Online Appendix to "Institutional Herding and Its Price Impact: Evidence from the Corporate Bond Market"

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[2] "Fallen angels" are defined as bonds that are downgraded from investment-grade to non-investment grade in the most recent two quarters.

1 Supplementary summary statistics

Table I: **Summary statistics of an average investor, by time period**

This table provides summary statistics for corporate bond holdings of an average eMAXX institutional investor, broken down into three time intervals (1998:Q3–2006:Q4, 2007:Q1–2010:Q4, and 2011:Q1–2014:Q3) and three types (insurance company, mutual fund, and pension fund). In the "Holding" columns, we average total dollar values and numbers of corporate bonds across all funds and all quarters in each subperiod. In the "Quarterly trading" columns, we define a fund as a buyer (seller) of bond i in quarter t if its holdings of bond i increase (decrease) from the end of quarter $t-1$ to the end of quarter t. (Note that when a fund first purchases a certain bond, it has no holding of that bond in the previous quarter, and when a fund liquidates its position in a certain bond, it sometimes does not have a "zero" holding of that bond in the next quarter. We take these special cases into consideration and include all "initial buying" and "liquidating selling" in our calculation.) Therefore, for each fund in each quarter, we can count the number of bonds sold and bought by that fund. We then average the number of trading across all funds and all quarters in each subperiod. In the "Percentage of portfolio traded" columns, we define $Sales_{i,t} = \sum_j Amount\_Sold_{i,j,t} / \sum_j Amount\_Held_{i,j,t-1} \times 100$ and $Purchase_{i,t} = \sum_j Amount\_Bought_{i,j,t} / \sum_j Amount\_Held_{i,j,t-1} \times 100$, where $Amount\_Sold(Bought)_{i,j,t}$ is the net par amount of bond j sold (bought) by fund i in quarter t, and $Amount\_Held_{i,j,t-1}$ is the par amount of bond j held by fund i at the end of quarter $t-1$. We then average the percentage of traded portfolio across all funds and all quarters in each subperiod. Bonds that are issued or maturing within one year are excluded from this table.

Type of investors	Period	Holding		Quarterly trading		Percentage of portfolio traded	
		Holding amount (in million $)	Number of bonds held	Number of sales	Number of purchases	Sales (in percent)	Purchase (in percent)
All	1998-2006	265	75	8	5	12	14
	2007-2010	301	94	10	8	11	16
	2011-2014	412	135	13	9	11	14
Insurance company	1998-2006	323	83	7	5	9	12
	2007-2010	347	90	7	4	8	12
	2011-2014	451	121	8	5	8	11
Mutual fund	1998-2006	175	59	9	6	16	18
	2007-2010	269	96	15	14	16	22
	2011-2014	410	151	22	17	16	21
Pension fund	1998-2006	188	76	9	7	14	15
	2007-2010	154	111	15	10	13	17
	2011-2014	190	167	20	10	13	15

Table II: **Summary statistics of an average corporate bond, by time period**

This table provides summary statistics for an average corporate bond held by eMAXX investors, broken down into three time intervals (1998:Q3–2006:Q4, 2007:Q1–2010:Q4, and 2011:Q1–2014:Q3) and two risk levels (investment-grade and high-yield). Bonds that are issued or maturing within one year are excluded from this table. Bonds with fewer than 5 trades in a given quarter are also excluded. In the "Bond characteristics" columns, we average amount outstanding (in million $), bond age, and time-to-maturity across all bonds and all quarters in each subperiod. In the "Holding information" columns, for each bond in each quarter, we count the number of eMAXX investors that have nonzero holdings of the bond and aggregate holdings across all of these investors. Then we take averages across all bonds and all quarters in each subperiod. In the "Quarterly trades" columns, we define a fund as a buyer (seller) of bond i in quarter t if its holdings of bond i increase (decrease) from the end of quarter $t-1$ to the end of quarter t. (Note that when a fund first purchases a certain bond, it has no holding of that bond in the previous quarter, and when a fund liquidates its position in a certain bond, it sometimes does not have a "zero" holding of that bond in the next quarter. We take these special cases into consideration and include all "initial buying" and "liquidating selling" in our calculation.) Therefore, for each bond in each quarter, we can count the number of institutions that sell and buy that bond. We then average the number of sellers and buyers across all bonds and all quarters in each subperiod.

