The Short-Term Persistence of International Mutual Fund Performance

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Abstract

This paper examines the short-term persistence in performance of equity mutual funds around the world between 1990 and 2013. Using a large survivorship bias-free sample of 35 countries, we document strong evidence of persistence in daily mutual fund returns over quarterly measurement periods. We rank countries by abnormal return and estimate the performance of each country for the following quarter. We find statistically and economically significant performance persistence that is more pronounced for the top and bottom countries. The post-ranking abnormal return disappears when performance is examined over longer time periods. Thus, our results confirm that superior performance is a short-lived phenomenon.

JEL Classification: G11, G12.
Keywords: Mutual funds; Performance persistence; Portfolio management; Factor models.

[1] We appreciate helpful comments and suggestions from Nick Bollen, Gustavo Manso, María Vargas, Fernando Muñoz, Juan Carlos Matallín, Luis García-Feijoó, and Hooi Hooi Lean, as well as seminar participants at the 2014 Paris Financial Management Conference.

I. Introduction

The mutual fund industry defends the idea that some mutual fund managers have superior ability that persists over time, suggesting to investors that it is possible to predict future performance based on past returns. The academic view involves incorporating new data or improving measurement methodology. Many studies provide evidence that performance persists over both short- and long-time periods (e.g., Bollen and Busse, 2005). In this paper, we re-examine mutual fund performance persistence and focus on global short-term persistence across countries using three-month periods. According to Ferreira et al. (2012), the mutual fund industry plays an important role in financial markets with global assets exceeding $26 trillion.

Research on mutual funds shows that fund's characteristics, including size, fees, age, expanses, loads, turnover and return can predict its future performance. Grinblatt and Titman (1992) find positive persistence in mutual fund performance over five-year periods and persistence is consistent with the ability of fund managers to earn abnormal returns. They argue that the past performance of a fund provides useful information for investing in mutual funds. Hendricks, Patel, and Zeckhauser (1993) investigate the short-term relative performance of no-load, growth-oriented mutual funds and find evidence for persistence in the short-term, with the strongest evidence for a one-year evaluation horizon. They claim that their sample was carefully constructed to avoid problems of survivorship bias. Brown and Goetzmann (1995) examine the performance persistence for a survivorship bias-free sample of U.S. equity mutual funds and find that relative performance of mutual funds persists, but persistence is mainly due to funds that lag the S&P 500 index. They argue that this relative performance is correlated across managers, due to a common strategy that standard stylistic categories and risk adjustment procedures do not capture. Considering the return data of all mutual funds, Malkiel (1995) finds that mutual funds have underperformed the market both after management expenses and gross expenses. Grinblatt, Titman, and Wermers (1995) examine investment strategies of a sample of mutual funds and find that around 77% of these mutual funds were momentum investors, buying stocks that were past winners, although they did not systematically sell past losers.

Electronic copy available at: http://ssrn.com/abstract=2467003

Using a momentum factor, Carhart (1997) shows that common factors in stock returns and expenses account for persistence in equity mutual funds´ mean and risk-adjusted returns. The author points that the only persistence not explained is the strong underperformance by the worst-return mutual funds. He explains that the Jegadeesh and Titman´s (1993) one-year momentum in stock returns accounts for hot hands effect in mutual fund performance of Hendricks, Patel, and Zeckhauser (1993). He points out that mutual funds that earn higher one-year returns do so because some funds hold larger positions in last year´s winning stocks and not due to fund managers following momentum strategies.

Tonks (2005) examines the abnormal returns of equity portfolios of U.K. pension funds. In particular, he focuses on the existence of performance persistence among fund management houses, which are fund managers of segregated pension funds. Using a large sample of pension funds, the author finds strong evidence of persistence in the performance of fund managers over a 1-year time horizon using several consistency tests but weaker evidence of persistence at longer time intervals. Even after allowing for momentum in stock returns, pension fund managers still show evidence of performance persistence.

Many factors cause the lack of persistence over long time horizons. One is the decreasing investment opportunities (Berk and Green (2004)). A fund manager can only invest in a limited way in each investment; otherwise he creates a market impact and this investment opportunity will be arbitraged away. Investors allocate their money to best performers making superior funds grow to the point where outperformance is no longer possible. An option is that top performing fund managers, who have built a strong reputation, may decide to find better paid jobs. Another possibility is that management fees increase over time and this eliminates any good performance record. Natin and Yao (2013) show that stock picking skills strongly predict the post-merger performance of corporate acquirers even after controlling for possible shareholder monitoring. The authors claim that their findings are stronger for funds with characteristics more indicative of active stock picking. They highlighted that mutual fund investors chase performance and managers get higher salaries from superior past performance. More recently, Guercio and Reuter (2014) show that flows chase risk-adjusted returns and mutual funds respond by investing more in active management.

The authors explain that actively managed funds sold through brokers face a weaker incentive to generate alpha and significantly underperform index funds.

Several studies show evidence in support of the performance persistence in U.S. equity funds after considering fund investment styles. Coggin, Fabozzi, and Rahman (1993) examine the performance of U.S. equity pension fund managers. The authors find that the average selectivity measure is positive whereas the average timing measure is negative. Moreover, they show that both selectivity and timing are sensitive to the choice of the benchmark when managers are classified by investment style. Meier and Rombouts (2009) investigate the relation between performance persistence and changes in style. The authors use a new holdings-based measure of style rotation for a large sample of US equity mutual funds, and find that top and bottom performing decile portfolios experience a higher degree of style rotation than middle deciles. They argue that there is a higher degree of performance persistence among style consistent funds. Their results imply that an investor needs to consider style rotation when choosing mutual funds based on past performance, otherwise future returns might exhibit big shifts in performance rankings. Additional studies that have documented performance persistence in U.S. mutual funds include Teo and Woo (2001), Ibbotson and Patel (2002), and Wermers (2003), among others.

Many studies on persistence in mutual fund performance suffer from survivorship bias or data limitations (short time-series), which prevent clear-cut conclusions. Brown et al. (1992) show that early studies exaggerate the result of persistence due to reliance on survivorship-biased data. The authors state that if fund volatility is constant, but varies cross-sectionally when the worst-performing funds disappear, then survivorship creates spurious persistence and biases persistence upwards. To tackle this issue, we use the largest sample to date of worldwide mutual funds which is not plagued by survivorship bias.

Few recent studies examine the relation between a fund returns and its characteristics such as fees or fund flows. Narayan, Narayan, and Prabheesh (2014) show that stock return shocks and mutual fund flow shocks together explain 20% of the total forecast error variance of stock returns and mutual fund flows. Vidal et al. (2015) find strong evidence of predictability for mutual fund fees. They point out that funds

with both positive and negative relations with fees show strong evidence of negative return predictability for their fees. While Vidal-García, Vidal and Nguyen (2016) confirm that liquidity and idiosyncratic risk are useful and important risk factors for quite large fund style subgroups of mutual funds.

Ferreira et al. (2012) examine the determinants of the performance of open–end actively managed equity mutual funds from 27 countries. The authors find that mutual funds underperform in the market in general. They also claim that funds from countries where stock markets are liquid and legal institutions are strong show better performance. Additional related literature find evidence of persistence for European funds (Vidal-García (2013) and Banegas et al. (2013)); US equity funds (Herrmann and Scholz (2013)), and little to no persistence for equity institutional products (Busse, Goyal and Wahal (2010)).

Using a unique database of daily returns that includes domestic equity funds from 35 countries, our study extends prior literature by examining short-term persistence in mutual fund performance across countries. It makes several contributions to the literature. First, it uses a unique dataset for 35 countries consisting of daily returns of 8,680 actively managed equity mutual funds registered across all continents. Second, our empirical investigation is based on four different approaches namely, multifactor performance models, market timing, contingency tables, and bootstrap evaluation of fund alphas, which rules out the possibility that our results are driven by the misspecification of any model. We use the quadratic model of Treynor-Mazuy to detect market timing abilities of mutual fund managers (See, Vidal, Vidal-García and Boubaker (2015) for more details on market timing of mutual funds around the world). In addition, we employ a non-parametric methodology based on contingency tables, and supported by several statistical tests to estimate the significance of the results. Finally, we use a bootstrap technique to examine the probability that large positive alphas are caused by sampling variability.

The empirical results show a strong evidence of persistence in daily mutual fund returns over quarterly measurement periods. The evidence confirms that superior performance is a short-lived phenomenon. The top country is Brazil with a daily abnormal return from stock selection of 0.0921%, and the bottom country is Sweden

with an abnormal return from stock selection of –0.0842% per day, both are quite robust across the different performance models. Interestingly, the country with the highest persistence is New Zealand and the one with the lowest persistence is Malaysia. In contrast with previous studies, we show that persistence is present across countries, and not concentrated mainly in the top and bottom fund portfolios. Our results confirm earlier findings on short-term performance persistence (See, Bollen and Busse (2005)) and are in contrast with those of Carhart (1997), who finds no evidence of superior ability.

Moreover, we find a significant negative relation between abnormal performance and management expenses, turnover, and maximum load for most countries. All countries show a significant positive relation between abnormal performance and total fund assets, which suggests potential economies of scale in the global mutual fund market. We also examine the effect of fund characteristics on fund performance for each country and find that expense ratio, portfolio turnover, and load fees are significantly and negatively related to performance in most countries, while maximum load is positively related to it.

