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Measuring Fund Performance Using Multi-Factor Models: Evidence for the Portuguese Market

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ABSTRACT

This paper examines the performance of Portuguese equity funds investing in the domestic and in the European Union market, using several unconditional and conditional multi-factor models. In terms of overall performance, we find that National funds are neutral performers, while European Union funds under-perform the market significantly. These results do not seem to be a consequence of management fees. Overall, our findings are supportive of the robustness of conditional multi-factor models. In fact, Portuguese equity funds seem to be relatively more exposed to small-caps and more value-oriented. Also, they present strong evidence of time-varying betas and, in the case of the European Union funds, of time-varying alphas too. Finally, in terms of market timing, our tests suggest that mutual fund managers in our sample do not exhibit any market timing abilities. Nevertheless, we find some evidence of time-varying conditional market timing abilities but only at the individual fund level.

JEL Classification: G10; G11

Keywords: Mutual funds; Performance evaluation; Multi-factor models; Conditional models

I. INTRODUCTION

Since the CAPM-based measures of Sharpe (1966) and Jensen (1968), performance evaluation measures have evolved considerably. One of the major improvements in the area has focused on models that control for some stock market anomalies. For instance, the Fama and French (1993, 1996) three-factor model controls for size and book-to-market effects, and the Carhart (1997) four-factor model adds a stock-momentum variable. Another line of research suggests conditional models of performance evaluation as being able to provide more reliable estimates of performance. Indeed, Ferson and Schadt (1996) and Christopherson, Ferson and Glassman (1998) have argued that it is important to take into account the public information available to investors at the time the returns were generated, allowing both performance and risk estimates to be time-varying.

In spite of the developments mentioned above, most of the recent empirical studies in the financial literature, which use these more sophisticated performance evaluation techniques, conclude that portfolio managers are not able to out-perform the market (e.g.: Blake, Lehmann and Timmermann, 2002; Otten and Bams, 2004; Ferson and Qian, 2004). Besides their poor overall performance, fund managers do not seem to be able to exhibit any market timing abilities as well (e.g.: Ferson and Qian, 2004; Byrne, Fletcher and Ntozi, 2006). This type of evidence is consistent with the earlier studies on fund performance evaluation and come in support of the efficient market hypothesis.

On the other hand, research on mutual fund performance has been somewhat geographically limited (Khorana, Servaes and Tufano, 2005), and essentially centred in the US and the UK markets. Recent developments in fund performance evaluation techniques have not yet been explored in many other markets, especially if we consider studies that employ the theoretically superior conditional multi-factor models. The studies of Kryzanowski, Lalancette and To (1997) in the Canadian market, Otten and Bams (2002) in some European markets and Bauer, Otten and Rad (2006) in the New Zealand market are some of the few exceptions.

Furthermore, given the well known “data mining” problem, one of the attractive features of our study is that it focuses on a largely unexplored European fund market: the Portuguese. In fact, we are aware of only two published studies that focus on the performance evaluation of Portuguese equity funds. Cortez and Silva (2002) evaluate the overall performance of a sample of 12 National stock funds, during the period April 1994 – March 1998, using two single-factor models: an unconditional model and a conditional model with time-varying betas. Their results are supportive of the conditional framework, with fund managers presenting, on average, neutral performances. Romacho and Cortez (2006) focus on the selectivity and timing abilities of 21 Portuguese-based funds, during the period January 1996 – December 2001. Using unconditional versions of the Henriksson and Merton (1981) model, their results show that managers do not exhibit selectivity or timing abilities and present evidence of a strong negative correlation between these two components of overall performance.

We investigate the performance of a survivorship bias-controlled sample of Portuguese-based mutual funds, with different investment objectives (National and European Union stocks) and during a longer and more recent period (January 2000 through December 2007). We contribute to the international mutual fund performance literature by providing a comprehensive analysis of the performance of Portuguese mutual funds investing locally as well as in the European market. Besides using more robust performance evaluation techniques (conditional multi-factor models) to analyse overall performance as well as timing and selectivity abilities of fund managers, the analysis is complemented with robustness tests to check for possible effects that may arise from survivorship bias, management fees and spurious regressions.

The paper is organized as follows: Section II presents the performance evaluation models used. Section III describes the data. Section IV presents and discusses our empirical findings. Finally, Section V summarizes our main results and presents the conclusions.

II. FUND PERFORMANCE EVALUATION MODELS

A. Overall Performance

1. Unconditional Multi-Factor Model

Most of the earlier mutual fund performance studies use an unconditional single-factor performance measure: Jensen's (1968) alpha. This measure is the intercept of the following regression:

$$r_{p,t} = \alpha_p + \beta_p \, r_{m,t} + \varepsilon_{p,t} \quad (1)$$

where $r_{p,t}$ represents the excess return of portfolio p over period t, $r_{m,t}$ the market's excess return during the same period, β_p the systematic risk of the portfolio and $\varepsilon_{p,t}$ is an error term with the following properties: $E(\varepsilon_{p,t}) = 0$, $Var(\varepsilon_{p,t}) = \sigma^2_{\varepsilon_{p,t}}$, $Cov(\varepsilon_{p,t}, r_{m,t}) = Cov(\varepsilon_{p,t}, \varepsilon_{j,t}) = 0$. A statistically significant positive (negative) alpha indicates an out-performance (under-performance) in relation to the market proxy.

The single-factor model presumes that a single market index is enough to explain the fund's investment strategies. Since we can have a wide variety of investment styles, single-factor models can yield biased estimates of performance. In fact, Fama and French's (1993, 1996) research on the cross-sectional variation of stock returns has provided strong evidence of the relevance of two additional risk factors: size and book-to-market. The unconditional multi-factor model we use is the Fama and French three-factor model, which is based on the following regression:

$$r_{p,t} = \alpha_p + \beta_{p,m} \, r_{m,t} + \beta_{p,SMB} \, r_{SMB,t} + \beta_{p,HML} \, r_{HML,t} + \varepsilon_{p,t} \quad (2)$$

where $r_{SMB,t}$ is the difference in the returns of a small-cap portfolio and a large-cap portfolio at time t and $r_{HML,t}$ is the difference in the returns of a portfolio of high book-to-market stocks and a portfolio of low book-to-market stocks at time t.

2. Conditional Multi-Factor Model

It is well recognised that unconditional models may produce incorrect performance estimates, especially when portfolio managers exhibit market timing skills or employ dynamic investment strategies resulting in time-varying risk (Grinblatt and Titman, 1989; Jensen, 1972).