		Bond characteristics			Holding information		Quarterly trades	
Type of bonds	Period	Outstanding amount (in million $)	Years from issuance	Years to maturity	Number of investors	Amount held by eMaxx investors (in million $)	Number of investors who sell	Number of investors who buy
All	1998-2006	397	4	9	54	167	9	7
	2007-2010	631	5	8	75	215	12	9
	2011-2014	662	4	9	89	245	13	9
Investment-grade	1998-2006	463	4	10	66	227	8	7
	2007-2010	756	5	10	92	276	11	10
	2011-2014	736	5	10	107	301	12	9
High-yield	1998-2006	308	4	7	50	118	11	8
	2007-2010	443	4	7	64	158	16	11
	2011-2014	545	4	6	70	180	16	10

2 Supplementary herding measures

Table III: **Levels of herding in corporate bonds by managing firms**

This table reports managing firm-level mean herding measures of corporate bond institutional investors over the sample period 1998:Q3–2014:Q3, excluding bonds that are issued or maturing within a year. One managing firm generally manages multiple funds, while it is possible that one fund is co-managed by several firms.The herding measure $HM_{i,t}$ for a given bond-quarter is defined as $HM_{i,t} = |p_{i,t} - \mathrm{E}[p_{i,t}]| - \mathrm{E}|p_{i,t} - \mathrm{E}[p_{i,t}]|$, where $p_{i,t}$ is the proportion of firms trading bond i during quarter t that are buyers. The proxy used for $\mathrm{E}[p_{i,t}]$ is the proportion of all bond trades by firms during quarter t that are buys. $\mathrm{E}|p_{i,t} - \mathrm{E}[p_{i,t}]|$ is calculated under the null hypothesis that firms trade bonds independently and randomly. The buy herding measure $BHM_{i,t}$ is calculated for bonds with a higher proportion of buyers than the average and is defined as $BHM_{i,t} = HM_{i,t}|p_{i,t} > \mathrm{E}[p_{i,t}]$. Similarly, the sell herding measure $SHM_{i,t}$ is calculated for bonds with a higher proportion of sellers than the average and is defined as $SHM_{i,t} = HM_{i,t}|p_{i,t} < \mathrm{E}[p_{i,t}]$. Column (1) of this table presents the mean of $HM_{i,t}$, $BHM_{i,t}$, and $SHM_{i,t}$, averaged across all bond-quarters traded by the number of firms indicated by the row heading, and Column (2) reports the number of bond-quarters that are included in the calculation. This table also reports mean herding measures for each subgroup of managing firms, with $HM_{i,t}$, $BHM_{i,t}$, and $SHM_{i,t}$ all recalculated within each subgroup. We also compute the difference between the mean of $BHM_{i,t}$ and $SHM_{i,t}$ and report the significance of it being different from zero. ***, **, and * indicate significance at the 1%, 5%, and 10% level, respectively.

Number of active trades	Herding measures	All managing firms		Banks		Insurance groups		Investment managers	
		(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
≥ 5	HM	8.27***	(260, 734)	4.91***	(38, 666)	8.88***	(77, 712)	7.31***	(169, 554)
	BHM	7.16***	(136, 499)	4.78***	(19, 161)	8.09***	(41, 259)	6.72***	(86, 312)
	SHM	9.23***	(124, 235)	4.78***	(19, 498)	9.19***	(36, 453)	7.72***	(83, 242)
	BHM-SHM	−2.07***		0.00		−1.10***		−1.00***	
≥ 10	HM	8.26***	(151, 322)	5.27***	(6, 197)	12.22***	(17, 666)	7.23***	(86, 835)
	BHM	7.13***	(82, 152)	4.54***	(3, 085)	9.46***	(8, 482)	6.52***	(45, 631)
	SHM	9.47***	(69, 170)	5.81***	(3, 112)	14.58***	(9, 184)	7.89***	(41, 204)
	BHM-SHM	−2.34***		1.27***		−5.12***		−1.38***	
≥ 20	HM	8.39***	(65, 258)	6.08***	(221)	18.04***	(1, 964)	7.68***	(27, 978)
	BHM	7.00***	(36, 114)	7.68***	(75)	13.93***	(719)	6.51***	(14, 708)
	SHM	10.05***	(29, 144)	5.34***	(146)	20.33***	(1, 245)	8.94***	(13, 270)
	BHM-SHM	−3.05***		2.34		−6.40***		−2.43***	

