

Regulatory Arbitrage and Systemic Liquidity Crises

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Federal Reserve Bank of Atlanta
The Role of Liquidity in the Financial System
Nov 19, 2015

Motivation/research question

Regulatory arbitrage and the financial crisis of 2007-09

Linkages regulated banks ↔ shadow banks identified as source of fragility

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Restrict explicit and implicit linkages

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1. Contagion in absence of contractual linkages

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Mechanism: pecuniary channel

→ Systemic runs and deterioration of funding conditions

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Policy implications

- Macprudential regulation, central bank interventions

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- 1 A banking model with systemic runs
- 2 Banks, shadow banks, and systemic liquidity crises
- 3 Policy implications

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- 1 A banking model with systemic runs
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Setup: primitives

Modified Diamond & Dybvig 83

- Three dates, $t = 0, 1, 2$
- One good, can be used for consumption and investment

Three types of agents:

- Depositors
- Intermediaries
- Investors

Three types of technologies

Setup: technologies

	$t = 0$	$t = 1$	$t = 2$
Productive technology	-1	0	R
Shirking technology	-1	0	$R_{Shirk} + B$

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a. $R > 1 > R_{Shirk} + B$

b. B not pledgeable

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Setup: depositors

Continuum of depositors, endowment of 1 unit each

- A fraction π is ***impatient***, utility $u(c_1)$
- A fraction $1 - \pi$ is ***patient***, utility $u(c_2)$
- Types are initially unknown
- 1st key friction: privately revealed in $t = 1$

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- CRRA utility
- Expected utility $EU = U(c_1, c_2) = \pi u(c_1) + (1 - \pi)u(c_2)$

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Intermediary is required for investment

Setup: intermediaries

Continuum of intermediaries, competitive

- Endowment that may be invested in intermediation
- Required return $\rho > R$
 - skin-in-the-game costly
 - adverse selection, leverage-ratchet, non-pecuniary benefits, risk anomalies

Setup: investors

Continuum of investors, no market power

- Endowment A at date $t = 1$, “market liquidity”
- Required rate of return $\mu \in [1, R]$

Assumption

$$R/\mu \geq A \geq \pi R/\mu$$

“market provides sufficient liquidity in normal times, but liquidity is scarce in crisis”

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Depositors

Intermediaries

Liquid Assets	Demand Deposits
Illiquid Assets	

Illiquid Investment Technologies

Depositors

Intermediaries

Liquid Assets	Demand Deposits
Illiquid Assets	

Disciplining short-term debt

Illiquid Investment Technologies

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Illiquid Investment Technologies

Depositors

Wholesale
Funding
Market

Intermediaries

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Illiquid Investment Technologies

Depositors

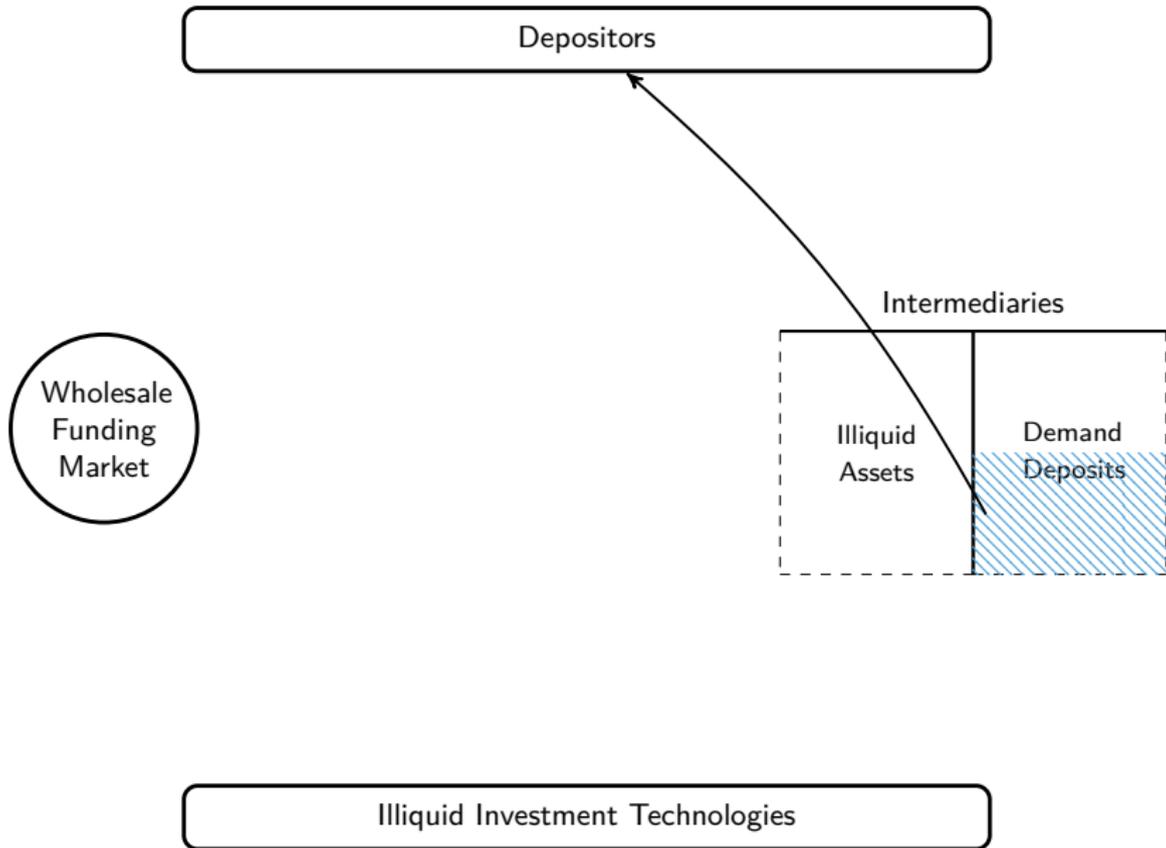
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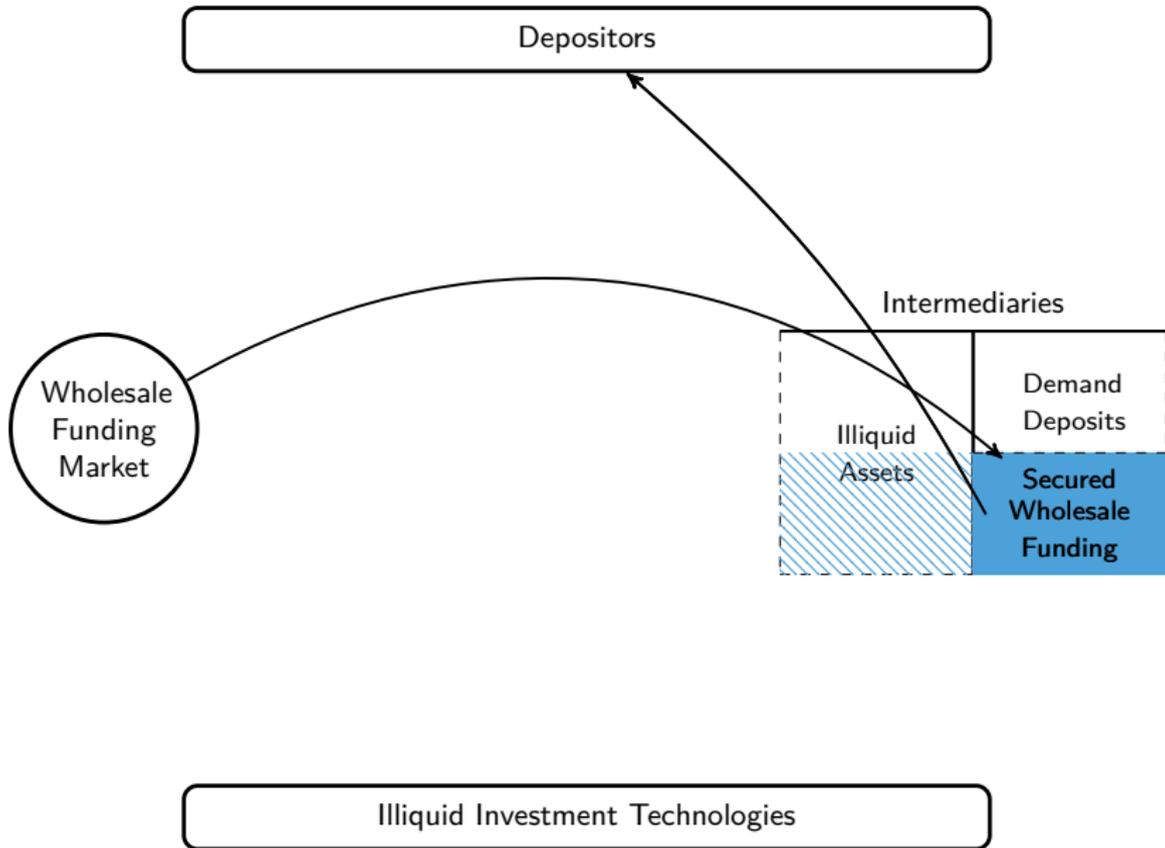
Intermediaries

