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Swedish Equity Mutual Funds 1993-2013: Performance, Persistence and Presence of Skill

Abstract

Actively managed Swedish equity mutual funds outperform the market in 1993-2001 but have negative gross and net excess returns of -0.18 and -1.47 per cent per year in 2002-2013. Across funds, there is no correlation between activism and return in the later period. Returns show little or no persistence: When funds are ranked on past performance, their returns converge to the cross-sectional mean in about two years and stay close to that subsequently. There is practically no evidence of stock-picking skills: Actual gross excess returns do not differ significantly from bootstrapped excess returns under the hypothesis of no skill in the population.

JEL-Codes: G230.

Keywords: mutual funds, index funds, fund performance, fund return persistence, management skill, luck.

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1 Introduction

Swedish households invest heavily in Swedish equity mutual funds. There are several channels through which households are exposed to these funds. First, about 70 per cent of all households hold stocks or equity funds, and a third of those households hold a Swedish equity fund. Second, practically all Swedish wage earners own shares in mutual funds through a mandatory defined contribution pension plan that is part of the public pension system. Although the plan is an open platform with more than 800 funds to choose from, 28 per cent of the investors hold a Swedish equity fund, which means that 13 per cent of the plan's investments are allocated to Swedish mutual equity funds, a portfolio share much higher than warranted by Sweden's share of global market capitalization.[1] Finally, 90 per cent of Swedish wage earners hold additional investments in occupational pension plans that are heavily exposed towards Swedish equity funds. The market value of Swedish households´ total investments in these funds was about SEK 360 billion in 2013, equal to about 7 per cent of their total financial wealth.[2] Consequently, the choice between different Swedish equity mutual funds is important for many households.

Most investors in equity mutual funds presumably have little or no knowledge about the equities that funds hold; they simply want to have exposure to the stock market. When financial industry or media experts advise investors on the choice of funds, they usually recommend actively managed funds with relatively high past performance based on the belief that high performance can be attributed to stock picking skill and that such skill is persistent. In contrast, when a researcher in finance is asked for advice, he or she is likely to recommend a low-cost index fund, based on the efficient market hypothesis that actively and passively managed funds can be expected to earn the market return before cost but passively managed funds do so at lower cost.

Most of the empirical evidence based on data on the U.S. mutual fund market supports the efficient market hypothesis. For example, Carhart (1997) finds that most funds underperform by about the magnitude of their investment expenses, Kosowski et al. (2006) that the average net risk-adjusted excess return per year is -1.2 per cent, Fama and French (2010) that it is –1 per cent, Barras et al. (2010) –0.5 per cent, and Berk and van Binsbergen (2014) –0.7 per cent.

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[1] Employers make contributions to the plan equal to 2.5 per cent of gross wages. Based on historical rates of return, the funded part of the public pension system may come to contribute as much to wage earners' public pensions as the non-funded, transfer part of the system. Our calculation is based on the LINDA 2007 sample for which we have access to detailed information about the fund holdings of the pension plan. We have excluded investments into the plan's default fund from this calculation.

[2] Swedish Investment Fund Association (2016), Riksbanken (2013).

Despite the fact that investment in mutual funds is more widespread among households in Sweden than in most other countries, there is no published evidence on the more recent performance of Swedish equity mutual funds. In fact, only two studies have been published, both based on fund performance during a few years in the 1990's. Dahlquist et. al. (2000) found that the subset of funds qualifying for preferential tax treatment had negative average and median net excess returns of –1 and –0.7 per cent and that funds without preferential tax treatment had positive but insignificant average and median excess net returns of 0.5 and 0.1 per cent per year. Engström (2004) found an average net excess return of 1.7 per cent for the period 1996-2000.

Our study covers the period 1993-2013. We find that excess returns differ substantially before and after 2001-2002. Gross and net excess returns were 3.55 and 2.14 per year in 1993-2001 and –0.18 and –1.47 per cent per year in 2002-2013. We suspect that the downward shift in returns was caused by increased competition: the number of Swedish equity mutual funds doubled between the periods and the total number of funds virtually exploded following the pension reform. It seems reasonable that inferences about today´s performance of Swedish equity mutual funds should be based on the latter period.

We find that the top ten funds plus two more had significant positive gross excess returns on average in 2002-2013. This is conventionally interpreted as evidence of stock-picking skill but could also be due to luck. Five of the top seven funds were sufficiently skilled or lucky to earn significant positive average net excess returns and were thereby able to more than compensate investors for management costs. Following Cremers and Petajisto (2009), Ekholm (2012) and Amihud and Goyenko (2013) there is no evidence, however, that more active funds performed better than less active funds in 2002-2013.

Persistence in fund returns among successful funds is often interpreted as an indication of skill. We find little evidence of persistence in returns and consequently little to indicate the presence of skill. Regardless of whether funds rank high or low based on past performance, their returns converge quickly to the cross-sectional mean and become similar after two years. This accords well with the findings of Carhart (1997) for U.S. equity mutual funds, except that he found that the bottom decile of funds underperforms persistently.

As an additional test, we make a direct investigation of whether superior and inferior performance should be attributed to superior and inferior skill or to good and bad luck by employing a version of the bootstrap method by Kosowski et al (2006) and Fama and French (2010). Simulated cross-sectional distributions of gross and net returns are created repeatedly under the null hypothesis that gross and net excess returns are zero. The cross-section of (the *t*-statistics of) actual gross and net returns is then compared to the cross-section of (the *t*-statistics of) simulated gross and net returns. (*t*-statistics of excess returns is the preferred test

statistic rather than excess returns to address various statistical problems.) We find that only one fund has actual gross excess returns that are significantly higher than the bootstrapped gross excess returns in the period 2002-2013 and that no fund had a significant positive net excess return. In other words, we find practically no evidence of skill.

The paper is organized as follows. Section 2 presents data sources and how data were constructed. Section 3 contains standard tests of fund performance. Section 4 describes persistence of fund returns while section 5 tests the presence of skill directly. Conclusions are presented in section 5.

2 Data sources and data construction

Our fund universe consists of 124 actively managed mutual funds holding a broad set of equities listed on the Stockholm Stock Exchange, plus 20 passively managed funds tracking several different indexes. It should be noted that some funds may have a small share of their assets in equities listed abroad and that funds must hold a minimum amount of liquidity for transaction purposes; the amount can vary over time. Specialized funds, for example funds that invest in specified industries, are excluded.

Our monthly data cover the period from January 1993 to December 2013. The minimum number of consecutive monthly returns required for a fund to be included is 36.[3] Funds that meet the requirement but have been closed and merged with other funds are included to avoid survival bias.

The data on monthly net fund returns were supplied by Morningstar and are based on primary data supplied by the Swedish Investment Fund Association. Fund returns include re-invested dividends and are net of expenses. Some funds are sold both in the retail market and in the market for various pension plans. In such cases, only retail market data are included.

Gross returns are obtained by adding back costs as given by the total expense ratio (TER) to net returns. TER is reported annually to the Swedish Financial Supervisory Authority by most but not all funds.[4] We have obtained TER from the annual financial statements for 114 out of 124 funds. To obtain gross returns, we add back the average TER for the years for which we have data.

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[3] We exclude 28 actively managed funds and 5 index funds that have 35 or fewer return observations.

