Success and failure on the corporate bond fund market

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Abstract We present the first broad overview of the factors determining corporate bond fund success and failure in terms of performance and survival. We show that the main determinant of survival is size. Performance matters only for small funds while large funds survive unconditionally, consistent with maintaining fee revenues. We neither find persistence in performance nor diseconomies of scale. This is due to advantages of larger funds in corporate bond trading. Other fund and family characteristics are unrelated to performance and survival, contrasting previous finings in equity funds. Thus, there are similarities but also important differences between the factors determining success and failure on the corporate bond and equity fund markets.

Keywords Corporate bond funds · Performance · Disappearance and survival · Fund size

JEL Classification G11 · G12

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Introduction

According to the ICI Factbook 2016, corporate bonds have recently become the second most important asset class for US mutual fund investors, surpassing government bonds, as assets under management grew from 190 billion US$ in 1995 to more than 1.8 trillion US$ in 2014. This equals 14% of the overall mutual fund market. Therefore, it is very important to learn more about the economic mechanisms at work on the corporate bond fund market, also in comparison with the intensively studied equity fund market. This paper is thus the first to provide a broad and consistent overview of the factors determining success and failure on the corporate bond fund market in terms of performance and survival. For our analysis, we use a sample of 313 active US domestic corporate bond funds over the 28-year sample period from 1987 to 2014.

Such an analysis is important because the corporate bond market is different from the stock market. A first difference is that trading costs and price impact increase with trade size on the stock market (e.g., Easley and O'Hara 1987; Chan and Lakonishok 1997). Conversely, on the corporate bond market, smaller trades are more expensive (e.g., Bessembinder et al. 2006; Edwards et al. 2007; Bessembinder and Maxwell 2008; Biswas et al. 2014), smaller institutions face higher transaction costs (e.g., Schultz 2001), and larger corporate bond funds have better access to attractive private placements (e.g., Blackwell and Kidwell 1988; Fenn 2000; Denis and Mihov 2003). The second important difference is that corporate bond funds can use a broader variety of instruments to tune specific types of systematic risk (e.g., Chen et al. 2010). For example, they can tune credit risk using CDS (Adam and Guettler 2015), term structure risk using interest rate derivatives (Natter et al. 2017) or option-related risk using mortgage-backed securities. Thus, the forces determining success and failure on the corporate bond fund market may be different to those on the equity fund market.

The performance of corporate bond funds is negative on average before and after fees. Analyzing the determinants of cross-sectional performance differences between the funds reveals that corporate bond fund performance, like equity fund performance, does not persist. The only exception may be that large percentage losses of previously large funds significantly reduce future alpha. Other than that, flows are unrelated to future performance, contrasting many findings in equity funds (e.g., Edelen 1999; Alexander et al. 2007). Also in sharp contrast to equity funds, where many previous studies consistently report diseconomies of scale (e.g., Chen et al. 2004; Evans et al. 2018), fund size is unrelated to corporate bond fund performance. However, this is in line with large funds having advantages in corporate bond trading. Further determinants of performance are systematic risk and expenses. Other fund and family characteristics found previously to influence equity fund performance are unrelated to performance. This confirms our expectation of similarities but also of important differences between the corporate bond fund and equity fund markets.

With respect to corporate bond fund survival, the most important determinants are size and performance. However, performance is relevant exclusively for small funds, while large funds survive unconditionally. With respect to flows, only large percentage losses in size of previously large funds increase the probability of disappearance. All these results are consistent with fund families maintaining the fee revenues of large funds. Other fund and family characteristics are unrelated to survival, which is in contrast to equity funds. Moreover, considering different exit forms of corporate bond funds, i.e., merger and liquidation, yields only marginal additional insight as the main determinants, size and performance, show similar economic relations for both exit forms.

Data and performance

Data selection

We use corporate bond fund data from CRSP and Morningstar, matching the databases following Pástor et al. (2015) and Berk and van Binsbergen (2015). We aggregate shareclasses on portfolio level.[1] We identify as active US domestic corporate bond funds all funds flagged as non-index funds, investing on average at least 50% of total net assets (TNA) in corporate bonds, and not having an international investment objective. We exclude all funds without net returns, expense ratios, loads, TNA and turnover. We exclude all observations before funds reach a size of 5 million USD to control for low reporting quality (e.g., Elton et al. 2001) and incubation bias (e.g., Evans 2010). We exclude all funds with less than 3 years of monthly returns remaining. From Morningstar, we additionally obtain daily returns, manager names and dates, the number of holdings and effective durations. The final sample consists of 313 funds in the period from 1987 to 2014.

We calculate gross returns by adding the expense ratio to the net returns. We calculate the monthly implied percentage net flow ("flow") from TNA and net returns following Berk and Tonks (2007) and winsorize such flows to a maximum of 100% to account for outliers, e.g., due to mergers (Eq. 1).[2]

$$\text{Flow}_{i,t} = \frac{\text{TNA}_{i,t} - \text{TNA}_{i,t-1}(1 + R_{i,t})}{\text{TNA}_{i,t-1}(1 + R_{i,t})} \quad (1)$$

We use Morningstar manager dates to determine the average tenure of the funds' managers. We use CRSP management codes to obtain family TNA, the number of family funds and the number of different family objectives. We derive the investor structure by identifying funds with institutional and retirement share classes and calculate the percentage of fund TNA invested in those shareclasses (e.g., Cohen and Schmidt 2009; Evans and Fahlenbrach 2012).[3] We use CRSP merge portfolio numbers to group non-survivors into liquidated and merged funds and, in the latter case, to obtain the size and the returns of the acquiring funds prior to the merger.

We obtain monthly and daily returns of Bank of America Merrill Lynch (BofAML) bond market indices from Morningstar Direct. Further information on average credit quality and effective durations of the bond indices is from the BofAML webpage. Panel A of Table 1 provides details on the bond market indices. Returns of the CRSP value-weighted stock market index and the risk-free rate are from Kenneth R. French's data library.

Performance measurement

To measure corporate bond fund performance, we apply the model introduced by Natter et al. (2018) using for each

[1] Net returns, fees and turnover are share class TNA weighted; Age is that of the oldest class; TNA is the sum.

[2] This calculation consistently assumes that all investor flow occurs at the end of the period in the numerator and in the denominator and is thus unbiased and floored at − 100%. Alternatively, calculating flow following Sirri and Tufano (1998) leads to unchanged results.

[3] We identify such share classes from share class names searching for the strings "Class I" and "Inst" (institutional) and "Class R" and "retire" (retirement), respectively..

