

Investment Commonality across Insurance Companies: Fire Sale Risk and Corporate Yield Spreads

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Introduction

- Insurers played a critical role in the financial crisis.
 - ▶ Some insurers could be "Too Big To Fail": AIG.
 - ▶ Dodd-Frank: subjects systemically important insurers to enhanced regulation by the Fed.
- Focusing on individual SIFIs is inadequate.
 - ▶ Linkage between insurers and the rest of the financial system: Insurers are major owners of financial assets (Acharya, Biggs, Richardson, and Ryan (2009)).

Introduction

- In the corporate bond market:
 - ▶ Insurers are the largest owners of corporate bonds: Insurers held more bonds than other institutions combined between 2002-2011 (eMaxx).
 - ▶ Investment strategies of insurers are correlated: Cai, Han, Li and Li (2016), Getmansky, Girardi, Hanley, Nikolova, and Pelizzon (2016).
 - ▶ Investment commonality arises from:
 - ★ Facing similar regulatory constraints: NAIC.
 - ★ Following similar business models: Schwarcz and Schwarcz (2014).
 - ★ Chasing liquidity premium: Huang, Sun, Yao, and Yu (2014).
 - ★ Reaching for yield: Becker and Ivashina (2015).

Introduction

- Insurers' investment commonality can exacerbate price risks and introduce a negative externality.
 - ▶ Fire sales induced by regulations (Ambrose, Cai, and Helwege (2008) , Ellul, Jotikasthira, and Lundblad (2011)).
 - ▶ Impose spillover costs on other investors:
 - ★ Portfolios are marked to market.
 - ★ Trigger/exacerbate fund outflows.
 - ★ Affect repo collateral values.
- This Paper: Understanding the economic implications of insurer investment commonality.
 - ▶ Examine the collective impact of insurance companies as major corporate bond investors in determining corporate yield spreads.

The Model

- The players:
 - ▶ Insurers buy and hold. Sell only after downgrade.
 - ▶ Other institutions (e.g., mutual funds) that face stochastic liquidity shocks.
- The assets:
 - ▶ A zero-coupon investment-grade bond with 2-period maturity and a risk-free bond.

The Model

- The Timeline:

- ▶ Day1: Offering date with \$1 Face Value.
 - ★ Regulatory burden for insurers to hold bond i is $K(\pi_1)$.
 - ★ A_i represents exogenous demand shocks.
 - ★ Pct of the bonds held by insurers is α_i .
- ▶ Day2: Possibility of a downgrade π_j .
 - ★ If downgraded, $V < \$1$; Otherwise, $V = \$1$.
 - ★ Insurers sell the bonds. Price drops by $L(\alpha_j)$.
 - ★ Others encounter a liquidity shock with a probability of γ . Cost for selling is λ .
- ▶ Day3: Maturity date.

The Model

- The valuation of an insurer:

$$P_{1i} = (1 - \pi_i) + \pi_i V - \pi_i L(\alpha_i) - K(\pi_1) + A_i$$

- The valuation of a marginal investor:

$$P_{1i} = (1 - \pi_i) + \pi_i V - \gamma \pi_i L(\alpha_i) - \gamma \lambda \quad (1)$$

→

$$\pi_i L(\alpha_i)(1 - \gamma) + K(\pi_1) = \gamma \lambda + A_i \quad (2)$$

- In equilibrium, P_{1i} and α_i are endogenously determined: An increase in $A_i \rightarrow$ an increase in α_i and Bond Yield.
- The effect of α_i on Bond Yield is related to $L(\cdot)$ and π_i . The effect is stronger when:
 - ▶ (1) bonds held by more constrained insurers and (2) bonds subject to higher capital requirements upon a downgrade ($L(\cdot) \uparrow$).
 - ▶ during financial crisis ($\pi_i \uparrow$).

Data and Sample

- Yield Spread Estimation
 - ▶ TRACE corporate bond transaction data: volume weighted average daily Yield to Maturity.
 - ▶ Extended Nelson-Siegel model to fit a daily default-free zero curve from CRSP Treasury. Each corporate bond is matched with a synthetic default-free bond with same coupon and maturity.
 - ▶ Daily Yield Spread is the difference in yield between corporate and matching synthetic bonds. Further averaged to quarterly Yield Spread.
- Clustering of Insurers
 - ▶ PCT of outstanding amount held by insurance companies.
 - ▶ Quarterly bond holdings data from Lipper eMAXX.
- Bond characteristics from Mergent FISD.
- Final Sample: 2002Q2 to 2011Q4; observation: bond-quarter.

Empirical Model

- Instrumental variable method and 2SLS to avoid potential endogeneity bias.

$$YieldSpread_{it} = \alpha + \beta * PCTbyInsurers_{it} + \sum Controls + \epsilon_{it}$$

- Instruments
 - ▶ A dummy variable for the year 2005: the most disastrous year for insurers.
 - ▶ Changes in insurers demand for outstanding bonds due to reinvesting proceeds from bond redemption at maturity.

Instrument Variable: Year2005 Dummy

- Insured Property Losses and Number of Deaths from Hurricanes: 2002-2011

Year	Hurricanes	Cata. Hurricanes	Insured Losses	Deaths
2002	4	1	0.5	5
2003	7	2	2.1	24
2004	9	5	26.8	59
2005	15	6	66.1	1518
2006	5	0	NA	0
2007	6	0	NA	1
2008	8	3	15.8	41
2009	3	0	NA	6
2010	12	0	NA	11
2011	7	1	4.3	44

- Manconi, Massa and Zhang (2016): Hurricane Katrina led to redemption driven sales by insurers.

