The Performance of Investment Grade Corporate Bond Funds: Evidence from the European Market

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Abstract

We examine the risk-adjusted performance of European mutual funds offered in Germany investing in euro-denominated investment grade corporate bonds. The funds are evaluated employing a single-index model and several multi-index and asset-class-factor models. In order to account for the risk and return characteristics of investment grade corporate bond funds, we use both maturity-based indices and rating-based indices, respectively, in our multi-factor models. In line with earlier studies focusing on (government) bond funds, we find evidence that corporate bond funds, on average, under-perform the benchmark portfolios. Moreover, there is not a single fund exhibiting a significantly positive performance. These results are robust to the different models. Additionally, we examine the driving factors behind fund performance. As well as examining the influence of several fund characteristics, in particular fund age, asset value under management and management fee, we investigate the impact of investment style on the funds' risk-adjusted performance. We find indications that funds showing lower exposure to BBB rated bonds, larger and older funds, and funds charging lower fees attain higher risk-adjusted performance (alphas).

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1 Introduction

The European corporate bond[1] market is a rapidly growing capital market sector which boasted a nominal value of approximately €1,370 billion at the beginning of 2005, and growth rates of 16.8% in 2003 and 9.5% in 2004. The European Monetary Union (EMU) in 1999 merged the formerly separated and comparatively small local markets for corporate bonds. Many European companies have started issuing bonds in order to benefit from the "new opportunities" of this capital market segment. As a consequence, the European corporate bond market now attracts more diverse investor groups than it did 10 years ago.

For private investors, given the highly asymmetrical distribution of corporate bond returns and the de facto existence of minimum investment amounts in this market, the most feasible way to take advantage of risk and return characteristics of this sector is to invest in broadly diversified corporate bond mutual funds. The rapidly rising number of actively managed mutual funds concentrating on the European corporate bond market reflects their attractiveness for private investors. Surprisingly, up to our knowledge, there is no research dealing with the performance of these funds.

There are only few studies on the performance of bond funds. Blake, Elton and Gruber (1993) is the first major study to investigate the bond fund market in the United States.[2] They apply single- and multi-index models and a multi-factor model similar to Sharpe (1988, 1992). In addition to their first study, Elton, Gruber and Blake (1995) analyze the performance of US bond funds using APT-based multi-

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1 We refer to corporate bonds as both financials and non-financials.

2 Cornell and Green (1991) examine the performance of low-grade bond funds in the US but their sample of funds serves as a proxy for the low-grade bond market, rather than for analyzing the performance of active fund management.

index models. Kahn and Ruud (1995) measure performance employing an asset-class-factor model but their work focuses on performance persistence. Gallo, Lockwood and Swanson (1997) and Detzler (1999) evaluate globally investing US-based bond funds using single- and multi-index models. Ferson, Henry and Kisgen (2003) are the first to apply conditional performance measurement to the US government bond fund market using a stochastic discount factor approach. The Australian government bond fund market is examined by Gallagher and Jarnecic (2002) who apply conditional and non-conditional factor models.

The very few studies of the European bond fund market examine exclusively or, at least, primarily funds which are invested in government bonds. Maag and Zimmermann (2000) investigate the performance of German government bond funds using single- and multi-index models and an asset-class-factor model. Silva, Cortez and Armada (2003) analyze the European bond fund market using conditional and non-conditional factor models. They refer to a sample of bond funds of six European countries, but only the UK sample contains a sub-sample that consists of funds that explicitly concentrate on corporate bond funds.

Our study is the first to investigate a sample of mutual funds explicitly investing in euro-denominated investment grade corporate bonds. We focus our analysis on investment grade corporate bond funds since, compared to the US, the European high-yield market is still poorly developed. Given their main focus on government (or mixed) bond funds, none of the studies mentioned above takes into account the special risk profile of corporate bond funds which can be largely attributed to different rating classes. Hence, our paper also represents the first study to apply rating-based indices, in addition to maturity-based indices, as factors in order to capture the risk and return characteristics of investment grade corporate bond funds.

As well as investigating the fund performance itself, we take a closer look at determinants affecting the performance. We investigate the influence of the fund characteristics management fee, fund size, and age. Finally, we examine whether investment style is related to performance.

The paper is organized as follows: Section 2 outlines the research objectives and our hypotheses. The methodology is described in section 3. Section 4 contains the data and specification of the models. The empirical results are discussed in section 5. Conclusions and implications are presented in section 6.

2 Research objectives and hypotheses

The following investigation is carried out to analyze the risk-adjusted performance of European corporate bond funds and its determinants. For the US bond fund market, Blake, Elton and Gruber (1993), Elton, Gruber and Blake (1995), Kahn and Ruud (1995), Gallo, Lockwood and Swanson (1997), Detzler (1999), and Ferson, Henry and Kisgen (2003) report that, fund managers do not out-perform passive benchmark portfolios. Gallagher and Jarnecic (2002) find significant under-performance in the Australian government bond mutual fund market. Having a look at the performance of government bond mutual funds in Europe, both Maag and Zimmermann (2000) and Silva, Cortez and Armada (2003) report that, on average, bond funds under-perform passive benchmark portfolios.

So far, all studies investigating the performance of actively managed (government) bond mutual funds report under-performance or report non-superior performance. This result is robust to both the specific models and benchmark indices as well as the specific market under consideration. Hence, we expect corporate bond funds to under-perform appropriate passive benchmark portfolios[3], as well. Thus, we hypothesize for our sample of European corporate bond mutual funds:

Hypothesis 1 (H1): Funds under-perform passive benchmark portfolios, net of expenses.

In addition to the measurement of performance, a well studied issue in the (government) bond fund market is the relation between expense ratios and performance. For the US market, Blake, Elton and Gruber (1993) find that, for most of their fund subgroups and models, the expense ratios account for the major part of the under-performance. The negative relation between the expense ratio and the performance is found to be statistically significant. An analogous result is reported by Kahn and Ruud (1995). The findings of Blake, Elton and Gruber (1993) imply that, on average, a percentage-point increase in expenses reduces performance by about one percentage-point. Detzler's (1999) results indicate an even more inverse relationship for the major part of her models, whereas Maag and Zimmermann (2000) find a less negative and not significant relation between performance and expense ratio in the German government bond fund market. Since we expect the relationship between fees and performance to be similar in similar markets, we hypothesize for the European corporate bond fund market:[4]

Hypothesis 2 (H2): There is a negative relationship between the fund management fees and performance.

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3 To evaluate performance, we later apply indices from the iBoxx € index family which represent comprehensive proxies for the euro-denominated corporate bond market and its segments.

4 Note, that there is a difference between expense ratios in the studies mentioned above and management fees we use, as the former contain, in addition to management fees, other directly chargeable operating costs we do not have information on. However, management fees can be assumed to account for the major part of the total costs.

Another issue of interest is the relation between fund size and performance. Larger funds should achieve economies of scale that can be realized both by spreading the fixed costs, e.g. reporting and marketing, over a larger amount of assets under management and by reducing variable costs, e.g. by efficiencies in security transactions and back-office functions (e.g. Collins and Mack, 1997). Hence, they should operate at lower costs, as found by Malhotra and McLeod (1997) for US equity mutual funds. On the other hand, larger funds tend to have disadvantages in trading resulting from the price impact of purchasing or selling large amounts of securities when acting in comparatively non-liquid markets.

So far, the relation between fund size and performance has primarily been addressed by studies dealing with equity mutual funds, such as Grinblatt and Titman (1989). Based on US equity mutual fund data they find an inverse relationship between fund size and performance when analyzing gross returns. In contrast, the performance based on net returns is unrelated to size. In a more recent study Chen et al. (2004) find evidence that fund size erodes performance of US equity mutual funds. This effect is more pronounced for small cap funds where it affects the performance significantly. This finding suggests that liquidity may be the driving factor reducing performance of large size funds in small markets.[5] As the corporate bond market in Europe is, compared to the blue chip equity market, such a very small market we would expect that the fund size erodes the performance in the corporate bond fund market, as well. Therefore, our third hypothesis for our sample of European corporate bond mutual funds is:

Hypothesis 3 (H3): There is a negative relationship between the fund assets under management and performance.

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[5] Moreover, another reason may be organizational diseconomies based on hierarchy costs, see, e.g., Chen et al. (2004). For a detailed analysis of all these so-called diseconomies of scale, see Perold and Salomon (1991).

In addition to a possible size effect, the performance may be related to fund age.[6] Malhotra and McLeod (1997) find that older US equity mutual funds tend to operate at lower cost.[7] If that was true and if (H2) held, we would expect older funds to have higher risk-adjusted performance. Thus, we hypothesize for the European corporate bond fund market:

Hypothesis 4 (H4): There is a positive relationship between the fund age and performance.

Finally, performance could be related to investment style. The less developed (and efficient) a market is, the more rewarded research activities should be. As the BBB market is known to be less homogeneous and (in Europe) less developed than the higher rating classes, one could expect funds primarily investing in this segment to show higher risk-adjusted performance. Therefore, our last hypothesis for the European corporate bond fund market is:

Hypothesis 5 (H5): There is a positive relationship between the fund engagement in BBB bonds and performance.

3 Models

As there is still no evidence how to apply particular equilibrium models to fixed-income markets such as the corporate bond market, we follow the majority of the

[6] See, e.g., Sawicki and Finn (2002) for an overview and an investigation of effects due to size and age in the smart money context. It would be interesting to investigate whether there can be found a smart money effect in the corporate bond fund market, as also reported by Gruber (1996) and Zheng (1999) for equity funds. However, given the short history of fund returns and the lack of monthly fund flow data, an analysis of this effect must await a subsequent study.

[7] For US bond mutual funds Malhotra and McLeod (1997) report an inverse, albeit not significant effect.

papers cited in section 1 and employ single- and multi-index models and asset-class-factor models in order to measure the risk-adjusted performance of the fund management.[8]

In multi-index models, the performance measure is the intercept in a regression of fund excess returns on benchmark excess returns while the benchmark consists of different indices. The general form of the models is given by (e.g., Blake, Elton and Gruber, 1993):

$$R'_{it} = \alpha_i + \sum_{j=1}^{K} \beta_{ij} I'_{jt} + \varepsilon'_{it}, \tag{1}$$

where R'_{it} is the one-month excess return on fund i in month t, I'_{jt} is the one-month excess return on index j in month t, β_{ij} is the sensitivity of fund i to index j and ε'_{it} is the residual for fund i in month t. Alpha, α_i, measures the risk-adjusted performance of fund i. K represents the number of indices which is simply one in the case of a single-index model. Using discrete excess returns, the estimated sensitivities can be interpreted as weights in a passive portfolio assuming the difference between 1 and the sum of betas as being invested in the risk-free asset. Therefore, excess returns of this benchmark portfolio represent the result of a passive strategy. The OLS method selects betas and alpha such that the risk of the resulting passive portfolio best mimics the risk of the examined fund in terms of similar variance.

