Rainy Day Liquidity

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Abstract

This study considers the role of life insurers as "rainy day" liquidity providers who help improve liquidity in stressful conditions. We show that on average insurers have positive liquidity supply scores in years following the 2007-09 financial crisis and that such positive liquidity supply scores are mainly driven by insurers' buy-side transactions. Cross sectionally, liquidity supply scores of individual insurers are higher for insurers with sufficient capital and high cash flow. We also find that in stressful periods such as the financial crisis and Dodd-Frank Act era, corporate bonds purchased more by high liquidity supply score insurers indeed experience liquidity improvement. In addition, high liquidity provision insurers are more likely to purchase downgraded bonds including fallen angels.

Motivation

- Life insurers are the largest stakeholder of U.S. corporate bonds
- According to Federal Reserve's Flow of Funds account: life insurers collectively hold 23% U.S. corporate and foreign bonds at the end of 2020
- As a group, life insurers are well capitalized and have stable cash flow from insurance products. They may provide liquidity in times of market stress

Percentage of Life Insurer Holding and Trading across Ratings
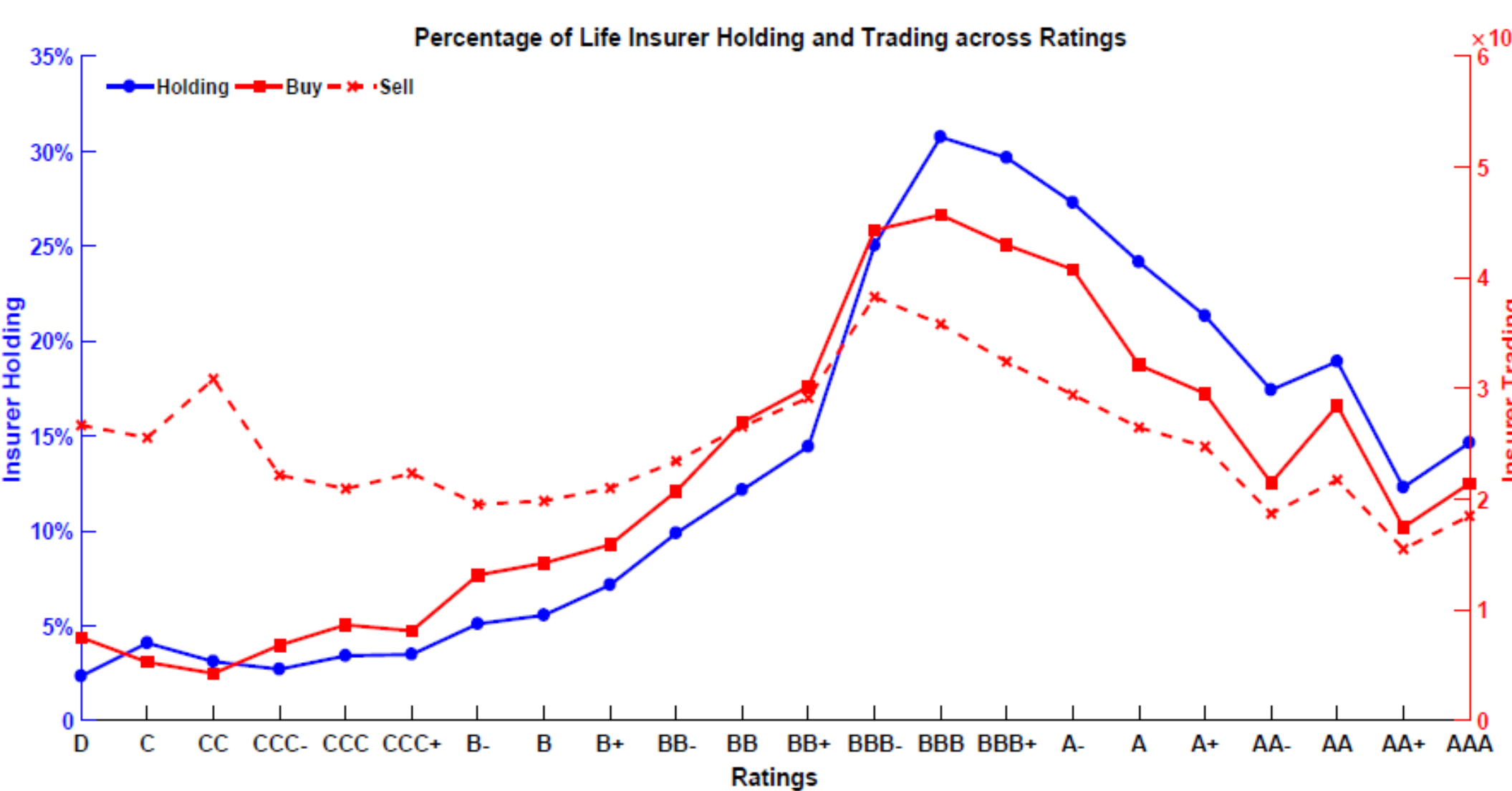
Paper Overview