Table IV: **Levels of herding in industry sectors**

This table reports sector-level mean herding measures of corporate bond institutional investors over the sample period 1998:Q3–2014:Q3, excluding bonds that are issued or maturing within a year. Using "sector codes" provided by eMAXX, we group corporate bonds into 96 sectors, including 10 financial sectors, 49 industrial sectors, 20 service sectors, 8 transportation sectors, 6 utility sectors, 1 telephone sector, 1 structured finance sector, and 1 supranational sector. Each sector is treated as an individual "bond" in a given quarter and the same calculation of herding measure is applied to them. The herding measure $HM_{i,t}$ for a given sector-quarter is defined as $HM_{i,t} = |p_{i,t} - \mathrm{E}[p_{i,t}]| - \mathrm{E}|p_{i,t} - \mathrm{E}[p_{i,t}]|$, where $p_{i,t}$ is the proportion of funds trading sector i during quarter t that are buyers. The proxy used for $\mathrm{E}[p_{i,t}]$ is the proportion of all trades by funds during quarter t that are buys. $\mathrm{E}|p_{i,t} - \mathrm{E}[p_{i,t}]|$ is calculated under the null hypothesis that funds trade sectors independently. The buy herding measure $BHM_{i,t}$ is calculated for sectors with a higher proportion of buyers than the average and is defined as $BHM_{i,t} = HM_{i,t}|p_{i,t} > \mathrm{E}[p_{i,t}]$. Similarly, the sell herding measure $SHM_{i,t}$ is calculated for sectors with a higher proportion of sellers than the average and is defined as $SHM_{i,t} = HM_{i,t}|p_{i,t} < \mathrm{E}[p_{i,t}]$. Column (1) of this table presents the mean of $HM_{i,t}$, $BHM_{i,t}$, and $SHM_{i,t}$, averaged across all sector-quarters traded by the number of funds indicated by the row heading, and Column (2) reports the number of sector-quarters that are included in the calculation. This table also reports mean sector-level herding measures for each subgroup of investors, with $HM_{i,t}$, $BHM_{i,t}$, and $SHM_{i,t}$ all recalculated within each subgroup. We also compute the difference between the mean of $BHM_{i,t}$ and $SHM_{i,t}$ and report the significance of it being different from zero. ***, **, and * indicate significance at the 1%, 5%, and 10% level, respectively.

Number of	Herding	All eMAXX investors		Mutual funds		Pension funds		Insurance companies	
active trades	measures	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
≥ 50	HM	5.40***	(4,655)	4.25***	(3,914)	3.14***	(2,702)	7.08***	(3,876)
	BHM	4.49***	(2,472)	3.70***	(1,924)	2.93***	(1,310)	6.41***	(2,153)
	SHM	6.42***	(2,183)	4.78***	(1,990)	3.34***	(1,392)	7.92***	(1,723)
	BHM-SHM	−1.93***		−1.07***		−0.41**		−1.51***	
≥ 100	HM	5.10***	(4,098)	4.09***	(3,280)	2.99***	(1,929)	6.68***	(3,198)
	BHM	4.25***	(2,209)	3.54***	(1,624)	2.69***	(952)	6.06***	(1,814)
	SHM	6.08***	(1,889)	4.62***	(1,656)	3.30***	(977)	7.50***	(1,384)
	BHM-SHM	−1.83***		−1.07***		−0.61***		−1.44***	
≥ 200	HM	4.86***	(3,521)	3.86***	(2,462)	2.81***	(1,115)	6.46***	(2,390)
	BHM	4.08***	(1,930)	3.35***	(1,241)	2.69***	(605)	5.78***	(1,377)
	SHM	5.80***	(1,591)	4.38***	(1,221)	2.94***	(510)	7.38***	(1,013)
	BHM-SHM	−1.72***		−1.02***		−0.25		−1.60***	

3 Excluding "fallen angels"

Table V: **Herding measures of corporate bond investors, excluding "fallen angels"**

