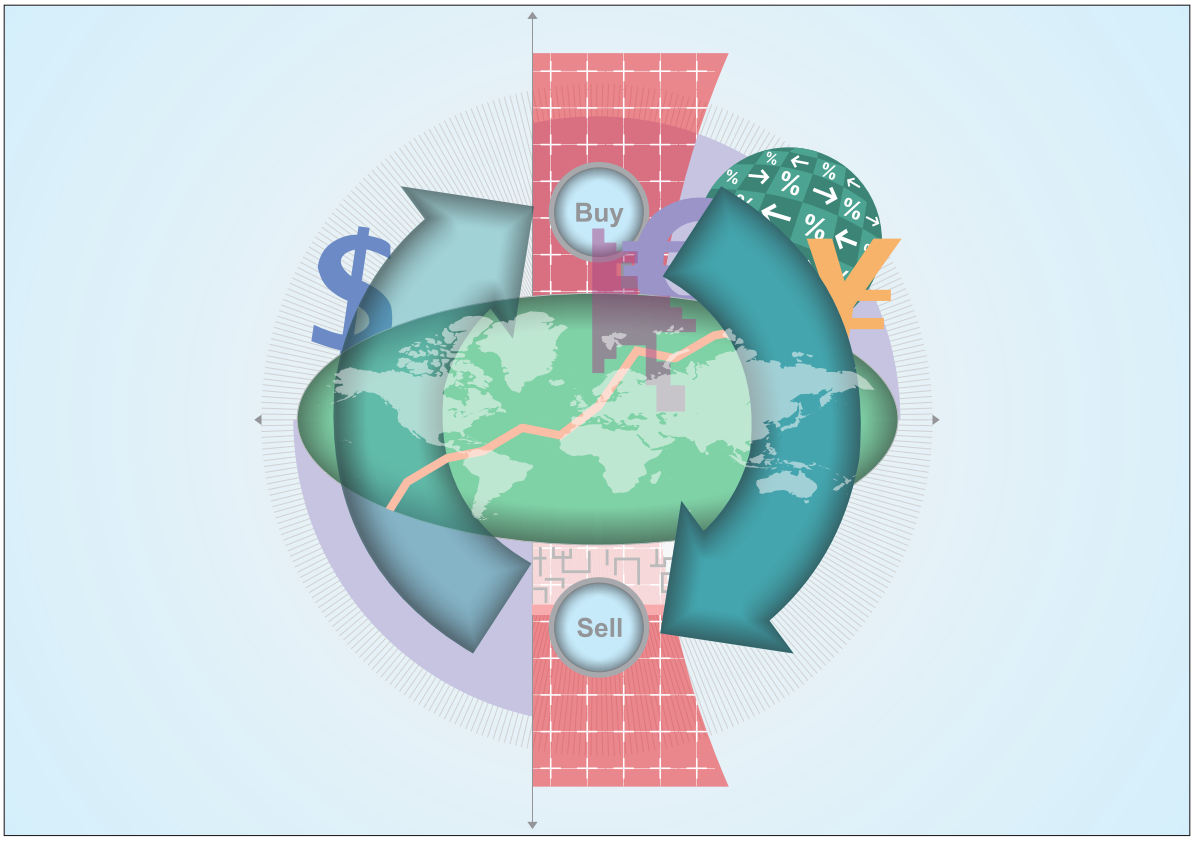


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# Behavioural Patterns in German and Spanish Equity Funds: A Comparative Study

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**Abstract:** This study tries to detect certain differences in the German and Spanish investment fund markets during the period 1995-2004. Specifically, the study compares the trends detected in both industries in two interesting financial topics such as performance persistence and the analysis of the impact of past returns on new money flows by using contingency table methodology. Present results provide evidence of higher performance persistence in the Spanish market, indicating that this market is less developed than German industry and its returns are more dependent. In trend reversal periods, negative persistence is found, probably because of its youth. In contrast, the relationship between past returns and new money flows is stronger in German funds in spite of the fact that the persistence phenomenon is weaker.

**Key words:** Equity funds, persistence, behavioural finance, contingency tables

## INTRODUCTION

The purpose of this study is to analyse the persistence phenomenon in two European countries, Germany and Spain and to study the behaviour of mutual fund investors in relation to past performance. This analysis aims to confirm the idea that the portfolio's past performance influences money flows.

This kind of study has traditionally focused on the American market; hence, this is an innovative and original study for Germany and Spain.

Past performance of a financial asset is useful when making investment decisions, since if the phenomenon of performance persistence exists, funds that have performed well in the past should be a more attractive investment alternative.

Performance persistence has been widely analysed in the financial literature with varying results. Whereas pioneering studies barely detect this phenomenon, more recent papers support its existence, mainly due to the usual absence of survivorship bias. This bias was first discarded by Grinblatt and Titman (1989). However, the consequences of this bias are not clear. Brown *et al.* (1992) claim that this bias could induce spurious persistence whereas Hallahan and Faff (2001) support the argument put forward by Grinblatt and Titman (1992), who maintain that performance reversals are induced by this bias. Meanwhile, Chevalier and Ellison (1997), Goetzmann and Peles (1997) and Sirri and Tufano (1998) conclude that the return-flow relationship is not affected by survivorship bias.

In this sense, Hendricks *et al.* (1993), Goetzmaun and Ibbotson (1994), Brown and Goetzmaun (1995) and Carhart (1997) are examples of studies that document short-run persistence whereas Grinblatt and Titman (1992) and Elton *et al.* (1996) detect long-term persistence.

The main methodologies applied by these studies are parametric methods based on regressions of the present performance against past performance and non-parametric methods based on 2×2 contingency tables. Thus, the use of 4×4 contingency tables in this study supposes a significant improvement.

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On the other hand, behavioural finance literature includes a wide range of studies showing that portfolio inflows usually display positive linear sensitivity to past performance from the earliest references by Smith (1978), Patel *et al.* (1991), Lakonishok *et al.* (1992), Ippolito (1992) and Sirri and Tufano (1992).

