Exorbitant Privilege? Quantitative Easing and the Bond Market Subsidy of Prospective Fallen Angels

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Understanding and addressing systemic risks in NBFI conference
Policy tools and approaches to address systemic risk in NBFI

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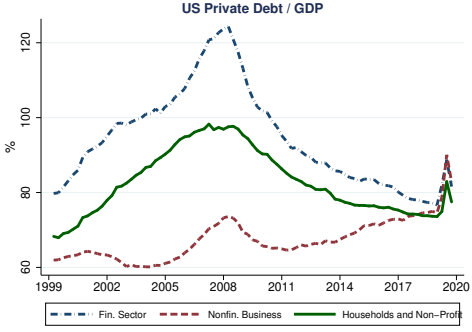
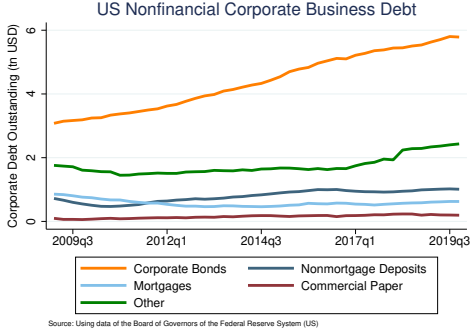
The boom in the U.S. corporate bond market

- Non-fin. corporate debt is now the largest type of private debt ($17.6T in 2020Q3)
- Credit cycle post-GFC driven by non-financial corporate debt
- U.S. corporate bond market doubled in size in 2009–19



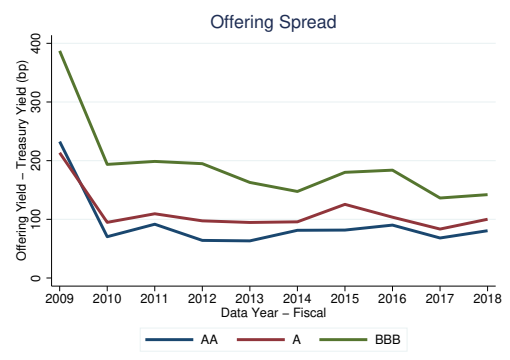
Source: FRED



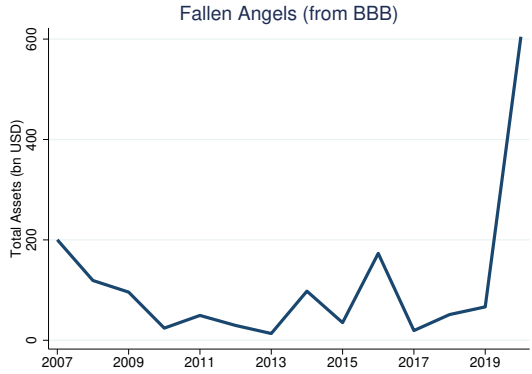
Source: FRED

The boom in the BBB corporate bond market

- U.S. corporate bond market doubled in size in 2009–19, driven by BBB segment
- Characterized by (i) deteriorating quality and (ii) lower yields in BBB segment
- Prospective fallen angels drive the increase in BBB bond volumes



Unprecedented wave of fallen angels during COVID



The exorbitant privilege of prospective fallen angels

Prospective fallen angels enjoy cheap funding in the bond market

- Drop in BBB spreads driven by downgrade-vulnerable firms that deteriorated in quality
- No privilege in the bond market pre-GFC; no privilege in the syndicated loan market
- Prospective fallen angels subsidy amounts to $307 billion in 2009–19

Privilege driven by demand by IG investors & ratings inflation

- Central bank QE induces a demand for risky BBB bonds by IG investors
- Prospective fallen angels meet this demand by issuing bonds to finance M&A
  - M&A deals help to gain market share, and effectively delay downgrades (rating inflation)
  - Risk materialization (Covid-shock) leads to substantial downgrade volumes

Real effects of the exorbitant privilege

- Negative spillover effects to competing firms (akin to spillover effects of zombie firms)

Identifying the prospective fallen angels

- Prospective fallen angels are (i) rated BBB and (ii) vulnerable to a downgrade

Identifying the prospective fallen angels

- Prospective fallen angels are (i) rated BBB and (ii) vulnerable to a downgrade
- A firm is "vulnerable" if its fundamentals suggest that it might be downgraded

1) Combine balance sheet characteristics using the Altman Z"-score (Altman, 2020)
   - i.e., current and total assets and liabilities, retained earnings, EBIT, book equity
   - Altman Z"-score is suitable for public as well as private firms

2) A firm is "vulnerable" if its Z"-score is lower than the historical median Z"-score of the next lowest rating

▸ Mapping ▸ Formal definition ▸ Drivers

Validating the "vulnerable" measure

1) Vulnerable firms look worse along observable dimensions across all rating categories ▸ Descriptive Stats
   - Lower net worth, sales growth, investments, employment growth, IC, profitability
   - Higher leverage

2) After becoming vulnerable, firms' performance deteriorates ▸ Tests
   - Decline in sales growth, investments, markup, and employment growth

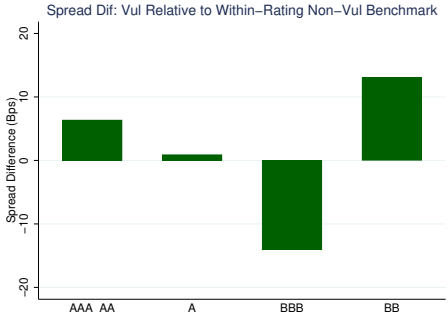
3) Vulnerable firms more likely to be downgraded ▸ Tests ▸ COVID Fallen Angels
   - Sensitvity lowest for vulnerable BBB firms ▸ Sensitivity

4) Vulnerable firms more likely to have a negative credit watch and outlook ▸ Tests
   - Sensitivity lowest for vulnerable BBB firms ▸ Sensitivity

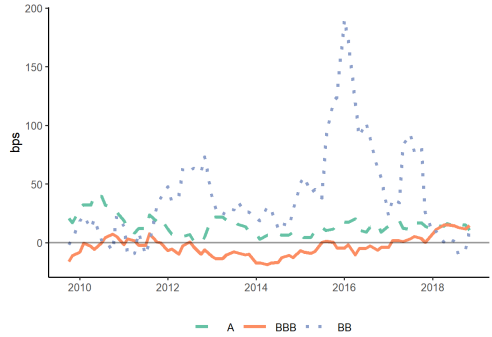
The funding privilege

The exorbitant privilege of prospective fallen angels

Δ Spreads (bps) between vulnerable and non-vulnerable firms



Vulnerable firms have higher offering spreads in each rating bucket, except in BBB



Low secondary market spreads, especially in 2013–16

Compare downgrade-vulnerable vs. non-downgrade-vulnerable

$$\text{Spread}_{bit} = \boldsymbol{\beta_1} \times \mathbf{Rating}_{it} + \boldsymbol{\beta_2} \times \mathbf{Rating}_{it} \times \text{Vulnerable}_{it} + \boldsymbol{\delta} \times \mathbf{X}_{bt} + \boldsymbol{\mu}_{ht} + \epsilon_{bit}$$