[4] We note that the Swedish measure of total expenses, TKA, is more inclusive. In addition to fees and trading costs, it also includes commissions and results-based fees in per cent of the average value of assets under management during the year. The TER for the 114 funds for which we have data is 1.3 per cent while it is 1.6 per cent for the TKA.

Our analysis is based on 1-factor excess returns. Data for the construction of two systematic risk factors – value versus growth bias and small versus large cap bias – are unfortunately not available after 2009. To check for potential differences between 1-factor excess returns on one hand and 3- and 4-factor excess returns on the other, we have, however, estimated 3- and 4- factor excess returns for the period 1999-2009 and compared them with estimated 1-factor excess returns.[5]

Before turning to estimates of fund performance, consider some descriptive statistics in Table 1 and Table 2. The equally-weighted average absolute net return– without risk adjustment – of actively managed funds was 21.75 per cent in 1993 – 2001 and 9.13 per cent in 2002 – 2013. Since the average TER was 1.3 per cent, see Table 2, this means that the gross absolute return was higher than the stock market average including reinvested dividends (SIXPRX) by 3.2 per cent in 1993 – 2001, but about the same as the stock market average in 2002-2013. Table 2 also reports the active share for 73 actively managed funds that benchmark against a broad Swedish stock market index (i.e., they are not focused on small-cap stocks) in 2002-2013. Evidently, at a value of 0.36 the average active share is quite low in our sample, consistent with the findings of Cremers et al. (2016).[6]

[5] The data were kindly delivered by the Data Center at the Swedish House of Finance. They were originally constructed by SIX Telekurs before 2004 and by NASDAQ OMX for the period 2004-2009. We construct the size (SMB) and value (HML) factors of Fama and French (1993) and of Carhart's (1997) momentum (MOM) factor as follows. We first take account of the fact that Sweden has a multiple share class system. For each corporation, we determine the largest share class in terms of market value and use only that class. We then attribute the entire market value of the corporation to this class. For each 12-month period starting in April of year *t-1* and ending with March of year *t* we require 12 recorded monthly observations. We then match the book and market values from March of year *t* with the return series from April of year *t* to March of year *t-1*. We also control for which particular stock market list that the stock was traded on in December of year *t-1* by excluding stock markets that are judged to be too small and illiquid to be suitable as investment targets for a mutual fund.[5] The SMB and HML factors were then constructed as in Fama and French (1993). The MOM factor was constructed by first sorting all stocks on their 12-month lagged returns, and then using the bottom 20 percent to construct a portfolio to go short in, and the top 20 percent to construct another portfolio to go long in. Betermier et al. (2013) also construct their factors from this material.

[6] The active share series was manually computed from reports filed to the Swedish FSA. The portfolio weights of SIXPRX were used in the calculations. Johansson and Häckner Posse (2015).

Table 1. Fund and factor returns

Panel A. Equally-weighted portfolio returns

	1993 - 2001			2002 - 2013		
Portfolio	No. of funds	Mean	Std	No. of funds	Mean	Std
All funds	103	21,72%	20,21%	153	9,11%	19,69%
Actively managed funds	95	21,75%	20,16%	133	9,13%	19,72%
Index funds	8	21,15%	21,69%	20	8,81%	19,88%
SIXPRX	-	19,85%	19,78%	-	10,47%	19,50%
STIBOR1M	-	5,68%	0,62%	-	2,41%	0,37%

Panel B. Factor returns

	2002 - 2009	
Factor	Mean	Std
SIXPRX	9,0%	21,5%
STIBOR1M	2,9%	0,4%
SMB	1,3%	20,3%
HML	17,3%	29,2%
MOM	-2,0%	38,2%

Note: Fund returns are equally weighted monthly returns. All return statistics have been converted from monthly to annual frequency.

Table 2. Fees, expense ratios and active share

	No. of funds	Mean	Std	No. of funds	Mean	Std
Annual fee	115	1,3%	0,4%	17	0,5%	0,2%
TER	124	1,3%	0,4%	19	0,46%	0,20%
Active share	73	0.36	0.16	-	-	-

Notes: TER = total expense ratio, funds costs divided by fund assets. For fees not charged or expense items not charged, observations has been coded as missing rather than zero. Active share is available for non-small cap funds during 2002-2013.

3 Performance

The CAPM, the 3-factor model by Fama and French (1993) and its extension to four factors by Carhart (1997) are consistent with models of market equilibrium with one, three or four systematic risk factors. They can also be interpreted as models for performance attribution; we will use them as such.

The following time series regressions attribute returns in excess of the risk-free interest rate to one (CAPM), three (Fama and French) and four (Carhart) systematic risk factors respectively:

$$r^j - STIBOR1M = \alpha + \beta(SIXPRX - STIBOR1M) + \varepsilon \quad (1)$$

$$r^j - STIBOR1M = \alpha + \beta\,(SIXPRX - STIBOR1M) + \gamma\, HML + \delta\, SMB + \varepsilon \quad (2)$$

$$r^j - STIBOR1M = \alpha + \beta\,(SIXPRX - STIBOR1M) + \gamma\, HML + \delta\, SMB + \omega\, MOM + \varepsilon \quad (3),$$

where r^j $(j = G, N)$ is the gross or net return of fund *i* at time *t* (fund and time subscripts are omitted), *STIBOR1M* is the Stockholm 1-month interbank lending rate, α is the net excess return (the return left unexplained by the benchmark model), β, γ, δ and ω are factor loadings, $SIXPRX$ is a value-weighted index for all companies listed on the Stockholm Stock Exchange, including reinvested dividends, where the weight of a single company is restricted to reflect UCIT regulations that applies to mutual fund portfolios, HML, *SMB* and *MOM* are the corresponding Swedish versions of the High-Minus-Low book-to-market value factor, the Small-Minus-Big market capitalization factor and Carhart's momentum factor, which is long on prior-year winners and short on prior-year losers, and ε is the regression residual. [7]

