Performance Persistence: Evidence for the European Mutual Funds Market

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Abstract

Using a sample of 333 European equity mutual funds, we show that persistence in risk adjusted returns is present in funds with investment objective European equity. We demonstrate that persistence is neither caused by FAMA/FRENCH(1996) related anomalies nor disappears if we correct for the European momentum effect documented in ROUWENHORST(1998). Persistence is not induced by mutual fund style related issues either, since we control for style issues using the SHARPE(1992) Asset Class Factor model. We find evidence in favour of persistent performance to be a robust phenomenon not very sensitive to different methodologies for testing persistence or adjusting for risk.

I. Introduction

The world-wide market for mutual funds has been growing rapidly over the last decades. Compared to the fast growth and the obvious relevance mutual funds enjoyed in the United States since the 1970s, the European market for mutual funds lagged behind in terms of size and importance. In the last fifteen years, however, the European Market for mutual funds faced a dramatic surge in the number of newly established funds and the amount of assets under management. In addition, as the European retail investment environment became more competitive, the average European investor started to be more concerned about the fund selection decision. As in the United States, a small industry has emerged in Europe devoted to collecting data on mutual funds, comparing and rating fund performances, and hence providing investors with "useful" information for their investment decision. It is, however, not yet certain whether rating information is really useful for selecting mutual funds.

In the United States, the question of whether equity fund performance is related to past performance has been discussed intensely in various studies. GRINBLATT/TITMAN(1992), HENDRICKS/PATEL/ZECKHAUSER(1993) and BROWN/GOETZMANN(1995) argue in favour of persistence in mutual fund returns. The probably most extensive studies in this area were conducted by CARHART(1997a) and WERMERS(1997); they shed some light on the persistence phenomenon and its relation to investment strategies pursued by mutual fund managers. Although much has been clarified for the American market, little evidence has been brought up with regard to the European situation. WITTROCK(1995) addresses the question of persistent performance in a sample of 21 German mutual funds and does not find persistence. BAKARIC/BITSCHNAU(1996) study a European database of 227 nationally diversified mutual funds. BROWN/DRAPER/MCKENZIE(1997) look at 602 British pension funds, BLAKE/TIMMERMANN(1998) base their studies on a complete sample of British unit trusts. In neither of the latter three studies, persistent performance in the respective samples is rejected.

Using a new, European mutual fund database that comprises 333 funds domiciled in eight European countries, we look at the question of consistency in mutual fund performance on the European level. All funds included are investing in European equities and are hence comparable in terms of their investment objective. The purpose of this research is to provide new insights in the structure of the returns of European mutual funds in general and to determine whether the historical performance of European funds is related to their future prospects.

The paper is structured as follows. Section II provides an overview about the database and addresses some issues associated with the European mutual fund market. In section III we introduce the performance measurement models. Relative performance of the different fund categories, comparisons between the performance measurement models as well as some simple tests for home-bias and fund category related biases are reported in section IV. In section V we address performance persistence, and section VI concludes.

II. Data

Our database covers 333 European equity funds domiciled in various European countries. 105 of these funds have performance data available for the full 10 year period from May 1988 to April 1998. Their common investment objective is European equity, which makes their performance to be more easily comparable. We have obtained monthly net-asset-values (NAV) from Standard&Poor's Micropal (Micropal) for all open-end investment funds investing mainly in European equities that were included in selected Micropal databases[1] as of April 30th,1998. The net-asset-values are designed to include any capital gains as well as income returns; furthermore, reinvestment of any distributions is assumed. The NAVs are net of expenses, transaction costs and management fees, but do not take into account any front- or back-end load fees. Our data thus enables us to calculate monthly, continuously compounded total return time series for all funds. Since our database does not comprise funds that terminated operation at some time during our period of studies, our sample is subject to a survivor-ship bias. The survivorship-bias issue has been studied extensively in the literature[2], however, to our knowledge with the exception of BLAKE/TIMMERMANN(1998)[3] the issue was not addressed in any European empirical study.

Specialised funds, emphasising on a particular industry sector within Europe as well as small-cap funds were deleted from the database in order to retain comparability in terms of investment objective. The funds are divided into ten fund categories, depending on either

[1] We obtained data from the following Micropal databases: UK Unit Trusts, Austrian Mutual Funds, Belgian Trusts, Netherlands Mutual Funds, French SICAV's, French FCP's and German Investmentfonds. Funds from the International/Off-shore Database have been included conditional on them being distributed in either Germany or Switzerland. The latter two are forming the German Auslandsfonds and Swiss Auslandsfonds sub-samples in our database, respectively.

[2] The most recent and perhaps most representative findings on the survivorship-bias issue in connection with persistent performance are presented in CARHART(1997a,b), CARPENTER/LYNCH(1998) and WERMERS(1997). One of the first papers on this subject, sparking off the debates on the significance of survivorship induced biases is BROWN/GOETZMANN/IBBOTSON/ROSS(1992).

[3] BROWN/DRAPER/MCKENZIE(1997) perform a simple test for survivorship bias on their survivorship biased sample of British pension funds. They remove the 5% worst performing funds from their database and compare the results on this now "doubly" survivorship biased sub-sample with their original results. They do not find that this manipulation had any effect on their outcome with respect to performance persistence.

country of domicile and/or legal form[4]. Table 1 gives the fund categories along with the number of funds belonging to these categories at the beginning and the end of the sample period. We calculate equally weighted, monthly rebalanced fund category indices for each category, as well as for the whole sample. The latter index will be addressed as equally weighted mutual fund index (EWMF) throughout this paper. As can easily be seen, the unit trusts dominate the sample, outnumbering any other fund category by far. Although the British market for investment funds is considerably smaller than the French or the Luxembourg's, the overwhelming predominance of equity funds in the UK[5] leads to such an abundance of European equity funds compared to other countries.

All fund returns are converted into US-$ and all computations are performed in that reference currency if not quoted otherwise. The risk free rate is the one month return on the US 3-month treasury bill as reported by the Federal Reserve. For currencies other than the US-$, the respective one month euro-currency deposit rate is used.

Monthly index time series for various European regions, countries and styles were obtained from Independence International Associates Inc. (IIA), a Boston based investment advisory firm. Their index universe is formed on the fundament of the MSCI database and comprises world wide country, region and style indices. A thorough description of the IIA index methodology can be found in ARSHANAPALLI/COGGIN/DOUKAS/SHEA(1998). In this study we rely upon the following IIA indices: The IIA Europe as market proxy, the IIA Europe small and large cap and the IIA Europe value and growth indices for the respective style segments.

Internationally diversified mutual funds have, until recently, not been subject to intense investigations. MACDONALD(1973) investigates the performance of internationally diversified French mutual funds. FARBER(1975) examines 10 funds with european portfolios as well as 17 funds investing world wide. GUY(1978), CUMBY/GLEN(1990) and EUN/KOLODNY/–RESNIK(1991) direct their efforts towards international performance measurement. Performance persistence was not addressed in any of these studies. The sample of funds that most closely resembles ours, is that used by DRUMMEN(1992). He conducts his study of fund performance on a sample of 30 mutual funds from Switzerland, Germany, France and Britain between 1980 and 1985. However, his sample is much smaller than ours and covers a different period of time; in his study he does not look for persistence in performance.

[4] Acknowledging differences in legal structure, we have divided the French fund sample into an FCP (fonds commun de placement – investment funds) and SICAV (sociétés d'investissement a capital variable – investment companies) category.

[5] In 1996 about 91% of the total wealth invested in British unit trusts were absorbed by equity funds. At the same time only 14% of the French and 21% of the German mutual fund investments could be classified as belonging to the equity category.

BACARIC/BITSCHNAU(1996) investigate a large sample of funds from Britain, France, Germany and Switzerland which are investing in their respective country of domicile. This makes comparisons between funds domiciled in different countries more problematic. They find persistence in CAPM alphas, but not in raw returns.

BLAKE/TIMMERMANN(1998) have a very complete set of British mutual funds at their disposition. It is free of survivorship-bias and does also contain unit trusts defined as European equity funds under the AUTIF[6] sector classification. The results of BLAKE/–TIMMERMANN(1998) are of distinct importance to us, since their findings on the issue of survivorship-bias for the European equity unit trusts concern a large proportion of our sample.

III. Models of Performance Measurement

Considering the different countries of domicile, it is reasonable to assume that institutional, fiscal and cultural differences will have an impact on the performance of the mutual funds in our sample. Apart from traditional problems associated with any attempt of measuring portfolio performance, there are many factors conceivable, most of them hard to quantify and hence difficult to adjust for, influencing inter-country comparisons of fund performance measures. Another important factor in comparing the performances of funds based in different countries is the currency issue. This inter-country comparison problem is imposing additional uncertainty and worsens the difficulties associated with performance measurement and persistent performance.

In order to alleviate these problems, we firstly assess the performance of our mutual funds by applying models of performance measurement designed to account for some of these factors. We then look, whether we can discover evidence for systematic differences in performance between the fund categories.

We employ four models of performance measurement. First, the capital asset pricing model (CAPM) adapted for the international setting in which we operate. Here we draw on the model for international asset pricing by ADLER/DUMAS(1983)[7] implemented for performance measurement purposes by CUMBY/GLEN(1990). Instead of using a portfolio consisting of the currencies involved as proposed by the former, or a trade weighted currency index as suggested by the latter as well as by HARVEY(1995), we use the excess return in reference currency US-$ of the risk free rate in Ecu as a proxy for the ADLER/DUMAS(1983) currency factors. The Ecu has been a weighted average of the relevant European currencies, and though

[6] Association of Unit Trusts and Investment Funds

[7] ADLER/DUMAS(1983) show that in an international setting a portfolio comprising a world equity portfolio as well as a portfolio of nominally risk-free interest-rates in each currency, will be efficient if the assumption of non-stochastic inflation holds.

not totally identical to e.g. the HARVEY(1995) or CUMBY/GLEN(1990) currency index portfolio, it should suffice our need to take currency fluctuations into account. Our international CAPM model is equivalent to the DRUMMEN(1992) model[8].

A second argument for using the risk-free return on the Ecu in models of performance measurement can be based on the fact that mutual funds sometimes keep considerable cash holdings in their portfolios[9]. Since all funds in our sample are restricted to invest in European equities, it is reasonable to assume that they will hold cash chiefly in currencies that are included in the Ecu basket.

The second model of performance measurement is based on the ELTON/GRUBER/BLAKE(1996) (EGB) 4-factor portfolio that itself is an extension of the well-known FAMA/FRENCH(1996) 3-factor portfolio. It consists of a market portfolio proxy, a factor intended to capture the size effect, another proxy for the value/growth premium, an European bond index and the Ecu factor. This factor model is consistent with a model of market equilibrium in the international context with 5 risk factors and explicitly considers known anomalies as well as fixed income exposures.

The importance of the benchmark specification in performance measurement is well documented. LEHMANN/MODEST(1987) show that the benchmark choice as well as the choice of the performance measurement model have considerable impact on performance measure based rank orderings of mutual funds. ELTON/GRUBER/DAS/HLAVKA(1993) show that the results of IPPOLITO(1989) are unreliable and biased due to a miss-specification of the benchmark by neglecting the large proportion of small firms in the portfolio of mutual funds. In recent studies, FAMA/FRENCH(1998) and ARSHANAPALLI/COGGIN/DOUKAS(1998)[10] provide evidence for the existence of a value-growth effect on European capital markets. An European size effect was documented by HESTON/ROUWENHORST/WESSELS(1995,1997). A concise review of international evidence on market anomalies can be found in HAWAWINI/KEIM(1997).

The third model of performance measurement is an extension of the CARHART(1997a) 4-factor benchmark (CAR). We add a factor proxying for the JEGADEESH/TITMAN(1993) momentum effect to the FAMA/FRENCH(1996) 3-factor portfolio. We again include the Ecu portfolio as an additional factor to account for the international environment. The first three

[8] DRUMMEN(1992) uses the same Ecu factor in his extension of the CAPM for measuring the performance of European equity funds. He found his results not sensitive to the inclusion of this factor.

[9] British unit trusts that are classified as equity trusts are obliged to have at least 80% of their investments in equities. The corresponding rates for the German and French equity funds are 51% and 60% equity exposure respectively. As we can see, fund managers have a certain manoeuvring area at their discretion.

[10] ARSHANAPALLI/COGGIN/DOUKAS(1998) conclude that *"[...] our findings suggest that the Fama and French (1994,1996) multifactor asset pricing model and their results are not limited to the U.S. Stock market."*

models of performance measurement are estimated by OLS regression according to equations (1) to (3) as follows:

$$\left(r_{i,t}^{Ref} - r_{f,t}^{Ref}\right) = \alpha_i + \beta_{i,E} \cdot \left(r_{E,t}^{Ref} - r_{f,t}^{Ref}\right) + \beta_{i,ecu} \cdot \left(r_{f,t}^{ecu} + c_{ecu,t}^{Ref} - r_{f,t}^{Ref}\right) + \varepsilon_{i,t} \quad (1)$$

$$\left(r_{i,t}^{Ref} - r_{f,t}^{Ref}\right) = \alpha_i + \beta_{i,E} \cdot \left(r_{E,t}^{Ref} - r_{f,t}^{Ref}\right) + \beta_{i,SMB} \cdot r_{SMB,t} + \beta_{i,HML} \cdot r_{HML,t} + \\ + \beta_{i,Bond} \cdot \left(r_{Bond,t}^{Ref} - r_{f,t}^{Ref}\right) + \beta_{i,ecu} \cdot \left(r_{f,t}^{ecu} + c_{ecu,t}^{Ref} - r_{f,t}^{Ref}\right) + \varepsilon_{i,t} \quad (2)$$

$$\left(r_{i,t}^{Ref} - r_{f,t}^{Ref}\right) = \alpha_i + \beta_{i,E} \cdot \left(r_{E,t}^{Ref} - r_{f,t}^{Ref}\right) + \beta_{i,SMB} \cdot r_{SMB,t} + \beta_{i,HML} \cdot r_{HML,t} + \\ + \beta_{i,Moment} \cdot r_{MOM,t} + \beta_{i,ecu} \cdot \left(r_{f,t}^{ecu} + c_{ecu,t}^{Ref} - r_{f,t}^{Ref}\right) + \varepsilon_{i,t} \quad (3)$$

$r_{i,t}^{Ref}$ is the monthly return on fund *i* for month *t*, $r_{f,t}^{Ref}$ and $r_{f,t}^{ecu}$ denote the log monthly returns on the three-month US t-bill and a one month Ecu euro-currency deposit, respectively. $r_{E,t}^{Ref}$ is the return on the IIA Europe index that serves as the market portfolio throughout the study, and $c_{ecu,t}^{Ref}$ is the currency return[11] of the Ecu in terms of the reference currency US-$. $r_{SMB,t}$ is the return of the IIA Europe small cap index minus the IIA Europe large cap index and hence an European equivalent to the FAMA/FRENCH(1996) SMB factor.

Corresponding to the FAMA/FRENCH(1996) HML factor, $r_{HML,t}$ is the return on a portfolio of long the IIA Europe value index and short the IIA Europe growth index, and $r_{Bond,t}$ is the return on the Salomon Brothers World Government Bond Index Europe. $r_{MOM,t}$ marks the returns on a portfolio long Europe's winners and short Europe's losers as defined in ROUWENHORST(1998). We use Rouwenhorst's country and size neutral winner and loser decile portfolios based on a 6-month formation-period. His time series end in December 1995, however, and we hence cannot use the extended model (3) over the whole 10-year period. Equation (3) is a regional, European version of the CARHART(1997a) 4-factor model. The subscripts *Ref* and *ecu* indicate returns nominated in reference currency US-$ or Ecu, respectively. α, β and ε are the regression intercept, slope and residual. The intercept alpha is used as performance measure. If not quoted otherwise, the t-tests for significance of intercept and betas are based on heteroscedasticity and autocorrelation consistent variance-covariance matrices estimates[12].