The rest of the paper is organized as follows. Section II describes the data and the variables used in the analysis. Section III reviews the basic models and the methodology. Section IV presents the main empirical results. Section V provides additional empirical results. The last section concludes the paper

II. Data and summary statistics

A. Data

Our dataset consists of daily returns of 8,680 actively managed equity mutual funds. The funds are registered in 35 countries across all continents: North America (Canada, United States); Europe (Austria, Belgium, Denmark, Finland, France, Germany, Italy, Netherlands, Norway, Poland, Portugal, Spain, Sweden, Switzerland, United Kingdom, Ireland, Luxembourg); Asia-Pacific (Australia, China, Hong Kong, India, Indonesia, Japan, Malaysia, New Zealand, Singapore, South Korea, Taiwan, Thailand); and other regions (Brazil, Chile, Israel, South Africa). All returns are in local

currency and are adjusted for dividend. We include only the primary share class when a fund is registered for sale in more than a single country and has multiple share classes. The returns are net of fund operating expenses (include management and distribution fees, although not sales loads). We obtain these data from Morningstar Direct database. Our time range is a 24-year period starting on January 1, 1990 and ending on December 31, 2013. Our sample of equity funds covers over 90% of the total net assets of worldwide equity funds as of December 2013, (see, Investment Company Institute (ICI) aggregate statistics). The mutual fund data coverage of Morningstar is better than other alternative data sources. In addition to returns, the Morningstar Direct database contains extensive descriptive information. We obtain, among others, time-series information on the funds´ investment sector, assets under management, fund size, and fund age.

We exclude from our sample the following funds: sector funds (e.g. technology or health care), index tracking funds, bond and money market funds, funds that invest in international equity, funds that invest in non-equity components such as convertible debt, or funds that convert to one of these types during the sample period.[2] We also apply several filters to the initial sample. First, we only consider equity funds with at least 24 months of data as a long enough return history is needed to reliably estimate a factor model regression. Second, we restrict our selection to open-end domestic equity funds as we are interested in mutual funds that invest nationally.

Survivorship bias is a serious issue in mutual fund research that has been extensively documented in previous literature (see, Elton et al. (1996a), Elton et al. (1996b), and Carhart (1997)). The survivorship bias is a property of the sample selection method and is the result of including only surviving funds in a sample. To address this important issue, we include dead funds in our sample until these are discontinued, then the portfolios are re-weighted with the surviving funds. Another relevant property to take into account in our test methodology is the look-ahead bias. This is the result of disappearing funds from the sample that do not survive after the ranking period. We implement a full look-ahead bias methodology in our sample construction, which means that we eliminate disappearing funds before the ranking process starts, eliminating observations when there is less than 20 months worth of data.

[2] We do not exclude merged and liquidated funds from our sample.

Our sample is, to the best of our knowledge, the largest and most complete database for daily mutual fund returns currently available. Although Bollen and Busse (2005), also use a daily returns database to study U.S. mutual funds. They only study 230 mutual funds from January 1985 through December 1995, whereas our study uses a longer time period and includes a much larger number of funds. Bollen and Busse (2005) do not include funds that come into existence at some point during their sample period, thus their data is limited in some respect and suffer from some selection bias. Our data set mitigates this problem as we obtain daily total returns for actively managed funds for each country irrespective of their starting date.

B. Variable Construction

In each country, we construct a daily version of the Carhart 4-factor model. For the U.S. we use the factors constructed by Fama and French (1993).[3] For the remaining countries, we construct national factors following the methodology of Fama and French (1993) by using, for each country, all stocks included in the Worldscope database (Thomson Financial Company).[4] We restrict our selection to only primary quotes of major securities and we do include dead and suspended stocks. The market excess return is calculated as the difference between the value-weighted average return of all stocks in each country and the Treasury bill rate for that country. We use the one-month Treasury bill return divided by the number of days in the month. The SMB (small minus big) factor is the average return on the three small portfolios minus the average return on the three big portfolios. The HML (high minus low) factor is the average return on the two value portfolios minus the average return on the two growth portfolios. Finally, we construct a daily version of the momentum factor of Carhart (1997). We use six value-weighted portfolios formed on size and prior returns, the momentum factor is the daily average return on the two high prior return portfolios minus the daily average return on the two low prior return portfolios.

[3] The U.S. factors are from French's website http://mba.tuck.dartmouth.edu/pages/faculty/ken.french/
[4] The Worldscope database contains over 98% of total market capitalization per country.

C. Descriptive statistics

Table 1 presents the descriptive statistics of the sample for each country. The selection of countries is based on mutual funds´ market capitalization. Table 1 provides the descriptive statistics on the sample of mutual funds.

The first column of Table 1 lists the countries covered by our sample; the second column presents the number of mutual funds for each country; the third column reports the average raw returns; the fourth column shows the average market value of assets; and the fifth column presents the average fund age in years. The largest number of mutual funds investing in domestic equity is registered in the US (5,981), while the smallest number is in Hong Kong (14). Mean returns vary significantly among countries, from –1.07% in Sweden to 1.05% for Brazil. The average fund has lost 0.08% per day in net returns over the whole sample period, and its average total net asset under management is worth $245 million. The average asset size per country ranges from $17 million for Portugal to $2,141 million for the United Sates. Finally, the fund age shows that a typical mutual fund has been active, on average, for 11 years.

III. Empirical methodology

A. Mutual fund performance measures

We examine the consistency in performance for each country by evaluating the performance across all the funds within that country. Each country consists of value-weighted returns from all the equity mutual funds registered in that country. Funds are weighted by assets under management on a daily basis. We focus on persistence in three-month period. Although investors usually evaluate performance over annual periods, using monthly returns does not allow us to examine short-term performance. We measure performance persistence using risk-adjusted returns, rank funds quarterly and then estimate three-month post-ranking performance. Abnormal returns for each fund are estimated using an asset pricing model. To examine cross-sectional variation in performance, we create aggregate measures of performance using value-weighted portfolio returns of all mutual funds on a daily basis. We use Carhart (1997) four-factor

model due to its common acceptance in the literature and its ability to explain cross-sectional variation in returns:

$$R_{it} - R_{ft} = \alpha_i + b_i (R_{Mt} - R_{ft}) + s_i SMB_t + h_i HML_t + m_i MOM_t + e_{it} \quad (1)$$

where R_{it} is the return on fund i for month t, R_{ft} is the risk-free rate and R_{Mt} is the market return over the same period, SMB_t and HML_t are the Fama-French (1993) size and book-to-market factors and MOM_t is the period t value of the Carhart (1997) momentum return, e_{it} is the regression residual, and α_i is the average return unexplained by the model. Similar to Dimson (1979) and Bollen and Busse (2005), we include lagged values of the four factors to account for the effect of infrequent trading of stocks on daily fund returns. We also use the Newey and West (1987) heteroskedasticity and autocorrelation consistent estimator of the standard deviation. We include the risk factors of Carhart´s (1997) in order not to reward fund managers for stock market systematic anomalies. Carhart (1997) shows that the momentum factor explains most of the difference in the performance of past winners and losers. Wermers (2003) shows that short-term persistence is due to the momentum strategies followed by outperforming mutual funds.

B. Market timing

We use the quadratic Treynor-Mazuy model to detect market timing abilities of mutual fund managers:

$$R_{i,t} = \alpha_i + \beta_i R_{m,t} + \gamma_i R^2_{m,t} + e_{i,t} \quad (2)$$

The gamma in Equation (2) is an estimated indicator of the fund´s market-timing performance. Treynor and Mazuy (1966) explain that a positive value for gamma is indicative of market-timing ability. The authors argue that market-timers will benefit when returns are large and positive (negative) if they increase (decrease) betas when they expect positive (negative) excess market returns. They point out that modifying the Jensen (1968) regression to include squared benchmark returns can effectively measure both market timing and security selection ability.

We also use the Henriksson and Merton (1981) model of market timing:

$$R_{i,t} = \alpha_i + \beta_i R_{m,t} + \gamma_i I_i R_{m,t} + e_{i,t} \quad (3)$$

where I is equal to one if the market´s excess return is above zero, and zero otherwise. In the Henriksson and Merton model, γ_i is the change in the portfolio´s β due to the fund manager´s timing ability.

Following Bollen and Busse (2005), we modify the two timing regressions by adding lagged values of the four factors, to account for the effect of infrequent trading of individual stocks on mutual fund returns, and including three additional explanatory variables in Carhart´s (1997) four-factor model.

To the best of our knowledge, there are no prior studies that investigate persistence in the market timing ability of mutual fund managers at a global level. Moreover, we use daily, and not monthly data to examine short-term persistence in market timing ability. Using daily data, Bollen and Busse (2005) show evidence of market timing ability in a large portion of their sample. Similarly, Chance and Hemler (2001) track the daily allocation strategies of 30 professional (non-mutual fund) market timers. The authors find a large percentage of successful market timers. Bollen and Busse (2005) point out that prior statistical tests lack power as they are based on monthly data.

C. Contingency tables

To complement our study, we examine daily mutual funds persistence through contingency tables. The contingency tables methodology is a non-parametric analysis of persistence to test the frequency with which winner or loser funds maintained that position over subsequent time periods. Contingency tables classify mutual funds as winners or losers in each time period, and the resulting combinations are counted: winner-winner (WW), loser-loser (LL), winner-loser (WL), and loser-winner (LW). Funds are classified taking into account the median fund return for each year. Contingency tables show the frequency with which winners and losers repeat. Performance persistence is present if there are a significantly larger number of observations in the WW/LL sections than in the other two. The contingency table

approach is preferred to other methods when the number of funds is limited. The contingency tables test examines the probability of a fund in a ranking position being in the same rank in the subsequent period.

