Expenses and the performance of Danish mutual funds

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1. Introduction

Mutual funds make it easy for investors to diversify their portfolio and hence reduce idiosyncratic risks. The drawback of mutual-funds investments is that investors must pay for the services offered by the funds: Some funds have low costs because they follow simple strategies and trade little (e.g. passive index funds) whereas other funds have higher expenses as a consequence of their more advanced asset allocation and stock picking decisions, and their possibly higher turnover of the fund's assets. Whether the costs of mutual fund investments outweigh the gains thus depend on the cost structure of the fund. The general stand in the literature is that funds are not able to generate return over and above their costs, i.e. it does not necessarily pay off to invest in actively managed funds; see for instance Blake et al. (1993), Gruber (1996), Carhart (1997), and Wermers (2000).

Figuring out the costs of mutual fund investments is not an easy task, however. There are many costs to keep track on: the investor must pay his part of the operating costs of the fund, possible load fees when entering or leaving a fund, and costs associated with trades in the underlying assets of the fund. In this paper, we analyze a new simple way of helping investors figuring out the costs of mutual fund investments. In particular, we describe the development of a simple indicator of the size of mutual fund costs, and we use this cost indicator to rank funds according to the size of their costs. We also test the predictive power of the cost ranking for future risk-adjusted returns using data from the Danish mutual fund market for the period 1994 to 2003.

The indicator we analyze in this paper is inspired by the Morningstar™ mutual fund ratings, and is called the ATP-Rating™.[1] As is well-known, Morningstar™ assigns "stars" to a mutual fund depending on the historical performance of the fund in comparison with its peers. Inspired by the Morningstar™ stars, the ATP-Rating™ assigns crowns to each individual fund depending on the historical costs of the fund in

[1] ATP (Arbejdsmarkedets Tillægspension) is a Danish pension scheme to which all Danes pay mandatory contributions. ATP is one of the largest pension managers in Europe and manages assets worth more than DKK 300 billion, or approximately USD 50 billion. Until January 1, 2005, Danes could not influence the portfolio composition of their pension savings in ATP. As of January 1, 2005, however, all individual Danes will be allowed to allocate a part of their pension savings (The Special Pension Savings Scheme) into different mutual funds (the aggregate value of the Special Pension Savings Scheme is DKK 43 billion). To facilitate the investment decisions, ATP has suggested the development of the ATP cost rating. It is the development of this rating that we describe in the paper.

relation to the costs of the fund's peers, with 5 crowns pertaining to those funds with the lowest costs and 1 crown to those funds with the highest costs. Having described the development of the cost indicator, and rated the Danish mutual funds, we investigate whether or not the cost indicator provides information about the future performance of a fund. In particular, we use the approach of Blake & Morey (2000), who test the predictive power of Morningstar™ ratings, to test the hypothesis that funds belonging to the high-cost (1 crowns) category yield a lower return than low-cost funds.

Prior to developing the cost indicator, we give information on the cost structure of Danish mutual funds. We have data on costs (and returns) for the period 1994 – 2003. We document several interesting features of how costs have developed over time and how and whether costs are related to risk-adjusted returns. In particular, we report that operating expenses have increased over time but load fees have remained fairly constant. We also show that costs are very persistent whereas the persistence in returns is very low. Before developing the cost indicator, we investigate the in-sample relation between costs and performance. We find that there is no simple linear relation between costs and risk-adjusted excess returns *in-sample*. Actually, we report a "v"-shaped relation between costs and returns: funds that do very bad have high costs and funds that do very good have high costs. Having documented a "v"-shaped relation between costs and performance, we turn to the question of whether one can pick out the funds that have high costs and have poor performance (i.e. generate low risk-adjusted excess returns) *ex ante*. We do this by investigating whether costs today contain information about the returns a fund generates in the future. Our procedure is as follows: first, we discuss ways to weight the cost components into a cost indicator, then we rank the funds as based on the size of the cost indicator, and finally we analyze whether the indicator has predictive power with respect to future risk-adjusted long-run returns. We find that the cost indicator contains some information about in particular long-run performance of the funds.

Why develop a new indicator? Barber et al. (2003) hypothesize that "expenses that remain out of sight are likely to remain out of mind". In other words, the way information about costs is conveyed to investors matter for how these investors

perceive and learn about the costs of mutual fund investing.[2] The underlying hypothesis of developing a new cost indicator is thus that investors are not able to absorb the vast amount of information about the costs of mutual fund investing, and, at the same time, costs of mutual fund investments are relevant for the return the investor obtains from his mutual fund investment. To help investors better understand the costs of mutual fund investing, a simple transparent cost indicator could be beneficial.

Finally, it should be mentioned that we, apart from the description and development of the cost indicator, provide Danish (i.e. non-US, and in this sense out-of-sample) evidence on the issue of whether a high-cost fund generates additional returns or not, i.e. whether it pays to invest in high-cost funds.[3] There is amble evidence from US data that high expenses on mutual funds do *not* necessarily yield high returns from the funds (Blake et al., 1993; Gruber, 1996; Carhart, 1997; Wermers, 2000). Much less is known about non-US funds.[4] Given the particularity of the US market,[5] it is in-itself of interest to know whether findings from the US prevail in non-US countries, too.

The remaining part of the paper is structured as follows. In the following section, we describe the Danish mutual fund market. In section 3, we document the cost structure of Danish mutual funds and the development over time in costs. Section 4 describes the development in raw returns. In section 5, we document that costs of investing in mutual funds are much more persistent than are the returns from mutual fund investments, i.e. perhaps there is considerable uncertainty about the future returns that a fund will generate, but there is much less uncertainty about the future costs. In

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[2] Barber et al. (2003) investigate the hypothesis that investors learn faster about the transparent front-end load fees than they do about the less transparent operating expenses. They find empirical support for this hypothesis using both detailed microeconometric studies, but also by the simple fact that assets invested in front-end load equity funds have dropped dramatically during the last decades (from 91 percent in 1962 to 35 percent in 1999).

[3] One hypothesis could be that high-cost funds yield high returns because they employ analysts that are better at picking the right stocks or better at strategic asset allocation decisions.

[4] Dahlquist et al. (2000) study the performance of Swedish mutual funds. Christensen (2003a, 2003b) studies Danish mutual funds, as we do. The studies in Christensen (2003a, 2003b) are not as comprehensive as the present study, however, and focus on other issues than the relation between mutual fund costs and performance.

[5] Except from the more general differences between the US market and other markets, such as the size of the US market as compared to other markets (US has the largest equity and bond markets in the world measured on many characteristics such as volume, trade, and so on) and the large equity premium in US as compared to others countries (Goetzmann & Jorion, 1999), US is also the market with the highest numbers of mutual funds. This makes is reasonable to ask whether mutual fund markets in other countries show characteristics similar to those of the US mutual fund market.

section 6, we investigate whether and how the different types of costs associated with mutual fund investing are related to risk-adjusted excess returns. In section 7, the ATP-Rating™ is described, and in section 8, it is investigated whether the ATP-Rating™ contains useful information about future returns. A final section concludes.

2. The Danish market for mutual funds

In 1982, regulation of Danish mutual funds was formally grounded in Danish law. However, it was not until the beginning of the 1990s that the Danish market for mutual funds really gained momentum: the total value of Danish mutual funds' holdings increased from DKK 21 billion in 1990 to DKK 124 billion in 1998, DKK 257 billion in 2000, and reached a value of DKK 364 billion in 2003.[6] This corresponds to an average annual growth rate of approximately 24.5%. In 2003, some 600,000+ Danes (approximately 12 percent of the Danish population) had directly invested in Danish mutual funds.

In our investigation, we look at both equity funds and bond funds.[7] We subdivide the equity funds and the bond funds into four subcategories following the classification used by ATP (listed in Appendix A). The equity funds are sorted into *Danish stocks, Global stocks, Regional stocks*, and *Other stocks*.[8] The bond funds are divided into *Short bonds, Long bonds, Global bonds*, and *Other bonds*.[9] The ATP classifications collect different Morningstar™ categories. ATP uses fewer categories than Morningstar in order to reduce the dimension of the investment universe faced by savers in ATP. In 2003, we have in total 363 Danish funds, and thereby cover the whole market for Danish mutual funds.

In Figure 1, the development of the number of Danish mutual funds during the period from 1980 to 2003 is shown in order to provide an impression of the growth in the Danish market for mutual funds. The market for Danish mutual funds has gone

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[6] One Danish krone approximately corresponds to USD 0.17, i.e. the total value of assets under management by Danish mutual funds was approximately USD 62.8 billion in 2003.

[7] All mutual fund data that we use have kindly been supplied by Morningstar™ through ATP.

[8] *Global stocks* refer to mutual funds investing in several countries, i.e. global portfolios, whereas *Regional stocks* refer to mutual funds holding stocks from individual single countries, i.e. for instance US large cap funds, UK mid cap funds etc.

[9] The *Short* and *Long bonds* refer to Danish and Euro-zone bonds. The Danish currency (the Danish kroner) closely follows the movements of the Euro and the exchange rate peg is very credible (the interest spread between Danish and German 10-year government bonds, for instance, is only 25 basis points and has been this low since the mid-1990s). For this reason, Euro and Danish bonds are collected in one category.

through three phases: during the 1980s more and more mutual funds were introduced. This development came to a halt during the first part of the 1990s were there was basically no net increase in the number of funds. Since 1995, the Danish market for mutual funds has gained momentum and there has been a high growth in the number of Danish mutual funds.[10] In 1995, there were still less than 100 Danish mutual funds, but less than ten years later there are more than 350 funds. Since 1990, the average annual growth rate of the number of Danish mutual funds is approximately 14%. Given the fact that the total value of assets controlled by the Danish mutual funds increased by 24.5% on an annual basis during the 1990-2003 period, the total value of assets has increased by more than the number of funds; in other words, the average size of a fund has increased.

There are more equity funds than bonds funds in Denmark, and this has been so in all years since 1985 (in each year approximately 60% of the funds have been equity funds). In 2003, there were 212 equity funds and 151 bond funds. The largest categories are *Regional stocks*, *Other stocks*, and *Long bonds*.

3. Expenses

In this section, we describe the cost structure of mutual fund investing in Denmark, and the data that we use in the analysis.[11]

We have four sources of data on costs of mutual fund investing: Front-end load fees, back-end load fees, operating expenses, and turnover. We have data on load fees and operating expenses from 1994, but we only have data on turnover for the years 2000, 2001, 2002, and 2003. We describe each cost source in turn below.

Front-end load fee: When buying a mutual fund, a front-end load fee (emissionstillæg) may be charged.[12] The load fee is denoted in percent and is a one-time transparent up-front fee. In the US, there has been a change in the way mutual funds charge their

[10] Notice that it is exactly this period we concentrate on in the empirical investigations, as this is the period for which we have data on costs, as described in the following section.

[11] The cost data have also been supplied by Morningstar™ through ATP.

[12] The front-end load fee is what the investor may be charged on top of the Net Asset Value per share in order to cover the costs associated with the fund's purchase of additional assets for its newly added additional wealth. The front-end load fee makes sure that the current investors in a fund are left unadjusted when the fund adjusts its holdings of assets due to the new fund investors. Furthermore, the front-end load fee includes the remuneration from the mutual fund to the bank (or other financial intermediary) that has established the sale of the mutual fund share to a private investor.

expenses. As mentioned, Barber et al. (2003) report that the assets under management by equity funds that charge front-end load fees have declined considerably (from 91 percent of total equity controlled by equity funds in 1962 to 35 percent in 1999). At the same time, and most likely as a reaction to this behaviour of fund investors, mean load fees have dropped from more than 8% in 1962 to approximately 5% in 1999. In Figure 2, we report the average front-end load fees for the different categories of Danish mutual funds that we study. As is clear, the front-end load fees have remained approximately constant throughout the sample period, i.e. in Denmark there has not been a tendency for front-end load fees to be reduced. Barber et al. (2003) argue that investor behaviour is strongly influenced by transparent attention-grapping information, and, in particular, that investors have learned to avoid the transparent front-end load funds. In Denmark, all funds use front-end load fees, and there has been no tendency to a reduction in these fees.

It should be noticed that the front-end load fees in general are lower for bond funds than they are for equity funds, i.e. the costs of entering an equity fund is higher than the entry costs of bond funds.

Back-end load fee: When selling a mutual fund, a back-end load fee (indløsningsfradrag) may be charged.[13] The fee is denoted in percent and is a one-time fee that is not known when buying a mutual fund share, as the fee can be changed from the day of purchase of the mutual fund to the day where the mutual fund share is sold. Figure 3 shows the development in the back-end load fees charged by Danish mutual funds. The averages of the back-end load fees changed by the Danish mutual funds have been fairly constant throughout the sample period. It is noteworthy, however, that the averages of back-end load fees decline from 2002 to 2003.

As with font-end load fees, the back-end load fees are generally higher for equity funds than they are for bond funds.

Operating expenses: The operating expenses cover salaries to the workers of the mutual fund, rental of mutual fund offices, marketing expenses, and so forth. The operating

[13] The back-end load fee is the reduction in the Net Asset Value per share that the investor must accept when selling a mutual fund share. The back-end load fee covers the costs associated with the fund's selling of assets for its reduced wealth. The back-end load fee makes sure that the remaining investors in a fund are left unaffected when the fund adjusts its holdings of assets due to the lost fund investors.

expenses are expressed as a percentage of the wealth of the mutual fund. Figure 4 shows the development over time in the average operating expenses. For all equity categories, the average operating expenses have clearly been increasing during the 1997/1998 to 2003 period. For instance, the average operating cost in mutual funds investing in *Danish stocks* was 1.19% in 2003, up from 0.71% in 1998; an increase of approximately 67%.[14] The same kind of pattern is also witnessed in the other equity categories. For the bond categories, the story is a little different. The average operating costs for the *Global bonds* funds and the *Other bonds* funds follow the same increasing pattern as do the equity funds. The operating costs of the *Short* and the *Long bonds* funds, though, do not seem to have increased significantly during the period.

In Table 1 we report averages and standard deviations of the time series presented in Figures 2 through 4.

Table 1. Average and standard deviations of expenses in percent for different categories of Danish mutual funds. 1994-2003.

		Stocks				*Bonds*			
		Danish	*Global*	*Regional*	*Others*	*Short*	*Long*	*Global*	*Others*
Ope. costs.	Avg.	0.90	1.08	0.94	1.12	0.58	0.62	0.72	0.72
	Std	0.15	0.16	0.11	0.18	0.06	0.08	0.09	0.17
Font-end fee	Avg.	1.90	1.81	1.54	2.35	0.96	0.87	1.47	1.76
	Std	0.10	0.32	0.23	0.17	0.10	0.21	0.06	0.28
Back-end fee	Avg.	0.66	0.69	0.92	1.10	0.28	0.26	0.30	0.58
	Std.	0.09	0.18	0.26	0.26	0.08	0.12	0.01	0.10

All averages of costs in the different fund categories are higher for equity fund categories than for bond fund categories. For instance, all equity fund categories have average operating costs exceeding 0.9% whereas all bond fund categories have average operating costs below 0.73%, equity fund categories have front-end load fees exceeding 1.5% whereas only one bond fund category has such high average front-end load fees, and, finally, all equity fund categories have average back-end load fees exceeding 0.6% whereas all bond fund categories have lower average back-end load fees. Equity fund costs vary more over time.