More recently, authors such as Del Guercio and Tkac (2002), Agarwal *et al.* (2003) and Barber *et al.* (2003) confirm this positive relationship for a set of American investment and pension funds, the hedge fund industry and the mutual fund market, respectively.

In this sense, it is interesting to note that whereas these studies use time-series regressions to detect whether investment flows are sensitive to past performance, our research examines whether the portfolios with higher returns in one period attract higher flows in the next period by using non-parametric tests.

Investment funds have experienced unprecedented growth throughout Europe and have become an important investment vehicle for German and Spanish investors. In the European investment fund industry, Germany and Spain are ranked third and seventh respectively. In 2004, the more developed German market had a market share of 16%, whereas the emerging Spanish market had a market share of 4.4%.

In 2004, €459,000 million were managed by approximately 2,300 German *Publikumsfonds*. In the same year, over 8 million investors put their money in approximately 2,500 Spanish investment funds. Total net assets managed by these funds were €219,730 million. The compound growth rate of assets under management by German funds in the last ten years is over 10%, whereas in Spain, this rate is over 13%.

The aims of this empirical study are to assess the persistence phenomenon in order to check the hypothesis that the best and worst managed portfolios in one period continue to be so in the next period and to examine the influence of past performance on new money flows to confirm the idea that investors make investment decisions bearing in mind past financial iuformation. These objectives allow us to shed light on the differences between the German and Spanish investment fund industries during the most important period of growth and development undergone by these industries.

Lower performance persistence rates are observed in German funds, probably because this market is more developed. In trend reversal periods, negative persistence is observed in the Spanish industry; however, no statistical significance is found in Germany, indicating that German management is more consistent.

We also observe that German investors also pay more attention to past returns than Spanish savers when it comes to choosing the most attractive investment fund.

## DATABASE AND FLOW MEASUREMENTS

The study includes past returns and total assets of all Spanish and German equity funds, which mainly invest in their respective domestic stock markets. Hence, the empirical results of the study are free of survivorship bias.

The research period runs from January 1995 to December 2004, a particnlarly interesting period since it covers both bullish and bearish market trends. This enables us to make an investor behaviour comparison under different macroeconomic circumstances.

Spanish data were provided by the Spanish Securities and Exchange Commission (CNMV) and German data by Bundesverband Investment und Asset Management e.V. (BVI).

Table 1 provides descriptive and summary statistics of several characteristics of the investment funds analysed. This table reflects certain differences between both markets. The number of funds has sharply increased during the sample period in the Spanish market, whereas this figure has remained stable in the German industry.

On the other hand, although the number of funds in Spain is very high, these funds managed rather less money than the German funds. These facts reflect that the Spanish investment fund industry is an emerging market in the European Union.

Table 1: Summary statistics of the investment fund samples

| Panels | Jan-1995 | Dec-2004 |
|---|---|---|
| **Panel A: German Aktienfonds** | | |
| No. of funds | 73 | 67 |
| Net assets (€ million) | 15,701 | 22,608 |
| Mean Return | 4.31% | 5.80% |
| **Panel B: Spanish equity mutual funds** | | |
| No. of funds | 81 | 146 |
| Net assets (€ million) | 1,446 | 10,204 |
| Mean Return | 11.74% | 13.07% |

Panels A and B show the German and Spanish figures, respectively. Each panel shows the number of funds in existence on the date indicated, the net assets managed and the mean return. These data are referred to the beginning and the end of the sample period

In accordance with previous literature, net money flow is defined as the change in fund size net of investment returns. This money flow can be calculated in absolute and relative terms. The relative variation of this magnitude has been calculated in order to avoid a possible size bias, since absolute variation is usually higher in top funds.

$$F'_{i,t} = \frac{TNA_{i,t} - TNA_{i,t-1} \cdot (1 + R_{it})}{TNA_{i,t-1}} \quad (1)$$

Where:

$F'_{it}$ = The net flow of money into fund i in year t in relative terms
$TNA_{i,t}$ = The total net assets of fund i in year t
$R_{it}$ = The return of fund i in year t

## MATERIALS AND METHODS

The cross-section study applies non-parametric methods in order to achieve the aforementioned aims. Firstly, 2×2 contingency tables are applied; then the analysis is extended and improved by using 4×4 tables.

Performance persistence is analysed in order to confirm the hypothesis that the best and worst managed investment funds continue to be so in the future. Furthermore, the hypothesis that fund investors make investment decisions bearing in mind past financial information is checked.

When performance persistence is analysed, 2×2 contingency tables compare performance rankings in two consecutive investment periods.

First, the funds with higher returns (Wiuners) and lower returns (Losers) in year t are determined using the median criterion. This process is then repeated for t+1.

The number of funds that are winners (or losers) in two consecutive periods are denoted by WW (LL), whereas WL (LW) represents the number of funds that were wiuners (or losers) in the first period, then losers (or winners) in the consecutive performance ranking.

However, when analysing the influence of performance on new money flows, the performance classification of the funds included in the sample in year t is compared with the ranking based on changes in net money flows into these funds the following year, t+1.

Hence, the first step is to identify the funds with higher returns (Winners) and lower returns (Losers) in year t. Then, the sample for the following year t+1 is divided in two: funds with higher values of money flows will also be denoted as winners (W) and funds with lower values of money flows will be denoted as losers (L).

Therefore, WW (LL) refers to the number of funds that are winners (or losers) in terms of their performance in t and winners (or losers) in terms of new money flows in t+1; whereas WL (LW) refers to the number of funds that are wiuners (or losers) in terms of performance in year t and losers (or wiuners) in terms of new money flows in t+1.

Once the different categories have been calculated, the statistical significance of both phenomena can be obtained using the following statistical tests.