Table 1 List of bond market total return indices and factor construction

Provider	Index (ticker)	Classification	Average effective duration Mean	SD	Average credit quality	Availability of returns in dataset
Panel A: Descriptions of bond indices						
Bank of America Merrill Lynch	US Treasury master TR USD	Treasury, investment grade	5.19	0.44	AAA	1987
Bank of America Merrill Lynch	US Treasury 1–3 years TR USD	Treasury, investment grade	1.72	0.09	AAA	1987
Bank of America Merrill Lynch	US Treasury 1–5 years TR USD	Treasury, investment grade	2.36	0.18	AAA	1987
Bank of America Merrill Lynch	US Treasury 3–5 years TR USD	Treasury, investment grade	3.50	0.16	AAA	1987
Bank of America Merrill Lynch	US Treasury 5–7 years TR USD	Treasury, investment grade	4.89	0.36	AAA	1987
Bank of America Merrill Lynch	US Treasury 5–10 years TR USD	Treasury, investment grade	5.89	0.37	AAA	1987
Bank of America Merrill Lynch	US Treasury 7–15 years TR USD	Treasury, investment grade	6.78	0.76	AAA	1987
Bank of America Merrill Lynch	US Treasury 10–15 years TR USD	Treasury, investment grade	7.26	1.46	AAA	1987
Bank of America Merrill Lynch	US Treasury 5 + years TR USD	Treasury, investment grade	8.75	0.51	AAA	1987
Bank of America Merrill Lynch	US Treasury 10 + years TR USD	Treasury, investment grade	11.40	1.95	AAA	1987
Bank of America Merrill Lynch	US high yield cash pay TR USD	Broad, high yield	4.53	0.25	B1	1987
Bank of America Merrill Lynch	US GNMA 30 years TR USD	Securitized, investment grade	3.33	0.90	AAA	1987
Bank of America Merrill Lynch	US corporate 5–10 years TR USD	Corporate, investment grade	5.77	0.32	A2	1987

Factor	Description	Construction
Panel B: Factor construction		
Def	Default risk, high yield bonds minus Treasury bonds with a similar average duration	US High Yield Cash Pay—US Treasury 5–7 years
Option	Option risk, mortgage-backed bonds minus Treasury bonds with a similar average duration	US GNMA 30 years—US Treasury 3–5 years
Term	Term risk, long-term Treasury bonds minus short-term Treasury bonds	US Treasury 10 + years—US Treasury 1–3 years

Panel A of this table describes the bond indices used to measure bond fund performance. Information on Bank of America Merrill Lynch (BofAML) indices is obtained from http://www.mlindex.ml.com/GISPublic/bin/MLIndex.asp and represent averages (SD) in the period 1987–2014. Effective durations are denoted in years

[a]Adjusted modified duration. Panel B describes the construction of additional risk factors used in the performance models

fund the US Treasury index that best matches the effective duration of the fund instead of a common broad bond market index (Eq. 2). This way, it controls for a systematic duration error in measured performance, which, according to Natter et al. (2018), is responsible for spurious results in previous bond fund analyses like, e.g., persistence in bond fund performance (Huij and Derwall 2008).

$$\mathrm{er}_{i,t} = \alpha_i + \beta_i^{\mathrm{Treasury}} \mathrm{er}_{\mathrm{Treasury},t}^{\mathrm{matching\,Dur.}} + \beta_i^{\mathrm{def}} \mathrm{Default}_t + \beta_i^{\mathrm{option}} \mathrm{Option}_t + \beta_i^{\mathrm{Equity}} \mathrm{er}_{\mathrm{Equity},t} + \varepsilon_{i,t} \quad (2)$$

$\mathrm{er}_{i,t}$ denotes the return of fund i in period t in excess of the risk-free rate (1-month T-Bill). To capture term risk, $\mathrm{er}_{\mathrm{Treasury},t}^{\mathrm{matching}}$ is the excess return of a US Treasury total return index with an effective duration matching that of the fund. def_t is a zero-investment factor capturing default risk, option_t is a zero-investment factor capturing option-related risk, and Equity_t is a broad stock market index. Panel B of Table 1 provides details on the construction of these factors. The regression intercept α_i represents the selection performance of fund i, while the betas β_i represent the sensitivities to the respective factors. $\varepsilon_{i,t}$ is a mean zero residual term.

To match funds and Treasury indices, we use their monthly average effective durations if available (218 of 313 funds).[4] Specifically, we compare the fund's effective duration with the effective durations of all Treasury indices and assign as duration-adjusted benchmark the one with the smallest absolute difference. If no effective durations are

[4] Fund effective durations are available in the dataset from 1987, however with gaps. We fill such gaps assuming that funds hold their durations relatively constant over time. Index effective durations are available from 1997. For the earlier period, we fill back the earliest duration, again assuming relatively constant durations over time. Supporting evidence may be drawn from the low standard deviations presented in Panel A of Table 1.

available (95 of 313 funds), we refer to the logic that an index with a matching duration must produce a beta of one. Thus, we run regressions of the funds' excess returns against Eq. (2) using all indices and chose the index with the smallest deviation from a beta of one.[5] We comment on robustness of the results with respect to the different duration matching approaches in Sect. 2.3.

In addition to the Natter et al. (2018) model, we alternatively use the two previous models most frequently used in bond fund performance measurement. The first is the "index-4" model from Elton, Gruber and Blake (1995) which uses a broad Treasury index instead of a duration matched one and is otherwise the same as the Natter et al. model (Eq. 3). Second, we use the Fama and French (1993) 5-factor model, which includes the equity factors *SMB* and *HML*, replaces the Treasury index with a *Term* factor (long-term treasury minus short-term Treasury, see Panel B of Table 1) and leaves out the *Option* factor (Eq. 4).

$$\mathrm{er}_{i,t} = \alpha_i + \beta_i^{\mathrm{Treasury}} er_{\mathrm{Treasury},t}^{\mathrm{Broad.}} + \beta_i^{\mathrm{def}}\mathrm{Default}_t + \beta_i^{\mathrm{option}}\mathrm{Option}_t + \beta_i^{\mathrm{Equity}}\mathrm{er}_{\mathrm{Equity},t} + \varepsilon_{i,t} \quad (3)$$

$$\mathrm{er}_{i,t} = \alpha_i + \beta_i^{\mathrm{Equity}}\mathrm{er}_{\mathrm{Equity},t} + \beta_i^{\mathrm{SMB}}\mathrm{SMB}_t + \beta_i^{\mathrm{HML}}\mathrm{HML}_t + \beta_i^{\mathrm{Term}}\mathrm{Term}_t + \beta_i^{\mathrm{def}}\mathrm{Default}_t + \varepsilon_{i,t} \quad (4)$$

Table 2 shows average fund-by-fund performance with heteroscedasticity-consistent Fama and MacBeth (1973) standard errors based on monthly returns. Consistent with the previous literature, the net Natter et al. (2018) alpha is negative on average around − 1.0% p.a. Gross alpha is negative on average and statistically significant at around − 0.4% p.a. Regarding risk exposures, the Treasury beta is close to one as expected from the duration matching procedure. The default beta is relatively high with around 0.6, consistent with high investments in corporate bonds. The option risk beta of around 0.14 indicates additional investments in mortgage-backed securities and the significant stock market beta around 0.02 indicates some exposure to equity risk. The average R^2 of 0.82 indicates a good overall model fit.