Table 2 displays basic statistics on the factors for the May 1988 to December 1995 period over which all factors are available. As can be seen, the factors show very small cross correlation coefficients and comparably high dispersions in the return distributions. This

[11] The natural log of the ratio of the exchange rates of Ecu in US-$ - the US-$-value of one Ecu - at the beginning and the end of month t.

suggests that they will indeed be able to capture very different aspects in fund returns and explain a great deal of time series variation.

The fourth and last model for assessing performance relies on the SHARPE(1992) Asset Class Factor model. By using this model we try to answer the question of whether or not distinct differences in style exist among the ten fund categories. The SHARPE(1992) model basically is a multi-factor model similar to those already employed with the exception of the factor loadings being subject to certain constraints. These constraints enable us to interpret the factor-loadings as asset class exposures of the fund in question. The basic model is given in equation (4) and it is estimated by minimising the residual variance *Var(ν)*.

$$r_{i,t}^{Ref} = \sum_{j=1}^{F} b_{i,j} \cdot r_{j,t}^{Ref} + \nu_{i,t} \qquad (4)$$

$$\text{Restrictions}: \quad \sum_{j=1}^{F} b_j = 1$$

$$b_j \geq 0 \quad \forall j$$

The $b_{i,j}$'s are the model's estimated factor exposures. F is the number of asset classes, $r_{j,t}$ the return on asset class *j*. $\nu_{i,t}$ denotes the residuals that are now no longer necessarily uncorrelated with the factor returns. The restrictions require every asset factor exposure to be positive and the exposures to sum up to one. Since we know some funds to hold short positions, this requirement may not always be realistic. The results show, however, that we have no reason to suspect serious miss-specifications in our model.

Since one of the aims of conducting Sharpe's style analysis is to ascertain, whether or not fund managers display behavioural patterns depending on their countries of domicile, we use the (total) returns on European country indices as asset classes. Of the ten factors, the first seven are the returns on the MSCI Europe indices for Britain, Belgium, France, Germany, Italy, the Netherlands and Switzerland. In order not to neglect the returns on smaller European countries and at the same time to keep the total number of factors reasonably low, we form an equally weighted portfolio from the remaining, small capitalised European country indices[13], denoted ewSCEu, and add the returns on this portfolio as the eighth asset class. The last two asset classes are represented by the Salomon Brothers European government bond index and the cash Ecu factor mentioned above.

[12] We correct for heteroscedasticity and autocorrelation by computing the variance-covariance matrices proposed by NEWEY/WEST(1987).

[13] For calculating this index we take the MSCI country indices Austria, Denmark, Finland, Luxembourg, Norway, Portugal, Spain and Sweden.

Due to the restrictions imposed, model (4) cannot be estimated by using OLS regression techniques. Instead, quadratic programming has to be employed to solve this system of equations. Defining $\underline{b} = \begin{pmatrix} b_{1,i} \\ \vdots \\ b_{j,i} \\ \vdots \\ b_{F,i} \end{pmatrix}$ as the vector of coefficients, $\underline{q} = \begin{pmatrix} Cov(r_i, r_1) \\ \vdots \\ Cov(r_i, r_j) \\ \vdots \\ Cov(r_i, r_F) \end{pmatrix}$ as the vector of covariances between the returns of fund i and the F factor returns, $\underline{\underline{V}}$ as the (F×F) variance-covariance matrix of the factor returns, and $\underline{e}$ as the F-dimensional vector of ones, the minimisation problem can be written as

$$\begin{aligned} &\min_{\underline{b}} \; Var(v) \;\Leftrightarrow\; \min_{\underline{b}} \; \underline{b}' \underline{\underline{V}} \, \underline{b} - 2\underline{b}'\underline{q} \\ &\text{s.t.} \;\; \underline{b}\,\underline{e} = 1 \quad \underline{b} \geq \underline{0} \end{aligned} \tag{5}$$

Solving this system for $\underline{b}$ produces an estimate for the asset allocation of the fund for the time window used to compute $\underline{\underline{V}}$ and $\underline{q}$. In order to obtain an equivalent to the Jensen alpha performance measure, we compute the return on the fund's style portfolio r_{style} as the factor b_j weighted sum of the asset class factor returns r_j for each month t. This style return is then, month by month, subtracted from the fund return for all months in the period to yield a monthly measure of fund performance, alpha. We obtain an alpha estimate for a certain period of time by simply averaging the monthly alphas over this time period. The significance of these alpha estimates then is assessed by computing a t-test for zero mean[14].

The R^2 of model (4) is calculated as:

$$R^2 = 1 - \frac{Var(v)}{Var(r_i)} \tag{6}$$

We have thereby constructed a measure of performance, explicitly taking into account the style of the mutual funds examined. Indeed, we are constructing customised benchmarks for each fund, avoiding the problems associated with inconsistent benchmarks as far as possible[15]. This method of performance adjustment should particularly alleviate any effects introduced by home-bias among fund managers, since tilting a portfolio systematically towards one's home country (or in effect any country) will be accounted for by a correspondingly large influence of this country on the returns of the customised benchmark. If

[14] LUCAS/RIEPE(1996) distinguish further between selection return, timing return and total alpha return. Our performance estimate alpha corresponds to the total alpha return proposed in their paper.

these overweightings are only short-term and changing frequently, and hence could well be characterised as some sort of country selection ability, the SHARPE(1992) Asset Class Factor model should recognise them as such[16], by assigning an appropriate alpha value to the fund. Table 3 gives summary statistics for the asset classes used in the study.

IV. European Mutual Fund Performance

In this section we assess the performance of European mutual funds over the period Mai 1988 to April 1998. We will put particular emphasis on comparing the returns on mutual funds of different categories, trying to spot patterns of deviating behaviour among fund categories. In order to be able to do so, we have to aggregate the funds within the single fund categories. This is done by forming the above mentioned equally weighted fund category portfolios. Additionally, we form an equally weighted fund index, named EWMF, using all mutual funds in the sample, regardless of their country of domicile or legal form.

A: Raw Returns on Fund Category Indices and Sharpe Ratio Performance Measures

Table 4 gives descriptive statistics for the 10 mutual fund category portfolios as well as a comparison with the MSCI Europe 15 index and the EWMF. Since there is no Swiss Auslandsfonds in our database whose return history starts earlier than November 1989, we have no data for the Swiss Auslandsfonds index back from this month. In order to make our statistics fully comparable, we calculate all measures given in Table 4 over the period November 1989 to April 1998. Sharpe ratios as simple means of adjusting for risk are obtained using a monthly risk-free return of 0.42% - which is the average monthly return on 3-month t-bills between 1989 and 1998 - throughout this period. We find the MSCI Europe among the top performers. This is exactly what we expected, since the MSCI index returns are not subject to any transaction costs that would incur for mutual funds even if they only wished to track the index. Surprisingly, however, is that we find two categories of mutual funds – British unit trusts and Swiss Auslandsfonds – quite close to the MSCI Europe in terms of risk adjusted performance. Indeed, if we look at the results for the full period Mai 1988 to April 1998, which is reported in Panel A of Table 5, we find the UK unit trusts on average even

[15] The selection of the asset classes has, of course, an important effect on the possible combinations of customised benchmarks. In our case, it would have been arguable to use European style or maybe industry sector indices instead of the country indices.

[16] If we compute our factor exposure estimates over the whole 10-year period, we find some average, hopefully representative asset class exposure of the fund. If the fund manager deviates from this exposure at some time during the 10-year period, we are likely to observe that the style portfolio return and the mutual fund return are not matching each other very accurately anymore. The difference between style and fund return can then be attributed to the selection or timing abilities of the fund manager.

slightly outperforming the MSCI Europe index[17]. All other fund categories do worse than the MSCI Europe, irrespective of which period is looked at.

We are now comparing the returns and Sharpe ratios between the fund categories and realise that the German Investmentfonds category lags very much behind, displaying high volatility and low average return. Apart from that, we cannot make out much, since rankings do change considerably if we compare the Sharpe ratio based rankings for two different time periods as in Panel B of Table 4. Dividing the November 1989 to April 1998 time-period into two sub-periods of equal length, we compute the Spearman rank correlation as a test of whether the fund category is related to performance. We find a very low Spearman correlation coefficient of 0.176 which is not significantly different from zero at any reasonable level of confidence. Our results hence do not suggest that there is any systematic difference in the return on mutual funds of different country of domicile.

B: Risk adjusted Fund Category Index Performance based on the CAPM(1), EGB(2) and CAR (3) Models

In a next step we estimate models (1) to (3) for the mutual fund category indices. We are interested to learn, whether or not adjusting for multiple sources of risk can improve our performance estimates. Panel B of Table 5 provides an overview of these results. Firstly, we realise that using the EGB (2) model for risk adjusting does not change the results very much compared to the ordinary CAPM (1) outcomes. The adjusted R^2 is on average only slightly higher and the alpha's remain fairly unchanged. Panel B in Table 7 shows the beta coefficients along with their corresponding t-values. We realise that the HML portfolio loadings are far from being significant in any case and that the same is true for the bond index factor. More than 50% of our fund category indices load significantly on the SMB factor and the Cash portfolio, but the overall accuracy is not significantly affected.

Things change if we use the CAR (3) model for performance measurement. All fund categories – with the exception of the Austrian mutuals – show high and significant MOM betas; the accuracy of the estimates is much higher now. No positive alphas remain, even the British and the Netherlands fund categories display negative, though insignificant alpha measures. On the other hand, the Austrian, German, both French and the Swiss fund categories now display significantly negative risk adjusted performance. The adjusted R^2 again rises only marginally. Although we have the momentum portfolio MOM available only

[17] As we will see later, this may be explained by the fact that the MSCI Europe index is perhaps not an appropriate benchmark for the British unit trust category after all.

up to December 1995, and hence estimate the CAR (3) model over a shorter period, in results not reported we find our inferences robust to different periods.

C: Asset Class Factor Model Estimates for the Fund Category Indices

Panel C in Table 5 gives the Asset Class Factor Model (4) estimates for the fund category indices. As can easily bee seen, all alphas but that of the Netherlands index are negative, four of them significant beyond the 5% level. For two others, the null of zero alpha can be rejected at the 10% confidence level. Compared to the results obtained from the CAR model (3) we find much higher coefficients of determination. These high coefficients suggest that the Sharpe Asset Class Factor model describes the fund category index returns fairly well. Only the Netherlands fund index displays a R^2 considerably below 0.9, which points to quite variable asset class exposures over the time period we look at. Indeed, we already acknowledged the Netherlands fund index having the smallest correlations by far with any other fund category index (cf. Panel A of Table 4).

In a next step we are interested to find out, whether or not the performance measurement model has an impact on the performance rankings of the fund categories. In order to assess the model influence on ranking, we compute the ranks from 1 (highest performance) to 10 (lowest performance) for each fund category index based on six different measures of fund performance. Apart from the alphas obtained by applying model (1) to (4), we also use the Sharpe ratio as well as raw returns for ranking the fund category indices. The rankings as well as the Spearman correlation matrix containing the rank correlations between the rankings of all performance measures display a very strong positive relationship. Any Spearman correlation coefficient is significant beyond the 1% level of confidence. Although there is some slight variation in rankings attributable to the models, we cannot conclude that the performance measurement model does have a decisive impact on the outcomes of rank ordering. The relative fund category index performance is consistently captured, irrespective of whichever model we use.

If we suspect dependencies between fund category and ranking – perhaps as an effect of systematic differences attributable to institutional, cultural and other country of domicile specific influences – one possible way to test for these is to look at the performance rankings over different time intervals. Since we have no reason to assume that fund managers in one country/category are as a group better in terms of management skill than fund managers in other countries or categories, this is hardly a test for persistent performance due to

management capabilities[18]. We hence divide the full period over which data is available for each model into two sub-periods[19] and order the fund category indices over both periods using the six performance measures as ranking criteria. We then compare the rankings obtained from the first period with those from the second period by calculating Spearmans rank correlation coefficient. The results are given in Table 6.

The rankings based on raw returns are certainly not related over the periods. Nor are the ranks based on Sharpe ratios or CAPM (1) alphas. The results from rankings based on the alpha estimates of the more sophisticated models (2) to (4) display some slight dependencies that are significant only at the 10% confidence interval.

These weak indicators for inter-period relationships could have three sources:

Firstly, they could indicate persistent performance due to managerial skills. However, as said before, the high level of aggregation makes this explanation extremely implausible.

Secondly, the persistence in ranking may indeed be the result of systematic differences between the countries of domicile, invisible since covered by noisy estimates of performance in raw return, Sharpe ratio and CAPM (1) rankings.

Thirdly, spurious persistence may also result from model miss-specification. Using the same, perhaps systematically inconsistent model for assessing performance over both periods, could produce results subject to so-called model-biases.

Taking this into consideration, we cannot infer with reasonable certainty that systematic dependencies between fund category and performance measures do exist. It is obviously not possible to spot any country of domicile specific influences this way.

Alternatively we can look at the asset class exposures for different fund category indices as generated by the Asset Class Factor model (4). In Table 8 the estimated asset class factor exposures for fund category indices are reported. Compared to the country weighting of the MSCI Europe, the funds seem to overweight the French, Netherlands and remaining small capitalised countries markets and simultaneously putting a very under-proportionate emphasis on British stocks[20]. The latter effect is mostly driven by the British unit trusts which seem not to invest at all in stocks of their home country. Apart from the Swiss Auslandsfonds category, none of the remaining fund category indices behave as if they had a more than 15% exposure on the British stock market. We find the Austrian funds as well as French funds of either legal

[18] This is certainly true as long as we remain on this high level of aggregation by using fund category indices.

[19] We do not use the months from Mai 1988 to October 1989 in the tests using raw returns and Sharpe ratios, since data for the Belgian fund index and the Swiss Auslandsfonds index are not fully available for these months. We expect these crude measures of performance to be most sensitive to such discrepancies.

[20] The inferences do not change if we consider only the equity share of the fund index exposures and the relative importance of the countries therein.

structure to be tilted towards cash holdings. The non-equity exposure of all fund indices moves between 10% and 24% with the exception of the British unit trusts holding only 4% of their assets in fixed income instruments[21]. At any rate, the asset class exposures produced by model (4) are very different between fund categories. In order to assess, whether the Asset Class Factor model estimates reasonably match the average asset allocation of the funds in a category, we compare the results of the model with a "snap-shot" of the real average asset allocation of two fund categories.

We take asset allocation data from the "BOPP ISP German Fund Guide 1998" to compute the average portfolio breakdown of the German Investmentfonds as of December 31st, 1997. We then compare this "snap-shot" real asset allocation with the estimates obtained from the Asset Class Factor model (4). We do the same for the Swiss Auslandsfonds category, relying on the "BOPP ISP Swiss Fund Guide 1996" for obtaining the "snap-shot" asset allocation for this category as of December 31st, 1995 and using the Asset Class Factor model (4) exposure estimates for comparison. The Asset Class Factor model (4) exposures are estimated over the 5-year period Mai 1993 to April 1998, explicitly accounting for the "timing"[22] of our "snap-shots". We find the model estimates reasonably close to the "snap-shot" portfolio compositions, producing an average deviation[23] of 1.9% for the German Investmentfonds exposures and 2.5% for the Swiss Auslandsfonds. All other estimated fund category index asset class exposures are deviating stronger (although sometimes only marginally)[24] from the "snap-shots".

After having collected some evidence in favour of the accuracy and reliability of our Asset Class Factor model (4) loading estimates, another test of plausibility is straightforward. We try to find out, whether the Asset Class Factor model (4) reasonably suggests a zero exposure in the British stock market for the UK unit trusts. The AUTIF regulation does not require unit trusts categorised as European equity trusts to be invested only in continental equity markets[25]. However, examining the fund prospectuses for about a dozen of funds in our unit

[21] This result is not surprising since we know that UK equity unit trusts are by regulation obliged to keep up a much higher equity exposure than equity funds governed e.g. according to German or French regulations.