We use some statistical tests to check the robustness of the performance persistence effect. To test for independence in the results from day to day, we examine the contingency table estimates by the use of the odds ratio (Brown and Goetzmann (1995)), the repeat winner approach (Malkiel (1995)), and the Chi-square statistic (Kahn and Rudd (1995). For the first test, we estimate the cross-product ratio (CPR), also known as the odds ratio (see, Brown and Goetzmann (1995)). The CPR is estimated as (WWxLL)/(LWxWL), the product of repeat winners (WW) and repeat losers (LL) divided by the product of winner-losers (WL) and losers-winners (LW). A CPR above one indicates persistence, and a value below one means a reversal in performance. Under the null hypothesis of no persistence the CPR is equal to 1. The statistical significance of the CPR can be determined by a Z-statistic. In the presence of large samples, it is normally distributed with mean the natural logarithm of CPR, while for small sample sizes results about CPRs may be misleading.

The second test is the repeat winner strategy introduced by Malkiel (1995). This test shows the proportion of repeat winners (WW) to winners-losers (WL). It employs a binomial test of p>1/2 to examine the significance of the proportion of WW to (WW+WL):

$$Z = (y - np) / \sqrt{np(1-p)} \qquad (4)$$

where Z is a statistical variable with a normal distribution (0,1), y is the number of repeat winners (WW), n is the number of repeat winners and winners/losers (WW+WL). There is presence of performance persistence when the percentage of winner portfolios to the number of repeat winners and winners/losers is above 50%.

The last statistical test is the Chi-square statistic of Kahn and Rudd (1995). The Chi-square statistic is estimated as follows:

$$Chi = (WW-D1)^2/D1 + (WL-D2)^2/D2 + (LW-D3)^2/D3 + (LL-D4)^2/D4 \quad (5a)$$

where

$$D1 = (WW+WL) \times (WW+LW)/N \quad (5b)$$

$$D2 = (WW+WL) \times (WL+LL)/N \quad (5c)$$

$$D3 = (LW+LL) \times (WW+LW)/N \quad (5d)$$

$$D4 = (LW+LL) \times (WL+LL)/N \quad (5e)$$

N is the number of funds. We use Yates's continuity correction, to adjust for small sample bias. As the Chi-square test is always positive, it is not possible to detect reversals in performance. However, Carpenter and Lynch (1999) explained that the Chi-squared test is well specified and more robust to the presence of survivorship bias in comparison to other tests of performance.

D. Bootstrap evaluation of fund alphas

We apply a bootstrap technique to the daily returns across all countries to examine the probability of large positive alphas to arise solely due to luck (sampling variability). We analyze the significance of the alphas of extreme funds, funds with large and positive estimated alphas. The post-ranking tests of return significance present a potential problem as the independence assumption, needed for a parametric test, may be violated. If there is persistence in fund performance, it is likely that alphas and abnormal returns are correlated to the alphas and abnormal returns estimated over other periods.

To examine this issue, we use the bootstrap approach of Kosowski et al. (2006). They explain that the main reasons to use the bootstrap technique for proper inference are the propensity of funds to show non-normally distributed returns, and the cross-section of funds being a combination of these fund distributions. They point out that these non-normalities are due to several reasons. First, it is likely that managers have large positions in few stocks or industries so that the central limit theorem does not approach normality in this situation. Second, returns from market benchmarks may be non-normal, and benchmark and stock returns may present co-skewness. Finally, funds can adjust their levels of risk due to changes in market risk or trying to improve their

performance. These practices could be a source of non-normally distributed mutual fund alphas. Thus, the bootstrap is essential for a proper assessment of the cross-sectional distribution of fund returns.

We implement the methodology of Kosowski et al. (2006) and bootstrap the returns of mutual funds under the null hypothesis of zero alpha and then base their inference on the whole cross-section of simulated alphas and their t-statistics. We use the Carhart four-factor model to implement this experiment and employ alphas and t-statistics in the simulation implementation. We do this for each trading day and we estimate a single bootstrap mean alpha. We replicate this procedure 1000 times and obtain the empirical distribution of the alpha mean. For each table, we present every country ranked according to their simulated alphas.

The average simulated alpha for each fund is the result of the alpha averaged across 1000 simulations. We use a variation of the bootstrap method that employs a Monte Carlo simulation of a potential missed factor in the residuals. To take into account the persistent nature of this omitted factor, we use a mean-reverting AR(1) process.

IV. Results

We examine persistence in stock selection and market timing of mutual fund managers in every country and use the four-factor model and the two timing models introduced above. We rank countries each quarter based on their stock picking and market timing performance and examine the performance of the countries during the subsequent period.

A. Daily performance persistence

Similar to Bollen and Busse (2005), we measure managerial ability in the timing models as follows:

$$r_{p,\gamma} = \frac{1}{N} \sum_{t=1}^{N} [\alpha_p + \gamma_p f(r_{m,t})] \quad (6)$$

where α_p and γ_p are calculated from the two timing models. For Treynor and Mazuy, $f(r_{m,t}) = r^2_{m,t}$; and for Henriksson and Merton, $f(r_{m,t}) = I_i r_{m,t}$. We sort funds in the stock selection model by α_p and by $r_{p,\gamma}$ in the two timing models. We also implement a mixed sort identifying each fund as either a stock picker or a market timer. We consider a fund as a market timer if the fund´s timing coefficient is statistically significant at the 5% level. Then, we classify the abnormal return for a fund as either α_p or $r_{p,\gamma}$ and rank funds based on this measure. The mixed rankings use the timing model when the γ_p is significant at the 5% level, otherwise use the α_p from the Carhart four-factor model. We estimate a separate mixed ranking for each timing model.

Table 2 shows the results for each country in the ranking quarter. The top country is Brazil with a daily abnormal return from stock selection of 0.0921%, and the bottom country is Sweden with an abnormal return from stock selection of –0.0842% per day, both are quite robust across the different performance models. We show the performance in the ranking quarter for comparison purposes with the post-ranking analysis. The post-ranking quarter, shown in Table 3, suggests that performance persists, as the averages are significantly different from zero at the 5% level for most countries, especially the top and bottom countries. The top country daily abnormal return is 0.0081% and the bottom country´s abnormal return is –0.0167% per day, the timing models present similar results. Our results are similar to Carhart (1997) and Bollen and Busse (2005), showing that the worst funds present a strongly persistent bad performance.

To further examine the impact of performance, we estimate the post-ranking daily returns and Sharpe ratios of the countries using the same quarterly sorting procedures. We also use a ranking based on prior quarter return, named R_p. In Table 4, there is some difference across the countries when ranking by R_p. The top country has 0.0425% daily return in the post-ranking quarter, while the bottom country has a 0.0355% daily return. The ranking on α_p shows a slightly larger gap, the top country has a daily return of 0.0455%, whereas the bottom country shows a 0.0335%. Table 5 shows the Sharpe ratios of the countries in the post-ranking quarter. There is also some difference across countries when ranking by returns, with 0.0531 for the top country versus 0.0464 for the bottom. The ranking based on α_p also shows a larger gap, with a

Sharpe ratio of 0.0567 for the top country and 0.0465 for the bottom. Our results show that the top country presents a superior risk-return profile.

Similar to the results of Bollen and Busse (2005), the raw returns of the top and bottom countries in the post-ranking quarter do not vary as much as the abnormal returns of the top and bottom countries. The superiority of the top country over the bottom country is then more pronounced when risk-adjusted returns are compared to raw returns. When ranking on stock selection, the difference between the top country and the bottom country in subsequent post-ranking abnormal returns due to stock selection is 0.0248% per day (See, Table 3), while the difference in post-ranking raw returns is 0.0120% daily (See, Table 4). This is due to the factor loadings being completely different for the funds in each country.

Following Bollen and Busse (2005), we provide additional evidence regarding the persistence of fund performance. We estimate the following cross-sectional regression of performance on its lagged value:

$$\text{Perf}_{i,t} = a + b\ \text{Perf}_{i,t-1} + \text{e}_{i,t} \qquad (7)$$

where $\text{Perf}_{i,t}$ is raw return. We use the Fama-Macbeth (1973) regression to avoid cross-fund correlation in the residuals of Equation (7) due to systematic misspecification that would affect performance results. We estimate the regression each quarter for every country. A positive slope coefficient would be an indication that previous performance is a predictor of the next period´s performance.

Table 6 presents the results for the cross-sectional regressions. The average slope is insignificant when we rank by return but positive and significant for the risk-adjusted performance measures, similar to the results obtained by Bollen and Busse (2005) for US mutual funds. The individual slope coefficients are positive in 60.2% of the quarters when we sort by return, and in around 73.6% of the quarters for the risk-adjusted performance measures. Our results show that ranking by return compared to abnormal return provides similar post-ranking performance, probably due to choosing similar funds.

B. Contingency tables

Table 7 shows a non-parametric contingency table of the persistence in performance of mutual fund winners and losers for every country from 1990 to 2013. The table presents the percentage of funds that are repeat winners and repeat losers and its significance, as well as the ones that are winners in one period and loser in the other period. The results from the contingency table confirm what we have found previously in the regression tests and show that short-term persistence is globally significant across countries. The ranking of countries persists and the percentage of funds repeating as winners or losers is larger than the amount of funds changing their status. We can conclude that winners will most likely remain winners and losers will possibly remain losers or might disappear. Our results suggest that mutual fund performance during the second quarter depends on the performance in the previous quarter. We, hence, reject the hypothesis of no persistence for all fund portfolios in each country.