[14] We investigated whether the increase in operating costs is due to newer funds being more expensive than older funds. This was not the case, i.e. the average costs of funds have indeed increased.

Before continuing, it should be noticed that even if the costs of Danish mutual fund investing have increased over the recent years, the costs are still lower than in many other European countries. For instance, a comparison conducted by Morningstar™ showed that the average of operating expenses was 1.03% in Danish mutual funds in 2002, whereas the average of management fees in European funds was 1.18% in 2002. The average front-end load fee was 2.47% in European funds versus 1.84% in Danish funds. Only the average back-end load fees was marginally higher in Danish funds (on average 0.66% in Danish funds versus 0.54% in European).[15]

Turnover: Turnover (omsætningshastighed) is defined as the fraction of total fund value that has been traded during a year. The higher is the turnover of a fund's asset, the higher are the total transactions costs of the fund, ceteris paribus. The exact costs of these transactions are not known, however, as we do not know the prices at which a fund can trade their underlying assets. In this paper, we will thus simply investigate whether there is a relation between the turnover of a fund's assets and the return the fund generates. Unfortunately, we only have turnover data for the years 2000, 2001, 2002, and 2003 (for 1998 and 1999, we have turnover data for 12 and 15 funds respectively – these two numbers are so low, however, that we disregard 1998 and 1999 in our analysis). Figure 5 shows the turnover of the funds. The figure reveals that it is the bond funds that have the highest turnover.

3.1 Private funds versus institutional funds

Some funds are not accessible to private investors, but to institutional investors only. For this reason, it makes sense to evaluate whether our findings are blurred by including all funds in the analyses. In order to analyze whether our findings prevail if we look at funds directed towards private investors only, we also looked at a partial sample of the funds where we have left out those funds that are directed towards institutional investors.

[15] Also if one splits up the funds into bond and equity categories, the operating expenses and front-end load fees are higher in European funds than they are in Danish funds.

In 2003, there are 68 funds that are directed towards institutional investors.[16] Table 2 shows the average operating expenses in funds directed towards private and institutional investors, respectively.

Table 2. Average operating expenses in private and institutional investors. 2003

	Stocks				*Bonds*			
	Danish	*Global*	*Regional*	*Others*	*Short*	*Long*	*Global*	*Others*
Private	1.252	1.451	1.217	1.484	0.748	0.656	0.949	1.121
Institutional	0.907	0.869	0.925	1.248	0.364	0.388	0.373	0.655

The most significant pattern to notice from Table 2 is that the costs of mutual fund investments are lower for funds directed towards institutional investors no matter the category that is examined. For instance, the average operating cost in 2003 for private-investor funds investing in *Danish stocks* was 1.252% whereas it was 0.907% for institutional-investor funds. For funds investing in *Global stocks*, the average operating cost was 1.451% versus 0.869%, and so forth. One reason for the difference between costs of mutual fund investments for private and institutional investors is probably due to lower marketing costs for funds directed towards institutional investors. Another reason could be that it is less costly to have fewer but larger investors.

Concerning the pattern over time, also institutional equity funds have experienced increasing costs, whereas this is less the case for institutional bond funds.

We will in the following concentrate on the sample of all funds, but report results for the sample of private funds only when relevant.

3.2 Correlation of expenses

Do high operating costs go hand-in-hand with, for instance, high front-end load fees, or is there no correlation? And are costs related to turnover? We make a perspective on these issues in this section.

We calculated the average costs (operating expenses, load fees, and turnover) for each fund over the three years 2001, 2002, and 2003. Based on the averages of the costs for each fund, we calculated the correlations between the costs. The correlation matrix is shown in Table 3.

[16] We thank Mads Gosvig from ATP for pointing out the funds directed towards institutional investors.

Table 3. Correlation of costs. All funds. 2001-2003.

	Ope. Exp.	*Front-end load*	*Back-end load*	*Turnover*
Ope. Exp.	1.000	0.531	0.471	-0.160
Front-end load	0.531	1.000	0.525	-0.246
Back-end load	0.471	0.525	1.000	-0.293
Turnover	-0.160	-0.246	-0.293	1.000

Table 3 makes clear that there are positive relations among the direct costs (operating costs and load fees). In other words, there is a tendency for load fees to increase when operating expenses increase, and vice versa. On the other hand, there only seem to be a minor (negative) correlation between the direct costs and turnover, i.e. it is not clear that funds with high turnover also have high direct costs. Finally, front-end and back-end load fees are highly correlated.

We can make a further perspective on the economic magnitude of the correlation by running multivariate regressions of operating expenses on the other cost sources. To evaluate, too, whether there are differences between the cost correlations of equity and bond funds, we perform the regressions for both kinds of funds. We present the results from these regressions in Table 4.

Table 4. Regressions of operating expenses on load fees and turnover. 2001-2003.
The regressions are cross-sectional regressions of average operating costs for each fund during the period 2001-2003 on average load fees and turnover. T-statistics are in parentheses.

	Constant	*Front-end*	*Back-end*	*Turnover*	R^2
Stocks	0.77**	0.24**	-0.09	0.08	0.15
	(6.40)	(5.47)	(-0.85)	(1.44)	
Bonds	0.32**	0.12**	0.62**	0.02	0.38
	(4.60)	(2.82)	(6.62)	(0.61)	

There are positive and significant relations between operating costs and front-end load fees and, for bond funds, also between operating costs and back-end load fees. Given that all numbers are in percentages, the estimated coefficients represent elasticities, i.e.

across equity funds, a one percentage increase in front-end load fees is generally associated with a 0.24 percentage increase in operating expenses.[17]

It should be noticed that turnover is generally not related to operating costs. One could have imagined that for instance active non-index funds that use resources on hiring analysts (and thus have higher operating expenses than passive fund) also had high turnover due to active portfolio management. This does not seem to be the case, however.

3.3 The importance of expenses for investor returns. Illustrative examples

In this section we present illustrative examples of the relevance of looking at expenses of Danish mutual fund investments. We do so by calculating the hypothetical return to investors with different holding periods for funds with different expense structures. It should be stressed that these examples are meant to be illustrative.

We perform the calculations for investors investing in bond and stock funds, respectively, as there are marked differences between the expenses association with stock and bond funds, as shown in Table 1.

In order to calculate investor returns after mutual fund costs have been accounted for, we must make assumptions about returns and costs. The long-run 1929-1996 return to Danish stocks has been 11.9% per annum (Parum, 1999) and the long-run return to Danish bonds has been 8.9%. The long-run 1926-1996 return to US stocks has been 12.7% per annum (see for instance Sharpe et al., 1999), whereas the long-run return to US bond has been 5% per annum. We have both Danish and foreign mutual funds in the analysis. In the following, we assume for simplicity an annual return to stocks of 12% per annum and a return of 7% to bonds (the average of the return to Danish and US bonds).

It is important to highlight the intention with the following calculation: we want to illustrate how costs affect the return from mutual fund investment - not evaluate whether high or low costs are warranted. In other words, we keep a constant rate of

[17] We also calculated correlations of average costs over five and eight years (for the eight year data, we can only calculate the correlations between operating expenses and load fees as we only have data on turnover for the 2000-2003 period, as mentioned). There are generally positive correlations between operating expenses and load fees over these longer horizons, too. The correlations between operating expenses and back-end load fees are larger when measured over longer periods. Furthermore, no matter the horizon, front-end and back-end load fees are strongly correlated.

return to bonds and stocks regardless of the level of costs. We will in the following sections of the paper evaluate whether high costs empirically have implied higher returns.

We calculate the realized return, *after expenses*, for investors investing in funds with low costs and investors investing in funds with high costs. We use the cost figures for 2003 in the examples. In Table 5, the cross-fund averages and standard deviations in 2003 are shown.

Table 5. Average expenses in different categorizes of Danish mutual funds. 2003.

		Stocks				*Bonds*			
		Danish	*Global*	*Regional*	*Others*	*Short*	*Long*	*Global*	*Others*
Ope. costs.	Avg.	1.19	1.36	1.13	1.47	0.67	0.60	0.85	1.00
	Std	0.44	0.61	0.49	0.33	0.38	0.22	0.62	0.50
Font-end fee	Avg.	1.97	2.14	1.70	2.38	0.82	1.03	1.37	1.85
	Std	0.50	0.55	0.88	0.49	0.41	0.48	0.36	0.63
Back-end fee	Avg.	0.47	0.66	0.60	0.57	0.07	0.14	0.27	0.40
	Std.	0.36	0.37	0.40	0.57	0.10	0.13	0.15	0.29

We define low-cost funds as funds whose costs equal the average cost in the category minus two standard deviations. For instance, in our example, a low-cost mutual fund investing in *Danish stocks* is assumed to have an annual operating cost of $1.19\% - 2 \cdot 0.44\% = 0.31\%$ per annum, a font-end load fee of $1.97\% - 2 \cdot 0.5\% = 0.97\%$, and so forth. High-cost funds are defined as funds whose costs equal the average cost in the category plus two standard deviations (for instance, in our example, a high cost mutual fund investing in *Danish stocks* is assumed to have an annual operating cost of $1.19\% + 2 \cdot 0.44\% = 2.07\%$ per annum and so forth).

Consider an investor who invests in a Danish stock mutual fund. We assume that the pre-cost value of a mutual fund stock is 100. After one year, the pre-cost value of the stock is thus 112. To buy a Danish mutual fund stock with low (high) costs, the investor must pay 100 plus the front-end load fee, which is 0.97, respectively 2.97. The net value of the stock after one year is the stock market value minus operating costs, i.e. 112− 0.31 (2.07) =111.69 (109.93).[18] When selling the stock, the investor may be charged the

[18] In other words, the net return to the investor is the annual stock market return minus the operating costs.

back-end load fee, i.e. for a low-cost fund he receives 111.69 · (1−0.00) = 111.69.[19] For a high-costs fund, the investor receives 109.93 · (1-0.0119) = 108.62. We can now calculate the return from the low-cost fund to be 111.69/100.97 = 10.62%, and the return from the high-cost fund to be 108.62/102.97 = 5.49%. In other words, if the investor has a horizon of only one year, he sees his return reduced from the stock market gain of 12% to 10.62% if investing in a low-cost fund, whereas he sees his return reduced from 12% to only 5.49% if investing in a high-cost fund. The return from the high-cost fund is thus only 45.7% percent of the return from the market, i.e. the costs of investing in a high-cost fund significantly reduce the return to the short-run investor.

We perform such calculations for investors with horizons of one, three, five, and twenty years. In Table 6, we show the annual returns to these investments and the fractions of investor return to actual market returns.

Table 6. Annual returns from investing in mutual funds with low and high costs.
Low (high) costs are defined as average costs within a category minus (plus) 2 standard deviations of the cost within a category. Percentages refer to the return the investor gets from investing in mutual funds compared to the return the stock, respectively the bond, market generates.

		Stocks				*Bonds*			
		Danish	*Global*	*Regional*	*Others*	*Short*	*Long*	*Global*	*Others*
1 year	low	10.62	10.71	11.92	9.65	7.00	6.75	6.32	6.37
		88.5%	89.3%	99.4%	80.5%	99.9%	96.4%	90.2%	91.1%
	high	5.49	4.49	4.71	4.48	3.61	3.50	2.17	0.85
		45.7%	37.4%	39.3%	37.3%	51.5%	50.0%	31.0%	12.1%
3 year	low	11.33	11.48	11.87	10.68	7.00	6.80	6.77	6.78
		94.4%	95.7%	99.0%	89.0%	100.0%	97.2%	96.7%	96.9%
	high	8.43	7.74	8.13	8.04	4.92	5.14	3.99	3.60
		70.2%	64.5%	67.8%	67.0%	70.2%	73.4%	57.0%	51.4%
5 year	low	11.47	11.63	11.87	10.88	7.00	6.81	6.86	6.87
		95.6%	96.9%	98.9%	90.7%	100.0%	97.4%	98.0%	98.1%
	high	9.03	8.41	8.83	8.77	5.18	5.47	4.36	4.16
		75.2%	70.1%	73.6%	73.1%	74.0%	78.1%	62.2%	59.4%
20 year	low	11.64	11.81	11.85	11.11	7.00	6.83	6.97	6.96
		97.0%	98.4%	98.8%	92.6%	100.0%	97.5%	99.5%	99.4%
	high	9.70	9.16	9.62	9.59	5.48	5.84	4.77	4.79
		80.9%	76.3%	80.1%	79.9%	78.3%	83.5%	68.2%	68.5%

[19] The back-end load fee is 0.47% and the standard deviation is 0.36. In such cases (where the average minus two standard deviations is less than zero), we set the back-end load fee to 0.

One way to gauge the importance of costs to investing in Danish mutual funds is to look at the difference between the fractions of mutual fund returns to actual market returns for the low- and high-cost funds. For instance, to take the most extreme example, if holding low-cost *Other bonds* funds for one year, the investor gets 91.1% of the actual bond market return (6.37% instead of 7%). On the other hand, if buying high-cost *Other bonds* funds, the investor only gets 12.1% of the actual bond market return. The implication of the calculation is that in situations where the return to two *Other bonds* funds is the same (7 percent per annum) but one fund has very high costs (two standard deviations larger than the mean of the costs in the category) and the other very low costs (two standard deviations smaller than the mean of the costs in the category), the return to the investor is very significantly affected.[20]

It is interesting to notice the relation between the investment horizon and the ratio of mutual fund investor annual returns to actual annual market returns. Consider for instance an investment in a high-cost mutual fund investing in *Danish stocks*. If the investor has a horizon of one year, mutual fund costs account for 54.3% of actual annual market return. However, if the investor has a horizon of 20 years, mutual fund costs account for "only" 19.1% of market returns. The reason for this decline in relative importance of expenses is that the load fees lose their importance the longer is the investment horizon because load fees are paid only once (when entering and leaving the fund, respectively), i.e. the longer the investor keeps his mutual fund, the less important are the load fees for the return he eventually realizes, all else equal. On the other hand, as operating expenses are paid every year they gain relative importance.

There is a practical implication to this: the size of load fees is of essential importance when the investor has a short horizon.

4. Returns

Costs of mutual fund investing are interesting. However, it is the return that the investor ultimately obtains that signifies whether a certain cost structure is warranted or not. In this section, we briefly describe the characteristics of the returns to Danish mutual funds.

[20] Of course, the return of 7 percent per annum is not what an investor could achieve if he invested on his own instead of investing through a mutual fund, as there are costs associated with investing directly, too. What the table shows, as mentioned, is how mutual fund costs affect the return on the market.