With respect to the alternative models, the first thing to notice is that the Elton et al. (1995) model with an R^2 of 0.78 and especially the Fama and French (1993) model with 0.74 show distinctively weaker model fit. Further, the equal-weighted and value-weighted results using Natter et al. (2018) lead to similar alpha estimates, indicating that the size of the funds does not play an important role for corporate bond fund performance. The other models show higher equal-weighted alphas, indicating that smaller funds outperform larger funds, consistent with diseconomies of scale (e.g., Chen et al. 2004). However, this might be driven by the weak model fit and the mechanical error in alpha using these models reported by Natter et al. (2018). Therefore, we use the Natter et al. (2018) model as our main performance measure and comment on robustness of our main results with respect to the choice of the performance model where appropriate.

Panel data sample construction

In preparation of different panel regressions, we run non-overlapping semiannual rolling window performance regressions on daily returns. For each non-surviving fund, we define the semiannual windows such that the last window ends with the fund's disappearance. For each surviving fund, we define the non-overlapping semiannual windows by randomly drawing a month. To control for autocorrelation in daily fund returns due to infrequent trading, we include one-day and two-days lagged factor returns following Dimson (1979).[6] In addition to alpha, we use the standard deviation of the linear prediction (*Xb*) as a measure of systematic risk.

Panel A of Table 3 shows pooled summary statistics of the 2244 non-overlapping semiannual observations of the fund and family characteristics. Returns, alphas and systematic risk are estimates using the Natter et al. (2018) model over the semiannual period, flow is the aggregate over the previous year and the remaining variables are at the end of the semiannual window. The mean (median) holdings percentage in corporate bonds is 66.48% (80.10%). The average effective duration of the funds of 3.95 years. Mean net alpha is negative with annualized − 0.30%. On average, funds attract mean annual flows of 17.8%, consistent with the steep growth of the market over the past decades. Average TNA is around 434 million US$, while the median is 158 million US$, indicating that there are a large number of small funds and a small number of very large funds. Overall, corporate bond funds are smaller on average than equity funds (see summary statistics on equity funds in, e.g., Rohleder et al. 2018). Annual expense ratios are on average around 0.6% and thus lower compared to equity funds. The average turnover ratio of 109% is also higher than that usually reported for equity funds.

To explore if the identification of the duration matched benchmark indices via two alternative approaches—by using the fund's effective duration whenever available ("duration only") and otherwise the Treasury beta closest to one ("beta only")—Panel B of Table 3 shows summary statistics of the semiannual fund characteristics separately

[5] We exclude all funds where the average smallest absolute beta deviation from one is outside the 5th and 95th percentile. In the remaining sample, the average (median) $\beta_i^{\mathrm{Treasury}}$ is 0.96 (0.98).

[6] Alternatively using 1-day leaded and 1-day lagged factor returns yields similar results.

Table 2 Corporate bond fund performance

	Net return						Gross return	
	Natter et al. (2018)		Elton et al. (1995)		Fama and French (1993)		Natter et al. (2018)	
	EW	VW	EW	VW	EW	VW	EW	VW
Treasury	1.0095***	0.9976***	0.6453***	0.6307***			1.0094***	0.9978***
	(0.00)	(0.00)	(0.00)	(0.00)			(0.00)	(0.00)
Term					0.2130***	0.2100***		
					(0.00)	(0.00)		
Default	0.6148***	0.6261***	0.5973***	0.6067***	0.5703***	0.5874***	0.6147***	0.6261***
	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)
Option	0.1468***	0.1159***	− 0.0149	− 0.0185			0.1467***	0.1159***
	(0.00)	(0.00)	(0.63)	(0.60)			(0.00)	(0.00)
Equity	0.0233***	0.0218***	0.0440***	0.0480***	0.0824***	0.0786***	0.0233***	0.0218***
	(0.00)	(0.01)	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)	(0.01)
SMB					− 0.0399***	− 0.0405***		
					(0.00)	(0.00)		
HML					− 0.0616***	− 0.0625***		
					(0.00)	(0.00)		
Alpha	− 0.0116***	− 0.0116***	− 0.0103***	− 0.0127***	− 0.0097***	− 0.0145***	− 0.0049**	− 0.0049**
	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)	(0.01)	(0.02)
R^2	0.81	0.82	0.78	0.78	0.74	0.74	0.81	0.82
No. funds	313	313	324	324	324	324	313	313

This table shows performance measures of corporate bond mutual funds in the period 1987–2014, calculated using time-series Fama and MacBeth (1973) regressions on monthly fund returns. The model by Natter et al. (2018) uses a duration matched *Treasury* index for each fund; the Elton et al. (1995) model uses a common broad treasury index. The *Term* factor is the return difference between a long-term index and a short-term Treasury index. The *Default* factor is the return difference between a high yield bond index and a duration matched Treasury index. The *Option* factor is the return difference between a mortgage-backed security index and a duration matched Treasury index. *Equity* is the excess return of the CRSP value-weighted stock index. *SMB* and *HML* are the Fama and French (1993) factors. Performance (alpha) is annualized and denoted in percent. Heteroscedasticity-consistent Fama and MacBeth p values are given in parentheses. ***, **, *Denote statistical significance on the 1, 5, and 10% level, respectively. EW (VW) denotes equal-weighted (value-weighted) results

for the both groups. The first thing to notice is that while 95 of 313 funds (30.4%) have no effective duration available, these account for only 192 of the 2244 semiannual fund observations (8.6%) used in the panel regressions. This discrepancy is mainly due to the "beta only" funds being much younger (2.23 years vs. 5.05 years on average) and covering only a relatively short period of time (8/2008–12/2014). They have higher corporate bond holdings on average, higher net excess returns, higher flows, are smaller, more expensive and have higher turnover. Further, they have a higher percentage of TNA managed in institutional share classes and belong to smaller families. Overall, they are quite different to the "duration only" funds. Therefore, it is necessary to include these funds in our empirical analysis because without them our sample may not be representative of the corporate bond fund market as a whole.

