ANATOMY OF A PERFORMANCE RACE

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Abstract

In 1998, an amendment of the German securities law introduced a new mutual fund category meant to be especially suited for private retirement savings. Within a few weeks, most fund companies that are active on the German market launched one or more funds belonging to the new category. The fund companies subsequently embarked on a performance race, which was largely fuelled by allocations of underpriced IPOs. The abnormal returns of the top five funds averaged 20% per annum. The results vividly illustrate the strength of incentives for achieving superior performance. More importantly, they cast doubts on the market's capacity to evaluate the nature of performance differentials between funds.

Key words: mutual funds, performance, tournaments, fund flows, IPO underpricing

JEL classification: G11, G23, G28

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1 Introduction

Imagine that you were to organize a tournament in which mutual fund companies compete through the performance of funds. Probably, you would restrict the range of admissible investment strategies to provide a level playing field. You would set a starting date, and you would offer attractive prizes for the winners. In effect, this is what the German government did in 1998.

In that year, an amendment of the German securities law introduced a new mutual fund category meant to be especially suited for private retirement savings. The funds are subject to several investment restrictions which are specific to this category. The equity share, for example, must not exceed 75%, and unhedged foreign currency holdings have to be below 30% of a fund's net asset value. Within a few weeks, almost all fund companies which are active on the German market launched one or more funds belonging to the new category. There was thus a clear cut starting line for the competition. The potential future market share of the funds was considerable because there were hopes that the funds receive tax privileges in the course of a reform of the German pension system. Since past performance is one determinant of mutual fund inflows, winners could expect to receive a disproportionate share of this cake.

The performance race which emerged is the subject of this clinical paper. It investigates the performance of the funds, the strategy of the top two funds, and the possible implications of the race. There are several reasons why such an investigation is useful. It gives a concrete illustration of how strongly fund managers react to incentives created by the performance sensitivity of mutual fund flows, and to what extent they can control the performance of funds. Since the analysis reveals that funds used allocations of underpriced IPOs as a means of improving performance, the paper contributes to the literature on IPO underpricing. On a more general level, the performance race provides a test of the market's capacity to evaluate performance differentials between funds. It also examines the effectiveness of government attempts to increase transparency in the mutual fund market.

The paper is embedded in a vast literature on mutual fund performance and flows. In this literature, it is customary to view the mutual fund market as a tournament. Funds with superior performance are the winners of a game whose prize are large inflows of new capital. This empirical relationship is documented in Ippolito (1992), Patel,

Zeckhauser and Hendricks (1993), Sirri and Tufano (1998) and, for the German market, Krahnen, Schmid and Theissen (1999). The evidence is supported by the survey conducted by Capan, Fitsimons and Prince (1996). It is still an open debate whether investors base their decisions primarily on raw or on risk-adjusted performance. Sirri and Tufano (1998) and Goriaev, Nijman and Werker (2002) document that both types of performance matter, while Krahnen, Schmid and Theissen (1999) conclude that investors focus on risk-adjusted returns. The issue is not critical for my analysis because conclusions do not hinge on whether performance is defined in raw or risk-adjusted terms.

As shown by Sirri and Tufano (1998), funds which are ranked low in terms of relative performance do not experience outflows to the same extent as highly ranked funds can attract inflows. An implication of this asymmetry is that low ranked funds have an incentive to gamble. Brown, Harlow and Starks (1996) as well as Chevalier and Ellison (1997) concluded that funds with a below average performance indeed tend to increase fund volatility. Recent papers have questioned this evidence on methodological grounds (Busse, 2001, and Goriaev, Nijman and Werker, 2003). Even if gambling is not prevalent, the positive performance-flow relationship rewards winning funds and thus creates incentives for achieving superior performance. Other support for the tournament interpretation comes from the observation that many mutual fund companies follow incubation strategies which create an artificial selection bias in fund performance. In their early years, incubator funds are not directly marketed. If they manage to build up a successful performance they are introduced to the public, else terminated (cf. Arteaga, Ciccotello and Grant, 1998). Incubator strategies can be ruled out for the funds analyzed in this paper.

Potential conflicts of interest between underwriting and fund management are examined by Ber, Yafeh and Yosha (2001) and Baums and Theissen (1999) for the Tel Aviv and Frankfurt stock exchanges, respectively. Ber, Yafeh and Yosha document that mutual funds tend to receive overpriced IPOs from the investment banking arm of the parent company. Baums and Theissen, by contrast, do not find that mutual funds suffer (or benefit) from IPO allocations. In the US, investment banks are currently being sued for allocating IPO shares to investors on the condition that those investors agree to return some of the gains in the form of high commissions.

The mutual fund literature has addressed several other questions. Khorana and Servaes (1999) examine determinants of mutual fund starts. Their findings are not directly relevant for this paper because the start of the funds was prompted by government regulation. Another issue is how to best measure abnormal fund performance. In the paper, I follow Grinblatt and Titman (1994), Carhart (1997) and others in using multiple portfolio benchmarks to measure abnormal returns.[1] The evidence on whether mutual funds are able to achieve superior risk-adjusted performance is mixed. While Jensen (1968) and many subsequent studies have found that mutual funds *on average* do not offer superior returns, *some* fund managers apparently do.[2] Studies of the German mutual fund market confirm these US findings. Krahnen, Schmid and Theissen (1999) document performance differentials between funds, while Stehle and Grewe (2001) find that the average fund underperforms the market.

The paper is organized as follows. Section 2 describes the data used in the analysis. Section 3 presents the setting in which the performance race began. In Section 4, I analyze the performance of mutual funds during the race. The strategy of the top two funds is examined in detail in Section 5. Section 6 discusses implications of the race, and Section 7 concludes.

2 Data

In the analysis, I use data from various sources. Monthly data on mutual fund volumes, net flows and performance is available from the German association of mutual funds (BVI). Weekly data on fund performance, index returns and risk-free interest rates are from Datastream. Data on IPOs on the Frankfurt Stock Exchange are obtained from the exchange (offer price, first trading price, lead manager), data on other IPOs from Bloomberg.

The analysis of IPO-allocations to mutual funds is based on the fund's official reports. German mutual funds are obliged to publish an annual report as well as an interim

[1] See Grinblatt and Titman (1995) for a review of performance evaluation.
[2] The literature is reviewed in Baks, Metrick and Wachter (2001).

report covering the first six months of the year. The reports contain a detailed list of the fund's holdings together with statements on any purchases or sales within the fiscal year. This information is also given for securities which are no longer held by the fund at the reporting date. The following table exemplifies the kind of information given:

Security	Holdings	Purchases	Sales
A	1000		
B	500	1000	500
C			500
D		2000	2000

Dates and the number of transactions are not reported. For security D, for example, it is indeterminate whether the 2000 shares were purchased on a single day or not. Likewise, one cannot follow that the fund initially acquired 1000 B shares and then sold 500 as there may have been repeated transactions. Finally, the data is indeterminate as to whether securities were purchased on the primary or secondary market. It is therefore impossible to identify the allocation of IPOs to a fund with certainty. However, it is possible to compute the maximum possible allocation of IPO shares. If both B and D went public in the reporting period, the maximum allocation amounts to the number of shares purchased, i.e., 1000 and 2000, respectively.