The mutual fund returns are defined as the percentage changes in the Total Net Asset Values of the funds. The Total Net Asset Value of a fund is the total value of the assets that the fund holds minus the operating costs of the fund, i.e. *all else equal* higher operating costs of a fund will lead to lower returns.[21]

Figure 6 shows the average annual returns that Danish mutual funds have generated since 1994 (we have data for the returns since 1980. We present only the returns for the period since 1994 in Figure 6, however, as this is the period for which we have data on load fees and operating costs, and thus the period we concentrate on in the following estimations and analyses). The returns from equity funds are much more volatile than the returns from bond funds. From the figure, the good years on the stock markets during the late 1990s are clearly visible, as are the generally declining stock markets during the first years of the millennium.

The average returns to equity funds are generally also higher than the average returns to bond funds – more risky assets carry higher returns. From Table 7, it is seen that the average annual return on Danish equity funds is 9.20% and on the other stock funds around 7% annually. The bond funds yielded around 5%-5.5% annually, with the exception of *Other bonds* that yielded 7.66% per year.

Table 7. Average return to mutual fund investing in Denmark. 1994-2003.
The numbers in the table are the average returns to investing in Danish mutual funds. We have calculated the average cross-fund return for each category each year during the 1994-2003 period. The numbers in the table are the averages of the annual cross-fund average returns.

	stocks				*Bonds*			
	Danish	*Global*	*Regional*	*Others*	*Short*	*Long*	*Global*	*Others*
Avg.	9.20	6.57	6.91	6.80	5.15	5.57	5.39	7.66
Std.	*19.95*	*24.12*	*23.44*	*30.13*	*2.30*	*4.69*	*6.60*	*7.70*

5. The persistence of return and expenses

In this and the next sections, we focus on the main task of this paper: a detailed study of the relation between returns and expenses.

We first make a perspective on the variation over time of expenses and returns by relating, across funds, expenses lagged once with current expenses and returns lagged once with current returns. This is done in Figures 7 and 8. At a first glance, the figures

[21] The question we examine later in the paper is whether higher expenses improve performance, i.e. whether an increase in e.g. operating expenses will lead to higher net returns.

give a strong indication of the high persistence in expenses (expenses from last and the current year are scattered closely around the regression line) and a very low persistence of returns (returns from last and the current year are spread all over the regression line. The implications of these figures should not be exaggerated, as the figures at best give a "first impression" of the persistence in returns respectively expenses.[22] Nevertheless, the figures indicate that there is much more persistence in expenses than there is in returns. For instance, an unsophisticated regression of last year's expenses on this year's expenses across funds and years generates the following result (with t-statistics in parentheses below)

$$Expense_t = \underset{(13.62)}{0.18} + \underset{(72.52)}{0.89}\, Expense_{t-1},$$

with an R^2 of 0.77, and the corresponding regression for returns is

$$r_t = \underset{(9.12)}{0.06} - \underset{(0.65)}{0.02}\, r_{t-1},$$

with an R^2 of 0.00. These regressions thus indicate that the persistence in expenses is highly significant, and one can explain a large part of the cross sectional variation in this year's expenses using last year's expenses (77%) whereas this is not the case for returns.

Given that returns are so volatile on an annual basis but costs are stable, it is difficult to imagine that one can find significant relations between costs and returns on the short run: on an annual basis, returns in a year t+1 will fluctuate much in relation to returns in a year t. And given that costs do not fluctuate much, there cannot be expected to be much relation between costs and returns on the short run. The interesting question will thus be whether there is a relation between costs and returns over longer horizons where the performances of the funds perhaps are less influenced by short-run noise.[23]

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[22] For instance, in Figures 7 and 8 we show scatterplots of all funds, i.e. funds with a history of more than ten years, and funds with only two years of data. This is perhaps not fair towards the young funds that need time to build expertise and so forth, and thus have relatively high costs in the first years of their existence.

[23] We also investigated the relation between raw returns obtained over a three-year period (for instance 1996-1998) and the next non-overlapping three-year period (for instance 1999-2001). The relation between non-overlapping three-year returns turned out to be very sensitive to the sample chosen, however. For the whole period, there was a negative relation between non-overlapping three-year returns. However, many observations in the full sample compares the "good" 1998-2000 stock-market period with the "bad" 2001-2003 stock-market period. If one leaves out this last period, there is no significant relation between non-overlapping 3-year returns. And if one instead concentrates on the late 1990s where stock markets were increasing, one can even find a positive relation. All in all, we will not put too much emphasis on these

6. The relation between return and expenses

Do high expenses compensate for good asset picking and allocation abilities in the fund? In other words, do high expenses imply high returns? This is the main question this paper asks and what we analyze in the following sections.

Investing in a high-return fund normally implies investing in a high-risk fund, too. Given that investors are risk-averse, they care not only about the return they receive, but also about the certainty with which they can expect to receive those returns. For this reason, it is not common to compare funds' raw returns when evaluating the performance of mutual funds (a fund showing high return could also be a very risky fund – we want to take this possibility into account in the analyses that follow). Instead, it has become standard to look at risk-adjusted performance measures. We follow this approach here. The standard performance measure used, and the one we use here, is Jensen's alpha which is the constant α_i from the time-series regression

$$r_i - r_f = \alpha_i + \beta_i\left(r_p - r_f\right),$$

where r_i is the return on fund i, r_p is the return on a benchmark portfolio, r_f is the return on the risk-free asset (the one-month Copenhagen Interbank Offered Rate, CIBOR1m, as our return data are sampled at a monthly frequency), and β_i is the beta of the fund with respect to the benchmark portfolio.

Two decisions must be made: What is the benchmark portfolio, and what is the period used to generate the alphas and the betas? In the US literature, it has become custom to generate alphas from a four factor model (Gruber, 1996; Carhartt, 1997; Wermers, 2000), i.e. not only look at the returns from a single benchmark portfolio, but several different benchmark portfolios. In the US literature, however, focus is often restricted to US equity funds only. In this study, we have both equity funds, bonds funds, money market funds, and mixed funds. Furthermore, we have funds investing in Denmark only and funds that hold assets from many countries.

The approach we follow below is to keep the model that we use as simple as possible and regress each fund's excess returns on the excess return of one single benchmark portfolio. However, we also rely on the insight of the US literature that one cannot expect the same single portfolio to capture the many facets of returns from many

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patterns, and consequently mainly note that costs are more persistent than returns implying that the relation between returns and costs are expected to be weak on a short horizon.

different funds with many different characteristics. For this reason, we regress the return from fund *i* on the return from the Morningstar™ Category associated with fund *i*, i.e. the models that we use are of the form

$$r_i - r_f = \alpha_i + \beta_i\left(r_{p,j} - r_f\right)$$

where $r_{p,j}$ is the return from the Morningstar-defined category-*j* portfolio to which fund *i* belongs.[24] The major advantage of this approach is that we measure performance of fund *i* in relation to the performance of its closely related peers.[25]

6.1 Alphas and expenses. First evidence

We investigate alphas based on estimations using three, five, eight, and ten years of observations. In the text, we concentrate on the results based on the three-year period from 2001-2003, as this is the period for which we have most funds. Furthermore, period 2001-2003 is the period during which we have data on turnover. We have 268 funds with data spanning the three-year period 2001-2003. We comment on the results of the regressions using longer samples as we go along.

Before starting the description of the results, it should be mentioned the Morningstar™ categories constitute relevant benchmarks for the funds. For instance, the average R^2 across all regressions used to generate the alphas is 0.85 when estimating the models on three years of data, i.e. a category return captures on average around 85% of the variation in the return of a fund during the 2001-2003 period. For the alphas estimated on 5 years of data, the average R^2 is 0.81 and with eight years of data the average R^2 is 0.77.

We estimated the alphas using data for 2001 through 2003 for each of the 268 funds. Following Gruber (1996), we then sorted the funds into deciles as based on their performance; their alphas. In decile 1, we collect the funds with the worst risk-adjusted performance (lowest alphas) and in decile 10 the funds with the best performance. We present the results for equity in Table 8. For each decile we report the average alpha of the funds in that decile and the associated average costs of the funds in the decile.

[24] There are 53 Morningstar™ categories in the data that we use. The categories and their summary statistics are listed in Appendix A.

[25] Notice that Morningstar™ base their "stars" of a fund on the performance of this fund in relation to the performance of other funds within the category. We thus follow this approach when estimating the alphas.

Table 8 reveals an important finding of this study: There is no clear-cut linear relation between the expenses charged by a mutual fund and its performance. Funds with the highest alphas, i.e. the funds that have had the best performance in relation to its peers, were also those with the highest costs (funds in decile 10 have both the highest operating expenses, front-end load fees, and back-end load fees) but funds with the second-highest operating expenses are those with the worst performance (decile 1). The same pattern is found when looking at front-end load fees and back-end load fees. In other words, high costs do not necessarily generate high performance. This is in accordance with the findings in Gruber (1996) for the US.[26] But high costs do neither necessarily imply low performance. Instead, high costs are associated with funds that have generated high risk-adjusted performance but also with funds that have generated very low risk-adjusted performance.

Table 8. Expenses and performance of Danish equity funds. 2001-2003.
The table shows equity funds sorted into deciles based on the alpha of each funds. The table reports the number of funds, average alpha, average operating expense, average front-end load fee, and average back-end load fee within each decile. The average costs are based on the 2001-2003 period. The last four columns give the distribution of funds sorted along the ATP-categories.

Decile	*No.*	*Alpha*	*Oper. Exp.*	*Front-end*	*Back-end*	*Danish*	*Global*	*Regional*	*Other*
1	17	-0.574	1.471	2.058	0.883	12%	47%	18%	24%
2	18	-0.346	1.323	1.909	0.830	24%	6%	29%	47%
3	17	-0.248	1.116	2.081	0.888	6%	18%	41%	35%
4	17	-0.185	0.983	2.096	0.780	24%	29%	35%	12%
5	17	-0.134	1.025	2.179	0.781	24%	29%	41%	6%
6	18	-0.077	1.324	2.083	0.902	18%	18%	35%	35%
7	17	-0.004	1.098	2.244	0.851	29%	12%	18%	41%
8	17	0.076	1.103	2.042	0.835	0%	12%	35%	53%
9	18	0.260	1.321	2.126	0.796	6%	6%	41%	53%
10	17	1.082	1.657	2.453	0.960	24%	29%	0%	47%

Table 8 also reveals that there is no systematic relation between the ATP-categories to which the funds belong and their risk-adjusted performance. For instance, one could have imagined that Danish mutual funds investing in *Danish stocks* should outperform its peers. This does not seem to be the case, however, as funds specializing in *Danish*

[26] Results for alphas based on five years of observations reveal similar results: The best performing equity funds also had the highest costs (all three kinds of expenses). On the other hand, there is no monotonic relation between performance and costs – many of the bad performing funds also had high costs.

stocks do not make up the majority of the funds in decile 10. If there is any tendency at all, it is that mutual funds investing in *Other stocks* have performed fairly well, as around 50% of the funds in deciles 8-10 are funds investing in *Other stocks*.

Finally, a comment on the interpretation and the sizes of the alphas is warranted. The data are monthly data, i.e. the alphas are the additional monthly excess return a fund generates in relation to the expected return of the fund given its risk, where the risk is measured by the beta of a fund with respect to the category return. In other words; the price of risk (the risk premium) of a category is given by $\left(r_{p,j} - r_f\right)$. The amount of risk is measured the beta of a fund. A beta of 1.1, for instance, expresses that the return of the fund that is evaluated is 10% more volatile than the return of the category to which the fund belongs (if the category return is increased with 1%, the return of the fund is increased with 1.1%, and so forth). The expected return on fund *i* is thus the price of risk times the quantity of risk of fund *i*: $\beta_i\left(r_{p,j} - r_f\right)$. The fund has generated excess return of $\left(r_i - r_f\right)$, i.e. the alpha measures the difference between the observed return and the expected return $\left(r_i - r_f\right) - \beta_i\left(r_{p,j} - r_f\right) = \alpha_i$. Table 8 verifies that there is an economically very large cross-sectional dispersion in the alphas: The best funds have generated risk-adjusted excess returns that are more than one percent higher per month than the expected returns of these funds (more than 12.5 percent per year) and the worst performing funds have generated excess returns that are more than 0.5% worse than their expected returns per month given their risks.

Table 9 shows the results for bond funds.

Table 9. Expenses and performance of Danish bond funds.
The table shows bond funds sorted into deciles based on the alpha of each funds. The table reports the number of funds, average alpha, average operating expense, average front-end load fee, and average back-end load fee within each decile. The average costs are based on the 2001-2003 period. The last four columns give the distribution of funds sorted along the ATP-categories.

Decile	*No.*	*Alpha*	*Oper. Exp.*	*Front-end*	*Back-end*	*Short*	*Long*	*Global*	*Other*
1	9	-0.115	0.857	1.431	0.442	22%	11%	11%	56%
2	10	-0.049	0.891	0.995	0.406	22%	44%	22%	22%
3	9	-0.024	0.644	0.927	0.172	56%	44%	0%	0%
4	10	-0.006	0.507	1.128	0.140	44%	56%	11%	0%
5	9	0.009	0.529	0.997	0.142	22%	78%	0%	0%
6	10	0.026	0.536	1.085	0.177	22%	89%	0%	0%
7	9	0.053	0.680	1.090	0.318	11%	67%	0%	22%
8	10	0.099	0.625	0.964	0.267	11%	78%	11%	11%
9	9	0.165	0.751	1.370	0.376	22%	11%	67%	0%
10	10	0.440	0.864	1.617	0.592	0%	0%	11%	100%

For bond funds, the overall conclusion concerning the relation between expenses and performance is as for equity funds: There is no clear relation between the expenses of a fund and its performance. The decile with the highest operating expenses is decile 2 (the group of "second-worst" performing funds), whereas the funds with the highest performance (those in decile 10) had second-highest operating expenses (and the highest load fees). The worst-performing bond funds (in decile 1), however, also had very high operating expenses and load fees.[27]

We have summarized our findings of this section in Figures 9 and 10. The figures report the relation between equity and bond funds, respectively, sorted into ten deciles as based on their alphas and their associated expenses. Again, the general impression is clear: there is no simple linear relation between performance and expenses. Actually, there is more of a "v"-shaped relation between fund performance and expenses: funds that do very bad (have poor performance) have high costs, and funds that do very good have high costs.

6.2 Causality between costs and performance

One could speculate whether the in-sample picture we report in Tables 8 and 9, and Figures 9 and 10, is blurred by strategic cost taking by the funds. For instance, a

[27] For bond funds with alphas based on five years of observations, again, the overall picture was as in Tables 8 and 9.

hypothesis could be that funds that have generated high returns during some period subsequently raise their costs. We investigated this hypothesis. In particular, we calculated the average raw return over the period 1996-1998. We then divided the funds into three groups as based on their average returns. Finally, we calculated the average operating expenses after one year (in 1999), after three years (in 2001), and after five years (in 2003). The main result from this exercise (not shown) is that we cannot confirm the hypothesis of strategic cost taking by the funds, i.e. we do not find that those funds that had the highest returns during the 1996-1999 period also were those funds that raised cost the most. Instead, there seem to be some indications that the funds that have had "average" performance (those in the middle group) have raised their costs the most.[28]

6.3 Private funds versus institutional funds

When excluding funds that are accessible to institutional investors only, we find the same picture as that reported in Tables 8 and 9 and Figures 9 and 10. In other words, when investigating only those funds that are accessible to private investors, we find that high costs are associated to those funds that have delivered good performance, but also to those funds that have delivered very bad performance, i.e. the private investor cannot be sure that a fund that has had high costs also has delivered good performance.