The statistical tests are also indicative of performance persistence. These tests are robust under the assumption that fund return distribution is non-normal. The contingency table tests might need some adjustment for potential small sample bias, as this test is only valid asymptotically. To take this into account, the last column of Table 7 presents the use of Yates's continuity correction for the Chi-square test. Our repeat winners test presents a probability over 50% for most countries being in the same ranking position in the following period. The cross-product ratio is significantly different from unity, except for a few countries, all of them being statistically significant at the 5%. The chi-square test of independence is rejected for all countries, showing the presence of persistence. The number of repeat winners ranges from 44% to 87.3%, with an average over 60% in most cases. The number of repeat losers varies from 46.6% to 83.1%, with an average over 60% for most countries. The country with the highest persistence is New Zealand and the one with the lowest persistence is Malaysia. In contrast with previous studies, we show that persistence is present across countries, and not mainly concentrated in the top and bottom fund portfolios.

C. Characteristics of individual mutual funds

We examine the relation between performance and mutual fund characteristics. Mutual fund managers try to maximize expected returns net of transaction fees. Thus, expenses and turnover should not negatively affect performance. Investors would expect fund returns to increase if management expenses are high in comparison to other funds. We evaluate this claim by measuring the marginal effect of these and other variables on daily abnormal performance. Each day, we estimate the following cross-section regression:

$$\alpha_{i,t} = a_t + b_t\, x_{i,t} + \mathrm{e}_{i,t} \qquad (8)$$

where α_{it} is a conditional four-factor alpha for an individual fund and $x_{i,t}$ is a fund characteristic. The explanatory variables in the Equation (8) are:

Expense ratio$_{it}$: Expense ratio for mutual fund *i*
Turnover$_{it}$: Turnover for fund *i*
LnAssets$_{it}$: The natural logarithm of total fund assets for fund *i*
Maximun load$_{it}$: Maximum load fees fund fund *i*

Total fund assets are lagged one quarter to avoid spurious correlation (Granger and Newbold (1974)), load fees are also lagged one quarter to avoid the possibility that fund managers change the fees according to performance.

The results in Table 8 show a strong relation between all explanatory variables and fund performance. Our results are in line with previous research, Otten and Bams (2002) and Vidal-García (2013) find the same relation for European funds, while Elton et al. (1993) and Carhart (1997) document the same evidence for US mutual funds. We find a significant negative relation between abnormal performance and management expenses, turnover, and maximum load for most countries. All countries show a significant positive relation between abnormal performance and total fund assets, which suggests potential economies of scale in the global mutual fund market. The evidence about expense ratios and turnover also points that outperforming funds do

not regain their investment costs. Finally, the evidence about load fees suggests that abnormal returns decrease when load fees increase.

D. Robustness test

We examine the robustness of our results using alternative momentum factors. We use a monthly momentum factor with the returns of the previous year, although a fund manager could follow a momentum strategy employing a shorter timeframe. We examine our results with value-weighted momentum factors created monthly using estimation periods of six, three, and one month. Additionally, we generate weekly and daily momentum factors, constructed on the previous week´s and previous day´s returns respectively. We examine the quarterly performance of our sample.

For all periods, the top country generates significantly positive abnormal returns in the post-ranking quarter as shown in Table 9. We find a higher measured performance when we employ a higher frequency momentum factor. With a one-month factor, the daily α is 0.0098%, while for a one-day factor the daily α is 0.0079%. Similar to previous studies, our results show that our conclusion does not depend on the choice of the momentum factor. Thus, these results suggest that the country´s abnormal returns found at the quarterly frequency are not spurious.

E. Economic significance

The performance persistence rankings present some advantages. It allows comparison among mutual fund competitors and also allows the financial decision-makers to contrast different investment options. Our results show that our worldwide mutual fund sample shows persistence over consecutive quarters. It is of interest to know if an investor could obtain economically significant excess returns taking advantage of this evidence. Investors could potentially follow a strategy consisting in ranking funds by quarterly performance, purchasing the top ones, and rebalancing the mutual fund portfolio on a quarterly basis.

The top country generates, on average, a significant abnormal return of 52 basis points per quarter out of sample (See, Table 10). Our interest is to see whether an

investor could obtain any gain from this persistence documented in our study. Considering an investor´s strategy as described above, we need to take into account that each time an investor changes his portfolio of funds; the front-end or deferred loads could reduce his realized return. Reid and Rea (2003) point out that the average front-end sales charge for equity funds was 1.1% in 2001, which would eliminate the reported abnormal return. Focusing on no-load funds would reduce the number of candidates. In addition, each time an investor removes a fund from his portfolio, the period return is taxable. Thus, to maximize the economic significance of persistence in mutual fund abnormal returns, after taking into account transaction costs and taxes, investors could obtain superior returns by following a naïve buy-and-hold approach instead of a short-term performance-chasing strategy.

V. Short-term versus long-term performance

Similar to previous studies about short-term fund performance persistence, our results are in contrast to existing evidence. Carhart (1997) finds a monthly top-decile four-factor alpha of –0.120% sorting by prior year return and an alpha of 0.012% sorting by prior three-year return, although in both cases it is statistically insignificant. The possible sources of this difference are the same as explained by Bollen and Busse (2005) in their paper. First, we rank funds and measure performance differently than Carhart (1997). We rank funds by previous quarter risk-adjusted performance and this procedure is not possible with the monthly data of Carhart´s (1997) paper. A second possible source of the difference is that we measure post-ranking performance in a different way than Carhart (1997). He measures post-ranking performance using a concatenated series of post-ranking returns while we estimate post-ranking performance by abnormal return in the next quarter.

To examine the difference between our results and previous studies, we follow Bollen and Busse (2005) using different measurement windows time frequencies, performance measures, and return frequencies. Tables 10 and 11 show results when we measure performance over a post-ranking period. Table 10 presents results when we rank funds by abnormal return. We find that the top country obtains a statistically significant quarterly average abnormal return of 52 basis points in the post-ranking quarter, which is similar to the result presented in Table 3. The quarterly average

abnormal return decreases to 8 and 6 basis points when we increase the measurement period to one and three years, respectively, although neither is statistically significant. The timing models present similar results, although not reported for the sake of brevity. Our results confirm that superior performance is a short-lived phenomenon that can only be identified using short measurement windows. This is consistent with the use of weekly and monthly returns; the top country does not show superior performance in this case either, as the weekly or monthly returns need a larger measurement window. We examine our results using weekly and monthly data as recent studies show the importance of data frequency for hypothesis tests (See, Narayan, Narayan, and Sharma (2013); Westerlund, Norkute, and Narayan (2015); and Narayan and Sharma (2015)).

Table 11 presents the results ranking countries by return instead of abnormal return. Using daily data and quarterly periods, the estimate of post-ranking abnormal return for the top country decreases from 52 basis points per quarter when we rank on abnormal return to an insignificant 23 basis points when we rank on return. This result is consistent with the performance estimates in Tables 4 and 5, which means that the ranking based on return is not as efficient to rank funds by performance in the post-ranking period. Similar to Bollen and Busse (2005), we interpret this result as evidence that ranking by return might not be as useful to identify top performers. When we rank countries for one and three-year periods, the top country becomes insignificant and insignificantly negative, respectively.

Tables 12 and 13 present our results when we measure post-ranking performance using a concatenated time series similar to Carhart (1997). To obtain the concatenated time series, we estimate the cross-sectional average return of all funds for each country and record them for the whole sample period. Then, these returns are regressed on the Carhart (1997) four-factors. The abnormal return in the post-ranking period is never statistically significant. Table 12 presents the results when we rank countries on abnormal return, for quarterly periods the abnormal return of the top country in the post-ranking quarter decreases to an insignificant 19 basis points. Thus, we confirm the conclusion of Bollen and Busse (2005) that the concatenation procedure fails to show the measured superior performance. Table 13 ranks funds by return and also uses a concatenated time series to measure performance in the post-ranking period. In this

case, the abnormal return of the top country decreases to an insignificantly negative 17 basis points. Our evidence also confirms that the difference between our results and those of Carhart (1997) is due to the methodology that measures abnormal returns in the post-ranking period and the ranking and post-ranking periods employed in each study.