[22] Both of them are situated in the 2nd half of the ten-year period.

[23] We compute this average deviation by subtracting the model (4) estimated asset factor exposure from the corresponding "snap-shot"-value, and then taking the mean of the absolute values of these deviations over all asset classes.

[24] In the case of the German Investmentfonds, we find the French SICAV's estimated exposure to be the second closest with an average deviation of 3.5% and the Netherlands Funds category the most remote with average deviation of 9.9%. As far as the Swiss Auslandsfonds are concerned, we find the Belgian Trusts estimated exposure matching the "snap-shot" with 2.53% only marginally less well than the Swiss Auslandsfonds index himself (2.52%). The maximum distance is 11.0%, again produced by the Netherlands Funds index.

[25] According to the AUTIF performance categories definition, unit trusts belonging to the European category are *"Trusts which invest at least 80% of their assets in European securities (including the UK but not exceeding 80% UK)"*

trust sample, we find not one fund displaying exposure to British equities. As it seems, for British unit trusts the classification "European equity" implies most frequently exposure to continental equity only; the results of the asset class factor model hence do not misguide us in the case of British unit trusts either.

D: Home Bias

So far we have established that we cannot make out systematic differences in fund performance that may be induced by factors attributable to the country of domicile or the legal form of funds. We also found the Asset Class Factor model (4) to provide reasonable estimates for a fund category's asset class exposure. Looking closer at the estimated asset class exposures leads us to suspect that there could indeed be some home-bias among fund managers of certain categories. The category German Investmentfonds for example, displays with 27.5% by far the strongest exposure to the German equity index if compared to the 14.3% of the equally weighted index containing all funds in the sample (EWMF). In order to perform a simple test on home-bias, we compute the asset class exposures with rolling, overlapping windows of 36 month each for all fund category indices as well as for the EWMF. These windows are overlapping for 35 month, since we re-compute the asset class exposure estimates every month. By doing so, we can get an idea of how the asset class exposure of the fund indices has changed over the Mai 1988 to April 1998 period. The results for each fund category index are depicted in Figures 1a to 1k. The most dramatic shifts in asset allocation, happen within the Netherlands fund category. It is therefore not surprising to find the Asset Class Factor model's R^2 - given in Table 8 - being the smallest among all fund indices. We now can explain the small R^2 as well as a relatively low coefficient of correlation between the fund category index Netherlands and all the others as shown in Panel A of Table 4.

We have obtained 84[26] monthly estimates of asset class exposure for each fund category index as well as for the EWMF index of all funds. If there were no systematic tilt in asset allocation whatsoever, we would expect the exposure of any fund category index with respect to a particular asset class to be roughly equally often smaller and larger than the corresponding exposure of the EWMF index[27]. If we find one fund category index' exposure with respect to any asset class systematically (significantly more often than expected) larger or smaller than that of the EWMF, then we have reason to suspect some asset class preferences among this

[26] Due to lack of data for the pre- November 1988 and November 1989 month, respectively, we do have only 79 and 67 observations for the Belgian Trust category index and the Swiss Auslandsfonds category index.
[27] We cannot use the MSCI asset allocation, since it is too different from the observed all fund average.

group of fund managers. To keep any timing[28] effects from influencing our results, we divide the full sample of observed asset allocation estimates into two halves with equal numbers of observations. We then require the proportion of observations with higher fund category index exposure to a particular asset class than that of the EWMF to the same asset class to be significantly different from 50% in both sub-periods. This can be looked at as testing the null hypothesis

$H_0: \ p = p_0 = 0.5$

against the alternative hypothesis

$H_A: \ p > p_0 = 0.5$

for both sub-periods.

Here p is the proportion of observations in which we find the exposure of the fund category index to the asset class in question being larger than the corresponding exposure of the EWMF index[29]. $p_0 = 0.5$ is the proportion we would expect, if there is no systematic deviation from the EWMF weightings.

We use this method to test the exposures of all fund category indices to the asset classes French equities, German equities as well as Netherlands and Swiss equities. The EWMF index' exposure to British stocks is strongly influenced by the unit trusts not showing any loading on their home stock market; it would therefore not make much sense to include this asset class in our investigations. We thus renounce testing for above average British equity exposure.

The results of this simple test suggest that German Investmentfonds managers indeed have an inclination towards overweighting the German stock market. We have to reject the null of $p = 0.5$ beyond the 1% level of significance[30]. No other fund category shows a similar strong pattern. The same holds, if we are looking for fund categories tilted towards French stocks. For the SICAV category, the null is again rejected in both periods; for the FCP category, however, it is not. Nor is it for any other fund category index.

Lastly, a statistically significant overweight of the Swiss equity market in the UK unit trust index portfolio can be established.

Home-bias can be found amongst the German Investmentfond and the French SICAV fund categories. We do not find evidence for home-bias in any other fund category, nor do we find

[28] E.g. over/underweighting one asset class temporarily.
[29] We use an one-sample z-test for the proportion being equal 0.5.
[30] The corresponding values for p are 1 and 0.93, respectively.

other significant overweightings of asset classes apart from UK unit trusts managers apparently being drawn towards the Swiss stock market.

V. Performance Persistence

After having investigated the properties of the fund returns in our sample very extensively, we now turn to assessing the degree to which we find persistence in fund performance. As CARHART(1997b) defines it, persistence is *"[...] a positive relation between performance rankings in an initial ranking period and the subsequent period"*. There are many ways conceivable to test for such relations or dependencies, each of which has distinct advantages be it in terms of comparability with studies already done, be it in terms of avoiding the introduction of systematic errors and biases. The following section will roughly be divided into two sub-sections. Firstly, we look for patterns of persistent performance by applying so called cross-sectional tests of performance persistence. Secondly, we will form portfolios of mutual funds according to prior performance and subsequently analyse the properties of these portfolios. The latter approach is often referred to as time-series test of persistence. In the course of these investigations, the four models of adjusting for risk as introduced in the previous section will be applied.

A: Cross - Section Tests of Persistent Performance

Cross-section tests of performance persistence require the measurement of fund performance in at least two consecutive time periods. The first period of will be called formation-period (FP), the second test-period (TP). Figure 2 shows, how formation-periods and test periods are defined over time. To obtain independent observations, we do not allow any overlapping of the formation-periods of two observations. However, the test-period in one observation becomes the formation-period for the following. Although many combinations of FP and TP lengths are conceivable, we restrict our investigations by requiring test- and formation-period to have the same length.

In the last section we have introduced several performance measures and ways of adjusting for risk. Applying these different measures of performance to investigations on the persistence of performance could probably shed some light on the mechanics of persistent mutual fund performance. CARHART(1997a) as well as WERMERS(1997) document evidence, that momentum strategies influence or even induce persistent performance. In the last section we have shown that an extension of the CARHART(1997a) 4-factor portfolio helps to explain fund performance in Europe with dramatic effects on risk-adjusted performance measures.

Another property of mutual funds that could be at least partly responsible for persistent performance estimates could be fund style. We will try to account for this possibility by style adjusting fund performances.

We conduct our cross-sectional persistence studies using raw returns, as well as CAPM, EGB and CAR alphas for ranking. Since studies for the US fund market found short and medium term persistence as well as long term persistence[31], we investigate formation- and test-period lengths from 3 months to 60 months each.

For each period, the mutual funds are divided into two categories: Funds with performance measures above the median are assigned to the winner (W) group, those with below median performance constitute the loser (L) category. Since we look at two periods, the formation- as well as the test-period, some funds will belong to the winners in both (WW) some will be losers in both (LL). The rest are winner in one, loser in the other period and hence categorised as WL or LW, respectively. For each observation of formation- and consecutive test-period performance we obtain the number of funds belonging to either category. Cumulating over all observations leads to the results shown in Panels A to D in Table 9. To check for persistent performance, we use a χ^2 non-parametric test of independence[32]. We define a null hypothesis of no relation between formation-period performance and test-period performance. χ^2 p-values lower than 0.05 allow us to reject the null on the 5% level of confidence.

Panel A of Table 9 gives the results for persistence in *raw returns*. We look at six different period lengths, three months, six months, one year, two years, 2.5 years and 5 years. According to the outcomes of the χ^2 test, we find strong evidence for persistence in the three, six and twelve months formation/test period length results[33].

The corresponding results using risk-adjusted performance measures draw a similar picture. In order to avoid model-bias effects, we use the average difference between the fund's return and the return of the adequate fund category index as a measure of sorting funds into winners and losers in the formation-period. The test-period performance then is measured using either the CAPM (1), the EGB (2) or the CAR (3) alpha. Since we cannot reasonably estimate any of these models using less than 36 data points, we apply a method similar to that of employed by ELTON/GRUBER/BLAKE(1996). If month *t* is the first month in our test-period, we find

[31] Sub-period lengths from twelve months to four years are studied by CARHART(1997a), HENDRICKS/PATEL/-ZECKHAUSER(1993), GOETZMANN/IBBOTSON(1994), BROWN/GOETZMANN(1995) and WERMERS(1997). Long term persistence over five to ten years is investigated by GRINBLATT/TITMAN(1992), ELTON/GRUBER/DAS/-HLAVKA(1993), ELTON/GRUBER/BLAKE(1996), KAHN/RUDD(1995), FEARSON/SCHADT(1996) and others. MALKIEL(1995) looks at period lengths from six months to ten years.

[32] If the sum of all categories, WW+WL+LW+LL happens to be smaller than 200, we compute a Yates corrected χ^2 statistic.

[33] The null of no persistence can be rejected far beyond the 1% level of significance.

estimates for the fund's CAPM (1), EGB (2) or CAR (3) model factor exposures over the 36 month period (*t-36* to *t-1*) preceding month *t*. We then add the residual[34] ε_t for month *t* to the estimated value of alpha to obtain an estimate for the fund's month *t* alpha. We repeat this procedure for every month in the test period and obtain *n* monthly alpha estimates for a test-period of length *n*. Averaging these *n* monthly alpha estimates yields the measure of fund performance we use to assign the fund to the winner or loser category over the test-period. This procedure is always the same and not dependent on the model be it CAPM (1), EGB (2) or CAR (3).

Additionally, we also use a FAMA/MACBETH(1973) type cross-sectional regressions as an additional test for performance persistence. For each cross-sectional observation we regress the test-period performance measure for all funds on the corresponding formation-period performance measure according to equation (7):

$$Perf_{TP(m),i} = a_m + b_m Perf_{FP(m),i} + \kappa_{m,i} \qquad (7)$$

$Perf_{TP(m),i}$ is the test-period performance[35] of fund *i* for observation *m*. $Perf_{FP(m),i}$ is the fund's formation-period performance[36] for the same observation *m*. a_m and b_m are the Fama/MacBeth coefficients and $\kappa_{m,i}$ is an error term. We then compute the average slope coefficient over all observations which is denoted *F/McB* in Panels B, C and D of Table 9. Obviously, if b_m is statistically significant, we have to reject the notion of independence of formation-period and test-period performance. The t-statistic to test for b_m=0 is computed according to FAMA/MACBETH(1973).

Looking at the outcomes of these risk-adjusted cross section tests for persistent performance given in Table 9, we are able to discern some differences compared to the raw return based results. Most important, however, is that we still find evidence for persistent performance. Even if we require both – the χ^2 test of independence as well as the *F/McB* slope coefficient – to display statistically significant evidence for persistence, we find that at least the 6-months period risk adjusted performance measures persist. This inference is not sensitive to the model of adjusting for risk. The results from the cross-sectional regression suffer from a low number of observations if we look at 12-months period length and beyond, hence we cannot rely heavily on them. Adjusting for risk using the CAPM (1) and EGB (2) model and looking at

[34] The residual ε_t for month *t* is computed as the fund return for month *t* minus the beta weighted sum of the month *t* factor portfolio returns minus alpha.

[35] This is either an alpha from the CAPM, EGB or CAR models, or the fund's raw return.

[36] Performance in the formation-period is always measured as abnormal return, defined as fund return minus the return on the corresponding fund index.

the χ^2 test statistic only, we find persistence for the 24-months period length as well. Since the CAR (3) risk adjustments extinct any trace of persistence if we use period lengths of more than 6-months, these results are somewhat doubtful, though. The reverse pattern can be observed looking at the 3-months period length. Here, CAR (3) performance (as well as raw returns) persists and the CAPM (1) and EGB (2) performance measures do not.

Summarising our results, we have established persistent performance in our sample of mutual funds by using cross-sectional methods. We find the strongest evidence for 6-months[37] based rankings and prove that this persistence effect is totally indifferent to the model for risk-adjustment.

On the other hand, the results do depend partly on the method we use to look for persistence. Non-parametric tests do not always yield results totally consistent with those obtained from cross-sectional regression approaches. In the next section we will gain some insights on the robustness of the inferences towards employing a different, time-series methodology.

B: Time - Series Tests of Persistent Performance

In this section we us a time-series approach to test for performance persistence in our sample. Following the method of HENDRICKS/PATEL/ZECKHAUSER(1993), ELTON/GRUBER/-BLAKE(1996), CARHART(1997a) and others, we form octile portfolios based on past mutual fund performance. Each year, we assign each fund in our sample to one of eight octile portfolios, depending on their performance over a specified formation-period. We use formation-period lengths from three to sixty months. The funds in each octile portfolio are used to form equally weighted portfolios that are held for exactly one year and subsequently replaced by again sorting the funds into octiles based on the (new) formation-period performance and forming the corresponding octile portfolios. If the formation-period is longer than twelve month, consecutive formation-periods will overlap.

Again, raw returns, CAPM (1) , EGB (2) and CAR (3) alphas are used as performance measures. To find alpha estimates for all formation-period lengths, we estimate the regression equations (1) to (3) over the full time period, for which the fund has returns available. Having obtained an overall alpha estimate, adding the average monthly residual for the formation-period yields the fund's alpha over the formation-period[38].

For brevity, we only report full results for the 6-month past performance sorted octile portfolios. Each row in Table 10 displays descriptive statistics and performance

[37] The formation-period here has a length of 6 months.

[38] This corresponds to the ELTON/GRUBER/BLAKE(1996) method of computing alphas.

measurements for one octile portfolio, starting with the winner octile 8 and ending with the loser octile portfolio 1. In the very last row, the properties of the Spread 8 – 1 portfolio is given. Spread 8 – 1 is the return on a portfolio long the winner octile portfolio 8 and short the loser octile portfolio 1.

We find the excess returns and alphas monotonically decreasing from octile 8 having the highest returns and alphas, to octile 1 proving less favourable in terms of performance. We cannot spot a similarly clear relation between octile and volatility of returns. As it seems, the middle octile portfolios tend to show higher volatility than either the winner and the loser octile[39]. However, in direct comparison, the loser octile is less risky in terms of standard deviation than the winner octile, although the difference in most cases is small[40]. This holds independent of whether persistence is present or not throughout all formation-period lengths (not reported).

Interestingly enough, the pattern of monotonically decreasing performance does not disappear if we adjust for risk in the octile portfolios. It remains pronounced regardless on whether we use the CAPM (1), EGB (2), CAR (3) or Asset Class Factor (4) risk adjustment. Panel A of Table 10 shows that there are even positive CAPM (1) and EGB (2) alphas for the top octiles. The alpha spread between top and bottom octile remains highly significant if we measure performance using the CAPM (1) and EGB (2) or Asset Class Factor (4) model. However, with the latter, the negative alpha estimates for the three bottom octiles turn significant (Table 10 – Panel C). Looking at the factor exposures, the picture remains the same as it was with the fund category indices. There are no significant beta estimates for the HML and Bond factor. SMB betas are strongly significant as are Cash and MOM exposures. As observed with the fund category portfolios, if we use the CAR (3) model, there are no positive alphas remaining and the negative bottom octile portfolio alphas become significantly smaller than zero. Additionally, the 8 – 1 alpha spread, although with 0.24% per month still large, is no longer significant. It seems, though, as if the momentum effect could indeed explain some of the persistence as has been observed by CARHART(1997a) in his US sample. However, the CAR (3) alphas still decrease quit monotonically from the top to the bottom octile. And, we find that the CAR (3) risk adjustment's effect in making 8 – 1 alpha spreads insignificant is confined to octile portfolios formed on past raw returns. Table 11 gives the octile portfolio 8 – 1 spread for 6-months sorted octile portfolios. Each column in Table 11 shows the performance spread of octile portfolio 8 minus octile portfolio 1 for different ranking criteria.