Given that, in reality, both expected returns and risk are time-varying, Ferson and Schadt (1996) proposed a conditional approach to performance evaluation. In their conditional model, betas are allowed to vary in time as linear functions of a vector of predetermined information variables, Z_{t-1}, that represents the public information available at time t-1 for predicting returns at time t:

$$\beta_p \,(Z_{t-1}) = \beta_{0p} + \beta'_p \, z_{t-1} \tag{3}$$

where z_{t-1} represents a vector of the deviations of Z_{t-1} from the (unconditional) average values, β'_p is a vector that measures the response of the conditional beta to the information variables and β_{0p} is an average beta, which represents the (unconditional) mean of the conditional betas. For a conditional single-factor model, the regression becomes:

$$r_{p,t} = \alpha_p + \beta_{0p} \, r_{m,t} + \beta'_p \left(z_{t-1} \, r_{m,t}\right) + \varepsilon_{p,t} \tag{4}$$

where $E\left(\varepsilon_{p,t} \middle| Z_{t-1}\right) = E\left(\varepsilon_{p,t} \, r_{m,t} \middle| Z_{t-1}\right) = 0$. If a manager uses only publicly available information, represented by Z_{t-1}, the conditional alpha will be equal to zero, indicating neutral performance, which is consistent with the semi-strong form of market efficiency of Fama (1970).

Christopherson, Ferson and Glassman (1998) have extended the model of Ferson and Schadt (1996) by also allowing alphas to be time-varying. In their conditional model, alpha is a linear function of the vector Z_{t-1}:

$$\alpha_p \,(Z_{t-1}) = \alpha_{0p} + A'_p \, z_{t-1} \tag{5}$$

where α_{0p} is an average alpha and the vector A'_p measures the sensitivity of the conditional alpha to the information variables. Combining equations (4) and (5) gives a conditional single-factor model with time-varying alphas and betas:

$$r_{p,t} = \alpha_{0p} + A'_p \, z_{t-1} + \beta_{0p} \, r_{m,t} + \beta'_p \left(z_{t-1} \, r_{m,t}\right) + \varepsilon_{p,t} \tag{6}$$

Regression (6) can be easily extended to a multi-factor framework. A model with L information variables and K factors will have a total of (L + 1) × (K + 1) regressors: a constant, the L information variables, the K factors and the cross-products of the L information variables with the K factors. Combining regression (6) with the Fama and

French (1993, 1996) three-factor model gives our conditional multi-factor model with time-varying alphas and betas:

$$r_{p,t} = \alpha_{0p} + A'_p\, z_{t-1} + \beta_{0p,m}\, r_{m,t} + \beta'_{p,m}\left(z_{t-1}\, r_{m,t}\right) + \beta_{0p,SMB}\, r_{SMB,t} + \beta'_{p,SMB}\left(z_{t-1}\, r_{SMB,t}\right) + \beta_{0p,HML}\, r_{HML,t} + \beta'_{p,HML}\left(z_{t-1}\, r_{HML,t}\right) + \varepsilon_{p,t} \quad (7)$$

B. Market Timing

1. Unconditional Multi-Factor Model

The fund performance evaluation models presented above are only capable of evaluating a fund manager's overall performance. However, overall performance itself can be decomposed into two components: the manager's security selection and market timing abilities.

By considering that a fund manager has the ability to predict market movements, Treynor and Mazuy (1966) have proposed a CAPM-based model for measuring market timing ability:[1]

$$r_{p,t} = \alpha_p + \beta_p\, r_{m,t} + \gamma_p\, r_{m,t}{}^2 + \varepsilon_{p,t} \quad (8)$$

In regression (8), α_p represents selectivity ability, γ_p indicates a fund's market timing ability and $\varepsilon_{p,t}$ is an error term with the following properties:

$$E\left(\varepsilon_{p,t}\right) = Cov\left(\varepsilon_{p,t}, r_{m,t}\right) = Cov\left(\varepsilon_{p,t}, r_{m,t}{}^2\right) = 0$$

The quadratic term is introduced to account for possible non-linearity between fund returns and market returns.

We use an unconditional multi-factor version of the Treynor and Mazuy (1966) model, which is obtained by including the Fama and French (1993) size and book-to-market factors in regression (8):

$$r_{p,t} = \alpha_p + \beta_{p,m}\, r_{m,t} + \beta_{p,SMB}\, r_{SMB,t} + \beta_{p,HML}\, r_{HML,t} + \gamma_p\, r_{m,t}{}^2 + \varepsilon_{p,t} \quad (9)$$

2. Conditional Multi-Factor Model

Treynor and Mazuy's (1966) market timing model relies on the convexity in the relation between the fund's returns and the market return to indicate timing ability. Convexity implies that the increase in the fund's return when market return increases will be higher than the decrease in the fund's return generated by a similar decrease in the market's return. However, Ferson and Schadt (1996) argue that a convex relation can also be a result of ignoring the time variation in risk and risk premiums across the different states of the economy. To account for this source of nonlinearity, Ferson and

Schadt (1996) propose a conditional version of the Treynor and Mazuy (1966) model, by adding the quadratic term to equation (4), as follows:

$$r_{p,t} = \alpha_p + \beta_{0p}\, r_{m,t} + \beta'_p \left(z_{t-1}\, r_{m,t}\right) + \gamma_p\, r_{m,t}^{\;2} + \varepsilon_{p,t} \qquad (10)$$

In regression (10), α_p and γ_p measure conditional selectivity and market timing abilities, respectively, and vector β'_p captures the adjustments for public information effects. This conditional model allows us to distinguish nonlinearities that only reflect publicly available information, from timing ability based on better information, which is known as conditional market timing.

The finance literature on market timing (e.g.: Becker et al., 1999) shows that the timing coefficient depends on the precision of the manager's market timing signal and on the level of manager's risk aversion. Since both may be time-varying, Ferson and Qian (2004) argue that it is probable that the timing coefficient varies over time as a function of the predetermined information variables. So, they substitute the fixed timing coefficient in regression (10) with the following expression:

$$\gamma_p\,(Z_{t-1}) = \gamma_{0p} + \gamma'_{1p}\, z_{t-1} \qquad (11)$$

Substituting (11) into regression (10), gives a single-factor conditional market timing model with time-varying timing coefficients. Vector γ'_{1p} is able to capture the variability (if it exists) in the manager's timing ability over different states of the economy:

$$r_{p,t} = \alpha_p + \beta_{0p}\, r_{m,t} + \beta'_p \left(z_{t-1}\, r_{m,t}\right) + \gamma_{0p}\, r_{m,t}^{\;2} + \gamma'_{1p} \left(z_{t-1}\, r_{m,t}^{\;2}\right) + \varepsilon_{p,t} \qquad (12)$$

We expand this model to a multi-factor framework by adding the Fama and French (1993) size and book-to-market factors to regression (12), as well as their cross products with each of the predetermined information variables:

$$\begin{aligned} r_{p,t} &= \alpha_p + \beta_{0p,m}\, r_{m,t} + \beta'_{p,m}\left(z_{t-1}\, r_{m,t}\right) + \beta_{0p,SMB}\, r_{SMB,t} + \beta'_{p,SMB}\left(z_{t-1}\, r_{SMB,t}\right) \\ &+ \beta_{0p,HML}\, r_{HML,t} + \beta'_{p,HML}\left(z_{t-1}\, r_{HML,t}\right) + \gamma_{0p}\, r_{m,t}^{\;2} + \gamma'_{1p}\left(z_{t-1}\, r_{m,t}^{\;2}\right) + \varepsilon_{p,t} \end{aligned} \qquad (13)$$

In general, a model with L information variables and K factors will have a total of (L + 1) × (K + 1) + 1 regressors: a constant, the K factors, the cross-products of the L information variables with the K factors, the quadratic term and the cross-products of the quadratic term with each of the L information variables. To the best of our knowledge, this will be the first study to employ such a conditional multi-factor market timing model to evaluate the selectivity and timing abilities of mutual fund managers.