Illiquid
Assets

Demand
Deposits

Illiquid Investment Technologies





Bank runs and systemic runs

Intermediaries are financing illiquid asset by demand deposits (c_1^*, c_2^*)

Mass of intermediaries that experience a run: $\alpha \in [0, 1]$

* $c_1^* > R/\mu$: runs on single intermediaries always possible

Bank runs and systemic runs

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□ When are systemic runs possible? (interesting)

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■ Systemic runs: runs on some intermediaries that affect other intermediaries

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Proposition

A run on α intermediaries is systemic if $\alpha > \bar{\alpha}$, where

$$\bar{\alpha} = \frac{A - \pi c_2^*}{R/\mu - \pi c_1^*}$$

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Systemic runs (“proof”)

L units of the asset can be sold at $p = R/\mu$ (“fundamental value”) if

$$LR/\mu \leq A$$

Otherwise, the market clears via cash-in-the-market pricing
(compare Allen and Gale 94)

Cash-in-the-market price is given by

$$p = A/L$$

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α intermediaries experience a run and sell all assets

$1 - \alpha$ intermediaries need to pay out πc_1^* each

If $p = R/\mu$, the amount of assets sold in aggregate is:

$$\alpha + (1 - \alpha)\pi c_1^*/(R/\mu)$$

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Not compatible with $p = R/\mu$ if:

$$R/\mu[\alpha + (1 - \alpha)\pi c_1^*/(R/\mu)] > A$$

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Given our assumptions, $\bar{\alpha} < 1$

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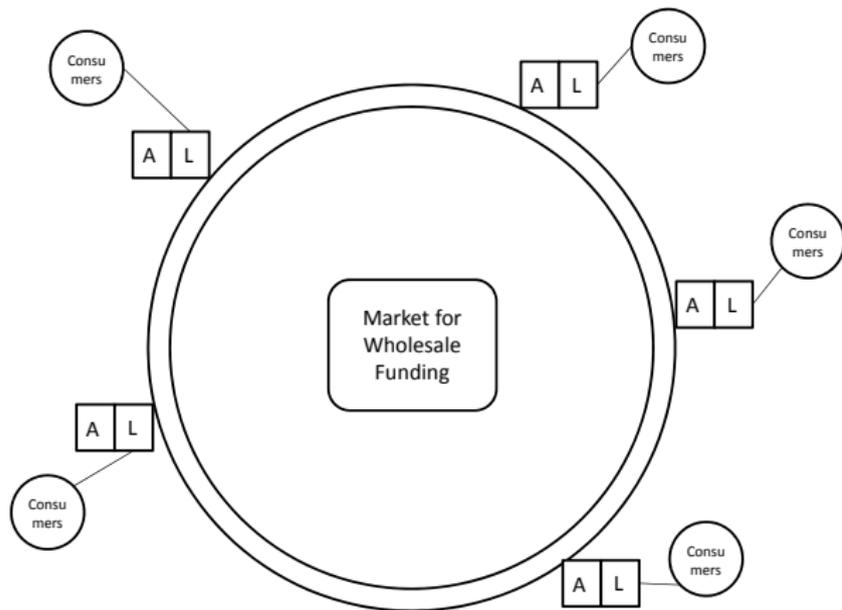
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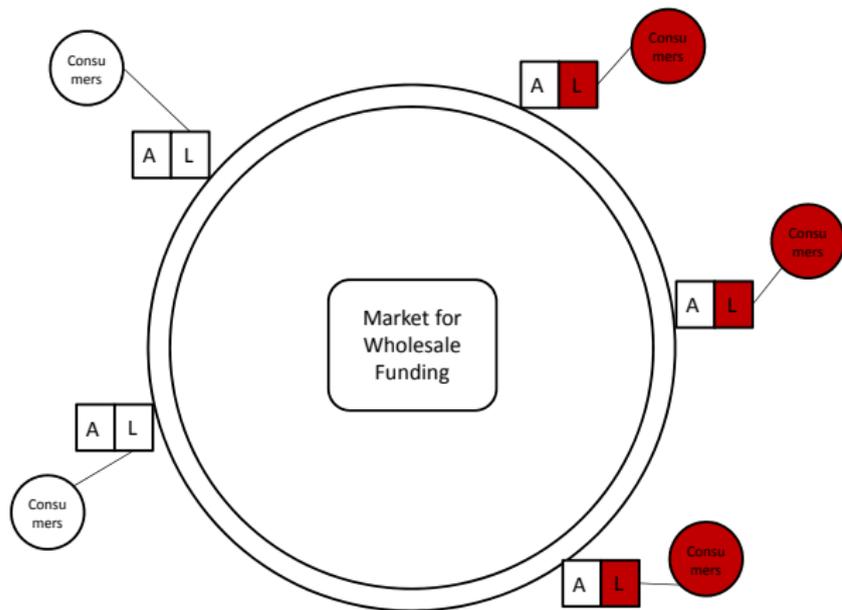
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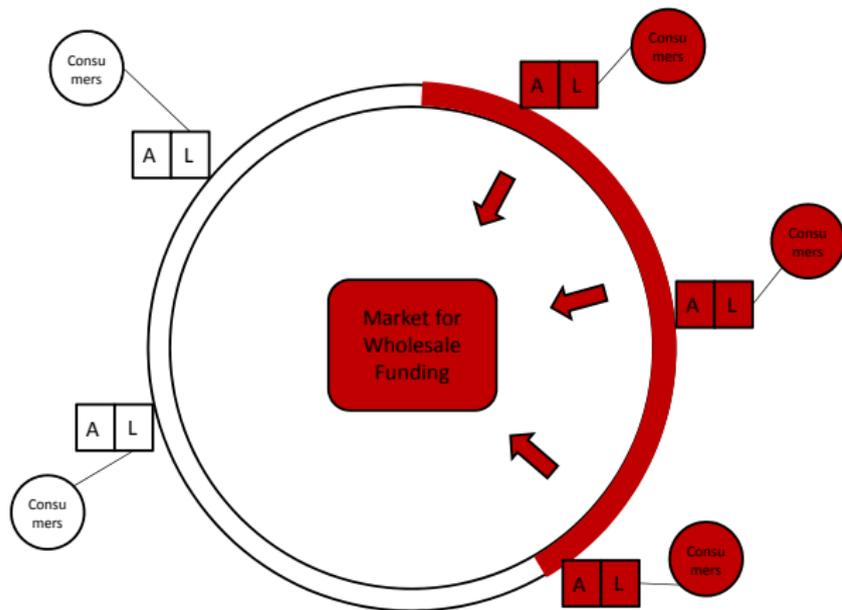
Systemic runs: an illustration



