Dealer Funding and Market Liquidity

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Research questions

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Dealers use balance sheet to provide immediacy in OTC markets
($\neq$ brokers)

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Questions:

How can funding frictions affect

- the behaviour of dealers/market makers,
- and hence, the market liquidity of assets?

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This paper's approach: agency problem in market making.

Results preview

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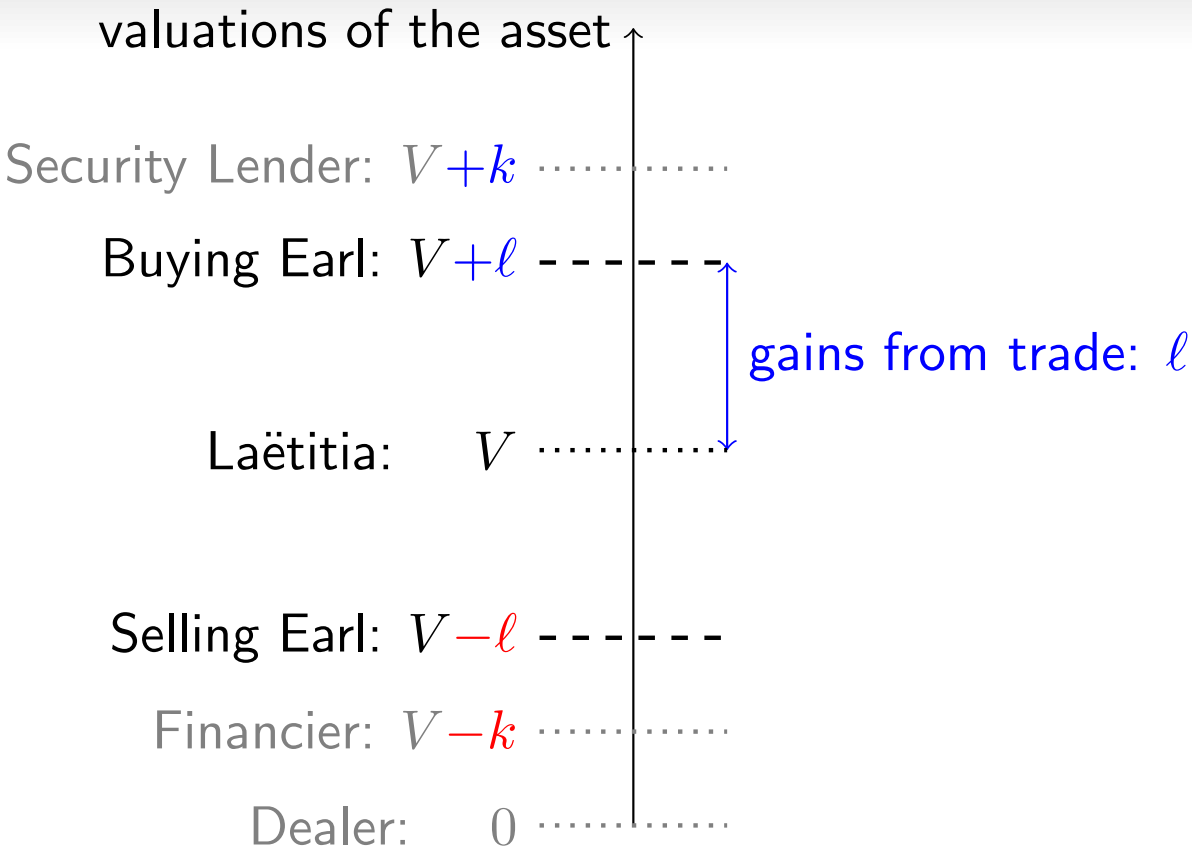
  3. Financiers: cash rich (no asset)
  4. Security Lenders: asset rich (no cash)

Interpretation:

- $+k$, $+\ell$: portfolio/hedging needs
- $-k$, $-\ell$: liquidity needs, opportunity costs of cash



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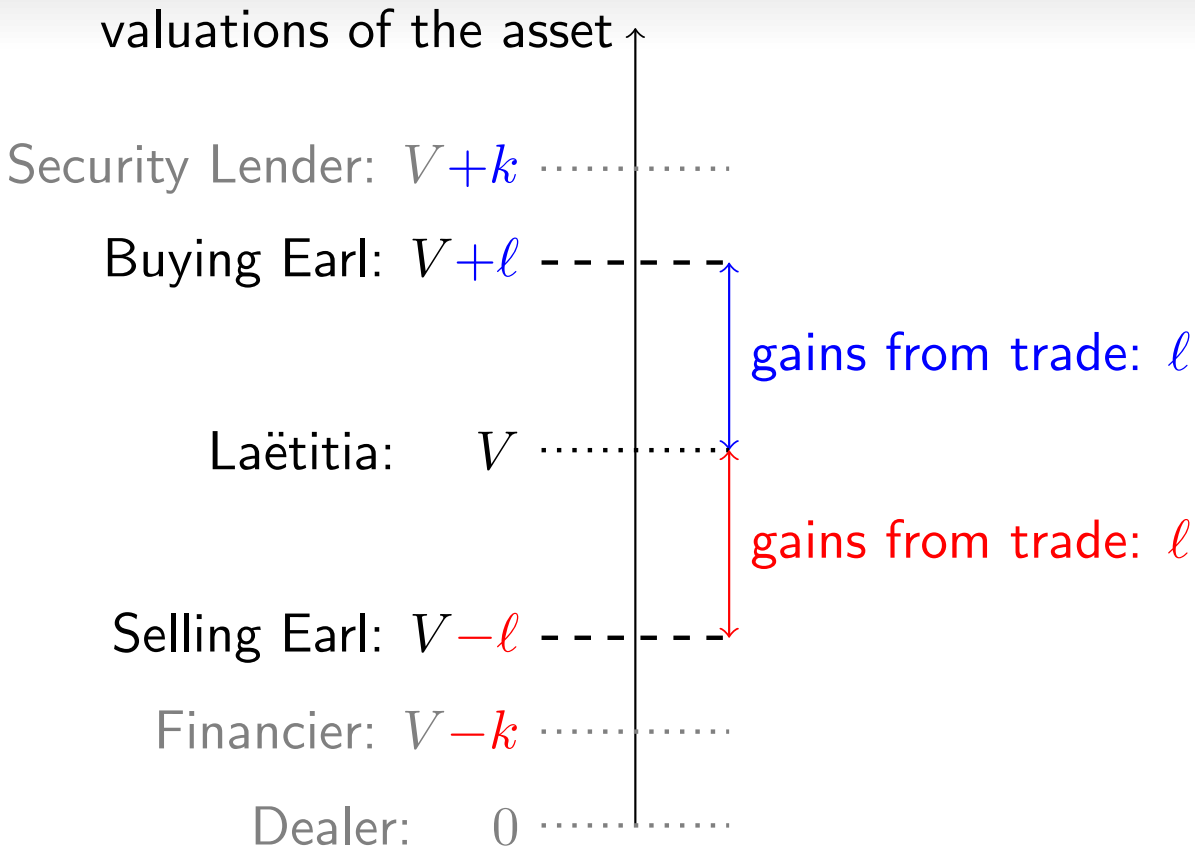

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(Other possible effort in practice: risk management, execution, market monitoring, etc.)

