Short-Sale Collateral as a Source of Financial Instability

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Proceeds of short-sales can be held in collateral accounts, which invest them in liquid safe assets

Example of short-sale collateral intermediation chain

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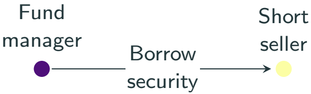

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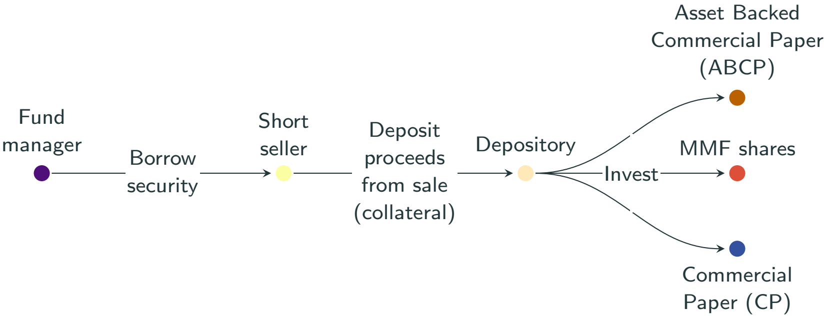

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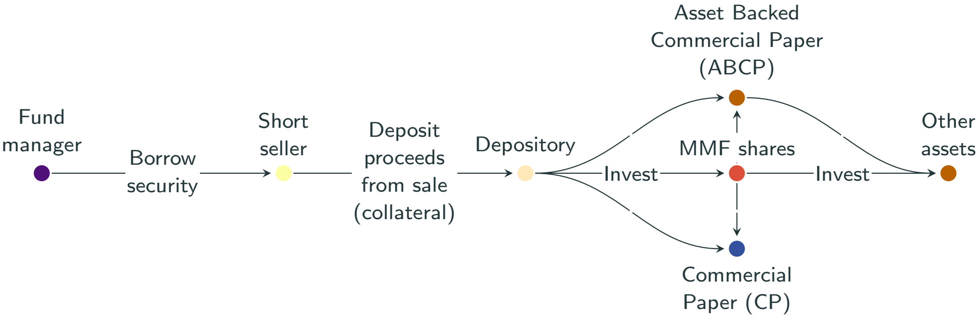
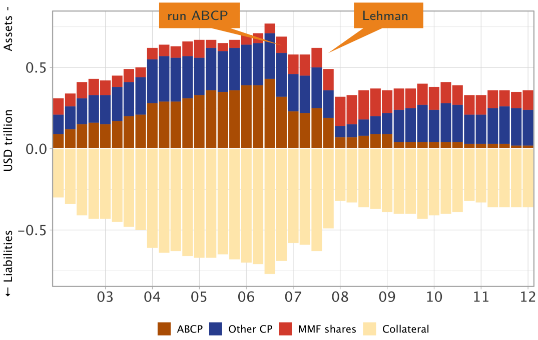


Shocks to assets within the intermediation chain can destabilize the entire intermediation chain

Depositories accounted for 66% of ABCP and 94% of CP Subprime Crisis contraction

US aggregate depository balance sheet



Decomposition of balance sheet changes

	Run on ABCP		Lehman	
Period	07Q3	07Q4	08Q3	08Q4
Δ collateral ($bn)	−78.5	−113.3	−134.3	−170.7
Δ Depository ABCP ($bn)	−134.2	−77.6	−62.0	−102.8
- Unwinding (%)	29.7	54.1	65.2	42.7
- Reallocation (%)	70.3	45.9	34.8	57.3
Δ Depository CP ($bn)	−64.5	−36.6	−60.4	−95.8
- Unwinding (%)	40.9	86.9	64.0	43.5
- Reallocation (%)	59.1	13.1	36.0	56.5
Share of Δ ABCP outstanding (%)	62.0	74.5	66.1	1634
Share of Δ CP outstanding (%)	149	98.7	65.6	184

Values >100% mean other sectors (Fed CPFF) were net buyers

Two mechanisms:

- **Unwinding** of short positions → mechanical collateral sell-off
- **Reallocation** from riskier (ABCP, CP) to safer (MMF shares) collateral

[0]**Source**: Fed Flow of Funds Accounts, Bol (2026).