The shortcoming of the model presented above is the failure to incorporate the restrictions facing the fund management. Negative betas would imply short-positions in the corresponding indices which is normally not allowed in fund management. A sum of the betas exceeding unity would imply a leverage of the fund which is generally not the case either. Both investment strategies, shorting and leverage, can

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8 It is interesting to note that both studies, Ferson, Henry and Kisgen (2003) and Silva, Cortez and Armada (2003) report that the results of their conditional models are not substantially different from unconditional models.

be assumed to be even less feasible for an individual investor. To overcome these shortcomings, we additionally employ the constrained asset-class-factor model of Sharpe (1988, 1992):

$$R_{it} = \sum_{j=1}^{K+1} \beta_{ij} I_{jt} + \varepsilon_{it}, \tag{2}$$

where R_{it} is the one-month return on fund i in month t, I_{jt} is the one-month return on index j in month t and β_{ij} is the sensitivity of fund i to index j. $I_{K+1,t}$ denotes the one-month return of the risk-free asset class. ε_{it} is the residual for fund i in month t which accounts for a possible alpha of the fund, too. The aim is to find the best set of index exposures (betas) that conforms with fund restrictions (no leverage and no short sales). Following Sharpe (1987, 1988, 1992), we employ a quadratic optimization procedure which minimizes the variance of the residual. More specifically:

$$\min \operatorname{Var}\left(R_i - \sum_{j=1}^{K+1} \beta_{ij} I_j \right) \qquad \text{s. t.} \sum_{j=1}^{K+1} \beta_{ij} = 1 \text{ and } \beta_{ij} \geq 0, \forall\, j = 1, ..., K+1. \tag{3}$$

Note that, in order to keep the constraints simple, returns instead of excess returns are used. For that reason, the risk-free asset has to be included as a separate asset class. If the benchmark portfolio estimated by the unconstrained regression approach in a multi-index model does not imply a violation of fund constraints, i.e. if $\beta_{ij} \geq 0$ and sum of betas ≤ 1 holds in the multi-index model, the estimated weights of the benchmark indices of the corresponding asset-class-factor model are exactly the same.

Note that in Sharpe's asset-class-factor model, the mean of the residuals generally is not equal to zero as the residuals still contain the alpha. Normally, having estimated the betas and, hence, determined the passive portfolio, performance in the sense of Sharpe (1992) is measured out-of-sample as the difference between fund return and return of the benchmark portfolio in the next month (selection return). In order to compare the performance based on the constrained model to that of the unconstrained model, we first slightly modify the Sharpe procedure for the measurement of performance. We use our beta estimates resulting from the return data of the whole observation period not for determining the appropriate benchmark for the next month but for the whole obersvation period. The risk-adjusted performance, alpha, is then measured in-sample as the difference between the average fund return and the average benchmark return, i.e. the average of the residuals.[9]

Additionally, following Sharpe (1992), we calculate the selection returns for each fund out-of-sample using a moving time-window. The average of these selection returns in the investigated period represents the corresponding risk-adjusted performance measure, called average selection return (ASR).

4 Data and Model Specification

As already pointed out in section 1, the market for corporate bonds in the Euro zone, especially for non-financial corporate bonds, has been a rapidly growing market over the last decade starting from a relatively low level. This corresponds to an initially small, but increasing number of European mutual funds investing in euro-denominated corporate bonds. In our analysis we concentrate on those mutual funds investing in euro-denominated investment grade corporate bonds that are offered in Germany, which is one of the largest markets for mutual funds in Europe. All fund data were provided by the German fund rating company Feritrust. To be included in our data sample, we require funds to have more than €20 million assets under management, according to the latest available fund report, and a complete time-series history throughout the 5-year period from July 2000 to June 2005. As reported by

9 Note that this is equivalent to employing the multi-index model (1) subject to the above mentioned fund restrictions.

Feritrust, there is only one fund with inception date before July 2000 that was liquidated during this time period. Hence, our later results are not affected by survivor-only conditioning that can cause biased estimates of performance, i.e. survivorship bias in performance, and of the relationship between performance and fund characteristics (e.g., Carhart et al., 2002). The resulting sample consists of 19 investment-grade corporate bond funds.[10] We examine monthly discrete total returns, net of management fees and other expenses, while load charges are not taken into account.

Table 1 shows major characteristics of the funds and descriptive statistics of their excess returns, where the excess return is calculated as the difference between fund return and the one-month Euribor. The funds have an average age of 7.8 years, but most of them were founded in 1999 or 2000. The average asset value equals €356 million, 5 funds have an asset value of less than €100 million and one fund an asset value of more than €1,000 million. The average mean monthly excess return of the funds is 0.263% and the average volatility equals 0.762%. For most funds the return distribution is slightly skewed to the left. Further, we find a kurtosis of less than 3 in most cases. Nevertheless, applying the Jarque-Bera test and taking a look at the p-values, we cannot reject the hypothesis of normal distribution except for two funds (Deka, HSBC Trinkaus).

In our later regressions we choose total return indices from the iBoxx € bond index family as offered by International Index Company Ltd. (2004) as benchmark indices. Specifically, we use the total return iBoxx € Corporates index and its rating-specific and maturity-specific sub-indices. Thus, unlike the studies mentioned before that

[10] In June 2005, 67 mutual funds concentrating on euro-denominated investment grade bonds were offered in Germany. If we had allowed for a shorter period of returns we would have had a larger sample since lots of corporate bond funds were founded within the last 4 years. Nonetheless, we require the 5-year period in order to achieve better stability in the time-series regressions.

typically apply just one overall investment grade index and (sometimes) one overall non-investment grade index to capture credit risk, we can have a closer look at the impact of credit quality within the investment grade corporate bond market. In the iBoxx € index family, there are four rating-specific indices (AAA, AA, A, BBB) that include bonds with identical letter ratings and five maturity-specific indices (1-3, 3-5, 5-7, 7-10, 10+)[11] that include bonds with similar (expected) time to maturity. These indices include both financial and non-financial bonds. Today, these indices are suitable to represent the European investment grade corporate bond market. This is also reflected by the fact that banks start offering index-tracking exchange-traded funds based on iBoxx indices.

In order to be included in the iBoxx € Corporates index and its sub-indices, corporate bonds must fulfil certain criteria: A) Bonds have to be denominated in euros or pre-euro currencies; however, the issuer's nationality is not relevant. B) Bonds require a minimum rating of BBB- from the rating agencies Fitch or Standard & Poor's or Baa3 from the rating agency Moody's.[12] C) The remaining (expected) time to maturity may not be less than one year. D) The outstanding amount may not be less than €500 million.[13] E) The bond must be a fixed coupon straight bond, zero bond, step-up-bond, event-driven bond, or callable bond.[14]

The Corporates index and its rating- and maturity-specific sub-indices are capitalization-weighted. Composition and the weightings of each index are rebalanced at the beginning of each month. Seven major financial institutions[15]

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[11] These abbreviations stand for the respective maturity ranges in years.

[12] If a bond is rated by several agencies, the lowest rating is applied. The assignment of a bond to a certain rating sub-index is also based on the lowest rating.

[13] For bonds issued in a pre-euro currency, the minimum amount is €1 billion.

[14] Note that the eligible bond types have changed in July 2005.

[15] ABN AMRO, Barclays Capital, BNP Paribas, Deutsche Bank, Dresdner Kleinwort Wasserstein, Morgan Stanley, UBS.

provide prices for all bonds in the indices. In general, index calculations are based on bid prices. New bonds enter the Corporates index and the respective sub-indices at their ask price. In contrast to this, bonds changing their rating or maturity sub-index leave the old and enter the new sub-index at their bid price. Similarly, bond purchases resulting from weighting changes in the indices are closed at bid prices. That means that the portion of total transaction costs already accounted for by the indices depends on the frequency of index changes of bonds and the extent of changing index weights. Thus, additional costs for index-tracking would be difficult to estimate.

In addition, we apply the total return iBoxx € Sovereigns index as a broad European government bond index and the DJ Stoxx 600 performance index[16] as a broad equity index. The iBoxx € Sovereigns index is constructed similar to the indices described above, but consists of bonds issued by the Euro zone countries.

The return series for all iBoxx indices were provided by the International Index Company Ltd. and return data of the DJ Stoxx 600 performance index were provided by Handelsblatt. For proxy risk-free returns, we use the one-month Euribor published by Deutsche Bundesbank.

Table 2 presents descriptive statistics for the monthly excess returns of the indices. The International Index Company monthly reports the average Macaulay duration of the bonds included in each index. The average of these reported average durations is also given in Table 2. Taking a look at the mean excess returns of the iBoxx € indices, the mean of the BBB and the Sovereigns indices are striking. Whereas one could expect the mean of the returns to increase with lower rating, i.e. with higher

[16] Note that, apart from Euro zone-based companies, the DJ Stoxx 600 also includes stocks of non-Euro zone-based companies. However, we have applied other (smaller) Euro zone indices, too. As later results do not change, we chose to use the broad DJ Stoxx 600.

credit risk, this is not true of the mean of the BBB index. The mean equals 0.298%, and is hence lower than the AA (0.393%) and A (0.403%) means and very similar to the AAA mean of 0.284%. This may be caused by different durations, since a higher duration yields higher returns in general.[17] The average duration of the BBB index (4.15) is similar to the respective AAA value (3.98), and lower than the average AA (5.33) and A (4.95) durations. Further, the returns of lower rated bonds are generally more equity-linked than those of higher rated bonds.[18] Since we find a negative average excess return of the DJ Stoxx 600 (-0.460%) in our sample period the comparatively low BBB mean return gains further plausibility.

Furthermore, the mean and volatility of the Sovereigns index, consisting of government bonds, are higher than the respective values of the AAA index. This could also be explained by the higher duration of the Sovereigns index. Furthermore, the Euro zone government bonds cannot all be considered as totally default-free and, therefore, can have different yields, even higher than AAA corporate bonds.[19]

Similarly to the return distribution of the funds the excess returns of nearly all iBoxx € indices are slightly skewed to the left with a kurtosis of less than 3. The hypothesis of normality must only be rejected for the BBB index.

To specify the single-index model, we apply the iBoxx € Corporates as a broad index representing the whole market. Two types of multi-index- and asset-class-factor models are specified, the first one related to rating segments and the second one related to maturity segments. The first type has four rating-based factors, the iBoxx € Corporates AAA, AA, A, and BBB, which represent all factors in the first multi-

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[17] Note that this holds for the maturity-specific indices in our sample.

[18] In our sample period we find a correlation of 0.11 between the excess returns of the BBB index and the excess returns of the DJ Stoxx 600, whereas the other investment grade indices are negatively correlated to the equity index, see Table 4 for details.

[19] See Geyer, Kossmeier and Pichler (2004) for a detailed analysis.

index model, called MIM-1. In the second and third multi-index model, called MIM-2 and MIM-3, the iBoxx € Sovereigns index and the DJ Stoxx 600 are added to the four rating indices. This allows us to analyze the separate marginal impact of the government bond market and the stock market. The latter also allows us to control for fund investments in non-investment grade bonds, too, since the stock market is well known to be more strongly correlated to the non-investment grade bond market than to the investment grade bond market.[20] The maturity-based model MIM-4 contains the iBoxx € Corporates maturity indices 1-3, 3-5, 5-7, 7-10 and 10+. Again, to capture a possible fund exposure to the stock market, the DJ Stoxx 600 is added in the last model, called MIM-5. The five corresponding asset-class-factor models, called ACFM-1 to ACFM-5, are specified in the same way as the multi-index models, but the one-month Euribor is added to represent the risk-free asset in each model. Table 3 provides a summary of our models.