[39] CARHART(1997a) reports U-shaped patterns of volatilities, the best and worst performing funds both having higher volatilities than the mid-deciles.

[40] We find the volatility of octile 1 to be 0.1% to 0.4% per month less than the volatility of octile 8.

In the first column the raw return ranking results are repeated. The second column shows the results for octile portfolios formed according to CAPM (1) alpha performance, the third and fourth column give the corresponding EGB (2) and CAR (3) alpha ranking results, respectively.

Adjusting for octile portfolio risk by using the CAR (3) model does indeed reduce the alpha spread somewhat, however, it still remains strongly significant. The Asset Class Factor (4) risk adjustment fails to reduce the alpha spread[41]. As can be seen from Panel C of Table 10, the coefficients of determination as a measure of how good the Asset Class Factor (4) model is matching the octile portfolio returns, are much lower than those we experienced with the fund category indices. The asset class exposure of the octile portfolios is thus likely to be rather variable over time, resulting in uncertain inferences to be drawn from Asset Class Factor (4) model results. What perhaps can be said is that it is not exposure to a certain European country causing persistent performance. We do not find any obvious pattern in the asset class factor exposures of the octile portfolios.

Controversial evidence is produced by risk-adjusted octile portfolio return spreads in Table 12. The octile portfolios are now formed based on 48-months historical performance. We again find raw returns persisting, independent on the performance measure used for sorting the funds. If we look at the CAPM (1) and EGB (2) adjusted 8 – 1 performance spread, we find only blurred indications for persistent performance. The spreads are still large, but have much lower t-statistics. But if we adjust for risk using the CAR (3) model, the return spread is zero for octile portfolios sorted on raw returns and CAPM (1) alphas and about 0.10% for the EGB (2) and CAR (3) based portfolios[42]. None of the spreads are significant anymore.

In results not reported we find for portfolios formed based on 12-months past performance a behaviour similar to that encountered with the 6-months formation period. Although the alpha spreads are not significant from the beginning, if the CAPM (1), EGB (2) and CAR (3) performance measures are used for forming the octile portfolios, it is irrelevant in which way we are measuring octile portfolio performance. The octile 8 – 1 spread remains essentially unchanged. However, if the portfolios have been formed using raw returns, adjusting for octile portfolio risk using the CAR (3) model substantially reduces the 8 – 1 performance

[41] It does not make much sense to test for the significance of the alpha spread 8 – 1 portfolio using the Asset Class Factor (4) model. Since we have constrained model (4) to positive asset class exposures, and since the spread portfolio will by definition include negative factor exposures – it is *long* octile portfolio 8 and *short* octile portfolio 1 – we use a simple test for equality of means to judge the significance of the alpha spread.

[42] Since the EGB (2) and CAR (3) models are only different in one factor, one could speculate, whether the remaining 0.1% spread could possibly be attributed to effects of model-bias.

spread. Nevertheless, we do not find significant persistence in the performance of 12-months sorted octile portfolios[43].

VI. Summary and Conclusions

We finally conclude that persistent performance can be found amongst European mutual funds domiciled in different European countries and holding diversified European equity portfolios. Adjusting for several risk factors including the JEGADEESH/TITMAN(1993) momentum effect as well as style related factors do not explain much of the spread between the returns on a fund portfolio composed of the last 6-months winners and a fund portfolio formed from the last 6-months losers. As we have seen with our cross-sectional approaches, relying on only one measure of performance persistence can easily lead to invalid inferences. However, both means of assessing persistent performance in the cross-section, the non-parametric $\chi 2$ test of independence as well as the Fama/MacBeth cross-section regression, strongly support the hypothesis that 6-months based persistence does indeed exist.

The momentum effect is not able to explain this persistence. Nevertheless, there may be some components of performance persistence associated or at least correlated with the momentum effect. This can be concluded from the 48-months octile portfolio spread, that is disappearing if we use the CAR (3) model for performance measurement (cf. Table 12). It therefore seems to be necessary to correct for these influences by including a momentum factor portfolio into the model of performance measurement as has been demonstrated by CARHART(1997a) for the US and now in this study for the European fund market.

Nevertheless, it was not possible to fully explain patterns of persistence in the performance of our sample. Selecting funds on the basis of their 6-months return leads to statistically significant excess returns not explained by the exposure to any risk factor we know so far. We have not taken transaction costs into account and up to now have neglected load-fees as well as survivorship-bias related issues. It remains to be seen, whether the persistence we have documented is economically significant as well. Persistence is obviously strongly dependent on the formation-period length and most dominant and robust if based on 6-months formation-periods. We infer that from our cross-section as well as time-series results.

We find the persistence effect fairly robust to the methodology employed; cross-section as well as time-series tests for persistent performance produce very similar results.

[43] Consequently, the performance measures never fall monotonously along the octiles if the octile portfolios are formed based on 12-months formation-periods.

We have also seen that using a European version of the ELTON/GRUBER/BLAKE(1996) multi-factor portfolio does not produce results superior to those obtained by simple CAPM risk-adjusting.

Our results from style adjusted performance measures suggest that style related issues are not responsible for persistence. Moreover, the Asset Class Factor model (4) proves not to match the asset class exposure of the octile portfolios very closely, leaving about 25% of the variance unexplained[44]. The more conventional, OLS based performance measures explain on average about 15% more of octile portfolio variation. Portfolios formed on past performance obviously display rather inconsistent asset class exposures.

On the other hand, the Asset Class Factor model (4) does a good job in explaining fund category returns, displaying consistently higher coefficients of determination as the OLS methods and producing very accurate estimates for the asset class exposures.

Based of asset class exposure estimates, we establish that there is indeed some home-bias among German Investmentfonds and French SICAVs large enough to be detected with our somewhat crude measure.

We could not find any evidence for systematic differences in fund category index returns and therefore must conclude, that the county of domicile, has no obvious direct influence on relative performance.

[44] See the values for R^2 in Table 10 – Panel C.

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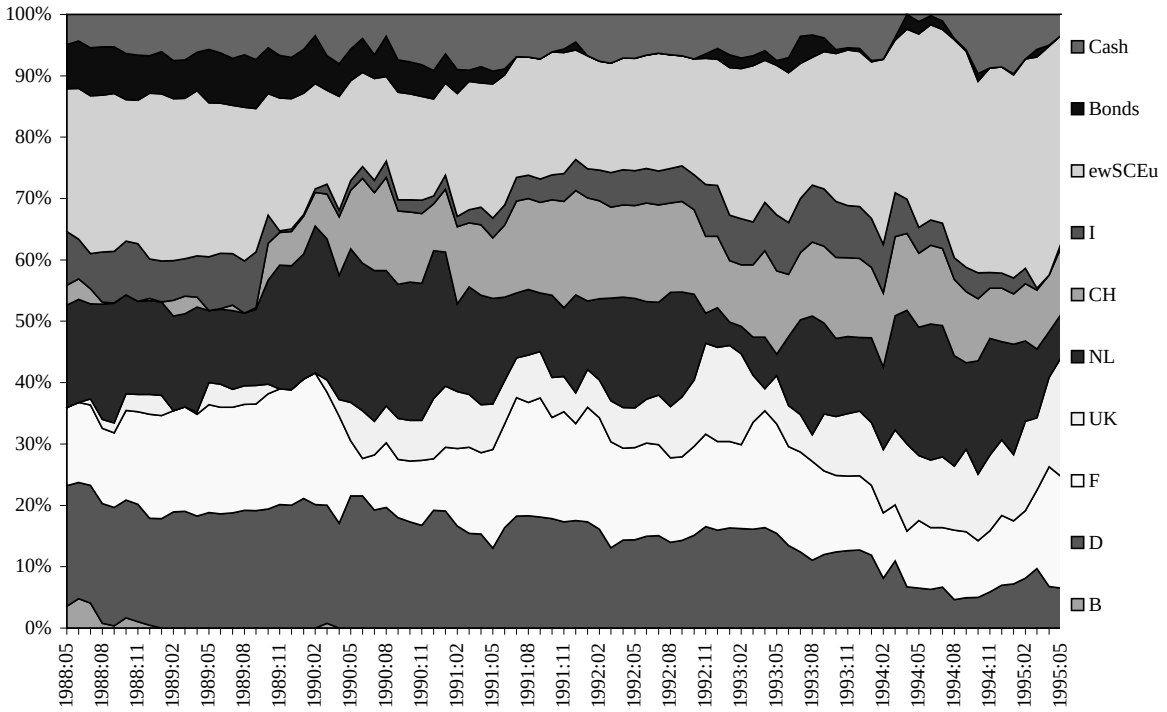


Figure 1a: Asset class factor exposure for the EWMF Index of all mutual funds in the sample. Estimated using model (4) over 36 month rolling windows. The country asset classes are proxied by the respective MSCI country indices. B, D F, UK, NL, CH and I are the MSCI indices for Belgium, Germany, France, UK, Netherlands, Switzerland and Italy, respectively. ewSCEU is an equally weighted index of small capitalised European country indices. Bonds is the Salomon Brothers Govt. Bond Index Europe, Cash the US-$ return on an one-month Ecu euro-currency deposit.

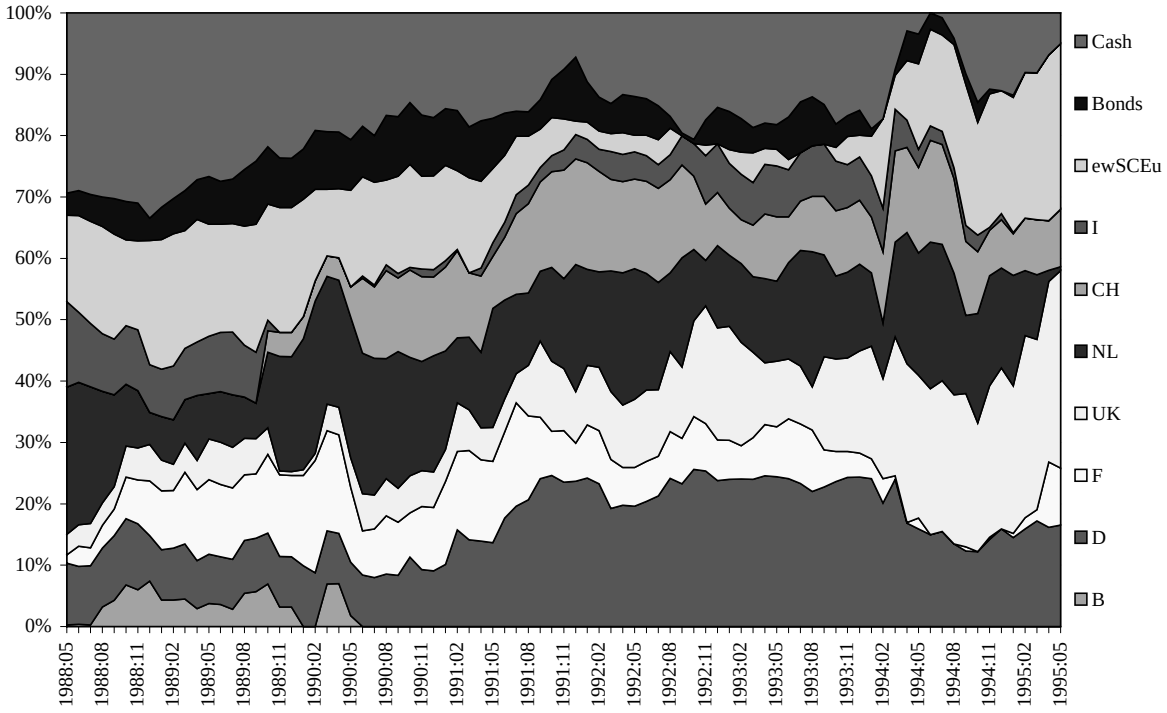


Figure 1b: Asset class factor exposure for the equally weighted Austrian mutual fund index. Explanations: See Figure 1a.

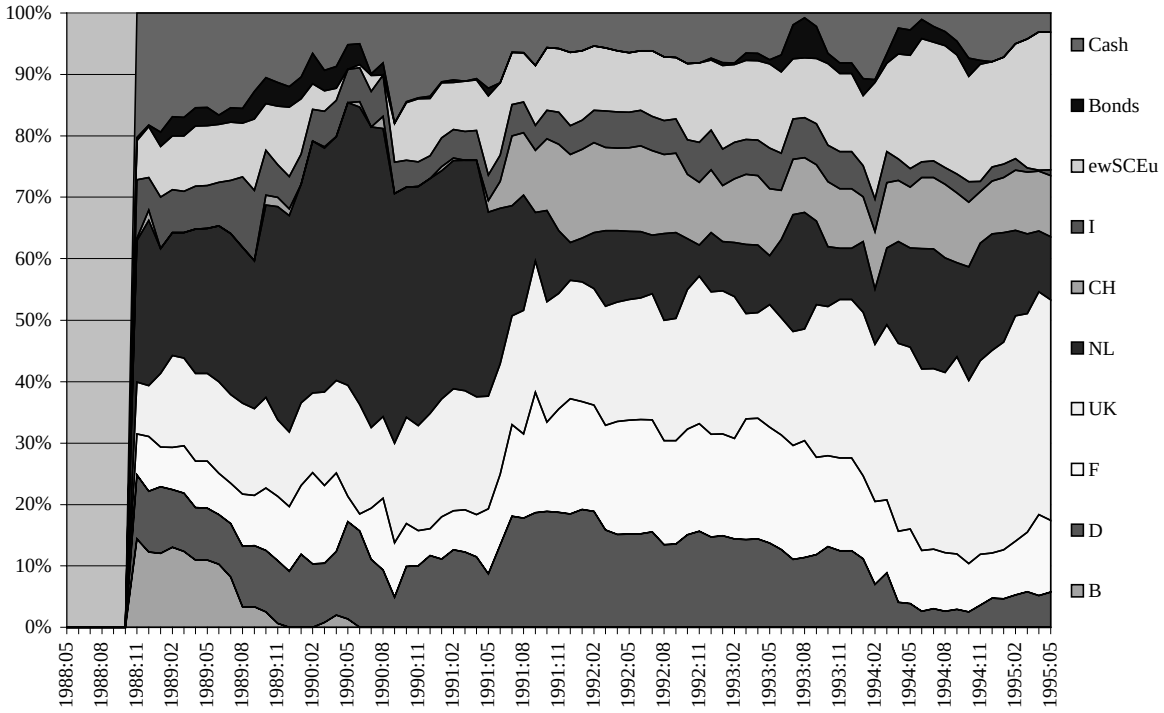


Figure 1c: Asset class factor exposures for the equally weighted Belgian trusts index.
Explanations: See Figure 1a.