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$t = 2$

- Chosen Dealer finds Laëtitia with $\Pr = 1 - (1 - e)\delta$
- Two observable outcomes:
  "H:" sells to Laëtitia, Cashflow: qV
  "L:" sells to Financiers, Cashflow: $q(V - k)$
- Dealer makes payout according to contract

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Symmetric to the "Earl sells" case (shown in the paper)

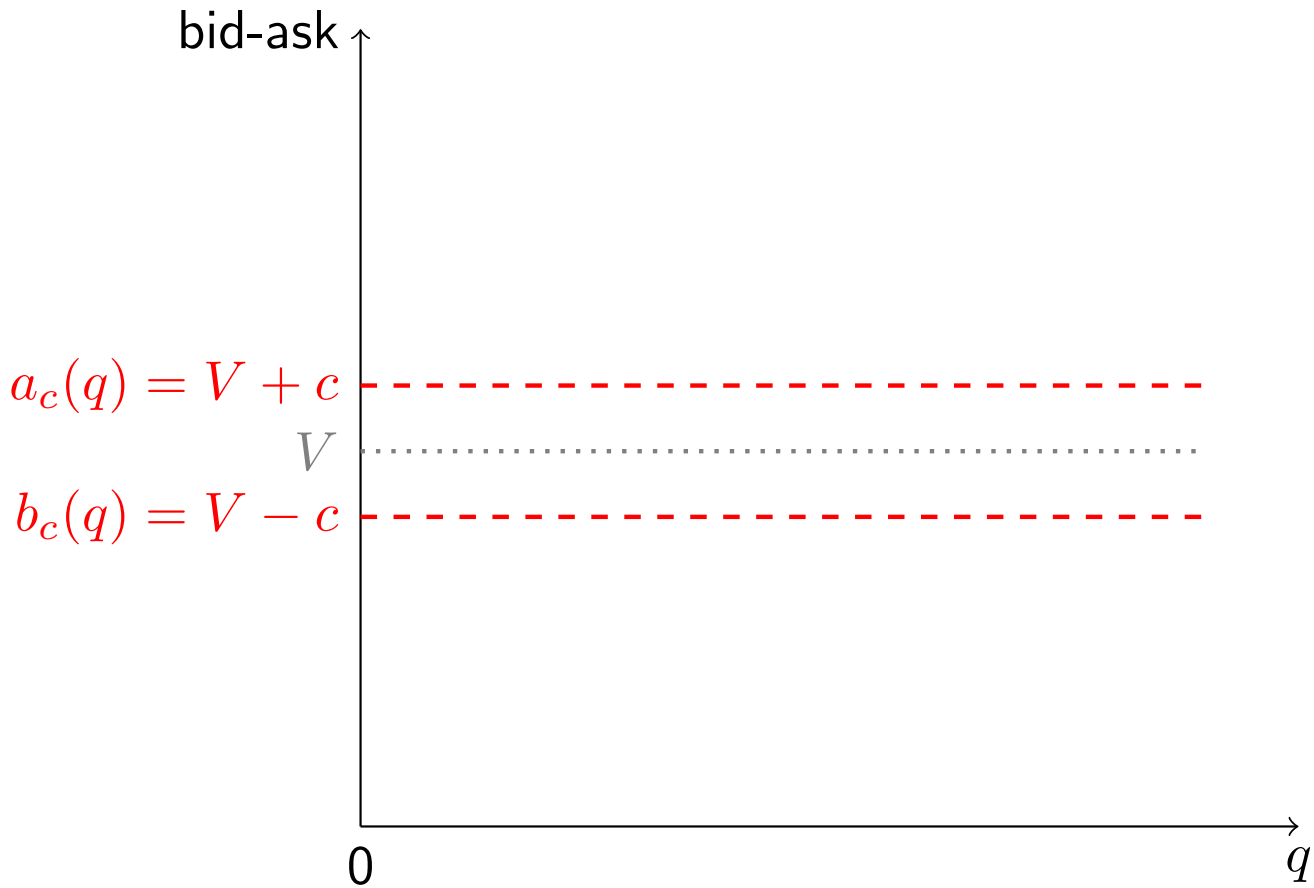
- Dealer(s) post asks
- Financing needed: to pledge cash collateral to security lender
- Two outcomes: Laëtitia is found or not

Benchmarks

Unconstrained dealers: large w or observable effort

- Effort is always induced
- All trades are intermediated

Unconstrained competition leads to zero-profit bid-ask



Note: gains from trade $= \mathbb{E}[q] \times (\ell - c)$

Constrained dealers and optimal contract

Suppose again Earl wants to sell. To bid $b(q)$, a dealer

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- offers contract $\{R_L, R_H\}$

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Dealer's problem: raise as much finance as possible while maintaining incentive

- maximizes "pledgeable income"

The optimal contracting problem

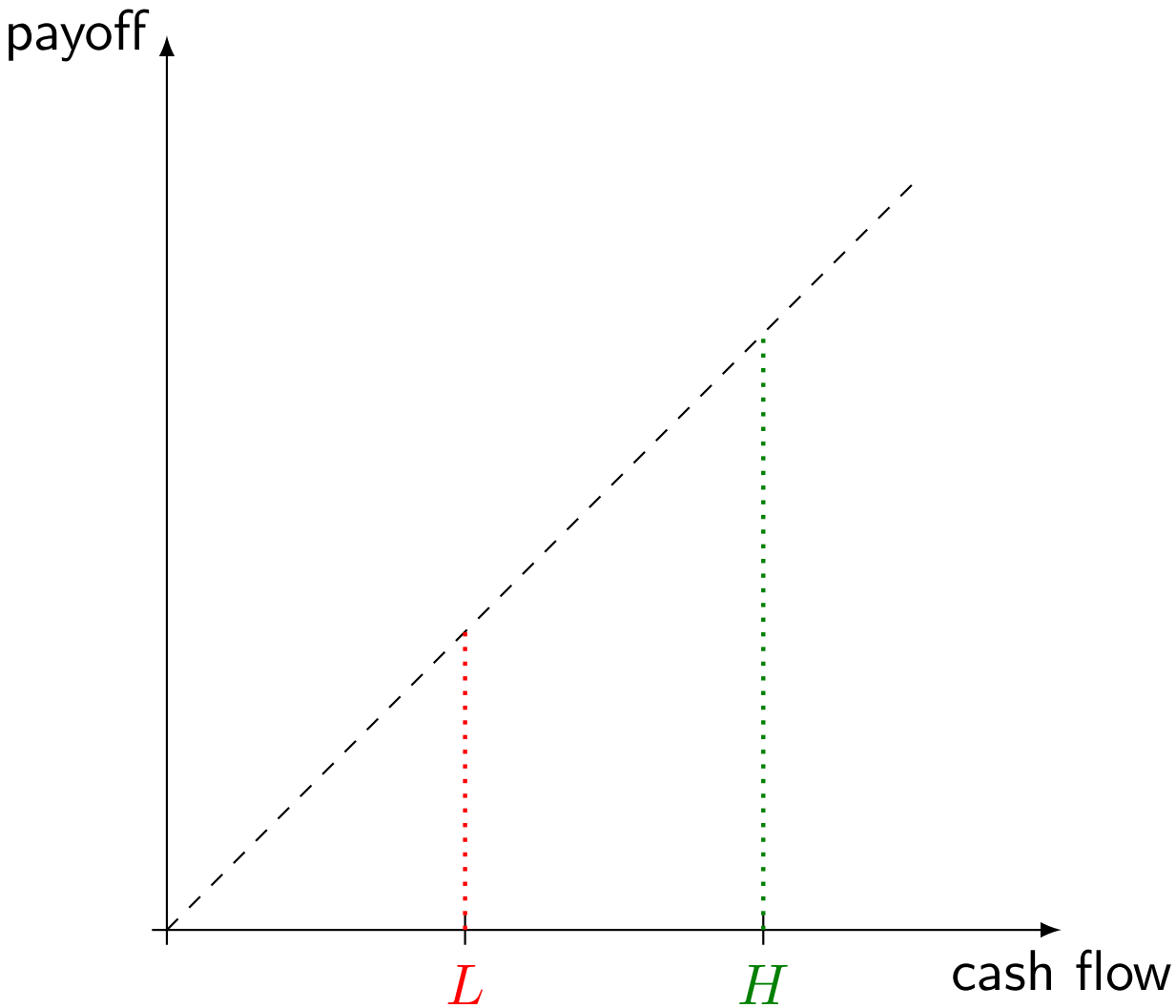
$$\max_{\{R_L, R_H\}} \mathcal{P}(q) = R_H$$