Before presenting our empirical results the problem of multicolinearity has to be addressed.[21] Table 4 provides the correlations of the excess returns of the indices in our data sample. As expected, the AAA, AA, and A rating-specific indices and the Sovereigns index are highly correlated (above 0.9). Obviously, these indices do not fulfill the condition of clearly different returns (Sharpe, 1992) that is most often required when style analysis is the aim of research. From this strong dependence it follows that the later estimated coefficients (Table 10 and Table 11) of these factors can be very sensitive to slight modifications of the data set. Therefore, in terms of style analysis, these coefficients have to be treated with caution. On the other hand, as already pointed out, the main focus of this paper is on the performance of the

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[20] See Merton (1974) for theoretical and Cornell and Green (1991) for empirical evidence.

[21] This problem could be solved by using orthogonalized factors. However, the resulting new factors cannot be interpreted economically in the sense of real investment opportunities for the fund manager or fund holders. Since the alphas of the corresponding regressions do not change, we do not present the results of orthogonalization here.

funds in comparison to a passive benchmark portfolio consisting of the indices. This performance is measured by the alpha, which is in general not affected by multicolinearity. The same observations hold for the maturity models.

The sole hypothesis where we apply (a bit of) style analysis is hypothesis H5. Here, we will regress the alphas against the coefficients of the BBB index. So, these coefficients have to be reliable. Table 4 reports correlations of the BBB index to the other rating indices and the Sovereigns index in a range from 0.77 (A) to 0.53 (Sovereigns). Moreover, we calculate the variance inflation factor (VIF) of the BBB index for each rating-based model. We observe a VIF of 3.65, 4.38 and 4.85 for the MIM-1, MIM-2 and MIM-3, which means that multicollinearity should not be a statistical problem in this analysis.[22]

5 Empirical Results

In order to examine the risk-adjusted performance of the funds, we first apply the single-index model (SIM) and the multi-index models (MIM). We estimate the alpha and the betas of the funds by applying the OLS procedure. The p-values (based on t-tests) are based on heteroscedasticity- and autocorrelation-adjusted covariance matrices according to Newey-West (1987). The alphas are summarized in Table 5. The corresponding beta coefficients and (adjusted) R^2 are provided in Table 9 and Table 10. Even though style analysis is not the aim of our analysis it is worth having a look at the betas and the fitting of the models to the data. The single-index model has an average R^2 of 83.6%. The use of multi-index models results in an increase in the average (adjusted) R^2 from 83.6% to at least 86.8% for the rating-based models (MIM-1 to MIM-3) and to at least 85.3% for the maturity-based models (MIM-4,

22 In general, it is suggested that a VIF in excess of 10 indicates harmful multicollinearity, see, e.g., Kennedy (2003), p. 213.

MIM-5). These adjusted R^2 are comparable to those reported, for instance, by Blake, Elton and Gruber (1993) and Maag and Zimmermann (2000) for the US bond and German government bond fund market, respectively. On average, the rating-based models provide a better fit to the data than the maturity-based models. Furthermore, a comparison of MIM-1 and MIM-2 shows that adding the iBoxx € Sovereigns index does not really improve the explanatory power of the models, but causes, for some funds, relevant changes in their benchmark portfolio. When the beta coefficient of the Sovereigns index is large and positive this might indicate a strong participation of the corresponding fund in the government bond market.[23] The lower correlated DJ Stoxx 600 does not add much explanatory power to the models either. Moreover, its small beta coefficients with a maximum of 2.4% in the rating-based models and a maximum of 5.4% in the maturity-range models reveal that the funds do not exhibit a material equity exposure. In addition, interpreting the stock index as a proxy for non-investment grade bonds we can conclude that the funds in our sample do not participate significantly in the low-quality-segment either.

The overall findings displayed in Table 5 support hypothesis H1. There are just two funds (Bayern LB, Capital Invest) that have an average positive alpha. In contrast to that, 17 funds show a negative alpha on average. Depending on the model, we have statistical significance at the 10% level for 9 to 12 funds with negative alphas.[24] The sign and significance of the alphas are quite robust to different models. The average alpha of the fund sample (-0.051% per month) is slightly less negative than its average management fee (0.062% per month).[25]

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[23] Note that, due to high correlations between the Sovereigns index and the AAA, AA, and A index (see section 4), we must be cautious in interpreting these betas.

[24] None of the funds has a significantly positive alpha when we change the null hypothesis from alpha ≥ 0 to alpha ≤ 0.

[25] For the characteristics of the funds see Table 1.

Table 6 and Table 11 provide the corresponding results for the asset-class-factor models. Again, there are only two funds (Bayern LB, Capital Invest) showing an average positive alpha. In contrast to that, 17 funds have a negative alpha on average. For significance tests in the asset-class-factor models we rely on the method of Kim, White and Stone (2005), that is based on Andrews (1999), and use Monte Carlo simulation for deriving the distributions of alphas and beta coefficients. Following Kim, White and Stone (2005) we set the pretest level to be 50% and the number of Monte Carlo draws to be 5,000. Depending on the model we have statistical significance at the 10% level for 9 to 10 funds with negative alphas.[26] Again, sign and significance of the alphas are quite robust to different models. The average alpha of the fund sample is -0.047% per month. The differences between the alphas of the multi-index models and the alphas of the respective asset-class-factor models are small in comparison to the alpha size (see Table 7). However, the average fund alphas obtained by the rating-based asset-class-factor models tend to be slightly higher than the alphas of the respective multi-index models. In contrast to that, average alphas of the maturity-based models remain almost unchanged. Hence, our overall findings are almost identical to the results we reported for the multi-index models.

While Table 6 reports results which are directly comparable to the results of the multi-index models, Table 8 contains the average selection returns of our fund sample. The selection return is calculated monthly out-of-sample as the difference between the fund return and the return of the passive benchmark portfolio which is (dynamically) estimated on the basis of a moving 36-month time-window. Given our 60-month sample this results in a time-series of 24 selection returns for each fund. Due to differences in the investigated time period of performance measurement (only

[26] None of the funds shows a significantly positive alpha when we change the null hypothesis to alpha ≤ 0.

the two last years instead of five years) and the different benchmark approach (the benchmark is adjusted every month instead of keeping a constant benchmark throughout the whole period and the performance is measured out-of-sample), the results cannot directly be compared. However, Table 8 reports negative average selection returns for most funds across all models and suggests that funds are not able to out-perform in the two year period either.

Summarizing our results, we can conclude that hypothesis H1 holds for most funds. This result is robust against the type of model and the model specification. However, absolute average alphas are a bit smaller than average management fees. Given the fact that total costs (expense ratios) exceed management fees, this indicates that many funds were able to beat the benchmarks on the basis of gross returns. However, on average, this out-performance was not large enough to cover the costs caused by active fund management.

After calculating the fund performance, the next step is to analyze its determinants, i.e. to investigate whether our hypotheses H2 to H5 of section 2 hold. Based on several studies dealing with similar fund markets, we hypothesized that higher fees are associated with worse performance (H2). In order to examine the relationship between these two variables in more detail, we run a regression of the fund alphas on the management fees, separately for each model.[27] Table 12 contains the results. The sign of the coefficients of the management fee (slope) is negative (albeit not statistically significant) across all eleven models.[28] This indicates that higher fees are related to poorer performance in our sample and supports hypothesis H2. Even the

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[27] In addition to the univariate regressions presented in the following, we ran various multivariate regressions of the fund performance on the fund characteristics. The results are similar and robust across the models. However, due to the limited number of funds multivariate regressions provide less statistical significance of the coefficients.

[28] Given the limited number of funds, it is hard to achieve statistical significance in the regressions which we run in order to examine the hypotheses H2 to H5.

size of the slope appears to be rather robust. The average slope of -0.464 is similar to results of Maag and Zimmermann (2000) but explicitly less negative than the results reported by Blake, Elton and Gruber (1993) and Detzler (1999).

Moreover, in section 2, we aimed at investigating how performance varies with the size of a corporate bond fund. Table 13 reports the results of the regression of the alphas on the fund assets under management for each model. The slope is positive for each model. Naturally, the null hypothesis of a positive slope cannot be rejected.[29] Hence, the empirical results do not support hypothesis H3 and contradict recent findings for the US equity mutual fund market as reported by Chen et al. (2004). This suggests that, in our data sample, large funds may realize economies of scale that seem to outweigh the possible disadvantages of large mutual funds in trading in comparatively non-liquid markets. This interpretation is supported by a negative correlation coefficient of -0.13 between the funds' assets under management fund and the fees. The positive relationship between alphas and fund size suggests that investors in the corporate bond market should select funds with higher asset values in order to take advantage of their cost structure.

Our next hypothesis H4 deals with the relationship between fund performance and fund age. We regress the fund alphas on the fund age for each model. Table 14 supports our hypothesis of a positive relationship. The positive slopes are statistically significant at the 5% level.[30] Our results confirm that older corporate bond funds tend to have higher alphas. This relationship could be caused by a better cost structure of older funds since they can be assumed to achieve greater operating

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[29] Note that the opposite null hypothesis of negative slopes cannot be rejected either. However, the corresponding p-values are naturally much smaller ranging from 0.192 to 0.352.

[30] It is interesting to note that, on average, fund age accounts for approximately 20% of the variance of the alphas.

efficiency than newly established funds. Indeed, the observed negative correlation coefficient of -0.24 between fund fees and age supports this assumption. Moreover, this interpretation is in line with a positive correlation of 0.23 between fund size and age indicating a possible economies of scale-effect. In addition to the cost-driven advantages of older funds, better connections of these well established funds to issuing banks may provide improved access to attractive issues. Another contributing factor generating higher risk-adjusted performance may be given by better integration in different financial networks that could provide access to non-public information.[31]

Finally, our last hypothesis H5 refers to the investment policy of the funds. We expected that funds with a higher exposure to BBB rated bonds would have higher alphas. Our first three multi-index models (MIM-1 to MIM-3) and our first three asset-class-factor models (ACFM-1 to ACFM-3) estimated the (average) weights of the iBoxx € BBB Corporates index in the appropriate passive benchmark portfolios (see Table 10 and Table 11). In order to assess our hypothesis, we regress fund alphas on the BBB betas in the corresponding models. Table 15 illustrates the results. All slope coefficients exhibit negative signs and, naturally, the null hypotheses of negative slopes cannot be rejected. Note that the opposite null hypothesis of positive signs can be rejected for the asset-class-factor models at the 10% level. Due to the assumed investment restrictions, the asset-class-factor models should be more realistic when dealing with investment policy. Interestingly, the R^2 is much better for the asset-class-factor models (ranging from 0.099 to 0.127) than for the multi-index models (ranging from 0.036 to 0.054). Based on the regression results, we have to

[31] See, for similar assumptions related to fund manager characteristics, for example, Chevalier and Ellison (1999).

reject our hypothesis H5 concluding that the fund engagement in BBB bonds was not rewarded by a better, but a poorer performance.[32]

6 Summary and Conclusions

This paper represents the first investigation of the performance of actively managed funds investing in the euro-denominated investment grade corporate bond market. Due to the lack of appropriate equilibrium models for (corporate) bonds, we followed earlier studies dealing with the (government) bond fund market and applied several multi-index and asset-class-factor models to measure risk-adjusted performance. Specifically, in order to take into account the particular characteristics of the investment grade corporate bond market, we employed several rating-based and maturity-based models. All our results turned out to be robust across the different models.