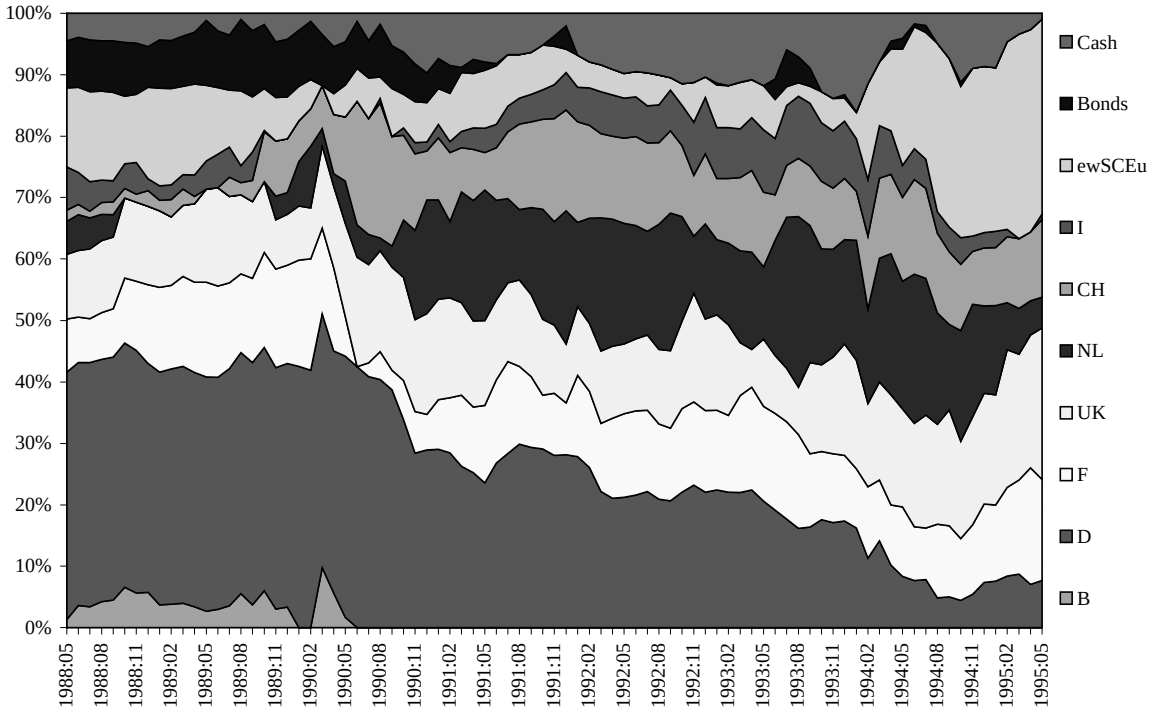


Figure 1d: Asset class factor exposures for the equally weighted German Investmentfonds index.
Explanations: See Figure 1a.

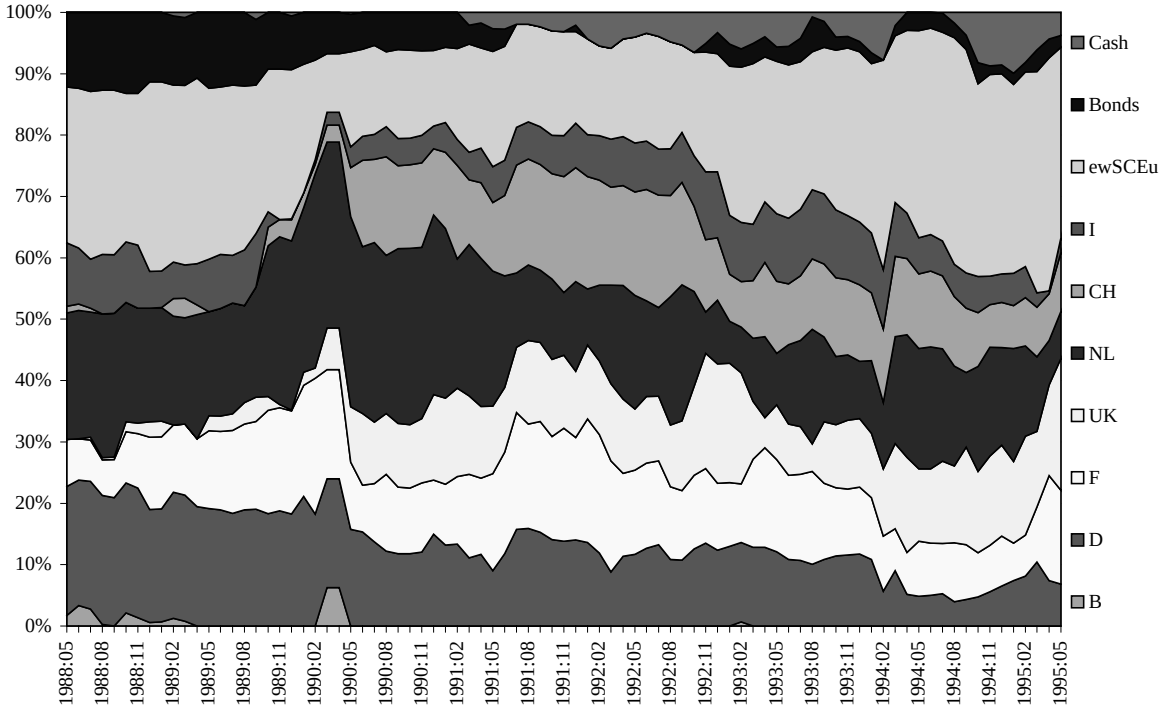


Figure 1e: Asset class factor exposures for the equally weighted German Auslandsfonds index.
Explanations: See Figure 1a.

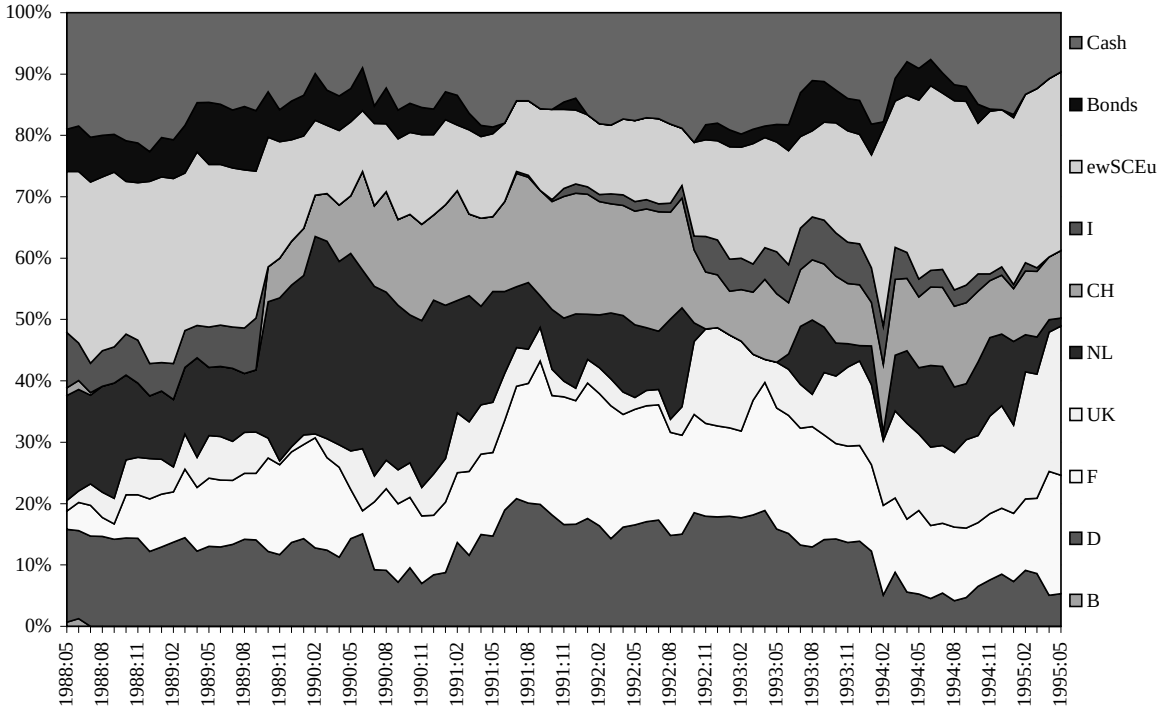


Figure 1f: Asset class factor exposures for the equally weighted French FCP index.
Explanations: See Figure 1a.

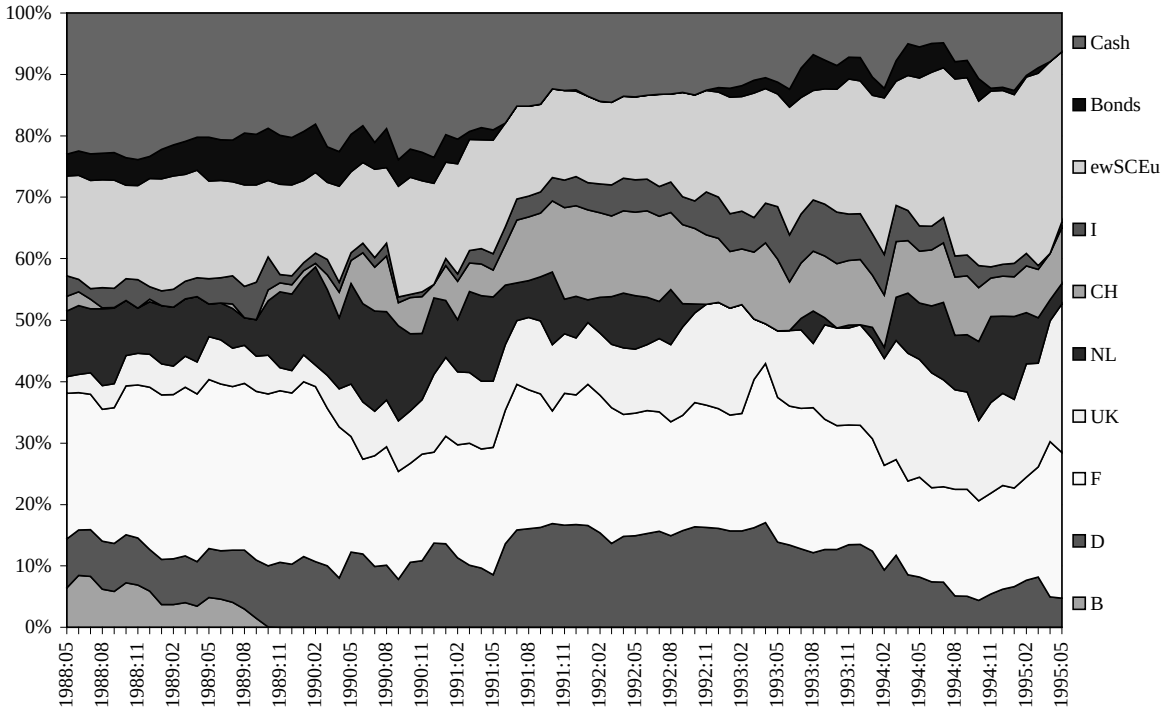


Figure 1g: Asset class factor exposures for the equally weighted French SICAV index.
Explanations: See Figure 1a.

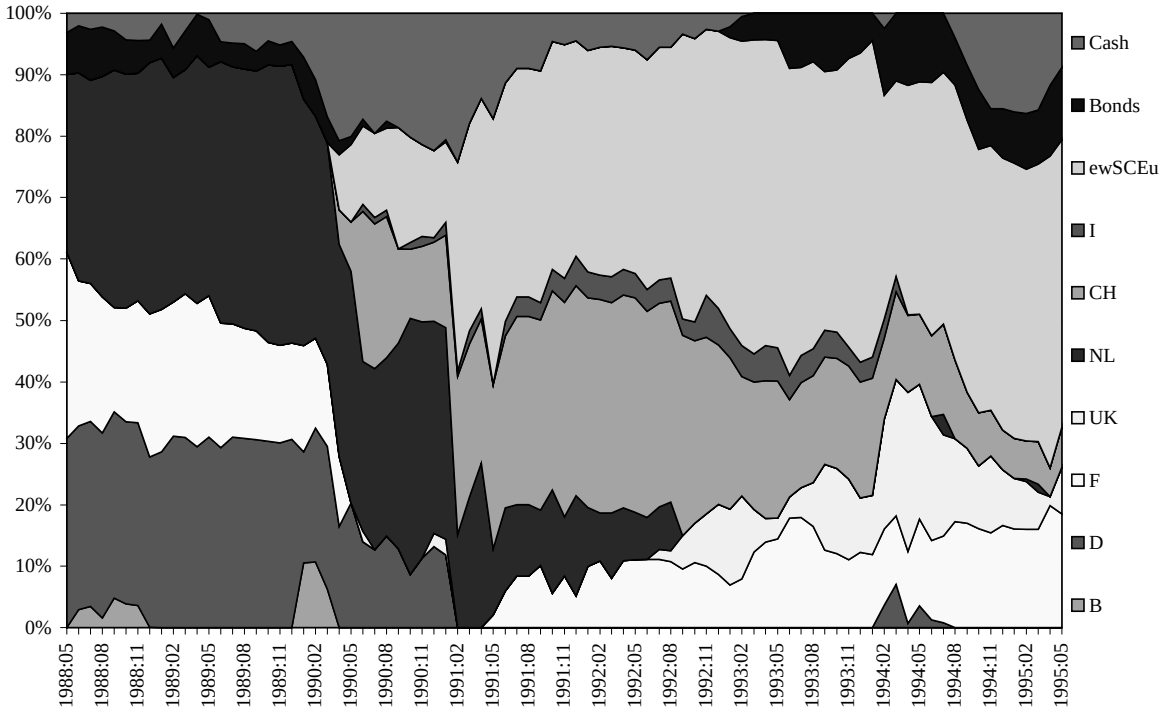


Figure 1h: Asset class factor exposures for the equally weighted Netherlands Mutual Fund index.
Explanations: See Figure 1a.

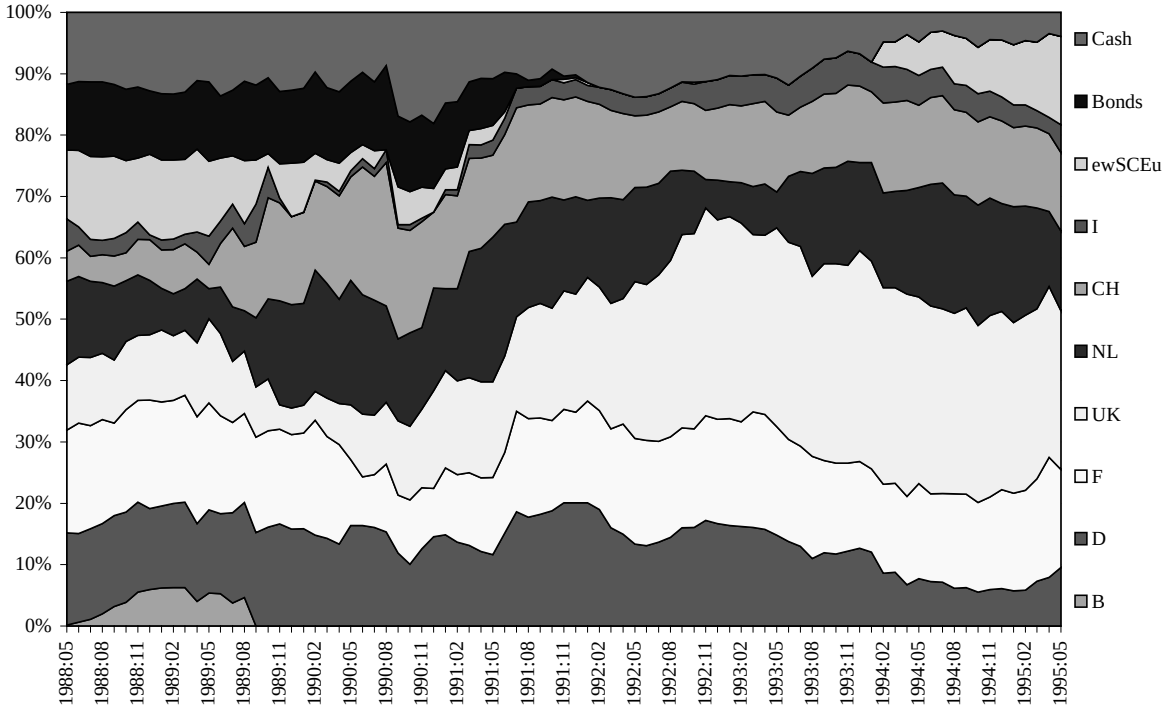


Figure 1i: Asset class factor exposures for the equally weighted Swiss Mutual Fund index.
Explanations: See Figure 1a.