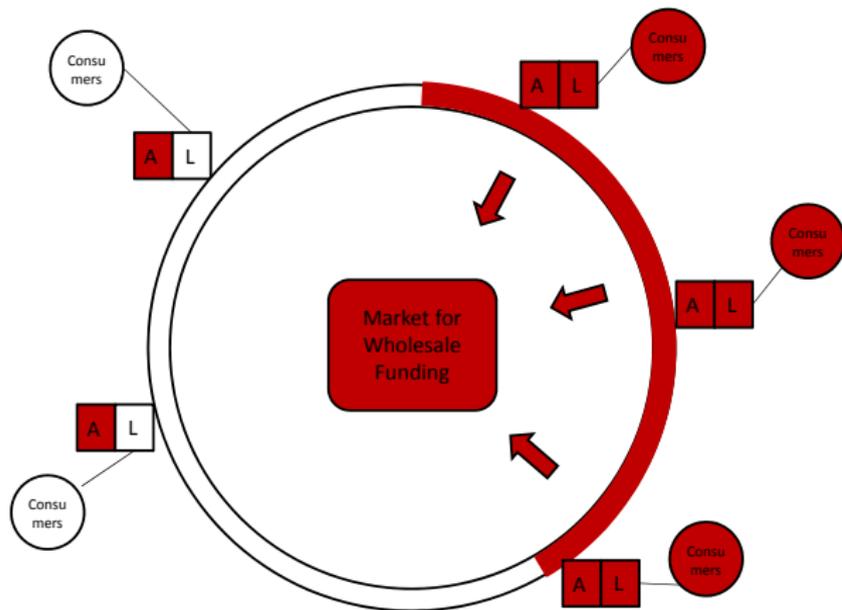
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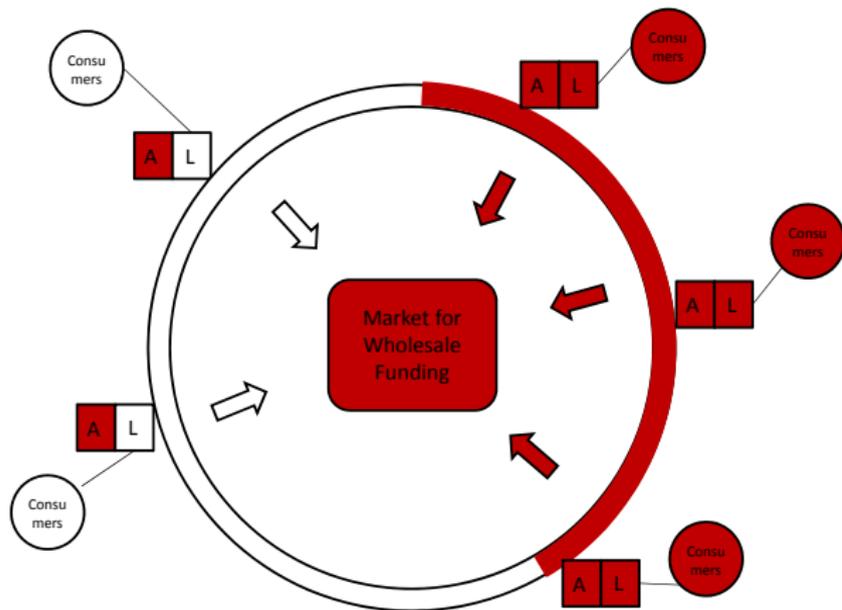
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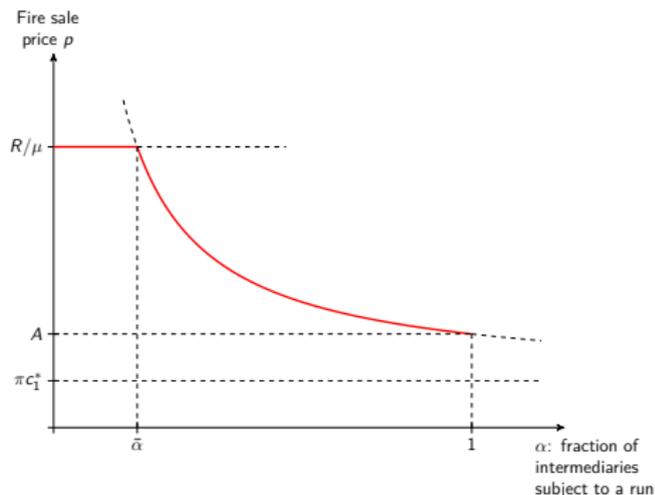
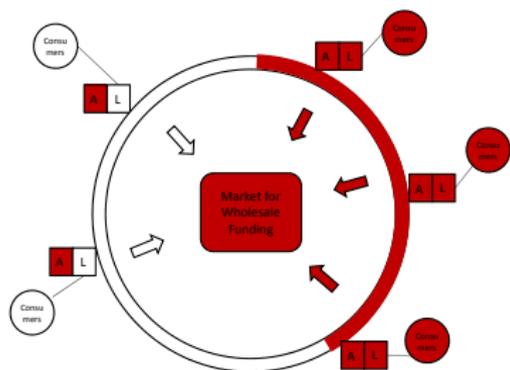
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Systemic runs: an illustration



Systemic runs: an illustration



Interaction of two frictions

- 1st friction: Types are private information (Diamond and Dybvig 1983)
- 2nd friction: Cannot contract with investors in $t = 0$ (Holmstrom and Tirole 1998)

Systemic runs: deterioration of funding conditions

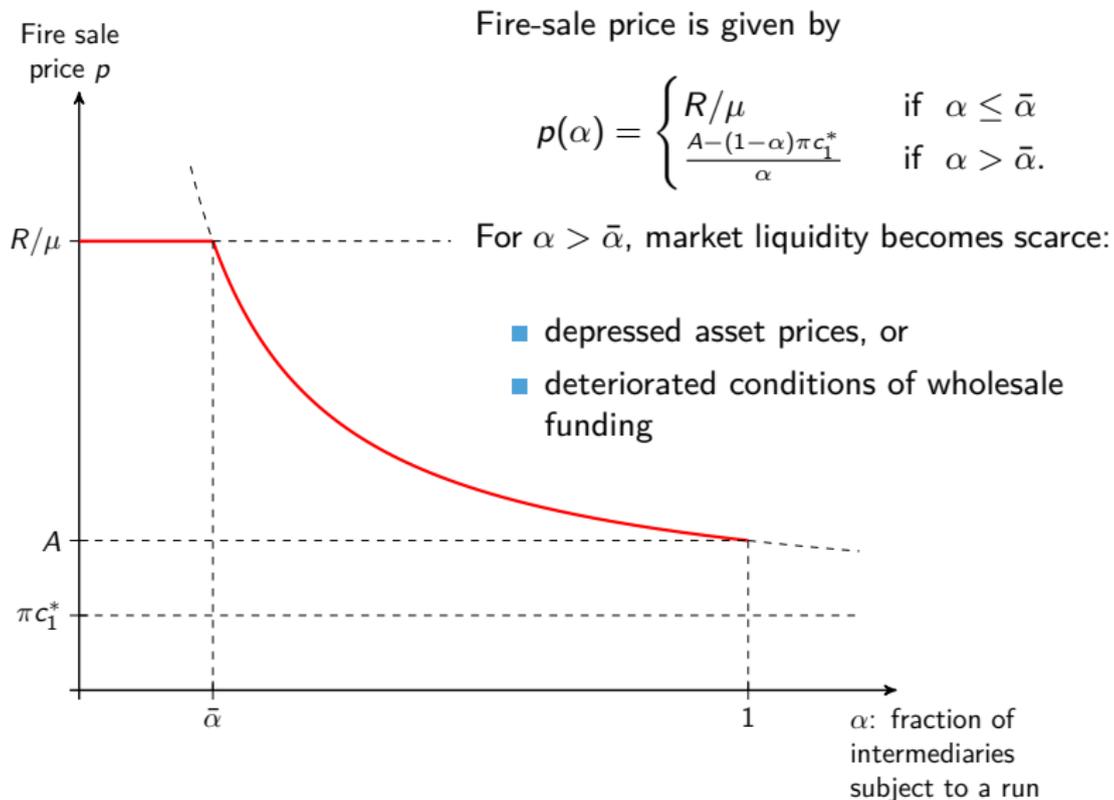


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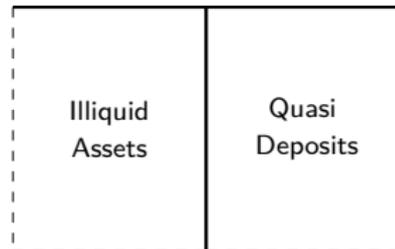
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Depositors

Illiquid Investment Technologies

Depositors

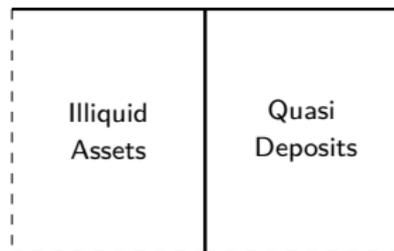
Shadow Banks



Illiquid Investment Technologies

Depositors

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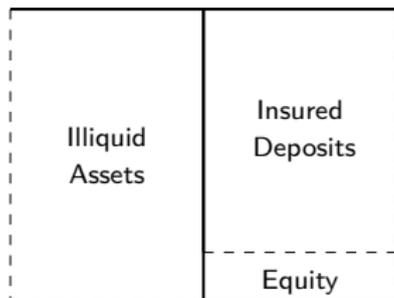


Disciplining short-term debt

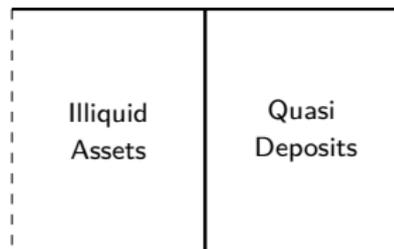
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Depositors

Regulated Banks



Shadow Banks

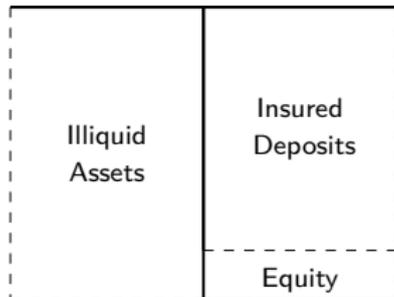


Disciplining short-term debt

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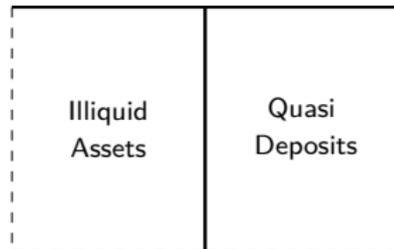
Depositors