We found evidence that most funds under-performed relevant benchmark portfolios consisting of several indices. Across all models, there is not a single fund showing significant positive performance. These general findings for corporate bond funds are consistent with the results of earlier studies focusing on the performance of mutual funds investing in (government) bonds; for instance Blake, Elton and Gruber (1993) for the US-market and Maag and Zimmermann (2000) for the German market.

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[32] Of course, this result is not caused by the comparatively low mean return of the iBoxx € Corporates BBB index in our sample (reported in section 4), as this effect is already accounted for by the benchmark portfolio. Moreover, this result cannot easily be explained by the other fund attributes. Whereas the results for the correlation between the BBB exposure according to our rating-based models and both fees and fund size are mixed, i.e. both positive and negative signs, we observe only negative correlation coefficients ranging from -0.21 to -0.17 between BBB exposure and age indicating that, for our sample, older funds tend to invest in higher quality bonds.

Recent studies on government (or mixed) bond funds report that fund performance obtained from conditional models is substantially comparable to results obtained from unconditional models (Ferson, Henry and Kisgen, 2003, Silva, Cortez and Armada, 2003). It is a challenging topic for future research to analyze if analogous conclusions hold for the type of funds we look at. However, more research about determinants and predictability of corporate bond spreads in Europe has to be carried out before.

The dismal performance of the funds in our data sample seems to be primarily due to management fees. As expected, we found alphas to decrease with higher management fees. The average size of the alpha (of the under-performance) is smaller than the average management fee. Since total expense ratios of the funds exceed management fees, this indicates that many fund managers would be able to beat the benchmark portfolios if gross returns were considered.

In addition to the impact of management fees, we analyzed the influence of fund age, fund size, and the BBB fraction in their passive benchmark portfolios, i.e. their BBB exposure, on the performance. Our results indicate that larger funds tend to have higher alphas. This contradicts findings for the equity fund market, for instance recently reported by Chen et al. (2004). We found a positive relationship between fund performance and fund age. Moreover, our results support an inverse relationship between fund performance and fund engagement in BBB rated bonds.

To sum up, our results suggest that investors willing to invest in actively managed European corporate bond funds should select older, large size funds with low management fees and low exposure to BBB rated bonds.

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Tables

Table 1: Fund characteristics and descriptive statistics for fund excess returns

		Fund characteristics					Descriptive statistics of excess returns (July 2000 to June 2005)					
Fund	ISIN	Inception date	Age	Asset value	Management fee p. a.	Management fee per month	Mean	Volatility	Skewness	Kurtosis	Jarque-Bera	p-Value
ADIG	LU0011193892	10/1988	16.74	127.00	0.800%	0.067%	0.277%	0.736%	0.054	2.379	0.992	0.609
Balzac	FR0000018483	11/1999	5.64	99.89	0.500%	0.042%	0.272%	0.769%	-0.217	2.743	0.635	0.728
Bayern LB	LU0110699088	06/2000	5.07	154.23	0.850%	0.071%	0.267%	0.656%	-0.121	3.259	0.313	0.855
CA	LU0119099819	06/1999	6.02	717.03	0.800%	0.067%	0.311%	0.783%	-0.007	2.402	0.894	0.639
Capital Invest	AT0000859046	06/1987	18.04	642.21	0.600%	0.050%	0.304%	0.707%	0.252	2.593	1.049	0.592
Deka	LU0112241566	05/2000	5.16	693.60	0.850%	0.071%	0.181%	0.917%	-1.055	5.332	24.724***	0.000
dit	LU0079919162	09/1997	7.83	220.40	1.000%	0.083%	0.276%	0.759%	0.169	2.187	1.936	0.380
Rothschild	LU0112663983	06/2000	5.04	30.55	0.800%	0.067%	0.183%	0.499%	-0.079	2.511	0.660	0.719
Fortis	LU0083949205	02/1998	7.39	800.01	0.750%	0.063%	0.288%	0.744%	-0.277	2.446	1.533	0.465
HSBC Trinkaus	DE0005152003	03/2000	5.28	80.20	0.700%	0.058%	0.173%	1.032%	-1.246	8.048	79.231***	0.000
ING	LU0092545796	10/1998	6.75	396.51	0.200%	0.017%	0.325%	0.824%	-0.430	2.846	1.907	0.385
KBC	LU0094437620	03/1999	6.33	571.16	0.750%	0.063%	0.298%	0.802%	-0.331	2.683	1.343	0.511
LB	LU0078314985	05/1994	11.12	40.90	0.500%	0.042%	0.180%	0.635%	-0.012	2.828	0.075	0.963
LODH	LU0095725387	02/1999	6.40	304.37	0.750%	0.063%	0.306%	0.734%	-0.183	2.393	1.255	0.534
Pictet	LU0128470845	11/1999	5.59	224.27	0.700%	0.058%	0.214%	0.725%	-0.205	2.573	0.874	0.646
Schroder	LU0113257694	06/2000	5.00	281.50	1.000%	0.083%	0.246%	0.755%	-0.102	2.545	0.620	0.734
Spängler	AT0000768296	09/1999	5.83	39.44	0.950%	0.079%	0.293%	0.828%	-0.028	2.528	0.566	0.753
UBAM	LU0095453105	03/1999	6.31	253.67	0.950%	0.079%	0.298%	0.826%	-0.306	2.502	1.554	0.460
Uni	LU0045581039	04/1993	12.25	1095.80	0.600%	0.050%	0.312%	0.743%	-0.016	2.734	0.179	0.914
Average			7.78	356.46	0.739%	0.062%	0.263%	0.762%	-0.218	3.028	6.334	0.573
Maximum			18.04	1095.80	1.000%	0.083%	0.325%	1.032%	0.252	8.048	79.231	0.963
Minimum			5.00	30.55	0.200%	0.017%	0.173%	0.499%	-1.246	2.187	0.075	0.000

* 10% level, ** 5% level, *** 1% level

This table reports main fund characteristics and descriptive statistics for fund monthly excess returns over the period July 2000 to June 2005. Age is given in years as of June 2005. The asset value under management is given in € million. Asset values and management fees were obtained from the funds' latest reports prior to June 2005. The excess return is calculated as the difference between the fund's discrete monthly total return and the one-month Euribor. The p-values correspond to the Jarque-Bera test for normality.

Table 2: Average duration and descriptive statistics for excess returns of the benchmark indices

	Index	ISIN	Average duration	Excess returns (July 2000 to June 2005)					
				Mean	Volatility	Skewness	Kurtosis	Jarque-Bera	p-Value
iBoxx € Indices	Corporates	DE0006301161	4.73	0.374%	0.807%	-0.224	2.476	1.188	0.552
	Corporates AAA	DE0006304454	3.98	0.284%	0.716%	-0.290	2.728	1.027	0.598
	Corporates AA	DE0006600083	5.33	0.393%	0.916%	-0.384	2.774	1.600	0.449
	Corporates A	DE0006601024	4.95	0.403%	0.845%	-0.312	2.404	1.862	0.394
	Corporates BBB	DE0006601362	4.15	0.298%	1.000%	-1.271	7.390	64.345***	0.000
	Corporates 1-3	DE0006301187	1.94	0.177%	0.402%	-0.057	2.523	0.601	0.740
	Corporates 3-5	DE0006301518	3.60	0.302%	0.714%	-0.226	2.560	0.996	0.608
	Corporates 5-7	DE0006301534	5.16	0.411%	0.943%	-0.146	2.459	0.945	0.623
	Corporates 7-10	DE0006301559	6.81	0.538%	1.121%	-0.209	2.576	0.886	0.642
	Corporates 10+	DE0006301575	10.64	0.729%	1.609%	-0.194	2.879	0.412	0.814
	Sovereigns	DE0009682831	5.54	0.340%	0.911%	-0.394	2.707	1.767	0.413
	DJ Stoxx 600	EU0009658210	-	-0.460%	4.971%	-0.394	3.045	1.556	0.459
	Average			0.316%	1.246%	-0.342	3.043	7.444	0.528
	Maximum			0.729%	4.971%	-0.057	7.390	64.345	0.814
	Minimum			-0.460%	0.402%	-1.271	2.404	0.412	0.000

* 10% level, ** 5% level, *** 1% level

This table reports the average duration of the benchmark indices and descriptive statistics for their monthly excess returns over the period July 2000 to June 2005. The average duration is the mean of the average Macaulay durations of the bonds included in each index as reported by International Index Company every month. The excess return is calculated as the difference between the fund's discrete monthly total return and the one-month Euribor. The p-values correspond to the Jarque-Bera test for normality.

Table 3: Specification of the multi-index models and the asset-class-factor models

Multi-Index Models				
MIM-1	MIM-2	MIM-3	MIM-4	MIM-5
(Rating)	(Rating + Sovereigns)	(Rating + Sovereigns + Stock)	(Maturity)	(Maturity + Stock)
Corporates AAA	Corporates AAA	Corporates AAA	Corporates 1-3	Corporates 1-3
Corporates AA	Corporates AA	Corporates AA	Corporates 3-5	Corporates 3-5
Corporates A	Corporates A	Corporates A	Corporates 5-7	Corporates 5-7
Corporates BBB	Corporates BBB	Corporates BBB	Corporates 7-10	Corporates 7-10
	Sovereigns	Sovereigns	Corporates 10+	Corporates 10+
		DJ Stoxx 600		DJ Stoxx 600

Asset-Class-Factor Models				
ACFM-1	ACFM-2	ACFM-3	ACFM-4	ACFM-5
(Rating)	(Rating + Sovereigns)	(Rating + Sovereigns + Stock)	(Maturity)	(Maturity + Stock)
Euribor	Euribor	Euribor	Euribor	Euribor
Corporates AAA	Corporates AAA	Corporates AAA	Corporates 1-3	Corporates 1-3
Corporates AA	Corporates AA	Corporates AA	Corporates 3-5	Corporates 3-5
Corporates A	Corporates A	Corporates A	Corporates 5-7	Corporates 5-7
Corporates BBB	Corporates BBB	Corporates BBB	Corporates 7-10	Corporates 7-10
	Sovereigns	Sovereigns	Corporates 10+	Corporates 10+
		DJ Stoxx 600		DJ Stoxx 600

This table reports the specification of the multi-index models and the asset-class-factor models. For each model, the included factors are provided. Except for DJ Stoxx 600 and one-month Euribor, the indices belong to the iBoxx € index family. The multi-index models are based on the respective excess returns. The asset-class-factor models are based on the returns of the respective indices and the one-month Euribor.