subject to

$$(qV - R_H) - cq \qquad \geq (1-\delta)(qV - R_H) + \delta(q(V-k) - R_L) \qquad \text{(IC)}$$

and limited liability

A contract



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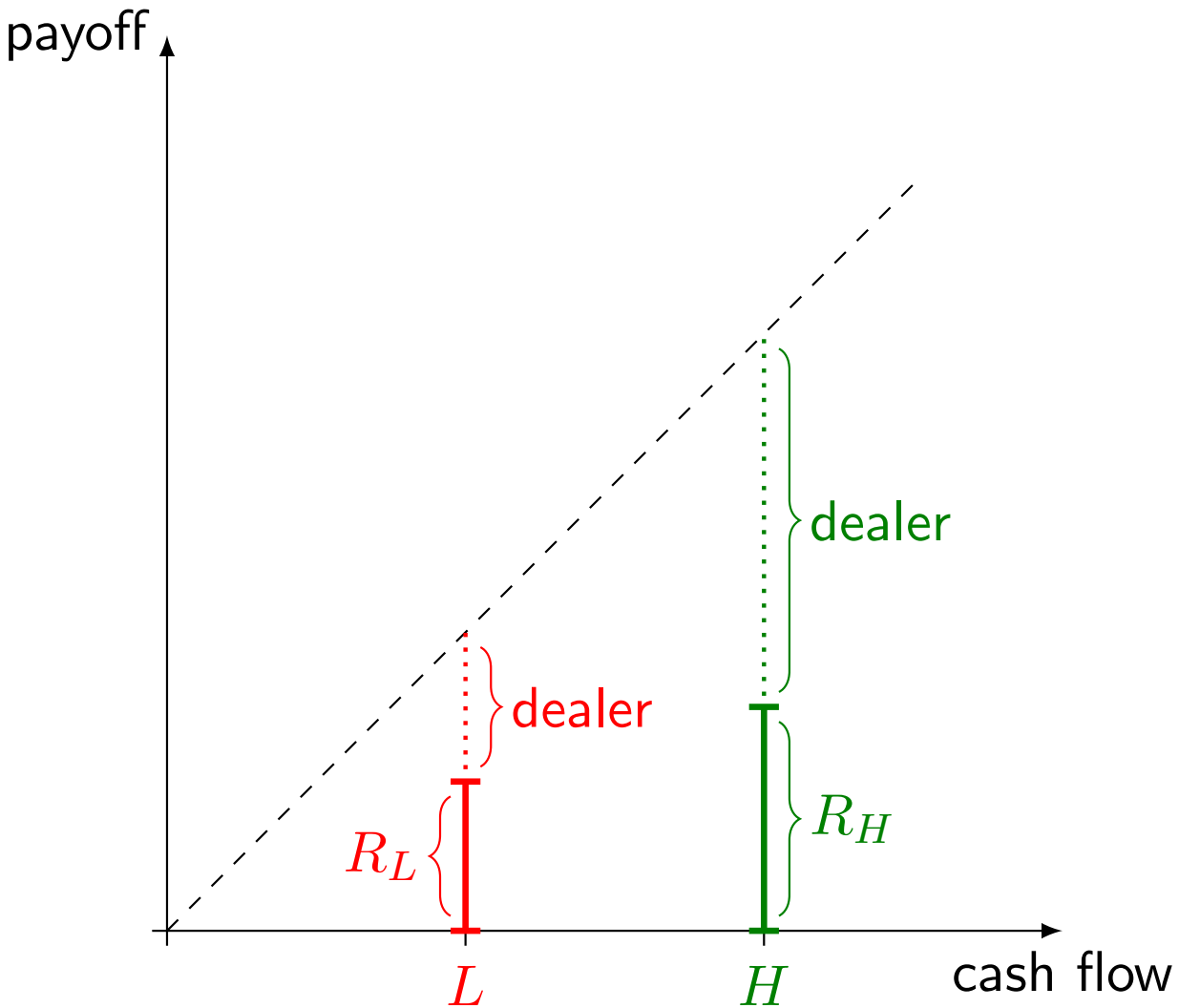
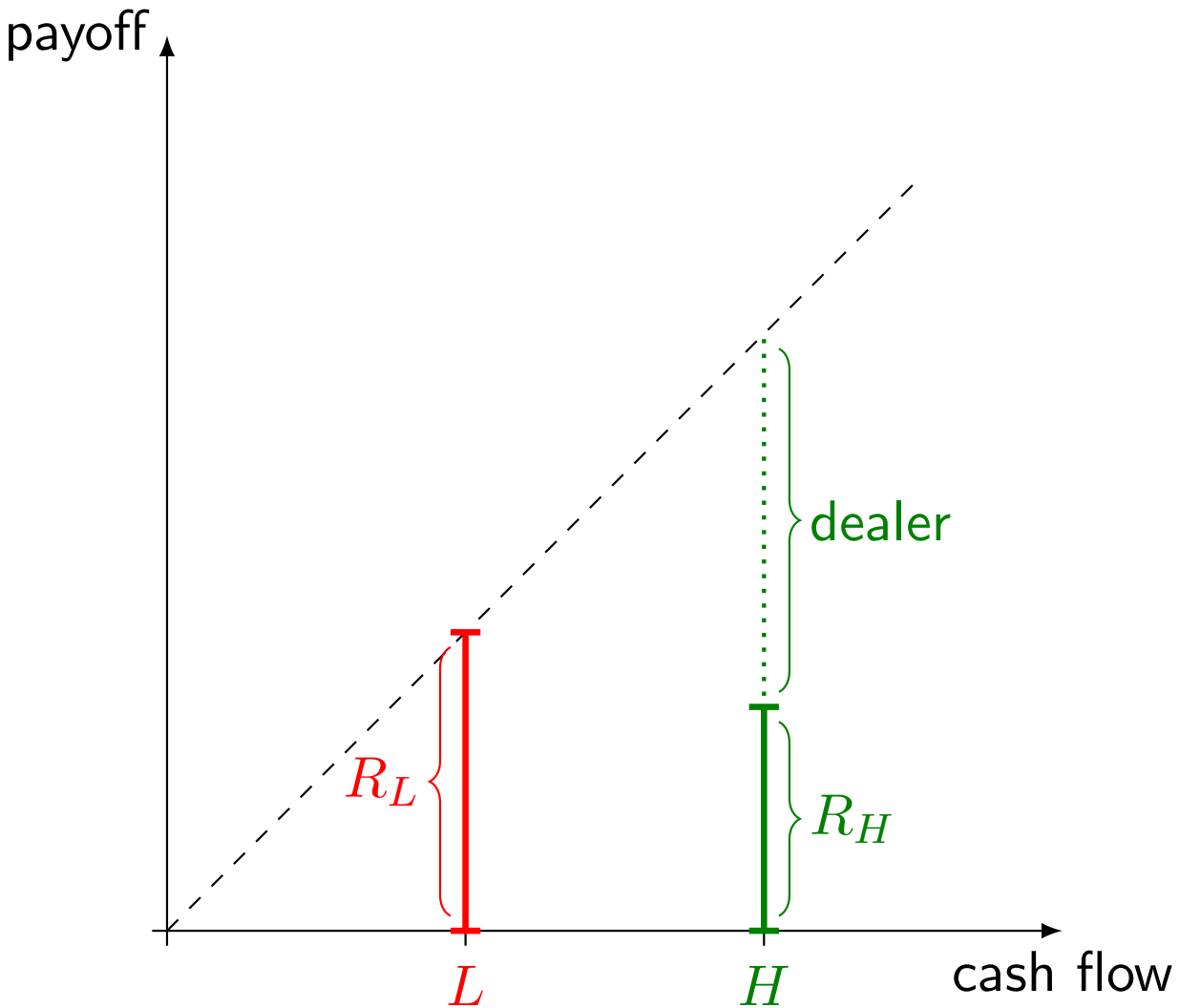
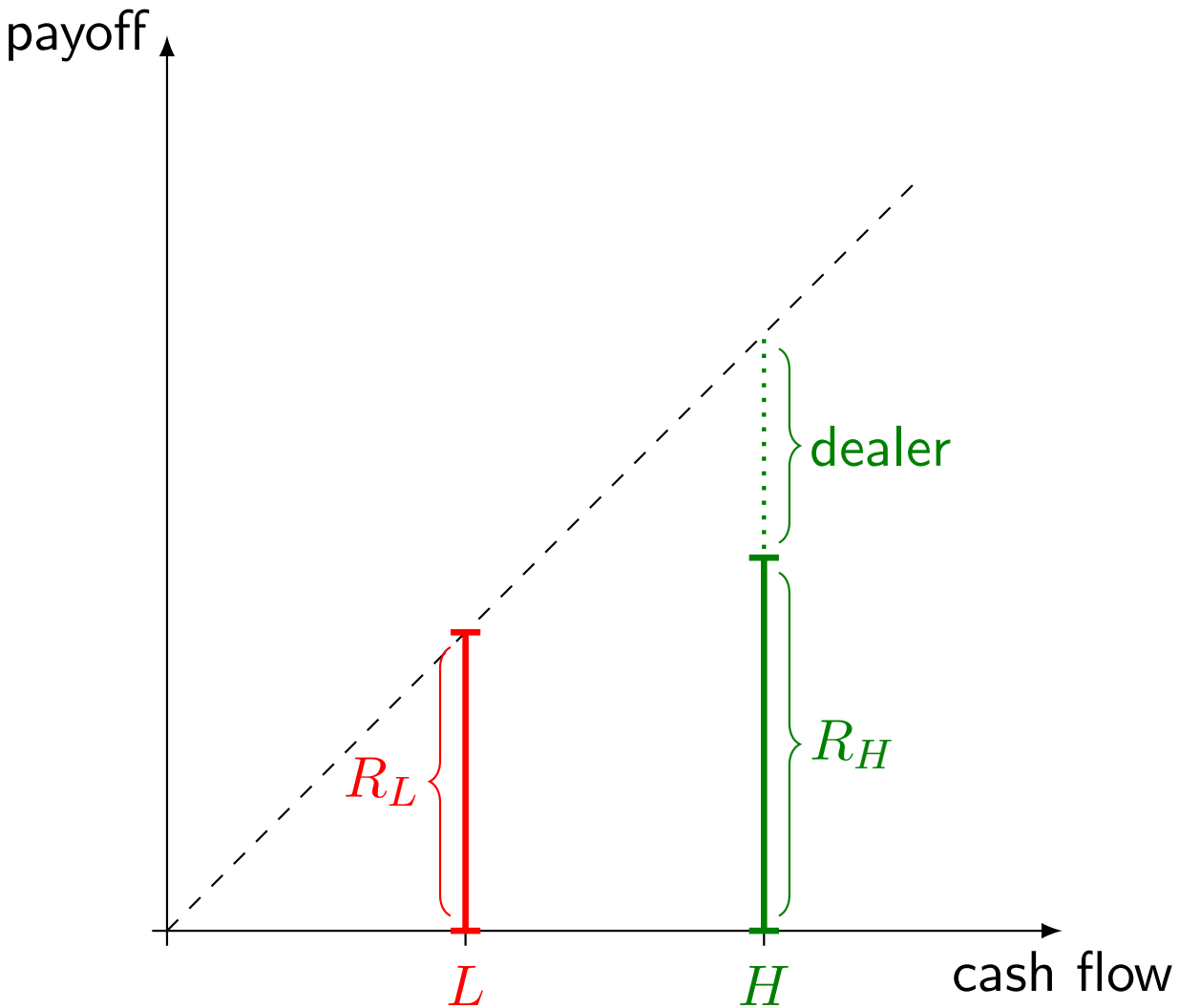


Contract with stronger incentives



Contract with maximal pledgeable income



Pledgeable income determines market liquidity

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Maximum incentive-compatible bid for depth q is:

$$b_{IC}(w,q) = \frac{w + \mathcal{P}(q)}{q} = \frac{w}{q} + \left(V - \frac{c}{\delta}\right)$$

- $\left(V - \frac{c}{\delta}\right)$: per unit pledgeable income $< V$
- $w + \mathcal{P}(q)$ is dealer's balance-sheet capacity