3 The setting

In 1998, an amendment of the German securities law[3] created a new legal type of mutual fund. The name of the fund type is 'Altersvorsorge-Sondervermögen'. It is mostly abridged to AS funds, and can be loosely translated as 'pension fund'. AS funds are intended to serve as a vehicle for private retirement savings. The main requirements to qualify for such a fund pertain to asset allocation. The maximum equity share is 75%, and unhedged foreign currency holdings have to be below 30% of the fund's net present value. Several restrictions pertaining to all mutual funds apply to AS funds as well. In particular, the maximum portfolio weight of an individual position is 10%; together, positions with an individual weight of more than 5% must not exceed 40% of the fund's net asset value.

[3] The amendment bears the name „3. Finanzmarktförderungsgesetz".

At the time of their introduction, AS funds did not have a material advantage against other funds when saving for retirement, nor do they have today. The idea behind the amendment was to increase transparency, and to include AS funds in the list of tax-favored saving vehicles. At that time, there was no tax deduction for precautionary investments into securities or mutual funds. Already in 1998, however, the reform of the German social security system was on the political agenda. A main point of discussion was to complement the pay-as-you-go system by funded pensions, and to support this move by widening the existing tax deductions for savings. In May 2001, the pension reform has passed. AS funds have not received any privileges relative to other mutual funds.

Most investment companies launched one or more AS funds as soon as this was possible (October 1998), including those who had previously run marketing campaigns for retirement saving plans using other mutual funds.[4] This shows the importance that the industry assigned to this fund type.

As noted in the introduction, many empirical studies document a positive relation between fund performance and fund flows. The investors' demand for performance information is catered for by the financial press and by companies like Lipper, Micropal and Morningstar. A mutual fund company thus has an incentive to outperform the competitors' funds as this tends to increase the inflow of funds and ultimately, through management fees, the companies' value as a concern. The quest for performance can manifest itself in several ways. Mutual fund companies sometimes launch funds which are not immediately open to sale. If a fund achieves superior performance, it is marketed to the public. If not, it is closed (Arteaga, Ciccotello and Grant, 1998). Increasing risk is another means of achieving superior performance as long as it is raw rather than risk-adjusted performance which matters to the investors (see Sirri and Tufano, 1998, and Goriaev, Nijman and Werker, 2002). Another possibility is to exploit market misvaluations. In an efficient market, the costs of uncovering such misvaluations should equal the gains. A fund company, however, may subsidize individual funds by spreading research costs across all funds and allocating `the best ideas' only to a few. Finally, funds can benefit from the allocation of underpriced initial public offerings.

[4] DWS, for example, had promoted the concept of a saving plan based on standard equity and fixed income funds.

For several reasons, both the incentives for superior performance and the means for achieving it were particularly strong in the case of AS funds. Through the legal restrictions on asset allocation, AS funds constitute a relatively homogenous group.[5] The higher the funds' homogeneity, the lower will be investor concerns that superior performance is due to differences in investment styles, rather than being due to superior fund management abilities. In addition, there was a positive probability that the fund category would receive a favorable tax-treatment which other mutual funds do not get. Investment companies thus could not rely on having *some* winning funds to advertise because it could have been important to have a good performing fund in this *particular* category. The potential inflows to AS funds were difficult to estimate as they heavily depended on political decisions. The largest German fund company, DWS, estimated that a policy reform could lead to additional fund inflows of €8 billion in 2001 and €50 billion in 2008. As the inflows to Germany-based mutual funds totaled €38 billion in 1999[6], these figures show the potential importance of AS funds.

In contrast to their enormous market potential, the size of AS funds was small. The median size of all AS funds was €5.9 million in December 1998, and €22.1 million in December 1999. The smaller a fund, the less costly it is to foster it through cross-subsidization, and the fewer underpriced issues are needed to produce a given percentage increase in the fund's value. In addition, the introduction of AS funds coincided with a hot issue market in Germany. From October 1998 to July 2000, there were 276 IPOs on the Frankfurt Stock Exchange, compared to 70 in the years 1995 to 1997. The average initial return (defined as first market price/offer price – 1) was 44.47%, and only 9.78% of all IPOs began trading below the offer price. This describes the setting in which the performance race began.

[5] This is particularly true for those funds whose announced average equity share is close to 75%. Fund managers cannot exceed this share, which is legally binding, and they are not likely to go substantially below. Many investment companies issued two AS funds which differ in their average equity share, so that large asset allocation changes would compromise the difference between the companies' own products.
[6] Source: Monthly reports of the Deutsche Bundesbank.

4 The performance of AS funds

The first AS fund was launched on October 16, 1998. By November 11 of the same year, the five largest German mutual fund companies (in terms of money under management) had all launched at least one AS fund, and the total number was 25. From November 1998 to June 2000, the number of funds increased by only ten. I therefore decided to start the performance analysis on November 11, 1998. It ends on June 28, 2000, at a time the hot issue market had already cooled down.

The funds' performance is set against a representative set of equity and bond indices. I choose the CDAX, the broad market index of the German stock exchange, the NEMAX All Share, which tracks the technology segment of the Frankfurt stock exchange (i.e. the 'Neuer Markt'), the FTSE Eurobloc and World indices, the NASDAQ composite, and the REX, which tracks German government bonds.[7] All indices except for the NASDAQ composite are performance indices, and they are converted to Euro if dominated in US Dollar. Inclusion of the NASDAQ is motivated by the technology boom and the fact that the holdings of several funds include US technology stocks. For the purpose of comparison, I also analyze the performance of a group of other mutual funds. Specifically, I take those which the statistic of the German mutual fund association classifies as equity or balanced funds investing in Germany or Eurozone countries.

Figure 1 visualizes the performance of the two fund groups by plotting weekly raw returns against weekly standard deviation. In Figure 1a, this is done for AS funds, in Figure 1b for the selected other equity funds. Even though AS funds cannot hold more than 75% equity, and stock markets rallied in the period under analysis, several AS outperformed stock market indices without taking on more risk. The return of the top performing AS funds is only slightly below the NASDAQ and the Neuer Markt indices, but at a considerable lower risk. The AS funds with below average returns, too, are attractive from a risk-return perspective. None of the funds is dominated by any of the chosen indexes in terms of risk and return. Looking at the group of general equity and balanced funds, a different picture emerges. There are few funds which dominate the indices, while many are dominated.

[7] Using blue-chip indices (DAX 30, EuroStoxx 50, NEMAX 50, NASDAQ 100) instead of the broad market indices does not change conclusions.

The examination of the risk-return profiles already suggests that AS funds exhibited an unusual performance. To put this interpretation on solid grounds, I estimate risk-adjusted returns for each fund, and test for the significance of abnormal returns. Specifically, I use a multi-factor model to analyze individual excess fund returns:

$$R_j = \alpha_j + \beta_1 R_{CDAX} + \beta_2 R_{NEMAX} + \beta_3 R_{FT\text{-}Euro} + \beta_4 R_{FT\text{-}World} + \beta_5 R_{NASDAQ} + \beta_6 R_{REX} + D\,[\beta_7 R_{CDAX} + \beta_8 R_{NEMAX} + \beta_9 R_{FT\text{-}Euro} + \beta_{10} R_{FT\text{-}World} + \beta_{11} R_{NASDAQ} + \beta_{12} R_{REX}] + u_j \quad (1)$$

where

R_i = the excess return of fund j (fund return minus weekly risk-free interest)
R_{CDAX} = the excess return of the CDAX
R_{NEMAX}= the excess return of the NEMAX
R_{Euro} = the excess return of the FTSE-Eurobloc
R_{World} = the excess return of the FTSE-World
R_{NASD} = the excess return of the NASDAQ Composite
R_{REX} = the excess return of the REX bond index
D = a binary variable equal to zero in the time from 11/18/98 to 09/01/99, and one otherwise.