7. Constructing the ATP-Rating™

We want to combine the different relevant sources of costs involved in mutual fund investments into one cost indicator. Based on this indicator, we want to assign an ATP-Rating™ to the funds. To accomplish these tasks, we need to, first, develop the relevant cost-indicator and, second, sort the funds into the different rating categorizes. Finally, we want to test the predictive performance of the cost ratings. We delegate the investigations of the predictability of the ATP-Rating™ to section 8.

[28] If one should examine this question in more detail it would be relevant to examine in- and outflows to the funds. For instance, if a fund has done well, and as a consequence thereof gets a high inflow, the asset value of the fund increases. If the fund does not increase its costs in a one-to-one relation with inflows, operating expenses (that show costs in relation to asset value) should fall.

7.1 Estimating the relation between costs and alphas

There are four sources of costs associated with mutual fund investments: Front-end load fee, back-end load fee, operating expenses, and turnover. We must give these four sources of costs relevant weights such that an indicator can be constructed. The theoretical cost indicator *CI* thus takes the form

$$CI = \gamma_1 Ope. + \gamma_2 Front + \gamma_3 Back + \gamma_4 Turnover ,$$

where *Ope.* is the average of the operating expenses over the period used for estimating the alphas (i.e. averages of costs over 3, 5, 8, or 10 years), *Front* is the average of front-end load fees, *Back* is the average of Back-end load fee, and *Turnover* is the average of turnover.

How to find the γs, then? The underlying hypothesis of the ATP-Rating™ is that costs matter for performance, i.e. if a relation between costs and risk-adjusted excess returns can be established, this relation can be used to weight the different cost components into the cost indicator. We will therefore first estimate the relations between returns and costs. We do this by running cross-sectional regressions of the form

$$\alpha = \gamma_0 + \gamma_1 Ope. + \gamma_2 Front + \gamma_3 Back + \gamma_4 Turnover .$$

Notice that such kinds of regressions have been performed elsewhere in the literature (Blake et al., 1993; Gruber, 1996; and Carhartt, 1997; and Dahlquist et al., 2000). In this section, we thus provide additional non-US – Danish – evidence on the relation between costs and performance. The costs used in the regressions are the averages of the costs during the period over which the alphas are estimated, i.e. if alpha for fund *i* is estimated on the sample 2001-2003, *Ope.* is the average value of the operating costs of fund *i* during the 2001-2003 period.

We perform the cross-sectional regressions at three different levels of mutual fund groupings: cross-sectional regressions based on the eight individual ATP-categories (*Danish stocks, Regional stocks*, …..), cross-sectional regressions based on a grouping of all equity funds into one equity category and a grouping of all bond funds into one bond category respectively, and cross-sectional regressions based on all funds, i.e. all-in-all eleven different regressions. Table 10 shows the results from the multivariate regressions of alphas on all four cost sources estimated on three years of data.

Table 10. Multivariate regressions of risk-adjusted excess returns on cost sources. 2001-2003.

Alphas, based on estimations over the period 2001-2003, regressed on average costs. "p-values" shows probabilities from tests of the hypotheses that the coefficients equal zero. The "**Average**" line shows the average of the estimates of the parameters across the eight ATP-category regressions.

ATP Category	*Obs.*	*Adj. R^2*	*p-value F-test*	γ_0	γ_1	*p-value*	γ_2	*p-value*	γ_3	*p-value*	γ_4	*p-value*
I	28	0.246	15%	-0.409	0.051	72%	0.283	7%	-0.449	5%	0.165	17%
II	35	0.189	17%	-0.215	0.197	14%	0.095	54%	-0.172	59%	-0.442	7%
III	50	0.010	98%	-0.121	-0.005	94%	0.000	100%	0.011	91%	0.042	54%
IV	21	0.334	14%	-0.050	-0.031	66%	0.045	24%	0.209	4%	-0.011	50%
V	43	0.302	1%	0.045	0.035	41%	-0.005	78%	0.006	90%	-0.041	0%
VI	12	0.273	64%	0.193	-0.230	69%	0.081	87%	-0.065	87%	-0.027	64%
VII	60	0.180	3%	-1.362	0.621	4%	0.050	81%	0.452	11%	0.189	34%
VIII	19	0.550	2%	-0.400	-0.155	37%	0.248	5%	0.101	66%	0.415	0%
Average		**0.260**		**-0.290**	**0.060**		**0.100**		**0.012**		**0.036**	
Stocks	173	0.064	2%	-0.504	0.144	8%	0.067	33%	0.161	19%	0.062	46%
Bonds	95	0.100	5%	-0.048	-0.061	43%	0.079	2%	0.158	6%	0.012	62%
All	268	0.019	28%	-0.161	0.049	43%	0.031	49%	0.037	65%	0.067	12%

The overall picture provided by Table 10 is that there are not many coefficients that are significant. In other words, we cannot verify the hypothesis that higher costs lead to significantly lower risk-adjusted excess returns in-sample measured over the 2001-2003 period.

Given the results of Tables 8 and 9, this result does not come as a big surprise: In Tables 8 and 9, and Figures 9 and 10, we report that there is no simple relation between costs and performance in-sample but a "v"-shaped relation. The results of Table 10 lend statistical support to the finding that there is no simple linear in-sample relation between costs and performance.

There are, however, two factors that possibly blur this picture: some of the costs (especially the load fees) are highly correlated, as shown in section 3. Such multicollinearity can make it more difficult to interpret the coefficient estimates. Second, three years of data is perhaps not enough to see the effect of expenses on returns.

In order to make a perspective on the consequences of multicollinearity for our results, we also ran univariate regressions of alphas on each of the different cost sources in isolation. In Table 11, we illustrate the results from the univariate regressions with operating costs and front-end load fees as explanatory variables.

Table 11. Univariate regressions of risk-adjusted excess returns on operating costs and front-end load fees. 2001-2003.

	Operating costs						*Front-end load fee*				
ATP Category	*Obs.*	*Adj. R^2*	*p-value F-test*	γ_0	γ_1	*p-value*	*Adj. R^2*	*p-value F-test*	γ_0	γ_1	*p-value*
I	28	0.003	79%	-0.103	0.038	79%	0.010	61%	0.610	0.069	61%
II	35	0.054	18%	-0.335	0.173	18%	0.025	36%	-0.384	0.134	36%
III	50	0.000	95%	-0.095	-0.004	95%	0.001	80%	-0.083	-0.009	80%
IV	21	0.060	28%	-0.037	0.064	28%	0.052	32%	-0.032	0.041	32%
V	43	0.002	78%	0.017	0.012	78%	0.013	47%	0.037	-0.013	47%
VI	12	0.226	12%	0.334	-0.312	12%	0.024	63%	0.271	-0.112	63%
VII	60	0.079	**3%**	-0.762	0.660	**3%**	0.053	**8%**	-0.583	0.298	**8%**
VIII	19	0.016	61%	0.277	-0.095	61%	0.010	69%	0.107	0.054	69%
Average		**0.055**		**-0.088**	**0.067**		**0.023**		**-0.007**	**0.058**	
Stocks	173	0.033	**2%**	-0.256	0.194	**2%**	0.032	**2%**	-0.302	0.134	**2%**
Bonds	95	0.015	24%	0.014	0.070	24%	0.062	**2%**	-0.031	0.080	**2%**
All	268	0.008	14%	-0.067	0.075	14%	0.007	18%	-0.066	0.044	18%

The overall picture is not changed much from that of Table 10: there are not many significant coefficients and the signs to the coefficients differ from regression to regression.

What did turn out to matter somewhat, on the other hand, was the period over which the regressions are performed. To illustrate this, Table 12 presents the results from different kinds of regressions using different horizons. Table 12 is a condensed version of Tables 10 and 11 with results from different horizons, too. Table 12 contains results from univariate regressions of alphas on each of the cost sources in isolation, and multivariate regressions of alphas on all the cost sources together. Consider the results based on 3 years of data. In the row labelled "Average parameter from multiple", we show the averages of the coefficients from the multivariate ATP-category regressions of the alphas on the cost sources. These are the numbers from row "Average" of Table 9. Correspondingly, the numbers in the row labelled "Average parameter from univar." are the numbers from line "Average" in Table 11. In the rows labelled "Parameter from xxxx – multiple", we show the parameter estimates from multivariate regressions of alphas on all four cost sources together in one regression, and in the rows labelled "Parameter from xxxx – univar.", we show the estimates from univariate regressions of alphas on the each of the cost sources in isolation. These are, for the 3-year regressions, the numbers from the lines "stocks" and "bonds" in Tables 10 and 11, respectively. In the row labelled "Average" we show the average of the estimates from

the different regressions reported in the table. In addition to the results using three years of data, that are condensed versions of the results in Tables 10 and 11, Table 12 also shows the results using 5, 8, and 10 years of data.

Table 12. Summarizing coefficient estimates from regressions of alphas on expenses.

	3 years horizon				*5 years horizon*			
	Ope.	*Front*	*Back*	*Turn*	*Ope.*	*Front*	*Back*	*Turn*
Avg. parameter from multiple	0.060	0.100	0.012	0.036	0.066	0.053	0.107	-0.124
Avg. parameter from univar.	0.067	0.058	0.004	0.022	0.027	0.024	0.077	-0.050
Parameter from stock-reg. - multiple	0.144	0.067	0.161	0.062	0.111	-0.010	0.216	0.093
Parameter from stock-reg. - univar.	0.194	0.134	0.255	0.051	0.140	0.062	0.240	0.107
Parameter from bond-reg. - multiple	-0.061	0.079	0.158	0.012	-0.021	0.077	0.072	-0.032
Parameter from bond-reg. - univar.	0.070	0.080	0.140	-0.003	0.026	0.078	0.069	-0.036
Parameter from All-reg. - multiple	0.049	0.031	0.037	0.067	0.063	-0.013	0.104	0.031
Parameter from All-reg. - univar.	0.075	0.044	0.075	0.039	0.099	0.040	0.126	0.007
Average	**0.075**	**0.074**	**0.105**	**0.036**	**0.064**	**0.039**	**0.126**	**0.000**

	8 years horizon			*10 years horizon*		
	Ope.	*Front*	*Back*	*Ope.*	*Front*	*Back*
Avg. parameter from multiple	-0.163	-0.038	0.075	-0.039	0.018	0.090
Avg. parameter from univar.	-0.093	-0.058	0.016	-0.030	-0.025	0.074
Parameter from stock-reg. - multiple	-0.058	-0.041	0.097	-0.005	0.039	-0.058
Parameter from stock-reg. - univar.	-0.027	-0.021	0.067	-0.042	0.031	-0.040
Parameter from bond-reg. - multiple	-0.046	0.003	0.057	-0.101	-0.033	0.055
Parameter from bond-reg. - univar.	0.003	0.012	0.043	-0.037	-0.023	0.008
Parameter from All-reg. - multiple	-0.072	-0.036	0.079	-0.029	0.011	-0.025
Parameter from All-reg. - univar.	-0.037	-0.018	0.018	-0.044	0.001	-0.026
Average	**-0.062**	**-0.025**	**0.056**	**-0.041**	**0.002**	**0.010**

There is one important insight from the results reported in Table 12: the longer the horizon, the more negative do the point estimates of the coefficients to especially operating expenses get. At the three-year horizon, the raw average of the coefficient estimates to operating expenses is 0.075 and only one estimate is negative. At the longer eight (ten) year horizon, the raw average of the coefficient estimates to the operating expenses equals –0.062 (-0.041) and all coefficient estimates but one are negative (at the ten year horizon, all estimates are negative).

It is important to stress that even if the point estimates to especially operating expenses get more and more negative the longer is the horizon (indicating that higher operating costs lead to lower risk-adjusted returns on the long run), it is still only few of the individual coefficient estimates (not shown) that are significant. In other words: there is a clearer pattern in the coefficient estimates the longer is the horizon – they become more and more negative – but it is still difficult to statistically distinguish most of the coefficients from zero.

Concerning the estimates of the coefficients to the remaining cost sources, the average of the coefficients to front-end load fees is negative at the eight-year horizon and very close to zero at the ten year horizon. The coefficient to back-end load fees is consistently positive; nevertheless, for horizons longer than five years, the average of the estimates across specifications gets smaller and smaller. Finally, the average of the estimates of the coefficients to turnover is basically zero at the longest (five year) horizon for which we have data.

7.2 The cost indicator

How should the costs be weighted into a cost indicator? Five lessons can be drawn from the results presented in Table 12:

1. The longer the horizon, the more negative do the point estimates of the coefficients to operating expenses get. The average across specifications is approximately -0.05 at the longer horizons. We also note, however, that it is difficult to statistically distinguish the coefficients from zero, even if there is a clear tendency in the point estimates the longer is the sample used to estimate the coefficients.
2. The longer the horizon, the more negative do the coefficients to front-end load fees get.[29] The average across specifications is approximately -0.02 at the longer horizons.
3. The coefficient to turnover is basically zero (remember here that turnover only enters the regressions using 3 and 5 years of data as we do not have data on turnover in years prior to 1999).
4. The average coefficient estimates to back-end load fees are positive, though decline with the horizon. Furthermore, load fees are highly correlated, as reported in Tables 3 and 4, i.e. information from one of the load fees contains information about the other load fee, too.
5. There is much noise in the estimations and most of the parameters are not significant. This lesson is drawn primarily on the basis of the results in Tables 10 and 11.

With these observations and estimations in mind, the cost indicator we analyze in what follows takes the form:

[29] The negative "trend" for front-end load fees is not as clear as for operating costs, however.

$$CI = 0.7Ope. + 0.3Front + 0Back + 0Turnover\,.$$

In other words: operating expenses weight 70 percent in the costs indicator and front-end load fees weight 30 percent. The coefficients to back-end load fees and turnover are set to zero. The same weights are used for all funds regardless of their category.

Why these choices? The coefficient to turnover is set to zero because it is, for the shorter horizons for which we have data, estimated to be approximately zero. Furthermore, there is no data on turnover sufficiently back in time to provide a good estimate of the impact of trades on costs and we do not know the exact cost of trades for the different categories of funds. The hope was that regressions such as those in Tables 10 and 11 could have provided some reasonable estimates of the weight and price of trading for the different categories of funds. However, as these estimates are so far away from giving any economic meaning, it does not make sense to use these estimated parameters to calculate the cost indicator. Until more data on turnover, and possibly the costs of turnover for the individual funds, are available, it is too uncertain to base a cost indicator on turnover.

The coefficient to back-end load fees is set to zero because a large part of the information contained in back-end load fees is also contained in front-end load fees due to the high correlation of fees. Furthermore, the back-end load fees that the investors may be charged when leaving the fund is not known at the time of entrance. The advantage of using front-end load fees is thus that we only rely on cost data valid for the investor at the time of purchasing the mutual fund.

