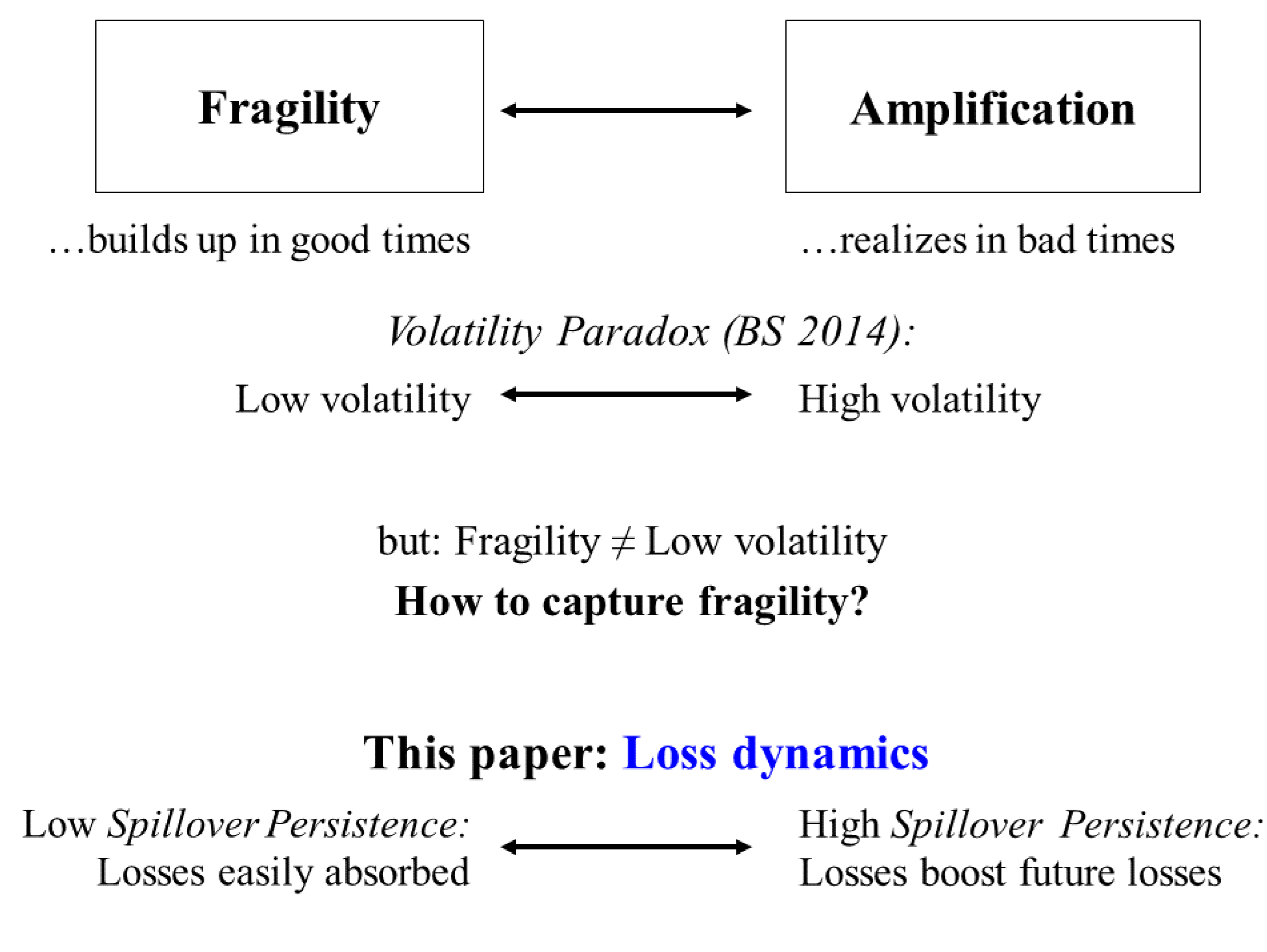


# Tackling the Volatility Paradox: Spillover Persistence and Systemic Risk

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## 1. Systemic Risk



## 2. Defining Spillover Persistence

- Firm  $i$ 's contribution to the system's future risk:

$$\Delta\text{CoSP}(\tau) = \mathbb{P}\left(\underbrace{-r_S(t+\tau) \geq \text{VaR}_S(q)}_{\text{system's return losses}} \mid \underbrace{-r_i(t) \geq \text{VaR}_i(q)}_{\text{firm's return losses}}\right) - q.$$