The parameters are estimated with ordinary least squares (OLS). The regression equation allows for a change of factor sensitivities halfway through the period. The main motivation is that the boom of technology stocks lead many fund managers to increase investments in such stocks. One example is ADIG AS Aktiv Dynamik, the top performing AS fund. From the fund's annual reports, the fund's investment in technology segments (Neuer Markt, other European New Markets, and NASDAQ) amounted to 3.07% of net asset value in June 1999, and 17.77% in June 2000.

One may object that the regression specification, whose generality comes at the cost of loosing degrees of freedom, makes it difficult to detect statistically significant abnormal returns. If this were the case, it would support the conclusions of the paper because AS funds will be found to have achieved abnormal returns. The performance of other mutual funds, however, is not superior, which is why I use the following, more parsimonious specification to strengthen confidence in the results:

$$R_j = \alpha_j + \beta_1 R_{CDAX} + \beta_2 R_{NEMAX} + \beta_3 R_{FT\text{-}Euro} + \beta_4 R_{REX} + u_j \quad (2)$$

The estimated coefficient $\hat{\alpha}_j$ represent a fund's abnormal performance as a weekly risk-adjusted return. Its significance is tested using a standard t-test. Since I conduct

separate regressions for all AS funds as well as for the group of other funds, one should expect significant test statistics even if the mean abnormal performance of each fund is zero. A conservative way of maintaining a constant significance level is to use Bonferroni t-statistics. For a given significance level *s*, they employ the (*s*/*r*)-point of the distribution where *r* is the number of individual tests.

Table 1 summarizes the results of the regressions (1). For AS funds and the group of other mutual funds, it lists the cross-sectional mean of the abnormal performance measure $\hat{\alpha}$ and the frequency with which individual test-statistics are significant. The latter is done for various confidence levels, and for both standard and Bonferroni t-statistics. The mean of the AS funds' alphas is 0.12%, which corresponds to an annualized abnormal performance of 6.51%. At conventional significance levels, 36% of all AS funds exhibit positive abnormal returns which are significant on the 10% level. By contrast, only 6.8% of the other funds achieved alphas which are significant at the 10% level. A similar picture emerges for significance levels of 1% and 5%. When applying Bonferroni t-statistics, there are still two AS funds whose return is significantly different from zero at the 5% level or better. Among the group of equity and balanced funds, there is no fund whose alpha is significant based on Bonferroni t-statistics. The average performance of the equity and balanced funds is close to that of the AS funds. If the full multi-factor model (1) is applied to estimate abnormal returns, however, the mean alpha reduces from 4.57% to 1.43% p.a; a t-test for the equality of means (allowing for unequal variances) rejects the hypothesis that the alphas are equal across the two groups at the 2% level.[8]

The analyses thus show that the group of AS funds contains a disproportionate number of funds with an exceptional performance. This is true for both raw and risk-adjusted returns. An obvious interpretation is that the market potential of AS funds incited a race for performance which made German fund companies devote resources to these funds in order to achieve top rankings. Alternatively, one could premise that mutual fund companies built up a cushion to avoid bad absolute performance in volatile market environments. If the AS funds were to receive tax-privileges at some time in the future, it would be detrimental if the performance

[8] This figure could misstate actual significance because of cross-sectional dependence. Some companies manage several funds, and funds may tend to herd on styles and individual securities.

figures would be disappointing due to a market downswing. This is especially true as insurance companies, the main competitors of mutual funds when it comes to retirement savings, offer a guaranteed minimum return. For two reasons, I favor the interpretation of the evidence as a race for relative performance. First, the median annual abnormal return of 3.5% provides only limited protection against major market declines. More importantly, the performance differentials between AS funds are substantial. This is evident in the cross-sectional dispersion of alphas, which is 0.0021 for AS funds against 0.0015 for the group of other funds. A test for the equality of these dispersion figures rejects the null hypothesis of no difference at the 1% level.

In Table 2, the five best performing AS funds as well as the median AS fund (in terms of raw performance) are examined in detail. The ranking according to the fund's alphas largely mirrors the absolute performance ranking. Taking individually, all five funds exhibit abnormal returns which are significant at the conventional 5% level or better. Intriguingly, the fund company DWS has two funds among the top 5. These two funds differ by their benchmark equity share, which is 75% for VORSORGE AS DYNAMIK, and 50% for VORSORGE AS FLEX. The other three AS funds have a benchmark share of 75%. Note the dramatic difference between the funds' performance and that of broad market indices. The AS fund ranked five beat standard benchmark indices by 40 percentage points or more, but lags nearly 70 percentage points behind the best performing AS fund. Even funds that managed to dwarf index returns appear to be losers of a performance race because their distance to the leader of the peer group is substantial.

In the following I will examine the dynamics of the performance race. To begin the analysis, Figure 2 graphs the performance evolution over the 85 weeks, both for total raw returns and for cumulative abnormal returns. Cumulative abnormal returns are computed by compounding the weekly abnormal returns from the multi-factor regression (1). More precisely, the cumulative abnormal return CAR at time τ is given by

$$CAR_\tau = \prod_{t=1}^{\tau}(1+\hat{u}_t+\hat{\alpha}) \quad - \quad 1 \qquad (3)$$

Figure 2a, which shows raw performance, also depicts the raw performance of that fund which, in time t, had the best performance besides the ADIG and the DWS fund. In March 1999, the DWS fund started to build a performance advantage against its competitors, which it maintained until December 1999. It was briefly overtaken by another fund, regained the lead, but then lost it to the ADIG fund. The ADIG had lagged behind the top funds until July 1999, and overtook them only in March 2000.

Figure 2b depicts the evolution of cumulative abnormal returns for the ADIG and the DWS fund. It also includes standard deviation bands which give an indication on the significance of observed abnormal returns. These are based on a per annum volatility of 10%, which is close to the funds' residual volatilities reported in Table 2; the standard deviation is adapted to the time horizon T by multiplying annual volatility with the square root of T. The DWS fund crossed the two standard deviation band already in February 1999, so that an observer may have concluded at this early time that the exceptional performance of the fund was not due to chance. The ADIG fund, on the other hand, traversed the one standard deviation band only in July 1999. The increase in abnormal performance is more steady for the DWS fund. Much of the ADIG performance is due to a spurt in February and March 2000.

An interesting question is how the overall speed of the race evolved over time. A decisive characteristic of a race is that participants respond to the moves of their competitors. Since the DWS made a breakaway at an early stage of the race, and managed to maintain a high pace, one should expect the average speed to increase if the other funds were indeed trying to catch up. To examine changes in the average speed of the race, I look at the mean weekly abnormal returns of those funds which, in the previous week, ranked among the top three in terms of cumulative raw performance. To avoid overfitting of the data, I use a parsimonious model to estimate the evolution of speed. I fit a linear spline function which allows for a one-time continuous change in the trend describing abnormal returns. This can be achieved by regressing weekly abnormal returns on a constant, time, and time minus the threshold date which marks the change in speed. The threshold is chosen to match the end of the 2000 hot issue market. In the week from 03/22/00 to 03/29/00, the average underpricing of German IPOs was 9.6% compared to 102.9% in the preceding eight weeks. The threshold date is thus set to 03/29/00. The results of the regression are as follows (t-statistics in parentheses):

Mean AR_t (top 3 funds in t-1) = -.00010 + .00014 t - .00117 (t - threshold date)
(-0.058) (2.724) (-2.962)