Spread_{bit}	Secondary market spread of bond b issued by firm i in year t over Treasuries (bps) (robust to matching cash flows following Gilchrist and Zakrajek, 2012)
$\mathbf{Rating}_{it}$	Vector of dummy variables corresponding to the rating of firm i in year t
Vulnerable_{it}	Dummy equal to one if issuer i is classified as downgrade-vulnerable in year t
$\mathbf{X}_{bt}$	Bond-level characteristics (residual maturity, liquidity, and a callable dummy)
$\boldsymbol{\mu}_{ht}$	Industry-year fixed effects

The pricing privilege of prospective fallen angels

	Spread (bps)
A	39.543***
	(8.489)
BBB	101.458***
	(8.791)
BB	244.896***
	(10.931)
B	395.971***
	(16.245)
CCC	1,079.020***
	(104.982)
Sample	Entire
Observations	19,322
R-squared	0.744

- Secondary market spread ↑ as ratings ↓ ▸ Callable bonds

The pricing privilege of prospective fallen angels

	Spread (bps)
Vulnerable×AAA-AA	23.464***
	(8.493)
Vulnerable×A	-3.902
	(5.458)
Vulnerable×BBB	**-18.186*** **
	(4.700)
Vulnerable×BB	30.919***
	(10.585)
Vulnerable×B	79.032***
	(26.524)
Vulnerable×CCC	447.860**
	(187.435)
Sample	Entire
Observations	19,322
R-squared	0.744

- Secondary market spread ↑ as ratings ↓ ▸ Callable bonds
- Privilege of BBB vulnerable firms

The pricing privilege of prospective fallen angels

	Spread (bps)	Spread (bps)
Vulnerable × AAA-AA	23.464***	29.006***
	(8.493)	(8.397)
Vulnerable × A	-3.902	-13.656
	(5.458)	(8.990)
Vulnerable × BBB	**-18.186*** **	**-33.213*** **
	(4.700)	**(7.093)**
Vulnerable × BB	30.919***	38.307***
	(10.585)	(12.909)
Vulnerable × B	79.032***	57.533*
	(26.524)	(32.964)
Vulnerable × CCC	447.860**	489.553*
	(187.435)	(251.471)
Sample	Entire	2013–16
Observations	19,322	9,015
R-squared	0.744	0.735

- Secondary market spread ↑ as ratings ↓ ▸ Callable bonds
- Privilege of BBB vulnerable firms ... especially in 2013–16

The pricing privilege of prospective fallen angels

	EDF 2Y	EDF 5Y
Vulnerable × AAA-A	0.484***	0.434***
	(0.160)	(0.136)
Vulnerable × BBB	0.361**	0.283**
	(0.152)	(0.120)
Vulnerable × BB	0.713***	0.560***
	(0.166)	(0.129)
Vulnerable × B	0.817***	0.691***
	(0.180)	(0.140)
Vulnerable × CCC	0.360	0.416*
	(0.284)	(0.1240)
Sample	Entire	Entire
Observations	4,223	4,223
R-squared	0.780	0.804

- Secondary market spread ↑ as ratings ↓ ▸ Callable bonds
- Privilege of BBB vulnerable firms ... especially in 2013–16
- Higher default risk based on EDFs

The pricing privilege of prospective fallen angels

	Spread (bps)	All-in-drawn Spread (bps)
Vulnerable × AAA-A	10.737	28.072*
	(7.709)	(16.952)
Vulnerable × BBB	21.285*	13.721*
	(11.020)	(7.147)
Vulnerable × BB	23.706*	22.946***
	(13.454)	(7.094)
Vulnerable × B	53.516*	42.873***
	(27.960)	(12.400)
Vulnerable × CCC	327.271***	17.238
	(65.169)	(71.769)
Sample	2002-07	Synd. loans
Observations	1,855	5,273
R-squared	0.715	0.516

- Secondary market spread ↑ as ratings ↓ ▸ Callable bonds
- Privilege of BBB vulnerable firms ... especially in 2013–16
- Higher default risk based on EDFs
- No privilege pre-GFC
- No privilege in synd. loans

The role of QE in driving investors' demand for IG downgrade-vulnerable bonds

QE-driven demand by IG investors

Security-level holdings by investors matched with Fed's Treasury portfolio

- QE Exposure$_{kt}$ is the share of k's holdings held by the Fed
  (holdings weighted by the share of amounts outstanding held by the Fed)

$$\text{QE Exposure}_{kt} = \frac{\sum_i (Holdings_{ikt} \times SOMA_{it})}{\sum_i Holdings_{ikt}} \tag{1}$$

- where i is a security, k is an investor, and t is a date
- $SOMA_{it}$ is the share of Treasury security i held by the Federal Reserve at date t
- $Holdings_{ikt}$ are the holdings of security i held by investor k at time t

▸ Time-series evolution

QE-driven demand by IG investors

$$Holdings_{kjt} = \beta_1 \text{QE Exposure}_{kt} \times Vulnerable_{jt} + \eta_{kt} + \mu_{jt} + \epsilon_{kjt}$$

- The unit of observation is investor k, issuer j, year t
- $Holdings_{kjt}$ is log (one plus) holdings of bonds issued by j by investor k at t
- $Vulnerable_{jt}$ is an indicator=1 if issuer j is vulnerable in year t
- Investor-time fixed effects η_{kt}

→ Issuer-time fixed effects μ_{jt}

QE-driven demand by IG investors

$$Holdings_{kjt} = \beta_1 \text{QE Exposure}_{kt} \times Vulnerable_{jt} + \eta_{kt} + \mu_{jt} + \epsilon_{kjt}$$

	$Holdings_{kjt}$						
QE Exposure$_{kt} \times Vulnerable_{jt}$	1.365***	-0.044	0.281	0.718*	**1.939*** **	**2.171*** **	-0.243
	(0.448)	(0.542)	(0.946)	(0.428)	**(0.483)**	**(0.658)**	(0.979)
Fixed Effects							
Investor k - time t	✓	✓	✓	✓	✓	✓	✓
Issuer j - time t	✓	✓	✓	✓	✓	✓	✓
Sample Investors	IG	non-IG	Full	Full	**Full**	**IG**	non-IG
Sample issuers	Full	Full	AAA/AA	A	**BBB**	**BBB**	BBB
Observations	1,316,637	1,153,770	287,950	1,020,557	1,744,170	549,619	220,531
R-squared	0.605	0.547	0.726	0.673	0.616	0.621	0.644

