Periphery Dealers in Over-the-counter Markets

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PIER Research Exchange

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Empirical Facts

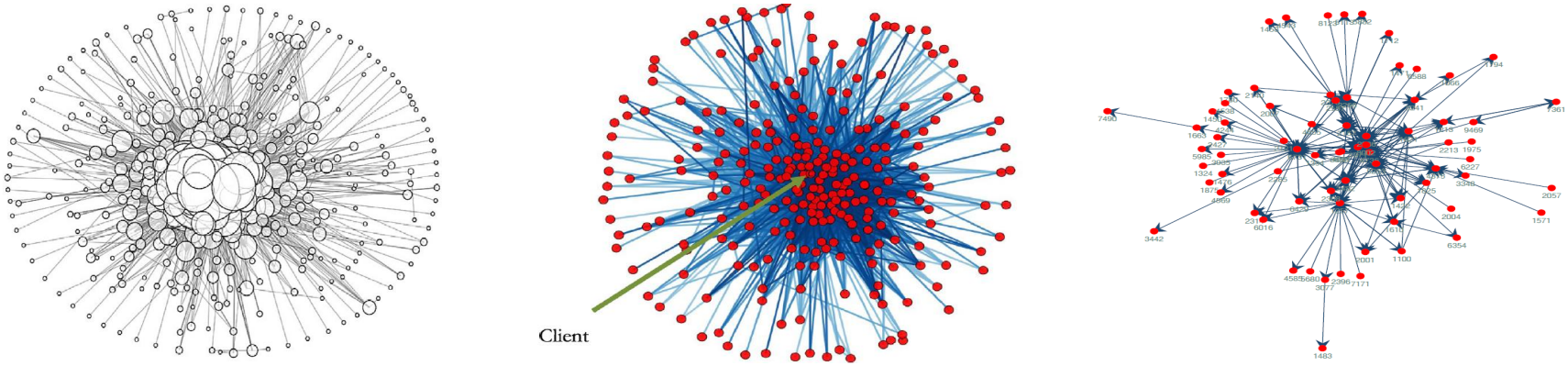

Figure: Inter-dealer network for securitized product (Hollifield et al (2017)), corporate bonds (Di Maggio et al (2017)), and municipal bonds (Li & Schürhoff (2019))

Persistent core-periphery dealer network:

- core (supplier) $\rightarrow$ market-making (principal)
- periphery (distributor) $\rightarrow$ pre-arrange trades between central dealers and investors (riskless principal/agency)

This Paper

Question: Why some buy-side investors prefer trading with periphery dealers (distributors) instead of core dealers (suppliers)? Why periphery dealers can co-exist with core dealers?

Objective:

1. construct a game-theoretic model to study strategic dealer choice of buy-side investors.
2. implications of vertical market fragmentation on market efficiency and stability.

Theoretical Framework:

Literature: (random) search and matching model.

This paper: long-term non-binding relationship formation model

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Outline

1. Basic model.
   - Why/how do investors form long-term relationship with dealers?
2. The model with agency dealer.
   - When will investors prefer trading with periphery dealers?
3. The model with heterogeneous investors (SKIP)
4. Discussion on allocative efficiency and market stability.
5. Conclusion

Basic Model – Primitives

- A market for indivisible goods – liquidity provision service.
- Infinite periods, discount factor δ.
- Players:
  - n number of homogeneous long-lived investors
  - a long-lived principal dealer P (supplier).
  - a non-strategic long-lived principal dealer P' (supplier).

Basic Model – Investors

Investor $i \in I$

- i.i.d. one-unit liquidity demand $l_{it} \in \{0, 1\}$ with $Pr(l_{it} = 1) = q$.
- Private valuation of liquidity service

$$V_{it} = \begin{cases} 0 & \text{if } l_{it} = 0 \\ V & \text{if } l_{it} = 1. \end{cases}$$

- Cash endowment V_L
- Payoff $= \hat{1}(\textit{obtain liquidity})V_{it} +$ net cash holding

Basic Model – Principal Dealers

A principal dealer P (i.e core dealers)

- Can provide liquidity service at per-unit cost of

$$C_t = \begin{cases} 0 & \text{if } \theta_t = G \\ C & \text{if } \theta_t = B. \end{cases}$$

  where θ_t = random market state with $Pr(\theta_t = G) = p$
- Payoff = profits from providing liquidity service.