R^2 = 0.1186, N=84 (4)

where inference is based on the White-correction for heteroscedasticity. Figure 3 plots the weekly abnormal returns, the fitted trend as wells as the 95% confidence band for the fitted trend. Both at the beginning and the end of the period, estimated mean abnormal returns are not significantly different from zero. In between they increase to a maximum of 0.94% per week, which is equivalent to 62.89% per annum. This figure is not due to outliers or a misspecification of the trend: in the ten (twenty) weeks before the threshold date, the median of the average weekly abnormal returns of the top three funds is 1.25% (0.99%). The picture is consistent with the interpretation that the breakaway of the DWS fund and its subsequent good performance led to a steady increase in the speed of the race. Several, not exclusive explanations can be offered for the finding that the race slowed down 14 months after the start. The higher the pace of the race, the higher is the probability that the nature of the race becomes obvious, and investors do not take the performance as an indication of superior fund management qualities. As an outperformance of more than 60% per annum seems hard to justify by referring to superior management qualities, this reasoning might have lead fund managers to slow down. Second, the possibilities of achieving outperformance were reduced. As will be detailed in section 3, it appears that much of the funds' abnormal performance was due to allocations of underpriced IPO stocks. The hot issue market, however, began to cool down in March. While the median underpricing of German IPO's was 56.64% from January to March 2001, it was only 10.34% in the subsequent three months. In addition, the volume of the AS funds was growing consistently, making it more expensive to subsidize the fund's performance through allocations of IPO stocks or research ideas. Finally, the threshold is close to the date on which the ADIG gained the lead for the first time. Another interpretation of the evidence is therefore that the competitors yielded the lead to the fund which, by making up a lot of ground in a fairly short period of time, had demonstrated its determination to win. From the February 16 to March 22, the cumulative abnormal return of the ADIG fund was 17.79%, while that of the DWS fund was only 6.37%.

5 The strategy of the top three AS funds

As noted in section 3, there are various ways in which a fund company might try to achieve superior performance for their funds. One is to choose risky investment strategies with high expected returns. The analysis of abnormal returns, however, suggests that the exceptional absolute performance is not due to such a strategy. Subsidizing funds by a allocating disproportionate amount of research ideas seems possible in principle, but is hard to document. This leaves the allotment of underpriced IPO shares as a potential source of outperformance. In the following, its empirical relevance will be examined for the top three funds, which are ADIG AS AKTIV DYNAMIK, DWS DYNAMIK AS and DEKA PRIVATVORSORGE AS.

The data published by the fund companies do not allow the exact identification of such IPO allocation because the fund reports contain only the total number of shares purchased during the reporting period. However, one can compute the maximum possible gain from an underpriced IPO. Whenever the reports document the purchase of a stock whose first trading day falls into the reporting period, I define the possible gain from an IPO allocation of stock i as follows:

$$IPOGAIN_i = \text{number of shares purchased} \times [\text{first market price - offer price}] \quad (5)$$

Based on this *IPOGAIN*, the contribution of IPO allocations to the abnormal performance of fund *j* in period *t* is taken to be:

$$IPOCONTRI_{jt} = \frac{\sum_i IPOGAIN_{ijt}}{fund\ volume_{jt}}, \quad (6)$$

that is, the sum of possible IPO gains in period t is divided by the fund volume in period t. The analysis is done on a weekly basis, with one period covering the seven days from Wednesdays to Tuesdays. Since I have only month-end values for fund volumes, I linearly interpolate to obtain daily values.

Table 3 summarizes the two variables along with other information. The assumed IPO allocations are spread across a large number of stocks. The ADIG fund reports purchases of 195 funds which went public during the reporting period, for DWS and DEKAN this number amounts to 153 and 42, respectively. The total possible gains from IPO allocations amount to 13 million Euro for the ADIG fund, 24 million for the DWS fund, and 16 million for the DEKA fund. In terms of the contribution to fund

performance, the possible return produced through underpriced IPOs is 57.9% (ADIG), 45.5% (DWS), and 14.9% (DEKA). From Table 2, the observed cumulative abnormal return over 85 weeks is 67.8%, 45.5% and 33.1% for the ADIG, DWS and DEKA fund, respectively. For each fund, the hypothetical gains from IPO allocations could thus explain a large part of the observed abnormal returns.

To examine the relationship between fund returns and possible IPO gains in more detail, I run the following regressions for each fund:

$$\hat{u}_t + \hat{\alpha} = \gamma + \partial\, IPOCONTRI_i + v \qquad (7)$$

where $\hat{u}_t$ are the residuals from the multi-factor regression (1) and $\hat{\alpha}$ is the estimated mean abnormal return from the same regression. I thus regress the one-week abnormal return on the possible performance gains from IPOs during the week. If the abnormal performance was produced solely through IPO allocations, the coefficient γ should be zero, while δ should be equal to one. The regression, however, is likely to suffer from measurement error in the independent variable *IPOCONTRI*. Even if the fund was indeed allocated IPOs and benefited from underpricing, it may not have received underpriced shares in all cases where a stock purchase and an IPO fell in the same reporting period. Rather, some of the purchases could have been made after the IPO. In addition, since I interpolate monthly net asset values in the coomputation of *IPOCONTRI*, the variable will be measured with error even if the fund indeed received the hypothesized allocation. From econometric analysis[9], one should therefore expect the estimated coefficient δ to be downward biased. The constant γ will be biased as well. To mitigate this problem, I use an instrumental variable (IV) estimator for regression (7). For each fund, I use the money left on the table in German IPO's during week t as an instrument for *IPOCONTRI*.[10] It seems to be a useful instrument because, for a fixed number of investors, the probability of receiving profitable IPO allocations rises if there is much to be allocated.

Figure 4 plots the dependent variable against the independent variable, suggesting that the regression does not suffer from outliers. One week stands out by particularly

[9] Cf., for example, Greene (1993), p. 283.
[10] For a single IPO, money left on the table is defined as (shares sold) × (first market price – offer price).

large sum of money left on the table (5.57 billion Euro). I therefore also report regression results when this value of the instrument is replaced by the second largest value (0.77 billion Euro). Table 4 shows the results. For each fund, I run OLS and IV on (7). In the multi-factor regression, the weekly mean abnormal return of the ADIG fund was 0.0064 (t-value=3.90). When controlling for possible gains from IPO allocations, it drops to values between 0.0011 or 0.0024, depending on the regression specification. It does not reach significance (5%) in any regression. The estimated coefficients of the IPO variable *IPOCONTRI*, by contrast, are strongly significant.[11] With IV estimation, coefficients are also not significantly different from one, which is the expected coefficient if the presumed IPO gains fully accrued to the fund. For the DWS and DEKA funds the picture is similar though somewhat less clear cut. In the IV specification, abnormal returns are not significantly different from zero, while the coefficient of *IPOCONTRI* do not differ significantly from one. The simple OLS specification leads to the same conclusion for the DEKA fund, while the abnormal return of the DWS fund is still significant using conventional levels.

To check whether the drop in statistical significance is due to the variance of the IV estimator I use a simulation experiment that answers the following question: Assuming that the variable *IPOCONTRI* is unrelated to abnormal returns, what effect does IV estimation have on the precision of the estimated mean abnormal return? I randomly reshuffle the paired values of the instrument and the independent variable, and then conduct an IV estimation of the dependent variable on the reshuffled variables. This is repeated 10,000 times. For the DWS fund and the capped instrument (Panel C), the simulated probability that IV estimation lets the OLS t-value of 3.058 drop below 0.982 is 3.7%. Thus, IV estimation is not only to be preferred on theoretical grounds; it also appears that it does not greatly affect precision.