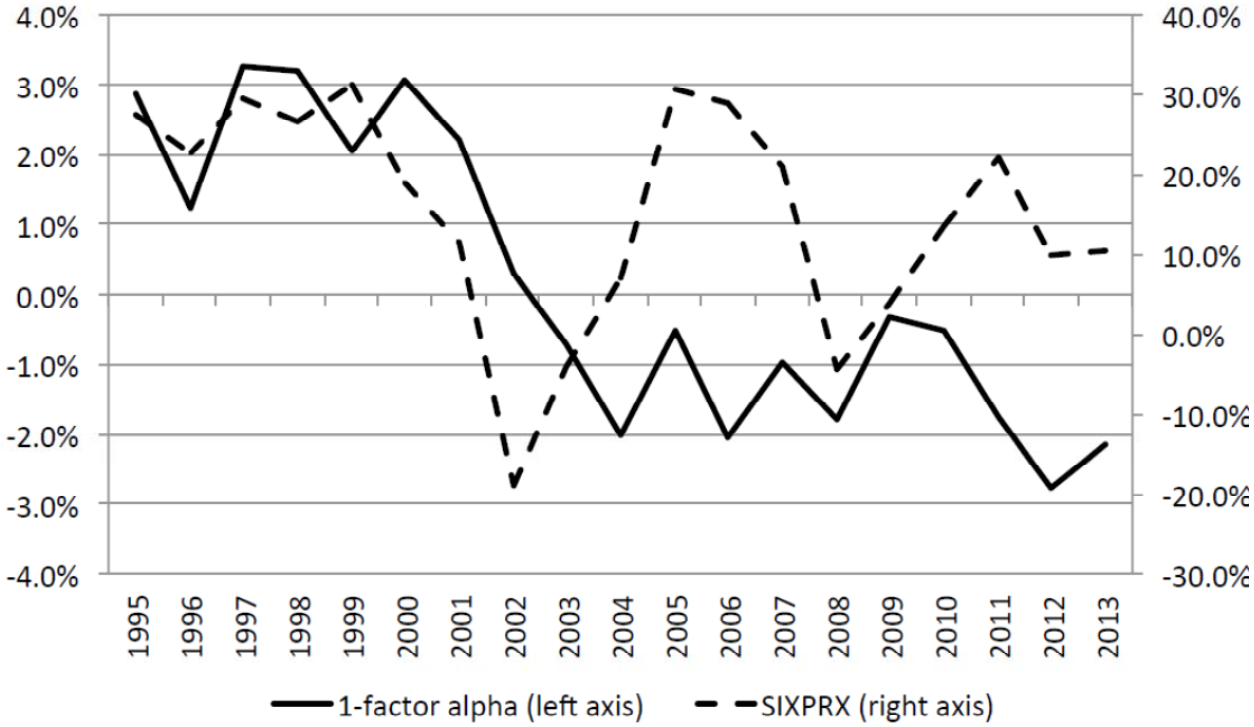
Equation (1) is estimated for all actively managed equity mutual funds with a minimum of 36 monthly return observations for the period January 1993 – December 2013. For index funds, we estimate equation (1) using their respective benchmark indexes. Requiring a minimum return history of 36 months means that we have practically no survival bias in our estimates, but also that estimates for the shortest-lived funds tend to have lower precision. Equations (2) and (3) are estimated for the period January 1999 – December 2009 for actively managed funds.

3.1 Performance shift in the time series

[7] There is controversy about whether the average SMB, HML and MOM returns are rewards for risk or the result of mispricing. Regardless, it remains true that fund managers can implement passive strategies to capture returns to size and value bias and to momentum, and that stock-picking ability, i.e. active management, should show up in the intercept (alpha).

Consider first the time series shown in Figure 1. The dashed line shows the SIXPRX index and the solid line the three-year moving average of monthly annualized 1-factor net excess returns (net alphas) of all actively managed Swedish equity mutual funds.[8] It is clear that the time series of fund net excess returns exhibits downward shift around 2002. Returns fluctuate roughly around 2.5 per cent per year before the break and around –1.5 per cent after. The stock market index does not show a similar break; it dips in 2000-2002 but returns to the previous level.

Figure 1 Average fund 1-factor net excess return and stock market absolute return



One may speculate about the reasons for the break in net excess returns. The number of actively managed Swedish equity mutual funds approximately doubled after the break. Our data set includes a total of 60 funds in 1993-2001 and 124 funds in 2002-2013.[9] At the same time, the number of other kinds of mutual funds virtually exploded. This increase was caused by the launch of a reformed public pension system that includes a funded part to which employers have to make contributions equal to 2.5 per cent of gross wages and employees subsequently can choose among more than 800 funds. It is likely that the increase in the number of investors

[8] Taking the three-year moving average instead of a shorter period such as the one-year average eliminates much noise.

[9] Dahlquist et al. (2000) include 40 equity funds with preferential tax treatment and 80 regular equity funds in their sample, which covers the time period 1993-1997. We include no funds with preferential tax treatment.

and funds lead to stronger competition and lower returns. It would therefore be misleading to make inferences about today's performance, persistence and presence of management skill based on data before the downward shift in returns. The choice of when the shift occurs is somewhat arbitrary; we choose to divide our analysis into 1993-2001 and 2002-2013.

3.2 1-factor performance

Table 3 reports equal-weighted gross and net returns above the risk-free interest rate and adjusted for market risk – 1-factor gross and net excess returns – of actively managed funds as given by estimated alphas in equation (1). The times series of risk-adjusted excess returns exhibit the same picture as absolute returns; they were positive and relatively high in 1993 – 2001 and turned negative in 2002 – 2013. The average gross excess return is close to zero in the later period and the net excess returns is approximately equal to the negative of the average total expense ratio.

Table 3. 1-factor alphas

	1993-2001		2002-2013		1993-2013	
Portfolio	Net	Gross	Net	Gross	Net	Gross
All funds	2,14%	3,55%	-1,47%	-0,18%	-0,91%	0,44%
1st decile	9,72%	10,8%	3,83%	5,04%	4,52%	5,55%
2nd decile	5,81%	7,11%	1,29%	2,68%	1,93%	3,34%
3rd decile	4,25%	5,62%	-0,14%	1,25%	0,61%	2,07%
4th decile	3,16%	4,53%	-0,83%	0,59%	-0,11%	1,22%
5th decile	2,20%	3,74%	-1,38%	-0,19%	-0,80%	0,66%
6th decile	1,04%	2,75%	-1,91%	-0,66%	-1,21%	0,15%
7th decile	0,38%	1,89%	-2,29%	-1,00%	-1,77%	-0,40%
8th decile	-0,10%	1,35%	-2,96%	-1,83%	-2,61%	-1,02%
9th decile	-1,09%	0,60%	-4,23%	-2,88%	-3,39%	-2,04%
10th decile	-3,97%	-1,84%	-5,71%	-4,40%	-5,90%	-4,76%
1st fund	13,6%	14,2%	5,42%	7,14%	7,10%	8,85%
2nd fund	12,9%	14,0%	5,39%	5,94%	7,05%	6,52%
3rd fund	10,1%	8,81%	4,51%	5,65%	5,28%	6,15%
4th fund	7,39%	8,59%	4,46%	5,22%	4,65%	5,94%
5th fund	7,28%	8,29%	4,24%	4,90%	4,51%	5,35%
5th from last fund	-2,52%	-0,05%	-5,47%	-4,12%	-4,85%	-3,92%
4th from last fund	-2,53%	-0,17%	-5,58%	-4,21%	-5,39%	-4,40%
3rd from last fund	-4,10%	-1,10%	-6,76%	-4,62%	-7,09%	-4,53%
2nd from last fund	-5,82%	-4,42%	-7,23%	-6,40%	-8,26%	-6,65%
Last fund	-7,01%	-5,40%	-8,22%	-6,61%	-14,7%	-13,2%