Table 4: Correlations between indices

	AAA	AA	A	BBB	1-3	3-5	5-7	7-10	10+	Sove-reigns	DJ Stoxx 600	Corpo rates
AAA	1.00											
AA	0.98	1.00										
A	0.91	0.95	1.00									
BBB	0.55	0.62	0.77	1.00								
1-3	0.80	0.81	0.88	0.78	1.00							
3-5	0.84	0.87	0.95	0.88	0.91	1.00						
5-7	0.88	0.92	0.97	0.80	0.89	0.95	1.00					
7-10	0.87	0.93	0.97	0.83	0.84	0.94	0.96	1.00				
10+	0.85	0.91	0.92	0.71	0.77	0.84	0.90	0.96	1.00			
Sovereigns	0.97	0.98	0.91	0.53	0.75	0.82	0.87	0.88	0.88	1.00		
DJ Stoxx 600	-0.49	-0.43	-0.29	0.11	-0.25	-0.18	-0.24	-0.20	-0.22	-0.47	1.00	
Corporates	0.88	0.92	0.98	0.85	0.90	0.98	0.98	0.99	0.93	0.87	-0.21	1.00

This table reports the correlations of the monthly excess returns of the respective indices over the period July 2000 to June 2005. The excess return is calculated as the difference between the index' discrete monthly total return and the one-month Euribor. Except for DJ Stoxx 600, the abbreviations refer to the respective indices of the iBoxx € index family.

Table 5: Alphas in the multi-index models

	SIM		MIM-1		MIM-2		MIM-3		MIM-4		MIM-5		Alpha	
Fund	Alpha (%)	p-Value (H_0: Alpha ≥ 0)	Alpha (%)	p-Value (H_0: Alpha ≥ 0)	Alpha (%)	p-Value (H_0: Alpha ≥ 0)	Alpha (%)	p-Value (H_0: Alpha ≥ 0)	Alpha (%)	p-Value (H_0: Alpha ≥ 0)	Alpha (%)	p-Value (H_0: Alpha ≥ 0)	Average (%)	Std. dev. (%)
ADIG	-0.038	0.192	-0.011	0.378	-0.011	0.377	-0.011	0.375	-0.027	0.223	-0.026	0.232	-0.021	0.010
Balzac	-0.072**	0.017	-0.027	0.114	-0.020	0.151	-0.018	0.175	-0.065***	0.009	-0.064***	0.009	-0.044	0.023
Bayern LB	-0.012	0.378	0.002	0.521	0.013	0.632	0.012	0.623	0.004	0.544	0.003	0.537	0.004	0.008
CA	-0.027	0.220	-0.001	0.487	-0.016	0.320	-0.016	0.312	-0.016	0.308	-0.016	0.301	-0.015	0.008
Capital Invest	0.020	0.700	0.040	0.872	0.044	0.881	0.044	0.878	0.006	0.555	0.006	0.558	0.027	0.017
Deka	-0.188**	0.032	-0.165**	0.011	-0.189***	0.004	-0.191***	0.004	-0.178*	0.055	-0.180**	0.041	-0.182	0.009
dit	-0.041	0.143	-0.057*	0.080	-0.051*	0.083	-0.057**	0.046	-0.026	0.253	-0.026	0.251	-0.043	0.013
Rothschild	-0.030	0.108	-0.032*	0.052	-0.029*	0.098	-0.029*	0.097	-0.022	0.177	-0.021	0.169	-0.027	0.004
Fortis	-0.043*	0.099	-0.033*	0.070	-0.030	0.104	-0.031*	0.099	-0.047*	0.054	-0.045**	0.038	-0.038	0.007
HSBC Trinkaus	-0.181*	0.077	-0.121*	0.060	-0.120**	0.045	-0.126**	0.035	-0.175*	0.053	-0.181**	0.026	-0.151	0.028
ING	-0.032	0.179	-0.048*	0.090	-0.053*	0.079	-0.053*	0.077	-0.022	0.233	-0.021	0.241	-0.038	0.014
KBC	-0.065***	0.010	-0.043**	0.036	-0.052**	0.012	-0.054***	0.008	-0.066***	0.009	-0.066***	0.010	-0.057	0.009
LB	-0.067	0.108	-0.088***	0.001	-0.081***	0.007	-0.081***	0.007	-0.052	0.129	-0.049*	0.100	-0.070	0.015
LODH	-0.009	0.418	0.000	0.502	-0.004	0.451	-0.007	0.408	-0.002	0.481	-0.001	0.492	-0.004	0.003
Pictet	-0.093***	0.009	-0.095***	0.001	-0.065**	0.013	-0.065**	0.013	-0.089***	0.006	-0.086***	0.006	-0.082	0.013
Schroder	-0.084**	0.011	-0.073***	0.009	-0.074**	0.011	-0.076***	0.007	-0.088***	0.006	-0.087**	0.010	-0.080	0.006
Spängler	-0.067**	0.015	-0.069**	0.015	-0.079**	0.011	-0.084***	0.007	-0.056**	0.047	-0.058**	0.043	-0.069	0.010
UBAM	-0.064*	0.086	-0.059***	0.001	-0.048***	0.004	-0.049***	0.004	-0.068*	0.052	-0.065**	0.030	-0.059	0.008
Uni	-0.014	0.276	-0.009	0.370	-0.019	0.242	-0.020	0.240	-0.014	0.291	-0.014	0.294	-0.015	0.004
Average	-0.058	0.162	-0.047	0.193	-0.046	0.186	-0.048	0.180	-0.053	0.183	-0.052	0.178	-0.051	0.011
Maximum	0.020	0.700	0.040	0.872	0.044	0.881	0.044	0.878	0.006	0.555	0.006	0.558	0.027	0.028
Minimum	-0.188	0.009	-0.165	0.001	-0.189	0.004	-0.191	0.004	-0.178	0.006	-0.181	0.006	-0.182	0.003
Pos. Alphas (*)	1 (0)		3 (0)		2 (0)		2 (0)		2 (0)		2 (0)		2	
Neg. Alphas (*)	18 (9)		16 (12)		17 (11)		17 (12)		17 (9)		17 (10)		17	
Average Adj. R^2	0.836		0.868		0.869		0.869		0.853		0.864			

* 10% level, ** 5% level, *** 1% level

This table reports monthly alphas and the average adjusted R^2, resulting from OLS for the single-index model and the five multi-index models specified in Table 3 for each fund i: $R'_{it} = \alpha_i + \sum_{j=1}^{K} \beta_{ij} \ I'_{jt} + \varepsilon'_{it}$. R'_{it} and I'_{jt} denote the excess returns of the fund and the indices, respectively, in the period July 2000 to June 2005. The excess returns are calculated as the difference between the fund's and the indices' discrete monthly total returns and the one-month Euribor. The corresponding beta coefficients are summarized in Table 9 and Table 10. The p-values correspond to the null hypothesis H_0: alpha ≥ 0. They (the t-tests) are based on heteroscedasticity- and autocorrelation-adjusted covariance matrices according to Newey-West (1987). The second and third last row show the number of positive and negative alphas, respectively, for each model. The number in brackets gives the number of significant alphas at the 10% level.

Table 6: Alphas in the asset-class-factor models

Fund	ACFM-1 Alpha (%)	ACFM-1 p-Value (H_0: Alpha ≥ 0)	ACFM-2 Alpha (%)	ACFM-2 p-Value (H_0: Alpha ≥ 0)	ACFM-3 Alpha (%)	ACFM-3 p-Value (H_0: Alpha ≥ 0)	ACFM-4 Alpha (%)	ACFM-4 p-Value (H_0: Alpha ≥ 0)	ACFM-5 Alpha (%)	ACFM-5 p-Value (H_0: Alpha ≥ 0)	Alpha Average (%)	Alpha Std. dev. (%)
ADIG	-0.011	0.384	-0.011	0.413	-0.011	0.401	-0.028	0.219	-0.028	0.225	-0.018	0.009
Balzac	-0.027*	0.081	-0.023	0.116	-0.023	0.122	-0.064**	0.011	-0.064***	0.010	-0.040	0.020
Bayern LB	0.002	0.510	0.009	0.626	0.008	0.614	0.000	0.509	0.000	0.495	0.004	0.004
CA	-0.001	0.491	-0.001	0.454	-0.001	0.454	-0.016	0.321	-0.016	0.318	-0.007	0.007
Capital Invest	0.040	0.852	0.044	0.857	0.044	0.856	0.012	0.586	0.012	0.586	0.031	0.015
Deka	-0.156***	0.007	-0.156***	0.006	-0.162***	0.008	-0.169**	0.016	-0.166**	0.014	-0.162	0.005
dit	-0.051	0.104	-0.051	0.105	-0.056*	0.062	-0.032	0.251	-0.032	0.250	-0.045	0.010
Rothschild	-0.030	0.148	-0.030	0.156	-0.030	0.163	-0.021	0.199	-0.021	0.200	-0.027	0.004
Fortis	-0.033*	0.070	-0.030*	0.096	-0.031*	0.079	-0.047**	0.049	-0.047**	0.048	-0.038	0.008
HSBC Trinkaus	-0.109*	0.069	-0.109**	0.048	-0.123**	0.030	-0.162*	0.081	-0.156**	0.028	-0.132	0.023
ING	-0.044	0.136	-0.044*	0.093	-0.045	0.104	-0.031	0.240	-0.031	0.221	-0.039	0.006
KBC	-0.043**	0.045	-0.043**	0.035	-0.045**	0.024	-0.066**	0.014	-0.066**	0.015	-0.052	0.011
LB	-0.074***	0.007	-0.067**	0.013	-0.067**	0.014	-0.059	0.134	-0.059	0.132	-0.065	0.006
LODH	0.000	0.504	0.000	0.475	-0.003	0.436	-0.004	0.502	-0.004	0.496	-0.002	0.002
Pictet	-0.095***	0.000	-0.075***	0.001	-0.075***	0.000	-0.092**	0.010	-0.092**	0.013	-0.085	0.009
Schroder	-0.073***	0.009	-0.073***	0.007	-0.075***	0.005	-0.088***	0.006	-0.088***	0.005	-0.079	0.007
Spängler	-0.058*	0.066	-0.058*	0.054	-0.069**	0.042	-0.056*	0.070	-0.058*	0.056	-0.060	0.005
UBAM	-0.059***	0.001	-0.048***	0.003	-0.049***	0.001	-0.068**	0.047	-0.068*	0.057	-0.058	0.009
Uni	-0.007	0.416	-0.007	0.380	-0.008	0.371	-0.014	0.318	-0.014	0.322	-0.010	0.003
Average	-0.044	0.205	-0.041	0.207	-0.043	0.199	-0.053	0.189	-0.052	0.184	-0.047	0.009
Maximum	0.040	0.852	0.044	0.857	0.044	0.857	0.012	0.586	0.012	0.586	0.031	0.023
Minimum	-0.156	0.000	-0.156	0.001	-0.162	0.001	-0.169	0.006	-0.166	0.005	-0.162	0.002
Pos. Alphas (*)	3 (0)		3 (0)		2 (0)		1 (0)		2 (0)		2	
Neg. Alphas (*)	16 (10)		16 (10)		17 (10)		18 (9)		17 (9)		17	
Average Adj. R^2	0.862		0.861		0.861		0.845		0.849			

* 10% level, ** 5% level, *** 1% level

This table reports the monthly alphas and the average adjusted R^2, resulting from variance-minimization for the five asset-class-factor models specified in Table 3 for each fund i: min $\text{Var}\left(R_i - \sum_{j=1}^{K+1} \beta_{ij} I_j\right)$. The betas are restricted to $\sum_{j=1}^{K+1} \beta_{ij} = 1$ and $\beta_{ij} \geq 0$. R_i and I_j denote the discrete monthly total returns of the fund and the indices, respectively, and the one-month Euribor (I_{K+1}) in the period July 2000 to June 2005. The corresponding beta coefficients are summarized in Table 11. The second and third last row show the number of positive and negative alphas, respectively, for each model. The p-values correspond to the null hypothesis H_0: alpha ≥ 0. They are based on 5,000 simulations and a pretest level of 50% according to Kim, White and Stone (2005). The second and third last row show the number of positive and negative alphas, respectively, for each model. The number in brackets gives the number of significant alphas at the 10% level.