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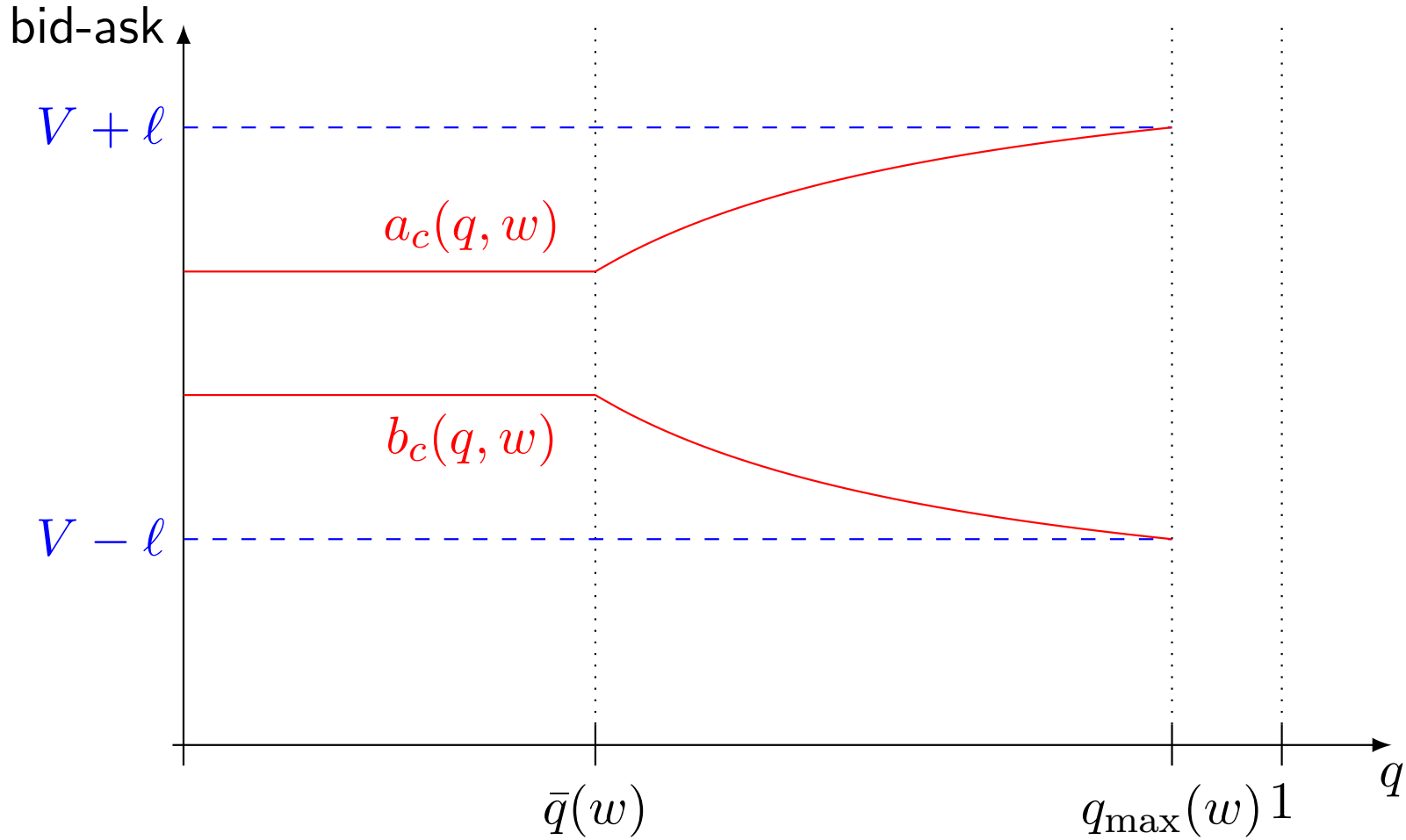
(Proposition 1) if $\frac{c}{\delta} > \ell$ (A3: agency friction matters)



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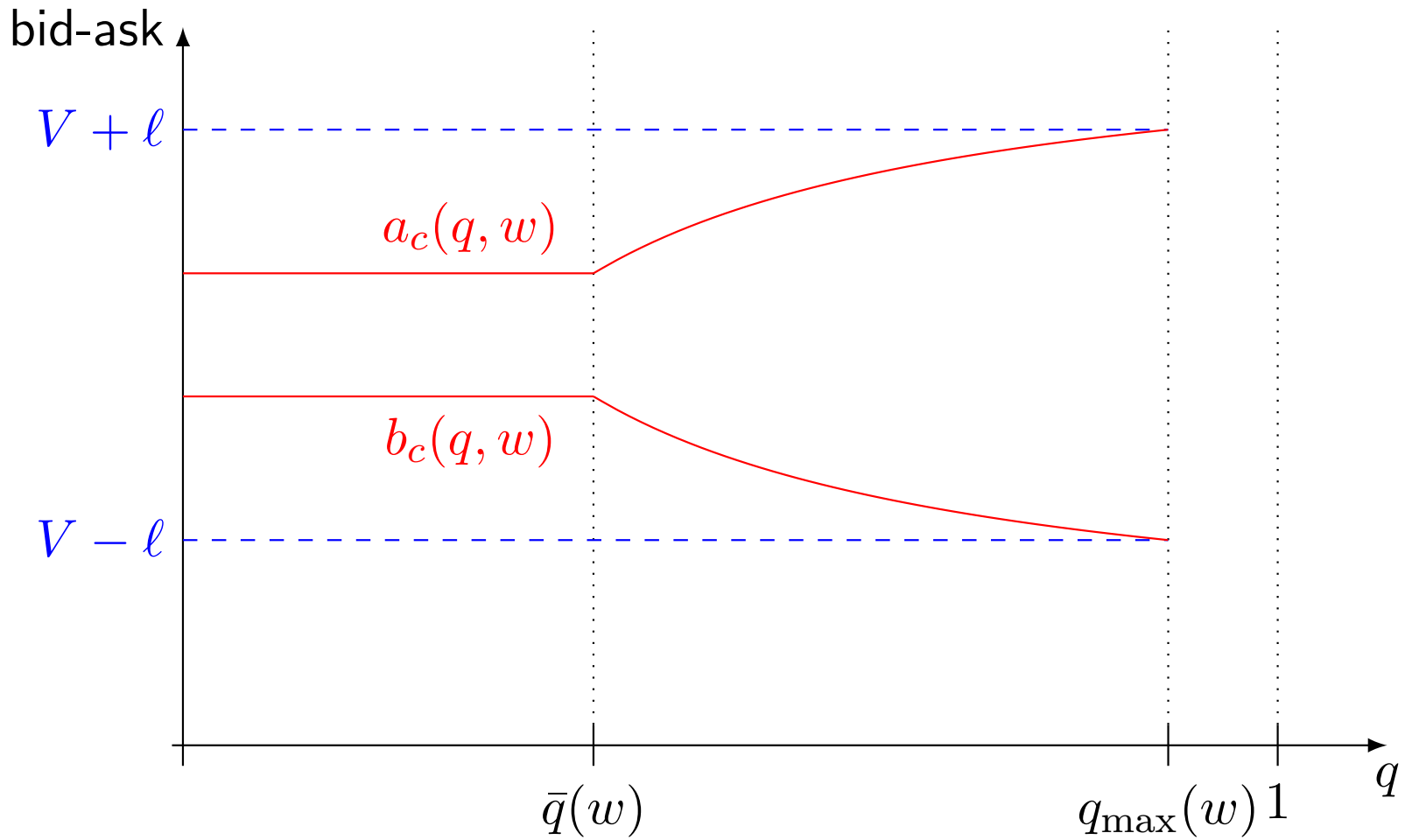

Trading volume and gains from trade decrease

Multiple assets

Consider a model with multiple assets. Questions:

- cross-market vs specialized dealers, who win?
- more or less liquidity?
- correlated liquidity and spillovers?