III. DATA

In comparison with the major markets (e.g.: US and UK), the Portuguese mutual fund industry is a very recent one, with the first equity fund being launched in 1986. Despite its significant growth in the last two decades, it still remains a small market within the European context.[2]

A. Sample

Our sample consists of Portuguese-owned open end equity funds, classified as National or European Union funds according to the Portuguese Unit Trust Association (APFIPP), with at least 24 monthly observations over the eight year period of January 2000 through December 2007. Taking into consideration mergers, name changes and investment policy changes, this leads to a sample of 34 funds,[3] of which 13 are National funds and 21 are European Union funds.[4] Since we include both surviving and non-surviving funds, our sample is free of survivorship bias.

The performance of each fund category was estimated by constructing two equally-weighted portfolios and not just by calculating the average of the individual funds' results, a procedure that allows us to deal with possible inference problems associated with the cross-correlations among individual fund returns. We chose to use equally-weighted portfolios because the Portuguese mutual fund industry is highly concentrated, thus size-weighted portfolios would be dominated by a very small number of funds.

B. Fund Returns, Benchmark Indices and Factors

Monthly data required to compute the fund's returns, namely Net Asset Values (NAV) and distributed dividends, were obtained from the mutual fund companies and the Portuguese Securities Market Commission (CMVM). Fund returns are calculated as $\ln\left[\left(NAV_{p,t} + D_{p,t}\right)/NAV_{p,t-1}\right]$, where $NAV_{p,t}$ and $NAV_{p,t-1}$ are the Net Asset Values of portfolio p at times t and t-1, respectively, and $D_{p,t}$ is the dividend distributed by portfolio p at time t. Given that returns are calculated using Net Asset Values, fund returns are net of operating expenses, but gross of any sales charge, with reinvestment of dividends. Table 1 presents some summary statistics for the equally-weighted portfolios of funds. We can observe that monthly returns are, on average and for the sample period, positive and normally distributed (according to the Jarque-Bera test) for the National funds and negative and not normally distributed for the European Union funds (as with most fund return data sets).

Table 1 also provides a first indication on survivorship bias. In fact, including surviving funds only, i.e., funds that still exist at the end of the sample period, would eliminate 13 funds (5 National funds and 8 European Union funds), which represents 38% of our sample. In that case, we would have an over-estimation of 0.06% per month in the raw returns of the portfolio of European Union funds and an under-estimation of 0.01% per month in the raw returns of the portfolio of National funds. This suggests that excluding non-surviving funds may have a significant impact on performance estimates, especially for the European Union funds. However, for a 5% significance level, t-tests for the equality of means between the series of surviving funds and all funds do not allow us to reject the null hypothesis of equal means for both fund categories.[5]

Table 1
Summary statistics on the returns of the portfolios of funds

This table presents some summary statistics for the monthly raw returns of the equally-weighted portfolios of National and European Union funds, computed for the period of January 2000 to December 2007. All includes both surviving and non-surviving funds. p-val (JB) is the probability that the Jarque-Bera statistic exceeds (in absolute value) the observed value under the null hypothesis of a normal distribution.

	Portfolios of National Funds		Portfolios of European Union Funds	
	All	Surviving	All	Surviving
Mean	0.0042	0.0041	-0.0010	-0.0004
Median	0.0089	0.0089	0.0102	0.0100
Maximum	0.1396	0.1392	0.0852	0.0814
Minimum	-0.1209	-0.1207	-0.1242	-0.1189
Std. Deviation	0.0477	0.0477	0.0423	0.0414
Skewness	-0.1583	-0.1521	-0.8289	-0.8225
Kurtosis	3.1437	3.1071	3.6173	3.5522
Jarque-Bera (JB)	0.4784	0.4118	12.3875	11.9174
p-val (JB)	0.7873	0.8139	0.0020	0.0026
Number of Funds	13	8	21	13

As benchmark portfolios we use two indices adjusted for dividends: the PSI-20 TR index for National funds and the MSCI Europe TR index for European Union funds. Data on indices was collected from Euronext Lisbon and Morgan Stanley Capital International (MSCI), respectively. Like fund returns, market returns are also continuously compounded. To compute excess returns, the risk-free rate is proxied by the 1-month Euribor (Euro Interbank Offered Rate), obtained from the Portuguese Central Bank.

For the multi-factor models, two additional risk factors are used to account for size and book-to-market effects. Small minus big (SMB) is the difference in return between a small-cap portfolio and a large-cap portfolio. For the small-cap portfolios we use the returns of the MSCI Portugal Small Cap and the MSCI Europe Small Cap indices for the National and European Union funds, respectively; for the large-cap portfolios we use the returns of the MSCI Portugal and the MSCI Europe indices. High minus low (HML) is the difference in return between a portfolio of high book-to-market stocks (value stocks) and a portfolio of low book-to-market stocks (growth stocks). For the returns of the portfolios of value and growth stocks we use the MSCI Portugal Value and the MSCI Portugal Growth indices, for the National funds, and the MSCI Europe Value and MSCI Europe Growth indices, for the European Union funds. The data for the construction of these factors was collected from MSCI.

Appendix 2 presents some summary statistics for the benchmarks and factors over the sample period, as well as their correlation matrix. The market excess returns are, on average, positive for the PSI20-TR index and negative for the MSCI Europe TR index. The hypothesis of normality is rejected for all benchmarks and factors, except the size factor of National funds. Given the low correlations between the variables (ranging from -0.1536 to 0.1948), multicollinearity will not substantially affect our results for the multi-factor models.

C. Information Variables

For the conditional models, we use a set of three 1-month lagged instruments that have been shown by previous studies (e.g.: Fama and French, 1989; Pesaran and Timmermann, 1995) to be useful in predicting stock returns: an indicator of the short-term interest rate level, a measure of the slope of the term structure and the dividend yield of a market index. Considering the convergence in European interest rates, bond returns and the increasing degree of integration in European stock markets following the establishment of the European Monetary Union (Fratzscher, 2002; Kim, Moshirian and Wu, 2005; Hardouvelis, Malliaropulos and Priestley, 2006), European information variables are used for both fund categories.

The annualized 3-month Euribor rate, collected from the Portuguese Central Bank, is used as an indicator of short-term interest rates. The slope of the term structure is measured by the annualized yield spread between the German listed Federal securities with a residual maturity of 9-10 years, obtained from the European Central Bank, and the 3-month Euribor rate.[6] The dividend yield variable is the dividend payments in the prior 12 months divided by the current price of the MSCI Europe index, obtained from MSCI.