- Argument: With a constant cash flow from life insurance products, life insurers potentially are rainy day liquidity providers
- Approach: Apply and develop liquidity supply (LS) scores
   - Connecting non-dealer investor transactions with liquidity supply
- Empirics: Present evidence that life insurers are rainy day liquidity providers
   - Liquidity provisions in stressful periods
   - Liquidity provisions to downgraded bonds

Liquidity Supply (LS) Score and Decomposition

- Introduced by Anand, Jotikashira, and Venkataraman (2021)

$$LS_{j,t} = \frac{\text{Liquidity Supplied}_{j,t} - \text{Liquidity Demanded}_{j,t}}{\sum_i \text{Buy}_{i,j,t} + \sum_i \text{Sell}_{i,j,t}}$$

- A **liquidity supplying** transaction: when an investor j trades in the same direction as bond i's aggregate dealer inventories
- A **liquidity demanding** transaction: when an investor j trades in the opposite direction from bond i's aggregate dealer inventories
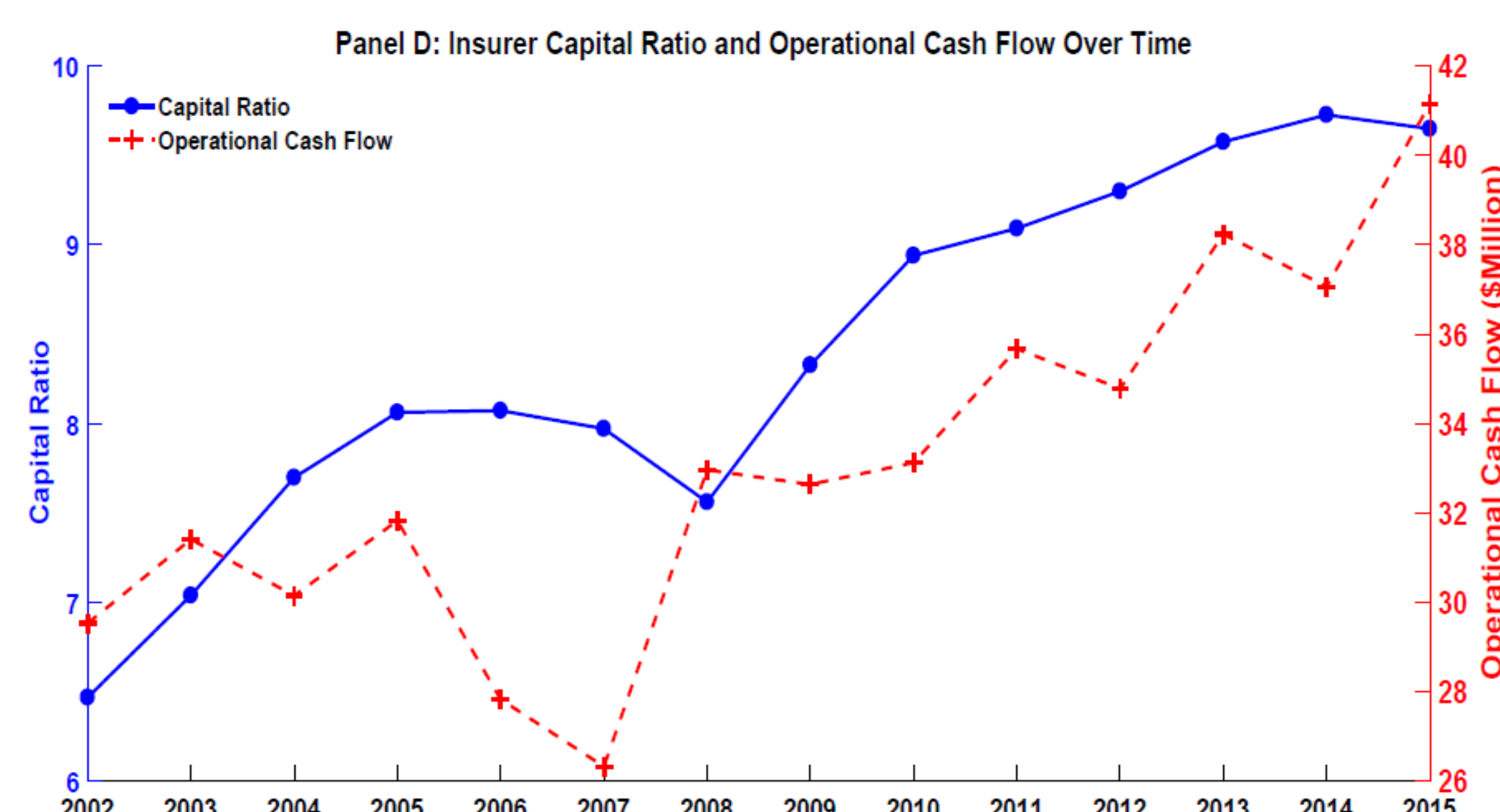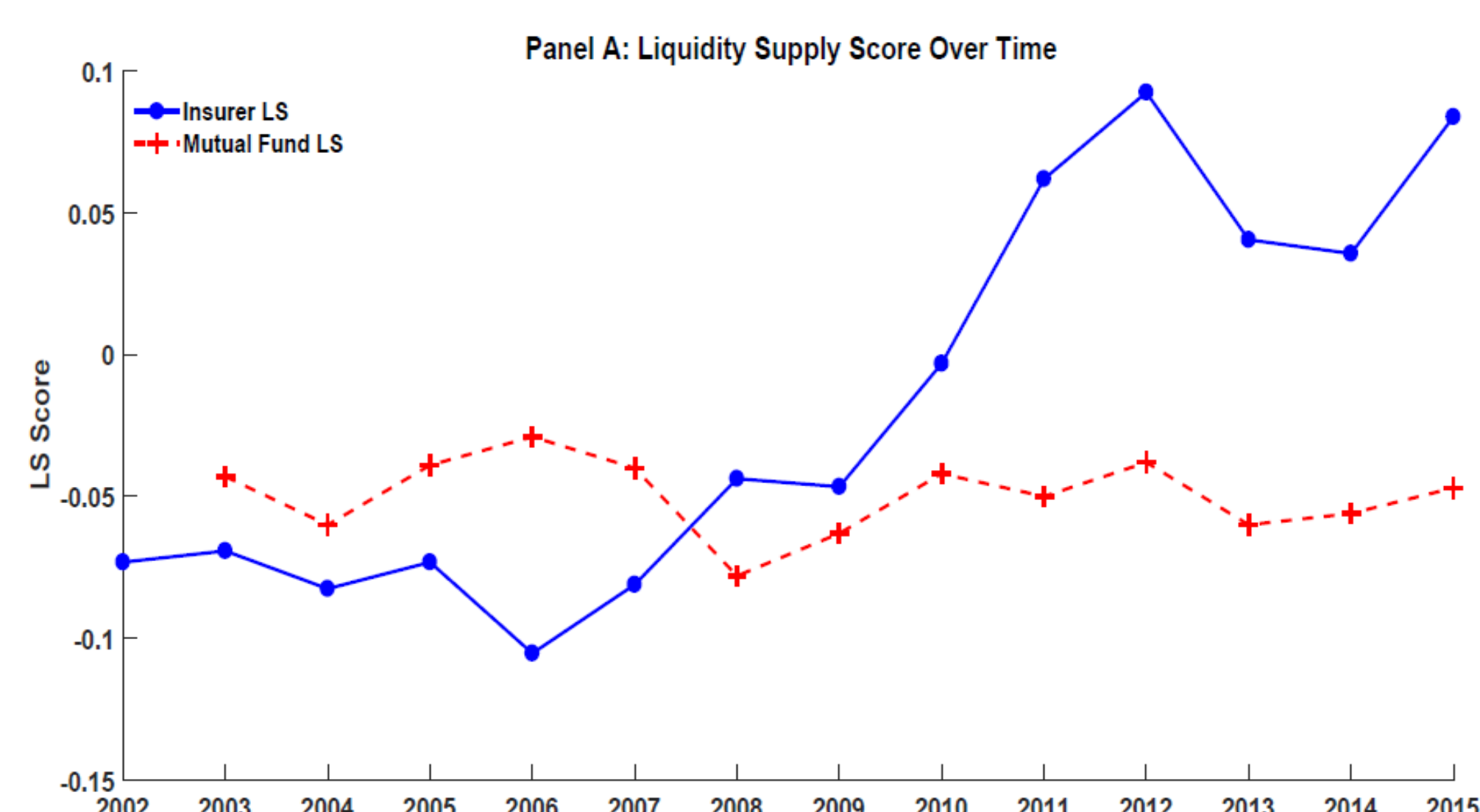- Dealer inventories can be both positive and negative