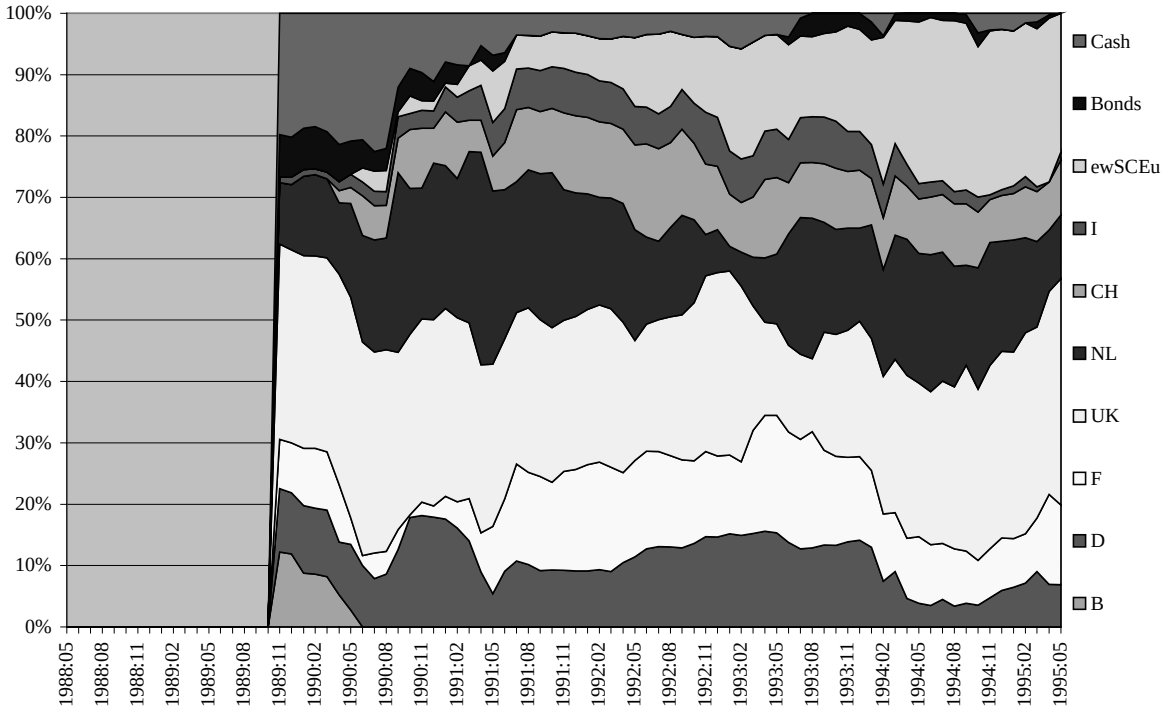


Figure 1j: Asset class factor exposures for the equally weighted Swiss Auslandsfonds index.
Explanations: See Figure 1a.

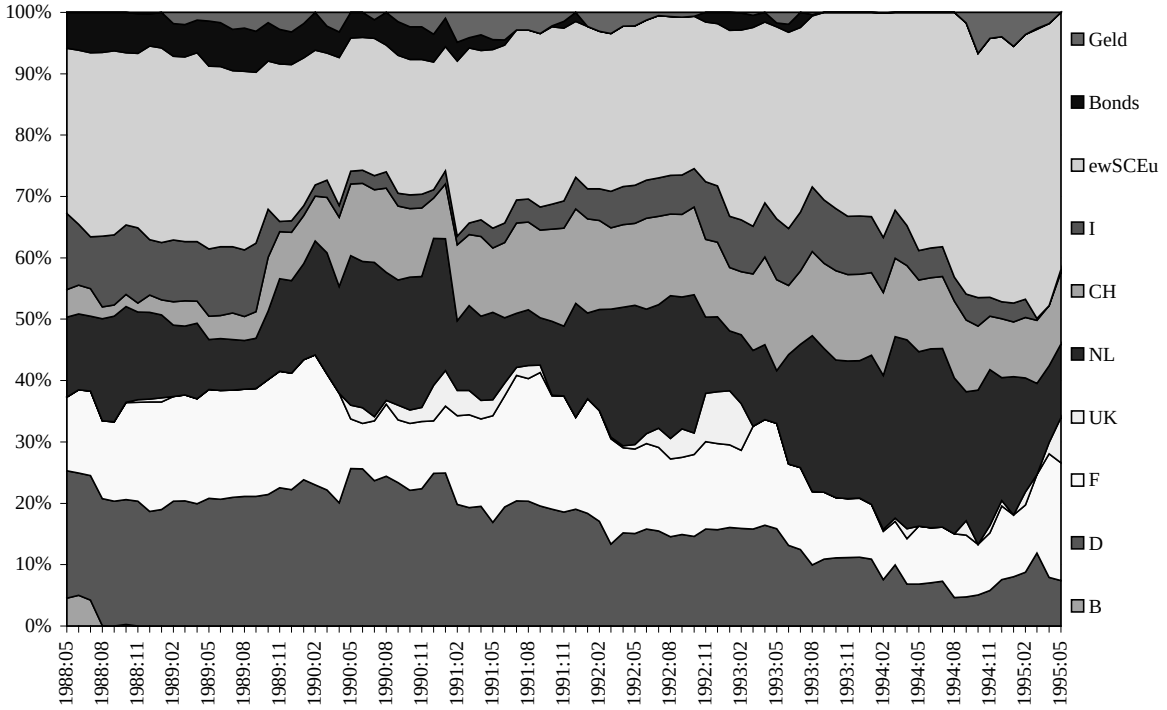


Figure 1k: Asset class factor exposures for the equally weighted UK Unit Trust index.
Explanations: See Figure 1a.

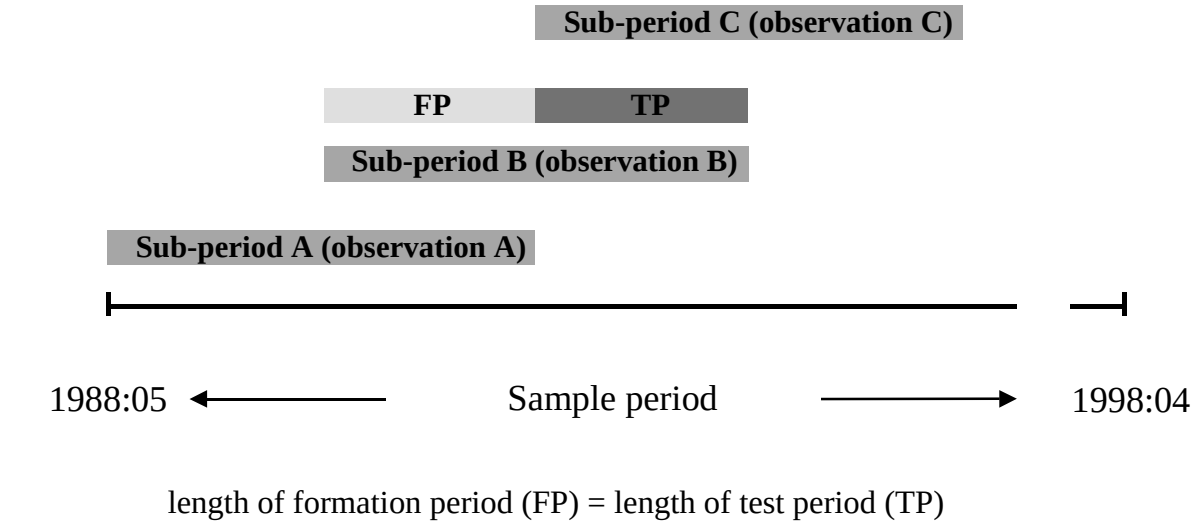


Figure 2: Formation-period (FP) and test period (TP) definition in cross-section studies of persistence. The formation-periods are not overlapping. Each consecutive combination of formation- and test-period is one cross-sectional observation or sub-period.

Table 1: Composition of the mutual fund database and the sub-samples. Each fund is assigned to a fund category depending either on the country of domicile or legal form. From all funds in these categories we caluculate equally weighted fund category indices that are monthly rebalanced. The abbreviations are used to identify the fund categories throughout the paper. EWMF is the equally weighted mutual fund index consisting of all funds in the sample.

Fund Category	Abbreviation for Category Indices	Number of Funds as of April 1988	Number of Funds as of April 1998
Austrian Mutual Funds	A	1	11
Belgian Trusts	B†	0	13
German Investmentfonds	D	3	30
German Auslandsfonds	D_A	8	47
French FCP's	F_FCP	10	43
French SICAV's	F_SICAV	11	42
Netherlands Mutual Funds	NL	5	10
Swiss Funds	CH	4	10
Swiss Auslandsfonds	CH_A†	0	12
UK Unit Trusts	UK	67	115
Total	EWMF	109	333

† The time series for funds belonging to the categories Belgian trusts and Swiss Auslandsfonds do not commence before November 1988 and November 1989, respectively

Table 2: Summary statistics on the factor portfolios used in the performance measurement models (1) to (3) over the period Mai 1998 to December 1995. Market is the return on the IIA Europe index minus the one month return on the 3-month t-bill. Cash is the return on the 1-month Ecu euro-currency deposit denominated in U$ in excess of the 3-month t-bill return. SMB ist the return on the IIA small cap index Europe minus that of the IIA large cap index Europe. HML is the return of the IIA value index Europe minus the IIA growth index Europe. MOM denotes the return on a portfolio long the Rouwenhorst(1998) size and country neutral winner decile portfolio and short the corresponding loser decile portfolio.

Factor	Mean Monthly Excess Return	Standard Deviation	t-statistic for zero Mean	Cross Correlations					
				Market	Cash	SMB	HML	Bond	MOM
Market	0.46%	4.36%	(1.00)	1.00					
Cash	0.27%	3.22%	(0.81)	0.43	1.00				
SMB	-0.14%	1.33%	(-0.98)	0.09	-0.16	1.00			
HML	0.12%	1.13%	(1.01)	0.13	-0.17	0.42	1.00		
Bond	0.34%	3.21%	(1.01)	-0.14	0.13	-0.08	-0.20	1.00	
MOM	0.76%	2.30%	(3.19)	-0.02	0.33	-0.48	-0.37	0.39	1.00

Table 3: Summary statistics on the asset class factor portfolios used in the sharpe style analysis model (4) over the period Mai 1988 to April 1998. The countries are represented by their respective MSCI total return indices. ewSCEu is an equally weighted portfolio of the remaining, small capitalised European countries. It consists of the MSCI indices for Austria, Denmark, Finland, Luxembourg, Norway, Portugal, Spain and Sweden. SB Gov BI Europe is the Salomon Brothers World Government Bond Index Europe and Cash is the U$ return on a 1-month Ecu euro-currency deposit.

Asset Class Factor	Mean Monthly Excess Return	Standard Deviation	t-statistic for zero Mean	Cross Correlations									
				Belgium	Germany	France	UK	Nether-lands	Switzer-land	Italy	ewSCEu	SB Gov BI Europe	Cash
Belgium	0.97%	4.35%	(2.13)	1.00									
Germany	1.07%	5.82%	(1.76)	0.70	1.00								
France	1.02%	5.25%	(1.86)	0.74	0.72	1.00							
UK	0.87%	5.24%	(1.59)	0.60	0.61	0.68	1.00						
Netherlands	1.35%	3.96%	(3.27)	0.77	0.76	0.75	0.78	1.00					
Switzerland	1.51%	4.93%	(2.94)	0.60	0.60	0.59	0.69	0.69	1.00				
Italy	0.26%	7.27%	(0.35)	0.38	0.51	0.37	0.34	0.41	0.33	1.00			
ewSCEu	0.85%	4.58%	(1.78)	0.70	0.77	0.70	0.70	0.77	0.66	0.57	1.00		
SB Gov BI Europe	0.80%	3.22%	(2.40)	-0.11	-0.10	-0.19	-0.10	-0.11	-0.05	-0.10	-0.20	1.00	
Cash	0.74%	3.23%	(2.18)	0.40	0.45	0.34	0.37	0.48	0.40	0.14	0.33	0.13	1.00

Table 4: Descriptive statistics and cross correlations for the mutual fund category indices as well as the MSCI Europe 15 index. Swiss and German Auslandsfonds are funds sold in these countries and domiciled with very few exceptions in Luxembourg. The statistics and correlations in **Panel A** are calculated over the period November 1989 to April 1998 to insure complete comparability as the Swiss Auslandsfonds data do not start before November 1989. The Sharpe ratios are computed using a risk free rate of 0.42% per month which is the average monthly return on 3-month US t-bills over that period of time. A F-test (not reported) for equality of means cannot reject the null hypothesis of equal means at any reasonable level of confidence. **Panel B** gives the Sharpe ratios for each fund category over the two sub-periods November 1989 to January 1994 and Ferbruary 1994 to April 1998 along with the Spearman rank correlation of the Sharpe ratio based ranking. Independence of the rankings in these two sub-periods cannot be rejected.

Table 4 - Panel A: Descriptive Statistics on Fund Category Indices

Fund Category Index	Abbreviation	Mean Monthly Return	Standard Deviation	t-statistic for zero Mean	Sharpe Ratio	Cross Correlation											
						A	B	D	D_A	F_FCP	F_ SICAV	NL	CH	CH_A	UK	EWMF	MSCI-Europe
Austrian Mutual Funds	A	1.02%	3.38%	(2.97)	0.179	1.00											
Belgian Trusts	B	1.08%	3.68%	(2.87)	0.179	0.95	1.00										
German Investmentfonds	D	0.95%	4.10%	(2.26)	0.128	0.96	0.96	1.00									
German Auslandsfonds	D_A	1.04%	3.78%	(2.71)	0.165	0.96	0.96	0.98	1.00								
French FCP's	F_FCP	0.93%	3.53%	(2.57)	0.144	0.97	0.97	0.97	0.97	1.00							
French SICAV's	F_SICAV	0.99%	3.61%	(2.68)	0.157	0.97	0.97	0.97	0.98	0.98	1.00						
Netherlands Mutual Funds	NL	1.10%	4.36%	(2.48)	0.157	0.87	0.87	0.88	0.89	0.89	0.90	1.00					
Swiss Funds	CH	1.01%	3.64%	(2.72)	0.162	0.96	0.97	0.96	0.96	0.96	0.98	0.87	1.00				
Swiss Auslandsfonds	CH_A	1.13%	3.66%	(3.03)	0.195	0.95	0.96	0.94	0.95	0.95	0.96	0.86	0.95	1.00			
UK Unit Trusts	UK	1.21%	4.14%	(2.86)	0.190	0.95	0.95	0.98	0.99	0.97	0.97	0.89	0.96	0.93	1.00		
All Funds	EWMF	1.09%	3.86%	(2.76)	0.173	0.97	0.97	0.99	0.99	0.98	0.99	0.90	0.97	0.95	1.00	1.00	
MSCI Europe 15	MSCIEurope	1.29%	4.18%	(3.01)	0.207	0.91	0.95	0.95	0.95	0.93	0.94	0.83	0.95	0.95	0.94	0.95	1.00

Table 4 - Panel B: Test of Independence of Sub-period Sharp Ratio based Rankings

Sub-period 1: November 1989 to January 1994

	A	B	D	D_A	F_FCP	F_SICAV	NL	CH	CH_A	UK	EWMF	MSCI-Europe
Sharpe ratio	0.059	0.100	0.040	0.059	0.050	0.068	0.098	0.058	0.121	0.088	0.076	0.121
Rank	6	2	10	7	9	5	3	8	1	4		

Spearman Rank Correlation Coefficient 0.176
5% Critical Value 0.564

Sub-period 2: February 1994 to April 1998

	A	B	D	D_A	F_FCP	F_SICAV	NL	CH	CH_A	UK	EWMF	MSCI-Europe
Sharpe ratio	0.335	0.298	0.279	0.334	0.291	0.287	0.289	0.298	0.295	0.346	0.323	0.345
Rank	2	5	10	3	7	9	8	4	6	1		

Table 5: Risk adjusted performance measures for the fund category indices. Panel A shows raw return and Sharpe ratio statistics for each fund category index. The 10-year period Mai 1988 to April 1998 is used to compute the statistics fot all indices with the exception of the Belgian fund index and the Swiss Auslandsfonds index which are available from November 1988 and November 1989, respectively. The Sharpe ratio is obtained by using the average monthly rate of return on 3-month t-bills as risk-free rate. **Panel B** gives the alpha estimates from the extended CAPM model (1), the EGB based 5-factor model (2) as well as the Carhart(1997a) based 5-factor model (3). The t-statistics are heteroscedasticity and autocorrelation consistent. The former two models are estimated over the full 10-year period. The Carhart(1997a) model (3) estimates were calculated over the period Mai 1988 to December 1995. In results not reported we find that the substantial differences in significance for the alpha estimates between the models (1) and (3) as well as models (2) and (3) are not caused by using different estimation periods.