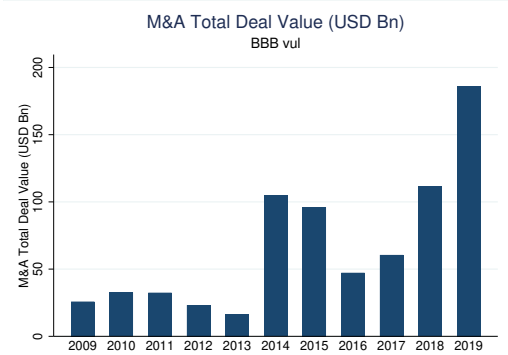
- IG investors more exposed to QE demand more bonds issued by vulnerable firms
- The effect is driven by bonds issued by BBB-rated firms

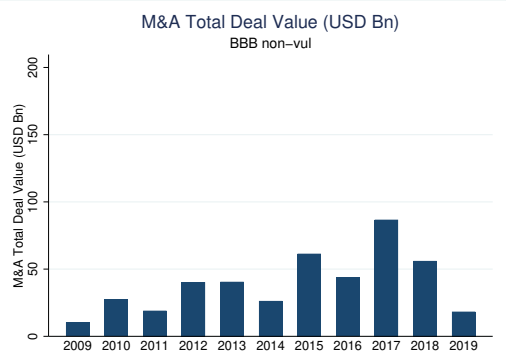
M&A as an equilibrium response to investor demand

- Prospective fallen angels supply bonds largely to fund M&A
- The sluggishness of credit ratings is exacerbated post-M&A (particularly pronounced at the IG cutoff)

→ M&A allows to rapidly increase market share while delaying downgrades

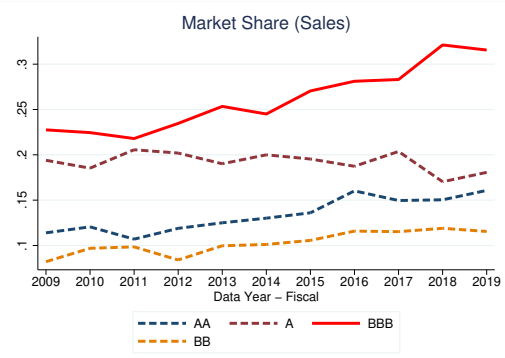
M&A deal volume of BBB-rated firms

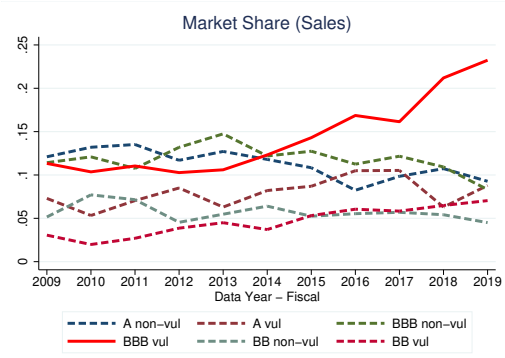




Upside: Increase in market share

- The increase in market share driven by prospective fallen angels thanks to M&A





Downside: M&A exacerbates the sluggishness of credit ratings

Full sample

From \ To	AAA/AA	A	BBB	BB
AAA/AA	97.2	2.8	0	0
A	0	91.0	8.9	0
BBB	0	4.4	92.1	3.0
BB	0	0	4.2	92.1

Post-M&A

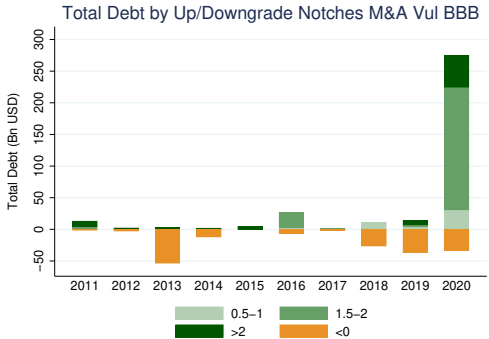
From \ To	AAA/AA	A	BBB	BB
AAA/AA	94.5	5.5	0	0
A	1.8	88.3	10.0	0
BBB	0	1.6	97.8	0.1
BB	0	0	5.8	93.4

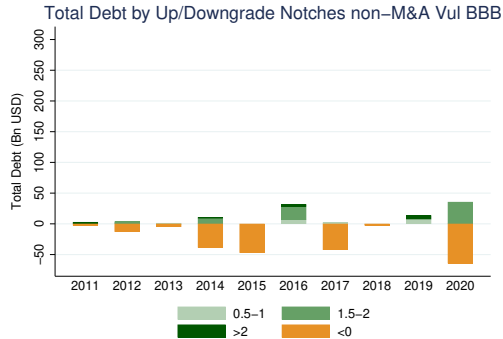
"We've seen this over and over again: a company does a ***massive deal****, and the* ***rating agencies give them the benefit of the doubt****," said Mr Forsyth of BNP Paribas Asset Management. But "****not all these companies are going to meet their leverage targets****, particularly in an* ***economic downturn****."*

Financial Times, June 2018

Downgrades materialize in a crisis

- Ex-post evidence from wave of fallen angels at the onset of COVID-19
- Assets downgraded from BBB in Feb-Mar 2020 5x volume during the *entire* GFC
- Debt downgraded from BBB in '20 driven by M&A-active prospective fallen angels





The downgrade severity is measured by the number of notches a firm is being downgraded, with three broad categories: 0.5-1, 1.5-2, >2 notches. The upgraded debt is shown by the orange bars, and is represented by the notches below zero.

▸ Downgrade frequency

Spillover effects to other firms

Non-vulnerable firms in an industry with a larger share of PFAs have

- lower investment levels
- lower sales growth rates
- lower markups

compared with non-vulnerable firms in an industry with a lower share of PFAs

Conclusion

- Persistent sharp increase in BBB market post-GFC

- Prospective fallen angels obtain exorbitant privilege of subsidized bond financing
- Privilege driven by QE-induced demand in IG investors
- Prospective fallen angels engage in M&A to increase their market share and exploit the sluggishness of credit ratings

- The BBB growth may have been a desired effect of QE, but there are costs:
  - subsidised firms grow disproportionately large and become more fragile
  - the resulting spillover effects force negatively affect their competitors

Appendix

Case studies of prospective fallen angels I

Case study Campbell

- Prospective fallen angel since 2013
- Struggled to adapt to changing consumer tastes in recent years
- Privilege in bond funding cost: Average bond spread 41bps below the average healthy BBB firm
- Used cheap funding for two acquisitions in 2017:
  - Pacific Foods of Oregon Inc: Announcement CAR -2.12%
  - Snyder's-Lane Inc: Announcement CAR -1.31%
- S&P rating BBB+ in 2017 but Z-score implied BB- (inflated by 5 notches)
- S&P rating dropped just to BBB by 2018, whereas Z-score implied rating dropped to CCC+ (rating inflated by eight notches)

Case study Marriott International Inc

- Prospective fallen angel since 2009
- Issued multiple bonds over 2012 to 2018, with an average subsidy of -21bps
- Enjoyed secondary market subsidized bond financing from 2011 to 2018, with an average of -29bps
- Multiple acquisitions over 2010-2015
  - Most notable acquisition was of Starwood Hotels & Resorts in 2015, with a deal value of $13bn
- S&P put Marriot on a BBB- negative watch from BBB in March 2020. Fitch withdrew BBB credit rating