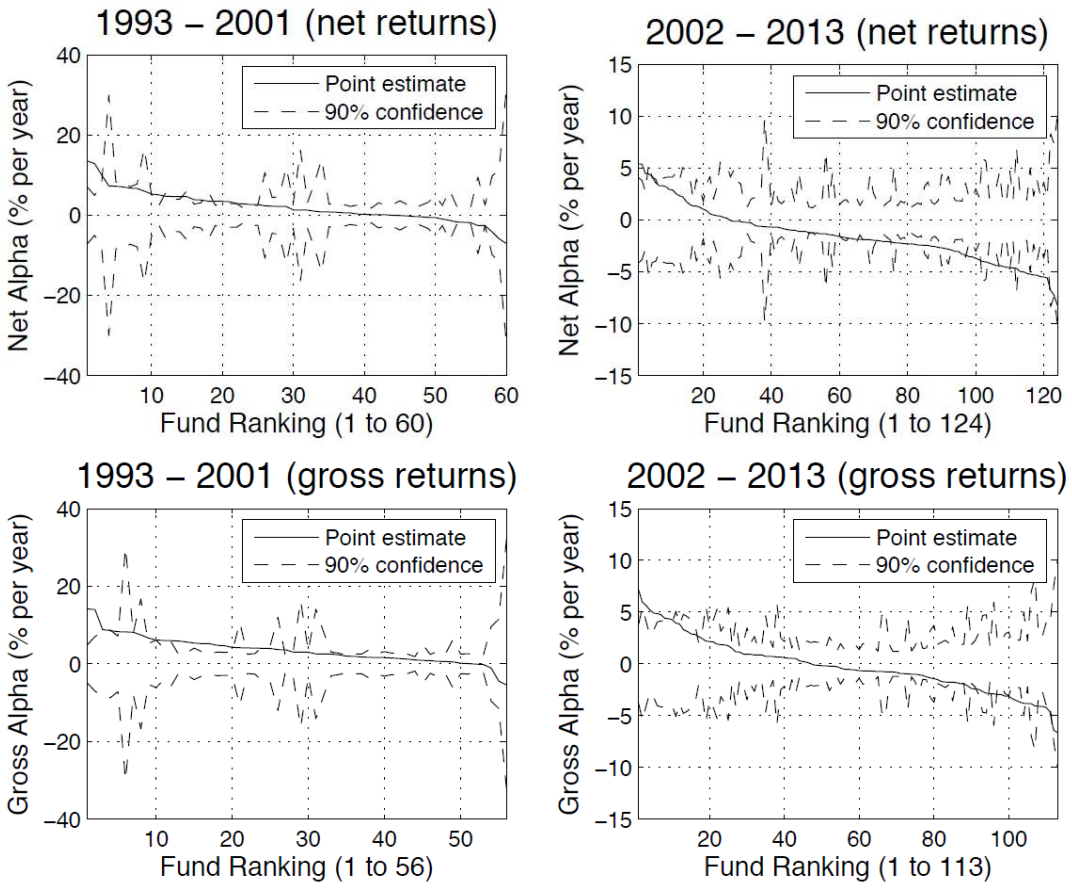
Notes: The 1993-2001 net sample comprises of 60 funds and the gross sample of 56 funds. The 2002-2013 net (gross) sample comprises of 124 (113) funds. The 1993-2013 net (gross) sample comprises of 128 (117) funds. The number of funds in each decile is rounded to nearest integer (e.g., either 5 or 6 in the 1993-2001 gross sample).

Table 3 also reports excess returns for the cross-section of fund deciles and for the five top and bottom funds. The spread in returns across deciles is large, particularly in the earlier period, and it is of course even larger across individual funds. The gross and net excess returns of the top decile in 2002 – 2013 were more than 10 percentage points higher than that of the bottom decile, and the gross and net excess returns of the top fund in the same period were about 22 percentage points higher than that of the bottom fund.

Figure 2 plots the performance of each fund and shows whether estimated gross and net excess returns are significantly different from zero at the two-sided 90 per cent confidence

level, which is a standard but naïve approach to measuring superior and inferior performance.[10] As can be seen, many funds exhibit superior performance in terms of both gross and net excess returns in the early period but relatively few in the late period. Twelve of 113 funds have significant positive gross excess returns in 2002-2013 and five of 124 funds have significant positive net excess returns.

Figure 2. Estimated fund returns



Although Figure 2 accurately depicts the cross-sectional distribution of net excess returns, it is naïve in terms of measuring superior and inferior performance. Statistically significant superior or inferior performance may be due to superior or inferior stock-picking skills or due to good or bad luck. Any cross-section of fund returns will show dispersion, suggesting that some funds have superior performance. Our analysis of performance

[10] The confidence interval was formed under the standard assumptions of independent and homoscedastic errors. Correcting for autocorrelation using Newey-West (1987) standard errors matters little.

persistence in the next section and our bootstrap of entire cross-sections of funds in the subsequent section attempts to determine if and to what extent fund managers possess true stock-picking skills.

3.3 3- and 4-factor performances

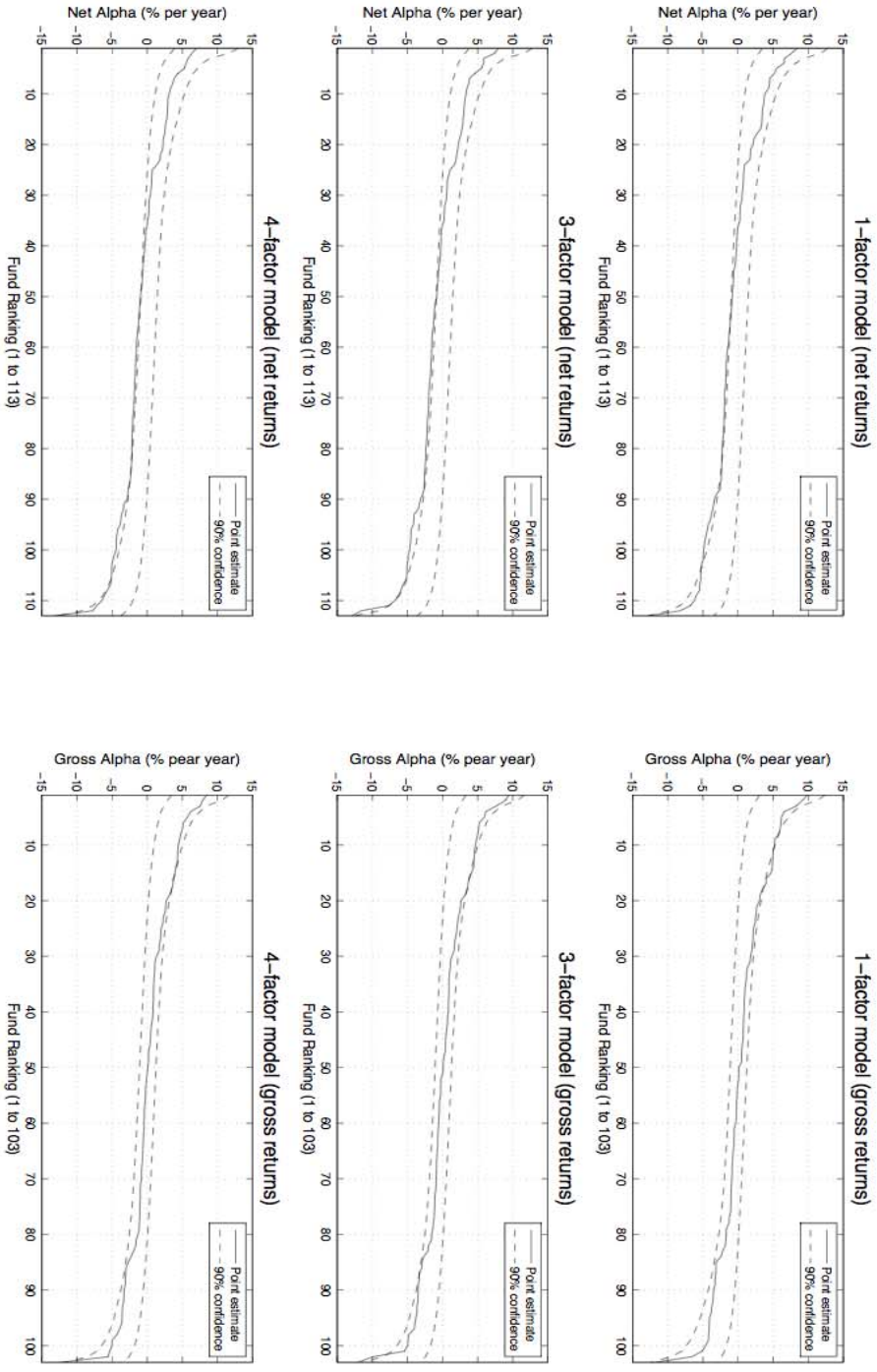
Our performance estimates are based on 1-factor returns and not on 3- or 4-factor returns. Lack of data prevents us from basing our analysis on excess returns that are adjusted for more systematic risk factors than market risk for the whole period. The necessary data, which need to account for Sweden's multiple share class system, are available only from 1999 to 2009. We can compare 1-, 3- and 4-factor excess returns for this shorter period in order to see whether performance is likely to be substantially different when account is taken of more than market risk, see Table 4. Looking at average performance and the performance of top and bottom deciles of funds, it is clear that performance is somewhat better in general when more risk factors are accounted for, especially when a momentum factor is added to the Fama-French high-versus- low book-to-market value and small-versus-big market capitalization risk factors. The average 4-factor gross and net excess returns are 20-25 basis points higher than the 1-factor returns, and the positive tail of the 4-factor distribution of decile returns is somewhat to the right of 1-factor distribution. The cross-sections in Figure 4 show very small differences of the number of funds with superior returns between gross and net 1-, 3- and 4-factor returns.