Table 7: Comparison between multi-index and asset-class-factor model alphas

Fund	ACFM-1 – MIM-1 (%)	ACFM-2 – MIM-2 (%)	ACFM-3 – MIM-3 (%)	ACFM-4 – MIM-4 (%)	ACFM-5 – MIM-5 (%)
ADIG	0.000	0.000	0.000	-0.002	-0.002
Balzac	0.000	-0.003	-0.005	0.000	0.000
Bayern LB	0.000	-0.004	-0.004	-0.004	-0.003
CA	0.000	0.015	0.015	0.000	0.000
Capital Invest	0.000	0.000	0.000	0.006	0.006
Deka	0.009	0.033	0.029	0.009	0.014
dit	0.005	0.000	0.002	-0.006	-0.006
Rothschild	0.002	-0.001	-0.001	0.001	0.000
Fortis	0.000	0.000	0.000	0.000	-0.002
HSBC Trinkaus	0.012	0.011	0.003	0.013	0.025
ING	0.003	0.009	0.008	-0.009	-0.010
KBC	0.000	0.009	0.009	0.000	-0.001
LB	0.014	0.014	0.014	-0.006	-0.009
LODH	0.000	0.004	0.004	-0.002	-0.003
Pictet	0.000	-0.010	-0.010	-0.003	-0.005
Schroder	0.000	0.001	0.001	0.000	-0.001
Spängler	0.010	0.020	0.015	0.000	0.000
UBAM	0.000	0.000	0.000	0.000	-0.003
Uni	0.002	0.012	0.011	0.000	0.000
Average	0.003	0.006	0.005	0.000	0.000
Maximum	0.014	0.033	0.029	0.013	0.025
Minimum	0.000	-0.010	-0.010	-0.009	-0.010

This table reports the differences between alphas obtained by asset-class-factor models and alphas obtained by corresponding multi-index models (see Table 5 and Table 6).

Table 8: Average selection returns in the asset-class-factor models

Fund	ACFM-1 ASR (%)	ACFM-2 ASR (%)	ACFM-3 ASR (%)	ACFM-4 ASR (%)	ACFM-5 ASR (%)	Average ASR (%)
ADIG	0.015	0.016	0.016	-0.011	-0.011	0.005
Balzac	-0.032	-0.030	-0.030	-0.061	-0.064	-0.043
Bayern LB	0.010	0.014	0.003	0.019	0.013	0.012
CA	-0.029	-0.029	-0.029	-0.030	-0.039	-0.031
Capital Invest	-0.017	-0.019	-0.026	-0.031	-0.031	-0.025
Deka	-0.061	-0.061	-0.082	-0.034	-0.073	-0.062
dit	0.034	0.034	-0.003	0.053	0.040	0.032
Rothschild	-0.035	-0.034	-0.037	-0.030	-0.030	-0.033
Fortis	-0.035	-0.034	-0.038	-0.096	-0.096	-0.060
HSBC Trinkaus	-0.036	-0.036	-0.069	0.022	-0.069	-0.037
ING	-0.023	-0.023	-0.023	0.022	-0.034	-0.016
KBC	-0.042	-0.042	-0.060	-0.073	-0.074	-0.058
LB	-0.088	-0.081	-0.096	-0.114	-0.114	-0.098
LODH	0.023	0.023	0.000	-0.023	-0.023	0.000
Pictet	-0.027	-0.020	-0.030	-0.089	-0.089	-0.051
Schroder	-0.004	-0.004	-0.020	-0.061	-0.061	-0.030
Spängler	-0.022	-0.022	-0.050	0.002	-0.039	-0.026
UBAM	-0.059	-0.062	-0.065	-0.135	-0.135	-0.091
Uni	-0.007	-0.007	-0.007	-0.004	-0.005	-0.006
Average	-0.023	-0.022	-0.034	-0.035	-0.049	-0.033
Maximum	0.034	0.034	0.016	0.053	0.040	0.032
Minimum	-0.088	-0.081	-0.096	-0.135	-0.135	-0.098
Positive ASR	4	4	3	5	2	4
Negative ASR	15	15	16	14	17	15

This table reports the average monthly selection returns out-of-sample in the period July 2003 to June 2005. The selection return for each month is calculated out-of-sample as the difference between the fund return and the return of the corresponding benchmark portfolio. Using a moving 36-month time-window, the dynamic benchmark portfolios are obtained from variance-minimization for the five asset-class-factor models specified in Table 3 for each fund i: min $\mathrm{Var}\left(R_i - \sum_{j=1}^{K+1} \beta_{ij} I_j\right)$. The betas are restricted to $\sum_{j=1}^{K+1} \beta_{ij} = 1$ and $\beta_{ij} \geq 0$. R_i and I_j denote the discrete monthly total returns of the fund and indices, respectively, and the one-month Euribor (I_{K+1}). The two last rows show the number of positive and negative average selection returns, respectively, for each model.

Table 9: Single-index model: beta coefficient and R^2

Index Coefficient	Corporates beta	R^2
ADIG	0.841	0.849
Balzac	0.920	0.931
Bayern LB	0.748	0.843
CA	0.906	0.869
Capital Invest	0.760	0.749
Deka	0.989	0.753
dit	0.850	0.812
Rothschild	0.569	0.844
Fortis	0.887	0.926
HSBC Trinkaus	0.947	0.541
ING	0.956	0.874
KBC	0.972	0.955
LB	0.662	0.703
LODH	0.841	0.853
Pictet	0.822	0.832
Schroder	0.883	0.888
Spängler	0.963	0.877
UBAM	0.969	0.893
Uni	0.873	0.897
Average	0.861	0.836
Maximum	0.989	0.955
Minimum	0.569	0.541

This table reports the beta coefficients and the R^2, resulting from OLS for the single-index model for each fund: $R'_{it} = \alpha_i + \beta_i I'_t + \varepsilon'_{it}$. R'_{it} and I'_t denote the excess returns of the fund i and the iBoxx € Corporates index, respectively, in the period July 2000 to June 2005. The excess returns are calculated as the difference between the fund's and the index' discrete monthly total returns and the one-month Euribor. The corresponding alphas are shown in Table 5.

Table 10: Multi-index models: beta coefficients and adjusted R^2

MIM-1

Index Coefficient	Corporates AAA beta1	Corporates AA beta2	Corporates A beta3	Corporates BBB beta4	Adj. R^2
ADIG	0.512	-0.055	0.251	0.212	0.824
Balzac	0.438	-0.032	0.130	0.451	0.960
Bayern LB	-0.049	0.079	0.447	0.230	0.849
CA	0.442	-0.192	0.460	0.259	0.843
Capital Invest	0.271	0.198	0.156	0.157	0.730
Deka	-0.276	0.081	0.683	0.395	0.796
dit	0.026	-0.168	0.972	0.002	0.828
Rothschild	0.698	-0.684	0.675	0.043	0.884
Fortis	0.370	0.123	0.341	0.103	0.946
HSBC Trinkaus	-0.480	0.231	0.280	0.763	0.726
ING	-0.437	0.495	0.749	0.002	0.897
KBC	0.130	0.355	0.239	0.232	0.953
LB	0.310	0.019	0.538	-0.146	0.840
LODH	0.116	0.408	0.218	0.084	0.876
Pictet	0.481	0.000	0.417	0.012	0.898
Schroder	0.094	0.470	0.178	0.120	0.917
Spängler	-0.027	-0.236	1.050	0.130	0.874
UBAM	0.179	0.562	0.172	0.053	0.970
Uni	-0.203	0.358	0.500	0.124	0.882
Average	0.137	0.106	0.445	0.170	0.868
Maximum	0.698	0.562	1.050	0.763	0.970
Minimum	-0.480	-0.684	0.130	-0.146	0.726

MIM-2

Index Coefficient	Corporates AAA beta1	Corporates AA beta2	Corporates A beta3	Corporates BBB beta4	Sovereigns beta5	Adj. R^2
ADIG	0.512	-0.062	0.250	0.213	0.007	0.821
Balzac	0.444	-0.196	0.120	0.473	0.157	0.960
Bayern LB	-0.038	-0.197	0.431	0.265	0.265	0.851
CA	0.428	0.166	0.481	0.213	-0.344	0.845
Capital Invest	0.275	0.088	0.150	0.171	0.106	0.725
Deka	-0.298	0.666	0.718	0.320	-0.562	0.803
dit	0.031	-0.301	0.964	0.019	0.128	0.825
Rothschild	0.701	-0.758	0.671	0.052	0.071	0.882
Fortis	0.372	0.054	0.337	0.112	0.066	0.946
HSBC Trinkaus	-0.479	0.208	0.278	0.766	0.022	0.721
ING	-0.442	0.619	0.757	-0.014	-0.119	0.896
KBC	0.122	0.569	0.252	0.204	-0.205	0.954
LB	0.317	-0.168	0.527	-0.122	0.180	0.839
LODH	0.112	0.504	0.223	0.071	-0.093	0.874
Pictet	0.508	-0.732	0.374	0.107	0.703	0.921
Schroder	0.093	0.493	0.179	0.117	-0.022	0.915
Spängler	-0.036	0.010	1.064	0.098	-0.236	0.874
UBAM	0.189	0.291	0.156	0.088	0.261	0.973
Uni	-0.212	0.608	0.515	0.092	-0.240	0.883
Average	0.137	0.098	0.444	0.171	0.008	0.869
Maximum	0.701	0.666	1.064	0.766	0.703	0.973
Minimum	-0.479	-0.758	0.120	-0.122	-0.562	0.721

MIM-3

Index Coefficient	Corporates AAA beta1	Corporates AA beta2	Corporates A beta3	Corporates BBB beta4	Sovereigns beta5	Stoxx 600 beta6	Adj. R^2
ADIG	0.514	-0.063	0.250	0.212	0.007	0.000	0.818
Balzac	0.378	-0.187	0.122	0.496	0.160	-0.009	0.961
Bayern LB	-0.010	-0.201	0.430	0.255	0.264	0.004	0.849
CA	0.442	0.164	0.481	0.208	-0.344	0.002	0.843
Capital Invest	0.296	0.085	0.149	0.163	0.105	0.003	0.720
Deka	-0.237	0.657	0.716	0.298	-0.564	0.009	0.800
dit	0.200	-0.325	0.960	-0.041	0.121	0.024	0.837
Rothschild	0.701	-0.758	0.671	0.052	0.071	0.000	0.880
Fortis	0.394	0.051	0.336	0.104	0.065	0.003	0.945
HSBC Trinkaus	-0.314	0.185	0.274	0.707	0.015	0.023	0.724
ING	-0.440	0.618	0.757	-0.014	-0.119	0.000	0.894
KBC	0.176	0.561	0.250	0.185	-0.208	0.008	0.954
LB	0.333	-0.170	0.526	-0.128	0.179	0.002	0.836