A non-strategic principal dealer P'

- Same cost function with P
- Always quote price = C_t (outside option of investors)

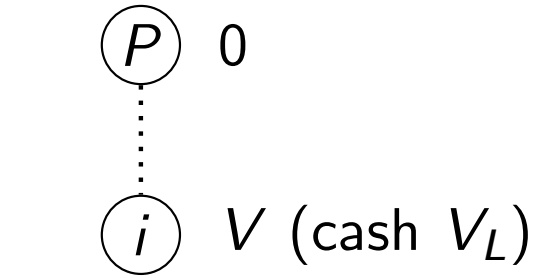
Trading Timeline – Take-it-or-leave-it Bargaining

For each period t,

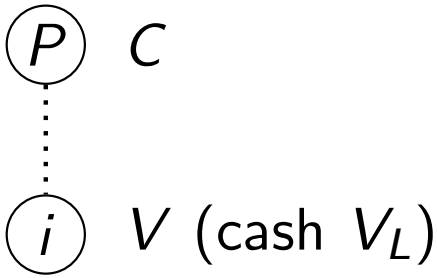
1. θ_t realized and I_{it} observable to i.
2. Principal dealer P quotes a price $\beta_{it} \geq 0$ to every investor.
3. Each investor i decides $\gamma_{it} \in \{0, 1\}$.
4. P observes $I_t = \{I_{it}\}_{\forall i}$.

- Equilibrium: P and I maximize their discounted sum of all future payoffs.

Basic Model – Trade Friction



good state

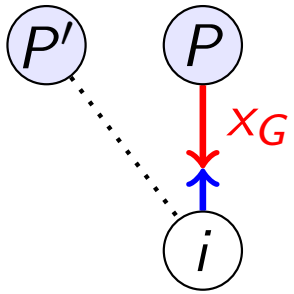


bad state

Assumption: $V > C > V_L$

- Urgent asset demand with insufficient cash.
- Urgent needs to sell asset to meet high cash target.
- **Implication: no trade/asset fire-sale phenomenon during bad states**

Result I: Trade Occurs With Long-term Relationship



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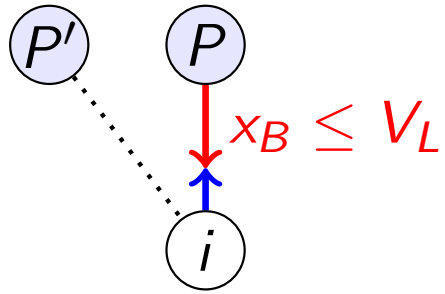
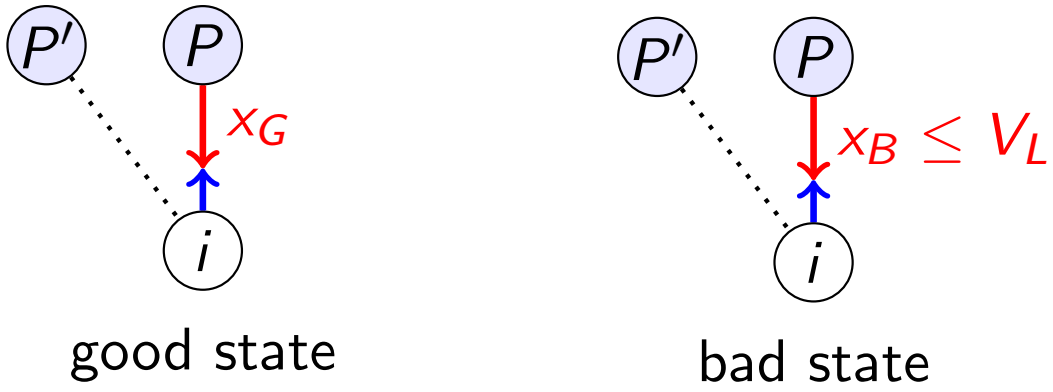


bad state

Non-binding agreement between P and i

- P provides liquidity at price x_B in bad states.
- i pays x_G in good states.
- **relationship continues as long as no one deviates...**

Result II: But Investors Must Be **Frequent** Customers...