Table 4. 1-, 3- and 4-factor alphas 1999-2009

	1-factor		3-factor		4-factor	
Portfolio	Net	Gross	Net	Gross	Net	Gross
All funds	-0,48%	0,84%	-0,30%	1,03%	-0,27%	1,09%
1st decile	6,16%	7,02%	6,02%	6,93%	6,63%	7,84%
2nd decile	3,15%	4,61%	3,03%	4,51%	3,32%	4,73%
3rd decile	1,45%	2,97%	1,68%	3,10%	1,68%	3,15%
4th decile	0,22%	1,57%	0,37%	1,77%	0,24%	1,55%
5th decile	-0,47%	0,86%	-0,32%	0,99%	-0,33%	0,84%
6th decile	-1,07%	0,32%	-0,93%	0,43%	-0,83%	0,51%
7th decile	-1,64%	-0,26%	-1,54%	-0,14%	-1,34%	0,06%
8th decile	-2,32%	-0,91%	-2,20%	-0,80%	-1,93%	-0,47%
9th decile	-3,73%	-2,39%	-3,20%	-1,73%	-3,60%	-1,91%
10th decile	-6,01%	-4,85%	-5,42%	-4,25%	-6,04%	-4,85%
1st fund	10,3%	10,41%	9,89%	9,80%	13,6%	15,2%
2nd fund	8,67%	9,89%	8,05%	9,46%	8,13%	9,88%
3rd fund	8,39%	9,14%	7,96%	8,92%	8,00%	8,49%
4th fund	7,64%	6,96%	7,42%	6,79%	6,99%	7,88%
5th fund	5,48%	6,28%	5,65%	6,15%	6,38%	6,97%
5th from last fund	-5,39%	-4,40%	-4,85%	-3,73%	-5,24%	-4,11%
4th from last fund	-6,03%	-4,53%	-5,37%	-4,51%	-5,48%	-4,62%
3rd from last fund	-6,20%	-4,83%	-5,94%	-4,84%	-6,43%	-5,31%
2nd from last fund	-7,09%	-5,10%	-7,86%	-5,17%	-8,00%	-5,34%
Last fund	-14,7%	-13,17%	-11,1%	-9,61%	-14,6%	-13,1%

Notes: The net sample consists of 117 funds and the gross sample of 107 funds.

Figure 3 Comparison of estimated fund excess returns with different numbers of risk factors



3.4 Active management and performance

A different strand of the literature on fund performance takes other approaches to detect skill. In order to beat the market fund managers have to be truly active, either by picking stocks or by following a particular management style such as betting on value or growth stocks or past winners (market timing). Cremers and Petajisto (2009) propose a simple measure of the difference between the fund´s portfolio weights and that of the benchmark index called active share. Funds with the highest active share significantly outperform their benchmarks in their data, both before and after expenses, and also exhibit strong performance persistence. Ekholm (2012) takes an approach that is not dependent on data of fund holdings. He decomposes fund tracking error into two components, called active alpha and active beta. Active beta measures excess systematic risk standard deviation while active alpha measures idiosyncratic residual return standard deviation, or security selection. Future performance is positively related to past stock picking and negatively related to past market timing in his data. He also finds that portfolio manager activity is highly persistent over time, which supports his conclusion that stock picking increases performance while market timing decreases performance. A third approach, by Amihud and Goyenko (2013), is similar to that of Ekholm. They show that $1 - R^2 = \frac{RMSE^2}{VARIANCE} = \frac{RMSE^2}{SystematicRisk^2 - RMSE^2}$, where root mean square error is the idiosyncratic volatility – the volatility of the residual from the factor returns equation – and $SystematicRisk^2$ is the return variance that is due to the benchmark indexes´ risk. The fund manager is a more selective stock picker if the fund´s idiosyncratic volatility is higher relative to its total variance and the systematic risk. They find that lower R^2 predicts better performance.

We find no evidence that more active management predicts higher net excess returns in 2002-2013. In Table 5 we regress three-year period 1-factor alphas on Amihud and Goyenko´s measure of management activity, $1 - R^2$ and active share. Both activity measures are lagged so that they are observed at the beginning of each 3-year period. For ease of interpretation the measures have also been normalized to mean zero and unit variance. Column 1 considers the predictive ability of $1 - R^2$ in both period 1 and period 2. During 1993-2001 a high level of activity does yield a significantly higher net excess returns. The effect is substantial; a one-standard deviation increase in $1 - R^2$ predicts an increase in net alpha of 2 percent per year. In contrast, $1 - R^2$ has no predictive ability after 2001. The second and third columns show that neither active share nor the two activity measures have any predictive ability on net excess returns in 2002-2013. These results provide alternative evidence of lack of skill in the latter period and are in line with Frazzini et al. (2015).

Table 5. 3-year overlapping net 1-factor alphas

	1993 – 2013	2002 – 2013	
	(1)	(2)	(3)
Intercept	-0.017***	-0.017***	-0.018***
	(0.002)	(0.002)	(0.002)
Dummy[1993-2001]	0.038***		
	(0.005)		
1 - R-squared	-0.0006		-0.005*
	(0.006)		(0.003)
(1 - R-squared) x Dummy[1993-2001]	0.020*		
	(0.012)		
Active share		0.002	0.005
		(0.002)	(0.003)
Observations	1114	445	445
Number of funds	108	73	73
R-squared	0.173	0.004	0.013

Note: All small company funds excluded. The first window for the second time period is 2000-2002. 1- R-squared and active share are normalized to mean zero and unit variance and lagged one year relative to the first year of the pertaining 3-year period of the alpha. Standard errors clustered at the fund-level.

4 Persistence

Financial advice on investing in mutual funds is often based on past performance. The presumption is that superior past performance is due to skill and that skill is persistent. To find persistence, we rank funds according to performance and then track performance during subsequent years, following Carhart (1997). We note that this approach is subject to possible model misspecification, since the same performance attribution model is used to rank funds and to measure performance. If the model has a bias in risk adjustment, for example due to an omitted variable, the bias in ranking will also affect the subsequent measurement of performance.