Panel C displays the corresponding performance estimates using the Sharpe(1992) asset class factor model (4). The performance based rank orderings are dependent on the model employed. Hovewer, as can be seen from **Panel D**, the Spearman rank correlation coefficients between rabkings based on the different methods of performance measurement are very significant. The critical value of Spearman's correlation coefficient for the one-sided 1% confidence interval is 0.794.

Table 5 - Panel A: Raw Return Statistics and Sharpe Ratio for Fund Category Indices

	Fund Category Index											
	A	B	D	D_A	F_FCP	F_SICAV	NL	CH	CH_A	UK	EWMF	MSCI Europe
Observations	120	114	120	120	120	120	120	120	102	120	120	120
Mean	0.95%	1.08%	0.94%	1.08%	0.91%	0.99%	1.21%	0.97%	1.13%	1.26%	1.13%	1.25%
Median	1.09%	1.33%	1.16%	1.28%	1.05%	1.21%	1.23%	1.27%	1.58%	1.55%	1.36%	1.24%
Std. Dev.	3.42%	3.69%	4.07%	3.75%	3.54%	3.60%	4.23%	3.65%	3.66%	4.10%	3.84%	4.22%
Sharpe Ratio	0.14	0.17	0.12	0.17	0.13	0.15	0.18	0.14	0.18	0.20	0.17	0.19

Table 5 - Panel B: Model (1) to (3) Alphas for Fund Category Indices

	Fund Category Index										
Model	A	B	D	D_A	F_FCP	F_SICAV	NL	CH	CH_A	UK	EWMF
CAPM α	-0.06%	-0.01%	-0.21%	-0.02%	-0.12%	-0.06%	0.13%	-0.10%	0.01%	0.11%	0.02%
t-Statistic	(-0.57)	(-0.15)	(-1.62)	(-0.18)	(-1.28)	(-0.69)	(0.69)	(-1.21)	(0.11)	(0.73)	(0.15)
adjusted R^2	0.861	0.894	0.905	0.901	0.879	0.908	0.714	0.915	0.918	0.889	0.910
EGB α	-0.04%	0.02%	-0.16%	0.02%	-0.06%	-0.01%	0.22%	-0.12%	-0.02%	0.17%	0.07%
t-Statistic	(-0.45)	(0.27)	(-1.31)	(0.20)	(-0.65)	(-0.15)	(1.12)	(-1.32)	(-0.15)	(1.26)	(0.62)
adjusted R^2	0.863	0.892	0.905	0.908	0.884	0.911	0.731	0.917	0.917	0.897	0.916
CAR α	-0.21%	-0.10%	-0.33%	-0.13%	-0.23%	-0.20%	-0.09%	-0.34%	-0.13%	0.00%	-0.09%
t-Statistic	(-2.13)	(-1.18)	(-2.17)	(-0.83)	(-2.37)	(-2.11)	(-0.43)	(-3.37)	(-1.02)	(-0.02)	(-0.71)
adjusted R^2	0.893	0.888	0.907	0.908	0.895	0.928	0.738	0.929	0.918	0.904	0.923

Table 5 - Panel C: Model (4) Alphas for Fund Category Indices

	Fund Category Index										
Model	A	B	D	D_A	F_FCP	F_SICAV	NL	CH	CH_A	UK	EWMF
Style α	-0.22%	-0.12%	-0.27%	-0.16%	-0.26%	-0.15%	0.05%	-0.26%	-0.11%	-0.02%	-0.10%
t-Statistic	(-2.13)	(-1.17)	(-2.96)	(-1.85)	(-2.63)	(-1.86)	(0.27)	(-3.05)	(-1.18)	(-0.19)	(-1.29)
R^2	0.892	0.913	0.938	0.934	0.906	0.942	0.768	0.935	0.931	0.949	0.951

Table 5 - Panel D: Performance Rankings of Fund Category Indices based on different Performance Measures

	Fund Category Index Rank									
Model	A	B	D	D_A	F_FCP	F_SICAV	NL	CH	CH_A	UK
Raw Return	8	4	9	5	10	6	2	7	3	1
Sharpe Ratio	7	4	10	5	9	6	3	8	2	1
CAPM α	6	4	10	5	9	7	1	8	3	2
EGB α	7	4	10	3	8	5	1	9	6	2
CAR α	7	3	9	4	8	6	2	10	5	1
Style α	7	4	10	6	9	5	1	8	3	2

Spearman Rank Correlation

Performance Measure	Raw Return	Sharpe Ratio	CAPM α	EGB α	CAR α	Style α
Raw Return	1.00					
Sharpe Ratio	0.96	1.00				
CAPM α	0.94	0.95	1.00			
EGB α	0.84	0.83	0.88	1.00		
CAR α	0.88	0.89	0.90	0.95	1.00	
Style α	0.95	0.95	0.96	0.88	0.89	1.00

Table 6: Spearman rank correlation between the performance based rankings of fund category indices for two consecutive time periods. The performance of each fund category index is computed over two time periods using different performance measures. The fund category indices are then ranked based on these performance estimates. With these rankings, the Spearman rank correlation is found. The critical value for rejecting the null hypothesis of no rang correlation in an one-sided test on the 5% level of significance is 0.564.

Ranking based on	Period 1	Period 2	Spearman Rank Correlation Coefficient
Raw Return	1989:11-1994:01	1994:02-1998:04	0.030
Sharpe Ratio	1989:11-1994:01	1994:02-1998:04	0.176
CAPM α	1988:05-1993:04	1993:05-1998:04	0.321
EGB α	1988:05-1992:02	1992:03-1995:12	0.479*
CAR α	1988:05-1993:04	1993:05-1998:04	0.467*
Style α	1988:05-1993:04	1993:05-1998:04	0.479*

* Statistically significant at the 10% level

Table 7: Comparison of the models CAPM (1), EGB (2) and CAR (3). The models are estimated over the full time length for which data is available. The CAPM (1) and EGM (2) model are hence estimated from May 1988 to April 1998, the CAR (3) model performance is calculated from May 1988 to December 1995. Alpha is the regression intercept, market denotes the excess return on the IIA Europe index over 1-month return on 3-month t-bills and Cash is the U$ excess return on an Ecu euro-currency 1-month deposit. SMB is the IIA Europe small cap index return minus the return on the IIA Europe large cap index, HML is similarly the IIA Europe value minus IIA Europe growth return. MOM is a proxy for the Jegadeesh/Titman(1993) momentum effect for Europe and is long the Rouwenhorst(1998) size and country neutral winner decile portfolio, short the corresponding loser decile portfolio. The t-statistics are heteroscedasticity and autocorrelation consistent.

Table 7 - Panel A: CAPM - Model (1) Performance Estimates

Fund Category Index	Alpha (t-Stat.)	Market (t-Stat.)	Cash (t-Stat.)	adj. R^2	Observations
A	-0.06%	0.71	0.19	0.861	120
	(-0.57)	(19.26)	(3.90)		
B	-0.01%	0.81	0.14	0.894	114
	(-0.15)	(22.84)	(4.40)		
D	-0.21%	0.90	0.12	0.905	120
	(-1.62)	(17.34)	(2.36)		
D_A	-0.02%	0.86	0.02	0.901	120
	(-0.18)	(27.46)	(0.58)		
F_FCP	-0.12%	0.75	0.18	0.879	120
	(-1.28)	(24.32)	(4.29)		
F_SICAV	-0.06%	0.78	0.17	0.908	120
	(-0.69)	(23.62)	(4.32)		
NL	0.13%	0.81	0.19	0.714	120
	(0.69)	(12.64)	(2.71)		
CH	-0.10%	0.81	0.12	0.915	120
	(-1.21)	(19.81)	(2.56)		
CH_A	0.01%	0.82	0.13	0.918	102
	(0.11)	(13.11)	(2.32)		
UK	0.11%	0.93	0.04	0.889	120
	(0.73)	(22.30)	(0.89)		
EWMF	0.02%	0.86	0.09	0.910	120
	(0.15)	(25.54)	(2.24)		

Table 7 - Panel B: EGB - Model (2) Performance Estimates

Fund Category Index	Alpha (t-Stat.)	Market (t-Stat.)	SMB (t-Stat.)	HML (t-Stat.)	Bond (t-Stat.)	Cash (t-Stat.)	adj. R^2	Observations
A	-0.04%	0.72	0.14	-0.03	0.05	0.18	0.863	120
	(-0.45)	(17.43)	(1.39)	(-0.23)	(1.24)	(3.42)		
B	0.02%	0.81	0.09	-0.05	-0.01	0.14	0.892	114
	(0.27)	(20.58)	(0.80)	(-0.66)	(-0.30)	(3.70)		
D	-0.16%	0.91	0.16	-0.12	0.02	0.11	0.905	120
	(-1.31)	(17.15)	(1.53)	(-1.11)	(0.38)	(2.09)		
D_A	0.02%	0.86	0.27	-0.04	0.03	0.02	0.908	120
	(0.20)	(28.22)	(3.92)	(-0.55)	(0.62)	(0.42)		
F_FCP	-0.06%	0.76	0.25	-0.11	0.01	0.17	0.884	120
	(-0.65)	(22.17)	(2.52)	(-1.20)	(0.16)	(3.75)		
F_SICAV	-0.01%	0.79	0.21	-0.09	0.01	0.16	0.911	120
	(-0.15)	(20.51)	(2.03)	(-1.11)	(0.27)	(3.75)		
NL	0.22%	0.82	0.48	-0.04	0.02	0.19	0.731	120
	(1.12)	(12.56)	(2.96)	(-0.21)	(0.29)	(2.80)		
CH	-0.12%	0.82	-0.08	-0.08	0.05	0.10	0.917	120
	(-1.32)	(23.33)	(-0.85)	(-1.18)	(1.04)	(2.52)		
CH_A	-0.02%	0.83	-0.01	0.00	0.06	0.11	0.917	102
	(-0.15)	(12.35)	(-0.13)	(-0.01)	(1.72)	(2.03)		
UK	0.17%	0.93	0.31	-0.06	0.01	0.04	0.897	120
	(1.26)	(21.28)	(3.05)	(-0.54)	(0.18)	(0.76)		
EWMF	0.07%	0.87	0.26	-0.07	0.01	0.08	0.916	120
	(0.62)	(24.29)	(3.03)	(-0.89)	(0.35)	(1.93)		

Table 7 - Panel C: CAR - Model (3) Performance Estimates

Fund Category Index	Alpha (t-Stat.)	Market (t-Stat.)	SMB (t-Stat.)	HML (t-Stat.)	MOM (t-Stat.)	Cash (t-Stat.)	adj. R^2	Observations
A	-0.21%	0.64	0.37	-0.11	0.10	0.26	0.893	92
	(-2.13)	(22.54)	(2.97)	(-0.86)	(1.69)	(6.67)		
B	-0.10%	0.77	0.28	-0.06	0.12	0.17	0.888	86
	(-1.18)	(18.78)	(1.79)	(-0.52)	(2.07)	(4.25)		
D	-0.33%	0.88	0.35	-0.13	0.18	0.12	0.907	92
	(-2.17)	(13.93)	(2.50)	(-0.97)	(2.28)	(2.25)		
D_A	-0.13%	0.83	0.44	-0.01	0.17	0.03	0.908	92
	(-0.83)	(25.31)	(4.99)	(-0.12)	(3.12)	(0.70)		
F_FCP	-0.23%	0.70	0.46	-0.10	0.14	0.22	0.895	92
	(-2.37)	(23.93)	(3.28)	(-0.98)	(2.37)	(5.69)		
F_SICAV	-0.20%	0.72	0.45	-0.07	0.16	0.21	0.928	92
	(-2.11)	(24.31)	(4.11)	(-0.91)	(4.40)	(6.15)		
NL	-0.09%	0.79	0.78	0.02	0.36	0.18	0.738	92
	(-0.43)	(11.89)	(2.88)	(0.07)	(3.62)	(2.56)		
CH	-0.34%	0.78	0.19	-0.08	0.25	0.11	0.929	92
	(-3.37)	(24.76)	(1.49)	(-1.12)	(4.74)	(3.12)		
CH_A	-0.13%	0.77	0.16	0.04	0.13	0.17	0.918	74
	(-1.02)	(10.79)	(1.41)	(0.37)	(3.21)	(2.50)		
UK	0.00%	0.88	0.51	0.03	0.19	0.06	0.904	92
	(-0.02)	(18.50)	(4.34)	(0.31)	(3.25)	(1.26)		
EWMF	-0.09%	0.82	0.46	-0.02	0.18	0.10	0.923	92
	(-0.71)	(22.79)	(4.40)	(-0.28)	(3.37)	(2.68)		

Table 8: Asset class factor loading estimates. Results from estimating the Asset Class Factor model (4). The asset classes are the MSCI country indices for Belgium, Germany, France, UK, Netherlands Switzerland and Italy. ewSCEu is an equally weighted portfolio containing the remaining small capitalised MSCI European country indices Austria, Denmark, Finland, Luxembourg, Norway, Portugal, Spain and Sweden. SB Gov BI Europe is the Salomon Brothers World Government Bond Index Europe and Cash is the U$ return on a 1-month Ecu euro-currency deposit. All returns are denominated in U$. Alpha is the average difference between the monthly return on the fund index and the style index obtained by weighting the asset class factors with their respective loadings. The t-statistic tests for zero mean.