To avoid any spurious regression biases, we tested the stationarity of the information variables using the Augmented Dickey-Fuller (1979) test. Using several lags and a MacKinnon critical value of 5%, we cannot reject the null hypothesis of a unit root for the short-term interest rate and the slope of the term structure variables. In addition, these variables present very high first-order autocorrelation coefficients (above 95%). Given the high degrees of persistence exhibited by these instruments, they were stochastically detrended by subtracting a trailing moving average over a period of 2 months, following the approach of Campbell (1991) and Ferson, Sarkissian and Simin (2003). This procedure not only diminishes the first-order autocorrelation coefficients considerably (to 70% and 51%, respectively) but also overcomes the non-stationarity problems, since we can reject the null hypothesis of a unit root in most cases.[7]

As in Ferson and Schadt (1996), the information variables will be demeaned in order to allow a simple interpretation of the estimated coefficients. Appendix 3 presents some descriptive statistics and autocorrelations for the information variables, as well as their correlation matrix.[8]

IV. EMPIRICAL RESULTS

A. Overall Performance

Panel A of Table 2 presents the results of applying the unconditional multi-factor model to our sample of funds. The main results are pointed out next. First, while the portfolio of National funds presents neutral performance, the portfolio of European Union funds shows a significant under-performance in relation to the market proxy. The same type of results are observed at the individual fund level: whereas all National funds present alphas that are not statistically different from zero, 52% of the European Union funds exhibit negative and statistically significant alphas at the 5% level. These results suggest the existence of a distance effect, as fund managers that invest locally seem to perform better than those investing in the European markets. Second, the size factor is highly significant for both fund categories and the positive weightings allow us to conclude that both types of funds are relatively more exposed to small-caps. Third, the coefficient for the book-to-market factor is only significant for the National funds, with the positive weighting indicating that they are more value-oriented. Fourth, the adjusted R^2's are relatively high for both portfolios (94.90% and 90.47% for the National and European Union portfolios, respectively).[9]

Our results confirm the importance of controlling for size and book-to-market effects, besides market risk. The coefficients of the additional factors are highly significant both at the individual level and at the aggregate level. In fact, at the 5% significance level, we can reject the null hypothesis of the Wald test[10] that the coefficients of the additional factors are jointly equal to zero for both portfolios (as we can see in Panel A of Table 2), all of the National funds and the majority of the European Union funds.[11]

Panel B of Table 2 presents the results of the conditional multi-factor model with time-varying alphas and betas. The incorporation of the lagged information variables has a positive impact in the performance estimates and in the explanatory power of the models, somewhat consistent with the findings of Ferson and Schadt (1996) and Otten and Bams (2004), among others. These results are also confirmed at the individual fund level: all National funds remain neutral, but there are less European Union funds that exhibit negative and statistically significant alphas at the 5% level. Additionally, 77% of the National funds and 90% of the European Union funds present higher adjusted R^2's in relation to the unconditional model, with increases that range up to 12.83%.

Table 2

Overall performance and risk estimates using unconditional and conditional multi-factor models

This table presents estimates of performance (alphas and average conditional alphas, in percentage) and risk (betas and average conditional betas) for the equally-weighted portfolios of National and European Union (EU) funds using the unconditional multi-factor model ($r_{p,t} = \alpha_p + \beta_{p,m} r_{m,t} + \beta_{p,SMB} r_{SMB,t} + \beta_{p,HML} r_{HML,t} + \varepsilon_{p,t}$) and the conditional multi-factor model with time-varying alphas and betas:

$$(r_{p,t} = \alpha_{0p} + A'_p z_{t-1} + \beta_{0p,m} r_{m,t} + \beta'_{p,m}(z_{t-1} r_{m,t}) + \beta_{0p,SMB} r_{SMB,t} + \beta'_{p,SMB}(z_{t-1} r_{SMB,t})$$
$$+ \beta_{0p,HML} r_{HML,t} + \beta'_{p,HML}(z_{t-1} r_{HML,t}) + \varepsilon_{p,t})$$

$r_{m,t}$ is the market index excess return, $r_{SMB,t}$ is the return differential between a small-cap portfolio and a large-cap portfolio and $r_{HML,t}$ is the return differential between a portfolio of high book-to-market (value) stocks and a portfolio of low book-to-market (growth) stocks. The predetermined information variables are the short-term interest rate level (EUR), the slope of the term structure (TS) and the dividend yield (DY). All these variables are demeaned, lagged 1-month and the first two instruments were stochastically detrended by subtracting a trailing moving average over a period of 2 months. R^2 adj. is the adjusted coefficient of determination. The asterisks are used to represent the statistically significant coefficients at the 1% (***), 5% (**) and 10% (*)

significance levels, based on heteroskedasticity and autocorrelation adjusted errors (following Newey and West, 1987). The number of individual funds presenting positive (N+) or negative (N–) coefficients with respect to the alphas or the average conditional alphas are also reported, as well as the number of those which are statistically significant at the 5% level, reported in brackets. Wald corresponds to the probability values of the χ-square statistic of the Newey and West (1987) Wald test for the null hypothesis that the coefficients of the size and book-to-market factors are jointly equal to zero. W_1, W_2, W_3, W_4 and W_5 correspond to the probability values of the χ-square statistic of the Newey and West (1987) Wald test on the existence of time-varying alphas, time-varying betas for the market factor, the size factor, the book-to-market factor and the joint time-variation in all coefficients, respectively.

Panel A: Unconditional Multi-Factor Model

Portfolios	α_p	$\beta_{p,m}$	$\beta_{p,SMB}$	$\beta_{p,HML}$	Wald	R^2 adj.
National Funds	0.0067	0.924***	0.254***	0.118***	0.00	94.9%
	N+ 5 [0]					
	N– 8 [0]					
EU Funds	-0.3949***	0.9256***	0.199***	-0.090	0.01	90.5%
	N+ 0 [0]					
	N– 21 [11]					

Panel B: Conditional Multi-Factor Model with Time-Varying Alphas and Betas

Portfolios	α_{0p}	$\beta_{0p,m}$	$\beta_{0p,SMB}$	$\beta_{0p,HML}$	W_1	W_2	W_3	W_4	W_5	R^2 adj.
National Funds	0.0319	0.940***	0.262***	0.083**	0.22	0.01	0.07	0.00	0.00	95.4%
	N+ 7 [0]									
	N– 6 [0]									
EU Funds	-0.3711***	0.900***	0.148***	0.096	0.00	0.00	0.00	0.01	0.00	92.4%
	N+ 1 [0]									
	N– 20 [7]									

The results of the Wald tests confirm the existence of time-varying betas for both fund categories and of time-varying alphas for European funds. At the 5% level, the hypothesis of constant betas can be rejected for all factors, except the size factor of the portfolio of National funds. At the same significance level, the hypothesis of constant alphas can be rejected only for the portfolio of European funds. The joint time variation of alphas and betas cannot be rejected for both portfolios.

The above results are also confirmed, although to a lesser extent, at the individual fund level. In fact, at the 5% (10%) level, the percentage of funds presenting time-varying betas in relation to the market, size and book-to-market factors is of 68% (68%), 38% (47%) and 41% (47%), respectively. The percentage of National funds presenting time-varying alphas is very small (only 15%) but, at the 5% (10%) level, the hypothesis of constant alphas can be rejected for 38% (48%) of the European Union funds. Only one individual fund rejects the joint time variation of alphas and betas at the 5% level.