We choose to rank funds based on their returns during three years rather than a shorter period to reduce noise. Our first ranking period is 1993-1995. Based on their net excess return alphas, we sort funds into deciles, with decile 1 having the highest performance. We also select

the top and bottom five funds. We next estimate the performance of deciles and top and bottom funds for one to five years starting with 1996. Moving the ranking and evaluation periods one year forward at a time, this is repeated 17 times. Note that the procedure means that the composition of deciles and the identity of a fund with a particular rank may change between ranking periods. The last ranking period is 2006-2008 and the last evaluation period 2009-2013. In each evaluation period we require that funds are present from the beginning to the end to be included. We then calculate average performance for the 18 evaluation periods. The results are presented in Figure 4.

Figure 4 a) Fund returns over time relative to mean, deciles

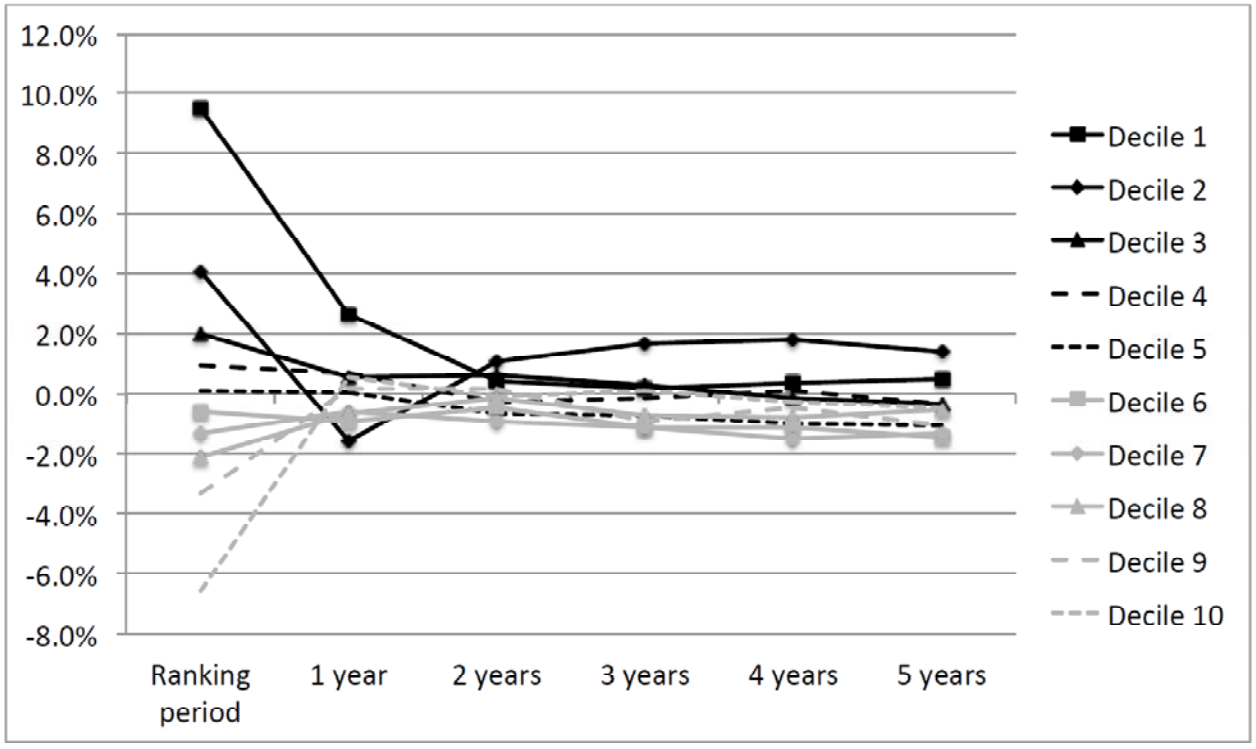
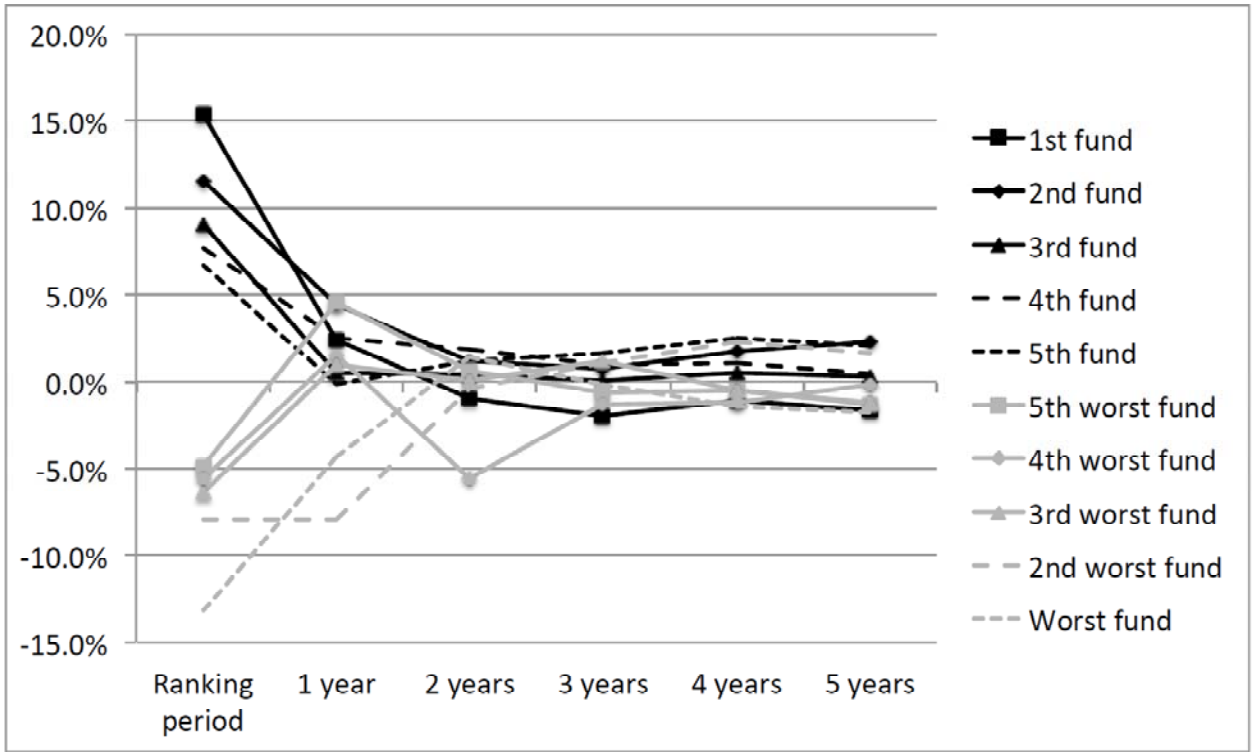


Figure 4 b) Fund returns over time relative to mean, top and bottom 5 funds



Performance varies greatly across deciles in the ranking period. The top decile fund has an average positive net excess return of nearly ten per cent per year and the average bottom decile fund an average negative excess return of nearly seven per cent per year. The absence of persistence in the evaluation period is quite striking. The spread in decile returns has more or less disappeared in the second year and returns stay close in the following years. It hardly pays to invest in a fund in the top decile for more than one year after the ranking period; the average net return is close to zero subsequently. The second decile funds is a more promising bet; excess returns are positive over the next two to five years, but investors can expect the worst return of all deciles in the first year of the performance period.

