Asset Transfers and Self-Fulfilling Runs on a Diamond-Dybvig Intermediary

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Abstract

We introduce a new mechanism to address self-fulfilling runs on a Diamond-Dybvig intermediary. If a depositor wants to end her relationship with the intermediary early, then she can withdraw goods *or* take ownership of unliquidated assets from the intermediary's balance sheet. We interpret this mechanism as a repo contract or a bankruptcy plan. When the intermediary can cheaply transfer ownership of its assets to depositors, this mechanism can eliminate runs while achieving the first-best outcome. This result highlights the importance of understanding transaction costs and which assets are best held by intermediaries rather than depositors.

Summary

Are solvent financial intermediaries vulnerable to self-fulfilling runs?

Not in the canonical Diamond and Dybvig (1983) environment.

- We propose a new mechanism that uses asset transfers to eliminate runs and achieve the first-best (Theorem 1)
- Desirable features: robust implementation, real world interpretations

However, self-fulfilling runs can occur if it is sufficiently difficult to transfer assets.

For example,

- Direct transaction costs (Theorem 1)
- Asymmetric ability to hold assets (Extended Environment and Theorem 2)
- Incomplete contracts and aggregate risk

Main Takeaway

To understand whether self-fulfilling runs are possible, we must look at the assets on the intermediary's balance sheet as well as the liabilities.

Baseline Environment: Diamond and Dybvig (1983)

Key Features

- 3 periods, $t = 0, 1, 2$
- Continuum of depositors $i \in [0, 1]$

$$U(c_{i,1}, c_{i,2}; \theta_i) = \begin{cases} u(c_{i,1}) & \text{if } \theta_i = \text{Impatient} \\ u(c_{i,1} + c_{i,2}) & \text{if } \theta_i = \text{Patient} \end{cases}$$

- At $t = 1$, fraction λ of depositors privately learn they are impatient
- Investment returns 1 in $t = 1$ if liquidated or $R > 1$ in $t = 2$ if held to maturity
- Intermediary accepts deposits at $t = 0$ and designs a payout policy for $t = 1, 2$
- Sequential service constraint in $t = 1$
- No aggregate risk

Weak Implementation of First-Best

- Full insurance gives $1 < c_1^* < c_2^* < R$
- Original demand deposit mechanism only asks whether impatient or patient in $t = 1$
- Vulnerable to runs: if all depositors say impatient, then intermediary runs out of funds
- First-best is *weakly* implemented, but not *strongly* implemented

Asset Side of Intermediary's Balance Sheet

- Investment generates perfectly divisible and transferable units of the asset
- Asset is a claim on goods and the right to choose whether to liquidate at $t = 1$
- Original model implicitly imposes infinite asset transfer cost
- We consider per unit asset transfer cost of $\epsilon \in [0, \infty)$

Asset Transfer Mechanism (ATM)

- Original demand deposit actions: withdraw goods immediately, W_G, or wait, W_0
- Additional action: transfer ownership of units of the asset, W_K
- Payout Function

$$(c_1, c_2, K) = \begin{cases} \begin{bmatrix} (c_1^*, 0, 0) & \text{if } B(s; \mathbf{a}) > 0 \\ (0, 0, 0) & \text{if } B(s; \mathbf{a}) = 0 \end{bmatrix} & \text{if } a_s = W_G \\ \begin{bmatrix} (0, 0, \kappa) & \text{if } B(s; \mathbf{a}) > 0 \\ (0, 0, 0) & \text{if } B(s; \mathbf{a}) = 0 \end{bmatrix} & \text{if } a_s = W_K \\ (0, RB(1; \mathbf{a})/m_0, 0) & \text{if } a_s = W_0 \end{cases}$$

- c_t is the payout of goods at time t
- K is the asset transfer at $t = 1$
- $B(s; \mathbf{a})$ is measure of assets remaining on intermediary's balance sheet after depositor s

$$B(s; \mathbf{a}) = 1 - \int_0^s c_1(a_{\tilde{s}}, \tilde{s}; \mathbf{a}) d\tilde{s} - (1 + \epsilon) \int_0^s K(a_{\tilde{s}}, \tilde{s}; \mathbf{a}) d\tilde{s}$$

Theorem 1

ATM can strongly implement the first-best if and only if $\epsilon \in [0, c_2^*/c_1^* - 1)$.

Intuition

- $R\kappa \le c_1^*$: patient depositors prefer goods over asset transfer and traditional run exists
- $(1 + \epsilon)\kappa > c_2^*/R$: asset transfer takes too many resources and new "run on assets" exists
- $\kappa \in (c_1^*/R, c_2^*/(R(1 + \epsilon))]$ *strongly* implements the first-best allocation
- $\epsilon = 0$: Direct mechanism, dissolve intermediary in period 1
- $\epsilon > 0$: Indirect mechanism, off-equilibrium-path option

Discussion

Implication

- Need to focus on asset side of bank's balance sheet to understand self-fulfilling runs

Robust Implementation: No Commitment Necessary

- Other solutions to run problem rely on commitment (Ennis and Keister (2009))
- ATM does not
- Value of taking asset does not depend on future depositor or intermediary actions

Real World Interpretations

- Repo agreement or other collateralized debt contracts
- Bankruptcy plan
- Securitized portfolio or mutual fund of intermediary assets

Extended Environment: Idiosyncratic Risk

- Return i.i.d. across assets and realized in period 2

$$R = \begin{cases} R_H & \text{w.p. } q \\ R_L & \text{w.p. } 1 - q \end{cases} \qquad \bar{R} = qR_H + (1 - q)R_L$$

- Investment of x units yields indivisible asset of size

$$s(x) = \begin{cases} x & \text{if } x \ge \bar{x} \\ 0 & \text{if } x < \bar{x} \end{cases}$$

- No securitization: ownership of each asset is perfectly indivisible
- Assume optimal to offer to transfer only one asset ($\bar{x}$ sufficiently large)
- No transfer cost: $\epsilon = 0$

Theorem 2

If $\eta \equiv R_H/R_L$ is varied while R_H and R_L adjust so that $\bar{R}$ and q are held constant, then there exists a $\bar{\eta} \in (1, \infty)$ such that the ATM can strongly implement the first-best if and only if $\eta < \bar{\eta}$.