- Commitment problem $\rightarrow$ relationship failure.
- **Proposition: investors must have frequent liquidity shock for successful relationship.**

What if investors rarely need liquidity...?

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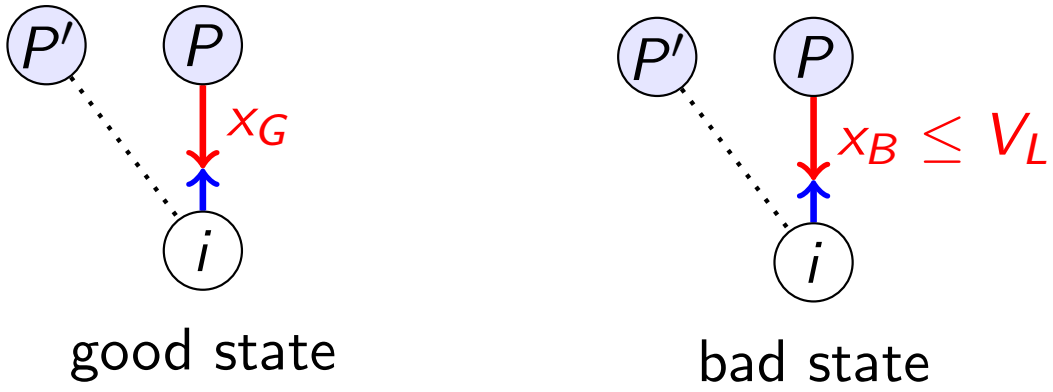

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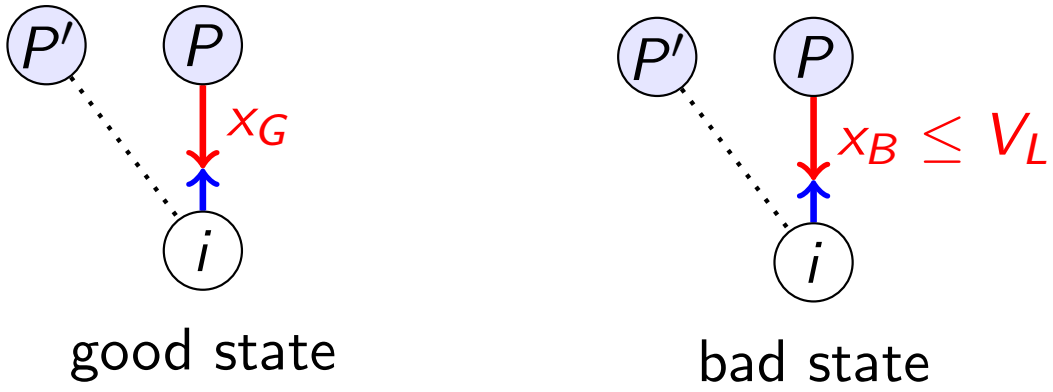

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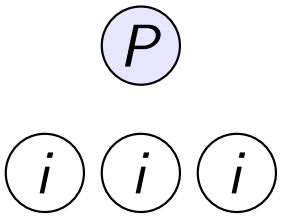

(a) No relationship

(b) Coalition under full information

(C) A as facilitator under limited information

- No relationship when Q low.
- What if I forms coalition $\rightarrow$ pool of liquidity demand $\rightarrow$ Q high.
- BUT i must know what others did **for collective punishment**

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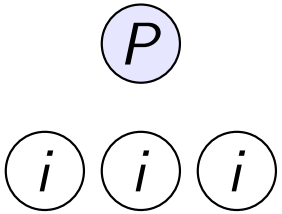

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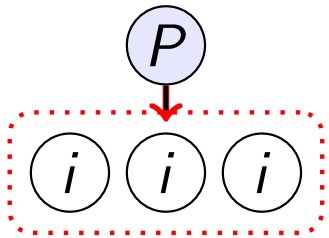