Regulated Banks



Diligence induced
via skin-in-the-game

Shadow Banks



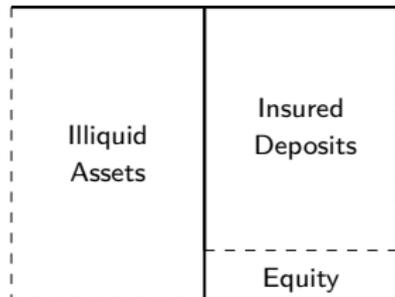
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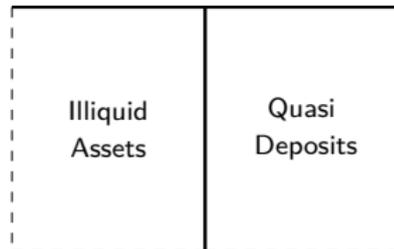
Depositors

Wholesale
Funding
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Shadow Banks



Illiquid Investment Technologies

Depositors

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Liquid Assets	Insured Deposits
Illiquid Assets	
	Equity

Shadow Banks

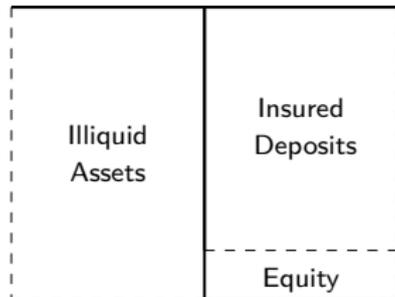
Liquid Assets	Quasi Deposits
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Illiquid Investment Technologies

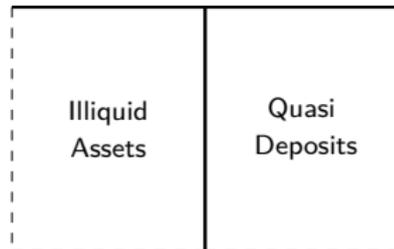
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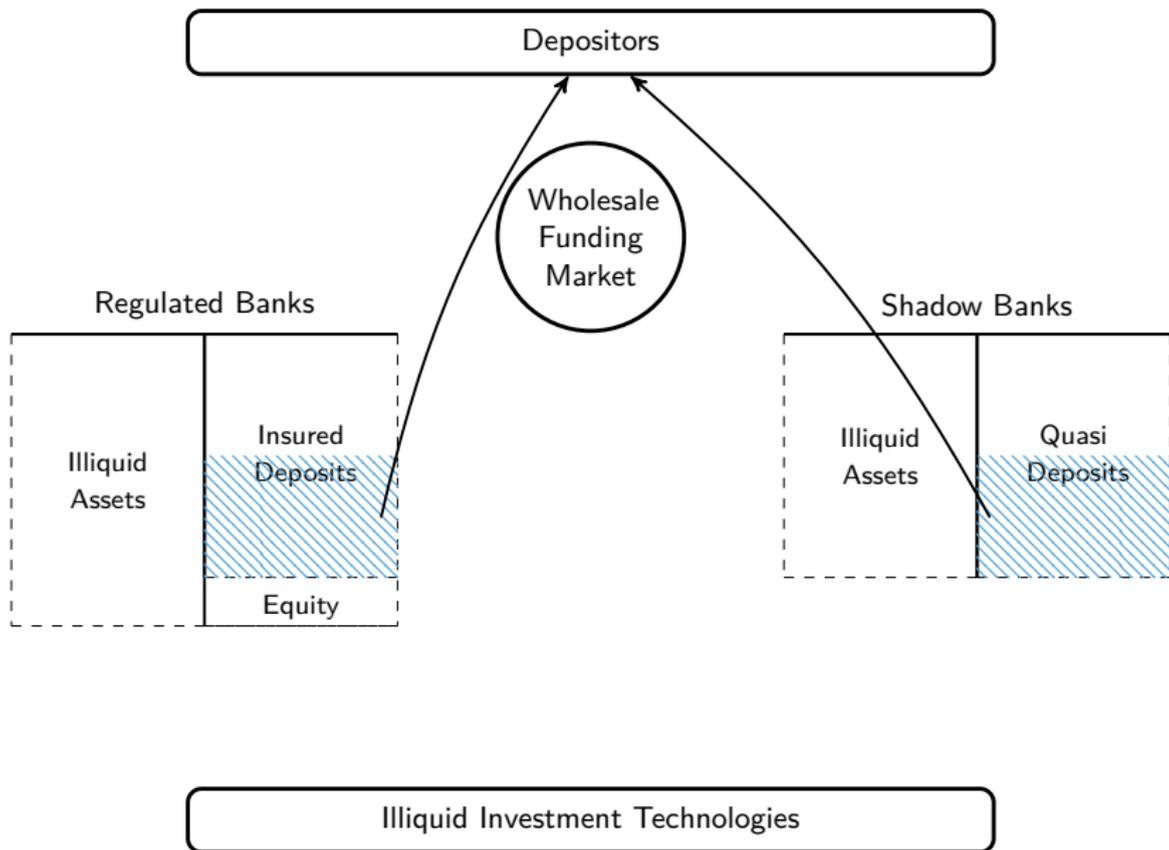
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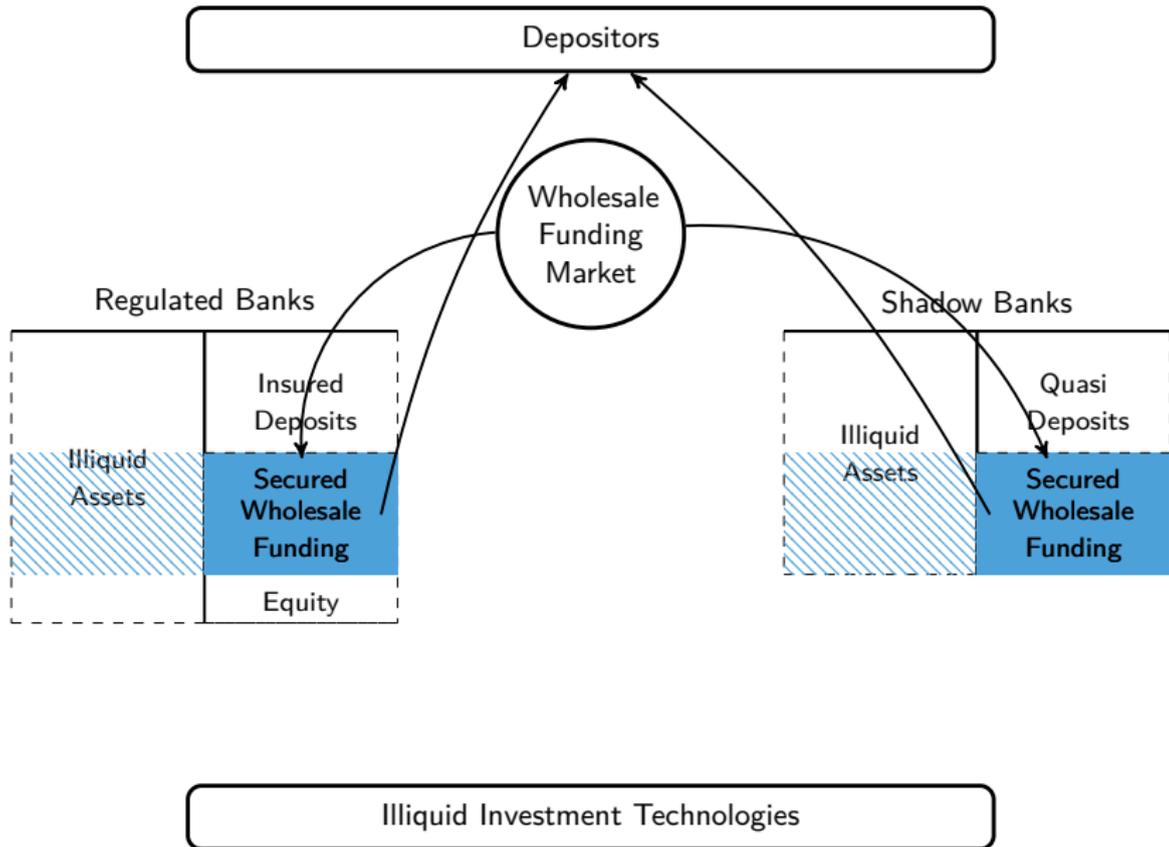