Depositories sell more safe assets and sell more risky safe assets

Identification: Within each asset × quarter, compare depositories to other holders of CP, ABCP and MMF shares (MMFs, insurers, pension funds, state/local govt., nonfinancial corp.)

$$\Delta h_{s,a,t} = \alpha_{a,t} + \alpha_s + \beta_1 \cdot \text{Depo} \cdot \Delta\text{short}_t + \beta_2 \cdot \text{Depo} \cdot \Delta\text{short}_t \cdot \text{Risk}_a + \varepsilon_{s,a,t}$$

[0]**Source**: Fed Flow of Funds Accounts, Bol (2026). $\text{Risk}_a \in \{1, 2, 3\}$ for MMF, CP, ABCP. Driscoll-Kraay SEs ($L = 3$). *** $p < 0.01$.

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Differential depository response

	$\Delta h_{s,a,t}$ ($bn)
Depo · Δshort_t	-0.256^{***}
	(0.062)
Depo · Δshort_t · Risk_a	0.211^{***}
	(0.056)
Asset×Qtr / Sector FE	Y / Y
Obs. / Adj. R^2	1,909 / 0.12

Implied marginal effects

MMF shares	(Risk = 1)	−0.05
CP	(Risk = 2)	+0.17
ABCP	(Risk = 3)	+0.38

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Depositories sell ABCP more aggressively than CP and *increase* MMF holdings when shorts contract → flight-to-safety *within* collateral, ruling out generic credit-quality reassessment

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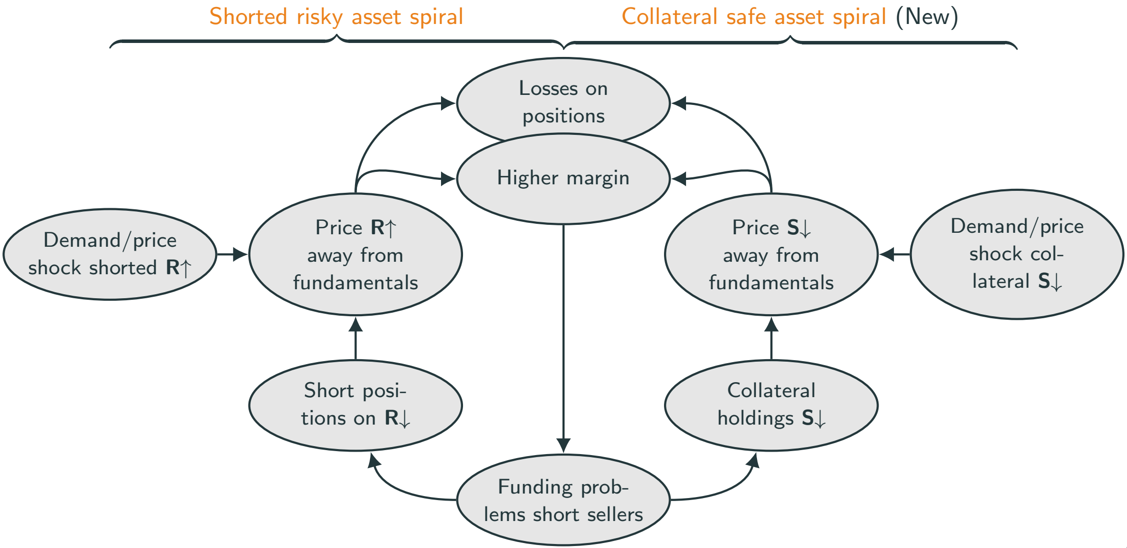
Shocks cause two reinforcing feedback loops between shorted and collateral assets



Related literature

Model: Extension of Brunnermeier and Pedersen (2009) with depositories that hold short-sale collateral

- Contagious liquidity spirals between risky shorted and safe collateral assets
- System amplification strictly exceeds isolated asset spirals

Extension 1: Profit-taking spirals under mean-reverting fundamentals

- Traders optimally unwind profitable shorts, causing collateral liquidation

Extension 2: Safe asset spirals with multiple collateral assets

- Depositories reallocate from riskier to safer safe assets when margin constraints tighten

Policy implications & conclusion

Relates to liquidity spirals, short-selling and safe asset fragility

Funding liquidity and liquidity spirals

- **Brunnermeier and Pedersen (2009)**, Shleifer and Vishny (1997), Gromb and Vayanos (2002)

Securities lending and short-selling

- Duffie et al. (2002), Brunnermeier and Pedersen (2005)

Short-sale collateral and financial instability during Subprime Crisis

- Covitz et al. (2013), Kacperczyk and Schnabl (2010), Ramcharan et al. (2016), Benmelech et al. (2017)

Safe asset fragility

- Pinter et al. (2024), Kashyap et al. (2025)