This table reports mean herding measures of corporate bond institutional investors over the sample period 1998:Q3–2014:Q3, excluding bonds that are issued or maturing within a year. Bonds that are downgraded from investment-grade to non-investment grade (i.e. "fallen angels") in the current quarter or the previous quarter are excluded. The herding measure $HM_{i,t}$ for a given bond-quarter is defined as $HM_{i,t} = |p_{i,t} - \mathrm{E}[p_{i,t}]| - \mathrm{E}|p_{i,t} - \mathrm{E}[p_{i,t}]|$, where $p_{i,t}$ is the proportion of funds trading bond i during quarter t that are buyers. The proxy used for $\mathrm{E}[p_{i,t}]$ is the proportion of all bond trades by institutional investors during quarter t that are buys. $\mathrm{E}|p_{i,t} - \mathrm{E}[p_{i,t}]|$ is calculated under the null hypothesis that funds trade bonds independently and randomly. The buy herding measure $BHM_{i,t}$ is calculated for bonds with a higher proportion of buyers than the average and is defined as $BHM_{i,t} = HM_{i,t}|p_{i,t} > \mathrm{E}[p_{i,t}]$. Similarly, the sell herding measure $SHM_{i,t}$ is calculated for bonds with a higher proportion of sellers than the average and is defined as $SHM_{i,t} = HM_{i,t}|p_{i,t} < \mathrm{E}[p_{i,t}]$. Column (1) of this table presents the mean of $HM_{i,t}$, $BHM_{i,t}$, and $SHM_{i,t}$, averaged across all bond-quarters traded by the number of funds indicated by the row heading, and Column (2) reports the number of bond-quarters that are included in the calculation. This table also reports mean herding measures for each subgroup of investors, with $HM_{i,t}$, $BHM_{i,t}$, and $SHM_{i,t}$ all recalculated within each subgroup. We also compute the difference between the mean of $BHM_{i,t}$ and $SHM_{i,t}$ and report the significance of it being different from zero. ***, **, and * indicate significance at the 1%, 5%, and 10% level, respectively.

Number of	Herding	All eMAXX investors		Mutual funds		Pension funds		Insurance companies	
active trades	measures	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
≥ 5	HM	10.99***	(247,004)	9.51***	(137,100)	8.51***	(49,198)	13.12***	(136,229)
	BHM	9.81***	(133,987)	8.40***	(75,281)	9.05***	(23,996)	13.39***	(72,543)
	SHM	12.05***	(113,017)	10.57***	(61,819)	7.65***	(25,201)	12.32***	(63,685)
	BHM-SHM	−2.24***		−2.18***		1.40***		1.07***	
≥ 10	HM	11.27***	(153,516)	9.84***	(75,849)	9.24***	(16,795)	15.10***	(56,962)
	BHM	9.91***	(87,371)	8.52***	(43,033)	9.39***	(8,230)	14.33***	(29,864)
	SHM	12.89***	(66,145)	11.40***	(32,816)	8.94***	(8,565)	15.72***	(27,098)
	BHM-SHM	−2.97***		−2.88***		0.44 * *		−1.39***	
≥ 20	HM	11.54***	(77,620)	10.71***	(29,454)	10.18***	(3,110)	17.99***	(16,205)
	BHM	9.80***	(44,751)	8.48***	(16,366)	9.52***	(1,551)	15.96***	(7,835)
	SHM	13.82***	(32,869)	13.43***	(13,088)	10.77***	(1,559)	19.81***	(8,370)
	BHM-SHM	−4.02***		−4.94***		−1.25***		−3.85***	
≥ 30	HM	11.95***	(44,140)	11.94***	(13,915)	11.43***	(804)	20.94***	(6,310)
	BHM	9.81***	(25,280)	8.73***	(7,452)	9.84***	(408)	18.74***	(2,753)
	SHM	14.76***	(18,860)	15.58***	(6,463)	12.97***	(396)	22.59***	(3,557)
	BHM-SHM	−4.95***		−6.85***		−3.13***		−3.85***	