- A **Positive cycle**: Aggregate dealer inventories are positive
- A **Negative cycle**: Aggregate dealer inventories are negative

$$\text{Liquidity supplied}_{j,t} = \underbrace{\sum_i \text{Buy}_{i,j,t} * \mathbb{I}_{\{C_{i,t}>0\}}}_{(1)\ \text{buy; positive cycle}} + \underbrace{\sum_i \text{Sell}_{i,j,t} * \mathbb{I}_{\{C_{i,t}<0\}}}_{(2)\ \text{sell; negative cycle}}$$

$$\text{Liquidity demanded}_{j,t} = \underbrace{\sum_i \text{Buy}_{i,j,t} * \mathbb{I}_{\{C_{i,t}<0\}}}_{(3)\ \text{buy; negative cycle}} + \underbrace{\sum_i \text{Sell}_{i,j,t} * \mathbb{I}_{\{C_{i,t}>0\}}}_{(4)\ \text{sell; positive cycle}}$$

Panel A: Liquidity Supply Score Over Time

Panel D: Insurer Capital Ratio and Operational Cash Flow Over Time

Hypotheses

- Insurers' liquidity supply scores are mainly determined by the buy side liquidity supply scores;
- Life insurers' engagement in the corporate bond market is correlated with their operational characteristics, such as cash flow, capitalization, and investment horizon;
- Life insurers provide liquidity in stressful market conditions and to downgraded bonds.

Data

- Sample period: July 2002 – December 2015
- Three data sources:
- Life insurers' bond holdings and trades from NAIC Schedule D
   - NAIC has annual holding and transaction data. We obtain a sample of insurer holding and trading at the bond-insurer level in the monthly frequency
   - Aggregate across insurers to obtain a monthly holding and trading data at bond level
- Bond illiquidity measures from TRACE
- Other bond information from Mergent FISD

Empirical Finding

- Capital ratio (CR): the ratio of total capital to required risk-based capital;
- Cash flow (CF): the sum of an individual life insurer's operational cash flow;
- Cash flow volatility (CFV): the standard deviation of CF scaled by insurer size in the past ten years;
- Horizon (HR): average holding period of insurer bond portfolio;
- Percentage of inferior bond purchased by insurers (INF): the fraction of below A- rated bonds purchased to all purchased bonds;
- Firm size (SIZE): the logarithm of total assets of the firm;
- Extract an insurer funding stability (FS) using the first principal component of CR, CF, and CFV.