To discuss further properties of our sample, we compare it with the samples used in the recent literature. Comer and Rodriguez (2013) use 235 corporate bond funds in the period 1994–2009, which are selected based on the funds' "prospectus objective" reported in Morningstar. The actual data is from CRSP. Compared to our funds, theirs are larger on average but of similar size in the median, they are more expensive and have higher turnover. Their annualized returns are similar to ours. Chen and Qin (2017) use 418 funds in the period 1991–2014. They select funds based on CRSP objective codes, additionally excluding all funds

Table 3 Summary statistics

	N	Mean	SD	P5	P25	Median	P75	P95
Panel A: Overall sample								
Corporate bond holdings (%)	2244	66.48	33.11	50.00	56.36	80.10	90.87	97.07
Government bond holdings (%)	2244	4.14	8.99	0.00	0.00	0.00	3.95	23.24
ABS/MBS holdings (%)	2244	2.65	7.06	0.00	0.00	0.00	0.46	18.53
Stock holdings (%)	2244	0.45	1.72	0.00	0.00	0.00	0.30	2.26
Effective duration (years)	2052	3.95	1.79	0.71	3.16	4.00	4.70	6.50
Net excess return (% p.a.)	2244	4.92	15.25	− 14.62	− 0.30	5.32	11.22	24.74
Gross excess return (% p.a.)	2244	5.56	15.15	− 13.83	0.37	5.88	11.77	25.32
Net alpha (% p.a.)	2244	− 0.30	5.69	− 7.99	− 1.44	0.15	1.76	5.63
Gross alpha (% p.a.)	2244	0.33	5.67	− 7.13	− 0.85	0.75	2.37	6.19
Flow (% p.a.)	2244	17.80	36.40	− 2.62	− 0.60	1.03	7.78	100.00
Total net assets (TNA, million US$)	2244	433.72	821.23	10.05	42.12	157.86	457.25	1845.21
Systematic risk (% p.a.)	2244	3.08	2.52	0.51	1.53	2.54	3.85	7.45
Expense ratio (% p.a.)	2244	0.59	0.54	0.00	0.00	0.66	0.99	1.48
Front load (%)	2244	0.55	1.36	0.00	0.00	0.00	0.00	4.50
Rear load (%)	2244	0.34	0.70	0.00	0.00	0.00	0.00	2.00
Age (years)	2244	4.81	4.37	0.58	1.75	3.50	5.92	15.17
Tenure (years)	2244	4.27	3.39	0.67	1.68	3.31	5.83	11.00
Turnover (% p.a.)	2244	109.86	77.92	19.00	54.00	117.00	141.41	197.00
Number of holdings	2244	254.05	226.95	24.00	87.00	193.00	358.00	673.00
Institutional class exists (Y/N)	2244	37.12	48.32	0.00	0.00	0.00	100.00	100.00
Institutional class (% of TNA)	2244	26.64	41.56	0.00	0.00	0.00	61.96	100.00
Retirement class exists (Y/N)	2244	6.33	24.35	0.00	0.00	0.00	0.00	100.00
Retirement class (% of TNA)	2244	0.95	7.92	0.00	0.00	0.00	0.00	0.09
Family TNA (billion US$)	2244	218.48	752.04	0.04	0.24	2.07	47.00	1121.91
# of family funds	2244	88.71	182.11	1.00	1.00	10.00	86.00	477.00
# of family objectives	2244	9.04	9.94	1.00	1.00	5.00	14.50	29.00

	Duration only (1987–2014)			Beta only (2008–2014)		
	N	Mean	Median	N	Mean	Median
Panel B: Duration only versus beta only sample						
Corporate bond holdings (%)	2052	65.84	80.12	192	73.31	79.98
Government bond holdings (%)	2052	4.22	0.00	192	3.38	0.00
ABS/MBS holdings (%)	2052	2.60	0.00	192	3.11	0.00
Stock holdings (%)	2052	0.47	0.00	192	0.25	0.00
Effective duration (years)	2052	3.95	4.00	–	–	–
Net excess return (% p.a.)	2052	4.84	5.19	192	5.84	5.97
Gross excess return (% p.a.)	2052	5.46	5.82	192	6.36	6.41
Net alpha (% p.a.)	2052	− 0.30	0.11	192	− 0.27	0.55
Gross alpha (% p.a.)	2052	0.34	0.73	192	0.23	1.11
Flow (% p.a.)	2052	16.16	0.88	192	35.35	7.23
Total net assets (TNA, million US$)	2052	438.24	165.45	192	385.42	76.24
Systematic risk (% p.a.)	2052	3.08	2.54	192	3.06	2.48
Expense ratio (% p.a.)	2052	0.58	0.66	192	0.72	0.70
Front load (%)	2052	0.51	0.00	192	0.97	0.00
Rear load (%)	2052	0.35	0.00	192	0.25	0.00
Age (years)	2052	5.05	3.67	192	2.23	1.75
Tenure (years)	2052	4.44	3.50	192	2.30	1.80

Table 3 continued

	Duration only (1987–2014)			Beta only (2008–2014)		
	N	Mean	Median	*N*	Mean	Median
Turnover (% p.a.)	2052	111.36	120.00	192	149.90	149.38
Number of holdings	2052	257.42	195.00	192	218.06	174.00
Institutional class exists (Y/N)	2052	35.43	0.00	192	55.21	100.00
Institutional class (% of TNA)	2052	24.96	0.00	192	44.54	35.07
Retirement class exists (Y/N)	2052	6.48	0.00	192	4.69	0.00
Retirement class (% of TNA)	2052	0.89	0.00	192	1.65	0.00
Family TNA (billion US$)	2052	229.20	2.09	192	103.91	1.87
# of family funds	2052	91.42	10.00	192	59.70	7.00
# of family objectives	2052	9.35	5.00	192	5.80	3.00

This table shows pooled summary statistics of the semiannual window observations of fund and family characteristics used in our panel probit regressions in the period 1987–2014. Flow denotes the implied net flow over the previous 12 months. Alpha, systematic risk and R^2 are calculated from time-series regressions over the semiannual window using daily returns. All other variables are measured at the end of the semiannual window

with above 30% holdings in government bonds and equity combined. Their funds are larger than ours on average and in the median, they are older, much more expensive and have lower turnover. Goldstein et al. (2017) analyze corporate bond shareclasses. They select their sample of 1660 corporate bond funds (4679 shareclasses) in the period 1992–2014 from CRSP using different objective codes combined. Their shareclasses are older and more expensive than our funds, while the percentage of assets managed in institutional shareclasses is similar to ours. Thus, all four samples are very different from each other and hardly comparable, mainly due to different sample selection criteria. Overall, we believe that our sample has the highest hurdles of entry and thus is the purest sample of corporate bond funds of the four respective papers.