Table VI: **Price impact of herding, excluding "fallen angels"**

This table reports quarterly abnormal returns (in percent) on portfolios constructed based on bonds' herding measures, for four quarters before the portfolio formation quarter t and six quarters after. Bonds' quarterly abnormal return is computed as the raw return subtracted by the size-weighted average return of the pool of bonds that share similar credit ratings, industry sectors, and time to maturity. In each quarter, bonds bought with higher intensity than the market average are sorted into quintiles "B1" to "B5," with "B5" representing the group of bonds with the highest buy herding measures. Bonds sold with higher intensity than the market average are sorted into quintiles "S5" to "S1," with "S5" representing the group of bonds with the highest sell herding measures. Portfolio S5–B5 is long the equal-weighted portfolio containing bonds that institutional investors most strongly sell as a herd (i.e., S5) and short the equal-weighted portfolio containing bonds that institutional investors most strongly buy as a herd (i.e., B5). Portfolios S5–S1 and B1–B5 are similarly defined. Bonds traded by fewer than five investors in a given quarter are excluded. Bonds that are downgraded from investment-grade to high-yield (i.e. speculative-grade or junk) in the portfolio formation quarter t and the previous quarter $t-1$ are also excluded. ***, **, and * indicate statistical significance at the 1%, 5%, and 10% level, respectively.

	Quarterly abnormal return (in percent)										
Portfolio	$t-4$	$t-3$	$t-2$	$t-1$	Portfolio formation quarter t	$t+1$	$t+2$	$t+3$	$t+4$	$t+5$	$t+6$
S5–B5	−0.56***	−0.75***	−1.10***	−1.09***	0.06	1.13***	1.40***	0.80***	0.08	0.41*	0.29
S5–S1	−0.42***	−0.61***	−0.70***	−0.65***	0.57**	1.45***	1.42***	0.73***	0.02	0.59**	0.25
B1–B5	−0.07	−0.17**	−0.37***	−0.47***	−0.42***	−0.35***	−0.02	0.11**	0.02	−0.09	0.16**

4 Effects of analyst revisions

In this section, we investigate the role of analyst revisions in driving herding in corporate bonds. We obtain the analyst recommendation data from Thomson Reuters' Institutional Brokers' Estimate System (I/B/E/S), which is available throughout our sample period from 1998 to 2014, and merge this data to our bond sample based on the first 6 digits of CUSIP, which identify the issuer. For ease of interpretation, we reverse the standard 5-point scale of the I/B/E/S recommendations so that an increase in the recommendation score indicates an upward revision, while a decrease in the recommendation score indicates a downward revision.

To obtain the revision on analyst recommendation in quarter t ($Revision_t$), we calculate the change in the consensus recommendations from the third month of quarter $t-1$ to the third month of quarter t.[3] To test potential asymmetric effects of upward revisions and downward revisions on herding, we further define two dummy variables: $Revision\_Up_t$ and $Revision\_Down_t$. Specifically, $Revision\_Up_t$ equals 1 if $Revision_t > 0$ and there has been at least one actual upward revision by analysts who cover the firm, and zero otherwise. $Revision\_Down_t$ is similarly defined. To test the effects of recommendation dispersions on herding, we also control for the standard deviation of analyst recommendations and the number of analysts who cover the specific firm. The model specifications are

$$BHM_{i,t}(\text{or, } SHM_{i,t}) = \alpha_{i,t} + \beta Revision_{j,t-1} + \sum_{\tau=1}^{4} \phi_\tau Ab\_Ret_{i,t-\tau} + FE_t + \epsilon_{i,t} \qquad (4.1)$$

Table VII presents regression results of herding levels on lagged analyst revisions, with Columns (1)-(3) showing results of buy herding measures (BHM), and Columns (4)-(6) showing results of sell herding measures (SHM). We control for bond returns in the previous year in all specifications. We also control for quarter-fixed effects and cluster standard errors at the firm level.

Consistent with Brown, Wei and Wermers (2014), we find that buy (sell) herding levels

[3]The analyst recommendation data is updated in the middle of every month. It is worth noting that $Revision_t \neq 0$ does not necessarily mean that there is an actual revision on analyst recommendations, as the number of analysts that cover a specific firm changes over time and the change in $Revision_t$ may be driven by the addition or reduction of analysts. To address this issue, we modify a non-zero $Revision_t$ to be zero if the change in the consensus recommendation is not driven by an actual revision.

are positively (negatively) associated with analyst revisions, although the effects are much smaller and not statistically significant, as shown in columns (1) and (4). As we interact analyst revisions with their directions, we find that institutional herding in corporate bonds significantly responds to analyst revisions that are in the same direction. As shown in column (2), when consensus recommendation is revised upward by 1 point, on average the buy herding measure increases by about 1.7 percentage points. On the other hand, when consensus recommendation is revised downward by 1 point, on average the sell herding measure increases by about 1.8 percentage points, as shown in column (5). However, it is worth noting that, after we further control for other bond characteristics, the effect of downward revisions on sell herding loses its significance, as shown in column (6), possibly subsumed by the addition of bond rating changes, while the effects of upward revisions on buy herding remain significant, as shown in column (3).