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Model: suppose two Earl come to sell two assets A and B

- denote the order size as $q^A > 0$ and $q^B > 0$
- $N \geq 3$ dealers compete
- a cross-market dealer makes two search effort, finding two Laëtitia *independently*
- a specialized dealer only intermediates one asset and searches for Laëtitia in that market

Economy of scope

(Prop. 2) Cross-market dealer has higher pledgeable income than the specialized dealers combined

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- contract: dealer only 'gets paid' two successful searches
- NPV in one successful search is 'pledged as collateral' $\Longrightarrow$ enhanced incentives to search for another asset
- also known as "cross-pledging"

A closer look at the pledgeable income

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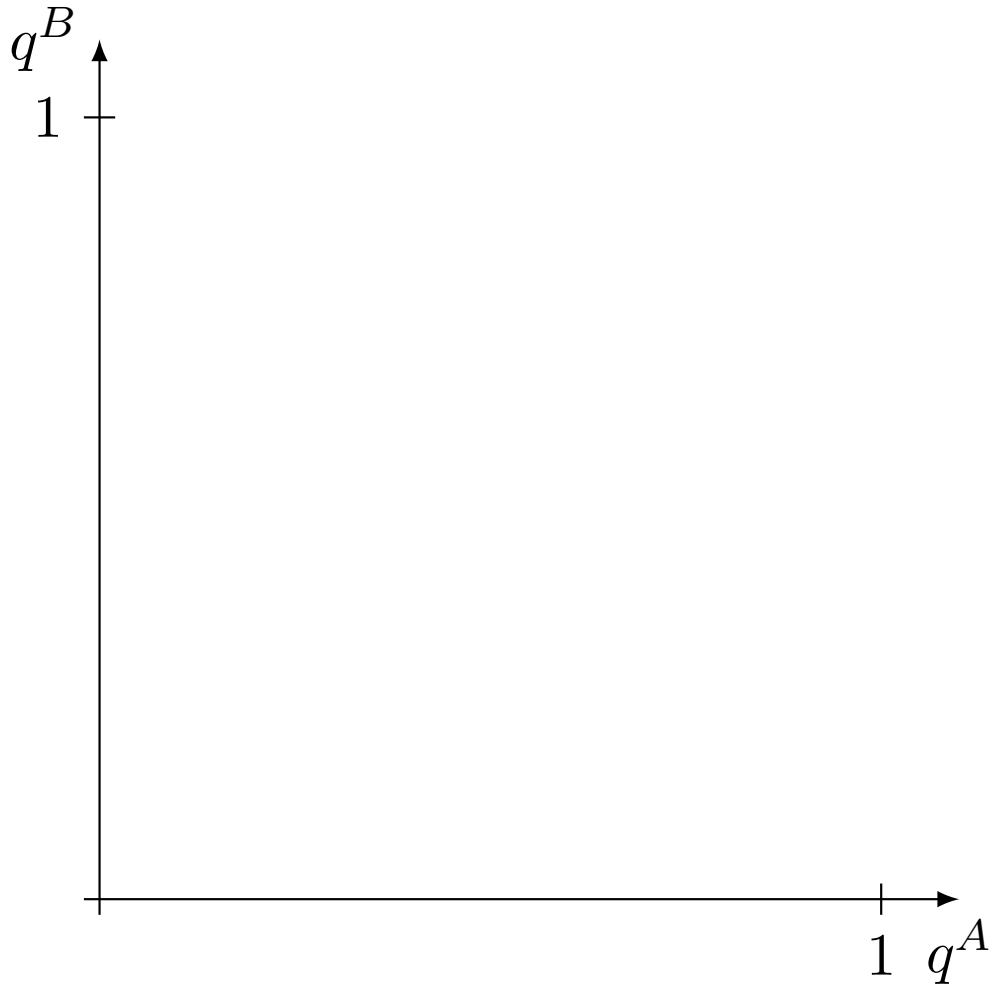
2. when q^A is small, asset A's pledgeable income $= V$!

Depth enhanced by cross-market dealer

(Prop. 3) pairs of orders (q^A, q^B) could be intermediated



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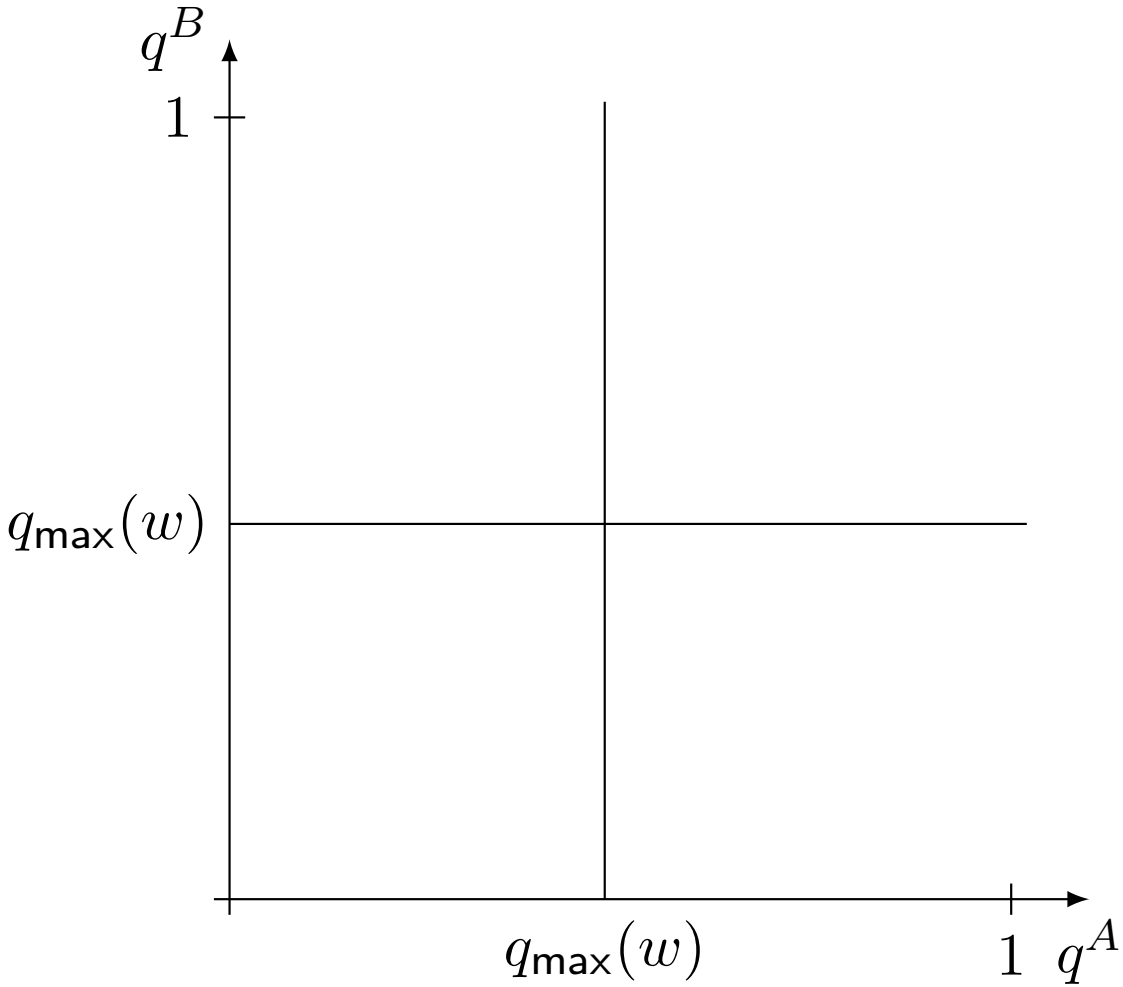