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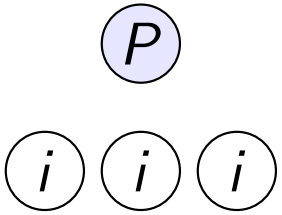

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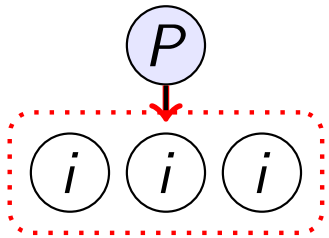

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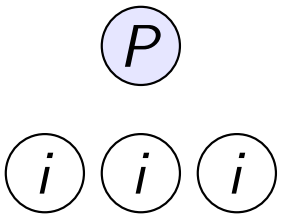

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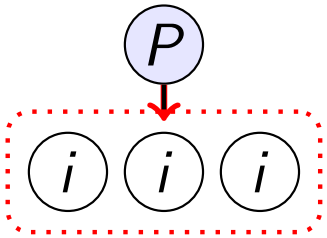

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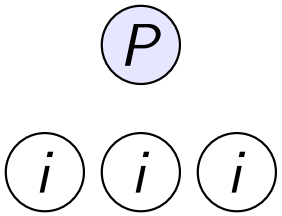

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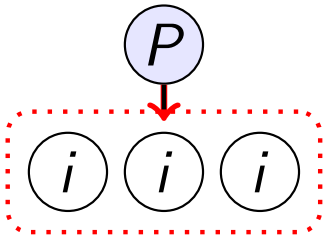

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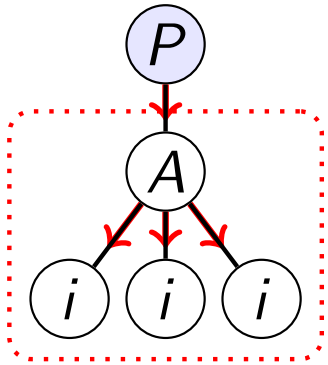

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The Model with Agency Dealer

Add an agency dealer A (i.e periphery dealers) to the model

- Intermediate trades between P and I
- No intermediation cost and can charge fees to investors.
- Payoff: profits from intermediation fees

- Trading: Sequential take-it-or-leave-it bargaining.
- Relationship: informal agreement on wholesale price, fees, and maximum quantity to sell in bad times (quota).

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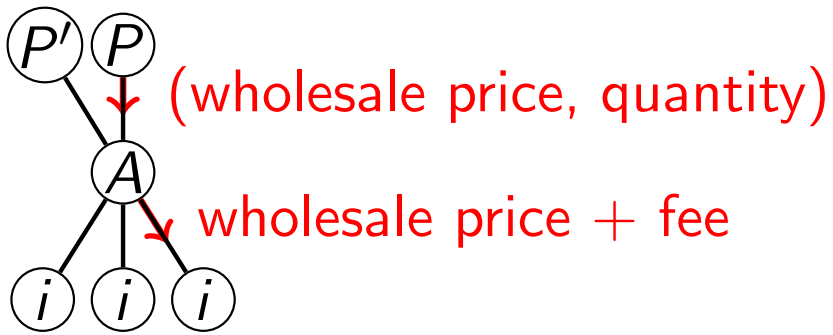

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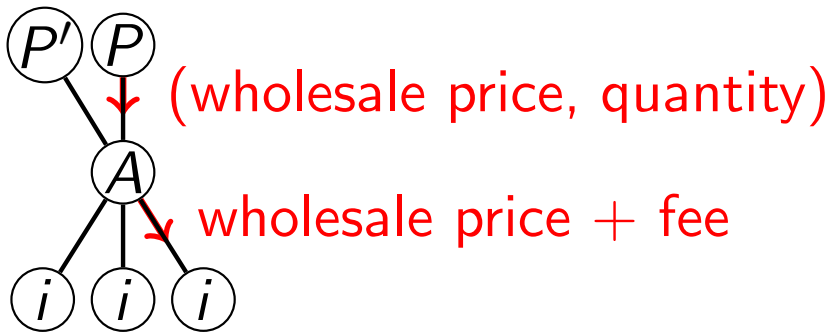