The same pattern of rapid convergence towards the mean is visible for the top and bottom five funds, see panel b) in Figure 3. The dispersion of returns across funds in the evaluation period is much greater than for fund deciles, with a difference in yearly net excess returns of nearly 30 percentage points per year between the average top and bottom fund. Looking at subsequent performance, it is not clear what the advice to an investor should be.

The top fund ends up being the bottom fund over the next three to five years, and the second worst fund becomes the second best in the next three to five years.

The rapid reversion to the mean of excess returns and the general lack of persistence in rankings are strong indications that fund managers lack stock-picking skills and that excess returns – positive or negative – are due to good and bad luck.

5 Skill or luck?

To test whether the performance of active funds is truly superior or inferior, we employ a bootstrap procedure that yields a distribution of pseudo-returns for each fund under the null hypothesis that true alpha of every fund is zero. With gross excess returns, setting alpha equal to zero presumes that funds obtain the same excess return as the market portfolio. With net excess returns, setting alpha equal to zero presumes that funds can obtain returns that exactly cover the costs of active management. Actual estimates of fund excess returns are compared to bootstrapped excess returns. If actual gross excess returns differ from bootstrapped returns with statistical confidence, we conclude that the abnormal excess returns are due to superior or inferior skill in picking stocks. If not, we cannot rule out that actual gross returns are due to good or bad luck, and not to superior or inferior skill. If actual net excess returns exceed bootstrapped returns with statistical confidence, we conclude that the fund manager has sufficient skill to more than compensate investors for the costs of active management. If actual net excess returns are significantly lower than bootstrapped returns, we conclude that the fund manager is unable to compensate investors for the costs of active management.

To generate returns under the null hypothesis of zero alphas, we subtract each fund's excess return as measured by alpha from equation (1) from its monthly gross and net returns for the part of 2003-2013 it has been in existence. A simulation run is a random sample with replacement drawn from the fund's zero alpha average monthly returns, the same random sample of months for each fund. Each time a certain month is drawn, all funds in existence that month are given its corresponding adjusted return and the corresponding factor return (beta) for that month. We estimate equation (1) for each fund on the simulation draw of adjusted fund returns and factor returns. Each simulation run produces a cross-section of alpha estimates using the same random sample of months. This is done 5,000 times to produce a distribution of alphas at each point in the ranking distribution (under the assumption of zero alphas). The distribution for the top fund is constructed as the distribution of the maximum alpha generated across all bootstraps, the distribution for the second best fund as the second best alpha across all bootstraps, and so on.

Note that in a given simulation run, funds will have the same random sample of months as when they overlap in existence. This has the advantage that the simulations will capture any

cross-correlation in fund returns. In unreported results, we see that cross-correlation exists and is important – the confidence intervals widen. The joint sampling of fund and factor returns has the added advantage of capturing any heteroscedasticity of the explanatory returns and the disturbances of the benchmark model. Sampling the same months for all funds has the disadvantage that a fund may show up in a simulation run for more or less than the number of months it has actually existed since any given month may be sampled more than once or never. Presumably, over-sampling of some funds will be balanced by under-sampling of others in each simulation and over the 5,000 runs used to make inferences. There is a caveat, however. We discard funds with a return history of less than 36 months, with the result that we may end up with a bit more over- than under-sampling.[11]

There are two more caveats. Using the same month's return for all funds in a simulation run preserves the cross-correlation of fund returns, but eliminates any effects of autocorrelation. This seems to be a minor problem, see e.g. Fama (1965) or Kosowski et.al. (2006). In unreported results we see very small effects on standard errors when we allow for the Newey-West (1987) correction. Also, since we randomly sample months, we lose any effects of time variation in the regression slopes of (1). Ferson and Schadt (1996) argue that time variation should be allowed.

5.1 Results for gross excess returns

We are now ready to turn to simulation-based results, and start with bootstrapped distributions of gross excess returns (gross alphas). Figure 4 shows 90 per cent confidence bands (five per cent on each side) around the bootstrapped gross 1-factor alpha distribution and around the t-values of the bootstrapped 1-factor alpha distribution for the period 2002 – 2013. It should be pointed out that the confidence bands are based not on an assumed parametric form of the distributions, but on actual counts of point estimates over the 5,000 simulations.[12] Estimates of actual gross 1-factor alphas and t-values of actual gross 1-factor alphas are also shown (the estimates of alpha are of course the same as in the plot on the right-hand-side of Figure 2). Funds that are short-lived have less precise estimates of excess returns – estimates with greater standard errors – than funds that exist the whole time period. By using the t-statistics of the estimates of excess returns, one can control for the effect of different life-times of funds and the subsequent precision of the estimates. Because of this, t-statistics is the preferred statistic of both Kosowski et.al. (2006) and Fama and French (2010).

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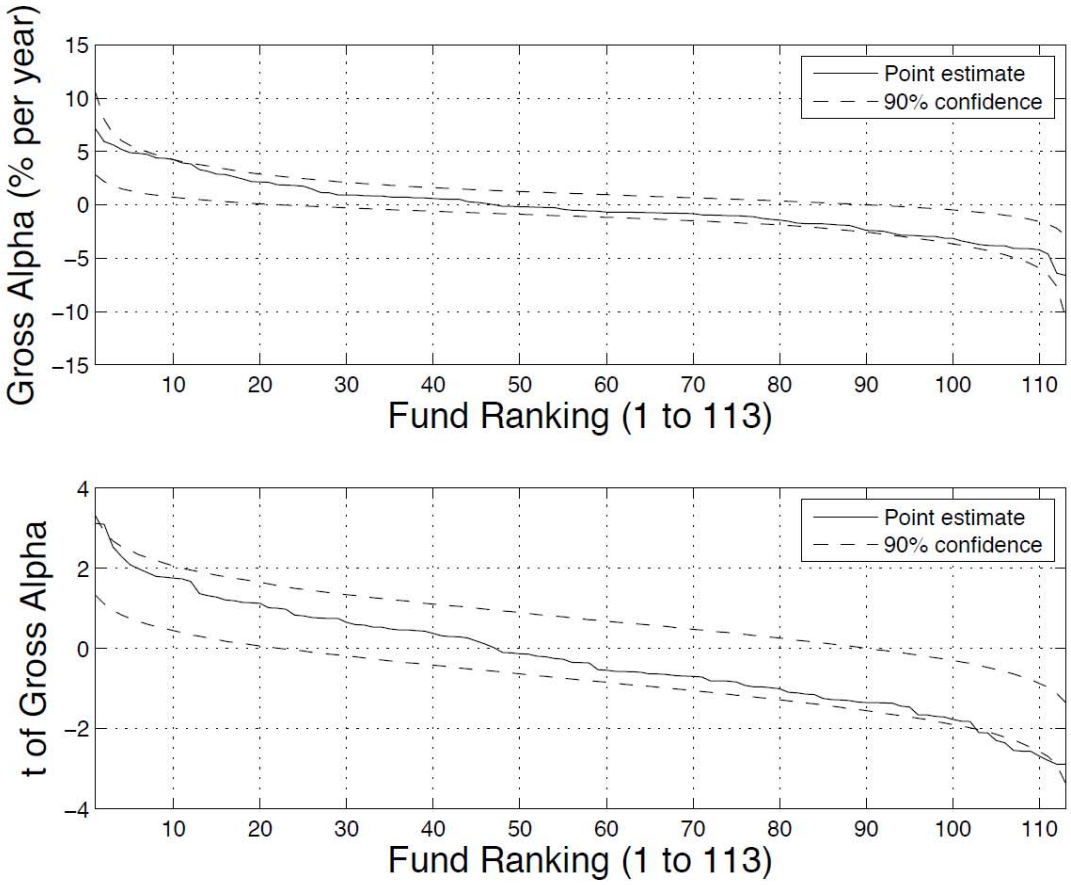
[11] Effectively, for the 2002-2013 period, for which we have 124 actively managed funds, 4,095 bootstrap samples contain this number of funds. 869 bootstrap samples contain 123 actively managed funds. Only 36 bootstrap samples contain 122 funds or fewer. In the cases when there are fewer then 124 funds in the bootstrap sample, we use the confidence interval of the closest fund percentile-wise in the ranking distribution, to form the confidence interval based on 5,000 bootstraps for all of the 124 funds.