Since Brown, Wei and Wermers (2014) study the effects of analyst revisions for equity mutual funds only, we also repeat our tests for bond mutual funds. Table VIII shows that while mutual funds' buy herding levels are significantly boosted by upward revisions in analyst recommendations, mutual funds' sell herding levels are not affected by analyst revisions in any significant way.

In sum, our results on the effects of analyst revisions on institutional herding are in general consistent with the findings by Brown, Wei and Wermers (2014). However, the effects of analyst revisions on corporate bond herding are generally smaller, less significant, and more mixed than those on equity herding. Two reasons may help explain this fact. First, in addition to analyst recommendations, corporate bonds also receive independent credit ratings from several rating agencies like Moody's and S&P, which also change over time and may dilute the information content of analyst recommendations. Second, it is worth noting that the I/B/E/S recommendations generally target equity investors, and mainly reflect analysts' views of the valuation of stocks, less so for bonds.

Table VII: **How do analyst revisions affect institutional herding?**

This table reports regression results of herding levels on lagged analyst revisions, with Columns (1)-(3) showing results of buy herding measures (BHM), and Columns (4)-(6) showing results of sell herding measures (SHM). Revision_{t-1} is the change in the consensus recommendations from quarter $t-1$ to quarter t, and consensus recommendations are in the scale of 1 to 5, with 5 representing "strong buy." Revision_up_{t-1} equals 1 if $\text{Revision}_{t-1} > 0$ and zero otherwise. $\text{Revision\_down}_{t-1}$ equals 1 if $\text{Revision}_{t-1} < 0$ and zero otherwise. SD of $\text{recommendations}_{t-1}$ represents the standard deviation of analyst recommendations. $\text{Ab\_ret}_{t-\tau}$ is computed as the raw return subtracted by the size-weighted average return of the pool of bonds that share similar ratings, sector, and time to maturity in quarter $t-\tau$. $\text{Upgrade}_{t-\tau}$ ($\text{Downgrade}_{t-\tau}$) is a dummy that equals 1 if there is an upgrade (downgrade) of ratings in quarter $t-\tau$ and equals 0 otherwise. Inv_grade_t equals 1 if the bond is investment-grade and 0 otherwise. Low_liq equals 1 if the bond is in the bottom two quintiles of the overall liquidity measure. Age_t and (time-to-)Maturity_t are measured in quarters. For details about the calculation of independent variables, see Appendix B of the paper. Standard errors are clustered at the firm level with corresponding t-values in parentheses. ***, **, and * indicate statistical significance at the 1%, 5%, and 10% level, respectively.