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Case studies of prospective fallen angels II

Case study Molson Coors Brewing

- Prospective fallen angel since 2009
- Issued multiple bonds from 2012 to 2017, with an average subsidy of 49bps
- Enjoyed on average a 31 bps secondary bond market subsidy from 2012 to 2018
- Acquisitions in 2012, 2015, 2018 and 2019
- Announced acquisition of MillerCoors LLC in 2015. (+9% CAR)
  - Deal size $12bn
  - Financing included a bond issuance of 5.3bn.
  - In total, net debt / ebitda rose from 2x to slightly over 5x on pro forma basis
- Following the acquisition, Molson was downgraded to BBB- by all three rating agencies
- S&P flagged it as a prospective fallen angel in 2020, and put Molson on a BBB- negative outlook

Case study Hyatt

- Prospective fallen angel since 2011, with some non-vulnerable years
- Subsidized bonds in secondary market in 2014, 2015 and 2017, with an average subsidy of 17bps
- Acquisitions done over 2013 to 2017 (on average CAR +1.3%)
- S&P downgraded Hyatt from BBB to BBB- in 2020. Also, it gave it a negative outlook status, and classified it as a potential fallen angel.
- S&P cut its debt rating of Hyatt Hotels to junk in 2021 following the hospitality group's $2.7bn acquisition of Apple Leisure Group (ALG)

Back

Case studies of prospective fallen angels III

Case study EQT Corp

- Prospective fallen angel since 2009
- Subsidized bonds in secondary market in 2017, with a subsidy of 8bps
- Acquisitions done in 2010, 2016 and 2017 (on average CAR -2.3%)
  - Including a $6.6bn acquisition in 2017 of Rice Energy
- Downgraded from BBB- to junk during COVID, both by S&P and Fitch.

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Top 15 largest BBB vulnerable and non-vulnerable firms (total assets)

Downgrade-vulnerable BBB
(At least once vulnerable over 2009-2020)

- AT&T INC
- Boeing CO (Covid)
- Comcast Corp
- CVS Health Corp
- Dominion Energy Corp
- Duke Energy Corp
- Exelon Corp
- Ford Motor Co
- General Electric Co
- General Motors Co
- Kraft Heinz Co
- Occidental Petroleum Corp
- Raytheon Technologies Corp
- Time Warner Inc
- Verizon Communications Inc

Non downgrade-vulnerable BBB
(Non-vulnerable over 2009-2020)

- Air Lease Corp
- Celgene Corp
- Corning Inc
- Ebay Inc
- Energy Transfer LP
- Enterprise Product Partners LP
- Home Depot Inc
- Icahn Enterprises LP
- Kinder Morgan Energy
- Lennar Corp
- McDonald's Corp
- MPLX LP
- Paypal Holdings Inc
- Plains All Amer Pipeline LP
- Williams Partners

Callable bonds dominate corporate bond issuance

- Increase in the share of corporate bonds with call options
  - Today, around 93% of all issues, up from 75% in early 2000s
  - For BBB around 90-95% of all bonds have had call options since 2010
- Movements in riskfree rates change value of embedded call option
  - Adjust for the value of embedded option following Gilchrist and Zakrajsek (2012) and Faust et. al (2013)
  - Step 1: Regress the log spread on the level, slope and curvature of yield curve and the implied volatility of 10-year treasury bond futures interacted with a callable bond dummy variable and ratings dummy variable.

$$ln(Spread_{it}) = D(CALL_i) \times (\beta_0 + \beta_1 LEV_t + \beta_2 SLP_t + \beta_3 CRV_t + \beta_4 VOL_t) + D(Rating)_{it} + \epsilon it$$

  - Step 2: Option adjust the spread on callable bonds by removing component of the spread that is correlated with the yield curve factors and implied volatility (last term due to Jensen's inequality):

$$OASSpread_{it} = exp(ln(Spread_{it}) - \hat{\beta_0} - \hat{\beta_1} LEV_t - \hat{\beta_2} SLP_t - \hat{\beta_3} CRV_t - \hat{\beta_4} VOL_t - \frac{\hat{\sigma_t}}{2})$$

Baseline results adjusted for bond callability

	Spread$_{it}$	Spread$_{it}$	Offering spread$_{it}$	Offering spread$_{it}$
A$_{it}$	39.265***	44.855***	46.112***	20.331
	(6.497)	(8.165)	(13.880)	(12.371)
BBB$_{it}$	78.375***	87.368***	117.364***	96.515***
	(6.573)	(8.303)	(14.592)	(14.839)
BB$_{it}$	185.476***	196.620***	242.182***	233.849***
	(8.964)	(11.052)	(16.045)	(17.008)
B$_{it}$	297.472***	294.156***	331.350***	303.145***
	(15.025)	(22.242)	(17.645)	(19.950)
CCC$_{it}$	1,000.066***	1,025.143***	267.783***	226.161**
	(113.253)	(185.911)	(41.425)	(98.024)
Vulnerable$_{it}$ × AAA-AA$_{it}$	26.703***	28.736***	21.848	-0.201
	(6.898)	(8.331)	(14.803)	(13.297)
Vulnerable$_{it}$ × A$_{it}$	-7.830	-17.102*	21.113*	24.360
	(5.014)	(8.982)	(11.765)	(15.435)
Vulnerable$_{it}$ × BBB$_{it}$	-12.287***	-22.952***	-25.867***	-31.306**
	(3.381)	(5.314)	(7.120)	(12.501)
Vulnerable$_{it}$ × BB$_{it}$	23.011***	21.831**	29.584***	14.045
	(7.576)	(10.491)	(11.125)	(17.697)
Vulnerable$_{it}$ × B$_{it}$	53.607***	60.663**	15.220	39.726
	(20.276)	(24.498)	(17.540)	(28.208)
Vulnerable$_{it}$ × CCC$_{it}$	264.562	271.503	-63.354	-67.445
	(170.846)	(215.279)	(97.961)	(121.948)
Industry-Year FE	✓	✓	✓	✓
Bond-level controls	✓	✓	✓	✓
Sample	Entire	2013–16	Entire	2013–16
Observations	14,068	7,015	3,729	1,604
R-squared	0.751	0.748	0.834	0.816

Back

QE-driven demand increases M&A holdings in vulnerable IG firms

$$
\begin{aligned}
Holdings_{kit} = {} & \beta_1 \text{QE Exposure}_{kt} \times Vulnerable_{it} \times \text{M\&A}_{it} \\
& + \beta_2 \text{QE Exposure}_{kt} \times Vulnerable_{it} \\
& + \beta_3 \text{QE Exposure}_{kt} \times \text{M\&A}_{it} + \eta_{kt} + \mu_{it} + \epsilon_{kit}
\end{aligned}
$$