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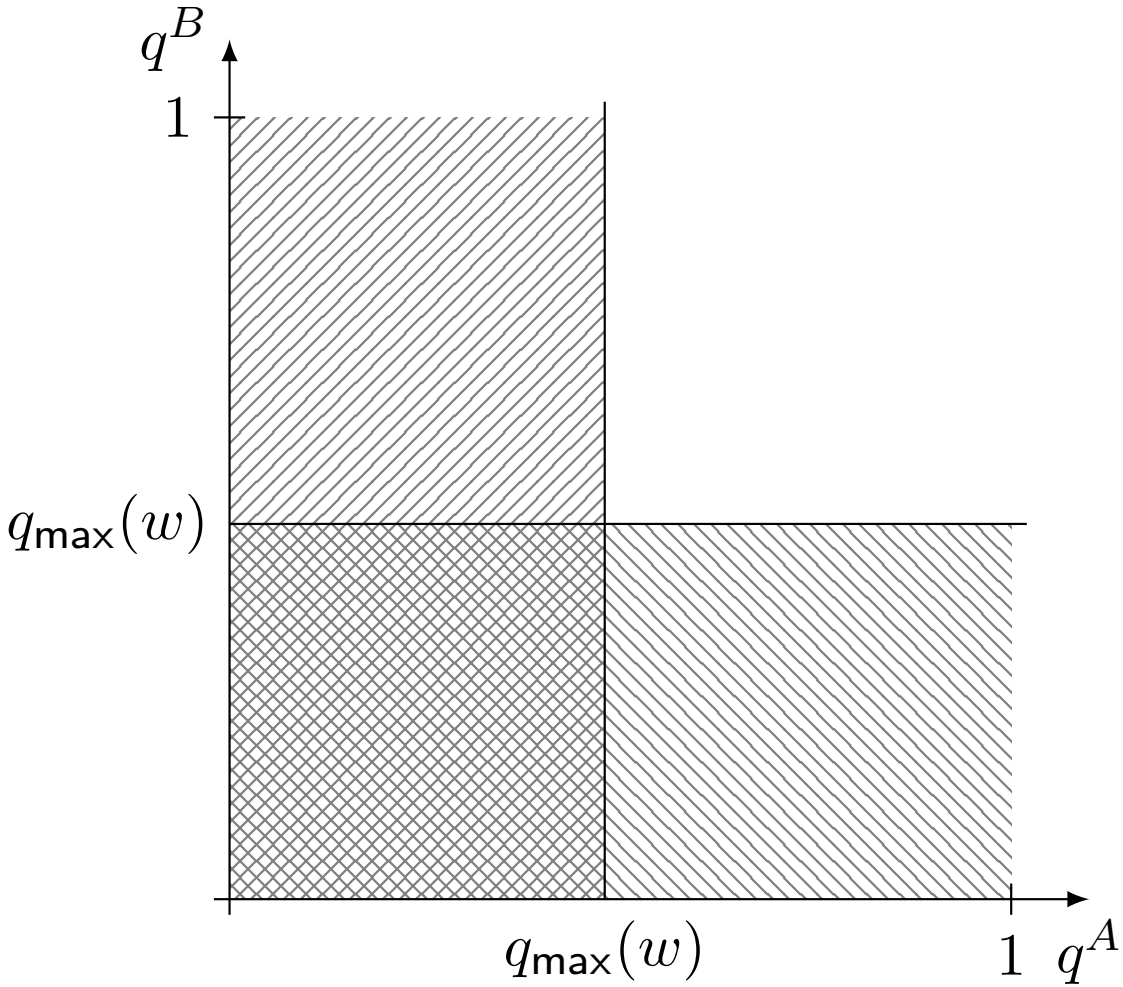

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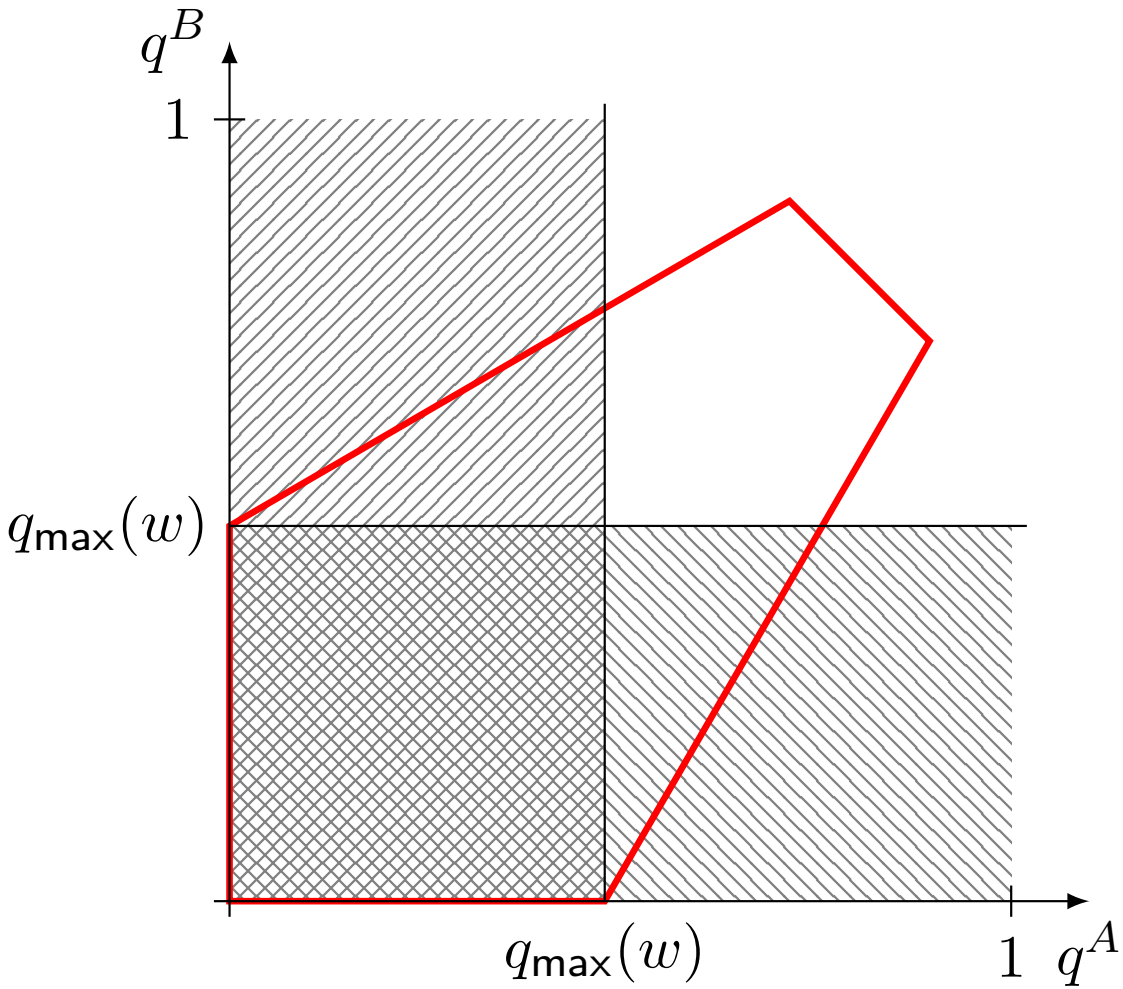