LODH	0.210	0.491	0.221	0.036	-0.097	0.014	0.877
Pictet	0.520	-0.733	0.373	0.103	0.703	0.002	0.920
Schroder	0.160	0.484	0.178	0.094	-0.025	0.009	0.916
Spängler	0.105	-0.010	1.061	0.048	-0.242	0.020	0.880
UBAM	0.217	0.287	0.155	0.078	0.259	0.004	0.972
Uni	-0.199	0.606	0.514	0.087	-0.240	0.002	0.881
Average	0.181	0.092	0.443	0.155	0.006	0.006	0.869
Maximum	0.701	0.657	1.061	0.707	0.703	0.024	0.972
Minimum	-0.440	-0.758	0.122	-0.128	-0.564	-0.009	0.720

MIM-4

Index	Corporates 1-3	Corporates 3-5	Corporates 5-7	Corporates 7-10	Corporates 10+	Adj. R^2
Coefficient	beta1	beta2	beta3	beta4	beta5	
ADIG	0.046	-0.147	0.829	-0.035	0.025	0.889
Balzac	-0.009	0.726	-0.065	0.272	-0.001	0.939
Bayern LB	-0.252	0.525	0.285	0.182	-0.090	0.864
CA	0.064	0.095	0.644	0.044	-0.001	0.885
Capital Invest	1.024	-0.163	0.176	-0.082	0.189	0.798
Deka	0.252	0.815	-0.076	0.017	0.124	0.738
dit	-0.218	0.454	0.408	-0.054	0.089	0.818
Rothschild	0.109	0.215	0.279	0.052	-0.031	0.853
Fortis	0.098	0.113	0.251	0.177	0.117	0.935
HSBC Trinkaus	-0.462	1.196	-0.608	1.136	-0.401	0.626
ING	-0.317	0.301	0.457	-0.075	0.226	0.898
KBC	0.191	0.264	0.173	0.150	0.136	0.954
LB	-0.157	0.181	0.566	-0.082	0.024	0.721
LODH	-0.059	0.088	0.501	0.007	0.112	0.863
Pictet	0.142	0.284	0.293	-0.081	0.157	0.840
Schroder	0.171	0.017	0.332	0.077	0.166	0.903
Spängler	0.054	0.237	0.519	0.055	0.034	0.878
UBAM	0.015	0.099	0.320	0.200	0.128	0.904
Uni	0.263	0.016	0.420	0.058	0.098	0.907
Average	0.050	0.280	0.300	0.106	0.058	0.853
Maximum	1.024	1.196	0.829	1.136	0.226	0.954
Minimum	-0.462	-0.163	-0.608	-0.082	-0.401	0.626

MIM-5

Index	Corporates 1-3	Corporates 3-5	Corporates 5-7	Corporates 7-10	Corporates 10+	Stoxx 600	Adj. R^2
Coefficient	beta1	beta2	beta3	beta4	beta5	beta6	
ADIG	0.023	-0.126	0.814	-0.029	0.022	-0.005	0.888
Balzac	-0.018	0.734	-0.071	0.274	-0.002	-0.002	0.938
Bayern LB	-0.220	0.495	0.305	0.174	-0.086	0.007	0.864
CA	0.081	0.079	0.655	0.039	0.001	0.004	0.883
Capital Invest	1.008	-0.148	0.166	-0.077	0.186	-0.003	0.795
Deka	0.387	0.689	0.012	-0.019	0.142	0.028	0.756
dit	-0.179	0.418	0.433	-0.064	0.094	0.008	0.817
Rothschild	0.075	0.246	0.257	0.061	-0.035	-0.007	0.855
Fortis	0.015	0.190	0.197	0.199	0.107	-0.017	0.947
HSBC Trinkaus	-0.206	0.959	-0.441	1.069	-0.368	0.054	0.686
ING	-0.369	0.349	0.424	-0.062	0.220	-0.011	0.901
KBC	0.168	0.286	0.157	0.156	0.133	-0.005	0.954
LB	-0.297	0.310	0.475	-0.046	0.006	-0.029	0.768
LODH	-0.109	0.134	0.468	0.020	0.106	-0.010	0.865
Pictet	0.028	0.391	0.218	-0.051	0.143	-0.024	0.864
Schroder	0.116	0.067	0.296	0.091	0.159	-0.012	0.907
Spängler	0.153	0.145	0.584	0.029	0.046	0.021	0.891
UBAM	-0.125	0.229	0.228	0.237	0.110	-0.030	0.933
Uni	0.260	0.019	0.418	0.059	0.098	-0.001	0.906
Average	0.042	0.288	0.294	0.108	0.057	-0.002	0.864
Maximum	1.008	0.959	0.814	1.069	0.220	0.054	0.954
Minimum	-0.369	-0.148	-0.441	-0.077	-0.368	-0.030	0.686

This table reports the beta coefficients and the adjusted R^2, resulting from OLS for the five multi-index models specified in Table 3 for each fund i: $R'_{it} = \alpha_i + \sum_{j=1}^{K+1} \beta_{ij} I'_{jt} + \varepsilon'_{it}$. R'_{it} and I'_{jt} denote the excess returns of the fund and the indices, respectively, in the period July 2000 to June 2005. The excess returns are calculated as the difference between the fund's and the indices' discrete monthly total returns and the one-month Euribor. The corresponding alphas are summarized in Table 5.

Table 11: Asset-class-factor models: beta coefficients and adjusted R^2

ACFM-1

Index	Corporates AAA	Corporates AA	Corporates A	Corporates BBB	Euribor	Adj. R^2
Coefficient	Beta1	Beta2	Beta3	Beta4	Beta5	
ADIG	0.466	0.000	0.227	0.214	0.093	0.822
Balzac	0.410	0.000	0.116	0.453	0.021	0.959
Bayern LB	0.000	0.034	0.454	0.231	0.281	0.846
CA	0.281	0.000	0.379	0.266	0.073	0.841
Capital Invest	0.271	0.198	0.156	0.157	0.219	0.728
Deka	0.000	0.000	0.507	0.447	0.046	0.787
dit	0.000	0.000	0.787	0.038	0.175	0.818
Rothschild	0.127	0.000	0.388	0.068	0.417	0.856
Fortis	0.370	0.123	0.341	0.103	0.063	0.946
HSBC Trinkaus	0.000	0.000	0.087	0.829	0.083	0.707
ING	0.000	0.094	0.814	0.015	0.077	0.891
KBC	0.130	0.355	0.239	0.232	0.045	0.952
LB	0.386	0.129	0.233	0.000	0.251	0.825
LODH	0.116	0.408	0.218	0.084	0.175	0.875
Pictet	0.481	0.000	0.417	0.012	0.089	0.895
Schroder	0.094	0.470	0.178	0.120	0.138	0.914
Spängler	0.000	0.000	0.726	0.197	0.077	0.864
UBAM	0.179	0.562	0.172	0.053	0.034	0.970
Uni	0.000	0.172	0.530	0.130	0.168	0.879
Average	0.174	0.134	0.367	0.192	0.133	0.862
Maximum	0.481	0.562	0.814	0.829	0.417	0.970
Minimum	0.000	0.000	0.087	0.000	0.021	0.707

ACFM-2

Index	Corporates AAA	Corporates AA	Corporates A	Corporates BBB	Sovereigns	Euribor	Adj. R^2
Coefficient	Beta1	Beta2	Beta3	Beta4	Beta5	Beta6	
ADIG	0.466	0.000	0.227	0.214	0.000	0.093	0.819
Balzac	0.338	0.000	0.073	0.468	0.088	0.034	0.959
Bayern LB	0.000	0.000	0.359	0.263	0.104	0.275	0.845
CA	0.281	0.000	0.379	0.266	0.000	0.073	0.838
Capital Invest	0.275	0.088	0.150	0.171	0.106	0.211	0.724
Deka	0.000	0.000	0.507	0.447	0.000	0.046	0.783
dit	0.000	0.000	0.787	0.038	0.000	0.175	0.814
Rothschild	0.127	0.000	0.388	0.068	0.000	0.417	0.854
Fortis	0.372	0.054	0.337	0.112	0.066	0.059	0.945
HSBC Trinkaus	0.000	0.000	0.087	0.829	0.000	0.083	0.701
ING	0.000	0.094	0.814	0.015	0.000	0.077	0.889
KBC	0.130	0.355	0.239	0.232	0.000	0.045	0.951
LB	0.242	0.000	0.233	0.000	0.249	0.276	0.829
LODH	0.116	0.408	0.218	0.084	0.000	0.175	0.873
Pictet	0.113	0.000	0.196	0.089	0.443	0.158	0.909
Schroder	0.094	0.470	0.178	0.120	0.000	0.138	0.913
Spängler	0.000	0.000	0.726	0.197	0.000	0.077	0.862
UBAM	0.189	0.291	0.156	0.088	0.261	0.016	0.972
Uni	0.000	0.172	0.530	0.130	0.000	0.168	0.877
Average	0.144	0.102	0.346	0.202	0.069	0.137	0.861
Maximum	0.466	0.470	0.814	0.829	0.443	0.417	0.972
Minimum	0.000	0.000	0.073	0.000	0.000	0.016	0.701

ACFM-3

Index	Corporates AAA	Corporates AA	Corporates A	Corporates BBB	Sovereigns	Stoxx 600	Euribor	Adj. R^2
Coefficient	Beta1	Beta2	Beta3	Beta4	Beta5	Beta6	Beta7	
ADIG	0.467	0.000	0.227	0.213	0.000	0.000	0.092	0.815
Balzac	0.338	0.000	0.073	0.468	0.088	0.000	0.034	0.958
Bayern LB	0.000	0.000	0.363	0.248	0.123	0.005	0.261	0.843
CA	0.291	0.000	0.378	0.263	0.000	0.002	0.067	0.834
Capital Invest	0.296	0.085	0.149	0.163	0.105	0.003	0.199	0.719
Deka	0.000	0.000	0.572	0.398	0.000	0.012	0.018	0.782
dit	0.017	0.000	0.794	0.000	0.052	0.022	0.115	0.827
Rothschild	0.127	0.000	0.388	0.068	0.000	0.000	0.417	0.851
Fortis	0.394	0.051	0.336	0.104	0.065	0.003	0.046	0.944
HSBC Trinkaus	0.000	0.000	0.231	0.721	0.000	0.027	0.021	0.708
ING	0.000	0.112	0.810	0.005	0.000	0.003	0.069	0.887
KBC	0.183	0.345	0.238	0.213	0.000	0.007	0.014	0.952
LB	0.242	0.000	0.233	0.000	0.249	0.000	0.276	0.826
LODH	0.214	0.390	0.215	0.049	0.000	0.014	0.118	0.876
Pictet	0.121	0.000	0.196	0.086	0.443	0.001	0.154	0.908