	$Holdings_{jkt}$			
QE Exposure$_{kt}$ × Vulnerable × M&A$_{it}$	**1.386*** **	-0.322	**1.448*** **	0.785
	(0.467)	(0.718)	**(0.500)**	(1.190)
QE Exposure$_{kt}$ × Vulnerable	0.641	0.042	0.733	-0.519
	(0.453)	(0.527)	(0.483)	(0.942)
QE Exposure$_{kt}$ × M&A$_{it}$	0.093	0.520	0.038	0.671
	(0.333)	(0.498)	(0.358)	(0.960)
Investor × time FE	✓	✓	✓	✓
Issuer × time FE	✓	✓	✓	✓
Sample investors	**IG**	non IG	**IG**	non IG
Sample issuers	**full**	full	**IG**	IG
Observations	1,316,637	1,153,770	1,131,525	318,344
R-squared	0.605	0.547	0.607	0.656

- QE-exposed IG investors demand bonds of vulnerable IG M&A-active firms Back

QE-driven demand increases M&A holdings in vulnerable BBB

	$Holdings_{ijt}$					
QE Exposure$_{jt}$ × Vulnerable × M&A$_{it}$	**1.428****	-0.003	**1.350***	-0.076	0.572	-0.672
	(0.682)	(1.868)	**(0.729)**	(1.393)	(5.326)	(1.000)
QE Exposure$_{jt}$ × Vulnerable	0.495	-0.505	**1.603****	-0.182	-4.332	-1.136
	(0.657)	(1.474)	**(0.660)**	(1.130)	(2.722)	(0.747)
QE Exposure$_{jt}$ × M&A$_{it}$	-0.048	-1.167	-0.463	2.060*	-0.258	-0.219
	(0.439)	(1.119)	(0.568)	(1.159)	(2.761)	(0.645)
Investor × time FE	✓	✓	✓	✓	✓	✓
Issuer × time FE	✓	✓	✓	✓	✓	✓
Sample investors	**IG**	non-IG	**IG**	non-IG	IG	non-IG
Sample issuers	**AAA-A**	AAA-A	**BBB**	BBB	BB	BB
Observations	577,719	95,130	549,619	220,531	20,008	412,867
R-squared	0.641	0.738	0.621	0.644	0.744	0.543

- Both vulnerable BBB as well as other IG-rated vulnerable firms experience higher demand from QE exposed investors when they announce an M&A Back

Bond spreads of vulnerable BBB decline around M&A announcement

$$\begin{aligned}\Delta_{12}Spread_{it} = &\boldsymbol{\beta_1} \times \text{M\&A}_{it} \times \text{vulnerable}_{it} \times \mathbf{Rating}_{it} \\ &+ \boldsymbol{\beta_2} \times \text{vulnerable}_{it} \times \mathbf{Rating}_{it} \\ &+ \boldsymbol{\beta_3} \times \text{M\&A}_{it} \times \mathbf{Rating}_{it} + \boldsymbol{\nu}_{rjt} + \epsilon_{it}\end{aligned}$$

	$\Delta_{12}Spread$	$\Delta_{12}Spread$
Vulnerable × AAA-AA	-2.567	5.118***
	(2.251)	(0.913)
Vulnerable × A	0.376	0.538
	(1.205)	(2.211)
Vulnerable × BBB	0.990	-1.854
	(1.263)	(1.649)
Vulnerable × BB	-0.634	0.358
	(5.590)	(6.324)
Vulnerable × B	20.598	13.853
	(16.106)	(14.241)
M&A × Vulnerable × AAA-AA	8.188***	1.847
	(1.678)	(1.743)
M&A × Vulnerable × A	0.147	0.709
	(1.682)	(2.385)
M&A × Vulnerable × BBB	**-4.525****	**-6.955****
	(2.255)	(2.962)
M&A × Vulnerable × BB	29.615*	30.236
	(16.845)	(19.937)
M&A × Vulnerable × B	44.585	79.343
	(43.006)	(54.312)
Rating × industry × year FE	✓	✓
Rating × M&A included	✓	✓
Sample period	**Entire**	**2013-16**
Observations	70,329	35,634
R-squared	0.720	0.715

Back

Issuer-level, bond-level, and holdings-level

Issuer-level data: 5,864 issuers

- Debt capital structure from Capital IQ
- Firm characteristics from Compustat
- Credit ratings from Thomson Reuters

Bond-level data: 3,140 issues by 910 issuers

- Primary market data from Mergent FISD
- Secondary market data from TRACE

Holdings-level data: 3,140,892 issuers and 569 investors

- Security quarterly holdings data from eMAXX Bond Holders

→ We combine the data at various levels: **bond, firm, investor**

- Considering 5864 firms, 1130 issuers and 569 investors
- Over the years 2009–2018

Median Z-score from Altman (2020)

Ratings	Z”-score 2006	Z”-score 2013
AAA	7.91	8.80
AA	7.78	8.40
A	7.10	6.12
BBB	6.36	5.70
BB	5.65	5.07
B	3.68	3.74
CCC	1.62	1.72
CC	0.84	0.05

Z”-score 2006 is used for the pre-GFC period and Z”-score 2013 for our main analysis Back

Using Altman Z" to find vulnerable firms

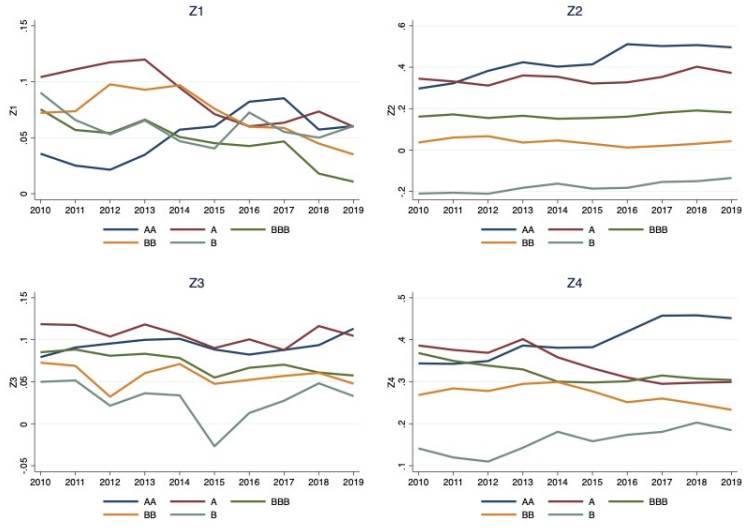
$$Vulnerable_{it} = \begin{cases} 1, & \text{if } Z''_{it} < Z''(next\,lower\,rating\,bucket) \\ 0, & \text{otherwise} \end{cases}$$

where

$$\begin{aligned} Z\text{"} = 6.56 \times & \frac{Current\,Assets - Current\,Liabilities}{Total\,Assets} \\ + 3.26 \times & \frac{Retained\,Earnings}{Total\,Assets} \\ + 6.72 \times & \frac{EBIT}{Total\,Assets} + 1.05 \times \frac{Book\,Value\,of\,Equity}{Total\,Liabilities} \end{aligned}$$