Ferson and Schadt (1996) explain the difference in performance persistence using different measurement methods based on the difference between conditional and unconditional performance measures. They show that performance of mutual funds improves when evaluated using conditional measures instead of unconditional ones. As Bollen and Busse (2005) point out in their paper, our unconditional models can be viewed as a non-parametric implementation of Ferson and Schadt´s (1996) conditional model. To evaluate how this interpretation can explain the relation between performance, horizon, and timing activity, we apply the demonstration of Bollen and Busse (2005) to our study:

Define the abnormal return of fund *i,* labelled α_i in Equation (1), over quarter *q* as

$$\alpha_{i,q} = \mu_{i,q} - \sum_{k=1}^{4} \beta_{i,k,q}\, \mu_{k,q} \qquad (9)$$

where $\mu_{i,q}$ and $\mu_{k,q}$ are the average return of fund *i* and factor *k,* respectively, and $\beta_{i,k,q}$ is the factor loading of fund *i* on factor *k* for quarter *q*. Considering the expected abnormal return for consecutive quarters:

$$E[\alpha_{i,q}] = E\,[\mu_{i,q}] - \sum_{k=1}^{4} E\,[\beta_{i,k,q}\, \mu_{k,q}] \qquad (10)$$

or

$$E[\alpha_{i,q}] = E\,[\mu_{i,q}] - \sum_{k=1}^{4} E\,[\beta_{i,k,q}]\, E[\mu_{k,q}] - \sum_{k=1}^{4} \mathrm{cov}\,(\beta_{i,k,q}, \mu_{k,q}) \qquad (11)$$

while the abnormal return estimated once over the whole period is calculated by

$$\alpha_i = \mu_i - \sum_{k=1}^{4} \beta_{i,k,}\, \mu_{k,} \qquad (12)$$

The first two terms on the right-hand side of Equation (11) are almost equal to the right-hand side of Equation (12), as the factor loading calculated over the whole period should be approximately equal to the average of the three-month factor loadings. Then, the difference between the expected quarterly abnormal return and the abnormal returns calculated over the whole period is estimated by:

$$E[\alpha_{i,q}] - \alpha_i = -\sum_{k=1}^{4} \text{cov}\,(\beta_{i,k,q}, \mu_{k,q}) \qquad (13)$$

This result means that if there is negative covariance between quarterly factor loadings and factor returns, the short-term abnormal performance could be hidden when performance is measured over a longer time period. We find an average abnormal return of 52 basis points per quarter for the top country measuring performance using daily data, as shown in Table 10. However, the abnormal return falls to 19 basis points when it is measured over the whole sample, as presented in Table 12. The difference on the left-hand side of Equation (13) is positive, which means that the fund managers show negative timing activity when measured over the whole time series with quarterly frequency data. In contrast, our previous results show a positive market timing ability when it is measured using daily returns and three-month post-ranking horizon.

Similar to previous studies on short-term fund performance, our results can contribute to explain the link between horizon and performance. Warther (1995), Ferson and Schadt (1996), and Edelen (1999) explain this link as a result of a relation between fund performance and cash-flow. They point out that when market returns are high investor subscriptions drive down the fund´s beta. Thus, the short term abnormal performance of top fund is reduced over the long term by providing liquidity to investors, allowing fund factor loadings to change at inconvenient times.

VI. Conclusion

In this article, we contribute to the debate about performance persistence by examining the issue of persistence in short-term mutual fund performance. We take advantage of a unique database of worldwide equity funds and rank countries every quarter by their abnormal return estimated over a three-month period using stock

selection, market timing, and mixed strategy models. We find that the top country shows a significant abnormal return in the post-ranking quarter of 52 basis points.

Our evidence is robust to many performance models (stock selection, market timing, and mixed strategies), which rules out the option that our results are driven by misspecification problems. In addition, we employ a non-parametric methodology based on contingency tables, and supported by several statistical tests (the repeat winner, the odds ratio, and the Chi-square) to estimate the significance of the results. The statistical tests confirm that short-term persistence is strongly significant at the 99.9% statistical level. We also examine the effect of fund characteristics on fund performance for every country. We find that expense ratio, portfolio turnover, and load fees are significantly and negatively related to performance in most countries, while maximum load is positively related.

Our results confirm earlier findings in the literature that find evidence of short-term performance persistence in the U.S. (see, Bollen and Busse (2005)) and are in contrast with those of Carhart (1997), who finds no evidence of superior ability. We test our results using Carhart´s (1997) methodology and we find that the post-ranking performance difference between the top and bottom country is substantially smaller. Furthermore, we increase the length of time of our ranking and post-ranking periods, and we also form a concatenated series of post-ranking returns to estimate performance over this time series. In the first case, we find that abnormal return disappears and we find no evidence of persistence using concatenated returns.

The economic significance of short-term persistence in fund performance is questionable. The gain from a "chasing winners" strategy of investing in a portfolio of mutual funds of the top country based on previous quarter performance is eliminated by sales loads. Thus, to maximize the economic significance of persistence in mutual fund abnormal returns, considering transaction costs and taxes, investors could obtain superior returns by following a simple buy-and-hold strategy instead of a performance-chasing approach.

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Table 1: Descriptive statistics

This table presents descriptive statistics for our sample of mutual funds. The sample period is from January 1990 to December 2013. The first column presents the number of actively managed equity mutual funds for each country. Mean return presents the average daily fund return over the entire period of study. TNA is the total net assets under management in millions of dollars. Fund age is the number of years since the fund was created.

Country	Number of funds	Mean return	TNA ($ million)	Fund age (years)
Australia	887	0.821	219	13
Austria	18	-0.031	154	12
Belgium	28	0.020	90	19
Brazil	89	1.050	108	9
Canada	911	0.153	374	10
Chile	52	-0.221	47	9
China	532	-0.595	319	4
Denmark	58	0.411	105	13
Finland	45	0.058	145	12
France	897	0.138	80	10
Germany	74	-0.094	579	17
Hong Kong	14	-0.770	516	13
India	441	0.904	91	7
Indonesia	100	0.289	103	6
Ireland	30	0.274	93	3
Israel	150	0.058	12	12
Italy	61	0.152	133	16
Japan	920	-1.080	87	12
Korea (South)	969	-0.132	78	6
Luxembourg	16	-0.365	458	12
Malaysia	187	0.112	78	13
Netherlands	26	-0.483	251	16
New Zealand	18	0.511	142	9
Norway	100	0.031	210	15
Poland	72	-0.963	105	7
Portugal	21	-0.131	17	16
Singapore	17	-0.460	134	14
South Africa	248	-0.480	136	9
Spain	133	-0.441	40	15
Sweden	176	-1.070	419	12
Switzerland	181	-0.780	276	8
Taiwan	227	0.646	52	13
Thailand	218	0.362	61	10
U.K.	903	-0.300	733	13
U.S.	5,981	0.140	2,141	12
All Countries	8,680	-0.079	245	11

Table 2: Risk-adjusted performance: Ranking quarter

This table shows average daily performance estimates during the quarterly ranking period for countries sorted according to the performance results in the ranking period. We use average simulated alphas. We assess the statistical significance of the γ_p from Equation (6) using bootstrap standard errors as in Bollen and Busse (2001). The sample period is from January 1990 to December 2013.

Performance			Market timing		Mixed	
rank	Country	Stock selection, αi (%)	TM	HM	TM	HM
1	Brazil	0.0921	0.0973	0.0980	0.0974	0.0941
2	India	0.0862	0.0923	0.0905	0.0926	0.0888
3	Australia	0.0824	0.0785	0.0843	0.0782	0.0824
4	Taiwan	0.0764	0.0735	0.0778	0.0738	0.0752
5	New Zealand	0.0754	0.0707	0.0750	0.0725	0.0758
6	Denmark	0.0714	0.0657	0.0741	0.0670	0.0735
7	Thailand	0.0705	0.0780	0.0684	0.0784	0.0634
8	Indonesia	0.0655	0.0642	0.0679	0.0643	0.0675
9	Ireland	0.0615	0.0586	0.0631	0.0567	0.0608
10	Canada	0.0545	0.0537	0.0566	0.0535	0.0544
11	Italy	0.0515	0.0483	0.0533	0.0464	0.0519
12	U.S.	0.0452	0.0471	0.0459	0.0497	0.0423
13	France	0.0411	0.0413	0.0425	0.0412	0.0408
14	Malaysia	0.0329	0.0387	0.0374	0.0387	0.0357
15	Norway	0.0257	0.0232	0.0289	0.0232	0.0256
16	Belgium	0.0217	0.0198	0.0203	0.0229	0.0282
17	Luxembourg	0.0206	0.0221	0.0255	0.0226	0.0237
18	Korea (South)	0.0123	0.0109	0.0151	0.0125	0.0139
19	Finland	0.0100	0.0083	0.0138	0.0080	0.0102
20	Israel	0.0084	0.0086	0.0105	0.0085	0.0101
21	Austria	0.0042	0.0077	0.0064	0.0094	0.0048
22	Germany	-0.0092	-0.0099	-0.0093	-0.0099	-0.0093
23	Chile	-0.0205	-0.0212	-0.0210	-0.0210	-0.0208
24	Portugal	-0.0208	-0.0211	-0.0208	-0.0211	-0.0206
25	U.K.	-0.0311	-0.0314	-0.0315	-0.0312	-0.0314
26	Spain	-0.0415	-0.0416	-0.0417	-0.0412	-0.0416
27	Singapore	-0.0418	-0.0417	-0.0419	-0.0417	-0.0417
28	South Africa	-0.0423	-0.0420	-0.0425	-0.0420	-0.0423
29	Hong Kong	-0.0627	-0.0626	-0.0629	-0.0628	-0.0626
30	China	-0.0628	-0.0620	-0.0632	-0.0625	-0.0636
31	Japan	-0.0832	-0.0837	-0.0836	-0.0837	-0.0834
32	Netherlands	-0.0835	-0.0838	-0.0837	-0.0832	-0.0836
33	Switzerland	-0.0839	-0.0842	-0.0842	-0.0840	-0.0841
34	Poland	-0.0840	-0.0844	-0.0843	-0.0844	-0.0842
35	Sweden	-0.0842	-0.0846	-0.0845	-0.0846	-0.0840
	All Countries	0.0074	0.0073	0.0086	0.0075	0.0077

Table 3: Risk-adjusted performance: Post-ranking quarter

This table shows average daily performance estimates during the following quarterly post-ranking period for countries sorted according to the performance results in the ranking period. We use average simulated alphas. We assess the statistical significance of the γ_p from Equation (6) using bootstrap standard errors. ***, **, and * indicate significance at the 1%, 5%, and 10% level, respectively. The sample period is from January 1990 to December 2013.