Determinants of corporate bond fund performance

To analyze what determines cross-sectional differences in the performance of funds, we use panel regressions with style- and time-fixed effects to explain fund performance in semiannual period $t + 1$. We chose as explanatory variables those fund and family characteristics shown to determine equity fund performance and survival in previous studies. We consider fixed effects via style-wise and date-wise demeaning (within transformation). This type of regression allows inferences on the effect of cross-sectional differences between the funds. We standardize all variables to mean zero and unit standard deviation. We two-dimensionally cluster standard errors by fund and date to control for heteroscedasticity, cross-sectional and serial correlation following Petersen (2009). Panel A of Table 4 follows Eq. (5).

$$\begin{aligned}\alpha_{i,t+1} = {} & \varphi_0 + \varphi_1\alpha_{i,t} + \varphi_2\text{Flow}_{i,t} + \varphi_3\text{LogRecDemTNA}_{i,t} \\ & + \varphi_4\text{LossSinceMaxTNA}_{i,t} + \varphi_5\text{SystematicRisk}_{i,t} \\ & + \varphi_6\text{ExpenseRatio}_{i,t} + \varphi_7\text{FrontLoad}_{i,t} \\ & + \varphi_8\text{RearLoad}_{i,t} + \varphi_9\text{LogAge}_{i,t} + \varphi_{10}\text{Tenure}_{i,t} \\ & + \varphi_{11}\text{Turnover}_{i,t} + \varphi_{12}\#\text{Holdings}_{i,t} \\ & + \varphi_{13}\text{Inst.Class\%TNA}_{i,t} + \varphi_{14}\text{RetireClass\%TNA}_{i,t} \\ & + \varphi_{15}\text{LogFam.TNA}_{i,t} + \varphi_{16}\#\text{Fam.Funds}_{i,t} \\ & + \varphi_{17}\#\text{Fam.Objectives}_{i,t} + \eta_{i,t+1}\end{aligned} \tag{5}$$

In Panel B of Table 4, we run piecewise panel regressions where the coefficient of performance may be different for Large (upper TNA tercile dummy in t), Medium (middle tercile) and Small (lower tercile) corporate bond funds. The regression follows Eq. (6) where $m = 2, \ldots, 17$ are the further fund and family characteristics.

$$\begin{aligned}\alpha_{i,t+1} = {} & \varphi_0 + \varphi_{1a}\alpha_{i,t} : \text{Large}_{i,t} + \varphi_{1b}\alpha_{i,t} : \\ & \text{Medium}_{i,t} + \varphi_{1c}\alpha_{i,t} : \text{Small}_{i,t} + \sum_{m=2}^{17}\varphi_m\text{Char}_{i,t}^m + \eta_{i,t+1}\end{aligned} \tag{6}$$

The results show insignificant coefficients for alpha independent of the funds size indicating no cross-sectional performance persistence. This is consistent with previous findings in equity funds as well as with findings in Natter et al. (2018) who show that, when controlling for the duration error, persistence in bond fund performance

Table 4 Panel regressions of future corporate bond fund performance

	Panel A: Linear regressions		Panel B: Piecewise linear in alpha	
	Net	Gross	Net	Gross
Alpha	0.0246	0.0247		
Alpha: large			0.0737	0.0704
Alpha: medium			− 0.0187	− 0.0180
Alpha: small			0.0336	0.0353
Flow	0.0267	0.0267	0.0238	0.0244
Log rec. dem. TNA	− 0.0080	− 0.0078	− 0.0150	− 0.0179
Loss since max TNA (%)	− 0.0596*	− 0.0603*	− 0.0609*	− 0.0618**
Systematic risk	− 0.2156***	− 0.2175***	− 0.2352***	− 0.2364***
Expense ratio	− 0.0750**	− 0.0758**	− 0.0751**	− 0.0760**
Front load	0.0377	0.0380	0.0347	0.0358
Rear load	0.0098	0.0099	0.0086	0.0071
Log Age	− 0.0082	− 0.0085	− 0.0086	− 0.0073
Tenure	0.0290	0.0293	0.0283	0.0284
Turnover	− 0.0148	− 0.0151	− 0.0154	− 0.0155
# of holdings	− 0.0125	− 0.0127	− 0.0104	− 0.0119
Institutional class	0.0296	0.0300	0.0286	0.0285
Retirement class	− 0.0075	− 0.0075	− 0.0081	− 0.0081
Log family TNA	0.0651	0.0654	0.0670	0.0672
# of family funds	0.0012	0.0011	− 0.0002	0.0008
# of family objectives	− 0.0640	− 0.0642	− 0.0620	− 0.0638
Style-fixed effects	Yes	Yes	Yes	Yes
Time-fixed effects	Yes	Yes	Yes	Yes
Within R^2	0.06	0.06	0.07	0.07
N	1942	1942	1942	1942

This table presents panel regressions for non-overlapping semiannual windows in the period 1987–2014 where the dependent variable is future MIM2 alpha and explained by fund and family variables. Style- and time-fixed effects are considered via style-wise and date-wise demeaned variables (within transformation). Large (Medium, Small) is a dummy which is one if the fund is in the upper (middle, lower) size tercile in month $t-1$, and zero otherwise. All variables except dummies are standardized to mean zero and unit standard deviation. Standard errors are two-dimensionally clustered by fund and date to control for heteroscedasticity, cross-sectional and serial correlation (e.g., Petersen 2009). ***, **, *Indicate two-sided statistical significance on 1, 5, and 10% level, respectively

reduces dramatically. However, the coefficients on the variable "Loss since maximum TNA" are negative and significant, which we interpret as evidence for long-term persistence in underperformance (e.g., Carhart 1997) or of a deteriorating effect of high long-term outflows on performance. Other than that, the effect of flow on future performance is insignificant. This is in contrast to the literature on flow risk in equity funds (e.g., Edelen 1999; Rakowski 2010; Rohleder et al. 2017, 2018) where flow may lead to negative subsequent performance due to liquidity constraints.

All coefficients on Log recursive demeaned TNA (e.g., Pástor et al. 2015) are insignificant indicating that corporate bond funds do not suffer from diseconomies of scale, which is in contrast to previous findings for equity funds (e.g., Chen et al. 2004). However, it is consistent with large corporate bond funds having no disadvantage in trading due to the specific structure of the corporate bond market. Higher systematic risk decreases alpha. This is consistent with expectation that alpha is not a risk-normalized measure of performance as it levers the benchmark to the risk of the fund. Given that the average alpha is negative, a fund with a higher systematic risk thus automatically has a lower alpha due to the higher leverage. A higher expense ratio decreases the fund's net performance as expected. However, also gross performance decreases with a higher expense ratio, which could indicate that funds with higher management expenses work less efficiently overall.[7] Apart from these findings, none of the further fund and family[8] characteristics are significant drivers of corporate bond fund performance, in contrast to previous findings in equity funds.

Survival and disappearance of corporate bond funds

Probit regressions of disappearance

The ultimate success for a mutual fund is to survive. To determine which factors drive the survival and disappearance of corporate bond funds, we run panel probit regressions with style- and time-fixed effects similar to Eq. (3) in Panel A of Table 5 and Eq. (4) in Panel B on the binary-dependent variable $\text{Disap}_{i,t+1}$ which is either survival $\{0\}$ or disappearance $\{1\}$ in the next month. From previous findings in equity funds, we expect that one of the main drivers of corporate bond fund disappearance is performance (e.g., Brown et al. 1992; Elton et al. 1996; Carhart et al. 2002; Rohleder et al. 2011). Consistent with this intuition, the coefficients in Panel A are negative and statistically significant, indicating the tendency of higher alpha to reduce the probability of disappearance (PD). To assess the economic relevance of the main fund characteristics on corporate bond fund disappearance, Fig. 1 displays the nonlinear relations between PD and percentiles of the respective variables assuming all other variables are constant at their mean. Supporting the high economic relevance of performance on PD, Plot A thus shows that PD is a steeply decreasing function of a fund's performance with an almost 80% PD for the worst performing funds and an almost zero PD for the best performing funds.