- The Z-test for repeat winners:

$$Z = \frac{(Y - np)}{\sqrt{np(1-p)}} \tag{2}$$

Where:

Z = Distributed as normal with zero mean and standard deviation one
Y = The number of wiuner funds in two consecutive periods
n = The total number of winners in the first period
p = The probability that a winning fund will also be a wiuner in the following period (0.5 using the median criterion) under the null hypothesis of no manager skill, which implies no persistence

This test was applied by Malkiel (1995) to test performance persistence in US mutual funds.

- The Odds Ratio (OR):

$$OR = \frac{WW \times LL}{WL \times LW} \tag{3}$$

This expression is the ratio of funds that display persistence to those that do not. Using the median criterion, if the ratio is equal to one, it implies that each category has a quarter of the total number of funds and there is no persistence, hence the null hypothesis (no persistence) cannot be rejected.

A Z-statistic is calculated based on this odds ratio. This statistic follows a normal distribution (0, 1).

$$Z = \frac{\ln(OR)}{\sigma_{\log(OR)}} \tag{4}$$

This ratio was applied by Brown and Goetzmann (1995) to test performance persistence in US mutual funds.

- The $\chi^2$-statistic:

$$\chi^2 = \sum_{i=1}^{n}\sum_{j=1}^{n}\frac{(O_{ij} - E_{ij})^2}{E_{ij}} \tag{5}$$

Where, $O_{ij}$ ($E_{ij}$) is the actual (expected) frequency in the $i^{th}$ row and the $j^{th}$ column in the contingency table.

The Chi-square distribution presents (r-1)×(c-1) degrees of freedom, where, is the number of rows and c is the number of columns. Therefore, in the case of a 2×2 contingency table, this distribution presents one degree of freedom.

This test was used by Kahn and Rudd (1995) to test performance persistence in US mutual funds. The above expressions determine performance persistence and the influence of past returns on new money flows, considering consecutive periods. To conflrm whether this fact exists for the whole period analysed, Cochran's test (1954) has been applied.

This method is really for use to detect small systematic differences in the proportions of contingency tables. As far as we know, this is one of the first studies to apply this approach.

$$Y = \frac{\sum_{i=1}^{g} w_i d_i}{\left(\sum_{i=1}^{g} w_i P_i Q_i\right)^{1/2}} \tag{6}$$

Where:

$$P_i = \frac{n_{i1}p_{i1} + n_{i2}p_{i2}}{(n_{i1} + n_{i2})} \tag{7}$$

$$Q_i = (1 - P_i) \tag{8}$$

$$d_i = (p_{i1} - p_{i2}) \tag{9}$$

$$w_i = \frac{n_{i1}n_{i2}}{(n_{i1} + n_{i2})} \tag{10}$$

Y follows a normal distribution (0,1); g is the number of 2×2 tables analysed, $n_{i1}$ ($n_{i2}$) is WW+WL (LL+LW) in each contingency table and $p_{i1}$ ($p_{i2}$) is the relationship between WW (LW) and $n_{i1}$ ($n_{i2}$).

In order to confirm the persistence phenomenon and the behaviour patterns more exhaustively, quartiles were considered in each ranking. Therefore, $Q_i$ is the subset of funds included in the $i^{th}$ quartile of the rankings analysed, where, i takes values from 1 to 4.

Following this approach, non-parametric tests such as the chi-square test and the analysis of residuals suggested by Haberman (1973) are applied.

- Chi-square test

This method compares expected and observed frequencies, as in 2×2 contingency tables. For 4×4 tables space, this distribution presents nine degrees of freedom.

- Haberman's analysis of residnals (1973):

This procedure identifies the categories responsible for a significant chi-square value. Therefore, it is necessary to examine the standardised residuals, $e_{ij}$:

$$e_{ij} = \frac{n_{ij} - E_{ij}}{\left(\sqrt{E_{ij}}\right)} \tag{11}$$

Where, $E_{ij}$ ($n_{ij}$) is the expected (observed) frequency in the $i^{th}$ row and the $j^{th}$ column of the contingency table.

An estimate of the variance of $e_{ij}$ is given by the following expression:

$$v_{ij} = \left(1 - \frac{n_{i.}}{N}\right)\left(1 - \frac{n_{.j}}{N}\right) \tag{12}$$

Where:
$n_{i.}$ = Total number of observations in the $i^{th}$ category of the row variable
$n_{.j}$ = Total number of observations in the $j^{th}$ category of the column variable

Thus, for each cell in the contingency table, an adjusted residual $d_{ij}$ can be calculated, where:

$$d_{ij} = \frac{e_{ij}}{\sqrt{v_{ij}}} \tag{13}$$

When the variables that make up the contingency table are independent, the terms $d_{ij}$ are approximately normally distributed with mean 0 and standard deviation 1.

The use of the above non-parametric tests is very important in order to observe which funds (Winners or Losers or $Q_1$, $Q_2$, $Q_3$ or $Q_4$, depending on the analysis) display persistence or a relation between past performance and new money flows. This information can not be shown by using correlation tests. Hence, a significant contribution is presented by using some tests barely considered in financial literature.

## ANALYSIS OF PERFORMANCE PERSISTENCE

The analysis of 2×2 contingency tables applied to test performance persistence is shown in Table 2.

Panel A in Table 2 shows evidence of significant persistence in certain periods. In the trend reversal periods from a bullish to a bearish market and vice versa (1999-2000 and 2002-2003) the German funds do not display significant persistence.