Performance			Market timing		Mixed	
Rank	Country	Stock selection, αi (%)	TM	HM	TM	HM
1	Brazil	0.0081***	0.0065**	0.0065***	0.0064***	0.0074***
2	India	0.0076***	0.0064**	0.0065***	0.0060***	0.0063***
3	Australia	0.0075***	0.0063**	0.0063**	0.0062***	0.0060***
4	Taiwan	0.0069**	0.0063**	0.0061**	0.0060**	0.0059***
5	New Zealand	0.0064**	0.0062*	0.0059**	0.0058**	0.0056**
6	Denmark	0.0064**	0.0060**	0.0057**	0.0053**	0.0054**
7	Thailand	0.0054**	0.0059**	0.0056**	0.0051**	0.0047**
8	Indonesia	0.0052***	0.0058**	0.0055*	0.0049**	0.0044***
9	Ireland	0.0050**	0.0055**	0.0049*	0.0047**	0.0038**
10	Canada	0.0047**	0.0045**	0.0044*	0.0044**	0.0036**
11	Italy	0.0042**	0.0034**	0.0036**	0.0032**	0.0034**
12	U.S.	0.0034**	0.0028**	0.0028*	0.0030**	0.0032**
13	France	0.0031*	0.0027**	0.0026*	0.0027*	0.0029*
14	Malaysia	0.0021**	0.0017**	0.0015*	0.0017*	0.0018**
15	Norway	0.0018**	0.0016*	0.0014***	0.0014**	0.0016**
16	Belgium	0.0016**	0.0015*	0.0013**	0.0013**	0.0016**
17	Luxembourg	0.0007**	0.0013*	0.0013*	0.0012*	0.0014
18	Korea (South)	0.0003**	0.0009*	0.0002	0.0002**	0.0003**
19	Finland	-0.0008***	0.0008*	-0.0002	0.0001*	-0.0008**
20	Israel	-0.0012***	0.0005**	-0.0003***	0.0001***	-0.0009***
21	Austria	-0.0015***	-0.0011**	-0.0015***	-0.0013***	-0.0014***
22	Germany	-0.0026***	-0.0022***	-0.0025***	-0.0026***	-0.0029***
23	Chile	-0.0027***	-0.0024***	-0.0026***	-0.0027***	-0.0028***
24	Portugal	-0.0030***	-0.0036***	-0.0039***	-0.0040***	-0.0041***
25	U.K.	-0.0032***	-0.0038***	-0.0039***	-0.0040***	-0.0042***
26	Spain	-0.0034***	-0.0040***	-0.0043***	-0.0042***	-0.0043***
27	Singapore	-0.0046***	-0.0042***	-0.0042***	-0.0043***	-0.0044***
28	South Africa	-0.0058***	-0.0052***	-0.0054***	-0.0055***	-0.0056***
29	Hong Kong	-0.0060***	-0.0055***	-0.0056***	-0.0058***	-0.0057***
30	China	-0.0062***	-0.0061***	-0.0063***	-0.0061***	-0.0062***
31	Japan	-0.0073**	-0.0074***	-0.0075***	-0.0074***	-0.0075***
32	Netherlands	-0.0074***	-0.0075***	-0.0076***	-0.0075***	-0.0076***
33	Switzerland	-0.0085***	-0.0087***	-0.0088***	-0.0085***	-0.0084***
34	Poland	-0.0096***	-0.0098***	-0.0099***	-0.0098***	-0.0099***
35	Sweden	-0.0167***	-0.0168***	-0.0168***	-0.0167***	-0.0165***
	All Countries	-0.0003	-0.0003	-0.0005	-0.0006	-0.0007

Table 4: Post-ranking period performance: Total returns

This table shows average daily total returns during the quarterly post-ranking periods for ranking of countries sorted according to performance results during the quarterly ranking period. The first column shows rankings based on return, R_p. We use average simulated alphas. We assess the statistical significance of the γ_p from Equation (6) using bootstrap standard errors. The sample period is from January 1990 to December 2013.

Performance				Market timing		Mixed	
Rank	Country	Returns. Rp (%)	Stock selection. αi (%)	TM	HM	TM	HM
1	Brazil	0.0425	0.0455	0.0448	0.0443	0.0448	0.0444
2	India	0.0423	0.0443	0.0445	0.0440	0.0445	0.0445
3	Australia	0.0418	0.0439	0.0443	0.0439	0.0440	0.0439
4	Taiwan	0.0417	0.0437	0.0438	0.0436	0.0438	0.0438
5	New Zealand	0.0415	0.0435	0.0435	0.0434	0.0436	0.0437
6	Denmark	0.0405	0.0434	0.0433	0.0433	0.0434	0.0433
7	Thailand	0.0416	0.0428	0.0429	0.0429	0.0427	0.0429
8	Indonesia	0.0415	0.0425	0.0423	0.0426	0.0426	0.0426
9	Ireland	0.0413	0.0423	0.0420	0.0422	0.0424	0.0424
10	Canada	0.0410	0.0422	0.0421	0.0422	0.0421	0.0421
11	Italy	0.0408	0.0418	0.0419	0.0417	0.0419	0.0419
12	U.S.	0.0406	0.0416	0.0415	0.0415	0.0415	0.0417
13	France	0.0400	0.0411	0.0413	0.0412	0.0412	0.0412
14	Malaysia	0.0398	0.0415	0.0412	0.0414	0.0414	0.0416
15	Norway	0.0389	0.0405	0.0411	0.0406	0.0405	0.0405
16	Belgium	0.0387	0.0403	0.0410	0.0404	0.0406	0.0405
17	Luxembourg	0.0386	0.0397	0.0398	0.0396	0.0396	0.0398
18	Korea (South)	0.0384	0.0394	0.0397	0.0395	0.0398	0.0395
19	Finland	0.0378	0.0388	0.0389	0.0389	0.0389	0.0389
20	Israel	0.0376	0.0386	0.0387	0.0387	0.0385	0.0387
21	Austria	0.0375	0.0378	0.0379	0.0377	0.0377	0.0379
22	Germany	0.0373	0.0375	0.0376	0.0376	0.0376	0.0374
23	Chile	0.0372	0.0373	0.0376	0.0374	0.0375	0.0372
24	Portugal	0.0370	0.0372	0.0375	0.0373	0.0373	0.0370
25	U.K.	0.0368	0.0369	0.0373	0.0370	0.0370	0.0369
26	Spain	0.0359	0.0360	0.0364	0.0369	0.0363	0.0368
27	Singapore	0.0367	0.0368	0.0369	0.0367	0.0369	0.0366
28	South Africa	0.0366	0.0367	0.0368	0.0366	0.0367	0.0366
29	Hong Kong	0.0365	0.0366	0.0367	0.0365	0.0365	0.0365
30	China	0.0364	0.0366	0.0367	0.0364	0.0367	0.0363
31	Japan	0.0359	0.0360	0.0362	0.0363	0.0361	0.0360
32	Netherlands	0.0357	0.0355	0.0358	0.0357	0.0354	0.0357
33	Switzerland	0.0356	0.0347	0.0348	0.0356	0.0348	0.0356
34	Poland	0.0356	0.0337	0.0336	0.0345	0.0338	0.0330
35	Sweden	0.0355	0.0335	0.0330	0.0332	0.0228	0.0330
	All Countries	0.1283	0.1263	0.1242	0.1271	0.1240	0.1254

Table 5: Post-ranking period performance: Sharpe ratios

This table shows average daily Sharpe ratios during the quarterly post-ranking period for countries sorted according to performance results during the quarterly ranking period. The first column shows rankings based on return, R_p. We use average simulated alphas. We assess the statistical significance of the γ_p from Equation (6) using bootstrap standard errors. The sample period is from January 1990 to December 2013.