In a further step, we dig deeper into the relation between performance and PD as Rohleder et al. (2011) show that there is a stronger effect of performance on the PD of small equity funds. The coefficients on the three size group-specific performance variables in Panel B clearly indicate that the overall effect is primarily due to small funds, while large and medium funds show no significant relations. Plot A1 in Fig. 1 supports this interpretation because PD is an almost flat function at zero for large funds. Plots A2 and A3 show that PD of median-sized funds drops from around 25% for the worst performing funds to below 10% for median performing funds and that PD of small funds drops from almost 50% for the worst performing funds to below 10% at the median performance, respectively. This is in line with the intuition that funds keep large funds alive even if their performance is inferior to maintain the fee revenues, which are typically a function of size and not of performance.

The variable with the absolute highest standardized coefficient is Log TNA. The large and significantly negative coefficients indicate that larger funds have a much lower PD consistent with the findings for the performance of large funds. Moreover, Plot C of Fig. 1 shows that PD decreases very steeply from around 28% for the smallest funds to less than 5% for medium funds before becoming zero for the largest funds. Thus, size clearly has a very high economic relevance for the survival and disappearance of corporate bond funds. This is consistent with maintaining the fee revenue potential of large funds as well as with the potentially very high administrational effort of closing large funds.[9]

Another variable related to performance and size is the loss of size since the fund reached its maximum TNA during our sample period. A high percentage loss has a positive and statistically significant effect on PD. Hence, if a fund was once large and then lost a high percentage of its TNA, through underperformance and outflow, the fund disappears because it is not attractive anymore to investors and to the fund family. Plot D of Fig. 1 shows the economic importance of the factor, which displays a rising function of the percentage loss with a PD of around 10% for the funds with the highest loss since maximum TNA. Other than that, the flow of the fund has no impact on PD, also indicated by a flat function in Plot B.

7 To explore if these findings are robust to the choice of performance model and to the inclusion of funds for which we identify the duration matched benchmark index using beta, we replicate Table 4 three times. First, we use the Elton et al. (1995) model described in Eq. (3); second, we use the Fama and French (1993) model described in Eq. (4); and finally, we use the "Duration only" sample described in Panel B of Table 3. All of the replications lead to economically unchanged results. Thus, our main results are not driven by the choice of performance model or by the duration matching approach. The results to these tests are available upon request.

8 To explore the possibility that, despite insignificant coefficients on the family control variables, the main results could be driven by specific families, we run additional tests by family-wise excluding the funds of the 10 largest families from the regressions. This way, we can analyze if there is for example a "Black Rock effect" (BLK is the largest family in our sample with 9 funds). However, Wald tests for equality of the coefficients from the regressions with and without the respective families cannot reject the null hypothesis that the pairwise differences between all common coefficients are jointly zero for all 10 families. We therefore conclude that our main findings are not driven by specific families. The results to this test are available upon request.

9 Similar to the tests described in Footnote 7, we replicate Table 5 using, first, the Elton et al. (1995) model described in Eq. (3), second, the Fama and French (1993) model described in Eq. (4), and third, the "Duration only" sample described in Panel B of Table 3. All of the replications lead to economically unchanged results. The results to these tests are available upon request.

Table 5 Panel probit regressions of future corporate bond fund disappearance

	Panel A: Linear regressions		Panel B: Piecewise linear in alpha	
	Net	Gross	Net	Gross
Alpha	− 0.1081*	− 0.1081*		
Alpha: large			0.0747	0.0595
Alpha: medium			− 0.0432	− 0.0385
Alpha: small			− 0.1187**	− 0.1193**
Flow	− 0.1368	− 0.1368	− 0.1294	− 0.1273
Log TNA	− 0.3062***	− 0.3063***	− 0.2956***	− 0.3074***
Loss since max TNA (%)	0.1907***	0.1907***	0.1877***	0.1887***
Systematic risk	− 0.0933	− 0.0933	− 0.0672	− 0.0653
Expense ratio	− 0.0434	− 0.0432	− 0.0637	− 0.0617
Front load	− 0.0119	− 0.0119	− 0.0229	− 0.0223
Rear load	0.0581	0.0580	0.0675	0.0660
Log age	− 0.0835	− 0.0835	− 0.0657	− 0.0647
Tenure	− 0.0235	− 0.0235	− 0.0326	− 0.0319
Turnover	0.0527	0.0526	0.0500	0.0495
# of holdings	0.0909	0.0908	0.0814	0.0817
Institutional class	0.0126	0.0127	0.0228	0.0222
Retirement class	− 0.0047	− 0.0046	0.0038	0.0041
Log family TNA	0.0811	0.0804	0.0903	0.0888
# of family funds	0.0849	0.0844	0.0769	0.0816
# of family objectives	− 0.1760	− 0.1748	− 0.1732	− 0.1781
Style-fixed effects	Yes	Yes	Yes	Yes
Time-fixed effects	Yes	Yes	Yes	Yes
Pseudo R^2	0.12	0.12	0.13	0.13
N	2244	2244	2244	2244

This table presents panel probit regressions for non-overlapping semiannual windows in the period 1987–2014 where the binomial dependent variable $\text{Disap}_{i,t+1}$ is survival {0} or disappearance {1} in the next month and explained by fund and family variables. Style- and time-fixed effects are considered via style-wise and date-wise demeaned variables (within transformation). Large (Medium, Small) is a dummy which is one if the fund is in the upper (middle, lower) size tercile in month $t-1$, and zero otherwise. All variables except the dependent dummy variable are standardized to mean zero and unit standard deviation. Standard errors are two-dimensionally clustered by fund and date to control for heteroscedasticity, cross-sectional and serial correlation (e.g., Petersen 2009). ***, **, *Indicate two-sided statistical significance on 1, 5, and 10% level, respectively. Pseudo R^2 denotes MacFadden's measure

Further fund and family[10] characteristics seem to have no impact on corporate bond fund PD as indicated by insignificant coefficients. This is especially remarkable in the case of the expense ratio, which increases the PD of equity funds according to, e.g., Brown and Goetzmann (1995) and Rohleder et al. (2011).

[10] Similar to Footnote 8, we apply Wald tests for equality between the coefficients from regressions with and without the funds of the 10 largest families in our dataset. These cannot reject the null hypothesis that the differences between all coefficients are jointly zero. The results to this test are available upon request.