The average of the coefficients to operating expenses was –0.05 and to front-end load fees –0.02. The sum of these two coefficients is –0.07, with approximately 70% (0.05/0.07) coming from operating expenses and 30% (0.02/0.05) from front-end load fees. When the cost indicator takes the form

$$CI = 0.7Ope. + 0.3Front\,,$$

the weights of the cost indicator sum to 1.[30] It is this cost indicator that we want to evaluate in the next section.

[30] It is chosen to set the weights to 0.7 and not the exact value of 0.05/0.07 = 0.714286. It should be remembered that our cost indicator is exactly nothing more than an indicator, i.e. it should be of practical use and easy to communicate to investors. For this reason, the exact values of the indicator are less important, in the sense that there is no scientific reason for choosing 0.07 instead of 0.714286, for instance. We choose to focus on easily understandable weights.

A remark: Other weights

We have attempted the base the choice of weights of the cost indicator upon the results of Tables 10 to 12. A clear message of these tables, however, is that there is much uncertainty regarding the coefficient estimates. For this reason, we also investigate rankings funds based on alternative cost indicators. Especially, we also report results using a cost indicator where operating expenses weight 80% and front-end load fees 20%, and an indicator where the weights are 60%/40% respectively. We do not include turnover in any cost indicator, however, due to the problems with turnover described above, and we also only include front-end load fees due to the high correlation of fees.

8. The ATP-Rating™

We want to evaluate whether the ranking of funds as based on their cost indicator contains information about future performance. To accomplish this task, we need to rank the funds. We did this as follows: we first calculated the values of the cost indicators in different years: 1994, 1995, 1998, and 2000, i.e. ten before the last year in sample, eight years before the last year in our sample, five before the last year in the sample, and three before the last year in the sample.[31] For 1995, for instance, we looked up the operating cost of each fund, multiplied the operating cost of the fund with 0.7 and summed that with 0.3 times the 1995 front-end load fee of the fund. We repeated this exercise for all funds. Having done so, we sorted all funds according to the size of their cost indicator in relation to the cost indicators of the other funds in the same ATP-category.

Having sorted the funds, we assigned one "crown", i.e. the highest cost assignment, to the ten percent of the funds that had the highest costs in the ATP-category. The next 22.5% of the funds in an ATP-category are assigned two "crowns". The third group of funds are the 35% of the funds that have costs around the value of the average cost indicator of the ATP-category. The next 22.5% are assigned four "crowns", and the ten percent of the funds with the lowest costs within an ATP-category are assigned five "crowns". The percentages used for the ranking of the funds are the same percentages as Morningstar™ uses for the ranking of funds when assigning "stars" to mutual funds.

[31] When analyzing ten-year future performance, we should in principle calculate the cost indicator and rankings in 1993. Due to the availability of cost data, we ranked the funds in 1994, however.

We decided that there should be at least 10 funds in each ATP-category before it made sense to rank the funds. We show the numbers of funds in the different ATP-categories for the different horizons in Table 13.

Table 13. Numbers of funds in different ATP-categories.

	Stocks				*Bonds*				
	Danish	*Global*	*Regional*	*Others*	*Short*	*Long*	*Global*	*Other*	***Total***
3 years	28	35	50	60	21	43	12	19	268
5 years	21	17	28	34	15	26	–	–	141
8 years	12	16	17	17	–	14	–	–	76
10 years	–	14	17	–	–	11	–	–	42

As can be seen from the table, there are ratings within all categories using 3 years of data whereas at the 10 year horizon there are ratings only in the groups of *Global stocks, Regional stocks*, and *Long bonds*.

8.1 Testing the ATP-Rating™

To test the predictive power of the ATP-Rating™, we follow the approach of Blake & Morey (2000), i.e. we run cross-sectional regressions of alphas on dummy variables that pick out four of the five categories. We do this using the rankings of the funds in 1994, 1995, 1998, and 2000. Consider 1994 as the base year: we rank the funds and assign "crowns" to the funds as based on their rating in 1994, as described in the previous section. We then create a dummy variable that picks out the funds in category 2, another dummy variable picking out the funds in category 3, and so forth. We create no dummy variable that picks out the funds in category 1 (with the highest costs), i.e. we use the funds in category 1 as the reference funds towards which we compare the other better-performing funds. We regress the alphas of the funds on the four dummies, remembering that the alphas are based on the period from 1994 to 2004, i.e. on the risk-adjusted performance of the fund in the ten years following the ranking. In this way, the regressions provide evidence on the out-of-sample performance of the ATP-Rating™. We do the same with 1995 as starting year and then look at alphas estimated over the following eight years, with 1998 as starting year and look at alphas over 5 years, and with 2000 as the starting year and evaluates alphas over 3 years.

The regressions we perform look as follows

$$\alpha_i = \delta_1 + \delta_2 D_2 + \delta_3 D_3 + \delta_4 D_4 + \delta_5 D_5 ,$$

where D_2 is a dummy picking out those fund that belong to rating group 2 (the group of funds with the second-highest costs), D_3 picks out those funds that belong to rating group 3, and so forth up to D_5 that picks out the funds with the lowest costs within their ATP-category. If the ATP-Rating™ contains information about future returns, we expect that funds with lower costs than the costs of the funds in group one (our reference group) also have higher alphas (perform better), i.e. we expect δ_2-δ_5 to be positive, and we expect δ_3 to be more positive than δ_2, δ_4 to be more positive than δ_3, and δ_5 to be more positive than δ_4.

The results from these regressions are presented in Table 14. We present results using both simple OLS regressions and robust regressions. We present results from robust regressions, too, to check the robustness of the OLS regressions.

Table 14. Dummy variable regression. All funds.

			p-value	δ_1		δ_2		δ_3		δ_4		δ_5	
	Obs	Adj. R^2	F-test	Cons.	p-value	Rat 2	p-value	Rat 3	p-value	Rat 4	p-value	Rat 5	p-value
3 year, OLS	268	0.077	**0%**	0.213	**0%**	-0.108	22%	-0.323	**0%**	-0.229	**1%**	-0.127	22%
3 year, Robust				-0.026	56%	0.053	33%	-0.074	15%	-0.007	90%	0.022	73%
5 year, OLS	141	0.051	13%	0.152	**6%**	-0.144	14%	-0.156	**9%**	-0.160	10%	0.032	78%
5 year, Robust				-0.010	86%	-0.033	63%	-0.021	74%	-0.043	53%	0.045	58%
8 year, OLS	76	0.163	**1%**	-0.008	92%	0.010	92%	-0.032	74%	-0.064	53%	0.295	**2%**
8 year, Robust				-0.103	14%	0.067	42%	0.046	56%	0.055	50%	0.248	**1%**
10 year, OLS	42	0.193	**9%**	-0.130	14%	0.110	29%	0.080	43%	0.165	11%	0.326	**1%**
10 year, Robust				-0.130	11%	0.064	50%	0.118	21%	0.153	11%	0.322	**1%**

The results contained in Table 14 show that ranking funds on the basis of their cost indicator contains information, at least to some extent, about long-term risk-adjusted excess returns of the funds. In more detail, looking at the OLS regression results for risk-adjusted returns over the three years as based on the values of the cost indicator in 2000 (the estimates presented in rows "3 year"), all coefficients have the "wrong sign" in the sense that funds with lower costs than those of group one also experienced lower risk-adjusted returns, i.e. the opposite of what would be expected. The same basically goes for the five year returns. For the eight and ten year returns, however, the story is different. In particular, the ranking of funds in 1995 implied that funds in group five (the funds with the lowest costs in 1995) actually obtained statistically significant higher risk-adjusted excess returns over the 1996 to 2003 period than did those funds that had the highest costs (those in groups 1) in 1995. In other words: out of sample, the

funds with the lowest costs did on average better than the funds with the highest costs. The ranking of funds in 1994 also had some predictive power: the funds in the group with the lowest costs, group 5, obtained significantly higher risk-adjusted excess returns over the out-of-sample period 1994-2003 than did the funds in group one (with the highest costs).

What is the interpretation of the coefficients? Consider the estimate of δ_5 as an example. The estimate of δ_5 gives the difference between the alphas generated by funds in groups 1 and 5 respectively, i.e. an estimate of δ_5 of 0.326 implies that the average monthly alpha of the funds in group 5 is 0.326% higher than the average alpha of the funds in group one. In other words: had an investor invested in the funds in group 5 (those with the lowest costs within their ATP-category) he would have obtained an annual risk-adjusted excess return that is approximately 3-4% higher than if he had invested in funds in groups 1 (with the highest costs within their ATP-category) measured over the period from 1994-2003. Our findings are thus economically significant, too.

We find that the coefficient to the dummy picking out the lowest-cost funds (δ_5) is significantly positive on the longer horizons. We also find that the coefficients δ_2 , δ_3, and δ_4 are estimated to be positive on the longer horizons, but that they are not significantly different from zero (δ_4 is significant at a 11% level, however). The finding that the lowest-cost funds have significantly superior long-run out-of-sample performance in relation to the highest costs funds, but that funds in groups two, three, and four do not have significant coefficients (even when the signs to the coefficients are positive and the δs are increasing in magnitude) is in line with the results from Blake & Morey (2000) on the predictive content of Morningstar™ ratings. Blake & Morey (2000) report that Morningstar™ categories 1 and 2, i.e. those picking out the funds with the historically lowest returns within their categories, predict low risk-adjusted returns out-of-sample in comparison to the return of Morningstar™ category 5 (with the historically highest returns), whereas Morningstar™ categories 3 and 4 have no predictive power. In other words, we find that our cost indicator predicts, at least to some extent, returns of the lowest-cost funds out-of-sample, and Blake & Morey (2000) report that Morningstar™ ratings predict, at least to some extent, the future returns of the historically best performing funds.

8.2 Robustness checks

We performed a number of robustness checks of our results: We investigated whether the results change if we use other weights to operating expenses and front-end load fees in our cost indicator and what happens if we look at funds that are accessible to private investors only.

Before presenting these results, however, we also evaluated whether our basic finding (that low-cost funds outperform high-cost funds on the long run) arise because those funds that are in the sample during the 1994-2003 period are "special". As can be seen from Table 14, there are 268 funds for which we have data during the period 2001-2003. There are only 42 funds, however, for which we have data during the full 1994-2003 period. The question we analyze in this section is whether the coefficients get "more and more positive" as the out-of-sample horizon is increased for the 42 funds for which we have data during the complete sample period. We thus conducted regressions such as those in Table 14 for the 42 funds that are available during the complete sample period only. We present the results in Table 15.

Table 15. Dummy variable regression. Only funds that are present during the period 1994-2003.

			p-value	δ_1		δ_2		δ_3		δ_4		δ_5	
	Obs	Adj. R^2	F-test	Cons.	p-value	Rat 2	p-value	Rat 3	p-value	Rat 4	p-value	Rat 5	p-value
3 year, OLS	42	0.094	44%	-0.050	79%	-0.004	98%	-0.047	81%	0.073	72%	0.219	34%
3 year, Robust				-0.050	74%	0.016	92%	-0.087	58%	-0.045	78%	0.108	55%
5 year, OLS	42	0.292	1%	-0.094	36%	0.126	31%	0.113	32%	0.042	73%	0.525	0%
5 year, Robust				-0.090	33%	0.049	66%	0.102	32%	0.004	97%	0.641	0%
8 year, OLS	42	0.209	6%	-0.114	23%	0.110	33%	0.073	50%	0.048	67%	0.362	1%
8 year, Robust				-0.115	17%	0.071	47%	0.073	43%	0.049	62%	0.354	0%
10 year, OLS	42	0.193	9%	-0.130	14%	0.110	29%	0.080	43%	0.165	11%	0.326	1%
10 year, Robust				-0.130	11%	0.064	50%	0.118	21%	0.153	11%	0.322	1%

As can be seen from the table, at the three-year horizon, the estimates are all insignificant whereas they are significant and positive at the longer horizons. The only difference to the results of Table 14 is that when looking at the 42 funds for which there are data for the complete 10 year sample only, significantly superior performance is shown by the funds in group 5 over the 5-year horizon, too. All-in-all, we conclude that when we look at funds that are present in the complete sample period, one does not get significantly superior performance over a short 3-year horizon by investing in funds

with the lowest costs. Though, if the horizon of the investor is longer, one on average obtains superior performance by investing in funds with low cost, and at the longest horizon, also funds in groups 4 yield performance that is close to being statistically superior to that of the funds with the highest costs.

8.2.1 Other weights in the cost indicator

Are the results robust if we choose other weights in the cost indicator? To answer this question, we rank the funds using an alternative cost indicator where operating costs weight 80% and front-end load fees 20%, $CI = 0.8Ope. + 0.2Front$, and one taking the form $CI = 0.6Ope. + 0.4Front$. Overall, the results are fairly robust towards the choice of other weights in the cost indicator. The only difference to the previously presented results is that the results are slightly more depended on the estimation method used. In particular, if we estimated the parameters by standard OLS methods, the estimates of the coefficients using three years of data turned out to be significantly negative. However, if we used the robust method that controls for outliers, the results were basically identical to those reported in Table 14.[32]

8.2.2 Private funds versus institutional funds

As the final exercise, we also conducted predicting regressions using data from funds that are available to private investors only, i.e. using a sample of funds where we have excluded the funds that are accessible to institutional investors only. The results are shown in Table 16.

Table 16. Dummy variable regression. Only funds accessible to private investors.

			p-value	δ_1		δ_2		δ_3		δ_4		δ_5	
	Obs	Adj. R^2	F-test	Cons.	p-value	Rat 2	p-value	Rat 3	p-value	Rat 4	p-value	Rat 5	p-value
3 year, OLS	216	0.087	0%	0.290	0%	-0.178	10%	-0.390	0%	-0.347	0%	-0.212	9%
3 year, Robust				0.003	95%	0.017	79%	-0.106	8%	-0.059	37%	-0.052	49%
5 year, OLS	128	0.083	3%	0.198	2%	-0.176	10%	-0.217	3%	-0.235	3%	0.025	84%
5 year, Robust				0.018	76%	-0.052	48%	-0.071	31%	-0.089	23%	0.027	75%
8 year, OLS	71	0.080	23%	-0.008	93%	0.025	82%	-0.058	58%	-0.052	63%	0.171	18%
8 year, Robust				-0.103	15%	0.084	33%	0.030	71%	0.047	58%	0.111	27%
10 year, OLS	40	0.106	40%	-0.130	14%	0.122	24%	0.073	47%	0.185	9%	0.153	22%
10 year, Robust				-0.130	12%	0.078	43%	0.095	32%	0.181	7%	0.149	21%

[32] These results are available upon request.

There are two clear patterns: (*i*) The longer the horizon, the more positive do the estimates get, and (*ii*) at the short horizon, the estimates are significantly negative if OLS methods are used but insignificant if robust methods are used. It is also noticeable that the estimate of δ_5 at the five-year horizon is insignificant, but that the estimate to δ_4 then turns out to be significant (at the 10% significant level).