Back

Increased vulnerability driven by leverage, profitability, and liquidity



Back

Validating the "vulnerable" measure: entire sample

	Vulnerable	Non-Vulnerable	Difference
Total Assets	24,114	10,988	13,126***
Leverage	0.403	0.354	0.049***
EBITDA/Assets	0.104	0.132	-0.028***
Interest Coverage	7.747	13.114	-5.367***
Sales Growth	0.038	0.056	-0.017***
CAPX	0.188	0.225	-0.037***
Employment Growth	0.008	0.036	-0.027***
Net Worth	0.183	0.248	-0.066***

Back

Validating the "vulnerable" measure: investment grade

	Vulnerable	Non-Vulnerable	Difference
Total Assets	38,366	21,993	16,673***
Leverage	0.325	0.271	0.054***
EBITDA/Assets	0.112	0.158	-0.046***
Interest Coverage	10.86	21.56	-10.70***
Sales Growth	0.032	0.041	-0.009*
CAPX	0.169	0.219	-0.05***
Employment Growth	0.006	0.030	-0.024***
Net Worth	0.252	0.279	-0.027***

Back

Validating the "vulnerable" measure: BBB

	Vulnerable	Non-Vulnerable	Difference
Total Assets	26,187	10,737	15,450***
Leverage	0.342	0.279	0.063***
EBITDA/Assets	0.108	0.148	-0.04***
Interest Coverage	7.92	17.30	-9.38***
Sales Growth	0.043	0.044	-0.001
CAPX	0.170	0.222	-0.052***
Employment Growth	0.003	0.032	-0.029***
Net Worth	0.257	0.284	-0.027***

Back

Validating the "vulnerable" measure: high-yield

	Vulnerable	Non-Vulnerable	Difference
Total Assets	8,000	4,273	3,727***
Leverage	0.491	0.406	0.085***
EBITDA/Assets	0.093	0.115	-0.022***
Interest Coverage	4.22	7.82	-3.60***
Sales Growth	0.045	0.065	-0.02***
CAPX	0.211	0.232	-0.021***
Employment Growth	0.009	0.040	-0.031***
Net Worth	0.104	0.228	-0.124***

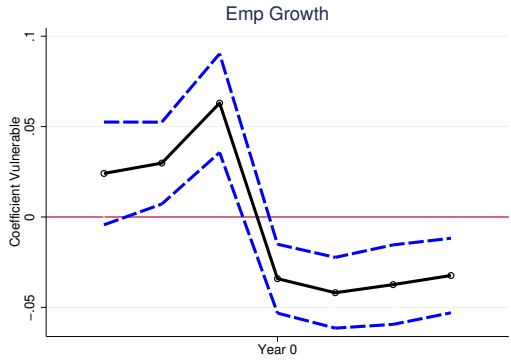
Back

Firms' performance deteriorates once classified as vulnerability

Back

$$Y_{iht+q} = \beta_q \times Enter\,Vuln_{iht} + \gamma_q \times Vuln_{iht} + \eta_q \times X_{iht+q} + \mu_{ht+q} + \epsilon_{iht+q}$$

1) Emp Growth

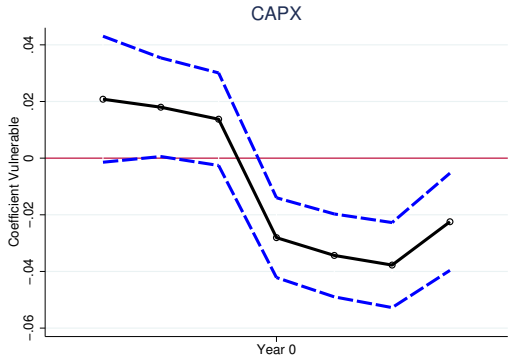


Firms' performance deteriorates once classified as vulnerability

Back

$$Y_{iht+q} = \beta_q \times Enter\,Vuln_{iht} + \gamma_q \times Vuln_{iht} + \eta_q \times X_{iht+q} + \mu_{ht+q} + \epsilon_{iht+q}$$

1) Emp Growth
2) Investment
   (CAPX/Fixed Assets)

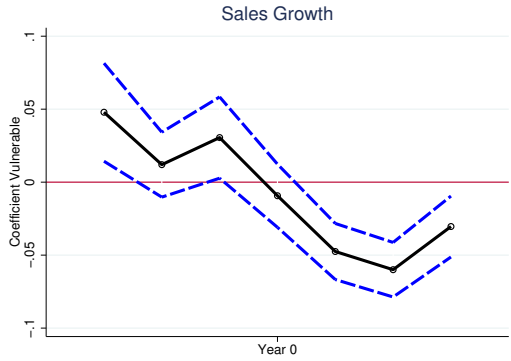


Firms' performance deteriorates once classified as vulnerability

Back

$$Y_{iht+q} = \beta_q \times Enter\,Vuln_{iht} + \gamma_q \times Vuln_{iht} + \eta_q \times X_{iht+q} + \mu_{ht+q} + \epsilon_{iht+q}$$

1) Emp Growth
2) Investment
   (CAPX/Fixed Assets)
3) Sales Growth

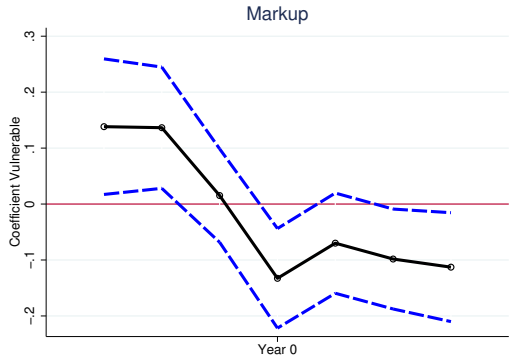


Firms' performance deteriorates once classified as vulnerability

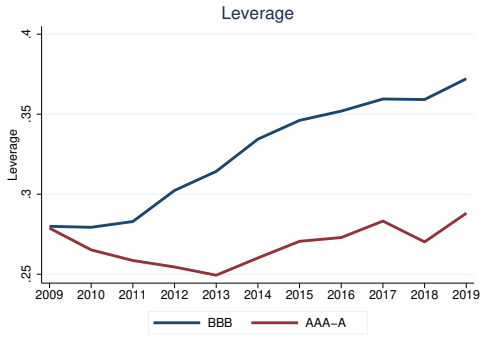
Back

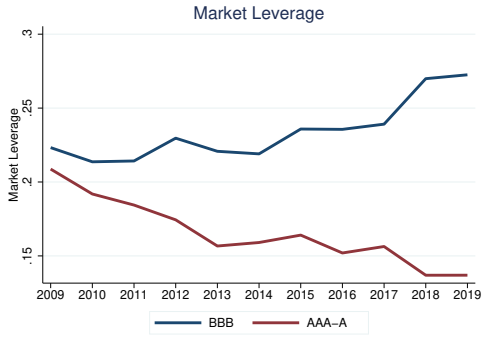
$$Y_{iht+q} = \beta_q \times Enter\,Vuln_{iht} + \gamma_q \times Vuln_{iht} + \eta_q \times X_{iht+q} + \mu_{ht+q} + \epsilon_{iht+q}$$