Table 2: Spanish and German return persistence in 2×2 contingency tables

| Panels | WW | WL | LW | LL | Malkiel Z-test | B and G Z-test | K and R $\chi^2$-test | Cochran Y-test |
|---|---|---|---|---|---|---|---|---|
| **Panel A** | | | | | | | | |
| 1995-1996 | 23 | 13 | 13 | 24 | 1.667 | 2.421* | 6.068* | |
| 1996-1997 | 26 | 11 | 11 | 29 | 2.466* | 3.625** | 14.377** | |
| 1997-1998 | 26 | 16 | 17 | 27 | 1.543 | 2.137* | 4.698* | |
| 1998-1999 | 26 | 17 | 18 | 28 | 1.372 | 1.996* | 4.169* | |
| 1999-2000 | 23 | 19 | 19 | 24 | 0.617 | 0.973 | 0.976 | 5.892** |
| 2000-2001 | 27 | 13 | 13 | 27 | 2.214* | 3.062** | 9.800** | |
| 2001-2002 | 24 | 12 | 9 | 27 | 2.000* | 3.428** | 13.000** | |
| 2002-2003 | 14 | 20 | 21 | 16 | -1.029 | -1.306 | 1.845 | |
| 2003-2004 | 18 | 15 | 15 | 19 | 0.522 | 0.852 | 0.761 | |
| **Panel B** | | | | | | | | |
| 1995-1996 | 29 | 11 | 11 | 30 | 2.846** | 3.948** | 16.926** | |
| 1996-1997 | 34 | 9 | 9 | 34 | 3.812** | 5.014** | 29.070** | |
| 1997-1998 | 45 | 7 | 7 | 45 | 5.270** | 6.477** | 55.538** | |
| 1998-1999 | 45 | 23 | 23 | 45 | 2.668** | 3.703** | 14.235** | |
| 1999-2000 | 23 | 55 | 55 | 23 | -3.623** | -4.965** | 26.256** | 7.085** |
| 2000-2001 | 50 | 28 | 28 | 50 | 2.491* | 3.474** | 12.410** | |
| 2001-2002 | 44 | 29 | 29 | 44 | 1.756 | 2.465* | 6.164* | |
| 2002-2003 | 18 | 55 | 55 | 18 | -4.331** | -5.817** | 37.507** | |
| 2003-2004 | 61 | 12 | 12 | 61 | 5.735** | 7.282** | 65.781** | |

*: Persistence statistically significant at 5%; **: Persistence statistically significant at 1%.
This table is divided in two panels: The information provided in panel A relates to the German Aktienfonds, whereas the information in panel B refers to the Spanish equity investment funds. The first column of this table indicates the consecutive annual periods analysed. The next four columns show the 2×2 contingency tables obtained and the last four columns include the results of the statistical tests

Panel B shows significant persistence for all annual periods analysed. However, this persistence is negative in trend reversal periods.

Cochran's test is statistically significant in both markets, which indicates that the persistence phenomenon exists for the whole period 1995-2004.

These results are in accordance with the conclusions previously reached in financial literature confirming the existence of performance persistence in the short-term.

The results for the German *Aktienfonds* and the Spanish equity funds, using 4×4 contingency tables, are presented in Table 3 and 4, respectively.

Table 3: German return persistence in 4×4 contingency tables

| Quartiles | Q1 | Q2 | Q3 | Q4 | $\chi^2$ |
|---|---|---|---|---|---|
| **1995-1996** | | | | | |
| Q1 | 8 (2.2439)* | 7 (1.6139) | 2 (-1.5362) | 1 (-2.2805)* | 26.593** |
| Q2 | 4 (-0.2762) | 4 (-0.2762) | 6 (0.9839) | 4 (-0.4239) | |
| Q3 | 4 (-0.2762) | 6 (0.9839) | 6 (0.9839) | 2 (-1.6616) | |
| Q4 | 2 (-1.6616) | 1 (-2.2805)* | 4 (-0.4239) | 12 (4.2887)** | |
| **1996-1997** | | | | | |
| Q1 | 8 (2.9697)** | 3 (2.2368)* | 7 (-2.1215)* | 1 (-2.8325)** | 44.409** |
| Q2 | 9 (0.9916) | 6 (0.9000) | 1 (-0.2571) | 2 (-1.5412) | |
| Q3 | 2 (-1.4989) | 6 (0.3214) | 7 (2.0571)* | 5 (-0.9712) | |
| Q4 | 0 (-2.2190)* | 3 (-3.2513)** | 5 (0.1689) | 12 (5.0686)** | |
| **1997-1998** | | | | | |
| Q1 | 8 (2.4368)* | 4 (2.0970)* | 4 (-1.3092) | 6 (-3.0123)** | 60.649** |
| Q2 | 4 (2.6647)** | 10 (2.6441)** | 5 (-2.0201)* | 1 (-3.0566)** | |
| Q3 | 2 (-1.8769) | 4 (-0.9836) | 11 (2.1259)* | 5 (0.5711) | |
| Q4 | 8 (-3.0123)** | 3 (-3.5748)** | 1 (1.0894) | 10 (5.2353)** | |
| **1998-1999** | | | | | |
| Q1 | 10 (2.599)** | 5 (-0.250) | 5 (-0.250) | 2 (-2.069)* | 16.750 |
| Q2 | 7 (1.047) | 4 (-0.689) | 5 (-0.111) | 5 (-0.243) | |
| Q3 | 3 (-1.507) | 8 (1.299) | 7 (0.738) | 5 (-0.522) | |
| Q4 | 2 (-2.069)* | 5 (-0.385) | 5 (-0.385) | 11 (2.797)** | |
| **1999-2000** | | | | | |
| Q1 | 4 (-0.5580) | 8 (1.4726) | 3 (-1.2759) | 6 (0.3242) | 10.854 |
| Q2 | 4 (-0.5580) | 7 (0.8984) | 6 (0.4733) | 4 (-0.8241) | |
| Q3 | 4 (-0.5580) | 5 (-0.2499) | 4 (-0.6928) | 8 (1.4726) | |
| Q4 | 8 (1.6484) | 2 (-2.0887)* | 8 (1.4726) | 4 (-0.9579) | |
| **2000-2001** | | | | | |
| Q1 | 10 (3.1854)** | 4 (-0.4551) | 2 (-1.6685) | 3 (-1.0618) | 18.929* |
| Q2 | 5 (-0.1461) | 8 (1.6069) | 6 (0.4383) | 2 (-1.8991) | |
| Q3 | 3 (-1.1926) | 4 (-0.5963) | 7 (1.1926) | 6 (0.5963) | |
| Q4 | 2 (-1.7889) | 4 (-0.5963) | 5 (0.000) | 9 (2.3851)** | |
| **2001-2002** | | | | | |
| Q1 | 10 (3.4570)** | 5 (0.8377) | 3 (-1.3473) | 0 (-2.8284)** | 38.768** |
| Q2 | 3 (-0.9428) | 6 (1.5079) | 7 (1.0479) | 2 (-1.5713) | |
| Q3 | 4 (-0.1617) | 2 (-1.0631) | 8 (1.8741) | 3 (-0.8085) | |
| Q4 | 1 (-2.2942)* | 2 (-1.2774) | 3 (-1.4813) | 13 (5.0471)** | |
| **2002-2003** | | | | | |
| Q1 | 9 (3.044)** | 1 (-2.316)** | 1 (-2.200)* | 7 (1.571) | 20.992* |
| Q2 | 2 (-1.187) | 3 (-0.786) | 7 (1.964) | 4 (0.000) | |
| Q3 | 4 (-0.447) | 8 (1.625) | 4 (-0.608) | 4 (-0.608) | |
| Q4 | 2 (-1.442) | 7 (1.389) | 6 (0.943) | 3 (-0.943) | |
| **2003-2004** | | | | | |
| Q1 | 8 (2.595)** | 3 (-0.847) | 2 (-1.493) | 4 (-0.202) | 12.643 |
| Q2 | 3 (-0.552) | 4 (-0.039) | 6 (1.278) | 3 (-0.698) | |
| Q3 | 0 (-2.673)** | 6 (1.088) | 5 (0.443) | 6 (1.088) | |
| Q4 | 5 (0.619) | 4 (-0.202) | 4 (-0.202) | 4 (-0.202) | |

