965), "How to Rate Management of Investment Funds", *Harvard Business Review*, January-February, Vol. 43 N. º 1, pp. 63-75.

Treynor, J. and K. Mazuy (1966), "Can Mutual funds Outguess the Market*?"*, *Harvard Business Review,* Vol. 44, pp. 131-136.

Tripathy, N. (2005), "Market Timing Abilities and Mutual Fund Performance: An Empirical Investigation into Equity Linked Saving Schemes", Working Paper, Indian Institute of Management.

Wah, L. and N. Ghazali (2005), "An Evolution of the Market-Timing and Security-Selection Performance of Mutual Funds: The case of Malaysia", IJMS 12 (1), pp. 97-115.

White, H. (1980) "A heteroskedasticity-consistent covariance matrix estimator and a direct test for heteroskedasticity", *Econometrica*, V. 48, pp. 817–838.

Wibowo, S. (2009), "Market Timing Ability of Domestic Equity Funds in Indonesia", Unpublished Msc Dissertation, KDI School of Public Policy and Management.