Overall, the evidence strongly suggests that fund managers used the allocation of underpriced IPO shares to achieve superior performance. One cannot reject the hypothesis that the abnormal performance of the three funds would have been zero if they had not purchased the IPO stocks. Nor is it possible to reject the hypothesis that the funds fully benefited from the postulated IPO gains. The usual caveat, of course, applies. A regression cannot prove causality. For example, there might have been

[11] The fact that the standard error is higher for the instrumental variable estimation should be expected, as the variance of such estimators is typically large.

special investment opportunities immediately after an IPO which were exploited by the fund managers. A different question is whether gains from IPO allocations constitute a free lunch, or rather compensate IPO subscribers for bearing risk or other costs. I will discuss this issue in the next section.

6 Implications

6.1 IPO underpricing and wealth transfers

The previous analysis suggested that AS funds benefited from the allocation of underpriced IPOs. From theoretical or regulatory perspectives, one might add several related questions. Does underpricing, for example, constitute a free lunch, or does it compensate IPO subscribers for risk and other costs?

In Germany, there is an active, when-issued trade in IPO shares which commences when the offer range is published. Löffler, Panther and Theissen (2003) show that the prices quoted on this market are unbiased and very close to the first market price. Since investors can condition their subscription on the observed prices, they face little information asymmetries. In addition, the assumed possible gain from IPOs, the variable *IPOGAIN*, is non-negative in most cases. For both funds, less than 2% of all cases where an IPO allocation is presumed are associated with a negative initial return. Given the size of the documented abnormal returns, it seems implausible that they arise because investors require a reward for risk.

Investment companies might receive underpriced IPOs as a compensation for information production and revelation (cf. Benveniste and Spindt, 1999). The potential value of the information provided by a fund management company is difficult to assess. If it is equal to the wealth gains from IPO allocations, however, it is clear that they could not be financed through the fee income from AS funds. From the funds' annual reports, fee income was 0.1 million Euro for the ADIG fund (10/15/98 to 06/30/00) and 1.8 Million Euro for the DWS fund (11/11/98 to 09/30/00). This is only 1% (ADIG) and 8% (DWS) of the assumed gains from IPOs documented in Table 3. Thus, even though information production could provide an economic rationale for underpricing, the fund management's discretion in allocating underpriced issues to selected funds is likely to involve wealth transfers across customers of the company. This could be current holders of other funds who are not allocated IPOs but whose

fee income is used to cover the company's research costs, or future buyers of AS funds who are willing to pay above average fees based on a misperception of the expected abnormal return.

If IPO underpricing implies that issuers leave money on the table whose distribution is in the hands of the investment bank, it is an interesting question whether the investment bankers favor the asset management units belonging to the same bank. ADIG, DWS and DEKA, the companies managing the top three funds, are subsidiaries of German universal banks, who are also active in the underwriting business. The parent companies are Commerzbank AG (ADIG), Deutsche Bank AG (DWS) and public sector banks (DEKA). For the issues floated on the Frankfurt Stock Exchange, I therefore check whether possible IPO allocations to the ADIG or DWS AS funds are more frequent if the parent bank was lead underwriter. The DEKA fund PRIVATVORSORGE AS did not purchase stocks underwritten by one of the public sector banks. Deutsche Bank was lead manager in 9.26% out of the 185 offerings conducted in the period from 11/11/98 to 06/30/00, while the IPO stocks purchased by DWS VORSORGE AS DYNAMIK were in 8.62% underwritten by Deutsche Bank. For Commerzbank and the ADIG AS AKTIV DYNAMIK fund, the corresponding figures are 8.52% and 13.33%. Based on a chi-square test. the latter difference is only significant on the 7.7% level. There is thus little evidence that fund companies were privileged by the investment banking arm of the parent company.

6.2 Distortions of investor choice

Based on a purely statistical analysis of the fund returns, investors might well conclude that the AS funds offer opportunities for gaining superior returns, and adjust their decisions accordingly. This holds not only for those funds whose abnormal returns are significant. In a Bayesian framework, even insignificant abnormal return influence decisions (cf. Baks, Metrick and Wachter, 2001). Possible distortions are twofold: Out of the universe of funds, investors may choose a fund whose performance has been 'manipulated' because they misestimate the expected abnormal returns. In addition, investors may increase the percentage of their wealth invested in equity because they overestimate attainable risk-adjusted returns.

Two observations suggest that distortions may indeed occur. First, while the performance of AS funds as a group has been repeatedly reviewed in the financial press, I am not aware of an instance in which the nature of the abnormal returns has been discussed in detail. The exceptional performance of the ADIG AS-AKTIV DYNAMIK, for example, was repeatedly mentioned without questioning the origin of the exceptional performance.[12] The investor magazine *Börse online* (04/23/2000, p.106), for example, ascribes the performance of the top AS funds to investments in the Neuer Markt and in IPOs. Since such an investment strategy is classified as risky, the article suggests to the reader that the performance should be attributed to management skills or a reward for risk.

Secondly, mutual fund companies refer to good absolute and relative performance in their marketing campaigns. ADIG, for instance, has repeatedly had half-page advertisements in major national newspapers, beginning as follows (author's translation):

> Stop dreaming of a high retirement income.
> Start to lay the foundations for it.
>
> ADIG retirement plans – worth a fortune.
> Best German AS Fund: ADIG AS AKTIV DYNAMIK
> +39.8% (year to date), +92.9% (last twelve months).
>
> (Frankfurter Allgemeine Zeitung, 12/15/2000, p. 5)

Note that the corresponding twelve month return of the DAX30, the most widely observed equity index in Germany, was a mere 28%, while the NEMAX All Share, which represents the German growth stocks, gained only 47%. The advertisement contains the usual statement that past performance does not guarantee future success. The fund's investment strategy is not described in detail. The reader is only informed that the fund predominantly invests in equity.

Two examples shall help to quantify the magnitude of possible distortions. Consider a long-term investor who holds a balanced fund with zero abnormal returns, but estimates the expected abnormal return of AS funds to be 1%-2% per annum. For this investor, exchanging the currently hold fund into an AS fund is attractive even if it involves the customary 3% to 5% up-front fee. If the true abnormal return of AS funds

[12] Cf. Capital (5/2001), Focus (41/2000) Handelsblatt (02/09/2001), Financial Times Deutschland (02/16/2001).

is zero, the investor would have lost 3%-5% of his initial wealth invested in funds. Consider another investor who determines optimal exposure to equity based on an isoleastic utility function. Using continuous returns, the solution for the optimum equity share is expected equity premium / (equity return variance · γ), with γ denoting the risk aversion coefficient of the utility function.[13] Assume that the true risk premium is 4% p.a., at an annual volatility of 18%. Table 5 then lists the resulting optimum equity shares, allowing for an overestimation of the risk premium. An investor who believes that the expected abnormal return of AS funds is equal to their median abnormal return from 11/11/98 to 06/28/00, which was 3.4% (see Table 2), would almost double her exposure to risk relative to a situation in which no superior investment opportunities are available. If abnormal returns is taken to 2% (1%), the optimal equity share would increase by roughly 50% (25%).