Table 3

Estimates for conditional alphas and betas

This table presents the coefficient estimates for the conditional alpha function (i.e., the coefficients of vector A'_p) and the conditional beta function (i.e., the coefficients of vector β'_p) for the equally-weighted portfolios of National and European Union (EU) funds using the conditional multi-factor model:

$$(r_{p,t} = \alpha_{0p} + A'_p z_{t-1} + \beta_{0p,m} r_{m,t} + \beta'_{p,m}(z_{t-1} r_{m,t}) + \beta_{0p,SMB} r_{SMB,t} + \beta'_{p,SMB}(z_{t-1} r_{SMB,t}) + \beta_{0p,HML} r_{HML,t} + \beta'_{p,HML}(z_{t-1} r_{HML,t}) + \varepsilon_{p,t})$$

The predetermined information variables are the short-term interest rate level (EUR), the slope of the term structure (TS) and the dividend yield (DY). The asterisks are used to represent the statistically significant coefficients at the 1% (***), 5% (**) and 10% (*) significance levels, based on heteroskedasticity and autocorrelation adjusted errors (following Newey and West, 1987). The number of individual funds presenting positive (N+) or negative (N–) coefficients with respect to the lagged information variables is also reported, as well as the number of those which are statistically significant at the 5% level, reported in brackets.

Portfolios	A_pEUR	A_pTS	A_pDY	$\beta_{p,m}$EUR	$\beta_{p,m}$TS	$\beta_{p,m}$DY
National Funds	0.011	0.001	-0.003	-0.054	-0.277**	-0.111**
N+	10 [1]	8 [0]	6 [0]	5 [1]	0 [0]	1 [0]
N–	3 [0]	5 [0]	7 [1]	8 [1]	13 [4]	12 [4]
EU Funds	0.011	0.004	0.010***	0.283	0.552***	-0.125
N+	15 [1]	15 [1]	17 [8]	14 [3]	18 [11]	4 [1]
N–	6 [0]	6 [0]	4 [1]	7 [0]	3 [0]	17 [6]
Portfolios	$\beta_{p,SMB}$EUR	$\beta_{p,SMB}$TS	$\beta_{p,SMB}$DY	$\beta_{p,HML}$ EUR	$\beta_{p,HML}$ TS	$\beta_{p,HML}$ DY
National Funds	-0.339	-0.108	-0.093	-0.480**	-0.511***	0.914
N+	1 [0]	17 [0]	3 [0]	3 [0]	2 [0]	6 [0]
N–	13 [3]	24 [0]	11 [1]	11 [3]	12 [7]	8 [2]
EU Funds	-0.39	-0.428	-0.375***	0.892**	-0.03	0.223
N+	10 [0]	3 [0]	5 [0]	19 [2]	10 [3]	12 [3]
N–	11 [1]	18 [1]	17 [5]	4 [0]	11 [1]	9 [1]

The results on the conditional beta functions, presented in Table 3, show that all information variables are highly significant in explaining the time variation of the three factors. Table 3 also presents the estimates of the conditional alpha functions. As we can observe, only the dividend yield variable is statistically significant (with a positive sign) and only for the portfolio of European Union funds (similar evidence is obtained at the individual fund level). This evidence indicates that these fund managers are achieving higher risk-adjusted performances when dividend yields are high. Since high dividend yields predict high stock returns, this points towards a positive correlation between conditional alphas and expected market returns, a fact that confirms the argument that it is easier for a fund manager to perform better in an up market. In this manner, our results are consistent with the findings of Christopherson, Ferson and Glassman (1998).

In spite of the evidence presented above, performance estimates remain neutral for the portfolio of National funds and negative and statistically significant at the 1% level for the portfolio of European Union funds. This means that conditional alphas do not make the performance of the portfolios of funds look significantly better than unconditional alphas, as reported by Christopherson, Ferson and Glassman (1998).

Overall, the results of our performance evaluation models suggest that Portuguese mutual fund managers are not able to out-perform the market. Therefore, they are consistent with the few performance evaluation studies conducted on the Portuguese market and with the majority of the empirical studies carried out in other markets.

B. The Impact of Survivorship Bias

Several studies have shown that survivorship bias may have a significant impact in fund performance estimates (Malkiel, 1995; Elton, Gruber and Blake, 1996), since it can lead to an over-estimation of fund returns. By using a survivorship bias-controlled sample of funds, we are able to analyze the impact of using only surviving funds in our research.

As mentioned in Section III.B, survivorship bias does not seem, *a priori*, to affect our results in significant way since the mean raw returns of the portfolios of surviving funds are not statistically different from those of the portfolios that include all funds. However, in order to measure the magnitude of this bias using risk-adjusted returns, we re-estimate our models using equally-weighted portfolios of surviving funds only, for each fund category. Then, we estimate survivorship bias by subtracting the performance (measured by alphas or the average conditional alphas) of a portfolio of all funds from that of a portfolio of surviving funds only. These results are presented in Table 4.

For National funds, survivorship bias estimates are very small and do not differ statistically from zero for both performance evaluation models used. For the European Union funds, survivorship bias reaches values of 0.0534% per month (unconditional model) and 0.0304% per month (conditional model). Since the first estimate is statistically significant at the 5% level, using surviving funds only would lead to a significant over-estimation of performance in the unconditional model.

It is very interesting to see that the incorporation of the predetermined information variables in the model not only reduces survivorship bias but removes its statistical significance. Lower survivorship bias estimates when conditional information is introduced have also been documented in a few studies, such as Dahlquist, Engström and Söderlind (2000) for Swedish funds and Ayadi and Kryzanowski (2005) for Canadian equity funds.

These results show that survivorship bias could have a significant impact on the performance estimates of some of our models. Studies that neglect for this issue should therefore be interpreted with caution.

Table 4
Survivorship bias estimates using risk-adjusted returns

This table presents estimates of performance (monthly alphas and average conditional alphas in percentage), using the unconditional multi-factor model and the conditional multi-factor model with time-varying alphas and betas, for equally-weighted portfolios of National and European Union (EU) funds during the period of January 2000 to December 2007. Surviving refers to portfolios of surviving funds only and All refers to portfolios of all funds, surviving and non-surviving. Survivorship Bias corresponds to the difference between Surviving and All; its significance is evaluated by running the regressions on the returns of a "difference" portfolio, which is obtained by subtracting the returns of the portfolio of All funds from the returns of the portfolio of Surviving funds only. The asterisks are used to represent the statistically significant coefficients at the 1% (***), 5% (**) and 10% (*) significance levels, based on heteroskedasticity and autocorrelation adjusted errors (following Newey and West, 1987).