Fund Category Index	Alpha (t-Stat.)	Asset Class Factor Portfolios										R^2	Observations
		Belgium	Germany	France	UK	Nether-lands	Switzer-land	Italy	ewSCEu	SB Gov BI Europe	Cash		
A	-0.22% (-2.13)	0.00%	12.76%	6.30%	7.50%	26.35%	5.69%	4.24%	13.38%	7.63%	16.17%	0.892	120
B	-0.12% (-1.17)	1.52%	9.41%	14.29%	14.42%	24.24%	3.86%	4.67%	12.60%	1.89%	13.10%	0.913	114
D	-0.27% (-2.96)	0.00%	27.50%	13.57%	12.60%	10.10%	8.56%	4.47%	13.05%	2.32%	7.83%	0.938	120
D_A	-0.16% (-1.85)	0.00%	13.03%	13.22%	6.25%	19.92%	7.85%	5.74%	24.30%	7.62%	2.09%	0.934	120
F_FCP	-0.26% (-2.63)	0.00%	11.05%	13.11%	5.55%	18.27%	8.72%	2.12%	20.33%	4.79%	16.06%	0.906	120
F_SICAV	-0.15% (-1.86)	0.00%	7.78%	23.28%	6.44%	14.64%	4.38%	3.81%	19.41%	3.91%	16.35%	0.942	120
NL	0.05% (0.27)	0.00%	10.93%	21.72%	0.10%	17.68%	0.42%	0.76%	30.64%	2.43%	15.31%	0.768	120
CH	-0.26% (-3.05)	0.00%	10.83%	18.41%	13.62%	22.37%	9.40%	3.28%	6.77%	6.64%	8.67%	0.935	120
CH_A	-0.11% (-1.18)	0.00%	6.65%	9.85%	27.22%	27.31%	2.89%	5.90%	5.61%	4.15%	10.42%	0.931	102
UK	-0.02% (-0.19)	0.00%	16.22%	15.51%	0.00%	18.70%	9.77%	5.23%	30.57%	2.95%	1.05%	0.949	120
EWMF	-0.10% (-1.29)	0.00%	14.34%	16.16%	4.09%	17.69%	8.21%	4.45%	24.32%	4.12%	6.63%	0.951	120
MSCI Europe Composition 1997		2.1%	14.7%	12.8%	30.2%	8.1%	10.7%	6.6%	15.0%				

Table 9: Cross-section measures of performance persistence. For each formation-period (FP) and consecutive test-period (TP), the performance of all mutual funds in the sample is computed. All funds belonging in both periods to those funds with above median performance are assigned to the winner-winner (WW) group, all funds performing in both periods below the median are categorised as loser-loser (LL). Those, who are in one period above, in the other below the median are either classified as winner-loser (WL) or loser-winner (LW), whichever appropriate. This is repeated for every non-overlapping combination of formation- and test-period and the number of fonds in either category is then cumulated over all observations. The Chi2 p-value denotes the probability for the observed cumulated combination to occur, if the fund performances in the formation and test periods are independent. NOBS is the number of non-overlapping observations at a given length of FP and TP. The results in **Panel A** are based on raw returns as measure of performance in FP and TP.

In **Panel B, Panel C** and **Panel D**, respectively, the average difference between the fund's return and the return of the adequate fund category index is the sorting criterium in the FP. The test-period performance measure is the CAPM (1), EGB (2) and CAR (3) risk adjusted return, computed as defined in the text. F/McB is the slope of a Fama/MacBeth cross sectional regression of the performance measure in the TP on the performance measure in the FP. t-statistics test for zero mean and are obtained according to Fama/MacBeth(1973)

Table 9 - Panel A: Persistence in Raw Returns

FP (Months)	TP (Months)	Performance Category					NOBS
		WW	WL	LW	LL	Chi^2 p-value	
3	3	2193	1976	2000	2167	0.00	39
6	6	1053	911	919	1064	0.00	19
12	12	485	402	398	482	0.00	9
24	24	170	178	191	160	0.14	4
30	30	137	110	119	129	0.10	3
60	60	32	19	27	24	0.42	1

Table 9 - Panel B: Persistence in CAPM (1) Adjusted Returns

FP (Months)	TP (Months)	Performance Category					Fama/McBeth Cross-Section Regression		NOBS
		WW	WL	LW	LL	Chi^2 p-value	F/McB	(t-Stat.)	
3	3	1368	1319	1320	1366	0.18	0.05	(0.97)	28
6	6	703	618	615	701	0.00	0.12	(2.71)	14
12	12	343	299	300	342	0.02	0.08	(1.12)	7
24	24	140	100	101	139	0.00	0.14	(3.45)	3
30	30	78	63	64	78	0.08	0.08		2
60	60	28	26	26	28	0.70	0.01	(0.12)	1

Table 9 - Panel C: Persistence in EGB (2) Adjusted Returns

FP (Months)	TP (Months)	Performance Category					Fama/McBeth Cross-Section Regression		NOBS
		WW	WL	LW	LL	Chi^2 p-value	F/McB	(t-Stat.)	
3	3	1363	1321	1324	1365	0.26	0.02	(0.41)	28
6	6	700	618	620	701	0.00	0.10	(2.32)	14
12	12	339	301	305	339	0.04	0.05	(0.94)	7
24	24	133	108	108	131	0.03	0.15	(1.13)	3
30	30	75	66	66	76	0.26	0.12		2
60	60	26	27	27	27	0.92	0.02	(0.13)	1

Table 9 - Panel D: Persistence in CAR (3) Adjusted Returns

FP (Months)	TP (Months)	Performance Category					Fama/McBeth Cross-Section Regression		NOBS
		WW	WL	LW	LL	Chi^2 p-value	F/McB	(t-Stat.)	
3	3	768	704	708	769	0.02	0.07	(1.20)	18
6	6	378	342	342	379	0.05	0.18	(4.26)	9
12	12	150	145	144	147	0.74	0.05	(1.21)	4
24	24	67	66	67	67	0.95	0.05		2
30	30	27	27	26	27	0.92	0.20	(1.44)	1

Table 10: Risk adjusted octile portfolio performance; octile portfolios are formed based on previous 6 month raw returns. Each year, all funds in the sample are ranked on their past 6 month average raw returns and assigned to portfolios accordingly. The best performing funds are placed in octile 8, the worst are forming octile portfolio 1. Spread 8 - 1 is the return on a portfolio long the winner octile 8 and short the loser octile 1. **Panel A** displays the CAPM (1) and EGB (2) risk adjusted performance of the octile portfolios. **Panel B** and **Panel C** give the CAR (3) and Asset Class Factor (4) model adjusted performances, respectively. Market denotes the excess return on the IIA index Europe, Cash is the excess U$ return on an one-month Ecu euro-currency deposit. SMB, HML, MOM are factor mimicking portfolios designed to capture size effect, value/growth effect and momentum effect in the Europe. Bond is the excess return on the Salomon Brothers World Govt. Bond Index Europe. B, D, F, UK, NL, CH and I are the returns on the MSCI indices for Belgium, Germany, France, UK, Netherlands, Switzerland and Italy. ewSCEu denotes the return on an equally weighted portfolio formed from the remaining, small capitalised Western European country indices.

Table 10 - Panel A: CAPM (1) and EGB (2) adjusted Octile Portfolio Performance

				CAPM (1) Factors				EGB (2) Factors							
	Octile Portfolio	Excess Return (t-Stat.)	Standard Deviation	Alpha (t-Stat.)	Market (t-Stat.)	Cash (t-Stat.)	adj. R^2	Alpha (t-Stat.)	Market (t-Stat.)	SMB (t-Stat.)	HML (t-Stat.)	Bond (t-Stat.)	Cash (t-Stat.)	adj. R^2	NOBS
Winner	8	0.70%	3.95%	0.17%	0.84	0.15	0.849	0.25%	0.85	0.37	-0.07	0.01	0.15	0.861	108
		(1.84)		(0.87)	(14.86)	(2.87)		(1.33)	(16.50)	(3.11)	(-0.62)	(0.12)	(2.73)		
	7	0.63%	4.06%	0.07%	0.91	0.08	0.893	0.13%	0.92	0.29	-0.12	0.03	0.07	0.900	108
		(1.62)		(0.44)	(16.29)	(1.86)		(0.86)	(16.99)	(2.61)	(-1.24)	(0.46)	(1.52)		
	6	0.54%	4.03%	-0.02%	0.92	0.04	0.898	0.04%	0.92	0.24	-0.10	0.00	0.04	0.901	108
		(1.39)		(-0.13)	(18.86)	(1.01)		(0.25)	(18.83)	(2.37)	(-1.08)	(0.08)	(0.82)		
	5	0.50%	3.93%	-0.05%	0.88	0.07	0.900	0.00%	0.89	0.22	-0.10	0.01	0.07	0.903	108
		(1.32)		(-0.34)	(20.99)	(1.87)		(0.04)	(19.49)	(2.10)	(-1.08)	(0.14)	(1.52)		
	4	0.47%	3.86%	-0.07%	0.87	0.09	0.911	-0.02%	0.87	0.22	-0.05	0.00	0.09	0.914	108
		(1.27)		(-0.56)	(25.49)	(2.42)		(-0.17)	(22.65)	(2.11)	(-0.51)	(0.06)	(2.12)		
	3	0.45%	3.83%	-0.08%	0.86	0.09	0.912	-0.04%	0.86	0.18	-0.05	-0.02	0.10	0.914	108
		(1.22)		(-0.68)	(25.17)	(2.34)		(-0.28)	(22.65)	(1.82)	(-0.62)	(-0.55)	(2.15)		
	2	0.39%	3.84%	-0.14%	0.86	0.09	0.912	-0.08%	0.87	0.25	-0.12	-0.01	0.09	0.917	108
		(1.07)		(-1.23)	(24.51)	(2.20)		(-0.74)	(22.01)	(2.55)	(-1.25)	(-0.27)	(1.92)		
Loser	1	0.37%	3.72%	-0.15%	0.82	0.09	0.880	-0.09%	0.83	0.30	-0.06	0.01	0.09	0.889	108
		(1.02)		(-1.06)	(24.62)	(1.87)		(-0.67)	(20.95)	(2.91)	(-0.56)	(0.22)	(1.67)		
	Spread 8-1	0.34%	1.20%	0.32%	0.01	0.06	0.018	0.33%	0.02	0.07	-0.02	0.00	0.06	-0.005	108
		(2.91)		(2.35)	(0.31)	(1.68)		(2.58)	(0.37)	(0.66)	(-0.14)	(-0.04)	(1.67)		

Table 10 - Panel B: CAR (3) adjusted Octile Portfolio Performance

		CAR (3) Factors							
	Octile Por	Alpha (t-Stat.)	Market (t-Stat.)	SMB (t-Stat.)	HML (t-Stat.)	MOM (t-Stat.)	Cash (t-Stat.)	adj. R^2	NOBS
Winner	8	-0.03%	0.83	0.54	0.09	0.30	0.14	0.881	86
		(-0.16)	(15.14)	(3.74)	(0.75)	(3.48)	(2.28)		
	7	-0.09%	0.89	0.50	0.00	0.26	0.08	0.913	86
		(-0.55)	(14.59)	(3.97)	(0.01)	(4.89)	(1.59)		
	6	-0.13%	0.90	0.45	-0.01	0.23	0.03	0.908	86
		(-0.83)	(16.53)	(3.68)	(-0.09)	(4.07)	(0.72)		
	5	-0.16%	0.86	0.44	-0.01	0.20	0.08	0.910	86
		(-1.18)	(18.16)	(3.23)	(-0.15)	(4.09)	(1.84)		
	4	-0.21%	0.84	0.43	0.05	0.19	0.11	0.924	86
		(-1.84)	(22.47)	(3.16)	(0.56)	(4.01)	(3.02)		
	3	-0.19%	0.83	0.34	0.05	0.14	0.12	0.919	86
		(-1.46)	(21.69)	(2.57)	(0.60)	(2.85)	(2.97)		
	2	-0.23%	0.83	0.45	-0.06	0.15	0.12	0.925	86
		(-2.16)	(21.53)	(3.50)	(-0.56)	(3.03)	(2.88)		
Loser	1	-0.27%	0.78	0.58	0.01	0.20	0.13	0.909	86
		(-2.17)	(25.42)	(5.10)	(0.09)	(4.13)	(2.94)		
	Spread 8-1	0.24%	0.05	-0.05	0.08	0.09	0.02	0.014	86
		(1.56)	(1.06)	(-0.34)	(0.56)	(1.32)	(0.31)		

Table 10 - Panel C: Style (4) adjusted Octile Portfolio Performance

					Sharpe Model (4) Asset Classes									
	Octile Portfc	Alpha (t-Stat.)	R^2	NOBS	B	D	F	UK	NL	CH	I	ewSCEu	Bond*	Cash*
Winner	8	0.11% (0.92)	0.681	108	0.00%	13.80%	17.23%	0.07%	17.03%	4.42%	2.03%	30.72%	2.11%	12.61%
	7	0.00% (-0.04)	0.747	108	0.00%	15.28%	16.70%	3.24%	13.98%	10.76%	2.41%	30.33%	3.36%	3.95%
	6	-0.11% (-1.17)	0.762	108	0.00%	17.46%	15.20%	3.51%	17.50%	9.40%	3.88%	27.46%	3.77%	1.82%
	5	-0.14% (-1.71)	0.783	108	0.00%	15.48%	17.66%	1.36%	18.82%	9.55%	4.20%	24.55%	3.69%	4.71%
	4	-0.15% (-1.80)	0.777	108	0.00%	14.74%	16.40%	5.16%	17.92%	7.18%	3.55%	24.75%	3.19%	7.11%
	3	-0.15% (-1.97)	0.793	108	0.00%	15.87%	18.46%	4.30%	16.48%	6.40%	3.91%	23.31%	2.44%	8.84%
	2	-0.22% (-2.69)	0.777	108	0.00%	16.15%	15.38%	6.13%	15.66%	7.94%	3.28%	24.51%	3.10%	7.86%
Loser	1	-0.25% (-2.48)	0.724	108	0.00%	12.18%	14.89%	3.77%	19.44%	5.51%	3.81%	26.73%	5.33%	8.35%

* Bond and Cash here do not denote excess returns but simply returns

Table 11: Performance of 6-months based octile portfolio 8 - 1 spreads using different measures of performance. Each year, all mutual funds are sorted into octile portfolios according to their performance over the 6 previous months. We use raw returns, CAPM (1), EGB (2) and CAR (3) alphas as performance measures for ranking. The portfolios are then held for one year after which they are reformed. Portfolio 8 - 1 spread is the return being long octile portfolio 8 (winner funds) while shorting octile portfolio 1 (loser funds). t-statistics for zero performance are given in brackets. p-val denotes the p-value of a z-test for equal means with unknown variances.

Measure for Evaluating Octile Portfolio 8 - 1 Spread	Performance Measure for sorting into Octile Portfolios			
	Raw Returns	CAPM α	EGB α	CAR α
Raw Returns	0.34% (2.91)	0.41% (3.68)	0.38% (3.48)	0.39% (3.56)
CAPM α	0.32% (2.35)	0.39% (2.98)	0.36% (2.91)	0.37% (3.34)
EGB α	0.33% (2.58)	0.42% (3.32)	0.38% (4.08)	0.36% (3.79)
CAR α	0.24% (1.56)	0.35% (2.36)	0.34% (2.92)	0.35% (2.97)
Style α	0.36% p-val 0.011	0.44% p-val 0.002	0.42% p-val 0.003	0.41% p-val 0.004

Table 12: Performance of 48-months based octile portfolio 8 - 1 Spreads using different measures of performance. Each year, all mutual funds are sorted into octile portfolios according to their performance over the 48 previous months. We use raw returns, CAPM (1), EGB (2) and CAR (3) alphas as performance measures for ranking. The portfolios are then held for one year after which they are reformed. Portfolio 8 - 1 Spread is the return being long octile portfolio 8 (winner funds) while shorting octile portfolio 1 (loser funds). t-statistics for zero performance are given in brackets. p-val denotes the p-value of a z-test for equal means with unknown variances.

Measure for Evaluating Octile Portfolio 8 - 1 Spread	Performance Measure for sorting into Octile Portfolios			
	Raw Returns	CAPM α	EGB α	CAR α
Raw Returns	0.31% (2.78)	0.26% (2.52)	0.31% (2.81)	0.25% (2.17)
CAPM α	0.26% (2.23)	0.24% (1.85)	0.28% (2.27)	0.22% (1.82)
EGB α	0.31% (2.13)	0.27% (1.73)	0.37% (2.99)	0.22% (1.78)
CAR α	0.01% (0.06)	0.00% (-0.01)	0.10% (0.84)	0.10% (0.82)
Style α	0.19% p-val 0.122	0.20% p-val 0.112	0.22% p-val 0.084	0.14% p-val 0.224