Extension of Brunnermeier and Pedersen (2009): Assets, agents and objectives

Assets: Safe asset s and risky asset r, traded at $t = 0, 1, 2, 3$. Fundamental value: random walk with ARCH:

$$v_{t+1}^j = v_t^j + \sigma_{t+1}^j \varepsilon_{t+1}^j, \qquad \sigma_{t+1}^j = \underline{\sigma}^j + \theta^j |\Delta v_t^j| \qquad \text{with } \underline{\sigma}^s < \underline{\sigma}^r,\ \theta^s < \theta^r$$

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Investors: Risk-averse, receive temporary demand shocks z^r_t for the risky asset, funded by selling safe assets, which results in demand y^j_t for $t = 0, 1$. Maximize expected utility:

$$\max_{y_t} \mathbb{E}_t[-e^{-\gamma W^k_3}] \quad \Longrightarrow \quad y^j_t = \frac{v^j_t - p^j_t}{\gamma(\sigma^j_{t+1})^2} - z^j$$

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Traders: Risk-neutral, maximize wealth short selling x_t risky assets and from storing proceeds at depositories:

$$\max_{x_t} \mathbb{E}[W^h_3], \qquad W^h_t = W^h_{t-1} + (p^r_t - p^r_{t-1})x_{t-1} + W^d_t$$

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Depositories (new): Invest all collateral proceeds in the safe asset: $p^s_t d_t = -p^r_t x_t$

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Financiers: Lend risky asset to traders and require VaR-based margins: $d_t m^{s+}_t - x_t m^{r-}_t \leq W^h_t$ and have incomplete information (observe prices p_t, not fundamentals v_t)

Extension of Brunnermeier and Pedersen (2009): Timing and equilibrium

t=0

- Fundamental values: $\mathbf{v}_0$
- Shock investor 0: z_0^r
- Investor demand: $\mathbf{y}_0^0$
- Financiers lend x_0 at margin m_0
- Trader short position: x_0
- Depositories store collateral: d_0

t=1

- Fundamental values: $\mathbf{v}_1$
- Shock investor 1: z_1^r
- Investor demand: $\mathbf{y}_1^0 + \mathbf{y}_1^1$
- Financiers adjust to x_1 and m_1
- Trader adjusts to x_1
- Depositories adjust to d_1

t=2

- Third shock: $-z_0^r - z_1^r$
- Prices return to fundamentals: $\mathbf{v}_2 = \mathbf{p}_2$
- Traders unwind and return risky asset to financiers: $x_2 = d_2 = 0$

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Assets pay out

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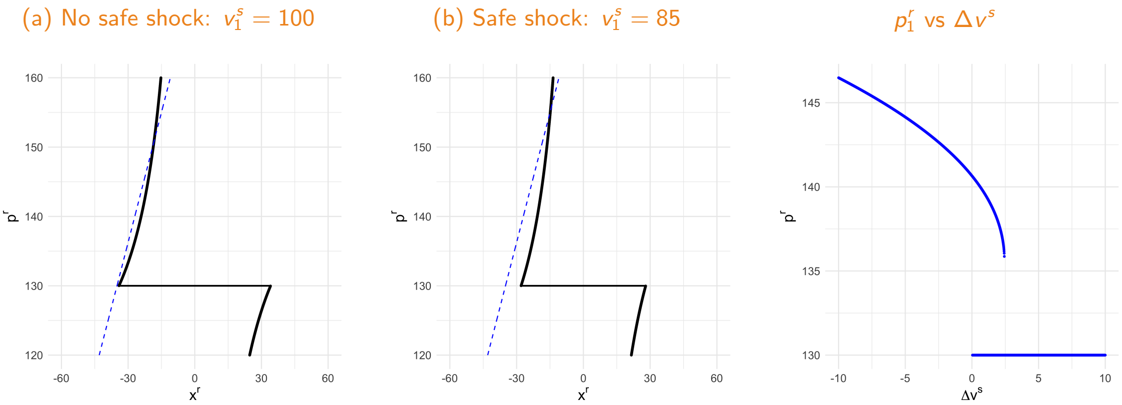
Assets pay out

Equilibrium: Perfect Bayesian with perfect competition at $t = 1$

Solve: Equilibrium implicitly defined by $E(\mathbf{p}_1, \mathbf{v}_1) = 0$ and implicit function theorem gives comparative statics

$$\begin{aligned} E_r(\mathbf{p}_1, \mathbf{v}_1) &= -x_1 m_1^{r-} + d_1 m_1^{s+} - W_1^h \quad \text{(margin)} \\ E_s(\mathbf{p}_1, \mathbf{v}_1) &= x_1 p_1^r + d_1 p_1^s \quad \text{(collateral)} \end{aligned} \quad \rightarrow \quad \underbrace{\frac{\partial p}{\partial v} = -\frac{\partial E/\partial v}{\partial E/\partial p}}_{\text{implicit function theorem}} \quad \text{with} \quad \underbrace{\frac{\partial E}{\partial p} = \begin{pmatrix} J_{rr} & J_{rs} \\ J_{sr} & J_{ss} \end{pmatrix}}_{\text{amplification factor}}$$