Performance				Market timing		Mixed	
Rank	Country	Returns. Rp	Stock selection. αi	TM	HM	TM	HM
1	Brazil	0.0531	0.0567	0.0564	0.0560	0.0562	0.0563
2	India	0.0528	0.0554	0.0553	0.0555	0.0560	0.0561
3	Australia	0.0527	0.0547	0.0546	0.0548	0.0547	0.0547
4	Taiwan	0.0523	0.0528	0.0526	0.0525	0.0527	0.0526
5	New Zealand	0.0519	0.0529	0.0525	0.0523	0.0526	0.0526
6	Denmark	0.0517	0.0527	0.0526	0.0524	0.0524	0.0527
7	Thailand	0.0515	0.0526	0.0525	0.0526	0.0524	0.0526
8	Indonesia	0.0513	0.0524	0.0523	0.0523	0.0522	0.0524
9	Ireland	0.0512	0.0522	0.0521	0.0521	0.0520	0.0523
10	Canada	0.0514	0.0520	0.0519	0.0520	0.0520	0.0520
11	Italy	0.0498	0.0499	0.0418	0.0419	0.0419	0.0419
12	U.S.	0.0497	0.0498	0.0496	0.0498	0.0497	0.0497
13	France	0.0496	0.0497	0.0495	0.0497	0.0496	0.0496
14	Malaysia	0.0495	0.0496	0.0494	0.0495	0.0494	0.0493
15	Norway	0.0494	0.0495	0.0495	0.0493	0.0493	0.0492
16	Belgium	0.0493	0.0495	0.0492	0.0492	0.0492	0.0491
17	Luxembourg	0.0492	0.0493	0.0491	0.049	0.0491	0.0490
18	Korea (South)	0.0491	0.0492	0.0490	0.0489	0.0491	0.0488
19	Finland	0.0489	0.0490	0.0490	0.0487	0.0490	0.0488
20	Israel	0.0488	0.0489	0.0489	0.0489	0.0489	0.0487
21	Austria	0.0492	0.0493	0.0490	0.0487	0.0489	0.0486
22	Germany	0.0487	0.0489	0.0486	0.0485	0.0488	0.0486
23	Chile	0.0486	0.0487	0.0485	0.0483	0.0486	0.0485
24	Portugal	0.0485	0.0486	0.0485	0.0483	0.0486	0.0484
25	U.K.	0.0483	0.0485	0.0484	0.0484	0.0485	0.0483
26	Spain	0.0482	0.0484	0.0483	0.0482	0.0484	0.0482
27	Singapore	0.0480	0.0482	0.0482	0.0481	0.0483	0.0481
28	South Africa	0.0478	0.0479	0.0480	0.0480	0.0482	0.0480
29	Hong Kong	0.0077	0.0078	0.0077	0.0078	0.0080	0.0079
30	China	0.0075	0.0076	0.0077	0.0077	0.0079	0.0077
31	Japan	0.0073	0.0074	0.0075	0.0076	0.0078	0.0074
32	Netherlands	0.0070	0.0072	0.0071	0.0074	0.0076	0.0071
33	Switzerland	0.0067	0.0068	0.0069	0.0072	0.0068	0.0070
34	Poland	0.0066	0.0067	0.0065	0.0063	0.0065	0.0069
35	Sweden	0.0464	0.0465	0.0467	0.0462	0.0463	0.0462
	All Countries	0.125	0.177	0.105	0.115	0.124	0.115

Table 6: Cross-sectional regression tests of performance persistence

This table shows the results of cross-sectional regressions of country performance during one quarter on country performance during the previous quarter. We use average simulated alphas. We assess the statistical significance of the γ_p from Equation (6) using bootstrap standard errors. P-values are estimated using the time series standard errors of the parameter estimates as in Fama and MacBeth (1973). We report the fractions of slope coefficients that are positive (negative) and its significance at the 10%, 5%, and 1% levels. The sample period is from January 1990 to December 2013.

			Market timing		Mixed	
	Returns. Rp (%)	Stock Selection. αi (%)	TM	HM	TM	HM
Coefficient A	0.048	0.023	0.021	0.028	0.028	0.028
p-value	0.013	0.165	0.134	0.128	0.149	0.143
Coefficient B	0.028	0.176	0.164	0.163	0.157	0.153
p-value	0.118	0.000	0.000	0.000	0.000	0.000
R2	0.175	0.134	0.131	0.175	0.131	0.145
Fraction of b coefficients						
Positive	0.602	0.736	0.743	0.752	0.764	0.748
p-value < 0.10	0.364	0.311	0.410	0.344	0.289	0.367
p-value < 0.05	0.298	0.290	0.344	0.304	0.276	0.345
p-value < 0.01	0.288	0.274	0.340	0.304	0.276	0.345
Negative	0.398	0.264	0.257	0.248	0.236	0.252
p-value < 0.10	0.356	0.027	0.033	0.035	0.042	0.038
p-value < 0.05	0.389	0.034	0.029	0.025	0.034	0.024
p-value < 0.01	0.333	0.017	0.028	0.024	0.028	0.036

Table 7: Performance persistence based on contingency table

This table shows the percentage of funds that were winners in the two periods (WW), winners then losers (WL), losers then winners (LW) and losers in both periods (LL). We classify mutual funds as winners or losers for each of the consecutive quarter periods. We apply the statistical tests of Malkiel (1995), Brown and Goetzmann (1995), and Kahn and Rudd (1995). The last column presents the Chi-square statistic and the corresponding p-value considering the Yates correction for continuity. ***, **, and * indicate significance at the 1%, 5%, and 10% level, respectively.

Performance						RW			chi-sq.
Rank	Country	WW	WL	LW	LL	Z-score	CPR	Z-score	Yates
1	Brazil	68.5%	31.5%	26%	74%	4.58	3.87	3.35	40.29***
2	India	63.9%	36.1%	34.5%	65.5%	3.38	2.34	2.89	58.27***
3	Australia	67.3%	32.7%	40%	60%	2.87	4.51	2.30	74.2***
4	Taiwan	66.8%	33.2%	35.6%	64.4%	4.24	3.45	3.35	8.72**
5	New Zealand	87.3%	12.7%	30.5%	69.5%	3.10	0.98	2.54	28.3***
6	Denmark	56.8%	43.2%	32.7%	67.3%	2.56	2.29	1.99	34.7***
7	Thailand	68.4%	31.6%	46.5%	53.5%	3.05	3.21	3.28	26.51**
8	Indonesia	72.3%	27.7%	53.4%	46.6%	3.68	4.03	3.74	38.17***
9	Ireland	57.4%	42.6%	21.6%	78.4%	4.13	10.84	2.28	15.28***
10	Canada	67.3%	32.7%	32.7%	67.3%	3.89	5.33	3.54	17.32***
11	Italy	74.6%	25.4%	31.2%	68.8%	2.67	0.80	2.92	24.34***
12	U.S.	69.9%	30.1%	33.6%	66.4%	2.44	6.51	3.51	74.19***
13	France	64.8%	35.2%	37.1%	62.9%	2.59	1.23	5.37	58.10***
14	Malaysia	44%	56%	16.9%	83.1%	2.35	3.06	2.31	24.68***
15	Norway	73.5%	26.5%	43.5%	56.5%	4.12	0.78	3.25	61.20***
16	Belgium	63.4%	36.6%	26.8%	73.2%	6.15	2.94	2.69	9.32**
17	Luxembourg	67.4%	32.6%	31.6%	68.4%	5.32	1.19	3.15	28.7***
18	Korea (South)	65.7%	34.3%	33.3%	66.7%	3.67	4.32	2.33	64.72***
19	Finland	67.5%	32.5%	31.1%	68.9%	2.99	3.07	4.36	36.23***
20	Israel	71.2%	28.8%	40.7%	59.3%	3.45	1.68	1.97	17.68***
21	Austria	66.6%	33.4%	32.9%	67.1%	4.87	2.94	5.11	34.19***
22	Germany	71.1%	28.9%	25.5%	74.5%	3.82	2.63	3.15	10.15***
23	Chile	72%	28%	28.8%	71.2%	3.68	1.94	3.19	18.29***
24	Portugal	65.5%	34.5%	33.5%	66.5%	4.77	3.43	4.50	35.44**
25	U.K.	63.9%	36.1%	43.8%	56.2%	3.34	2.34	2.98	23.58***
26	Spain	71%	29%	19.9%	80.1%	2.32	3.45	3.12	36.15***
27	Singapore	68.4%	31.6%	46.8%	53.2%	3.56	2.68	4.36	19.18***
28	South Africa	66.8%	33.2%	34.5%	65.5%	2.78	3.10	3.22	59.10***
29	Hong Kong	67.6%	32.4%	32.6%	67.4%	3.23	4.06	2.54	29.15***
30	China	78.4%	21.6%	30.9%	69.1%	4.17	3.18	4.61	54.12***
31	Japan	68.2%	31.8%	50.6%	49.4%	2.56	2.66	2.97	23.69***
32	Netherlands	65.5%	34.5%	21.6%	78.4%	3.49	6.32	1.98	22.16***
33	Switzerland	67.3%	32.7%	30.9%	69.1%	2.89	4.67	3.54	19.84**
34	Poland	65.7%	34.3%	18.4%	81.6%	3.67	3.20	3.67	38.32***
35	Sweden	58.3%	41.7%	45.7%	54.3%	2.77	3.19	3.94	60.54***
	All Countries	67.72%	32.73%	33.59%	66.37%				

Table 8: Fund characteristics analysis

This table presents cross-sectional regressions for each day from January 1990 to December 2013 across all countries in our sample. The dependent variable is the conditional 4-factor alpha for each fund. The independent variables are expense ratio, turnover, the natural log of total assets, and maximum load fees. Expense ratio is management, administrative, and 12b-1 expenses divided by average total net assets. Turnover represents reported turnover. LnAssets is the natural logarithm of fund total net assets. Maximum load is the sum of maximum front-end, back-end and deferred sales charges. ***, **, and * indicate significance at the 1%, 5%, and 10% level, respectively.