DepVar	LS (1)	LS^b (2)	LS^s (3)
CR	0.15***	0.15***	0.03
	(3.35)	(3.16)	(0.77)
CF (%)	0.16***	0.11***	0.04*
	(4.82)	(2.83)	(1.71)
CFV (%)	-0.73**	-0.51**	-0.11
	(-2.01)	(-2.18)	(-1.46)
HR	0.73***	0.63***	0.11
	(3.34)	(4.08)	(0.73)
INF (%)	0.05***	0.04***	0.02***
	(3.39)	(2.81)	(1.28)
ASSETS	0.77	0.77	0.81
	(1.36)	(1.28)	(1.32)
YIELD	-7.05***	-6.87***	-0.19
	(-16.06)	(-14.47)	(-0.47)
VIX	0.23	0.22	0.05
	(0.94)	(1.05)	(1.12)
S&P	-0.02	0.05	-0.07*
	(-0.53)	(0.94)	(-1.65)
Adj R^2	0.06	0.10	0.02
N	19,905	19,905	19,905

Dep Var: ΔILQ (ΔRoll)

	LS (1)	FS (2)	HR (3)	INF (4)
NP_i	5.01	5.18*	4.84	5.12
	(1.56)	(1.72)	(1.54)	(1.61)
NP_iX	-5.62*	-6.04**	-5.30*	-5.17
	(-1.94)	(-2.05)	(-1.82)	(-1.59)
$\Sigma_j NP_{i,j}H_j$	-6.01**	-6.59***	-5.97**	-6.12**
	(-2.37)	(-2.68)	(-2.35)	(-2.41)
$\Sigma_j NP_{i,j}H_jX$	-12.44***	-12.49***	-13.05***	-12.23***
	(-5.14)	(-5.17)	(-5.45)	(-4.86)
Bond FE	Yes	Yes	Yes	Yes
Month FE	Yes	Yes	Yes	Yes
Adj R^2	0.29	0.29	0.28	0.29
N	144,654	144,654	144,654	144,654

H: a dummy for insurers with high liquidity supply scores and high liquidity supply characteristics
X: stressed period: 2007-2015 (Crisis + DF)

Dep Var: $\log(P_{i,1}/P_{i,-21})$

	Within IG	Fallen Angel	Within NIG
NP	27.32***	32.84***	23.85***
	(4.05)	(5.49)	(2.93)
Cycle$^+$	-0.53***	-0.59**	-0.48**
	(-2.88)	(-2.49)	(-2.32)
NP*Cycle$^+$	27.51***	27.90***	20.94**
	(3.74)	(3.44)	(2.10)
Coupon	0.06	0.03	0.05
	(1.02)	(0.24)	(0.93)
BondAge	-0.32**	0.14	0.93
	(-2.43)	(0.41)	(0.14)
Maturity	-0.33***	-1.33***	-0.01
	(-3.66)	(-5.73)	(-0.03)
BondSize	-0.46***	-0.30	0.38**
	(-4.89)	(-1.06)	(2.55)
Trace NP	0.29	-0.80	-0.24
	(0.76)	(-0.38)	(-0.75)
Rating FE	Yes	Yes	Yes
Month FE	Yes	Yes	Yes

Regressions of Insurer Purchase of Downgraded Bonds (Table 9)
Dep Var: $NP_{i,j,t}$ (Individual insurer net purchase of an individual bond)

	Within IG	Fallen Angels	Within NIG
Cycle$^+$	0.44***	0.31**	0.26
	(3.61)	(2.04)	(1.57)
FS	-1.26	-1.92	-1.49
	(-0.69)	(-1.41)	(-0.83)
FS*Cycle$^+$	5.87***	5.95***	3.74*
	(4.52)	(4.79)	(1.83)
HR	-0.04	-0.05	-0.02
	(-0.95)	(-1.38)	(-0.79)
HR*Cycle$^+$	0.24***	0.21***	0.20***
	(4.98)	(4.22)	(4.03)
INF	-0.16	-0.18	-0.20
	(-0.82)	(-0.42)	(-0.74)
INF*Cycle$^+$	0.45***	0.67***	0.30*
	(3.12)	(2.50)	(1.72)
Rating Dummies	Yes	Yes	Yes
Month FE	Yes	Yes	Yes

Conclusion Remarks

- Connect insurer characteristics with insurer liquidity supply scores
- Present evidence that insurers with high liquidity scores (and consistent characteristics) provide bond liquidity in stressful periods and to downgraded bonds