Considering different exit forms

In the previous section, we treat all fund disappearances as equal without distinguishing liquidation or merger. However, the economic relations of the different exit forms may be different. Rohleder et al. (2011) show that the performance of liquidated equity funds prior to disappearance shows different patterns compared to merged funds. Zhao (2005) shows that for the combined sample of equity, bond and hybrid funds the drivers of liquidation are different to those for merger.

To get a first impression of the different exit forms in corporate bond funds, Table 6 shows by-year summary statistics of size and returns of all funds and for the subgroups of disappeared, liquidated, merged and acquiring

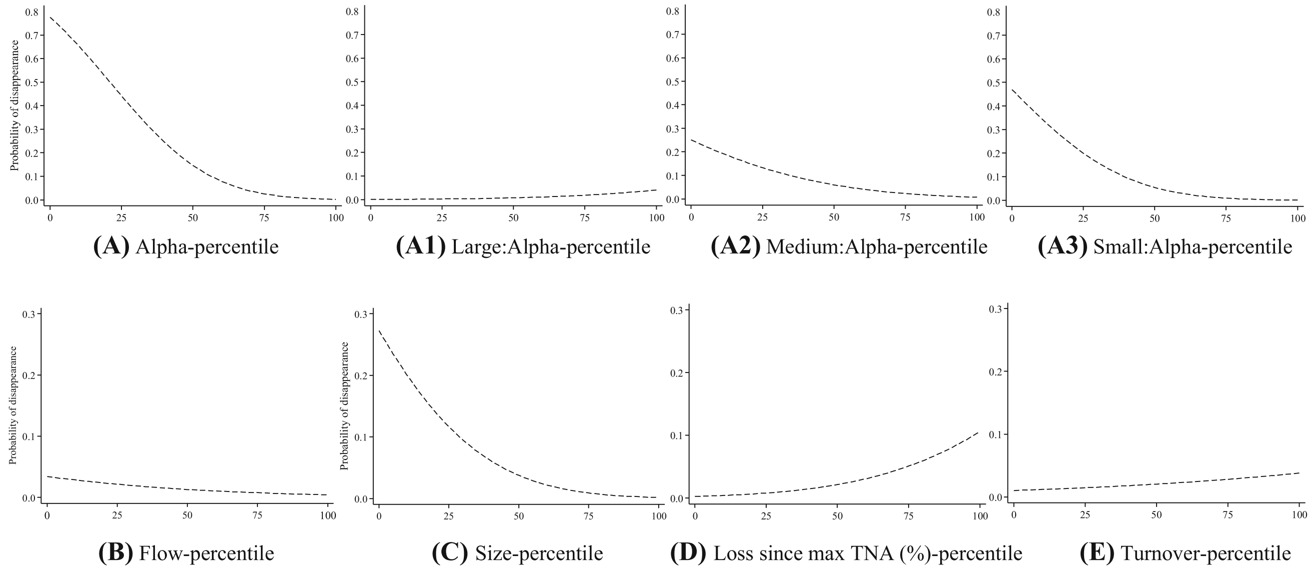

Fig. 1 Probability of disappearance for percentiles of explanatory variables. This figure plots probabilities of disappearance for corporate bond funds in the period 1987–2014 as functions of fund characteristic percentiles. All other variables are held at the mean. The relations are calculated from the panel probit models reported in Table 5. Plots A, B, C, D, E, and F are based on the probit regression in column two, plots A1, A2, A3 are from column six, and plots B1, B2, B3 are from column 10

funds. Over the entire sample period, 26 of the 85 disappeared funds are liquidated, while the majority of 59 funds are merged. Over the years, there is one major disappearance wave from 2000 to 2002, coinciding with the recession following the dotcom bubble burst in 2000. Another peak is in 2013, coinciding with the public debt crisis in the aftermath of the financial crisis of 2008. Disappeared funds are distinctively smaller than the average ("all") fund, consistent with our previous finding that size is a major driver of disappearance. Liquidated funds are exceptionally small on average compared to merged funds, indicating that the latter are more attractive to acquiring funds due to their higher fee revenue potential. Acquiring funds are larger than all funds on average and larger than the funds they acquire in all but one year (1998).

Looking at returns, calculated as annualized mean excess return over the previous 12 months, disappeared funds show distinctively lower performance on average than all funds, consistent with the results in Table 5. Liquidated funds outperform merged funds. Acquiring funds show higher returns than disappeared funds; however, their returns are below those of "all" funds. This may indicate that these acquiring funds are currently not able to attract flows with superior returns and must therefore acquire smaller, unsuccessful funds to sustain growth. Overall, these statistics show that we should consider the differences between liquidation and merger in an econometrically consistent way.

Therefore, we run multinomial panel probit regressions similar to Eqs. (5) and (6) where the multinomial dependent variable $\text{Disap}^{\text{multi}}_{i,t+1}$ is merger {1}, survival {0} or liquidation {− 1} in the next month (e.g., Zhao 2005).[11] Table 7 shows that the results are largely in line with those in Table 5. However, some of the fund characteristics have different effects on the probability of liquidation (PL) and merger (PM) of corporate bond funds. Specifically, higher flows significantly reduce PL, especially of small funds, while having no effect on PM. Higher systematic risk decreases PM while having no effect on PL. Older funds have a significantly lower PL while the effect of age on PM is insignificant. Turnover only has an increasing effect on PM, while there is no significant effect on PL. Finally, the higher number of holdings significantly increases PL but not PM.

Overall, the findings in this sub-section suggest that the econometric distinction between different exit forms for corporate bond funds, i.e., merger and liquidation, yields only marginal additional information compared to the combined treatment in Table 5. This is because with respect to the most influential characteristics, size and performance, the results in all probit regression setups are qualitatively the same.

[11] Alternative ordinal panel probit models explaining the ordinal dependent variable $\text{Disap}^{\text{ordinal}}_{i,t+1}$ is survival {0}, merger {1} or liquidation {2} in the next month lead to similar results as in Table 5. They are available upon request.