8.3 Interpretations

We believe that the overall insights to be learned from the out-of-sample regressions and robustness checks are that (*i*) at the longer horizons, more coefficient estimates turn out to be positive, (*ii*) at the longer horizons, the δs increase in magnitude when going from δ_2 to δ_5, (*iii*) at the longer horizons, the coefficients to the dummies picking out the funds with the lowest costs (funds in groups 4 and 5) are generally significantly positive, and (*iv*) the results depend to a small extent on the estimation method used and the kinds of funds that are analyzed (private funds versus institutional funds, and funds that exist during the complete sample period versus funds that exist during parts of the sample period only).

All in all, we have shown that there is some information about future risk-adjusted returns to be gained by considering costs today. How does this result line up with the results of section 7 that showed that *in-sample,* the coefficients to especially operating expenses get more and more negative the longer is the horizon, but also that most of the coefficients were insignificantly different from zero. In other words: how come that section 7 showed that there is only weak (negative) relation between costs and performance *in-sample* whereas section 8 showed that there is a significant negative relation between costs today and returns *out-of-sample*? To make a perspective on this, it should first be stressed, once again, that the two main differences between the analyses of sections 7 and 8 are:

1) The regressions in section 7 estimate the relation between the average cost during some period t till $t+N$ and average performance measured by the alpha estimated on the same sample period t till $t+N$. On the other hand, the regressions in section 8 show that there is a negative relation between costs in period t and the average performance in the subsequent period $t+1$ till $t+N$. In other words, in section 7, we look at the costs over time whereas costs are kept fixed at their initial level in

section 8. The left-hand-side variable (the alpha) is the same in both kinds of regressions.

2) The regressions in section 8 are based on a sorting of funds into those that have high respectively low costs within their ATP-category. There is no such sorting in section 7.

Point 1) indicates that the difference between the results of section 7 and 8 can be due to changes in the average costs (the right-hand side variables of the regressions) during the subsequent periods t+1 till t+N. In other words, especially operating costs have increased during the period 1994-2003, as shown Figure 4. When we thus report that there is only a weak relation between average costs and average performance in-sample in section 7 but a significantly negative relation between costs in a start year t and average performance in subsequent years t+1 till t+N in section 8, this must be due to costs having changed in a way such that costs match up with performance during periods t+1 till t+N. On the other hand, when we keep costs at their initial level and sort funds into those that have high respectively low costs in the starting year, we find that those funds with the lowest costs within their ATP-category have better out-of-sample performance than those funds with the highest costs in the starting year.

Secondly, it should also be stressed that our results do not necessarily imply that investors should stay away from high-costs funds at any time. Actually, the "v"-shaped relations between expenses and performance depicted in Figures 9 and 10 show that some funds do very well in spite of their high costs whereas others do very badly. What the out-of-sample results of section 8 suggest is that one way of potentially identifying a group of funds that on average do well in the future is to select funds with the lowest costs today among the funds in the investment universe considered by the investor. However, a good cost rating is not a guarantee for good future performance just as it is possible that some funds with a bad cost rating show good performance.

9. Conclusion

We have investigated the relation between costs and returns of Danish mutual fund investments, and we have described the development and predictive ability of a new cost rating – the ATP-Rating™.

We investigated the changes over time in different sources of costs since 1994. Front-end load fees and back-end load fees have remained fairly constant since 1994, whereas operating costs have increased significantly. Another source of mutual fund costs are those associated with trading in the underlying assets of the fund. In this study, we only had access to data on turnover since 2000 and we have no data on the actual costs of the funds' trade in their underlying assets. For these last reasons, we have consequently focused more on load fees and operating costs.

We show that operating costs are much more persistent than returns, i.e. in general the investor has much certainty about the costs of a fund, but not much certainty about the return of a fund.

Do costs matter for the return the investor obtains from buying Danish mutual funds? We show that there is a "v"-shaped *in-sample* relation between costs and performance such that funds with high costs can be divided into two groups: there is one group of funds with high costs that have showed good performance, but there is also another group of funds with high costs that have provided only low risk-adjusted returns to their investors. In other words: the investor cannot be sure that if he invests in a high-cost fund, the fund will also generate high performance; some high-costs funds have actually generated very bad performance historically.

A new contribution of this paper is that we rank mutual fund as based on their costs and test the predictive power of a cost indicator. We analyze a cost indicator where operating costs weight 70% and font-end load fees weight 30%. We use the indicator to sort funds into five different categories, inspired by the Morningstar™ "star" ratings. Most importantly, we test whether the ranking of funds as based on their costs provide information about future risk-adjusted excess returns. We find that the cost ranking has some predictive power for 8 or 10 years *out-of-sample* longer-horizon returns: If the investor in 1994 had invested in the 10% of funds that had the lowest costs within their ATP-category, he would over the 1994-2003 period have obtained an annual extra 2-3% of risk-adjusted excess returns as compared to investing in the 10% of funds that had the highest costs within their ATP-category.

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Appendix A.

ATP-category	Morningstar Kategori™	Category no.	Mean (%)	Median (%)	Min (%)	Max (%)	Stdev
I	Denmark - Stocks	119	0.9895	1.4619	-14.1690	11.3310	4.6671
II	Global Large Cap - Stocks	24	0.4431	0.8690	-13.1320	11.6100	4.7705
II	Global Mid/Small Cap - Stocks	25	0.6778	0.7258	-13.8400	14.1020	5.0177
III	England Large Cap - Stocks	1	0.5404	1.1027	-10.8850	9.1457	4.4400
III	Europe ex. England - Stocks	4	0.8252	1.3011	-16.0750	14.2700	5.4392
III	Euroland Large Cap - Stocks	6	0.7540	1.2834	-16.0940	12.8550	5.4264
III	Europe Large Cap - Stocks	9	0.6437	1.3738	-13.5970	11.4280	4.9037
III	Europe Mid Cap - Stocks	10	0.9647	1.3495	-18.3470	21.8340	5.8127
III	Northamerica Large Cap - Stocks	13	0.7300	0.9621	-13.5030	13.5450	5.3462
III	Northamerica Mid/Small Cap - Stocks	14	0.9785	0.8016	-17.7740	16.1590	6.3387
III	Japan Large Cap - Stocks	17	-0.0204	-0.0866	-13.9150	16.3790	6.2310
III	Japan Mid/Small Cap - Stocks	18	0.3647	-0.3531	-15.6390	27.8360	7.7124
III	Global New Markets - Stocks	29	0.2287	0.6698	-28.3080	16.9230	7.1553
IV	DKK Short - Bonds	121	0.3855	0.4494	-0.9886	1.2181	0.3865
IV	Euro Money market, dynamic	141	0.2793	0.2525	-0.3773	1.1840	0.2256
V	EUR Others - Bonds	66	0.4350	0.5511	-1.6654	2.1873	0.8043
V	DKK Others - Bonds	120	0.4969	0.7563	-3.1244	2.9870	1.0001
V	DKK Index Bonds	142	0.2607	0.3400	-6.7994	6.2084	1.6795
VI	EUR Global - Bonds	62	0.3567	0.3276	-2.3027	3.8352	1.2720
VI	European - Bonds	65	0.4312	0.4931	-2.3258	2.8653	1.0525
VII	England Small Cap - Stocks	3	1.0741	1.7364	-19.4530	17.7850	5.8362
VII	Europe Small Cap - Stocks	11	0.9047	1.2636	-19.0530	25.7180	6.9256
VII	Asia ex. Japan - Stocks	20	0.2237	-0.0920	-24.6290	20.0610	7.3805
VII	Asia - Stocks	22	0.1434	-0.5752	-17.4450	15.9820	6.0001
VII	Latinamerica - Stocks	23	0.6308	2.2666	-34.9740	21.5370	8.8389
VII	Tech Media Tele - Stocks	30	0.9289	0.6618	-23.7790	27.5400	8.8879
VII	Natural resourceses - Stocks	31	0.2639	0.3883	-17.6740	17.5580	5.2486
VII	Real estate - Stocks	32	0.6706	0.6419	-8.3652	6.3508	2.9007
VII	Finance - Stocks	33	0.8777	1.3684	-17.7370	11.3630	5.1242
VII	Health - Stocks	34	1.0106	1.0124	-13.1120	10.9560	5.3053
VII	Other sectors - Stocks	35	0.5094	0.7534	-13.0590	10.1110	4.2899
VII	Switzerland - Stocks	105	0.6501	1.0045	-16.2180	11.0370	4.8464
VII	Nordic countries - Stocks	107	0.9506	1.1465	-17.9650	20.3520	6.2114
VII	Central- and Eastern Europe - Stocks	110	1.1339	1.8561	-38.3660	24.4430	8.5835
VIII	EUR Low Risk - Balanceret	36	0.3512	0.3978	-2.1678	2.5974	1.0370
VIII	EUR Moderate Risk - Balanceret	37	0.4094	0.7512	-6.2787	5.8262	2.3777
VIII	EUR High Risk - Balanceret	38	0.4465	0.8031	-9.2073	7.8733	3.3809
VIII	USD - Balanced	43	0.3860	0.7875	-7.9699	8.7047	3.2857
VIII	USD - Money market	50	0.2460	0.0135	-6.7711	6.6643	2.7158
VIII	GBP Govn. - Bonds	56	0.5690	0.6594	-5.6330	6.6641	2.3792
VIII	EUR High yield - Bonds	58	0.2157	0.5020	-7.4638	5.5913	1.8733
VIII	USD High yield - Bonds	60	0.5587	0.6893	-8.9057	8.6573	3.4237
VIII	New Markets - Bonds	61	0.8205	1.1250	-11.7030	10.1340	3.4096
VIII	GBP Global - Bonds	63	0.4729	0.5415	-2.7124	4.4158	1.7199
VIII	USD Global - Bonds	64	0.2955	0.0823	-4.3036	5.1672	1.8509
VIII	GBP Others - Bonds	67	0.4935	0.5417	-5.9587	7.0904	2.4799
VIII	USD Others - Bonds	68	0.3938	0.2785	-5.3368	7.4308	2.5529
VIII	Garanteed funds	69	0.4183	0.3462	-2.2095	2.5699	0.9998
VIII	NOK Others - Bonds	109	0.4828	0.4393	-6.9504	7.3401	1.8993
VIII	SEK Others - Bonds	118	0.4992	0.3571	-8.6444	8.2001	2.2249

ATP-categories:
I: Danish stocks, II: Global stocks, III: Regional stocks,
IV: Short bonds, V: Long bonds, VI: Global bonds,
VII: Other stocks, and VIII: Other bonds

Figure 1. Number of Danish mutual funds in different categories during the sample period

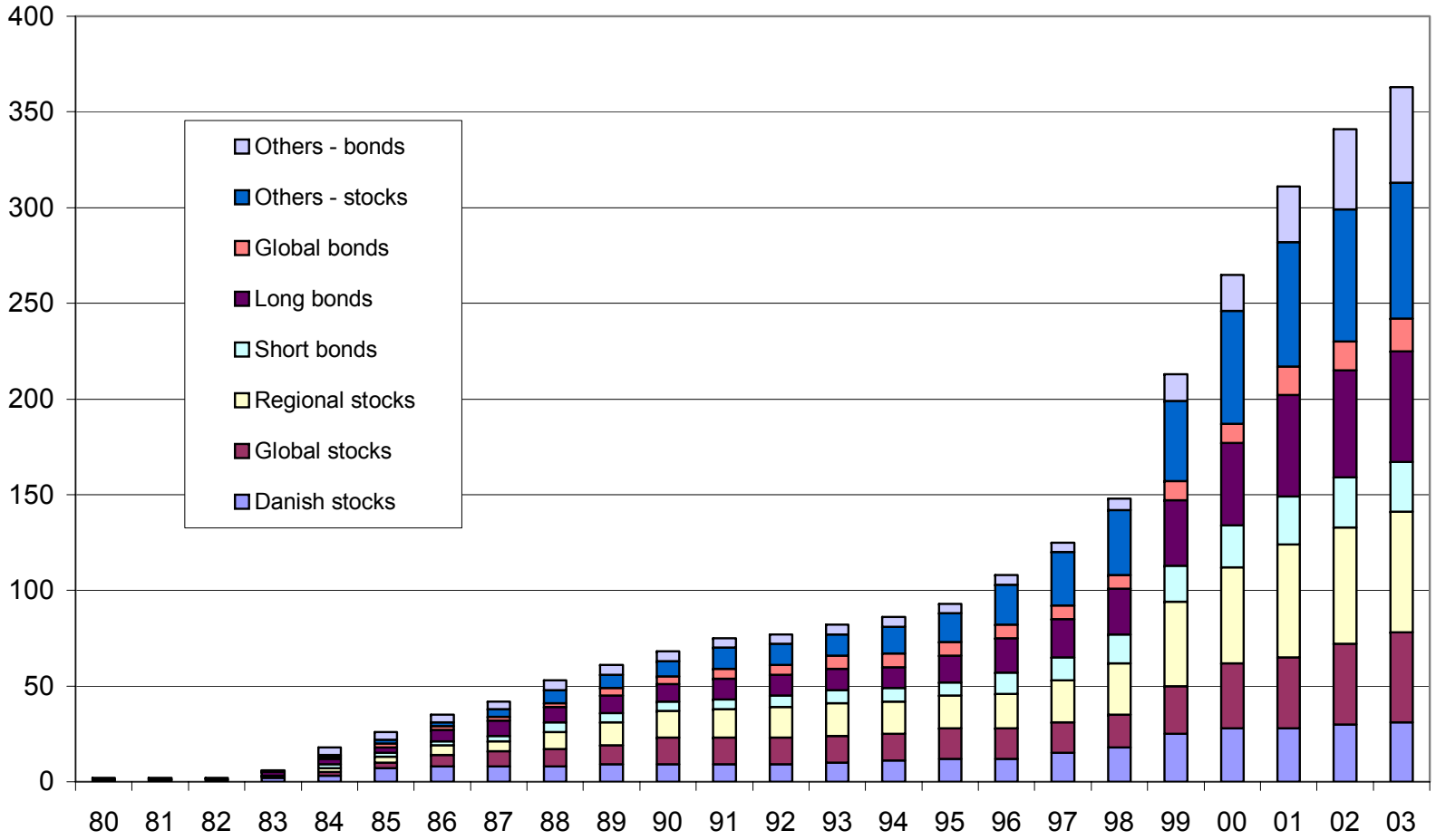

Figure 2. Average front-end load fees for Danish mutual funds. 1994-2003.