Performance Rank	Country	Expense ratio	Turnover	LnAssets	Maximum Load	Adj R-sq
1	Brazil	-0.087***	-0.079**	0.089***	-0.287**	0.348
2	India	-0.213***	-0.041**	0.107***	-0.135**	0.198
3	Australia	-0.089**	-0.033***	0.241**	-0.245*	0.564
4	Taiwan	-0.037***	0.012	0.017	-0.057***	0.256
5	New Zealand	0.014*	-0.057***	1.006**	-0.243**	0.397
6	Denmark	-0.675***	-0.087***	-0.003	-0.036***	0.586
7	Thailand	-0.534***	-0.245**	0.687**	-0.073***	0.346
8	Indonesia	-1.035**	-0.078**	0.591***	-0.410*	0.497
9	Ireland	-0.067***	-0.073**	0.926**	-0.234***	0.563
10	Canada	-2.189***	-1.407*	1.336**	-0.317**	0.234
11	Italy	-0.772**	-0.621***	1.387***	-0.018***	0.267
12	U.S.	-0.623***	-1.007***	1.178**	-0.231**	0.163
13	France	-1.087***	-0.324***	0.487**	-0.263**	0.345
14	Malaysia	-1.937***	-1.356**	1.387*	-0.322***	0.558
15	Norway	-2.638**	-0.321*	0.315*	-0.283**	0.346
16	Belgium	-1.083***	-0.528**	0.856***	-0.044***	0.488
17	Luxembourg	-1.717***	-0.281***	1.876**	-0.084*	0.509
18	Korea (South)	-1.045**	-0.352**	0.467***	-0.329**	0.238
19	Finland	0.024	-0.006***	0.291**	-0.356**	0.277
20	Israel	-1.875***	-0.309**	0.077***	-0.245**	0.198
21	Austria	-1.015***	-0.186***	0.066**	-0.324**	0.356
22	Germany	-1.017**	-0.376**	1.018*	-0.523**	0.654
23	Chile	-2.059***	-0.203*	0.014	-0.323**	0.576
24	Portugal	-0.344***	-0.109*	0.153***	-0.432***	0.643
25	U.K.	-0.289***	-0.317***	0.007***	-0.392**	0.465
26	Spain	-2.087***	-0.194**	0.682**	-0.344**	0.556
27	Singapore	-3.007***	-0.456*	1.766**	-1.244***	0.345
28	South Africa	-1.037**	-0.422**	0.768***	-0.334**	0.324
29	Hong Kong	-0.986*	-0.009***	0.584***	-0.140***	0.223
30	China	-0.797***	-0.015**	0.776*	-0.087*	0.432
31	Japan	-1.245**	-0.038*	0.427**	-0.134**	0.564
32	Netherlands	-0.783***	-0.097**	1.778***	-0.019**	0.453
33	Switzerland	-1.559***	-0.067***	0.755**	-0.159**	0.227
34	Poland	-1.056***	-0.428***	0.721**	-0.134**	0.342
35	Sweden	-0.077***	0.205	0.522***	-0.111**	0.256

Table 9: Robustness test using alternative momentum factors

This table shows average daily performance estimates during quarterly post-ranking periods. The columns report the results for alternative momentum factors. We re-estimate the factors using monthly horizons or greater each month. We re-estimate the weekly factor weekly and the daily factor daily. ***, **, and * indicate significance at the 1%, 5%, and 10% level, respectively. The sample period is from January 1990 to December 2013.

Performance Rank	Country	12 mo (%)	6 mo (%)	3 mo (%)	1 mo (%)	1 wk (%)	1 day (%)
1	Brazil	0.0081***	0.0089**	0.0092**	0.0098**	0.0088**	0.0079**
2	India	0.0076***	0.0081***	0.0084***	0.0088***	0.0080***	0.0077***
3	Australia	0.0075***	0.0077***	0.0078***	0.0082***	0.0076***	0.0076***
4	Taiwan	0.0069**	0.0073***	0.0077***	0.0078***	0.0070***	0.0072**
5	New Zealand	0.0064**	0.0072**	0.0074**	0.0075**	0.0068**	0.0066***
6	Denmark	0.0064**	0.0069**	0.0072**	0.0074**	0.0065**	0.0064**
7	Thailand	0.0054**	0.0059***	0.0064***	0.0062***	0.0060***	0.0062**
8	Indonesia	0.0052***	0.0059***	0.0063***	0.0060***	0.0058***	0.0055**
9	Ireland	0.0050**	0.0058**	0.0062**	0.0058***	0.0052***	0.0053***
10	Canada	0.0047**	0.0054**	0.0060**	0.0058***	0.0050**	0.0051***
11	Italy	0.0042**	0.0049***	0.0054***	0.0056***	0.0049**	0.0047***
12	U.S.	0.0034**	0.0042**	0.0048**	0.0052***	0.0047**	0.0045**
13	France	0.0031*	0.0039*	0.0041**	0.0048**	0.0041**	0.0048***
14	Malaysia	0.0021**	0.0029**	0.0039***	0.0043***	0.0040**	0.0045**
15	Norway	0.0018**	0.0024**	0.0034**	0.0038***	0.0040***	0.0044**
16	Belgium	0.0016**	0.0019**	0.0029**	0.0032**	0.0038**	0.0042***
17	Luxembourg	0.0007**	0.0015**	0.0020***	0.0028***	0.0029**	0.0030**
18	Korea (South)	0.0003**	0.0011**	0.0018**	0.0026***	0.0024**	0.0023***
19	Finland	-0.0008***	0.0006**	0.0010**	0.0019***	0.0020***	0.0020**
20	Israel	-0.0012***	0.0005**	0.0009**	0.0012**	0.0015**	0.0013***
21	Austria	-0.0015***	-0.0013***	-0.0009***	0.0006**	0.0011**	-0.0005***
22	Germany	-0.0026***	-0.0021***	-0.0018**	-0.0020**	-0.0020**	-0.0016**
23	Chile	-0.0027***	-0.0023***	-0.0022**	-0.0022***	-0.0021***	-0.0018**
24	Portugal	-0.0030***	-0.0025***	-0.0022**	-0.0024**	-0.0021**	-0.0020**
25	U.K.	-0.0032***	-0.0028***	-0.0025***	-0.0024**	-0.0023**	-0.0020***
26	Spain	-0.0034***	-0.0037***	-0.0033***	-0.0030**	-0.0026***	-0.0022**
27	Singapore	-0.0046***	-0.0039***	-0.0034***	-0.0032***	-0.0028***	-0.0023***
28	South Africa	-0.0058***	-0.0042***	-0.0037***	-0.0035***	-0.0030***	-0.0027**
29	Hong Kong	-0.0060***	-0.0058***	-0.0044***	-0.0042**	-0.0034**	-0.0030***
30	China	-0.0062***	-0.0059***	-0.0050***	-0.0047***	-0.0037***	-0.0032***
31	Japan	-0.0073**	-0.0061**	-0.0060**	-0.0060**	-0.0048**	-0.0038**
32	Netherlands	-0.0074***	-0.0064***	-0.0061***	-0.0061***	-0.0054***	-0.0047**
33	Switzerland	-0.0085***	-0.0075***	-0.0068***	-0.0062***	-0.0060***	-0.0052***
34	Poland	-0.0096***	-0.0086***	-0.0072***	-0.0068***	-0.0061***	-0.0059***
35	Sweden	-0.0167***	-0.0160***	-0.0139***	-0.0131***	-0.0127***	-0.0119***
	All Countries	-0.0003	0.0004	0.0010	0.0012	0.0012	0.0014

Table 10: Post-ranking period performance by length of ranking and post-ranking period: Time series averages – sorting on abnormal return

This table shows average abnormal quarterly returns during post-ranking periods for the top country ranked by abnormal return during ranking periods. Abnormal return is measured using the four-factor stock selection model. The ranking and post-ranking periods have the same duration. We use average simulated alphas. We report t-statistics in parenthesis estimated using the Fama and MacBeth (1973) approach. The sample period is from January 1990 to December 2013.

	Data frequency		
Measurement interval	Daily	Weekly	Monthly
Quarterly	0.524%		
	(0.00)		
1-yr	0.083%	0.076%	
	(0.32)	(0.19)	
3-yr	0.064%	-0.056%	0.012%
	(0.34)	(-0.43)	(-0.24)

Table 11: Post-ranking period performance by length of ranking and post-ranking period: Time series averages – sorting on return

This table shows average abnormal quarterly returns during post-ranking periods for the top country ranked by return during ranking periods. Abnormal return is measured using the four-factor stock selection model. The ranking and post-ranking periods have the same duration. We use average simulated alphas. We report t-statistics in parenthesis using the Fama and MacBeth (1973) approach. The sample period is from January 1990 to December 2013.

	Data frequency		
Measurement interval	Daily	Weekly	Monthly
Quarterly	0.233%		
	(0.27)		
1-yr	0.007%	0.013%	
	(0.41)	(0.19)	
3-yr	-0.238%	-0.012%	-0.007%
	(-0.44)	(-0.40)	(-0.53)

Table 12: Post-ranking period performance by length of ranking and post-ranking period: Concatenated series – sorting on abnormal return

This table shows average abnormal quarterly returns during post-ranking periods for the top country ranked by abnormal return during ranking periods. Abnormal return is measured from the four-factor stock selection model. We estimate post-ranking abnormal returns once over the whole sample using a concatenated post-ranking return series. The ranking and post-ranking periods have the same duration. We use average simulated alphas. We report standard OLS t-statistics in parenthesis. The sample period is from January 1990 to December 2013.

	Data frequency		
Measurement interval	Daily	Weekly	Monthly
Quarterly	0.186%		
	(0.19)		
1-yr	0.070%	0.598%	
	(0.24)	(0.14)	
3-yr	-0.030%	-0.384%	-0.405%
	(-1.34)	(-0.30)	(-0.41)

Table 13: Post-ranking period performance by length of ranking and post-ranking period: Concatenated series – sorting on return

This table shows average abnormal quarterly returns during post-ranking periods for the top country ranked by return during ranking periods. Abnormal return is measured from the four-factor stock selection model. We estimate post-ranking abnormal returns once over the whole sample using a concatenated post-ranking return series. The ranking and post-ranking periods have the same duration. We use average simulated alphas. We report standard OLS t-statistics in parenthesis. The sample period is from January 1990 to December 2013.

Measurement interval	Stock selection, αi
Quarterly	0.170%
	(0.51)
1-yr	0.297%
	(0.42)
3-yr	-0.342%
	(-1.05)