*: Persistence statistically significant at 5% **: Persistence statistically significant at 1%.

The first column of this table indicates the consecutive annual periods analysed (t, t+1) and the different quartiles (Q1,…,Q4), where, Q1 includes the best performing funds and so on. Columns 2 to 5 contain the 4×4 contingency tables obtained when comparing the performance rankings, as well as the results of the analysis of residuals, shown in brackets. As explained above, these figures identify the categories responsible for a significant chi-square value; this statistic is presented in the last column of the table

Table 4: Spanish return persistence in 4×4 contingency tables

| Quartiles | Q1 | Q2 | Q3 | Q4 | $\chi^2$ |
|---|---|---|---|---|---|
| **1995-1996** | | | | | |
| Q1 | 11 (3.622)** | 5 (0.037) | 2 (-1.756) | 2 (-1.873) | 31.530** |
| Q2 | 7 (1.232) | 6 (0.634) | 6 (0.634) | 1 (-2.461)* | |
| Q3 | 0 (-2.951)** | 7 (1.232) | 5 (0.037) | 8 (1.655) | |
| Q4 | 2 (-1.873) | 2 (-1.873) | 7 (1.067) | 10 (2.636)** | |
| **1996-1997** | | | | | |
| Q1 | 13 (4.176)** | 8 (1.512) | 1 (-2.515)* | 0 (-3.188)** | 52.333** |
| Q2 | 6 (0.361) | 7 (1.094) | 5 (-0.075) | 3 (-1.365) | |
| Q3 | 2 (-1.940) | 6 (0.510) | 9 (2.262)* | 4 (-0.789) | |
| Q4 | 1 (-2.621)** | 0 (-3.0901)** | 6 (0.361) | 15 (5.309)** | |
| **1997-1998** | | | | | |
| Q1 | 14 (3.922)** | 9 (1.307) | 3 (-1.830) | 0 (-3.399)** | 68.923** |
| Q2 | 10 (1.830) | 12 (2.876)** | 3 (-1.830) | 1 (-2.876)** | |
| Q3 | 2 (-2.353)* | 5 (-0.785) | 11 (2.353)* | 8 (0.785) | |
| Q4 | 0 (-3.399)** | 0 (-3.399)** | 9 (1.307) | 17 (5.491)** | |
| **1998-1999** | | | | | |
| Q1 | 15 (2.973)** | 11 (1.143) | 6 (-1.143) | 2 (-2.973)** | 21.176* |
| Q2 | 9 (0.229) | 10 (0.686) | 6 (-1.143) | 9 (0.229) | |
| Q3 | 6 (-1.143) | 7 (-0.686) | 9 (0.229) | 12 (1.601) | |
| Q4 | 4 (-2.508)* | 6 (-1.143) | 13 (2.058)* | 11 (1.143) | |
| **1999-2000** | | | | | |
| Q1 | 6 (-1.601) | 3 (-2.882)** | 9 (-0.320) | 21 (4.804)** | 41.538** |
| Q2 | 5 (-2.028)* | 9 (-0.320) | 15 (2.242)* | 10 (0.107) | |
| Q3 | 12 (0.961) | 16 (2.669)** | 6 (-1.601) | 5 (-2.028)* | |
| Q4 | 16 (2.669)** | 11 (0.534) | 9 (-0.320) | 3 (-2.882)** | |
| **2000-2001** | | | | | |
| Q1 | 20 (4.3768)** | 7 (-1.1743) | 5 (-2.0283)* | 7 (-1.1743) | 35.795** |
| Q2 | 13 (1.9045) | 10 (0.1465) | 6 (-2.1975)* | 10 (0.1465) | |
| Q3 | 3 (-2.8823)** | 7 (-1.1743) | 16 (2.6688)** | 13 (1.3878) | |
| Q4 | 3 (-2.8823)** | 15 (2.2418)* | 12 (0.9608) | 9 (-0.3203) | |
| **2001-2002** | | | | | |
| Q1 | 24 (6.3966)** | 7 (-0.9373) | 3 (-2.7030)** | 3 (-2.7893)** | 50.684** |
| Q2 | 7 (-0.9416) | 6 (-1.2874) | 15 (2.7403)** | 8 (-0.4981) | |
| Q3 | 3 (-2.7154)** | 12 (1.3977) | 8 (-0.3924) | 13 (1.7192) | |
| Q4 | 3 (-2.7893)** | 11 (0.8284) | 10 (0.3870) | 13 (1.5849) | |
| **2002-2003** | | | | | |
| Q1 | 4 (-2.352)* | 4 (-2.262)* | 14 (2.153)* | 15 (2.460)* | 40.856** |
| Q2 | 3 (-2.703)** | 7 (-0.836) | 12 (1.391) | 14 (2.153)* | |
| Q3 | 13 (1.711) | 14 (2.282)* | 5 (-1.727) | 4 (-2.262)* | |
| Q4 | 17 (3.335)** | 11 (0.828) | 5 (-1.820) | 4 (-2.352)* | |
| **2003-2004** | | | | | |
| Q1 | 20 (4.647)** | 13 (1.711) | 4 (-2.262)* | 0 (-4.102)** | 110.308** |
| Q2 | 12 (1.270) | 16 (3.173)** | 8 (-0.391) | 0 (-4.027)** | |
| Q3 | 5 (-1.820) | 6 (-1.282) | 17 (3.619)** | 8 (-0.496) | |
| Q4 | 0 (-4.102)** | 1 (-3.586)** | 7 (-0.937) | 29 (8.584)** | |