Finally, I examine empirically whether the top performing funds have attracted above average inflows. I use data on net fund inflows from July 2000 to March 2001, and define the market share as a fund’s inflows divided by the total inflows to the AS funds in the sample. This measure of market share is regressed on the raw performance from November 1998 to June 2000 (t-statistics in parentheses):[14]

$$\underset{}{\text{Market share}} = \underset{(-2.96)}{-0.06} + \underset{(6.15)}{0.16}\ \text{Performance}, \qquad R^2=0.65,\ \text{NOB}=22 \tag{8}$$

Inflows are significantly related to performance, both statistically and economically. A performance advantage of 10 percentage points increases the share of aggregate inflows by 1.6 percentage points. Recall that the performance difference between the top performing AS fund and the median AS fund is 109.3% (see Table 2). The corresponding difference in the expected market share is 17.5 percentage points. The observation that winning funds attract above average inflows rationalizes the fund companies’ attempts to achieve superior performance. Of course, the results could also arise if fund companies only believe that investors respond to performance and thus market top-performing funds more aggressively, while investors just respond to marketing efforts.

[13] Cf. Merton (1968).

[14] For the fund company UNION, data on net flows is only available as an aggregate figure for the four AS funds run by UNION. The value of the independent variable is set equal to the average performance of the four fund. The number of observations thus reduces from 25 to 22.

7 Conclusion

Stripped to its essentials, this paper is a performance analysis of 25 German mutual funds. Why, then, does it deserve its prestigious title? There are several aspects which suggest an analogy to a sports race. In a typical race, participants start simultaneously. Partly due to the fact that athletes are well equipped, speed is higher than what could be achieved by average human beings. In addition, the speed of the race, while often slow at the beginning, typically accelerates towards the end. Finally, winners receive publicity which can be converted into cash.

The funds under analysis were launched within four weeks, and they subsequently performed better than other German mutual funds. This differential does not seem to be due to superior skills; rather, performance was tuned through allocations of underpriced IPO stocks. As measured by abnormal returns, the funds steadily accelerated, and only came to a halt when the recent IPO wave receded, and the increased volume of the funds made them less maneuverable. After the race was over, winners tried to cash in on their success by attracting new investors.

The paper thus examines a manifestation of the tournament mentality prevalent among fund managers. One of its implications, the propensity of loosing funds to increase risk, has been examined by Brown, Harlow, and Starks (1996) and others. I complement the literature by documenting that fund managers can achieve superior performance through IPO allocations. On an individual fund level, IPO allocations are more visible, and easier to prove than an increase of risk. Even if there is statistically significant evidence for additional risk taking, it can be justified by referring to special investment opportunities which promised an attractive reward for risk. More than the previous evidence, the present study thus suggests that the tournament mentality is not controlled by possible drawbacks of the quest for performance. In fall 1999, halfway through the race examined here, a US money manager agreed to a fine imposed by the SEC for failing to disclose that the performance of a fund was largely due to IPO allocations (Fritz, 1999). Neither the prospect of such a fine, nor the possibility that investors regarded the funds' strategy as unsustainable or deceitful, prevented money managers from boosting fund performance artificially.

There are several reasons why regulators may want to restrict the practice of allocating IPOs selectively to individual funds. First, investors may be led to sub-

optimal investment decisions if they are not aware of the origin of observed fund performance. The empirical relation between fund inflows and performance suggest that this is indeed a valid argument. Second, boosting funds through IPOs could involve subsidizing individual funds at the expense of others. If fund companies need to compensate investment banks for IPO allocations through brokerage fees, funds whose performance is to be boosted might receive more allocations than their share of brokerage business would entitle them to. Finally, regulators may deal with IPO allocations to funds because they enable investment banks to reap benefits from underpricing. This, in turn, can aggravate interest conflicts between underwriters and issuers of new stock. The three leading funds analyzed in this paper did not receive preferential allocations from the investment banking arm of their parent company, but this does not imply that conflicts of interest were not manifest. As mentioned above, brokerage business provides a means of charging funds for the allocation of IPO shares. As long as fund companies can utilize such allocations to tune up the performance of their funds, they may be willing to pay a premium for receiving allocations of underpriced stocks. It is therefore conceivable that underwriters would benefit less from the allocation of IPOs if funds were not allowed to allot IPO shares discretionally to selected funds.

There is some irony in making the case for regulatory action. Even though the quest for superior performance fits into previous evidence on fund tournaments, one can argue that it was the government who excited the performance race. An amendment of the German securities law created a new legal type of mutual fund, meant to be especially suited for retirement savings and subject to several investment restrictions. In consequence, both investment and marketing strategies, and even the names of the newly issued funds were quite similar. It seems likely that this regulation-induced homogeneity increased the role performance differentials play for investor decisions. Moreover, the government was planning to widen existing tax deduction possibilities for savings, but only for savings which are directed to selected investment vehicles. Since the newly created AS funds were among the candidates for receiving tax privileges, the incentives of money managers to have a winning fund in this particular category grew considerably. The irony is increased by the fact that the government apparently followed the aim of increasing transparency between different products, and fostering ‘prudent’ investments of retirement savings. The measures it took, or

announced to take, were counterproductive. If investors want to use the performance of AS funds as an indicator of management quality, they first have to purge it of IPO gains. If they are not aware of this source of abnormal return, they may be led to sub-optimal investment decisions.

The fact that the financial press and fund information companies have not pointed out the reasons behind the funds' spectacular performance suggests that investors are indeed not aware of them. Even though the analysis of fund performance has already developed into an industry of its own, the market's capacity to evaluate the origin of performance differentials, and to separate skill or luck from tuned-up performance seems very limited.

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Table 1

Analysis of individual fund returns (weekly returns from 11/18/98 to 06/28/00)

For an AS fund j, the following regression is performed:

$$R_j = \alpha + \beta_1 R_{CDAX} + \beta_2 R_{NEMAX} + \beta_3 R_{FT\text{-}Euro} + \beta_4 R_{FT\text{-}World} + \beta_5 R_{NASDAQ} + \beta_6 R_{REX} + D\,[\beta_7 R_{CDAX} + \beta_8 R_{NEMAX} + \beta_9 R_{FT\text{-}Euro} + \beta_{10} R_{FT\text{-}World} + \beta_{11} R_{NASDAQ} + \beta_{12} R_{REX}] + u_j$$

For equity funds and balanced funds, the following regression is performed:

$$R_j = \alpha + \beta_1 R_{CDAX} + \beta_2 R_{NEMAX} + \beta_3 R_{FT\text{-}Euro} + \beta_4 R_{REX} + u_j$$

where R_j=the excess fund return (fund return - weekly risk-free interest rate), R_{CDAX} =the excess return of the CDAX, R_{NEMAX}=the excess return of the NEMAX, R_{Euro}=the excess return of the FTSE-Eurobloc, R_{World}=the excess return of the FTSE-World, R_{NASD}=the excess return of the NASDAQ Composite, R_{REX}=the excess return of the REX bond index, D=a dummy variable equal to zero in the period from 11/18/98 to 09/01/99, and one otherwise. The estimate of α is annualized by applying $(1+\hat{\alpha})^{52}$. Bonferroni t-statistics use the (s/r) point of the distribution where s is the significance level and r the number of tests (=number of funds within a group).