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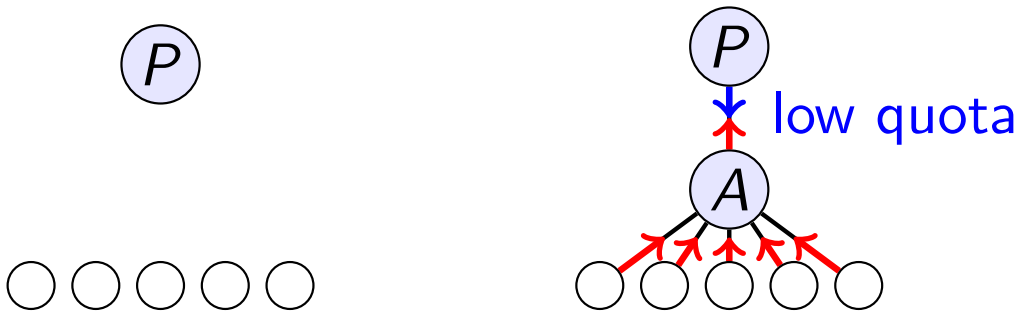

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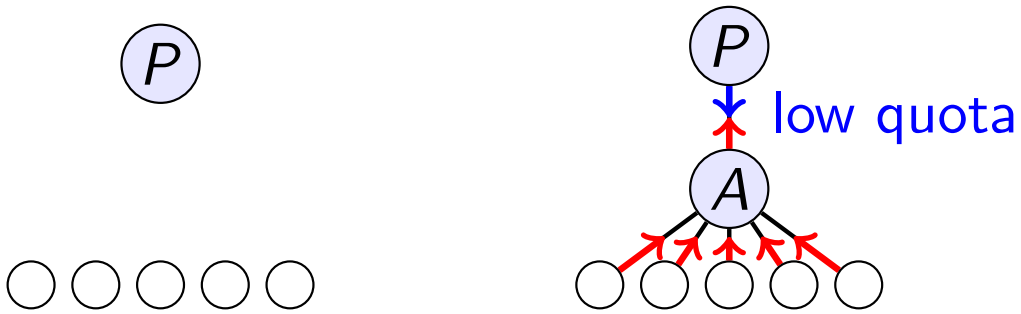

How: liquidity shock aggregation + low quota

But:

1. must leave enough surplus (intermediation fees) to incentivize A (agency cost).
2. effective only when the investors rarely demand liquidity simultaneously – HERE.

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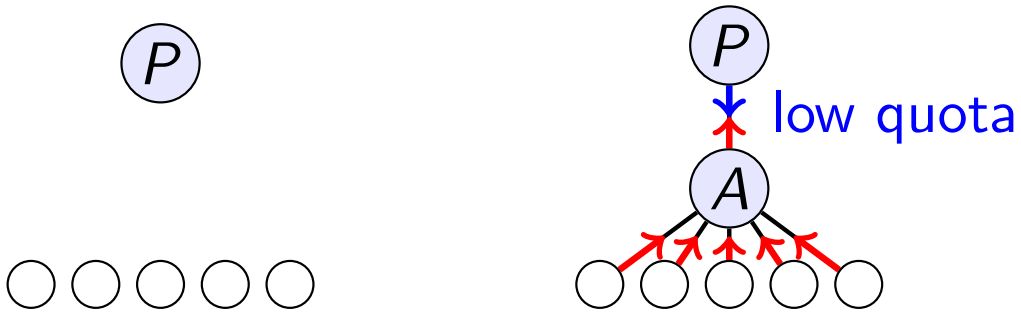
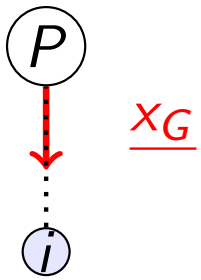