Panel A: Unconditional Multi-Factor Model		
	National Funds	EU Funds
Surviving	0.0034	-0.3415***
All	0.0067	-0.3949***
Survivorship Bias	-0.0033	0.0534**
Panel B: Conditional Multi-Factor Model with Time-Varying Alphas and Betas		
	National Funds	EU Funds
Surviving	0.0337	-0.3407***
All	0.0319	-0.3711***
Survivorship Bias	0.0018	0.0304

C. Fund Fees and Performance

As mentioned previously, we have considered fund returns net of operating expenses, but gross of any sales charge, i.e., management fees are already deducted from fund returns. However, several studies in the literature (e.g.: Elton, Gruber and Blake, 1995) argue that the usual under-performance of mutual funds may be due to the management fees they charge. To assess whether this is the case for our sample of funds, we repeat the analysis of Section IV.A, for the two equally-weighted portfolios of funds, considering fund returns before expenses.

To obtain returns before expenses, we add back the management fees to the returns of each portfolio. Information on the annual percentage of management fees for the individual funds was obtained by consulting each fund's prospectus, available in the Portuguese Securities Market Commission (CMVM) website. Then, we computed an average of the fees of the individual funds in each of the equally-weighted portfolios, divided it by twelve and added it to each month's return.[12] On average, management fees are of 1.983% and 2.011% of the Net Asset Value per year for the National and the European Union funds, respectively. Table 5 presents the performance estimates using risk-adjusted returns after and before management fees.

Table 5

Overall performance after and before management fees

This table presents estimates of performance (monthly alphas and average conditional alphas, in percentage), using the unconditional multi-factor model and the conditional multi-factor model with time-varying alphas and betas, for the equally-weighted portfolios of National and European Union (EU) funds, during the period of January 2000 to December 2007, after and before management fees are deducted from returns. The asterisks are used to represent the statistically significant coefficients at the 1% (***), 5% (**) and 10% (*) significance levels, based on heteroskedasticity and autocorrelation adjusted errors (following Newey and West, 1987).

Panel A: Unconditional Multi-Factor Model		
	National Funds	EU Funds
After management fees	0.0067	-0.3949***
Before management fees	0.0127	-0.3891***
Panel B: Conditional Multi-Factor Model with Time-Varying Alphas and Betas		
	National Funds	EU Funds
After management fees	0.0319	-0.3711***
Before management fees	0.0373	-0.3656***

As we can observe in the table above, despite higher alphas, there are no significant changes in performance estimates when management fees are added back. Performance remains neutral for National funds and negative and statistically significant at the 1% level for the European Union funds. So, there is no evidence that the under-performance of the funds in our sample is due to the expenses they charge.

D. Selectivity and Market Timing

Panel A of Table 6 shows the results of applying the unconditional multi-factor market timing model to our sample of funds. In relation to selectivity, although the portfolio of National funds presents a positive value and the portfolio of European Union funds presents a negative value, they are both not statistically different from zero at the 5% level. So, consistent with most of the literature on mutual fund performance, Portuguese equity fund managers do not seem to be able to identify undervalued stocks.

Table 6

Selectivity and timing estimates using unconditional and conditional multi-factor models

This table presents estimates of selectivity (alphas in percentage) and timing (gammas and average conditional gammas) for the equally-weighted portfolios of National and European Union (EU) funds using the unconditional multi-factor market timing model ($r_{p,t} = \alpha_p + \beta_{p,m}\, r_{m,t} + \beta_{p,SMB}\, r_{SMB,t} + \beta_{p,HML}\, r_{HML,t} + \gamma_p\, r_{m,t}{}^2 + \varepsilon_{p,t}$) and the conditional multi-factor model with time-varying timing coefficients:

$$(r_{p,t} = \alpha_p + \beta_{0p,m}\, r_{m,t} + \beta'_{p,m}(z_{t-1}\, r_{m,t}) + \beta_{0p,SMB}\, r_{SMB,t} + \beta'_{p,SMB}(z_{t-1}\, r_{SMB,t})$$
$$+ \beta_{0p,HML}\, r_{HML,t} + \beta'_{p,HML}(z_{t-1}\, r_{HML,t}) + \gamma_{0p}\, r_{m,t}{}^2 + \gamma'_{1p}(z_{t-1}\, r_{m,t}{}^2) + \varepsilon_{p,t})$$

$r_{m,t}$ is the market index excess return, $r_{SMB,t}$ is the return differential between a small-cap portfolio and a large-cap portfolio and $r_{HML,t}$ is the return differential between a portfolio of high book-to-market (value) stocks and a portfolio of low book-to-market (growth) stocks. The predetermined information variables are the short-term interest rate level (EUR), the slope of the term structure (TS) and the dividend yield (DY). All these variables are demeaned, lagged 1-month and the first two instruments were stochastically detrended by subtracting a trailing moving average over a period of 2 months. R^2 *adj.* is the adjusted coefficient of determination. The asterisks are used to represent the statistically significant coefficients at the 1% (***), 5% (**) and 10% (*) significance levels, based on heteroskedasticity and autocorrelation adjusted errors (following Newey and West, 1987). The number of individual funds presenting positive (N+) or negative (N–) coefficients with respect to the alphas or the average conditional alphas and the gammas or average conditional gammas are also reported, as well as the number of those which are statistically significant at the 5% level, reported in brackets. W_1, W_2 and W_3 correspond to the probability values of the χ-square statistic of the Newey and West (1987) Wald test on the existence of time-varying betas (for the 3 factors), time-varying market timing coefficients and the joint time-variation in all coefficients, respectively. ρ_{α_p,γ_p} and $\rho_{\alpha_p,\gamma_{0p}}$ are the correlation coefficients between the selectivity and timing estimates of the individual funds in each portfolio.

Panel A: Unconditional Multi-Factor Model							
Portfolios	α_p	γ_p				R^2 adj.	ρ_{α_p,γ_p}
National Funds	0.0256	-0.0798				94.85%	
	N+ 6 [0] N– 7 [0]	N+ 3 [0] N– 10 [0]					-0.13
EU Funds	-0.3210*	-0.3661				90.43%	
	N+ 2 [0] N– 19 [6]	N+ 9 [0] N– 12 [0]					-0.95
Panel B: Conditional Multi-Factor Model with Time-Varying Timing Coefficients							
Portfolios	α_p	γ_{0p}	W_1	W_2	W_3	R^2 adj.	$\rho_{\alpha_p,\gamma_{0p}}$
National Funds	0.0297	-0.1169	0.01	0.21	0.01	95.28%	
	N+ 5 [0] N– 8 [0]	N+ 5 [0] N– 8 [2]					0.85
EU Funds	-0.0578	-1.4400*	0.00	0.60	0.00	92.31%	
	N+ 7 [0] N– 14 [2]	N+ 4 [0] N– 17 [3]					0.71

By comparing the above results with those presented in Panel A of Table 2, we can observe that the inclusion of the quadratic term increases the alpha estimates for both portfolios. This increase is statistically significant for the portfolio of European Union funds, whose alpha remains negative but only at a significance level of 10%. In fact, it seems that the performance evaluation models tend to underestimate the contribution of selectivity to overall performance. This type of evidence is also observed at the individual fund level: all National funds continue to present neutral alphas, but now only 29% of the European Union funds still exhibit negative and statistically significant alphas at the 5% level. Therefore, our results show that the selectivity measure is sensitive to this non-linear adjustment in the benchmark model, in contrast with the findings of Dahlquist, Engström and Söderlind (2000) for Swedish funds.