- Spillover Persistence**

= Average time lag between losses of the firm and system  
 "For how long do losses cascade through the system?"

$$\bar{\tau} = \frac{1}{\int_1^{\tau^{\max}} \Delta\text{CoSP}(\tau) d\tau} \int_1^{\tau^{\max}} \tau \times \Delta\text{CoSP}(\tau) d\tau.$$

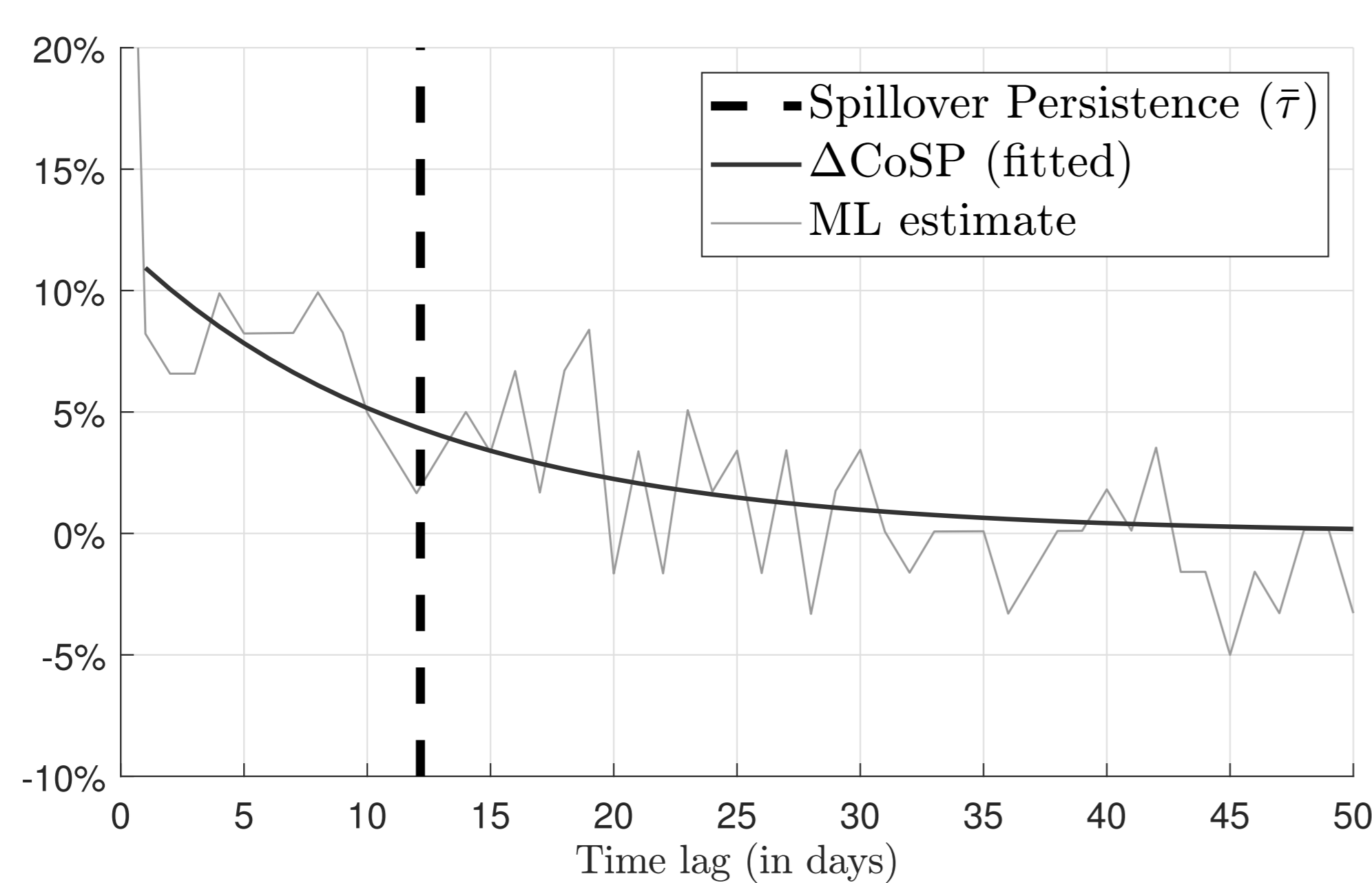


Figure:  $\Delta\text{CoSP}$  for Royal Bank of Canada for 2010-2016 with varying time lag (x-axis)..

- Compute for >700 financial firms, >25 countries, 1989-2017, based on daily equity returns
- Important determinant:** Financial constraints  
 Tighter constraints ↔ Higher Spillover Persistence (e.g., higher TED & credit spreads)