	AS funds	Equity and balanced funds
Number of funds	25	207
Mean of estimated alphas	0.0012 (=0.0651 p.a.)	0.0009 (=0.0457 p.a.)
Median of estimated alphas	0.0006 (=0.0340 p.a.)	0.0008 (=0.0413 p.a.)
Stand. deviation of estimated alphas	0.0021	0.0015
Relative frequency of sign. positive alphas (for Bonferroni statistics in parentheses)		
1% confidence	0.120 (0.040)	0.005 (0.000)
5% confidence	0.240 (0.080)	0.019 (0.000)
10% confidence	0.360 (0.080)	0.068 (0.000)

Table 2

Performance of the top 5 AS funds (11/18/98 to 06/28/00)

To estimate abnormal performance, the following factor regression is performed for each fund:

$$R_F = \alpha + \beta_1 R_{CDAX} + \beta_2 R_{NEMAX} + \beta_3 R_{FT\text{-}Euro} + \beta_4 R_{FT\text{-}World} + \beta_5 R_{NASDAQ} + \beta_6 R_{REX} + D\,[\beta_7 R_{CDAX} + \beta_8 R_{NEMAX} + \beta_9 R_{FT\text{-}Euro} + \beta_{10} R_{FT\text{-}World} + \beta_{11} R_{NASDAQ} + \beta_{12} R_{REX}] + u$$

where D is a dummy variable equal to zero in the time from 11/18/98 to 09/01/99, and zero otherwise. The estimated $\hat{\alpha}$ is annualized by applying $(1+\hat{\alpha})^{52}$, the residual volatility through $\sigma[\hat{u}]\sqrt{52}$.

Fund company: name of fund	Total raw performance	Annualized $\hat{\alpha}$	t for $\hat{\alpha}$	Annualized residual volatility
ADIG: AS AKTIV DYNAMIK	160.1%	37.2%	3.90***	9.7%
DWS: VORSORGE AS Dynamik	138.9%	34.0%	3.65**	9.6%
DEKA: PRIVATVORSORGE AS	114.0%	19.1%	2.21	9.5%
DWS: VORSORGE AS FLEX	97.1%	18.7%	2.65	7.7%
GERLING: AS	90.9%	20.2%	2.13	10.3%
As a comparison				
AS fund with median $\hat{\alpha}$	50.8%	3.4%	0.55	7.2%
FTSE Eurobloc	59.9%	-	-	-
CDAX (German market index)	44.1%	-	-	-

***,**,* indicates significance at the 1%, 5%, 10% level, respectively, using Bonferroni test statistics.

Table 3

Possible gains from underpriced IPOs for three AS funds (11/18/98 to 06/28/00)

Stock purchases documented in the funds' annual reports are screened for IPOs which took place during the respective reporting period. Whenever the fund purchased a stock which went public during the reporting period, the possible Euro gain from an IPO allocation *IPOGAIN* is computed as number of shares purchased $\times$ [first market price - offer price]. The contribution to the abnormal performance *IPOCONTRI* is the possible Euro gain divided by the contemporaneous fund volume.

	ADIG AS AKTIV DYNAMIK	DWS VORSORGE AS DYNAMIK	DEKA PRIVAT-VORSORGE AS
Number of purchased stocks which went public in reporting period	160	86	42
Sum of possible gains from IPOs (in million Euro, = $\Sigma_i \, IPOGAIN_i$)	13.1	24.0	15.3
Possible cumulative abnormal returns from IPOs (= $\Pi_i \, (1 + IPOCONTRI_i)$)	57.9%	45.5%	14.9%
Estimated cumulative abnormal return	67.8%	61.4%	33.1%
Fund volume (million Euro)			
12/31/98	4.2	5.8	25.3
06/30/99	8.7	31.9	64.6
12/31/99	24.5	101.5	150.4
06/31/00	77.2	263.0	228.6

Table 4

Regression analysis of weekly abnormal returns of three AS funds (11/18/98 to 06/28/00)

Weekly abnormal returns from a multi-factor model are regressed on a constant and the possible performance contribution from underpriced IPOs (=*IPOCONTRI*). The instrumental variable (IV) estimation uses the money left on the table in German IPO's as an instrument. In panel C, the maximum value of the instrument (5.57 billion Euro) is set to the second largest value (0.77 billion Euro). T-statistics in parentheses. The number of observations is 85.

	ADIG AS AKTIV DYNAMIK	DWS VORSORGE AS DYNAMIK	DEKA PRIVATVORSORGE AS
Panel A: abnormal return = $\delta + \gamma$ IPOCONTRI + v (OLS)			
$\hat{\delta}$	0.0024 (1.830)	0.0046 (3.058)	0.0025 (1.830)
$\hat{\gamma}$	0.6881 (6.015)	0.2369 (1.501)	0.5220 (1.914)
Panel B: abnormal return = $\delta + \gamma$ IPOCONTRI + v (IV)			
$\hat{\delta}$	0.0016 (0.982)	0.0021 (0.576)	0.0018 (1.038)
$\hat{\gamma}$	0.8281 (3.850)	0.7889 (1.030)	0.9825 (1.542)
Panel C: abnormal return = $\delta + \gamma$ IPOCONTRI + v (IV, one extreme instrument value capped)			
$\hat{\delta}$	0.0011 (0.758)	0.0023 (0.982)	0.0019 (1.166)
$\hat{\gamma}$	0.9206 (5.693)	0.7545 (1.819)	0.9050 (1.595)

Table 5

Optimum equity allocation for various assumptions about the equity premium (for an isoelastic utility function, assuming equity volatility to be 18% p.a.)

	Estimated equity premium			
risk aversion y	0.04	0.05	0.06	0.04+median α of AS funds = 0.0736
2	0.62	0.77	0.93	1.14
4	0.31	0.39	0.46	0.57
6	0.21	0.26	0.31	0.38

Figure 1a
Risk-return analysis of AS funds (weekly simple returns from 11/18/98 to 06/28/00)

The indices are, from left to right, REX (German government bonds), FTSE World, FTSE Eurobloc, CDAX (German broad market), NASDAQ composite, NEMAX all share (German Neuer Markt)

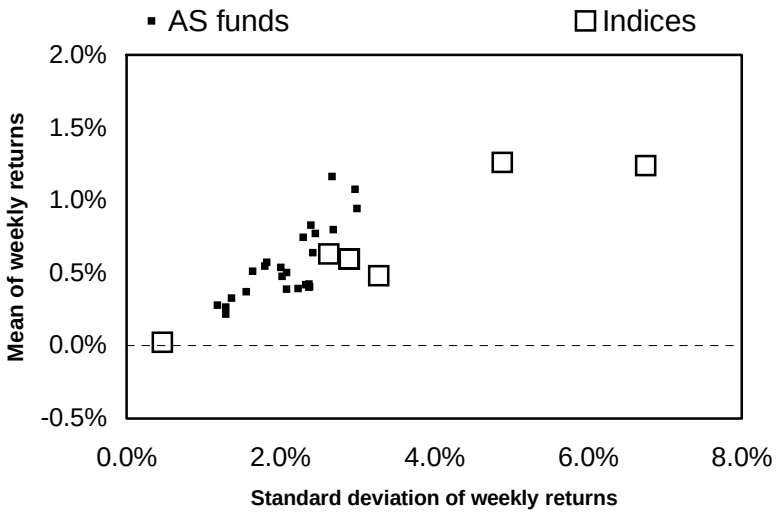

Figure 1b
Risk-return analysis of mutual funds investing in Germany or Eurozone countries (weekly simple returns from 11/18/98 to 06/28/00)

The indices are as in Figure 1a.