1) Emp Growth
2) Investment
   (CAPX/Fixed Assets)
3) Sales Growth
4) Markup



Asset-weighted (market) leverage over 2009 to 2019





Back

Vulnerable firms more likely downgraded and put on watch/outlook

$$Y_{iht+1} = \beta_1 \times Vulnerable_{iht} + \gamma \times X_{iht} + \eta_{ht} + \epsilon_{iht+1}$$

- Firm i, industry h, year t
- $Vulnerable$: indicator=1 if firm is vulnerable in year t
- Industry-year fixed effects η
- LHS variables: negative watchlist/outlook, downgrade by at least one rating category (i.e. a firm that has a rating of A+, A, A- is downgraded to at least BBB+)

Vulnerable firms more likely downgraded and put on watch/outlook

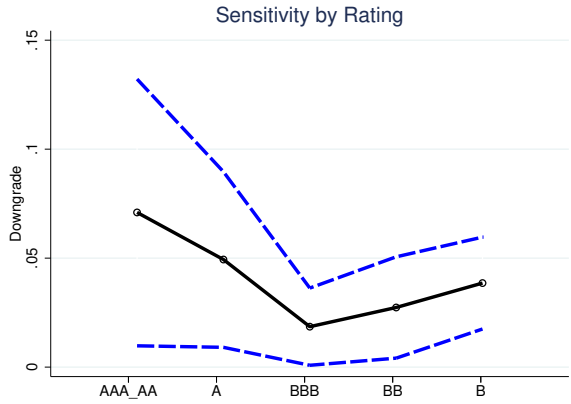
$$Y_{iht+1} = \beta_1 \times Vulnerable_{iht} + \gamma \times X_{iht} + \eta_{ht} + \epsilon_{iht+1}$$

	Negative Watch	Negative Watch	Downgrade	Downgrade
Vulnerable	0.078***	0.043**	0.021***	0.018***
	(0.018)	(0.018)	(0.005)	(0.005)
Size		0.017**		0.003*
		(0.007)		(0.002)
Leverage		0.131**		0.016
		(0.055)		(0.015)
IC Ratio		-0.010***		-0.000**
		(0.001)		(0.000)
Industry-Year FE	✓	✓	✓	✓
Observations	9,056	8,973	9,431	9,341
R-squared	0.118	0.150	0.094	0.097

- 4.3pp more likely to be put on neg watch/outlook; 1.8pp to be downgraded

Back

One-year downgrade sensitivity across rating categories



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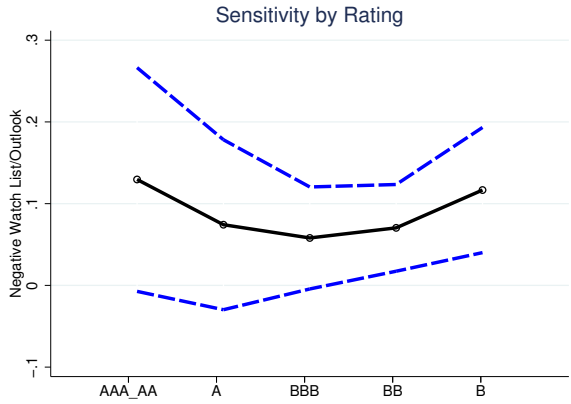
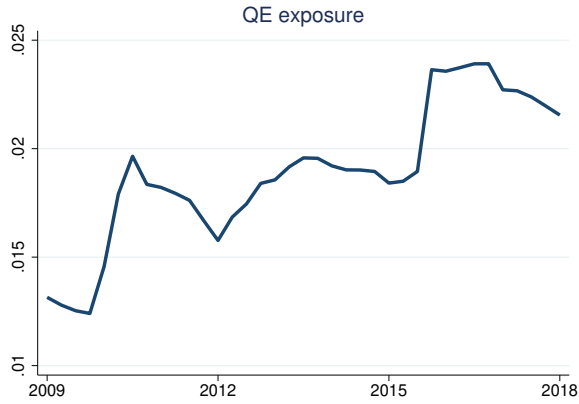
One-year watch list/outlook sensitivity across rating categories



Back

QE Exposure: time-series evolution



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Defining the subsidy

- The green bars are the difference between the mean offering spread of downgrade-vulnerable firms in a given rating category relative to the mean offering spread of non-downgrade-vulnerable firms in the next lowest rating category, multiplied by the average maturity and the total offering amount of the bonds in the downgrade-vulnerable rating category over the years 2009–2019.
- The bar in grey is based on the spread difference, if positive, between non-downgrade-vulnerable firms and downgrade-vulnerable firms. This component of the subsidy is computed by multiplying the aforementioned spread difference by the average maturity and the total offering amount of the bonds in the downgrade-vulnerable BBB rating category over the years 2009–2019.

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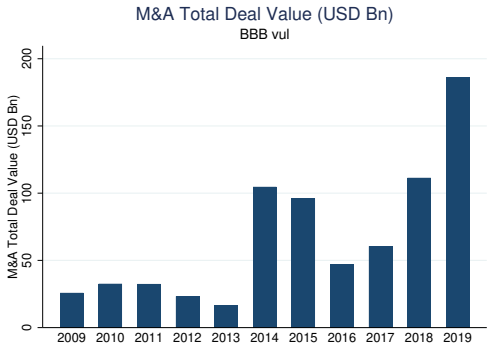
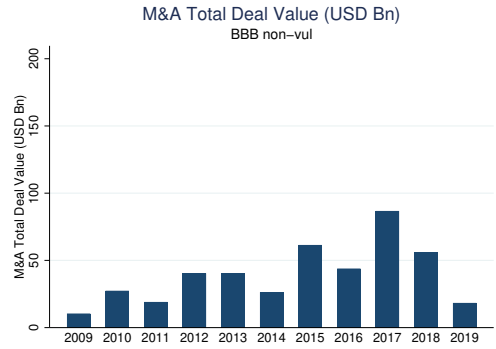
M&A deal volume BBB by downgrade-vulnerability