Intuition

- Intermediary's portfolio has non-random return $\bar{R}$
- However, intermediary can only transfer risky assets
- Thus, asset transfer is risky while goods withdrawal is not
- A riskier return necessitates a larger asset transfer to prevent traditional run
- If dispersion is high ($\eta > \bar{\eta}$), required asset transfer is so large that "run on assets" exists

Discussion

Implications

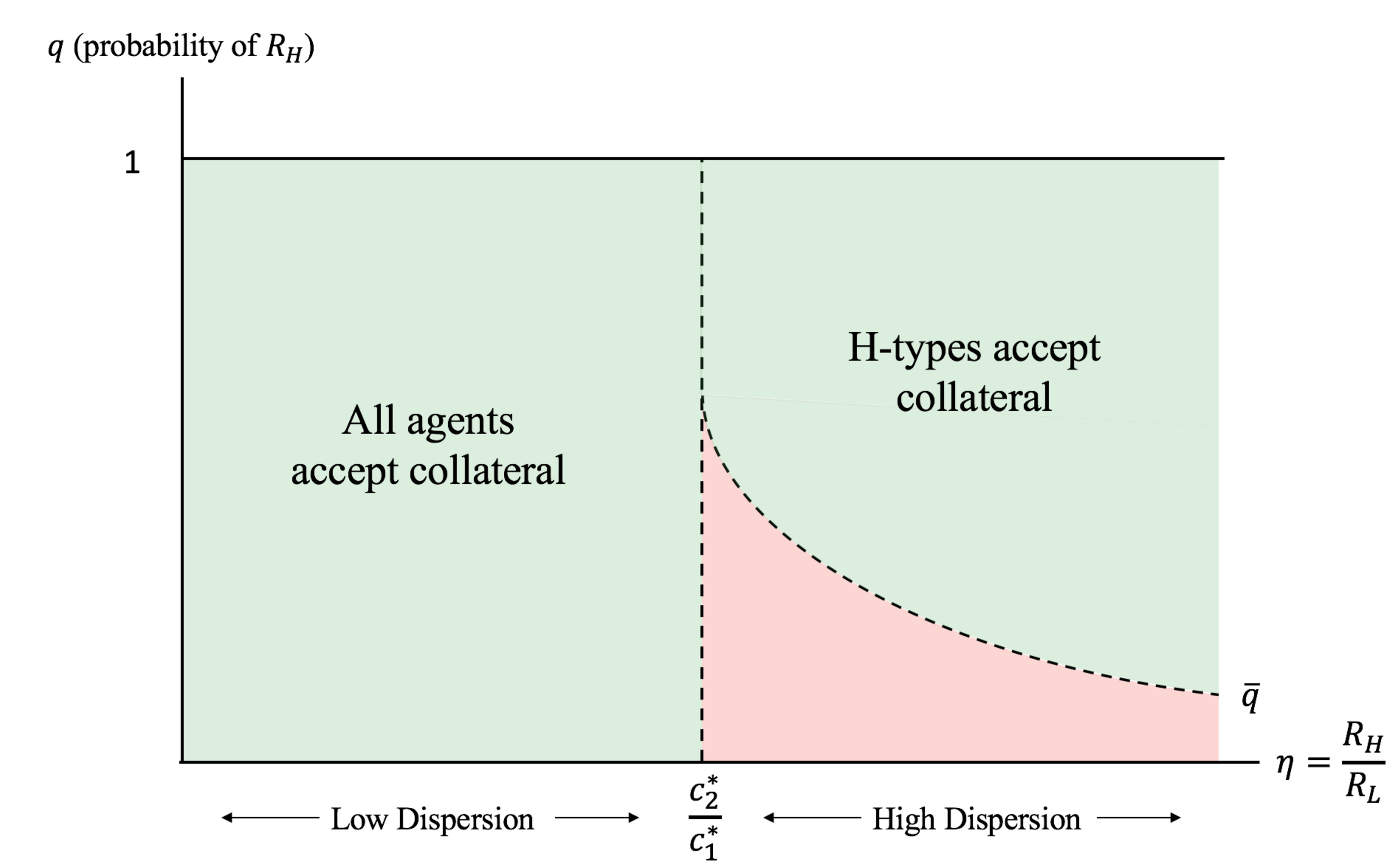
- Higher moments of return distribution matter for whether runs can occur
- Increase in dispersion can introduce instability even if average return remains the same

Real World Application to Mortgage Backed Securities During Crisis

- Average return fell little, but dispersion increased dramatically (Ospina and Uhlig (2018))
- Model predicts the emergence of run equilibria, in line with data

Extension: Depositor Sophistication

- Each depositor observes the return on the asset offered to her (L-type, H-type)
- Intermediary knows this, but does not observe asset type
- If dispersion is high, L-types lose interest in asset transfer
- But, still no runs as long as there are sufficiently many H-types (high q)



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