Shadow Banks



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Depositors

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Illiquid Assets	Insured Deposits
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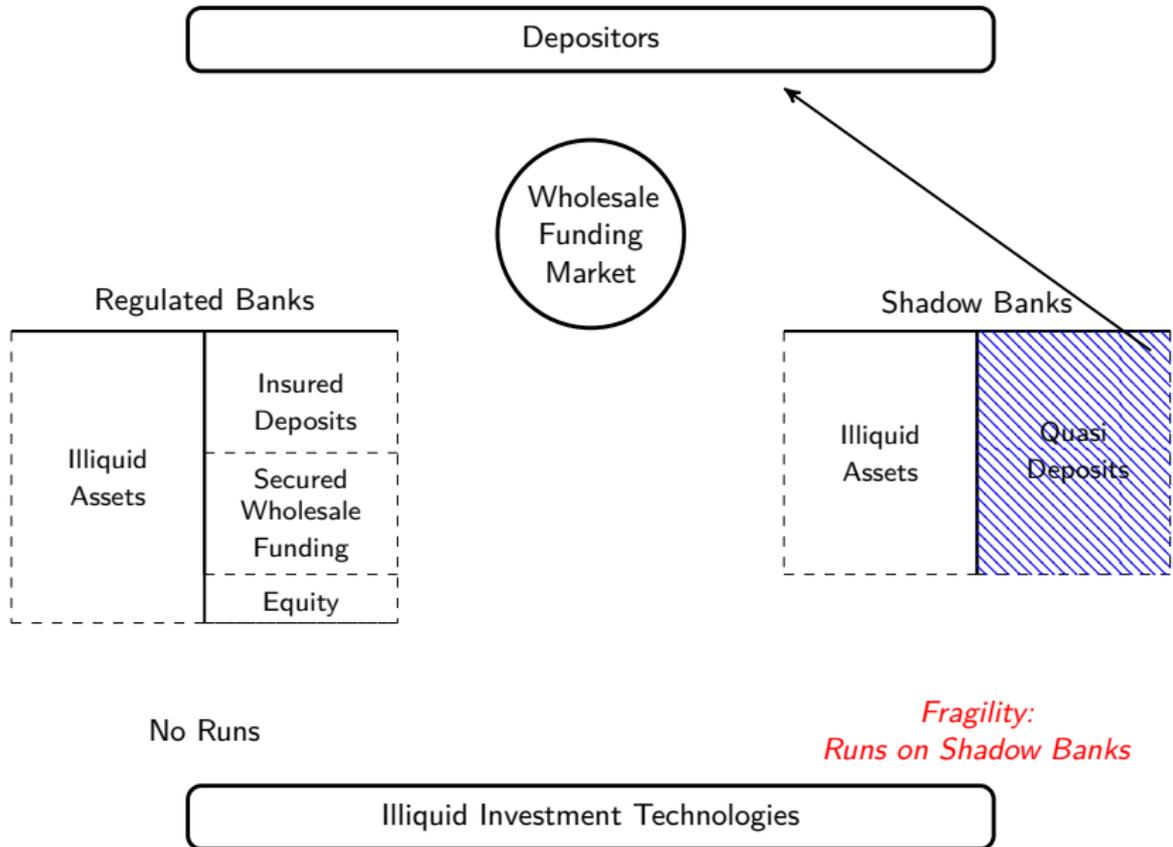
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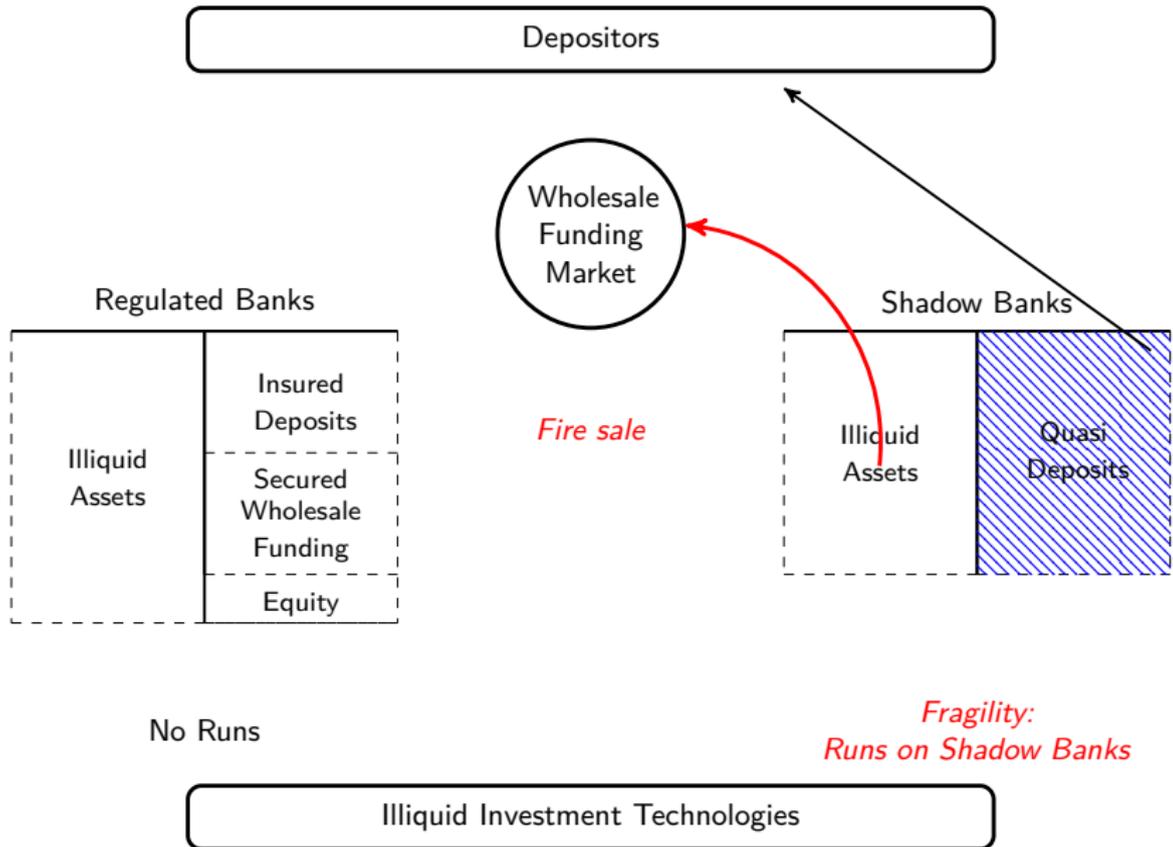
Illiquid Assets	Quasi Deposits
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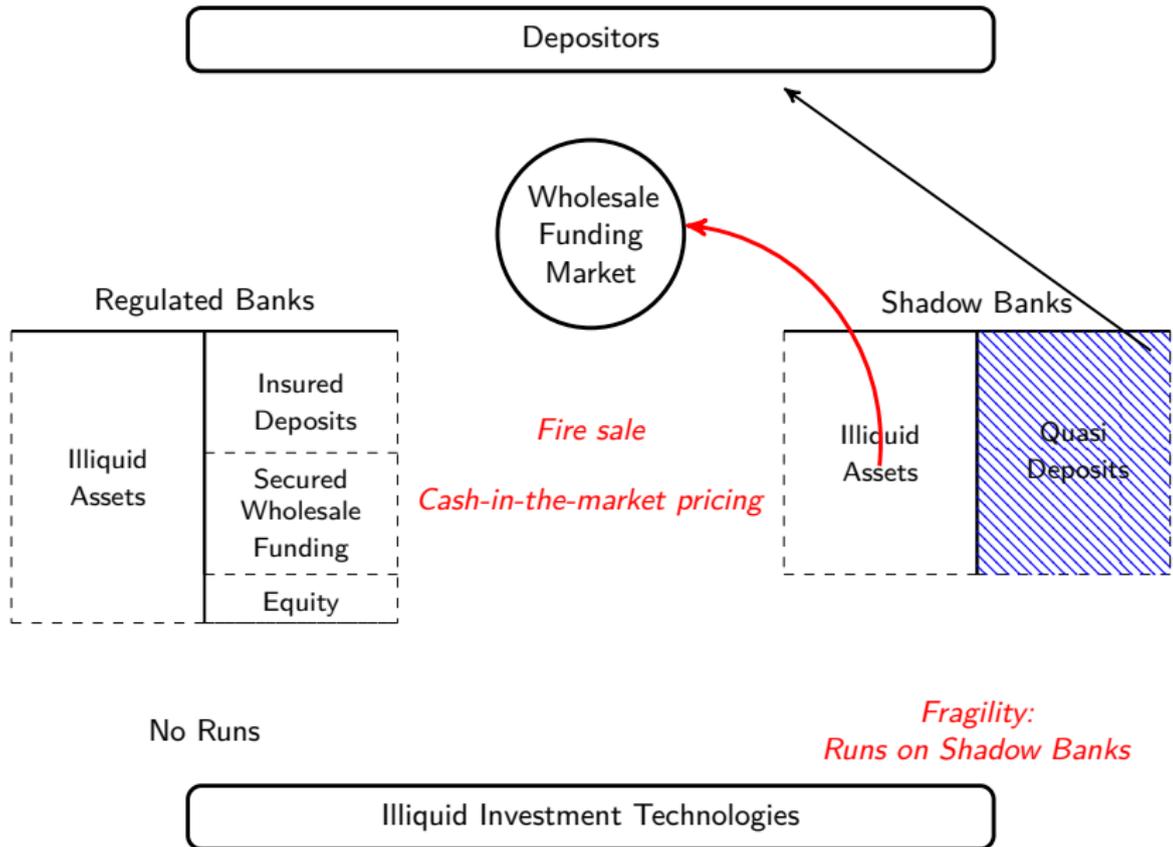
No Runs