As to the contribution of timing to overall performance, mutual fund managers in our sample do not exhibit any market timing abilities, both at the aggregate level and at the individual fund level. In spite of having negative coefficients for both portfolios and for 65% of the individual funds, none of these are statistically different from zero at the 5% level. Many studies that use the unconditional Treynor and Mazuy (1966) model provide evidence of significant negative or even “perverse” timing ability (e.g.: Cumby and Glen, 1990; Fletcher, 1995; Ferson and Schadt, 1996; Sawick and Ong, 2000). These latter findings probably reflect some kind of a model misspecification since it means that fund managers have some timing ability but use it in the wrong way, increasing their market exposure when the market performs poorly and decreasing it when the market performs well.

Panel A of Table 6 also shows a negative correlation between selectivity and timing for individual funds, consistent with previous findings (e.g.: Coggin, Fabozzi and Rahman, 1993). In addition, it is also interesting to see that this negative correlation is much higher for European Union funds (-0.95) than for National funds (-0.13). A possible explanation for these findings is that, as the investment universe increases, fund managers seem to become more focused on one of the two components of overall performance (Romacho and Cortez, 2006).

Panel B of Table 6 presents the results of the conditional multi-factor model with time-varying timing coefficients. The incorporation of the lagged information variables increases the explanatory power of the models and has a positive impact in the selectivity estimates, but a negative impact in the timing estimates. However, at the 5% level, both estimates remain neutral for the two portfolios. These results are also observed at the individual fund level, with 68% of the funds presenting higher selectivity estimates and 71% having lower timing coefficients in relation to the unconditional model.

Therefore, our results are inconsistent to those reported by Ferson and Schadt (1996) and Sawicki and Ong (2000), who show that the incorporation of conditioning information in the single-factor version of the Treynor and Mazuy (1966) model is able to improve the managers’ timing abilities and greatly reduce the number of significant negative timing coefficients.

As a consequence of the lower timing estimates obtained with the conditional model, 15% of the individual funds show evidence of “perverse” timing abilities at the 5% level. As Ferson and Schadt (1996) point out, these negative timing coefficients may be related to model misspecification or be a consequence of the use of options or other related trading strategies. However, the proportion of options in Portuguese mutual funds is very small and there is no evidence of significant positive selectivity estimates to compensate for the negative timing coefficients.

It should be noted, however, that 60% of these significant negative coefficients are generated by non-surviving funds that exhibit time-varying timing coefficients. This suggests that the significance of the average conditional gammas in our model may be related to the covariance between the information variables and the timing coefficient. In fact, if we use a conditional multi-factor model with a fixed timing coefficient, i.e., a multi-factor version of the conditional Treynor and Mazuy (1966) model proposed by Ferson and Schadt (1996), the significance of these timing coefficients is removed.

The results of the Wald tests confirm the existence of time-varying betas but reject the hypothesis of time-varying timing coefficients for both portfolios. These results are in contrast with those of Ferson and Qian (2004), who report significant time-varying conditional timing abilities associated with variables like dividend yields and the slope of the term structure, among others. However, at the individual fund level, we find some evidence of time-varying timing abilities, since we can reject the null hypothesis of a fixed timing coefficient for 26% of the funds. The joint time variation in all coefficients cannot be rejected for both fund categories.

The use of the conditional multi-factor timing model has a very interesting impact in terms of the correlation between timing and selectivity. In fact, in contrast with previous findings, Panel B of Table 6 shows a positive correlation between the two components of overall performance for the individual funds of both categories (0.85 and 0.71 for the National and European Union funds, respectively). So, it seems that the incorporation of the information variables is able to remove the negative correlations reported by the unconditional model.

It is puzzling, however, that, on the one hand, Panel B of Table 6 shows that the incorporation of conditioning information is statistically significant and increases the explanatory power of the model but, on the other hand, leads to some evidence of significant negative timing abilities at the individual fund level.

V. CONCLUSIONS

This paper investigates overall performance and market timing abilities of Portuguese equity funds investing in the domestic and in the European Union market, during the period of January 2000 to December 2007, using both unconditional and conditional multi-factor models.

In terms of overall performance, our results show that while National funds are neutral performers, European Union funds underperform the market significantly. It is clear that a conditional multi-factor model with time-varying alphas and betas is more robust to evaluate the performance of fund managers in our sample. In fact, our results confirm the importance of controlling for size and book-to-market effects, besides market risk. Furthermore, there is strong evidence of time-varying betas for almost all factors in both fund portfolios and of time-varying alphas for the European Union funds portfolio. Similar evidence is obtained at the individual fund level, although to a less extent.

Our results also call attention to the issue of survivorship bias. If we had used portfolios of surviving funds only, we would have a significant over-estimation of performance for European Union funds when using the unconditional multi-factor model. It is also interesting to observe that the use of a conditional multi-factor model with time-varying alphas and betas would not only reduce survivorship bias, but would also remove its statistical significance. This evidence is in favour of the argument of using conditional multi-factor models in samples that are not free of survivorship bias.

We also show that the under-performance of the funds in our sample does not seem to be a consequence of the expenses they charge, since performance before management fees is not statistically different from after fees performance.

In terms of market timing, our tests suggest that mutual fund managers in our sample do not exhibit any market timing abilities. Additionally, there is little evidence of time-varying conditional market timing abilities and only at the individual fund level. However, while the unconditional multi-factor model does not seem to be severely misspecified, with all individual funds and both portfolios presenting neutral timing abilities, the conditional version of the model presents some evidence of "perverse" timing abilities, although only at the individual fund level. If this puzzling result reflects any kind of model misspecification is a debatable issue and is certainly an interesting line of research for the future.

ENDNOTES

1. The two most widely used market-timing models are the Treynor and Mazuy (1966) and the Henriksson and Merton (1981) models. Since there are several studies in the literature that report very similar results between the two (e.g.: Ferson and Schadt, 1996; Bollen and Busse, 2001), we will restrict our analysis to the first model and explore several of its extensions.
2. By December 2007, the Net Asset Values of Portuguese mutual funds were worth € 25 763 million.
3. See Appendix 1 for a description of our sample of funds.
4. We use and compare the performance of these two fund categories due to the increasing tendency towards European stock market integration and the rising participation of Portuguese investors in other European markets.
5. The probability values of the t-tests for the equality of means between the two series are 0.9947 and 0.9249 for the National and European Union funds, respectively.
6. It would be preferable to use another German government bond rate as the short term rate; however, due to the non-existence of a liquid Treasury bill market, that data was not available.
7. Using lags of up to 6 periods and a MacKinnon critical value of 5%, the hypothesis of a unit root is always rejected for both variables.
8. We can see that the correlations between the instruments range from -0.6010 to 0.1141.
9. We have also used the MSCI Portugal TR index as the benchmark for the National funds. However, the explaining power of the model was not as high as with the PSI-20 TR index.
10. The significance of the additional factors was also tested using log likelihood (Log L) ratio tests and the results were similar to those obtained by the Wald tests.
11. This evidence is further supported when comparing these results with those of an unconditional single-factor model, presented in Appendix 4. In fact, the multi-factor model adds a considerable explanatory power, with increases in the adjusted R^2 of 5.77% for the portfolio of National funds and 1.2% for the portfolio of European Union funds. Unreported results at the individual fund level show similar

evidence: the adjusted R^2's are higher for all National funds and 86% of the European Union funds, with increases that range up to 12.53%.