	Dependent variables: BHM			Dependent variables: SHM		
	(1)	(2)	(3)	(4)	(5)	(6)
Revision_{t-1}	0.334			-0.576		
	(0.88)			(-1.18)		
$\text{Revision}_{t-1}\times$ Revision_up_{t-1}		1.702***	1.632**		1.071	0.378
		(2.62)	(2.39)		(1.20)	(0.51)
$\text{Revision}_{t-1}\times$ $\text{Revision\_down}_{t-1}$		-0.806	-0.937		-1.817**	-0.176
		(-1.29)	(-1.48)		(-2.52)	(-0.27)
SD of $\text{recommendations}_{t-1}$		-0.195	-0.348		-0.526	-0.364
		(-0.45)	(-0.82)		(-1.09)	(-0.85)
Number of $\text{recommendations}_{t-1}$		-0.035***	-0.014		-0.172***	-0.005
		(-2.97)	(-1.20)		(-10.48)	(-0.29)
Ab_ret_{t-1}	4.681***	4.596***	4.374***	-9.575***	-9.352***	-6.879***
	(2.89)	(2.88)	(2.82)	(-5.73)	(-5.86)	(-4.75)
Ab_ret_{t-2}	3.505***	3.358***	3.145***	-6.927***	-6.858***	-5.116***
	(2.71)	(2.63)	(2.61)	(-4.62)	(-4.73)	(-3.64)
Ab_ret_{t-3}	0.983	0.793	0.896	-6.704***	-6.831***	-6.077***
	(0.80)	(0.65)	(0.76)	(-3.57)	(-3.83)	(-3.67)
Ab_ret_{t-4}	-0.509	-0.622	-0.382	-2.853	-2.805	-1.800
	(-0.40)	(-0.49)	(-0.30)	(-1.52)	(-1.49)	(-1.11)
Upgrade_t			0.327			0.813**
			(1.38)			(2.43)
Upgrade_{t-1}			0.466*			1.621***
			(1.77)			(4.42)
Downgrade_t			-0.259			1.316***
			(-1.00)			(4.82)
Downgrade_{t-1}			0.003			2.443***
			(0.01)			(7.66)
Inv_grade_t			-0.114			-3.381***
			(-0.54)			(-13.24)
$\log(\text{Size}_t)$			-0.756***			-1.625***
			(-6.65)			(-8.19)
$\log(\text{Age}_t)$			-0.009			0.636***
			(-0.07)			(3.90)
$\log(\text{Maturity}_t)$			0.954***			-1.216***
			(10.01)			(-9.71)
Low_liq			1.069***			0.634***
			(7.09)			(3.14)
Quarter fixed effect	Yes	Yes	Yes	Yes	Yes	Yes
Adjusted R^2	0.017	0.018	0.027	0.024	0.037	0.089
N of observations	45948	45948	43306	24011	24011	22331

Table VIII: **How do analyst revisions affect mutual fund herding?**

This table reports regression results of herding levels of mutual funds on lagged analyst revisions, with Columns (1)-(3) showing results of buy herding measures (BHM), and Columns (4)-(6) showing results of sell herding measures (SHM). Revision_{t-1} is the change in the consensus recommendations from quarter $t-1$ to quarter t, and consensus recommendations are in the scale of 1 to 5, with 5 representing "strong buy." Revision_up_{t-1} equals 1 if $\text{Revision}_{t-1} > 0$ and zero otherwise. $\text{Revision\_down}_{t-1}$ equals 1 if $\text{Revision}_{t-1} < 0$ and zero otherwise. SD of $\text{recommendations}_{t-1}$ represents the standard deviation of analyst recommendations. $\text{Ab\_ret}_{t-\tau}$ is computed as the raw return subtracted by the size-weighted average return of the pool of bonds that share similar ratings, sector, and time to maturity in quarter $t-\tau$. $\text{Upgrade}_{t-\tau}$ ($\text{Downgrade}_{t-\tau}$) is a dummy that equals 1 if there is an upgrade (downgrade) of ratings in quarter $t-\tau$ and equals 0 otherwise. Inv_grade_t equals 1 if the bond is investment-grade and 0 otherwise. Low_liq equals 1 if the bond is in the bottom two quintiles of the overall liquidity measure. Age_t and (time-to-)Maturity_t are measured in quarters. For details about the calculation of independent variables, see Appendix B of the paper. Standard errors are clustered at the firm level with corresponding t-values in parentheses. ***, **, and * indicate statistical significance at the 1%, 5%, and 10% level, respectively.