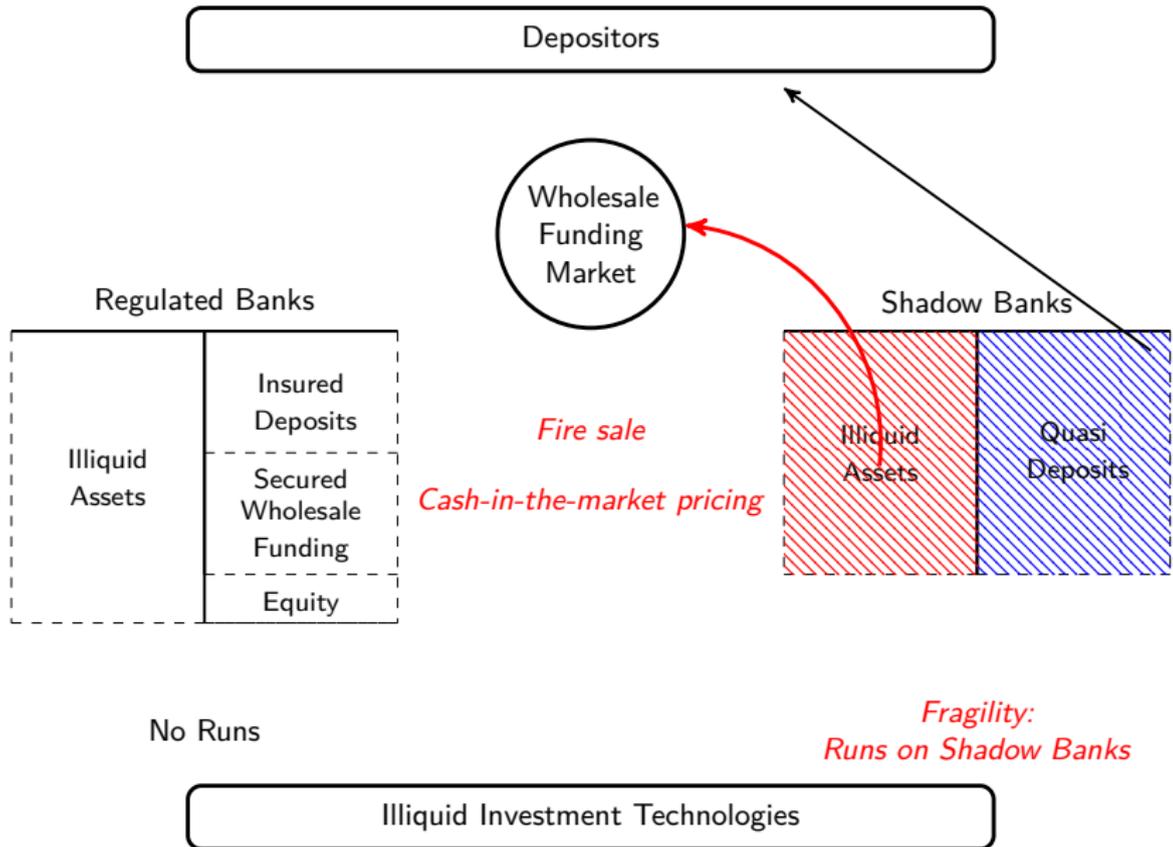
*Fragility:
Runs on Shadow Banks*

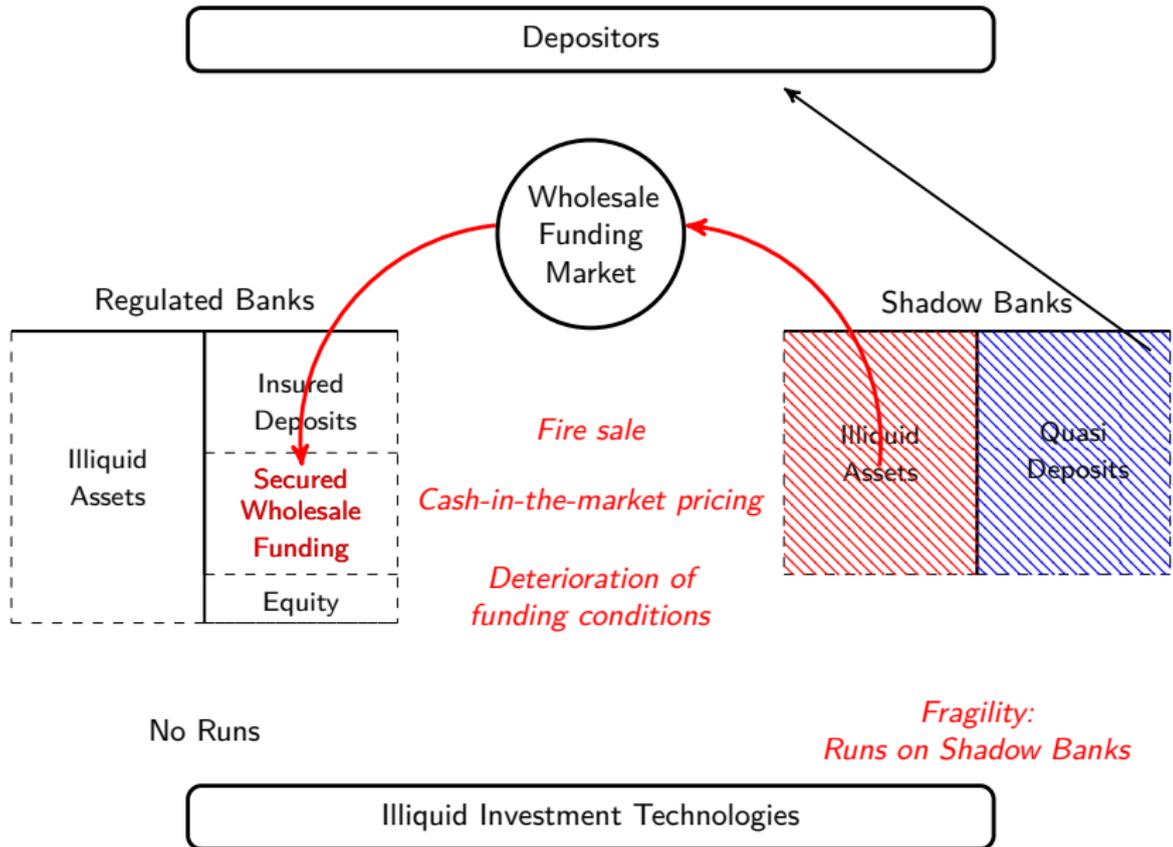
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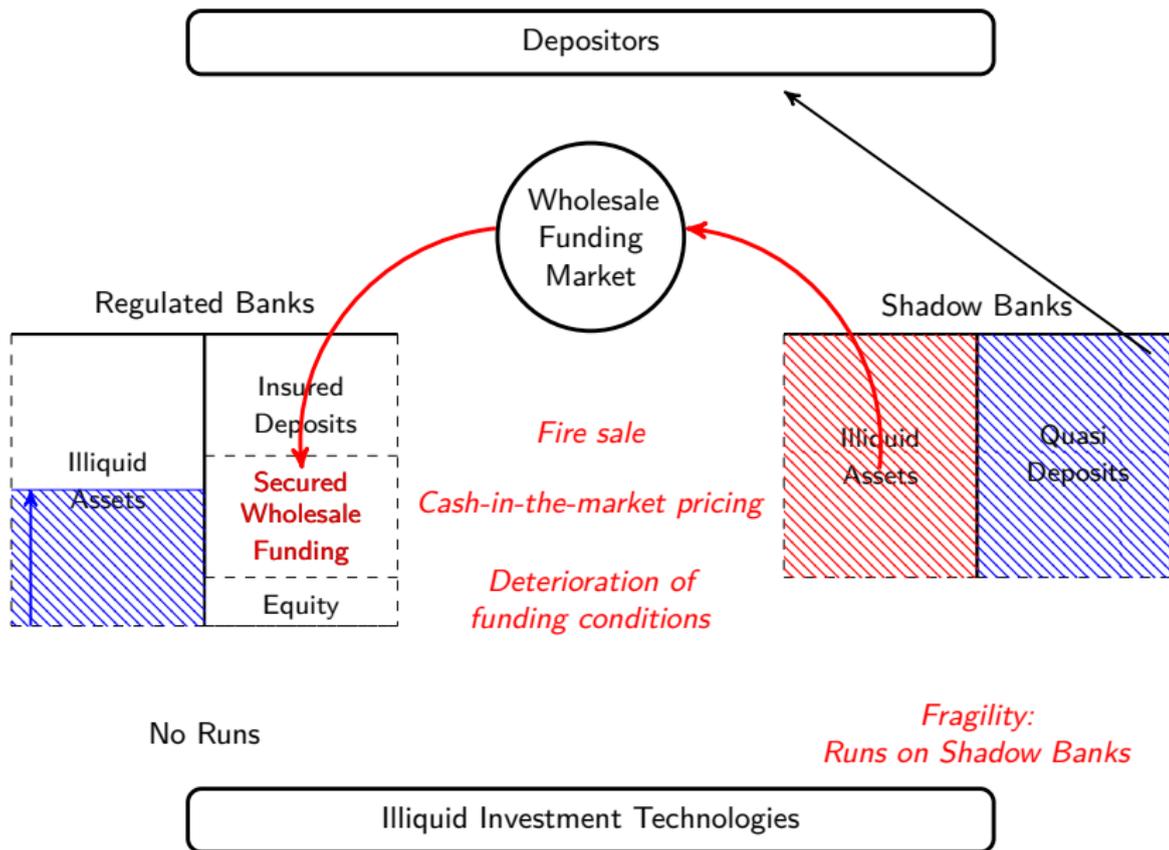