*: Persistence statistically significant at 5%; **: Persistence statistically significant at 1%

In the Spanish market, the chi-square statistic displays high significance in all periods, which reinforces the results obtained in the 2×2 analysis. Once more, negative persistence in periods of trend reversal is shown in Table 4.

The number of funds allocated in Q1 and Q4 in two consecutive periods is also statistically significant for almost all periods in Spain. It is also worth highlighting that negative and significant values are observed when two extremely different categories are compared, indicating that it is unlikely that a fund will change from Q1 to Q4 and vice versa.

The above analysis makes this study highly attractive, offering a wealth of potential conclusion that could not be detected without the use of 4×4 contingency tables.

The fact that the persistence phenomenon in Spain is stronger than in Germany should indicate that the German market is more developed. It should also indicate that the German market is more efficient because of fund returns are less dependent. Hence, past returns are not such an important indicator of future returns. The negative persistence displayed in periods of trend reversal is another fact that distingnishes the Spanish market.

## INFLUENCE OF PAST RETURNS ON MONEY FLOWS

This section looks at the influence of past performance on relative changes of total net assets in German and Spanish equity funds.

Table 5 shows the results of this relationship in both countries, using 2×2 contingency tables. In both countries, past returns are an important variable for investors when it comes to choosing the most attractive investment fund. Past returns seem to be more relevant in Germany than in Spain, since this influence is more significant. Moreover, this influence is observed for the whole time period in both markets.

In order to conclude this section, the influence of past returns on new German and Spanish money flows, considering 4×4 contingency tables, is shown in Table 6 and 7, respectively.

These tables reinforce the aforementioned conclusions. A stronger relationship between past returns and new money flows is observed in the German industry, indicating that German investors pay more attention to past returns in spite of the fact that return persistence is not very strong.

This conclusion is particularly interesting, because it might indicate that new money inflows could have a negative effect on German fund management since the better managed funds are the more money inflows they attract. However, they are not necessarily the best-managed funds the following year.

In addition, in periods where a significant influence is observed, the number of funds repeating in the first and the fourth quartile are also significant, showing that the best and worst managed funds in one year are the funds that pursue higher and lower money inflows. This finding is consistent with the asymmetric relationship (This relationship refers to the fact that although funds that perform well in a given period attract the largest investment inflows, funds which perform poorly are not penalized by proportionate equity fund outflows) between performance and fund flows documented in the work of Sirri and Tufano (1998) among others.

In contrast, Spanish investors do not pay as much attention as German savers to past financial information in spite of stronger return persistence.

Table 5: Investor behaviour in 2×2 contingency tables

| Panels | WW | WL | LW | LL | Malkiel Z-test | B and G Z-test | K and R $\chi^2$-test | Cochran Y-test |
|---|---|---|---|---|---|---|---|---|
| **Panel A** | | | | | | | | |
| 1995-1996 | 19 | 12 | 12 | 19 | 1.257 | 1.762 | 3.161 | |
| 1996-1997 | 21 | 18 | 18 | 21 | 0.480 | 0.679 | 0.462 | |
| 1997-1998 | 29 | 15 | 15 | 29 | 2.111* | 2.931** | 8.909** | |
| 1998-1999 | 31 | 16 | 16 | 31 | 2.188* | 3.039** | 9.574** | |
| 1999-2000 | 27 | 15 | 15 | 27 | 1.852 | 2.581** | 6.857** | 6.830** |
| 2000-2001 | 25 | 17 | 17 | 25 | 1.234 | 1.735 | 3.048 | |
| 2001-2002 | 30 | 10 | 10 | 29 | 3.162** | 4.180** | 19.278** | |
| 2002-2003 | 23 | 13 | 13 | 22 | 1.667 | 2.226* | 5.113 | |
| 2003-2004 | 19 | 16 | 16 | 19 | 0.507 | 0.716 | 0.514 | |
| **Panel B** | | | | | | | | |
| 1995-1996 | 26 | 14 | 14 | 27 | 1.897 | 2.730** | 7.741** | |
| 1996-1997 | 20 | 23 | 23 | 20 | -0.457 | -0.646 | 0.419 | |
| 1997-1998 | 25 | 27 | 27 | 25 | -0.277 | -0.392 | 0.154 | |
| 1998-1999 | 35 | 33 | 33 | 35 | 0.243 | 0.343 | 0.118 | |
| 1999-2000 | 54 | 24 | 24 | 54 | 3.397** | 4.675** | 23.077** | 3.792** |
| 2000-2001 | 42 | 36 | 36 | 42 | 0.679 | 0.960 | 0.923 | |
| 2001-2002 | 40 | 33 | 33 | 40 | 0.819 | 1.157 | 1.342 | |
| 2002-2003 | 18 | 55 | 55 | 18 | -4.331** | -5.817** | 37.507** | |
| 2003-2004 | 61 | 12 | 12 | 61 | 5.735** | 7.282** | 65.781** | |