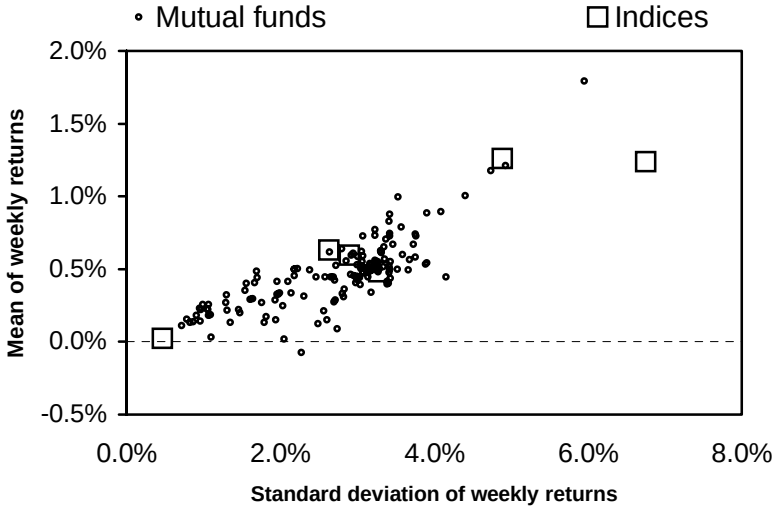

Figure 2a
Total performance since 11/18/00 of ADIG and DWS AS funds and their best competitor in time t

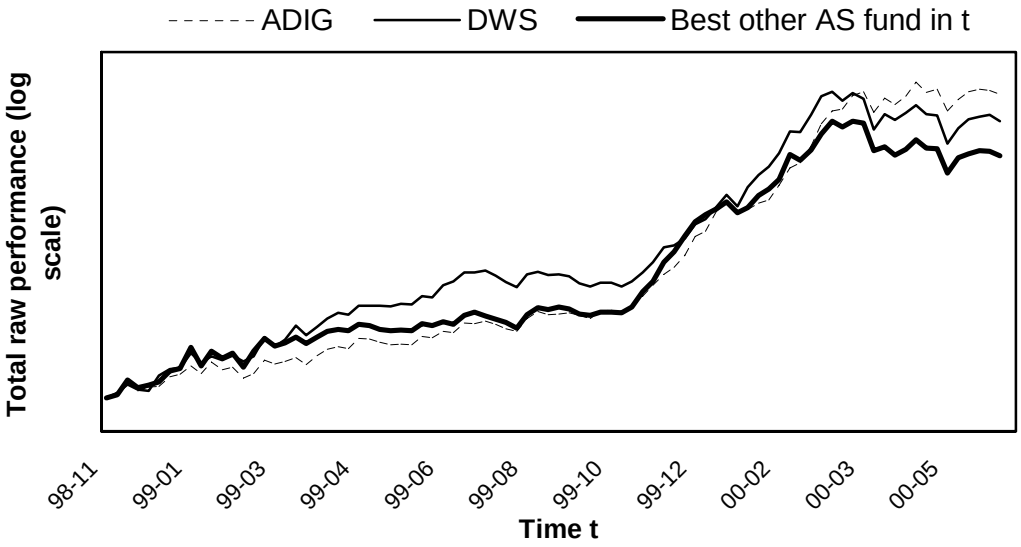

Figure 2b
Cumulative abnormal return of ADIG and DWS AS funds with standard deviation bands for σ (abnormal return) =10% p.a.

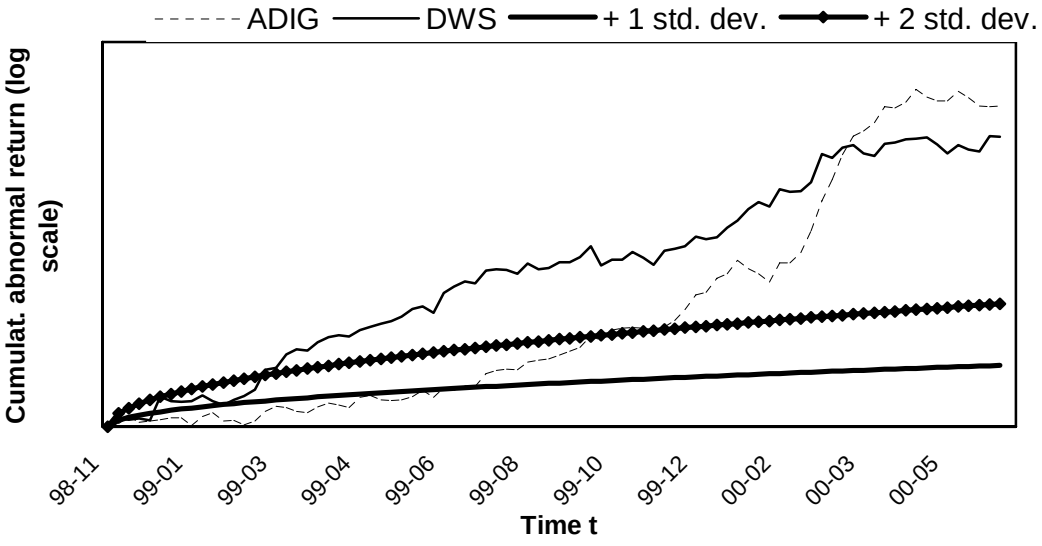

Figure 3
Weekly abnormal returns of the top three AS funds

The mean weekly abnormal returns of those funds which, in the previous week, ranked among the top three in terms of cumulative raw performance are regressed on a constant, time, and time minus the threshold date (03/29/00).

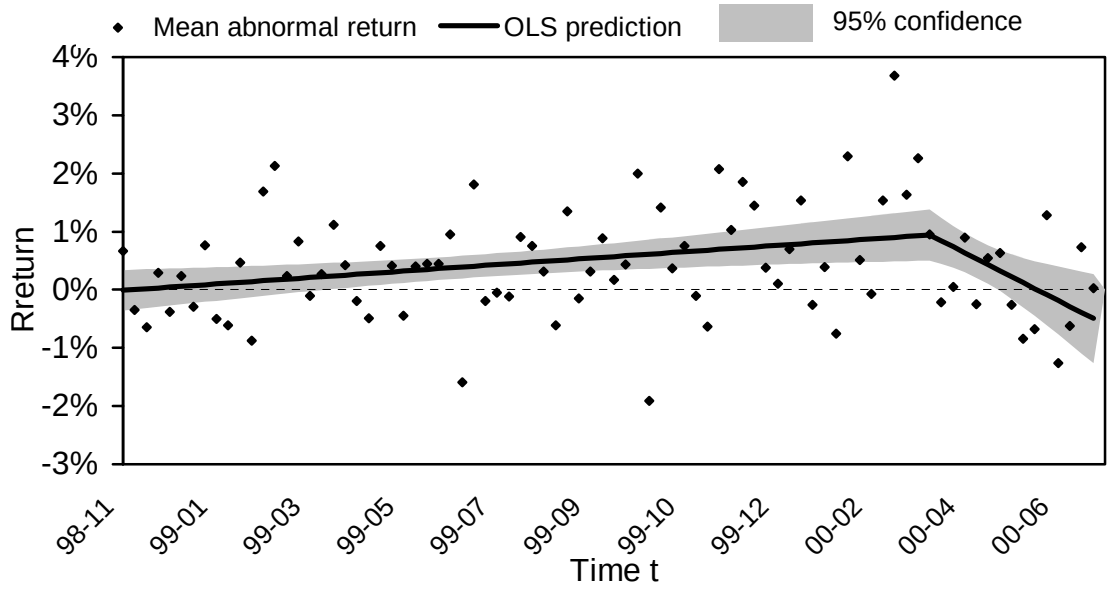

Figure 4
Weekly abnormal fund returns and possible performance gains from IPO allocations (= IPOCONTRI)