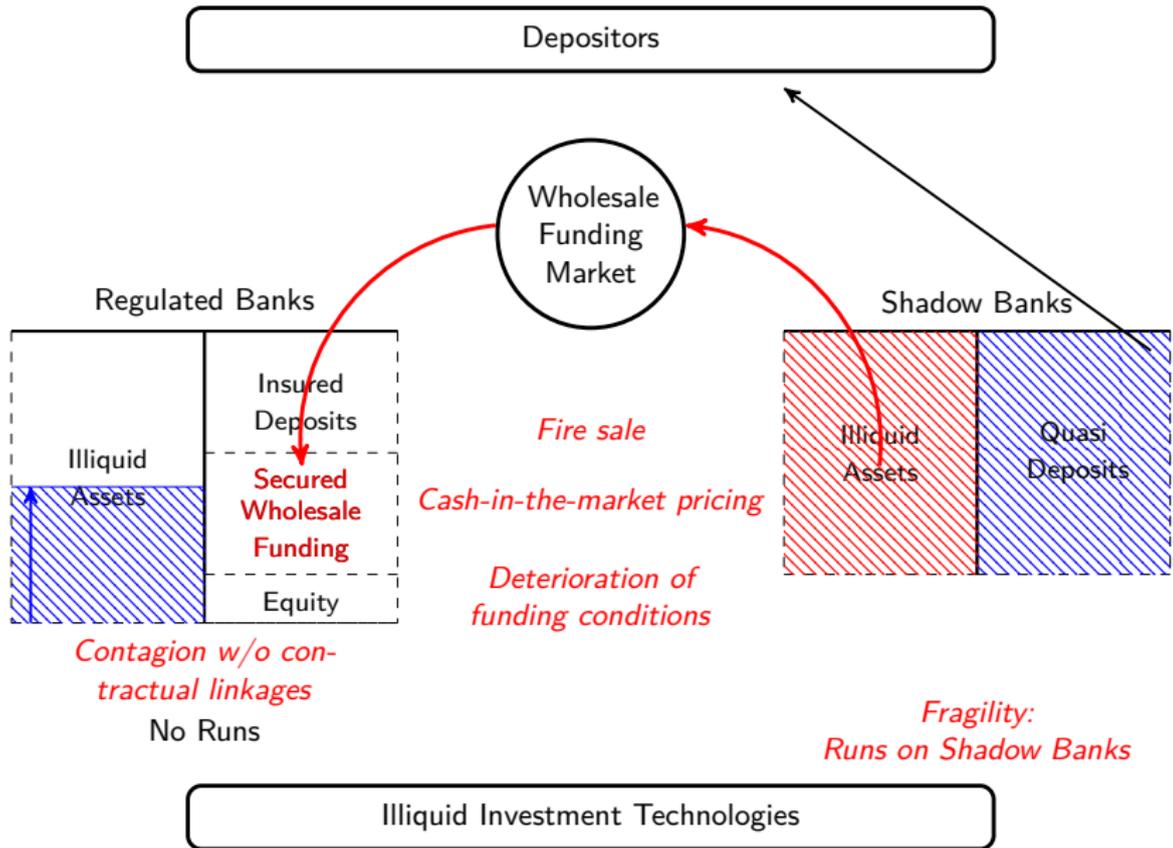










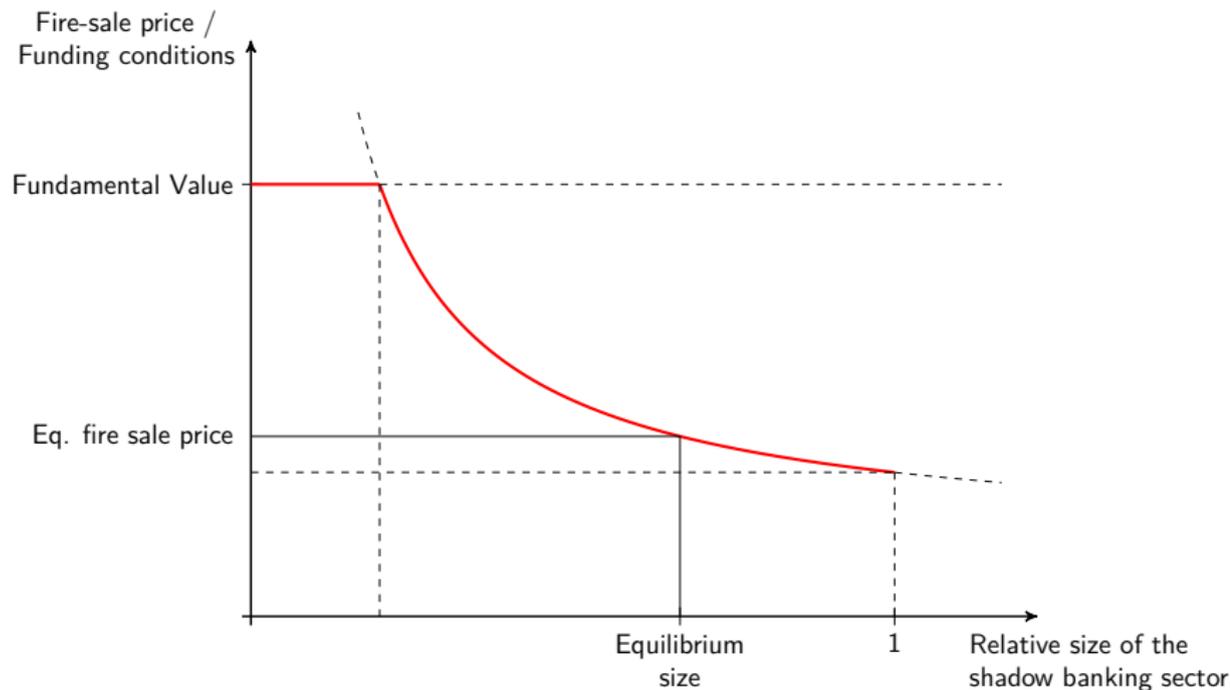


Result 1: Systemic Runs

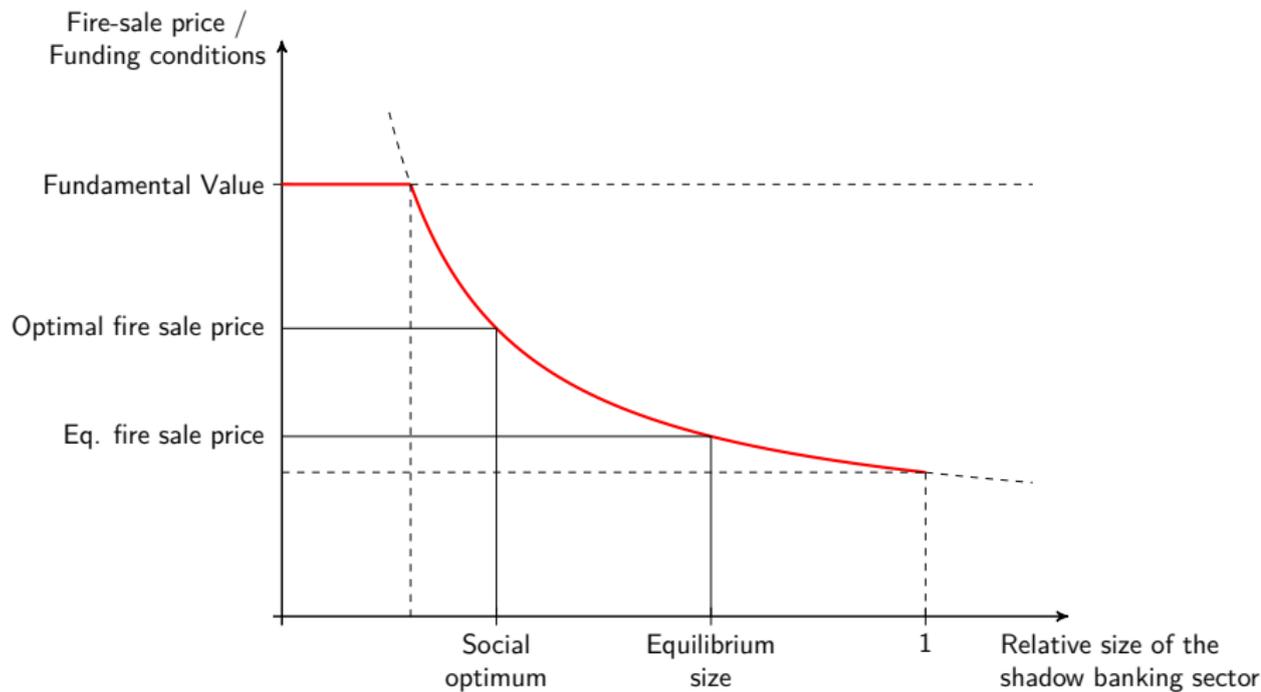
Contagion from the shadow banking sector to regulated banks, even without contractual linkages

- Deterioration of funding conditions for regulated banks
- Even without aggregate risk and *classic* bank runs
 - ⇒ Banks may turn illiquid and insolvent
 - ⇒ Deposit insurance may become tested and costly

Fire sales and deterioration of funding conditions



Fire sales and deterioration of funding conditions



Result 2

Shadow banking sector is too large in equilibrium

- Atomistic agents and incomplete markets;
pecuniary externality has effect on welfare (Lorenzoni 08)
- ⇒ Excessive regulatory arbitrage
- ⇒ Low fire-sale price
 - Probability of runs in the shadow banking sector is *too high*

Determinants of composition of financial system

Consumers face the following trade-off

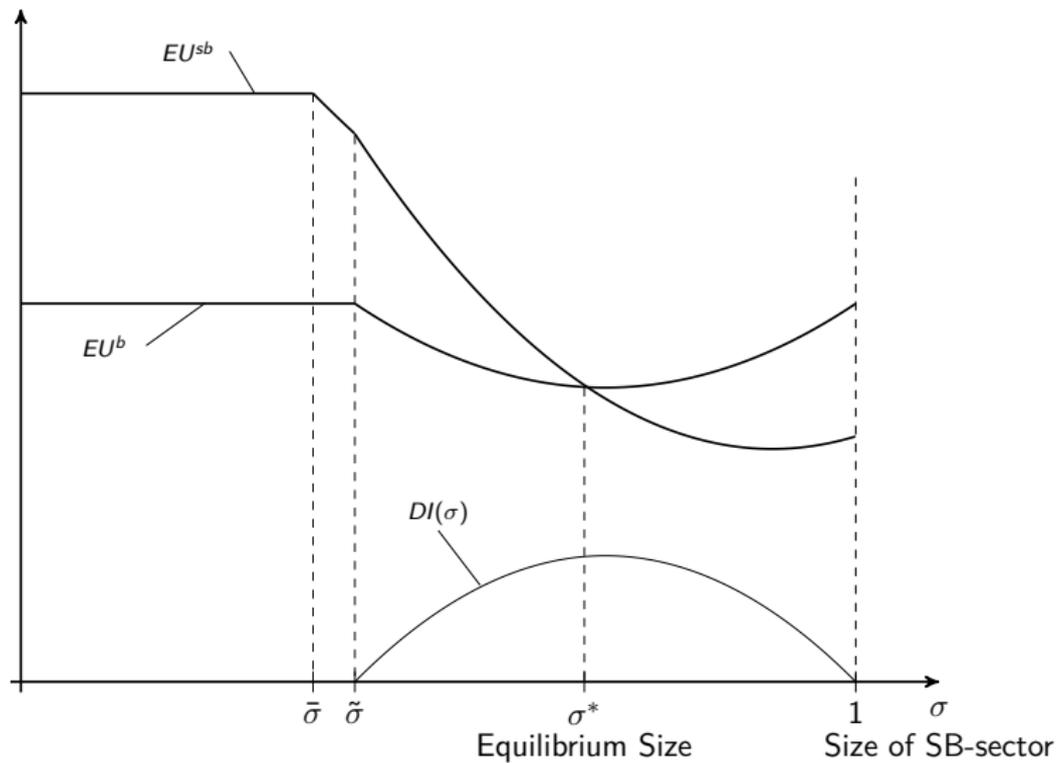
a) Deposit at regular bank

- Low interest due to regulatory requirements
- No risk

b) Deposit at shadow bank

- Higher interest as no regulatory cost
- Face prospect of panic-based run