Table 6 Statistics on fund disappearances, size and performance

Year	All			Disappeared			Liquidated			Merged			Acquiring		
	N	Size	MER	N	Size	MER	N	Size	MER	N	Size	MER	N	Size	MER
01/1987	15	250.41													
1987	18	262.40													
1988	20	250.87	2.04												
1989	22	253.27	0.73												
1990	23	192.80	− 13.60												
1991	27	165.30	4.93												
1992	35	183.16	16.39												
1993	39	231.48	10.50												
1994	54	223.57	1.17												
1995	66	204.86	1.28												
1996	78	239.16	5.88												
1997	84	300.36	5.48												
1998	87	350.43	2.77	1	212.84	8.06				1	212.84	8.06	1	142.79	5.29
1999	86	335.15	− 3.72												
2000	86	281.06	− 4.94	18	49.19	− 2.54	6	17.20	− 2.38	12	65.19	− 2.62	8	836.57	− 1.31
2001	70	349.64	− 3.58	19	46.52	− 10.68	3	22.42	− 4.57	16	51.04	− 11.90	9	280.96	− 0.75
2002	51	393.02	− 1.89	9	80.12	− 0.17	5	22.96	2.35	4	151.56	− 3.34	4	1152.29	− 2.54
2003	43	505.90	7.66	3	150.73	2.83				3	150.73	2.83	3	376.45	5.35
2004	41	566.32	9.27	6	177.84	8.09				6	177.84	8.09	6	1861.78	8.81
2005	38	598.15	3.86	4	145.12	2.79	1	27.10	− 1.09	3	184.46	4.08	3	322.32	3.94
2006	36	550.05	0.85	2	230.70	− 2.75				2	230.70	− 2.75	2	1179.23	− 2.16
2007	40	515.84	2.23	1	172.28	4.95				1	172.28	4.95	1	2802.02	6.06
2008	102	352.61	− 7.57												
2009	113	417.54	6.96												
2010	139	535.02	21.42	1	29.74	22.67				1	29.74	22.67	1	47.93	22.20
2011	161	580.39	8.62	3	35.97	5.73	2	35.97	5.73	1			1		
2012	197	653.76	6.86	4	197.00	11.39	1	4.04	17.58	3	261.33	9.32	3	1147.73	8.85
2013	227	692.19	6.85	10	89.30	5.34	5	35.89	1.39	5	132.02	8.51	5	385.70	9.34
2014	252	743.64	4.98	4	39.14	3.93	3	38.61	4.38	1	40.73	2.57	1	67.90	2.84
Total	333			85			26			59			45		
Average		479.30	4.81		88.42	− 0.32		25.49	1.03		114.46	− 0.89		744.85	2.55

This table shows the number, size and performance of funds grouped by year into all, disappeared, liquidated, merged and acquiring funds in the period 1987–2014. Size is denoted as total net assets (TNA) in million US$. Performance is the mean monthly net excess return (MER) over the last 12 months and denoted in % p.a

Conclusion

What are the factors determining success and failure on the corporate bond fund market and how are they different from what we know for equity funds? This paper answers these questions by providing the first broad overview of the determinants of success and failure on the corporate bond fund market in terms of performance and survival. Overall, we find some similarities but also important differences between the economic relations on both markets and thus provide important new insights into the structure of the growingly important corporate bond fund market. Specifically, our findings show that the most important determinants of survival are size and performance. However, performance is only important for small funds and unimportant for large funds. Corporate bond funds display no performance persistence as in similar studies for equity funds. However, corporate bond funds face no relevant diseconomies of scale sharply contrasting similar analyses in equity funds. This is due to the underlying corporate bond market structure, which is quite different to the stock market as it favors larger trades over smaller trades and

Table 7 Multinomial panel probit regressions of corporate bond fund disappearance

	Panel A. Linear regressions				Panel B. Piecewise linear in alpha			
	Net		Gross		Net		Gross	
	Merger	Liquidation	Merger	Liquidation	Merger	Liquidation	Merger	Liquidation
Alpha	− 0.1170*	− 0.2117**	− 0.1167*	− 0.2114**				
Alpha: large					0.0675	0.0184	0.0502	− 0.0514
Alpha: medium					− 0.1265**	0.2143	− 0.1147**	0.2005
Alpha: small					− 0.0673**	− 0.2111***	− 0.0823**	− 0.2083**
Flow	− 0.0012	− 0.4795**	− 0.0013	− 0.4794**	− 0.0082	− 0.4508**	− 0.0053	− 0.4471**
Log TNA	− 0.0988	− 0.8262***	− 0.0989	− 0.8262***	− 0.0997	− 0.7899***	− 0.1090	− 0.8174***
Loss since max TNA	0.1812*	0.3697***	0.1813*	0.3697***	0.1803	0.3736***	0.1805*	0.3755***
Systematic risk	− 0.1384*	− 0.1555	− 0.1381*	− 0.1552	− 0.1608**	− 0.0327	− 0.1507*	− 0.0372
Expense ratio	− 0.1454	0.1041	− 0.1451	0.1043	− 0.1573	0.0519	− 0.1583	0.0638
Front load	0.0124	− 0.0899	0.0122	− 0.0898	0.0116	− 0.1288	0.0116	− 0.1263
Rear load	0.1360	− 0.0274	0.1359	− 0.0275	0.1324	0.0398	0.1329	0.0248
Log Age	0.1682	− 0.6886**	0.1681	− 0.6884**	0.1735	− 0.6385**	0.1760	− 0.6394**
Tenure	− 0.1418	0.1878	− 0.1419	0.1879	− 0.1511	0.1739	− 0.1511	0.1781
Turnover	0.1126**	− 0.0317	0.1125**	− 0.0317	0.1076*	− 0.0389	0.1085**	− 0.0415
# of holdings	0.0457	0.1961	0.0456	0.1959	0.0441	0.1779	0.0425	0.1839
Institutional class	0.0274	0.0228	0.0274	0.0228	0.0343	0.0401	0.0335	0.0403
Retirement class	− 0.0588	0.0905	− 0.0588	0.0906	− 0.0572	0.1102*	− 0.0561	0.1076*
Log family TNA	0.0437	0.0969	0.0429	0.0957	0.0426	0.0891	0.0441	0.0837
# of family funds	0.0809	0.2315	0.0805	0.2304	0.0678	0.1742	0.0724	0.1891
# of family objectives	− 0.1671	− 0.4862	− 0.1659	− 0.4838	− 0.1549	− 0.3989	− 0.1607	− 0.4146
Style-fixed effects	Yes		Yes		Yes		Yes	
Time-fixed effects	Yes		Yes		Yes		Yes	
Pseudo R^2	0.03		0.03		0.03		0.03	
N	2244		2244		2244		2244	

This table presents multinomial panel probit regressions for non-overlapping semiannual windows in the period 1987–2014 where the multinomial dependent variable $\text{Disap}_{i,t+1}^{\text{multi}}$ is liquidation {− 1}, survival {0} or merger {1} in the next month and explained by fund and family variables. Style- and time-fixed effects are considered via style-wise and date-wise demeaned variables (within transformation). Large (Medium, Small) is a dummy which is one if the fund is in the upper (middle, lower) size tercile in month $t-1$, and zero otherwise. All variables except the dependent multinomial variable are standardized to mean zero and unit standard deviation. Standard errors are two-dimensionally clustered by fund and date to control for heteroscedasticity, cross-sectional and serial correlation (e.g., Petersen 2009). ***, **, * indicate two-sided statistical significance on 1, 5%, and 10 level, respectively. Pseudo R^2 denotes MacFadden's measure

thus allows economies of scale in transaction costs. These results are robust to various specifications including different performance models, the application of different benchmark index identification approaches and tests for the influence of specific fund families.

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