## 3. Low Spillover Persistence before Crises

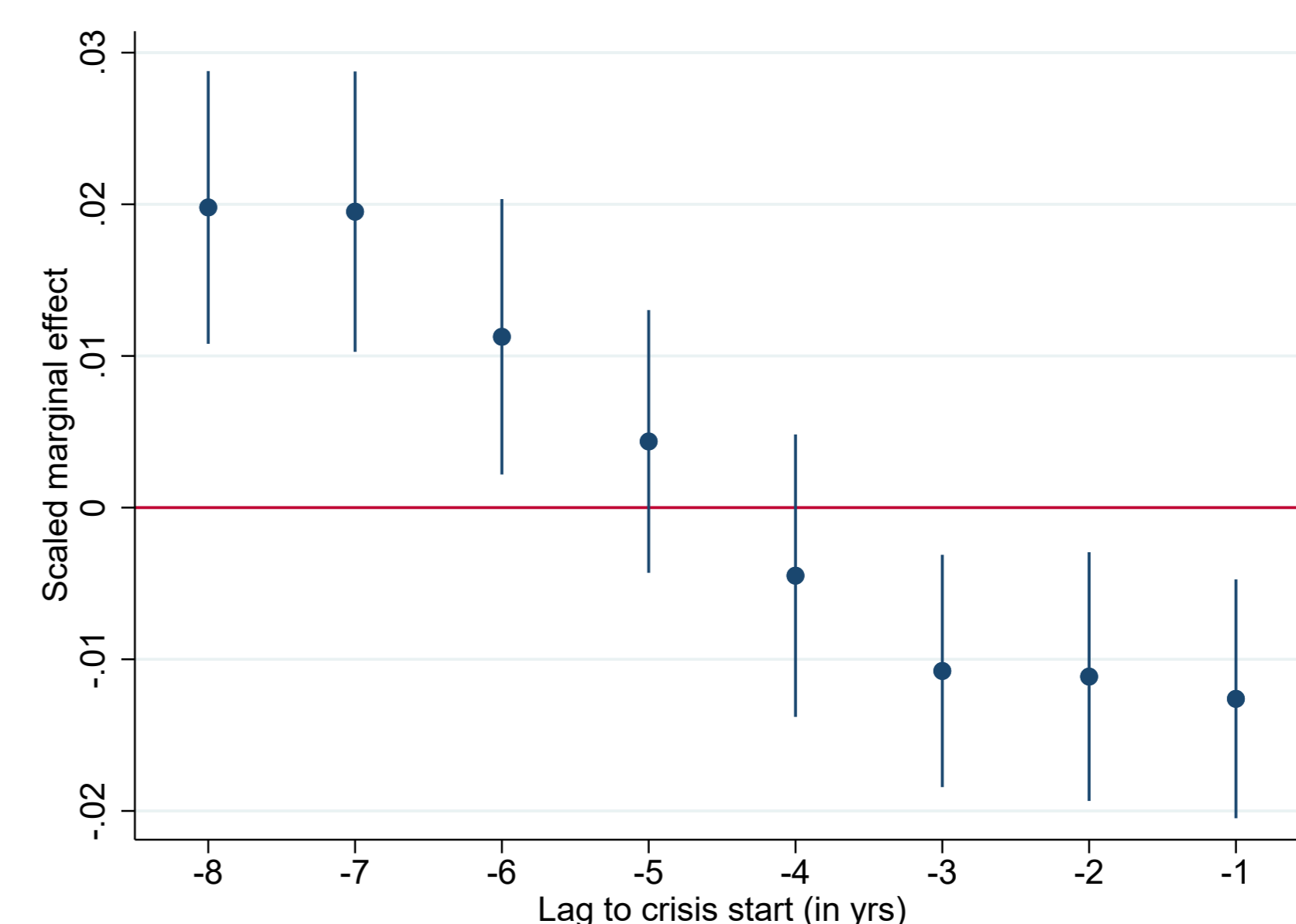


Figure: Estimated change in the likelihood of crises in year  $t$  (in percentage points) and its 95% confidence interval associated with a 1 standard deviation increase in Spillover Persistence in year  $t-1, t-2, \dots$ . Banking crises indicators are from Laeven and Valencia (2018) for 26 countries from 1989 to 2017.

⇒ Low Spillover Persistence ↔ Fragility before crises.

## 4. Low Spillover Persistence during Stock Market Booms

Dependent variable:	Spillover Persistence			
	(1)	(2)	(3)	(4)
Sample:	Baseline		Ban & Bro	
Boom	-3.671*** [-3.27]	-3.573** [-2.46]	-1.897** [-2.37]	-1.751* [-1.83]
Macro controls	✓	✓	✓	✓
Additional macro controls			✓	✓
Firm controls			✓	✓
Bank controls			✓	✓
$\Delta\text{CoVaR}$			✓	✓
Firm FE	✓	✓	✓	✓
Time FE			✓	✓
Estimated effect of 1SD increase				
Boom	-.52	-.51	-.27	-.27
No. of obs.	7,592	7,592	7,592	1,295

⇒ Low Spillover Persistence ↔ Fragility during booms.

## 5. High Spillover Persistence during Fire Sales

Explore fire sales by US non-life insurers exposed to hurricane Katrina (Girardi et al., 2021).

Dependent variable:	Spillover Persistence		
	(1)	(2)	(3)
Sample:	US insurers		All insurers
Exposed × post-Katrina	0.749*** [4.92]	1.120*** [3.60]	0.749** [2.30]
Insurer FE	✓	✓	✓
Day FE	✓	✓	
Country-Day FE			✓
No. of obs.	820	2,093	2,093

⇒ High Spillover Persistence ↔ Fire sale amplification.

## 6. Takeaways

**Spillover Persistence disentangles fragility & amplification:**

- Low: Loose constraints, run-up of crises, stock market booms  
 ⇒ Fragility
  - High: Tight constraints, during crises, fire sales  
 ⇒ Amplification
- ⇒ Useful for policy & understanding systemic risk.

## References

- Brunnermeier, M. K. and Sannikov, Y. (2014). A macroeconomic model with a financial sector. *American Economic Review*, 104:379–421.
- Girardi, G., Hanley, K. W., Nikolova, S., Pelizzon, L., and Getmansky Sherman, M. (2021). Portfolio similarity and asset liquidation in the insurance industry. *Journal of Financial Economics*, 142(1):69–96.
- Laeven, L. and Valencia, F. (2018). Systemic banking crises database: An update. *IMF Working Paper*, 18/206.