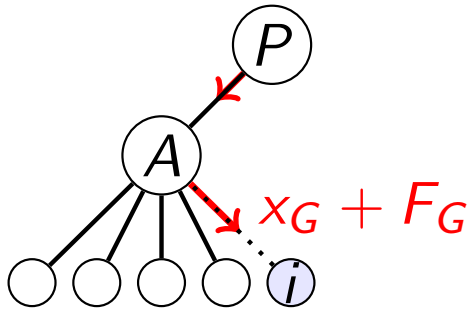
Corollary: Provided that the probability of liquidity shock is low enough, A can help **excluded** investors form relationship if $\frac{quota}{n(investors)}$ is sufficiently low.

Empirical Implication: Longer Intermediation Chain $\neq$ Higher Price

Let $\underline{x_G}$ = minimum price that would induce P to form direct relationship.



Direct relationship

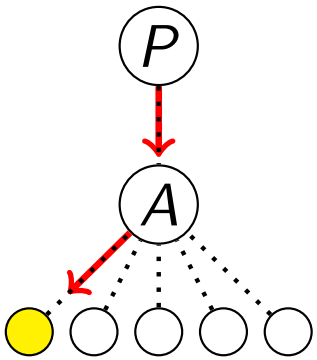


Indirect relationship via A

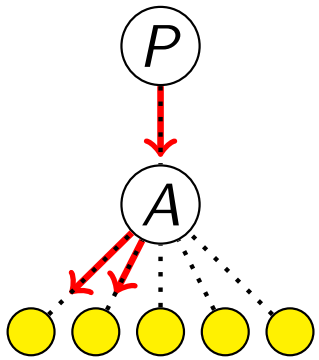
Provided that the investors cannot form direct relationship with P

- Finding: $X_G + F_G < \underline{x_G}$
- Tradeoff between execution cost and trading speed.
- Infrequent investors can only commit to relationship contract offered by agency dealer.

Implications on Market Efficiency and Stability



Normal bad period



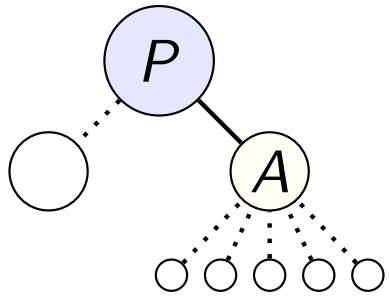
Extremely bad event

Efficiency – improving!

Stability (likelihood of first-trigger event of systemic crisis) – ambiguous!

- $\uparrow$ as existing investors get liquidity during bad times.
- $\downarrow$ as $\uparrow$ participation of new investors facing liquidity shortage during extremely bad events.

Conclusion



This paper: construct a game-theoretic model to study strategic dealer choice of buy-side investors in OTC secondary asset markets.

Key insight: Infrequent investors trade with periphery dealers to obtain the benefit of long-term relationship.

Takeaway point: periphery dealers can improve market efficiency but might create market instability.

The model with heterogeneous investors – here

THANK YOU VERY MUCH!

Appendix

The Model with Heterogeneous Investors

What we know so far...

- Low-liquidity-need investors choose agency dealer (i.e periphery dealers) to obtain the benefit of long-term relationship (i.e. costly liquidity in future bad states).
- What about high-liquidity-need investors?

Separating equilibrium

Pooling equilibrium

$\rightarrow$ High-type investor: price & insurance coverage.

The Model with Heterogeneous Investors

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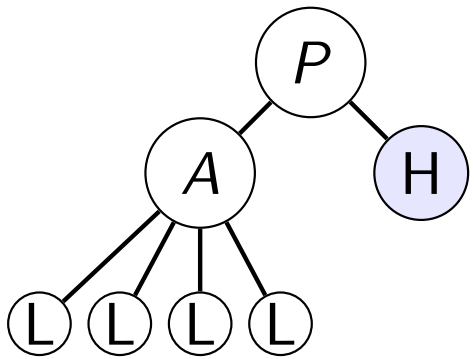

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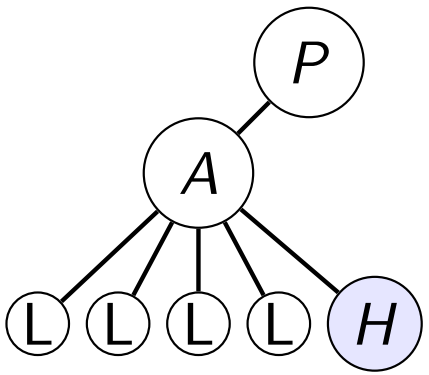


Pooling equilibrium

$\rightarrow$ High-type investor: price & insurance coverage.