12. Although we could only obtain annual percentages of management fees for the second half of our sample period (2004-2007), we believe this will not affect our results significantly, because these fees are fairly constant across the years.

Appendix 1

Mutual funds in the sample

National Funds		European Union Funds	
Surviving		Surviving	
1	Banif Acções Portugal	14	Banif Euro Acções
2	Barclays Premier Acções Portugal	15	BBVA Bolsa Euro
3	BPI Portugal	16	BPI Europa Crescimento
4	Caixagest Acções Portugal	17	BPI Europa Valor
5	Espírito Santo Portugal Acções	18	Caixagest Acções Europa
6	Millennium Acções Portugal	19	Espírito Santo Acções Europa
7	Postal Acções[1]	20	Finicapital
8	Santander Acções Portugal	21	Millennium Eurocarteira
Non-surviving		22	Montepio Acções
9	AF Investimentos Acções Portugal	23	Montepio Acções Europa
10	BNU Acções	24	Popular Acções
11	Caixagest Gestão Lusoacções	25	Raíz Europa
12	Caixagest Valorização	26	Santander Acções Europa
13	Santander Capital Portugal	Non-surviving	
		27	AF Acções Euro
		28	AF Investimentos Acções Europa
		29	BIG Eurocapital
		30	BNU Acções Europa
		31	BNU Gestão Activa Acções
		32	Caixagest Gestão Euroacções
		33	Espírito Santo Acções Rendimento
		34	Santander Iberfundo Acções

Note 1. This fund is currently a European Union Fund, but until March 2007 it was a National Fund.

Appendix 2

Summary statistics for the market returns and factors

This appendix presents some summary statistics for the market returns and factors for the period of January 2000 to December 2007. For the National Funds, MKT_{NF} is the monthly excess return of the PSI20-TR index, SMB_{NF} is the difference in the monthly returns of the MSCI Portugal Small-Cap and the MSCI Portugal indices and HML_{NF} is the difference in the monthly returns of the MSCI Portugal Value and the MSCI Portugal Growth indices. For the European Union Funds, MKT_{EUF} is the monthly excess return of the MSCI Europe TR index, SMB_{EUF} is the difference in the monthly returns of the MSCI Europe Small-Cap and the MSCI Europe indices and HML_{EUF} is the difference in the monthly returns of the MSCI Europe Value and the MSCI Europe Growth indices. Table **A** presents several monthly statistics for these variables. Tables **B1** and **B2** present the correlation matrixes among the factors for the National and European Union Funds, respectively.

Table A – Descriptive Statistics

	National Funds			European Union Funds		
	MKT_{NF}	SMB_{NF}	HML_{NF}	MKT_{EUF}	SMB_{EUF}	HML_{EUF}
Mean	0.0002	0.0025	0.0055	-0.0004	0.0052	0.0045
Median	0.0013	0.0007	0.0052	0.0095	0.0083	0.0065
Maximum	0.1646	0.1369	0.1642	0.1033	0.0529	0.0770
Minimum	-0.1838	-0.0833	-0.1032	-0.1515	-0.0796	-0.0756
Std. Deviation	0.0512	0.0398	0.0414	0.0436	0.0243	0.0214
Skewness	-0.2795	0.3876	0.5418	-0.8565	-0.7129	-0.2430
Kurtosis	4.5837	3.6139	4.7950	4.2013	4.0381	5.6189
Jarque-Bera (JB)	11.1647	3.8709	17.4011	17.3287	12.3121	28.0829
p-val (JB)	0.0038	0.1444	0.0002	0.0002	0.0021	0.0000

Table B1 – Correlation Matrix (NF)

	MKT_{NF}	SMB_{NF}	HML_{NF}
MKT_{NF}	1.0000		
SMB_{NF}	-0.1226	1.0000	
HML_{NF}	-0.1536	0.1125	1.0000

Table B2 – Correlation Matrix (EUF)

	MKT_{EUF}	SMB_{EUF}	HML_{EUF}
MKT_{EUF}	1.0000		
SMB_{EUF}	0.0443	1.0000	
HML_{EUF}	0.1948	0.0936	1.0000

Appendix 3
Summary statistics for the information variables

This appendix presents some summary statistics for the lagged information variables for the period of January 2000 to December 2007: short-term interest rate level (EUR), the slope of the term structure (TS) and dividend yield (DY). The first two instruments were stochastically detrended by subtracting a trailing moving average over a period of 2 months. Table **A** presents several statistics for these variables (annual, demeaned and expressed in percentage) as well as their autocorrelation coefficients of order 1, 3, 6 and 12. Table **B** presents the correlation matrix among the instruments.

Table A – Descriptive Statistics and Autocorrelations

	EUR	TS	DY
Mean	0.0000	0.0000	0.0000
Median	-0.0011	0.0133	0.1242
Maximum	0.4959	0.6218	1.1202
Minimum	-0.7141	-0.7082	-0.9478
Std. Deviation	0.1817	0.2215	0.4481
Skewness	-0.4910	-0.1928	-0.5739
Kurtosis	5.1208	3.7288	2.9955
ρ_1	0.70	0.51	0.93
ρ_3	0.50	0.21	0.79
ρ_6	0.256	0.06	0.64
ρ_{12}	0.02	-0.12	0.33

Table B – Correlation Matrix

	EUR	TS	DY
EUR	1.0000		
TS	-0.6010	1.0000	
DY	-0.2786	0.1141	1.0000

Appendix 4

Performance and risk estimates using the unconditional single-factor model

This appendix presents estimates of performance (alphas expressed in percentage) and risk for the equally-weighted portfolios of National and European Union (EU) funds using the unconditional single-factor model ($r_{p,t} = \alpha_p + \beta_p r_{m,t} + \varepsilon_{p,t}$). R^2 (adj.) is the adjusted coefficient of determination. The asterisks are used to represent the statistically significant coefficients at the 1% (***), 5% (**) and 10% (*) significance levels, based on heteroskedasticity and autocorrelation adjusted errors (following Newey and West, 1987). The number of individual funds presenting positive (N+) or negative (N–) alphas is also reported, as well as the number of those that are statistically significant at the 5% level, reported in brackets.

Portfolios		α_p	β_p	R^2 (adj.)
National Funds		0.1363	0.8849***	89.13%
	N+	11 [1]		
	N–	2 [0]		
EU Funds		-0.3316***	0.9221***	89.27%
	N+	2 [0]		
	N–	19 [13]		

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