[12] Kosowski et.al. (2006) stress that the actual distribution may differ from the normal distribution.

Figure 5 Cross-section of bootstrapped fund gross excess returns and *t*-values of returns, 2002-2013



As can be seen, there is only one positive and significant actual gross 1-factor alpha relative to the bootstrapped gross alpha (for the fund ranked tenth) and only one significant positive gross 1-factor alpha when testing on t-values of actual and bootstrapped gross alphas (for the fund ranked second in terms of t-statistic). No fund has a negative and significant gross alpha.

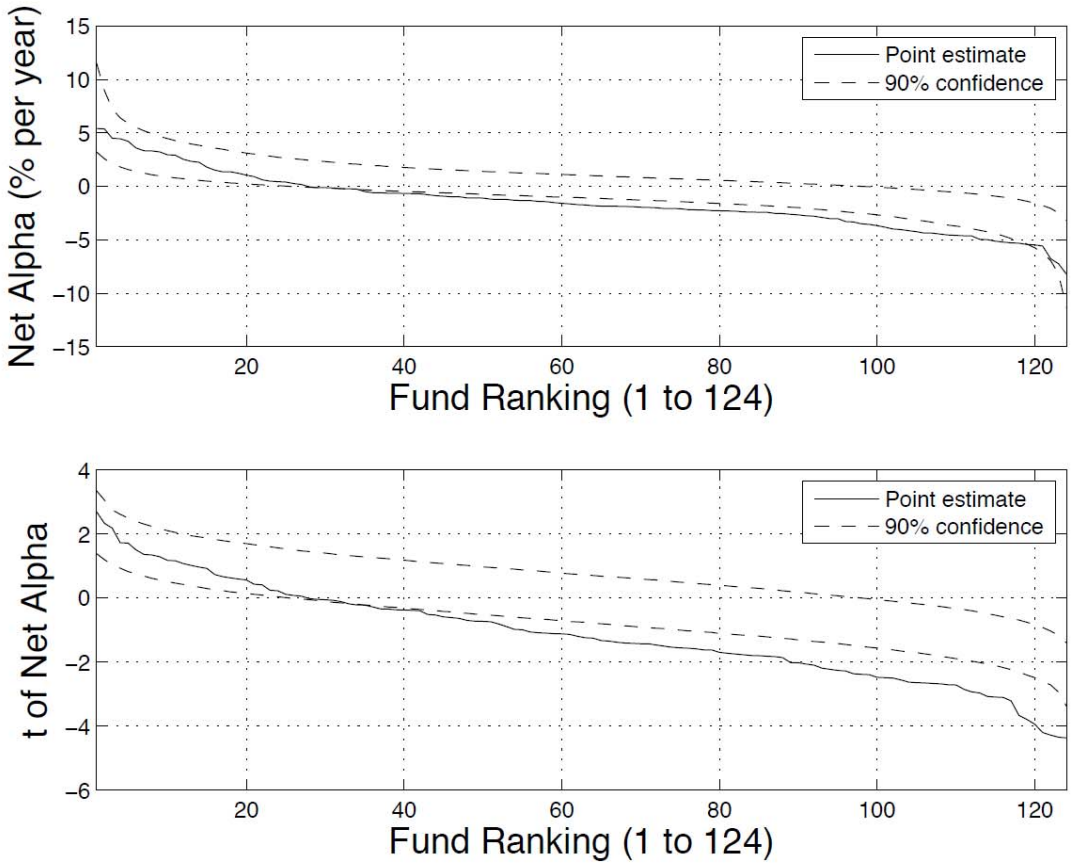
We draw the conclusion that there is very little evidence of true stock picking skill among managers of actively managed Swedish equity mutual funds in 2002 – 2013. Also, there is no evidence of inferior skills at the other end of the distribution.

5.2 Results for net excess returns

Figure 6 shows the results of the analogous exercise for net excess returns (net alphas). As expected from the finding of very little skill in the gross alphas, no fund is found to be

sufficiently skilled to compensate for the cost of active management and give investors a significant positive net alpha in 2002-2013. This holds for both tests on actual relative to bootstrapped net alphas as well as tests on t-values of actual and bootstrapped net alphas. About two thirds of the funds have significant negative net alphas, which means that they cannot compensate investors for expenses.

Figure 6 Cross-section of bootstrapped fund net excess returns and *t*-values of returns, 2002-2013



6 Conclusions

Most investors and financial advisers seem to believe that some fund managers possess true skill in picking stocks. We find some support for these beliefs based on data for Swedish equity mutual funds and applying conventional tests of performance. Their average gross excess 1-factor return (alpha before costs) was –0.18 per cent in 2002 – 2013, but 12 out of 113 funds obtained significant positive gross returns at conventional levels of statistical confidence.

However, non-conventional tests proposed by Amihud and Goyenko (2013) and (Ekholm (2012) find that more active management does not predict higher returns.

Persistence in performance is commonly seen as a sign of stock-picking skill. When we examine persistence by ranking funds based on their three-year performance and then track their performance during the following one to five years, we find that the large initial differences in performance largely disappear after about two years and are small subsequently. This holds both for decile averages and for the five top and bottom funds. Hence, there is practically no evidence of persistence in performance and therefore of skill.

Finally, we examine whether observed superior returns are due to skill or luck by comparing actual to bootstrapped returns. Bootstrapped returns are generated under the assumption of zero alphas. The bootstrap yields a distribution of pseudo-excess gross and net returns for each fund. We test whether the actual excess return of each fund is significantly different from the simulated excess return in 2002-2013. We find that only one fund (ranked second) has a positive and significant gross excess return at the (two-sided) 90 per cent level when testing on the *t*-values of alpha estimates. Similarly, only one fund (ranked tenth) has a positive and significant gross excess return when testing on the alpha estimates directly. No fund is able to give investors a positive and significant net excess return. Looking at negative gross excess returns in 2002-2013, nine funds have significantly inferior gross excess returns when testing on the *t*-values of the alpha estimates, but not when testing on the alpha estimates directly.

In conclusion, there is very little evidence of true stock picking skill among managers of Swedish equity mutual funds and no evidence that funds can give investors positive net returns.

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