A safe-asset shock can cause an equilibrium shift for the risky asset (and vice versa)



(a)→(b): Negative safe-asset shock tightens the margin constraint, eliminating the liquid equilibrium at $p_1^r = v_1^r = 130$. The risky asset becomes illiquid even though its own fundamentals are unchanged.

Contagious liquidity spirals amplify instability beyond isolated asset effects

Isolated price responses: In a stable illiquid equilibrium, the isolated marginal price response of the risky asset consists of a stabilizing baseline and two destabilizing spirals:

$$\frac{1}{J_{rr}} = -\frac{1}{\underbrace{\frac{2}{\gamma(\sigma_2^r)^2} m_1^{r-}}_{\text{baseline (stabilizing)}} + \underbrace{\frac{\partial m_1^{r-}}{\partial p_1^r} x_1}_{\text{margin spiral}} + \underbrace{x_0}_{\text{loss spiral}}}$$

Margin and loss spirals reduce the denominator: when it reaches zero, prices jump discontinuously

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Contagious Liquidity Spirals: The full system sensitivity expands as:

$$\frac{\partial p_1^r}{\partial W_0^h} = \frac{J_{ss}}{\det(J)} = \frac{1}{J_{rr}} \left(1 + \frac{J_{rs} J_{sr}}{J_{rr} J_{ss}} + \left(\frac{J_{rs} J_{sr}}{J_{rr} J_{ss}}\right)^2 + \dots\right)$$

- Cross-terms $J_{rs} J_{sr} > 0$: safe asset declines worsen risky asset funding and vice versa
- System amplification $1/\det(J)$ *exceeds* isolated spirals $1/J_{rr}$ $\rightarrow$ Short spirals are worse than long spirals
- System-wide fragility can occur even when neither asset is individually fragile

Profit-taking spirals and safe asset spirals

Extension 1: With mean-reverting fundamentals, traders optimally unwind profitable shorts during crises, causing collateral liquidation even without binding margin constraints

Profit-taking spirals: For risky-asset buying pressure, there exists a threshold such that it is optimal for traders to unwind the short position ($x_1 = 0$), liquidating all collateral ($d_1 = 0$)

- Operates precisely during financial crises, when negative shocks are largest

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Extension 2: With multiple safe collateral assets, depositories hold the riskiest safe asset when unconstrained (highest return) and reallocate to the safest when margin constraints bind (largest short position)

Safe asset spirals:

- When a shock causes the margin constraint to bind, depositories reallocate from riskier to safer safe assets
- A shock that changes the *relative* safety ordering can trigger reallocation: assets may lose funding without any change in their own risk

Regulation has its limitations and has to be complemented by interventions

Concentration limits: Diversify collateral across N safe assets

- Demand shock to any single asset reduced by factor $1/N$
- Trade-off: disperses rather than eliminates the channel and may create demand for less-liquid assets

Eligibility restrictions: Restrict riskiness of eligible collateral ($\bar{\sigma}$, $\bar{\theta}$)

- Reduces margin sensitivity and weakens margin spiral amplification
- Trade-off: concentrates demand on fewer assets, creating scarcity and pricing distortions

Dealer of last resort intervention: Central bank provides elastic demand

- Eliminates cross-fragility between risky and safe assets
- Expected to be profitable (buys at liquidity discount)[1]

Short selling bans: Forced unwinding under a ban triggers exactly the collateral sell off a ban aims to prevent

[1] Fed CPFF was profitable (Adrian et al., 2011)

Novel contagion channel: Short-sale collateral as mechanical link between shorted and collateral assets

- Two-way contagious liquidity spirals through the collateral link
- Liquidity spirals for short positions strictly exceed spirals for long positions
- Can also be triggered by price decreases
- Riskier safe assets most sensitive due to rebalancing to safer safe assets

Policy: Regulation can increase stability, but has to be complemented with central bank backstops

Empirics: Likely large role during the Subprime Crisis

- Depositories accounted for 66% of ABCP and 94% of CP demand contractions
- Reallocations from riskier (ABCP) to safer (MMF) collateral during stress

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