 - Coordination with sunspots á la Gertler and Kiyotaki (2015)

Social optimum and equilibrium



Social optimum and equilibrium

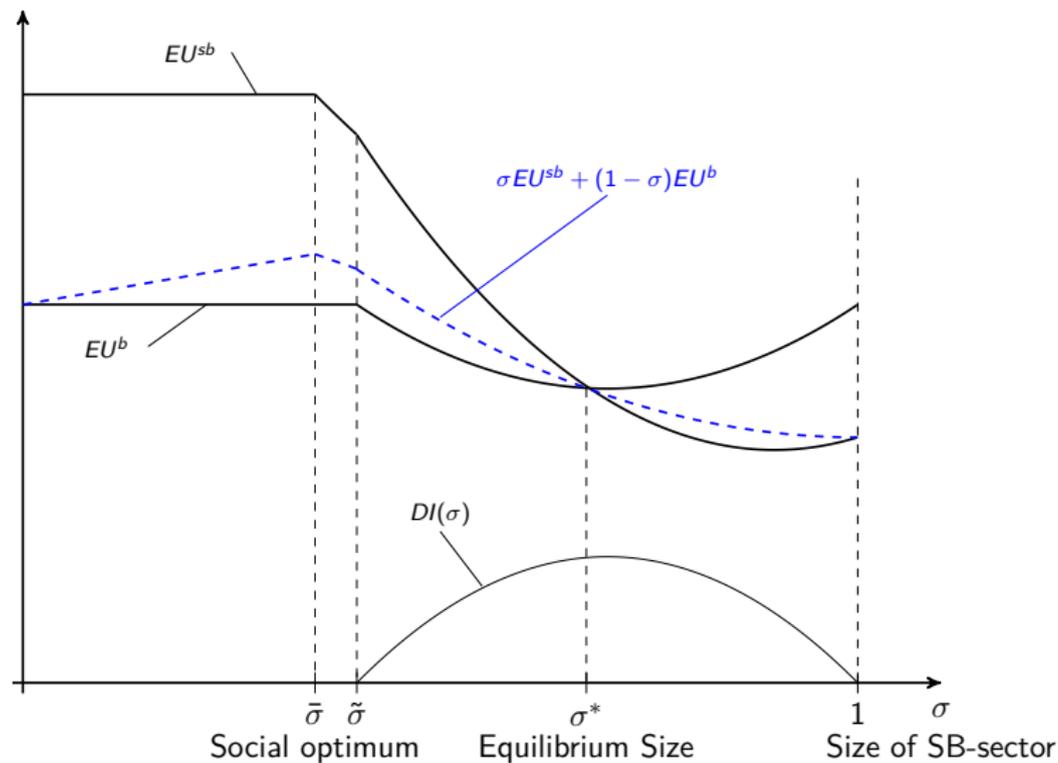


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Policy Implications

Addressing regulatory arbitrage

- Some regulatory arbitrage may be efficient
- But: regulatory arbitrage has negative externalities
- Possible?

Macroprudential liquidity regulation – Basel III?

- Restricting wholesale funding: shields banks from turmoil originating outside the banking sector
- But: allocative inefficiency and growth of shadow banking sector
- Welfare effects are ambiguous, may backfire
 - Ring-fencing/shielding banks is no end in itself

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Lender of last resort, Market maker of last resort

- Shields banking sector, but also change of composition of financial system
- Market maker of last resort: crowding out of regulated banks

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Shadow banking remains important (FSB 2014)

- 25% of total (global) financial assets
- 50% of assets held by the (global) banking system
- and 120% of GDP on average

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