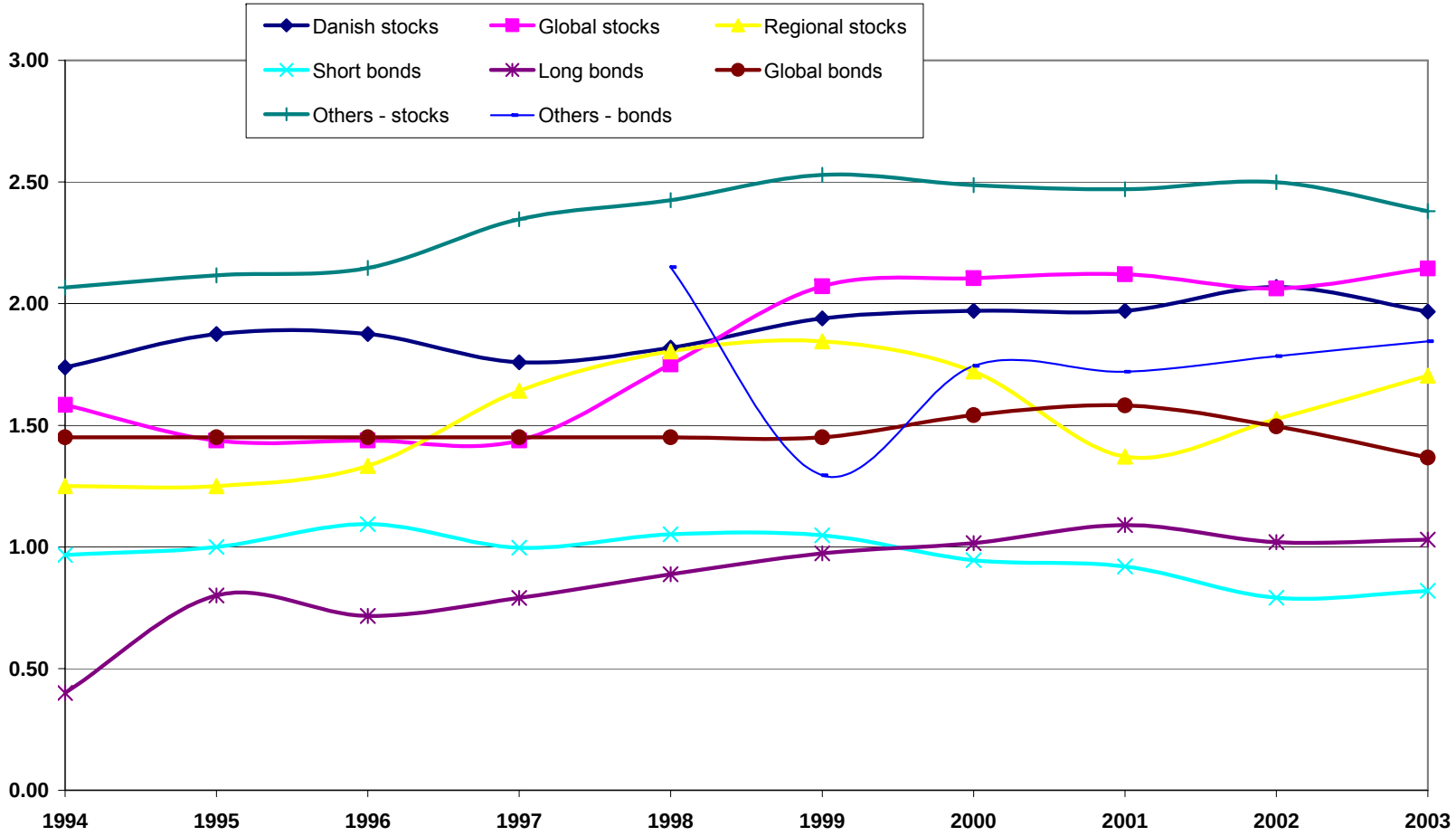

Figure 3. Average back-end load fees for Danish mutual funds. 1994-2003.

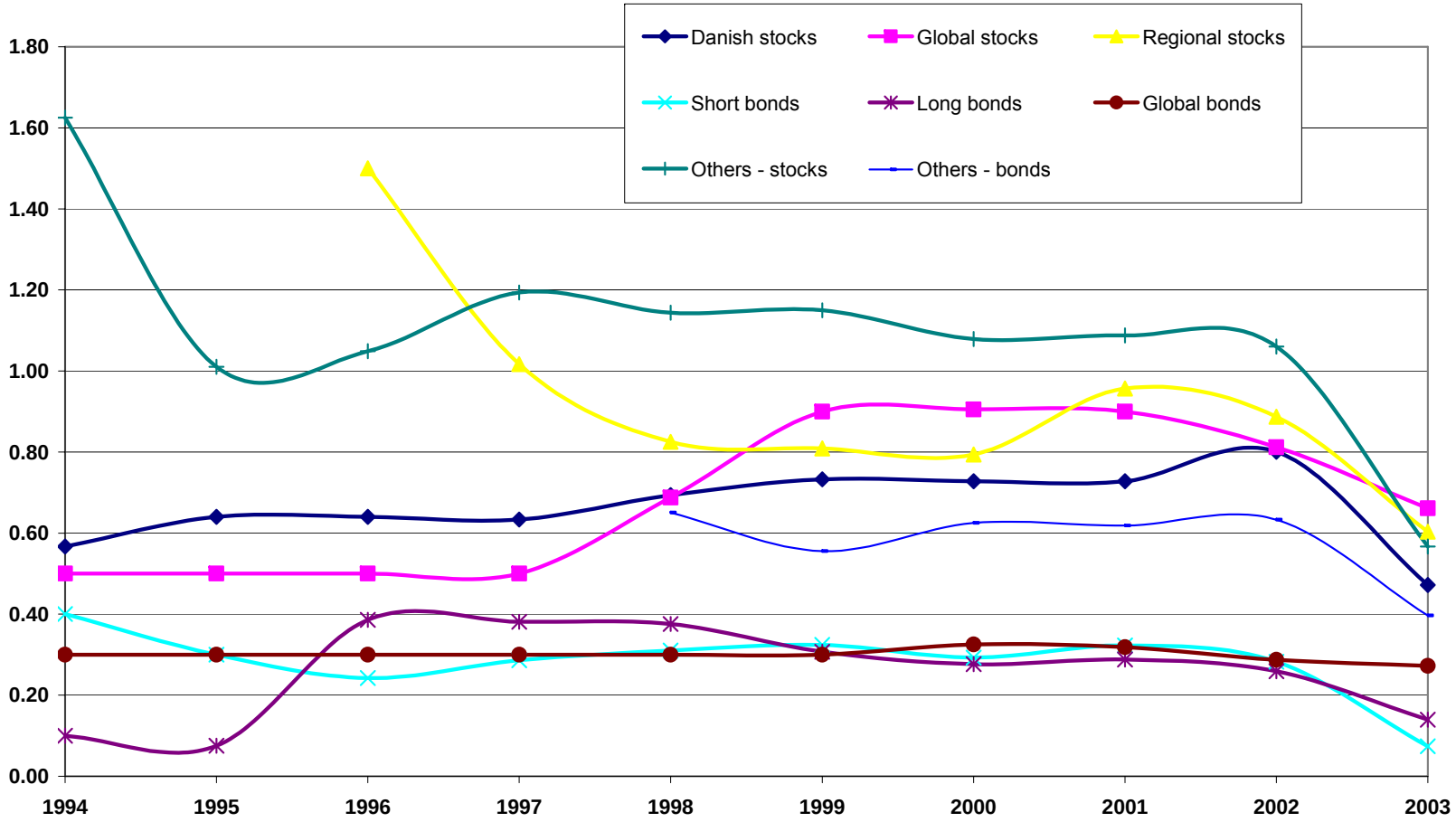

Figure 4. Average operating costs for Danish mutual funds. 1994-2003.

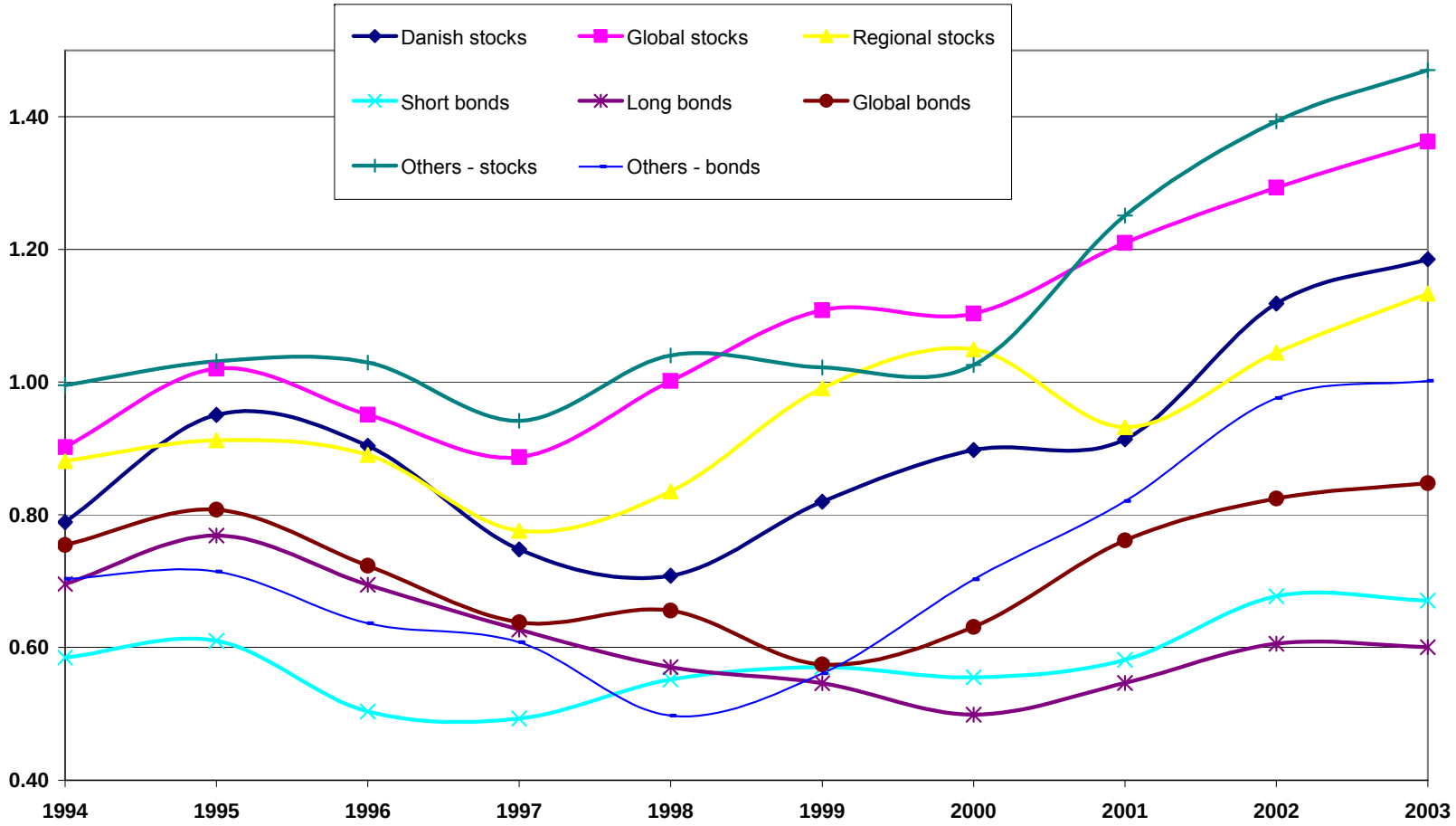

Figure 5. Average turnover for Danish mutual funds. 1998-2003.

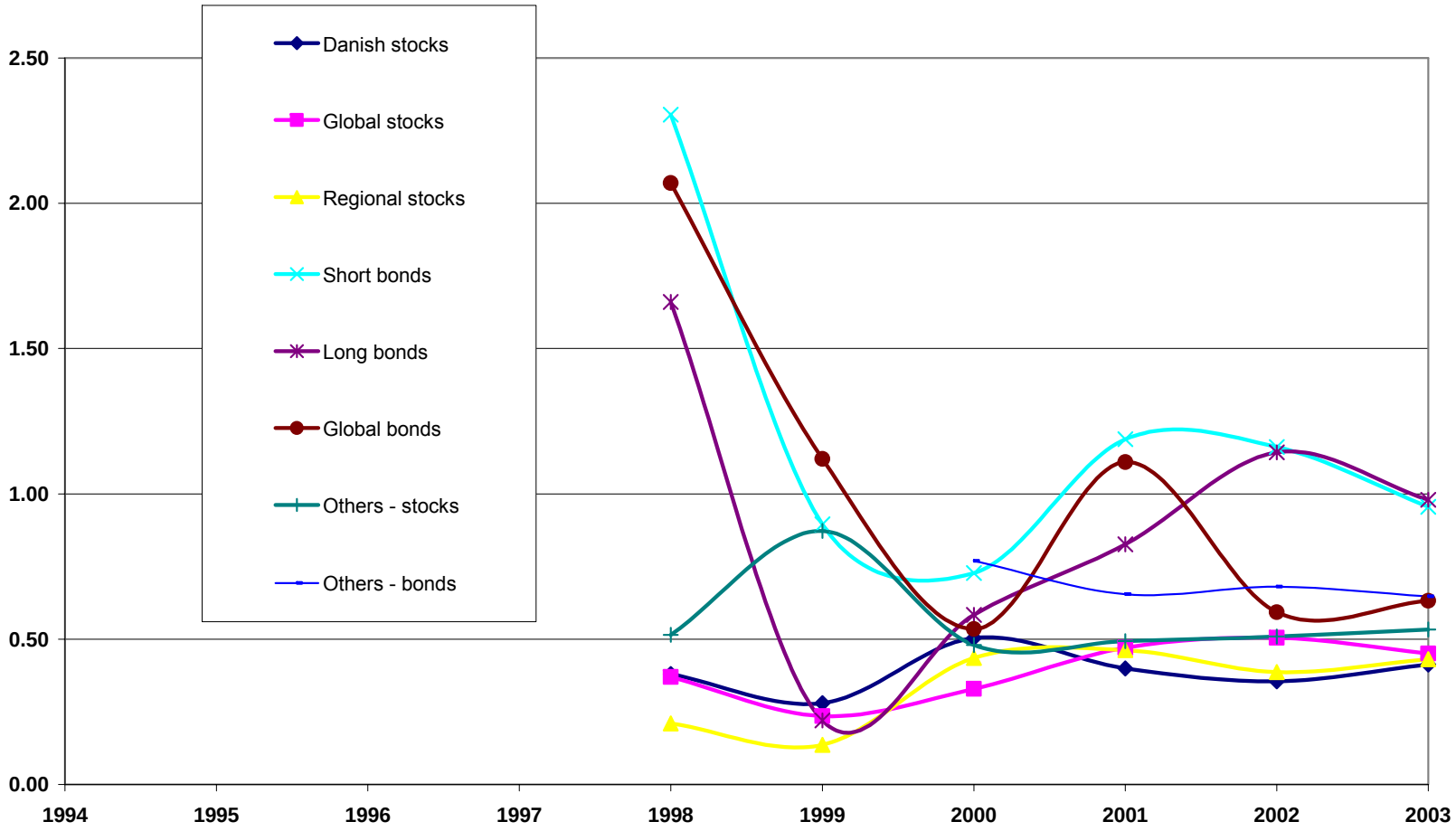

Figure 6. Average returns for Danish mutual funds. 1994-2003.