Instrument Variable: Redemption at Maturity

- Insurers' proceeds from redeeming bonds with the same rating and maturity.
- Insurers' reinvestment of proceeds from bond redemption at maturity.

	Acq. ST AAA	Acq. LT AAA	Acq. ST AA	Acq. LT AA	Acq. ST A	Acq. LT A	Acq. ST BBB	Acq. LT BBB
Redm ST AAA	0.12	0.05	0.04	0.08	0.05	0.06	0.03	0.05
Redm LT AAA	-0.01	0.016	0.01	0.03	0.00	0.02	0.01	0.02
Redm ST AA	0.08	0.04	0.22	0.04	0.01	0.04	0.02	0.04
Redm LT AA	0.02	0.03	0.02	0.26	0.02	0.07	0.03	0.07
Redm ST A	0.03	0.08	0.14	0.10	0.24	0.07	0.05	0.09
Redm LT A	0.02	0.06	0.04	0.07	0.11	0.29	0.15	0.17
Redm ST BBB	0.03	0.06	0.10	0.08	0.07	0.10	0.26	0.11
Redm LT BBB	0.10	0.07	0.10	0.14	0.18	0.16	0.09	0.27

2SLS Regressions

$$I : PCTbyInsurers_{it} = \alpha_1 + \beta_1 * 2005Dummy + \beta_2 * Redm + \sum Controls$$

$$II : YieldSpread_{it} = \alpha_2 + \beta_3 * PCTbyInsurers_{it} + \sum Controls$$

	Stage I		Stage II	
	Estimate	p-value	Estimate	p-value
Intercept	1.570	0.000	-4.375	0.007
Redm	0.605	0.000		
2005Dummy	-0.009	0.016		
PCT by Insurers			7.165	0.000
	<i>Controls suppressed</i>			
Observations	39884		39884	
First-Stage F-Test (p-value)	0.000			
R ²	0.318		0.372	

Insurer Regulatory Capital Constraint

- Regulatory constraint insurers are more likely to sell following downgrade: Ellul, Jotikasthira, and Lundblad (2011).
- Insurers are classified into more and less regulatory constraint based on:
 - ▶ the NAIC risk-based capital ratio (RBC ratio)
 - ▶ Weiss Ratings risk-adjusted capital ratio 1 (RACR1)
- PCT by More CONSTRNT and PCT by Less CONSTRNT.

Insurer Regulatory Capital Constraint

	Stage I		Stage I		Stage II	
	<u>More CONSTRNT</u>		<u>Less CONSTRNT</u>		Est	p-value
	Est	p-value	Est	p-value		
Intercept	1.171	0.000	0.345	0.000	-4.311	0.006
Redm	0.170	0.044	0.690	0.001		
2005Dummy	-0.064	0.000	-0.007	0.012		
PCT by More CONSTRNT					7.853	0.000
PCT by Less CONSTRNT					4.662	0.000
	<i>Controls suppressed</i>					
Observations	34641		34641		34641	
First-Stage F-Test (p-value)	0.000		0.000			
R ²	0.235		0.244		0.532	
Diff Test (p-value)		0.000				

Proximity to Higher Capital Requirement

- Higher capital requirement makes a bond more expensive to hold from the perspective of regulatory capital.
- AAA and AA are further away from the NAIC risk boundary while A and BBB are right on the boundaries.
- Compared to A, BBB face higher capital charges and other restrictions (e.g., 20% or less in junk).

Proximity to Higher Capital Requirement

	I. AAA&AA		II. A&BBB		III. A		IV. BBB	
	Est	p-value	Est	p-value	Est	p-value	Est	p-value
PCT by Insurers	6.114	0.008	19.425	0.008	10.505	0.000	17.580	0.000
	<i>Controls suppressed</i>							
Observations	2840		37044		18695		18349	
R ²	0.447		0.195		0.218		0.372	
AAA&AA vs. A&BBB		0.000						
A vs. BBB		0.000						

Financial Crisis

- Downgrade is more likely during financial crisis.
 - ▶ 9.68% of all issuers was downgraded during 03-07. It increased to 16.05% in 08 and 19.18% in 09 (2012 Annual Global Corporate Default Study and Rating Transitions by S&P).
- Insurance industry was adversely affected in the crisis.
 - ▶ Average RBC ratio was 30.15 during 02-07. It declined to 11.08 during 08-10.
- Effect of fire sale risk on corporate yield spread is expected to be larger due to increased downgrade probability with industry-wide capital constraints.

Financial Crisis

	Pre-crisis		Post-Crisis	
	Estimate	p-value	Estimate	p-value
Intercept	-1.182	0.025	-4.799	0.079
PCT by Insurers	1.394	0.035	8.932	0.001
	<i>Controls suppressed</i>			
Observations	18784		21100	
R^2	0.391		0.370	
Diff Test (p-value)		0.001		

Conclusions

- Investors require higher yield for holding bonds with greater clustering of insurers (subject to higher risk of fire sales).
 - ▶ A one std increase of 22.50% in the PCT by Insurers is associated with a 1.61% increase in yield spread.
- Clustered investment activities among insurance companies can emerge as a new source of risk in the bond market.
- Policy implications: regulators should address the potential systemic risk from the collective investment decisions of insurers, in addition to those individually too big to fail firms.