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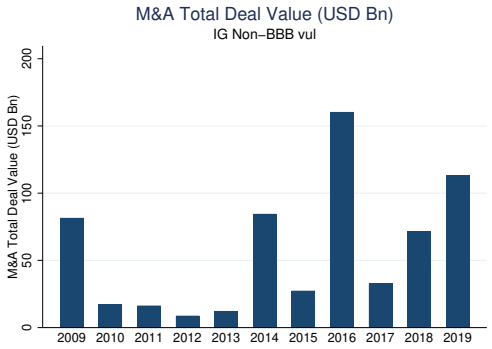
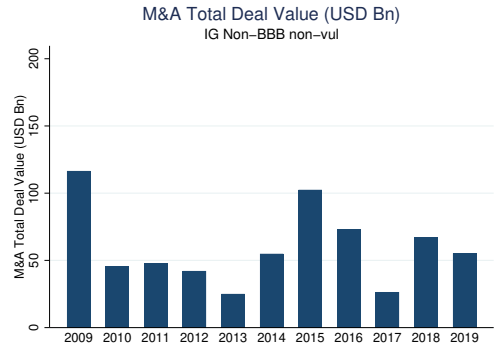
M&A deal volume IG by downgrade-vulnerability





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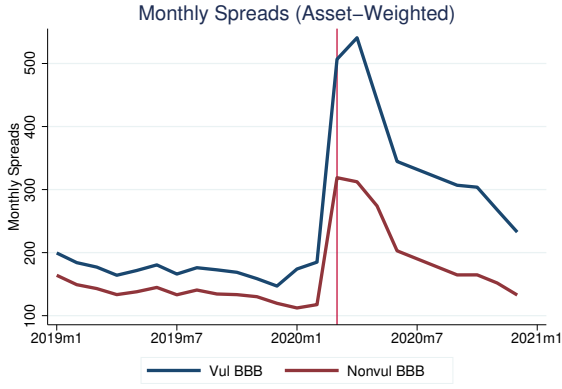
Monthly spreads during COVID-19 for (non-)vulnerable BBB



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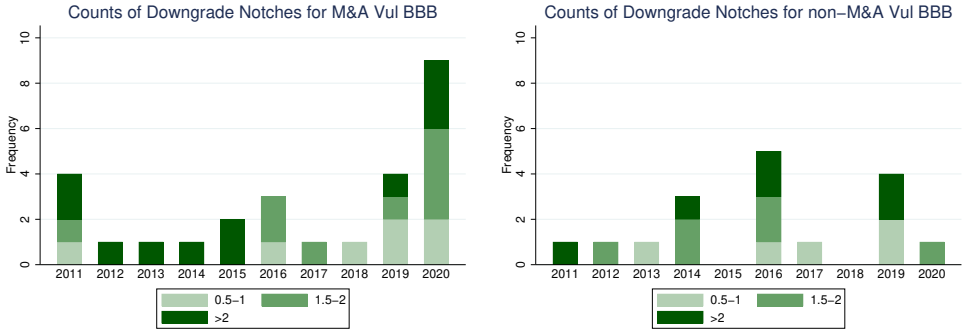
Downgrade frequency of M&A and non-M&A prospective fallen angels



- The panels plots the downgrade (notch) frequency for vulnerable BBB firms that have conducted an M&A since the year that they have become vulnerable (left) and the ones that have not (right)
- The downgrade severity is measured by the number of notches a firm is being downgraded, and is subdivided into three broad categories: 0.5-1, 1.5-2, >2 notches

Back

Vul BBB firms do large and highly levered deals, with neg. returns

$$\begin{aligned} Y_{iht} &= \beta_1 Vulnerable_{iht} + \beta_2 BBB_{iht} + \beta_3 Vulnerable_{iht} \times BBB_{iht} \\ &+ \gamma \times X_{iht} + \eta_{ht} + \epsilon_{iht}, \end{aligned} \tag{2}$$

where i is a firm, h an industry, and t a year. Y_{iht} measures the relative deal size (total transaction value of a firm in a given year over lagged assets), net debt/EBITDA (adjusted to Y_{iht+1}) and CARs (adjusted to deal level j with Y_{ijht}).

	$Relative\ Deal\ Size_{iht}$	$Net\ Debt/EBITDA_{iht+1}$	$CARs_{ijht}$
Vulnerable × BBB	0.055**	0.373*	-0.010*
	(0.025)	(0.212)	(0.005)
Vulnerable	-0.033**	-0.263	0.003
	(0.015)	(0.183)	(0.004)
BBB	-0.045***	-0.222*	0.001
	(0.013)	(0.125)	(0.003)
Controls	✓	✓	✓
Industry-Year FE	✓	✓	✓
Sample	M&A Rated	M&A Rated	M&A Rated
Level	Firm	Firm	Deal
Observations	1,840	2,625	2,412
R-squared	0.261	0.470	0.197

Interplay between M&A and sluggishness of ratings

	Downgrade probability	Time to downgrade	Upgrade probability	Up/Downgrade intensity (Δnotch)
BBB_{ij}	-0.069**	-0.677***	-0.026	0.003
	(0.032)	(0.244)	(0.019)	(0.082)
$M\&A_{ij} \times BBB_{ij}$	-0.082**	-0.176	0.070**	-0.250***
	(0.038)	(0.290)	(0.033)	(0.093)
$M\&A_{ij}$	0.043*	0.533*	-0.036*	0.104*
	(0.024)	(0.270)	(0.019)	(0.059)
Controls	✓	✓	✓	✓
Industry-Year FE	✓	✓	✓	✓
Sample	Vulnerable	Vulnerable	Vulnerable	Vulnerable
Sample	Rating changes	Downgrades	Rating changes	Rating changes
Observations	255	143	255	255
R-squared	0.616	0.723	0.505	0.543

where i is a firm and j is a rating change.

- Prospective fallen angels that undertake M&A have lower prob. of downgrade
- Conditional on being downgraded, M&A extends the time-to-downgrade
- For prospective fallen angels, M&A provides an upside potential
- Higher upgrade intensity (minus sign) relative to other M&A firms

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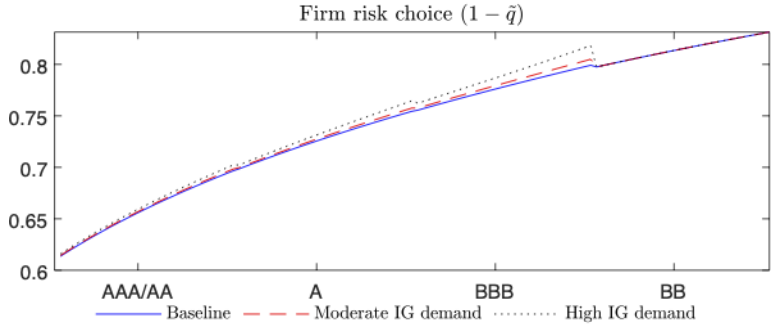
Firm risk taking as a function of firm quality



Investors' characteristics

Top 5 funds	**Top 5 insurance**	**Top 5 insurance**
Full sample	**IG-focused**	**non-IG-focused**
Teachers Ins & Ann Assn of America	TIAACREF Life	Teachers Ins & Ann Assn of America
Northwestern Mutual Life	State Farm Fire & Cas.	Northwestern Mutual Life
Vanguard Tot Bond Mkt Index Fund	Nat Western Life	Metropolitan Life
Allianz Life	State Farm Mutual Auto	NY Life
Lincoln National Life	Symetra Life	John Hancock Life

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