The Model with Heterogeneous Investors

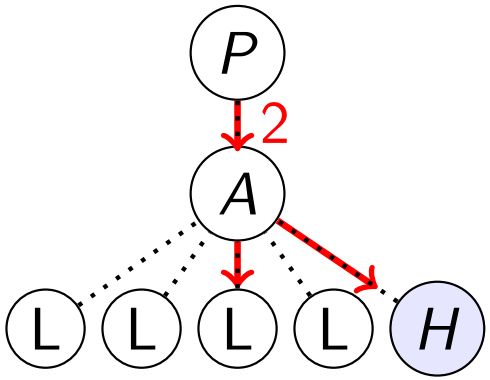
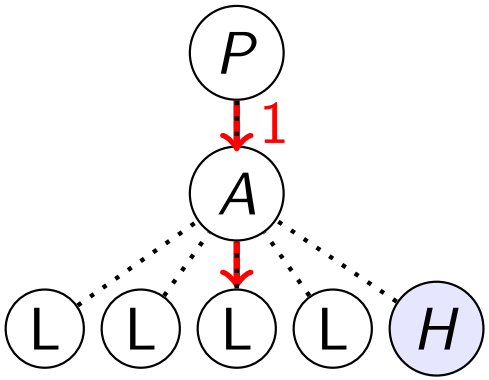
Setting:

- Investors $\{H, L_1, L_2, \ldots, L_n\}$ with q_H, q_L.
- $q_L \in \mathcal{N}_\epsilon(0) \rightarrow$ (almost) full insurance with $n^* = 1$.
- n sufficiently high to sustain any equilibrium.
- Lowest possible payoff for $\{P, A\}$.
- Investors pay F for only their trades $\rightarrow$ no cross-subsidy.

Equilibrium:

- liquidity quota $= 1$ under separating equilibrium

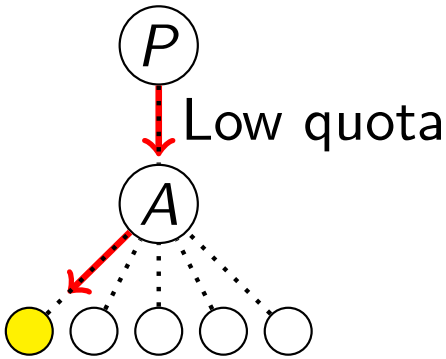
Pooling Equilibrium: Existence

	n^* increases one unit	n^* unchanged
		
Efficiency	pooling $>$ separating	separating $>$ pooling
Existence	$nQ_L \geq \frac{2+Q_H}{2p-1}$	q_H low & $nQ_L \in [\underline{Q}, \bar{Q}]$
Payoff	$\bar{P}$, $L \downarrow$	$P \downarrow$, L unknown

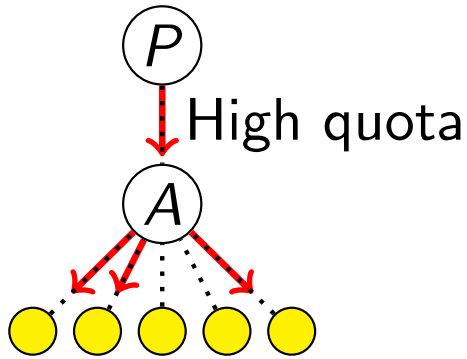
- A and P are complementary if A not too big.
- A may have too much power on the low-type.

BACK

Extra: Probability of Liquidity Shock (q) Matters



Low prob of liquidity shock



High prob of liquidity shock

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