Schroder	0.161	0.458	0.176	0.097	0.000	0.009	0.099	0.913
Spängler	0.000	0.000	0.843	0.109	0.000	0.022	0.026	0.872
UBAM	0.216	0.288	0.155	0.078	0.259	0.004	0.000	0.972
Uni	0.000	0.188	0.526	0.122	0.000	0.003	0.161	0.875
Average	0.161	0.101	0.363	0.179	0.073	0.007	0.115	0.861
Maximum	0.467	0.458	0.843	0.721	0.443	0.027	0.417	0.972
Minimum	0.000	0.000	0.073	0.000	0.000	0.000	0.000	0.708

ACFM-4

Index	Corporates 1-3	Corporates 3-5	Corporates 5-7	Corporates 7-10	Corporates 10+	Euribor	Adj. R^2
Coefficient	Beta1	Beta2	Beta3	Beta4	Beta5	Beta6	
ADIG	0.000	0.000	0.713	0.000	0.017	0.270	0.885
Balzac	0.000	0.681	0.000	0.242	0.000	0.077	0.937
Bayern LB	0.000	0.534	0.197	0.047	0.000	0.222	0.853
CA	0.064	0.097	0.643	0.041	0.000	0.154	0.884
Capital Invest	0.734	0.000	0.101	0.000	0.165	0.000	0.790
Deka	0.053	0.815	0.000	0.008	0.124	0.000	0.728
dit	0.000	0.333	0.373	0.000	0.075	0.219	0.808
Rothschild	0.101	0.259	0.263	0.000	0.000	0.378	0.852
Fortis	0.098	0.113	0.251	0.177	0.117	0.244	0.934
HSBC Trinkaus	0.000	0.858	0.000	0.142	0.000	0.000	0.528
ING	0.000	0.126	0.406	0.001	0.207	0.260	0.893
KBC	0.191	0.264	0.173	0.150	0.136	0.086	0.953
LB	0.000	0.065	0.534	0.000	0.000	0.401	0.721
LODH	0.000	0.056	0.491	0.021	0.109	0.324	0.862
Pictet	0.164	0.220	0.286	0.000	0.127	0.204	0.835
Schroder	0.171	0.017	0.332	0.077	0.166	0.238	0.901
Spängler	0.054	0.237	0.519	0.055	0.034	0.102	0.874
UBAM	0.015	0.099	0.320	0.200	0.128	0.237	0.903
Uni	0.263	0.016	0.420	0.058	0.098	0.145	0.906
Average	0.100	0.252	0.317	0.064	0.079	0.187	0.845
Maximum	0.734	0.858	0.713	0.242	0.207	0.401	0.953
Minimum	0.000	0.000	0.000	0.000	0.000	0.000	0.528

ACFM-5

Index	Corporates 1-3	Corporates 3-5	Corporates 5-7	Corporates 7-10	Corporates 10+	Stoxx 600	Euribor	Adj. R^2
Coefficient	Beta1	Beta2	Beta3	Beta4	Beta5	Beta6	Beta7	
ADIG	0.000	0.000	0.713	0.000	0.017	0.000	0.270	0.883
Balzac	0.000	0.681	0.000	0.242	0.000	0.000	0.077	0.936
Bayern LB	0.000	0.509	0.233	0.041	0.000	0.008	0.209	0.855
CA	0.081	0.079	0.655	0.039	0.001	0.004	0.141	0.882
Capital Invest	0.734	0.000	0.101	0.000	0.165	0.000	0.000	0.786
Deka	0.032	0.724	0.079	0.000	0.140	0.025	0.000	0.744
dit	0.000	0.302	0.407	0.000	0.075	0.009	0.207	0.808
Rothschild	0.101	0.259	0.263	0.000	0.000	0.000	0.378	0.850
Fortis	0.098	0.113	0.251	0.177	0.117	0.000	0.244	0.933
HSBC Trinkaus	0.000	0.634	0.000	0.307	0.000	0.060	0.000	0.615
ING	0.000	0.126	0.406	0.001	0.207	0.000	0.260	0.891
KBC	0.191	0.264	0.173	0.150	0.136	0.000	0.086	0.952
LB	0.000	0.065	0.534	0.000	0.000	0.000	0.401	0.716
LODH	0.000	0.056	0.491	0.021	0.109	0.000	0.324	0.859
Pictet	0.164	0.220	0.286	0.000	0.127	0.000	0.204	0.832
Schroder	0.171	0.017	0.332	0.077	0.166	0.000	0.238	0.899
Spängler	0.153	0.145	0.584	0.029	0.046	0.021	0.022	0.888
UBAM	0.015	0.099	0.320	0.200	0.128	0.000	0.237	0.901
Uni	0.263	0.016	0.420	0.058	0.098	0.000	0.145	0.904
Average	0.105	0.227	0.329	0.071	0.081	0.007	0.181	0.849
Maximum	0.734	0.724	0.713	0.307	0.207	0.060	0.401	0.952
Minimum	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.615

This table reports the beta coefficients and the adjusted R^2, resulting from variance-minimization for the five asset-class-factor models specified in Table 3 for each fund i: min $\mathrm{Var}\left(R_i - \sum_{j=1}^{K+1} \beta_{ij} I_j\right)$. The betas are restricted to $\sum_{j=1}^{K+1} \beta_{ij} = 1$ and $\beta_{ij} \geq 0$. R_i and I_j denote the returns of the fund and the indices, respectively, and the one-month Euribor (I_{K+1}) in the period July 2000 to June 2005. The corresponding alphas are summarized in Table 6.

Table 12: Alpha regressed on management fee

Model	Intercept	p-Value H_0: Intercept = 0	Slope	p-Value H_0: Slope ≥ 0	R^2
SIM	-0.00029	0.568	-0.485	0.268	0.023
MIM-1	-0.00021	0.646	-0.417	0.282	0.020
MIM-2	-0.00019	0.697	-0.450	0.276	0.021
MIM-3	-0.00016	0.738	-0.515	0.252	0.027
MIM-4	-0.00023	0.639	-0.481	0.267	0.023
MIM-5	-0.00022	0.668	-0.503	0.262	0.024
ACFM-1	-0.00017	0.698	-0.439	0.259	0.025
ACFM-2	-0.00013	0.766	-0.455	0.249	0.028
ACFM-3	-0.00011	0.799	-0.518	0.230	0.033
ACFM-4	-0.00027	0.558	-0.415	0.285	0.019
ACFM-5	-0.00026	0.560	-0.423	0.276	0.021
Average	-0.00020	0.667	-0.464	0.264	0.024

*10% level, ** 5% level, *** 1% level

This table reports the results of the regression alpha = intercept + beta · management fee + error. We run this regression for the alphas obtained by each model separately. The abbreviations of the models correspond to the model specifications in Table 3. The monthly alphas are given in Table 5 and Table 6, the management fees per month are reported in Table 1. The p-values are based on t-statistics and correspond to the null hypotheses H_0: intercept = 0 and H_0: slope ≥ 0, respectively.

Table 13: Alpha regressed on asset value

Model	Intercept	p-Value H_0: Intercept = 0	Slope	p-Value H_0: Slope ≥ 0	R^2
SIM	-0.00069***	0.002	2.96E-07	0.760	0.030
MIM-1	-0.00059***	0.004	3.34E-07	0.808	0.045
MIM-2	-0.00052***	0.013	1.54E-07	0.647	0.009
MIM-3	-0.00054***	0.011	1.66E-07	0.656	0.010
MIM-4	-0.00059***	0.007	1.76E-07	0.664	0.011
MIM -5	-0.00059***	0.008	1.78E-07	0.663	0.011
ACFM-1	-0.00054***	0.004	2.88E-07	0.787	0.038
ACFM-2	-0.00050***	0.007	2.52E-07	0.759	0.030
ACFM-3	-0.00053***	0.006	2.79E-07	0.772	0.033
ACFM-4	-0.00060***	0.004	2.05E-07	0.700	0.016
ACFM-5	-0.00060***	0.003	2.04E-07	0.703	0.017
Average	-0.00057	0.006	2.30E-07	0.720	0.023

*10% level, ** 5% level, *** 1% level

This table reports the results of the regression alpha = intercept + beta · asset value + error. We run this regression for the alphas obtained by each model separately. The abbreviations of the models correspond to the model specifications in Table 3. The monthly alphas are given in Table 5 and Table 6, the asset value is given in € million (see Table 1) . The p-values are based on t-statistics and correspond to the null hypotheses H_0: intercept = 0 and H_0: slope ≥ 0, respectively.

Table 14: Alpha regressed on fund age

Model	Intercept	p-Value H_0: Intercept = 0	Slope	p-Value H_0: Slope ≤ 0	R^2
SIM	-0.00105***	0.001	6.00E-05**	0.028	0.198
MIM-1	-0.00092***	0.001	5.79E-05**	0.022	0.218
MIM-2	-0.00092***	0.002	5.88E-05**	0.026	0.203
MIM-3	-0.00095***	0.001	6.00E-05**	0.026	0.204
MIM-4	-0.00095***	0.002	5.37E-05**	0.044	0.162
MIM-5	-0.00095***	0.002	5.47E-05**	0.044	0.162
ACFM-1	-0.00088***	0.001	5.70E-05**	0.017	0.238
ACFM-2	-0.00084***	0.001	5.63E-05**	0.017	0.237
ACFM-3	-0.00089***	0.001	5.91E-05**	0.017	0.239
ACFM-4	-0.00095***	0.001	5.38E-05**	0.034	0.183
ACFM-5	-0.00094***	0.001	5.31E-05**	0.032	0.188
Average	-0.00093	0.001	5.68E-05	0.028	0.203

*10% level, ** 5% level, *** 1% level

This table reports the results of the regression alpha = intercept + beta · fund age + error. We run this regression for the alphas obtained by each model separately. The abbreviations of the models correspond to the model specifications in Table 3. The monthly alphas are given in Table 5 and Table 6, age is given in years as of June 2005 (see Table 1). The p-values are based on t-statistics and correspond to the null hypotheses H_0: intercept = 0 and H_0: slope ≤ 0, respectively.

Table 15: Alpha regressed on BBB exposure

Model	Intercept	p-Value H_0: Intercept = 0	Slope	p-Value H_0: Slope ≤ 0	R^2
MIM-1	-0.00037**	0.022	-0.00055	0.825	0.051
MIM-2	-0.00036**	0.036	-0.00061	0.830	0.054
MIM-3	-0.00040**	0.020	-0.00051	0.781	0.036
ACFM-1	-0.00030*	0.051	-0.00071	0.905	0.099
ACFM-2	-0.00024	0.109	-0.00081	0.933	0.127
ACFM-3	-0.00028*	0.080	-0.00085	0.915	0.108
Average	-0.00033	0.053	-0.00067	0.865	0.079

*10% level, ** 5% level, *** 1% level

This table reports the results of the regression alpha = intercept + beta · BBB exposure + error. We run this regression for the alphas obtained by each model separately. The abbreviations of the models correspond to the model specifications in Table 3. The monthly alphas are given in Table 5 and Table 6. The BBB exposure is measured by the respective beta coefficient of the iBoxx € Corporates BBB (see Table 10 and Table 11). The p-values are based on t-statistics and correspond to the null hypotheses H_0: intercept = 0 and H_0: slope ≤ 0, respectively.