*: Influence statistically significant at 5%; **: Influence statistically significant at 1%.
This table is divided in two panels: The information provided in panel A relates to German Aktienfonds, whereas the information in panel B refers to Spanish equity funds. The structure of this table is similar to Table 2. The first column indicates the consecutive annual periods analysed. The next four columns present the 2×2 contingency tables obtained and the last four columns show the results of the statistical tests

Table 6: German investor behaviour in 4×4 contingency tables

| Quartiles | Q1 | Q2 | Q3 | Q4 | $\chi^2$ |
|---|---|---|---|---|---|
| **1995-1996** | | | | | |
| Q1 | 7 (1.904) | 5 (0.765) | 2 (-1.268) | 2 (-1.412) | 12.445 |
| Q2 | 5 (0.765) | 2 (-1.128) | 6 (1.642) | 2 (-1.268) | |
| Q3 | 2 (-1.268) | 4 (0.257) | 4 (0.257) | 5 (0.765) | |
| Q4 | 2 (-1.412) | 4 (0.087) | 3 (-0.590) | 7 (1.904) | |
| **1996-1997** | | | | | |
| Q1 | 7 (1.112) | 4 (-0.527) | 4 (-0.527) | 5 (-0.076) | 12.671 |
| Q2 | 6 (0.682) | 4 (-0.386) | 7 (1.457) | 2 (-1.735) | |
| Q3 | 5 (0.077) | 6 (0.843) | 5 (0.228) | 3 (-1.131) | |
| Q4 | 2 (-1.858) | 5 (0.077) | 3 (-1.131) | 10 (2.893)** | |
| **1997-1998** | | | | | |
| Q1 | 9 (1.990)* | 6 (0.284) | 4 (-0.853) | 3 (-1.421) | 17.091* |
| Q2 | 6 (0.284) | 8 (1.421) | 4 (-0.853) | 4 (-0.853) | |
| Q3 | 5 (-0.284) | 4 (-0.853) | 9 (1.990)* | 4 (-0.853) | |
| Q4 | 2 (-1.990)* | 4 (-0.853) | 5 (-0.284) | 11 (3.127)** | |
| **1998-1999** | | | | | |
| Q1 | 11 (2.643)** | 5 (-0.480) | 4 (-1.030) | 4 (-1.154) | 18.412* |
| Q2 | 8 (1.171) | 7 (0.766) | 5 (-0.350) | 3 (-1.580) | |
| Q3 | 4 (-1.030) | 7 (0.766) | 6 (0.208) | 6 (0.070) | |
| Q4 | 1 (-2.782)** | 4 (-1.030) | 8 (1.171) | 11 (2.643)** | |
| **1999-2000** | | | | | |
| Q1 | 13 (4.510)** | 4 (-0.727) | 3 (-1.309) | 1 (-2.473)* | 36.000** |
| Q2 | 3 (-1.309) | 7 (1.018) | 9 (2.182)* | 2 (-1.891) | |
| Q3 | 2 (-1.891) | 8 (1.600) | 4 (-0.727) | 7 (1.018) | |
| Q4 | 3 (-1.309) | 2 (-1.891) | 5 (-0.145) | 11 (3.346)** | |
| **2000-2001** | | | | | |
| Q1 | 9 (2.366)* | 2 (-1.775) | 4 (-0.592) | 5 (0.000) | 19.226* |
| Q2 | 9 (2.060)* | 5 (-0.294) | 3 (-1.472) | 5 (-0.294) | |
| Q3 | 2 (-1.891) | 9 (2.182)* | 6 (0.436) | 4 (-0.727) | |
| Q4 | 1 (-2.473)* | 5 (-0.145) | 8 (1.600) | 7 (1.018) | |
| **2001-2002** | | | | | |
| Q1 | 9 (2.299)* | 5 (0.077) | 2 (-1.735) | 4 (-0.670) | 27.394** |
| Q2 | 7 (1.297) | 8 (2.090)* | 3 (-1.009) | 1 (-2.359)* | |
| Q3 | 0 (-2.889)** | 5 (0.392) | 8 (2.302)* | 5 (0.241) | |
| Q4 | 4 (-0.803) | 1 (-2.426)* | 6 (0.522) | 10 (2.675)** | |
| **2002-2003** | | | | | |
| Q1 | 6 (0.943) | 3 (-0.943) | 3 (-0.943) | 6 (0.943) | 9.412 |
| Q2 | 5 (0.481) | 7 (1.762) | 4 (-0.160) | 1 (-2.083) | |
| Q3 | 5 (0.154) | 3 (-1.081) | 5 (0.154) | 6 (0.772) | |
| Q4 | 2 (-1.571) | 5 (0.314) | 6 (0.943) | 5 (0.314) | |
| **2003-2004** | | | | | |
| Q1 | 6 (0.858) | 4 (-0.237) | 3 (-0.875) | 5 (0.232) | 2.547 |
| Q2 | 4 (-0.237) | 5 (0.566) | 4 (-0.084) | 4 (-0.237) | |
| Q3 | 5 (0.401) | 3 (-0.734) | 5 (0.566) | 4 (-0.237) | |
| Q4 | 3 (-1.019) | 5 (0.401) | 5 (0.401) | 5 (0.232) | |

*: Influence statistically significant at 5%; **: Influence statistically significant at 1%