	Dependent variables: BHM			Dependent variables: SHM		
	(1)	(2)	(3)	(4)	(5)	(6)
Revision_{t-1}	0.803			0.319		
	(1.49)			(0.55)		
$\text{Revision}_{t-1}\times$ Revision_up_{t-1}		2.665***	2.856***		0.831	0.462
		(2.72)	(2.92)		(0.80)	(0.45)
$\text{Revision}_{t-1}\times$ $\text{Revision\_down}_{t-1}$		-0.833	-0.535		-0.186	0.912
		(-1.00)	(-0.64)		(-0.21)	(1.01)
SD of $\text{recommendations}_{t-1}$		-0.359	-0.380		-0.337	0.096
		(-0.68)	(-0.75)		(-0.61)	(0.18)
Number of $\text{recommendations}_{t-1}$		-0.018	0.005		-0.146***	0.006
		(-1.33)	(0.38)		(-9.03)	(0.30)
Ab_ret_{t-1}	2.813**	2.849**	3.167**	-7.136***	-6.914***	-4.727***
	(2.09)	(2.13)	(2.23)	(-4.19)	(-4.15)	(-2.91)
Ab_ret_{t-2}	4.069***	3.990***	3.917***	-5.539***	-5.647***	-4.245**
	(2.90)	(2.87)	(2.90)	(-3.03)	(-3.09)	(-2.37)
Ab_ret_{t-3}	1.606	1.471	1.699	-3.742**	-3.830**	-3.354**
	(1.05)	(0.96)	(1.12)	(-2.20)	(-2.34)	(-2.02)
Ab_ret_{t-4}	-0.463	-0.507	-0.188	0.154	0.187	0.055
	(-0.31)	(-0.34)	(-0.12)	(0.08)	(0.10)	(0.03)
Upgrade_t			-0.407			0.169
			(-1.19)			(0.42)
Upgrade_{t-1}			-0.124			1.202***
			(-0.33)			(2.93)
Downgrade_t			0.403			0.964**
			(1.31)			(2.58)
Downgrade_{t-1}			1.451***			2.233***
			(3.72)			(4.99)
Inv_grade_t			0.156			-1.239***
			(0.61)			(-4.27)
$\log(\text{Size}_t)$			-0.670***			-2.333***
			(-4.11)			(-11.72)
$\log(\text{Age}_t)$			1.205***			0.716***
			(7.01)			(3.05)
$\log(\text{Maturity}_t)$			0.096			-1.324***
			(0.80)			(-7.48)
Low_liq			1.096***			0.592**
			(5.17)			(2.29)
Quarter fixed effect	Yes	Yes	Yes	Yes	Yes	Yes
Adjusted R^2	0.046	0.046	0.055	0.028	0.036	0.071
N of observations	27699	27699	26836	16606	16606	15783

5 Trading dynamics in a sell-herding event

Table IX: **Trading amount in a sell-herding event, by investor type**

This table reports the average net trading amount of each group of market participants (i.e., all eMaxx investors, insurance companies, mutual funds, pension funds, and corporate bond dealers) in the quarter of a sell-herding event. In Panel A, a bond is identified as experiencing a sell-herding event if it is traded by at least 5 investors in a quarter, and its selling propensity is higher than the market average in that quarter. In Panel B, a bond is further identified as experiencing a large sell-herding event if its sell herding measure falls into the highest two quintiles in that quarter. In both panels, Four types of "sell-herding events" are studied: sell herding by all eMaxx investors, sell herding by insurance companies, sell herding by mutual funds, and sell herding by pension funds. Specifically, the first column in this table shows that when a corporate bond experiences a selling herd defined within all eMaxx investors, on average eMaxx investors sell about $20 million worth of that bond, among which $10 million is sold by insurance companies, $9 million sold by mutual funds, and $2 sold by pension funds. Similarly, the second to fourth columns show the net transaction amount of bonds that experience a selling herd from insurance companies, mutual funds, and pension funds, respectively. We also obtain the dealer transaction data from TRACE and calculate the average inventory change for bonds that are sold in herds by each type of institutional investors, and report the results in the last row of each panel. In particular, dealers on average increase their inventory holdings of a sold-in-herd bond by about $3 million in a given quarter, as shown in the first column of last row in Panel A.

Panel A: Net trading amount of market participants in a sell-herding event

Net trading amount (in million$)	Event: sell herding			
	All investors	Insurers	Mutual funds	Pension funds
All investors	-20.4	-25.1	-24.6	-36.9
Insurers	-9.6	-17.4	-5.9	-8.7
Mutual funds	-9.0	-6.3	-16.3	-21.8
Pension funds	-1.8	-1.4	-2.3	-6.3
Dealers	3.2	4.1	2.7	3.4

Panel B: Net trading amount of market participants in a large sell-herding event

Net trading amount (in million$)	Event: large sell herding (S4 or S5)			
	All investors	Insurers	Mutual funds	Pension funds
All investors	-33.4	-39.3	-43.4	-64.0
Insurers	-16.1	-26.1	-11.7	-16.5
Mutual funds	-14.8	-11.0	-28.0	-38.2
Pension funds	-2.4	-2.1	-3.7	-9.1
Dealers	3.4	3.6	3.8	4.2