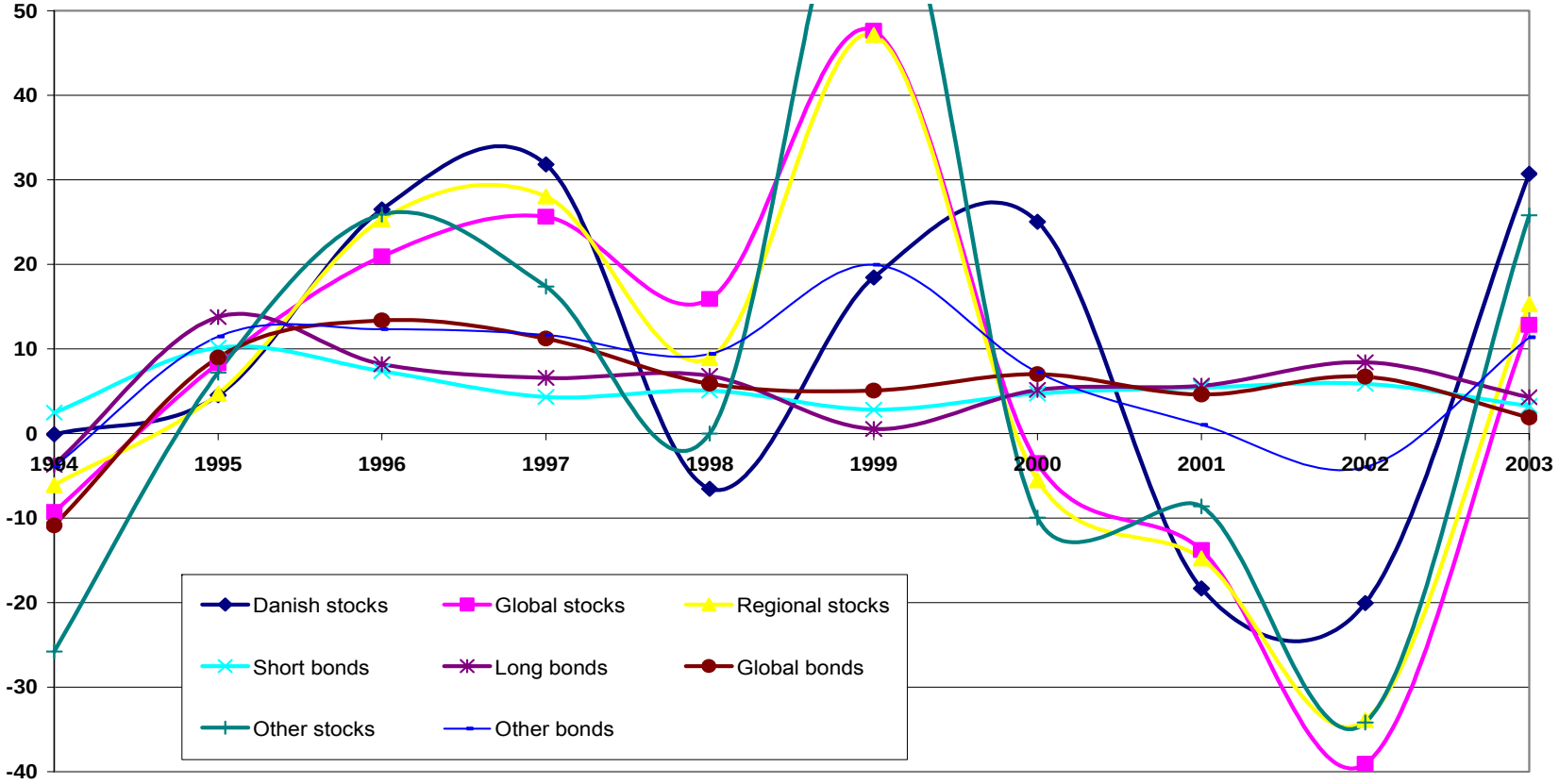

Figure 7. Scatter plot of last year's operating costs against this year's operating costs.

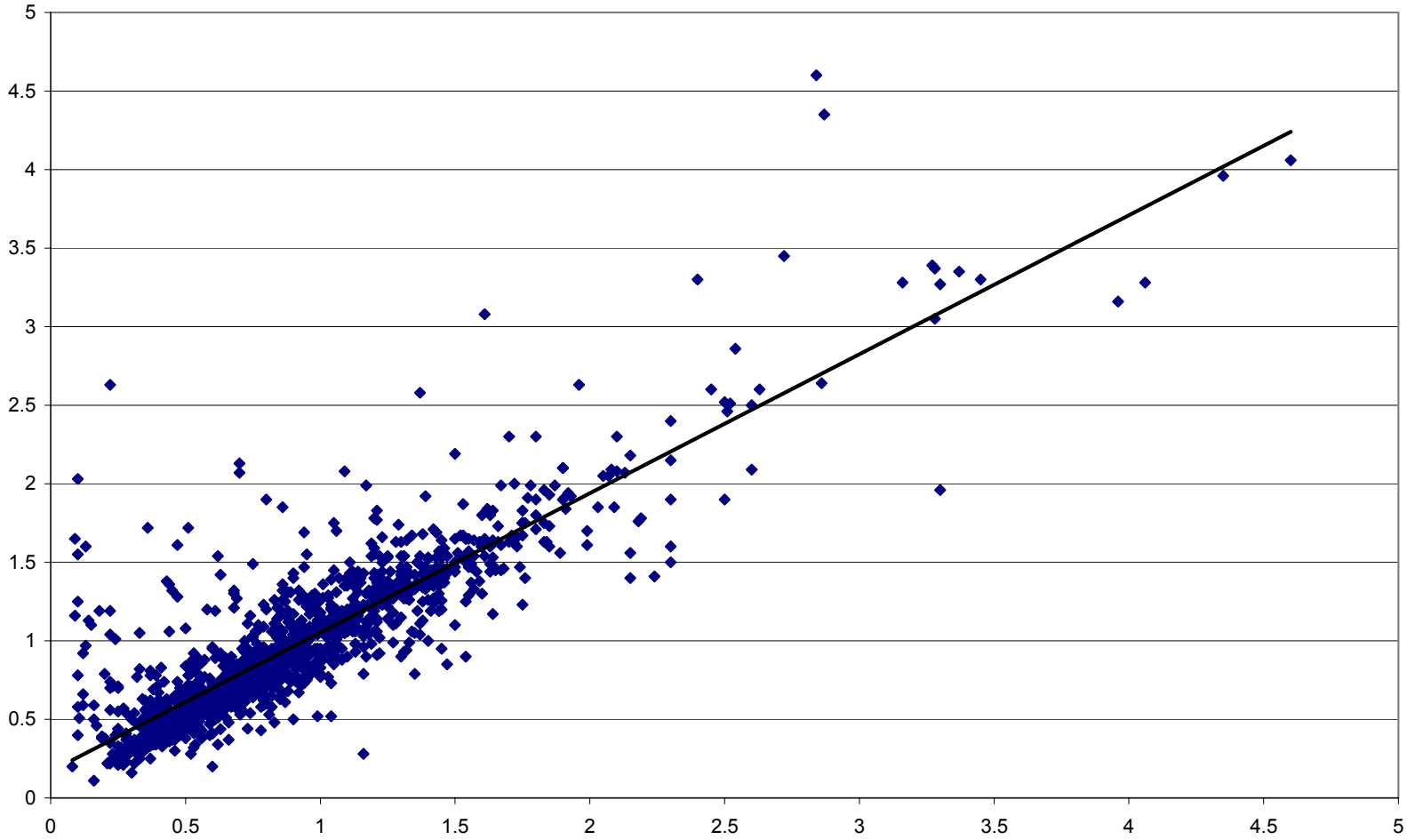

Figure 8. Scatter plot of last year's return against this year's return.

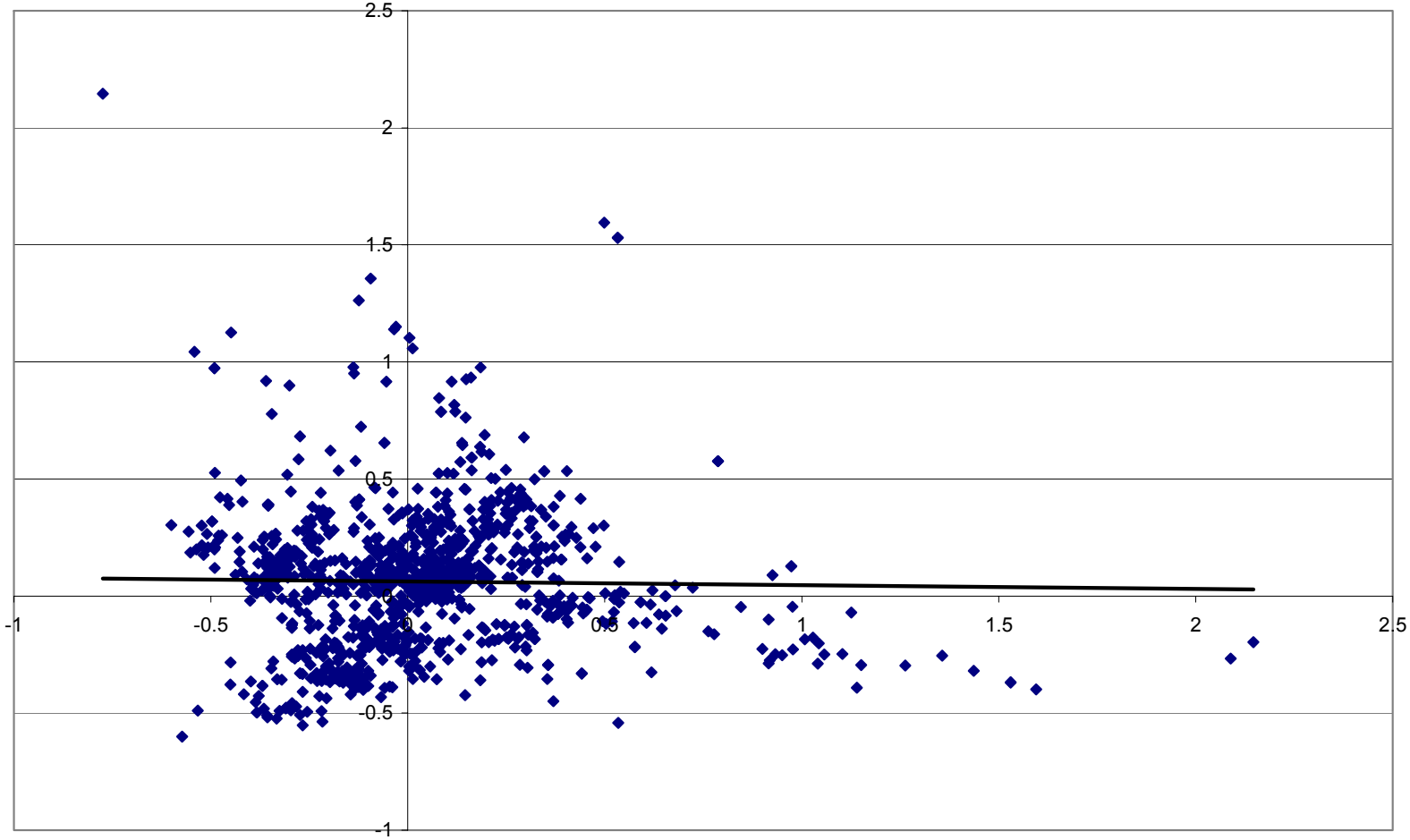

Figure 9. Alphas and expenses.

Funds have been divided into deciles based on their alphas. The figure shows the average alpha and expense figure within each decile for equity funds.

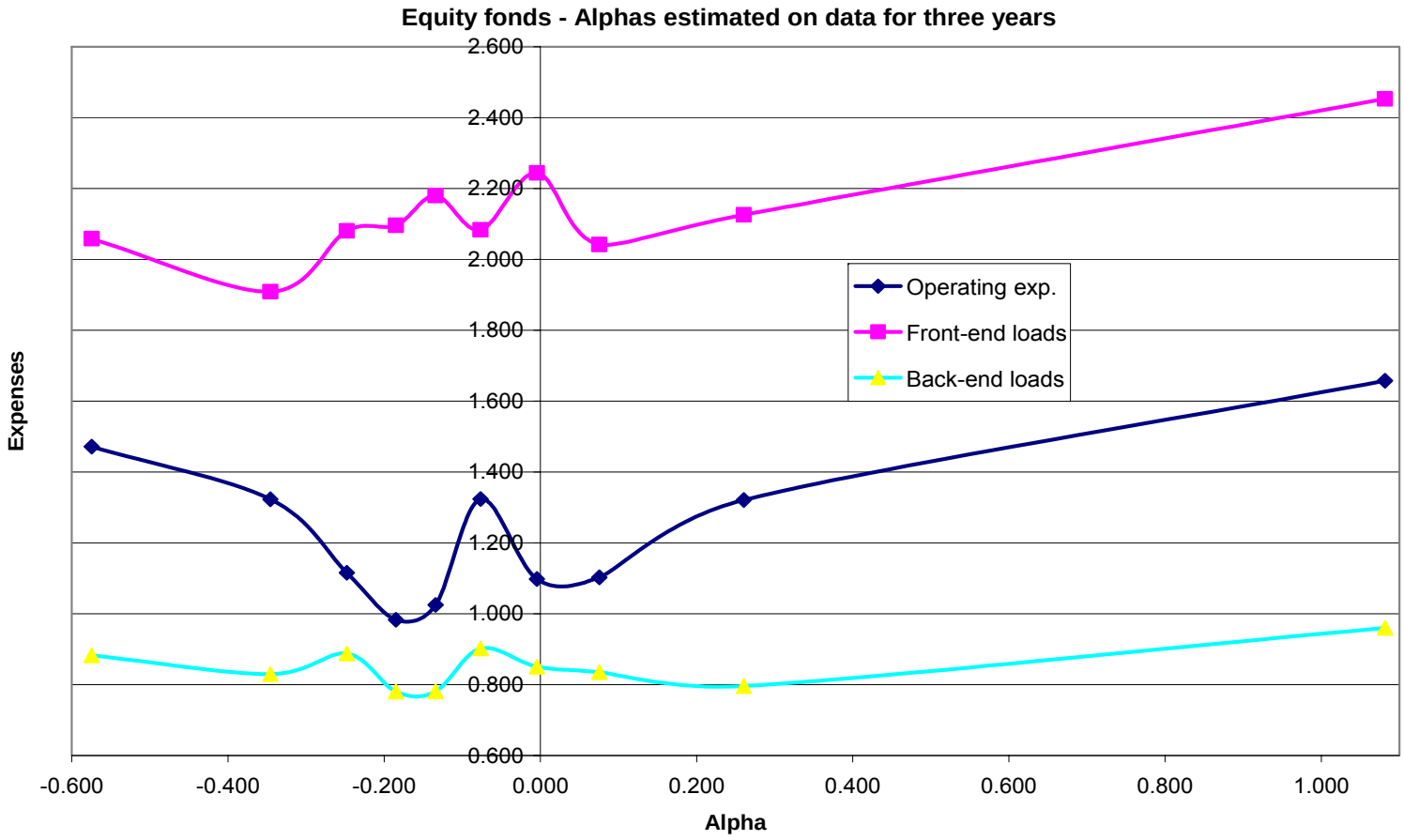

Figure 10. Alphas and expenses.

Funds have been divided into deciles based on their alphas. The figure shows the average alpha and expense figure within each decile for bond funds.