Table 7: Spanish investor behaviour in 4×4 contingency tables

| Quartiles | Q1 | Q2 | Q3 | Q4 | $\chi^2$ |
|---|---|---|---|---|---|
| **1995-1996** | | | | | |
| Q1 | 8 (1.8295) | 7 (1.2320) | 2 (-1.7557) | 3 (-1.2848) | 13.127 |
| Q2 | 4 (-0.5607) | 7 (1.2320) | 6 (0.6344) | 3 (-1.2848) | |
| Q3 | 3 (-1.1582) | 4 (-0.5607) | 5 (0.0369) | 8 (1.6551) | |
| Q4 | 5 (-0.1089) | 2 (-1.8728) | 7 (1.0671) | 7 (0.9000) | |
| **1996-1997** | | | | | |
| Q1 | 5 (-0.3557) | 6 (0.3612) | 7 (0.9365) | 4 (-0.9221) | 6.155 |
| Q2 | 4 (-0.7893) | 5 (-0.0747) | 5 (-0.0747) | 7 (0.9365) | |
| Q3 | 5 (-0.2141) | 4 (-0.6590) | 7 (1.0938) | 5 (-0.2141) | |
| Q4 | 8 (1.3436) | 6 (0.3612) | 2 (-1.9399) | 6 (0.2108) | |
| **1997-1998** | | | | | |
| Q1 | 4 (-1.3074) | 11 (2.3534) | 4 (-1.3074) | 7 (0.2615) | 14.462 |
| Q2 | 7 (0.2615) | 3 (-1.8304) | 9 (1.3074) | 7 (0.2615) | |
| Q3 | 10 (1.8304) | 6 (-0.2615) | 3 (-1.8304) | 7 (0.2615) | |
| Q4 | 5 (-0.7845) | 6 (-0.2615) | 10 (1.8304) | 5 (-0.7845) | |

Table 7: Continued

| Quartiles | Q1 | Q2 | Q3 | Q4 | $\chi^2$ |
|---|---|---|---|---|---|
| **1998-1999** | | | | | |
| Q1 | 10 (0.686) | 5 (-1.601) | 14 (2.515)* | 5 (-1.601) | 19.529* |
| Q2 | 9 (0.229) | 11 (1.143) | 5 (-1.601) | 9 (0.229) | |
| Q3 | 7 (-0.686) | 12 (1.601) | 10 (0.686) | 5 (-1.601) | |
| Q4 | 8 (-0.229) | 6 (-1.143) | 5 (-1.601) | 15 (2.973)** | |
| **1999-2000** | | | | | |
| Q1 | 18 (3.5228)** | 13 (1.3878) | 6 (-1.6013) | 2 (-3.3093)** | 41.128** |
| Q2 | 9 (-0.3203) | 14 (1.8148) | 13 (1.3878) | 3 (-2.8823)** | |
| Q3 | 6 (-1.6013) | 7 (-1.1743) | 11 (0.5338) | 15 (2.2418)* | |
| Q4 | 6 (-1.6013) | 5 (-2.0283)* | 9 (-0.3203) | 19 (3.9498)** | |
| **2000-2001** | | | | | |
| Q1 | 12 (0.9608) | 10 (0.1068) | 8 (-0.7473) | 9 (-0.3203) | 9.538 |
| Q2 | 10 (0.1465) | 10 (0.1465) | 7 (-1.6115) | 12 (1.3185) | |
| Q3 | 4 (-2.4553)* | 10 (0.1068) | 14 (1.8148) | 11 (0.5338) | |
| Q4 | 13 (1.3878) | 9 (-0.3203) | 10 (0.1068) | 7 (-1.1743) | |
| **2001-2002** | | | | | |
| Q1 | 11 (0.7101) | 8 (-0.4959) | 11 (0.8284) | 7 (-1.0396) | 14.327 |
| Q2 | 14 (2.1626)* | 7 (-0.8399) | 8 (-0.3924) | 7 (-0.9416) | |
| Q3 | 6 (-1.3850) | 14 (2.2928)* | 8 (-0.3924) | 8 (-0.4981) | |
| Q4 | 6 (-1.4770) | 7 (-0.9373) | 9 (-0.0544) | 15 (2.4598)* | |
| **2002-2003** | | | | | |
| Q1 | 4 (-2.352)* | 4 (-2.262)* | 14 (2.153)* | 15 (2.460)* | 40.856** |
| Q2 | 3 (-2.703)** | 7 (-0.836) | 12 (1.391) | 14 (2.153)* | |
| Q3 | 13 (1.711) | 14 (2.282)* | 5 (-1.727) | 4 (-2.262)* | |
| Q4 | 17 (3.335)** | 11 (0.828) | 5 (-1.820) | 4 (-2.352)* | |
| **2003-2004** | | | | | |
| Q1 | 20 (4.647)** | 13 (1.711) | 4 (-2.262)** | 0 (-4.102)** | 110.308** |
| Q2 | 12 (1.270) | 16 (3.173)** | 8 (-0.391) | 0 (-4.027)** | |
| Q3 | 5 (-1.820) | 6 (-1.282) | 17 (3.619)** | 8 (-0.496) | |
| Q4 | 0 (-4.102)** | 1 (-3.586)** | 7 (-0.937) | 29 (8.584)** | |

*: Influence statistically significant at 5%; **: Influence statistically significant at 1%

## CONCLUSIONS

The differences between German and Spanish eguity fund industries point to three main conclusions.

Firstly, the persistence phenomenon is less strong in Germany than in Spain, indicating that the German market is more developed and hence the returns are less dependent.

Secondly, German fund management is more consistent, therefore special situations in trend reversal periods are not observed. Meanwhile Spanish funds display negative persistence in such periods.

Thirdly, German investors pay more attention to past returns than Spanish savers when it comes to choosing an investment fund in spite of the fact that the persistence phenomenon is weaker.

This last conclusion allows us to state the need of paying special attention to the topic of smart money in further research to contrast whether funds with larger flows subsequently obtain high performance.

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