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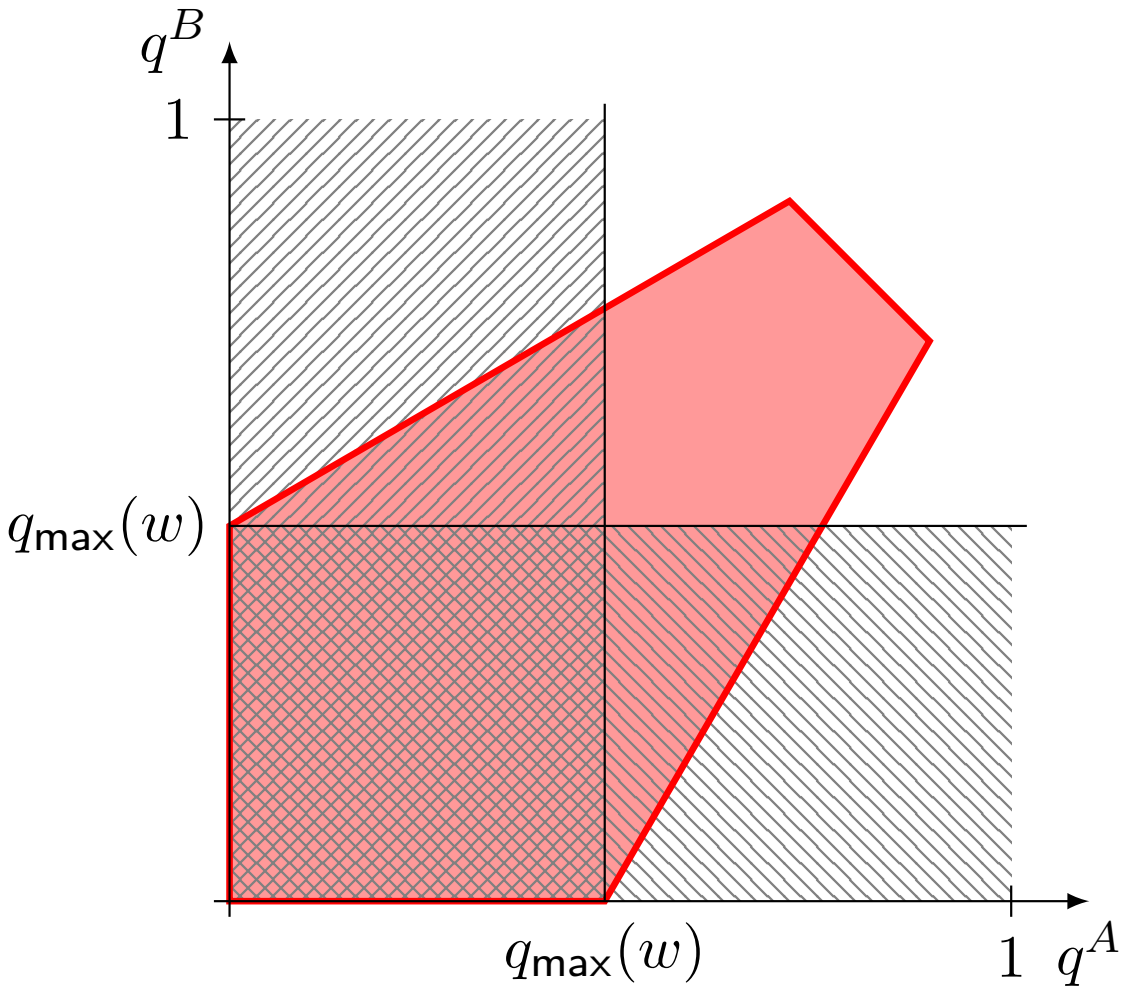

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Cross-market dealer dominates

(Prop. 4) Cross-market dealer out-competes others

- More balance-sheet capacity to out-bid two specialized dealers
- micro-foundation of similar intermediary capital risk price for many assets (He-Kelly-Manela (2017))

Correlations, spillovers, and price impacts

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Non-monotonic price impact: for small q^A and small w, $\frac{\partial b^A}{\partial q^B} > 0$.

Extensions

1. Risky asset
2. Dealer's optimal leverage and effect of regulation on liquidity
3. Bank v.s. non-bank affiliated dealers
4. Broker or Dealer

Intermediating risky asset

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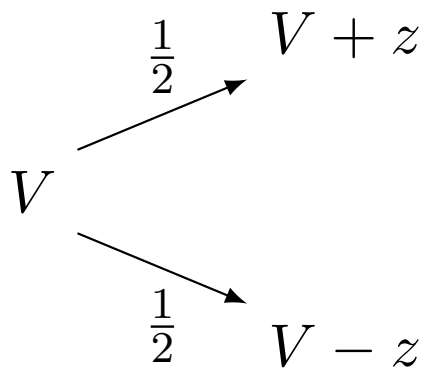

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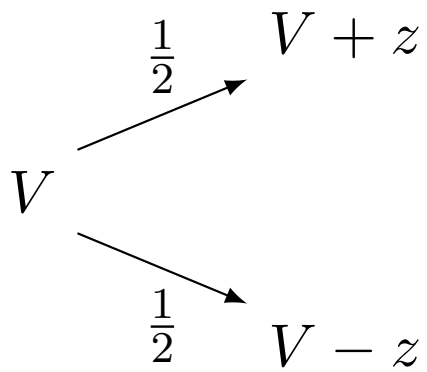

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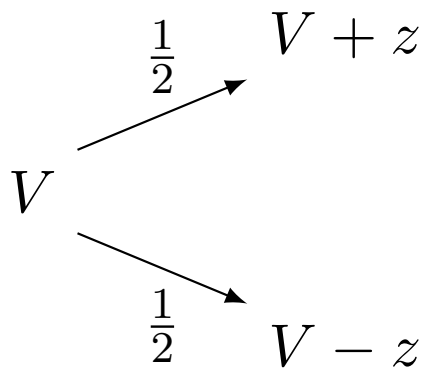

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- asset risk reduces reduces pledgeable income.

Riskier assets are more illiquid

Implications: dealers are *effectively* risk averse.

- Consistent with evidence, e.g. Comerton-Forde et al. (10,JF)

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- Consistent with evidence, e.g. Comerton-Forde et al. (10,JF)
- Risk-based margin constraint endogenized:

$$\text{Margin} = \frac{\text{Market value of asset}}{\text{Loan amount}} - 1 = \frac{qb_c(q,w)}{\mathcal{P}(q)} - 1 = \frac{w}{\mathcal{P}(q)}$$

and $\mathcal{P}(q)$ decreases in asset risk

Regulation and market liquidity

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  - net stable funding ratio, liquidity coverage ratio
  - capital adequacy ratio, leverage ratio

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We illustrate the effect of leverage ratio cap on market liquidity.

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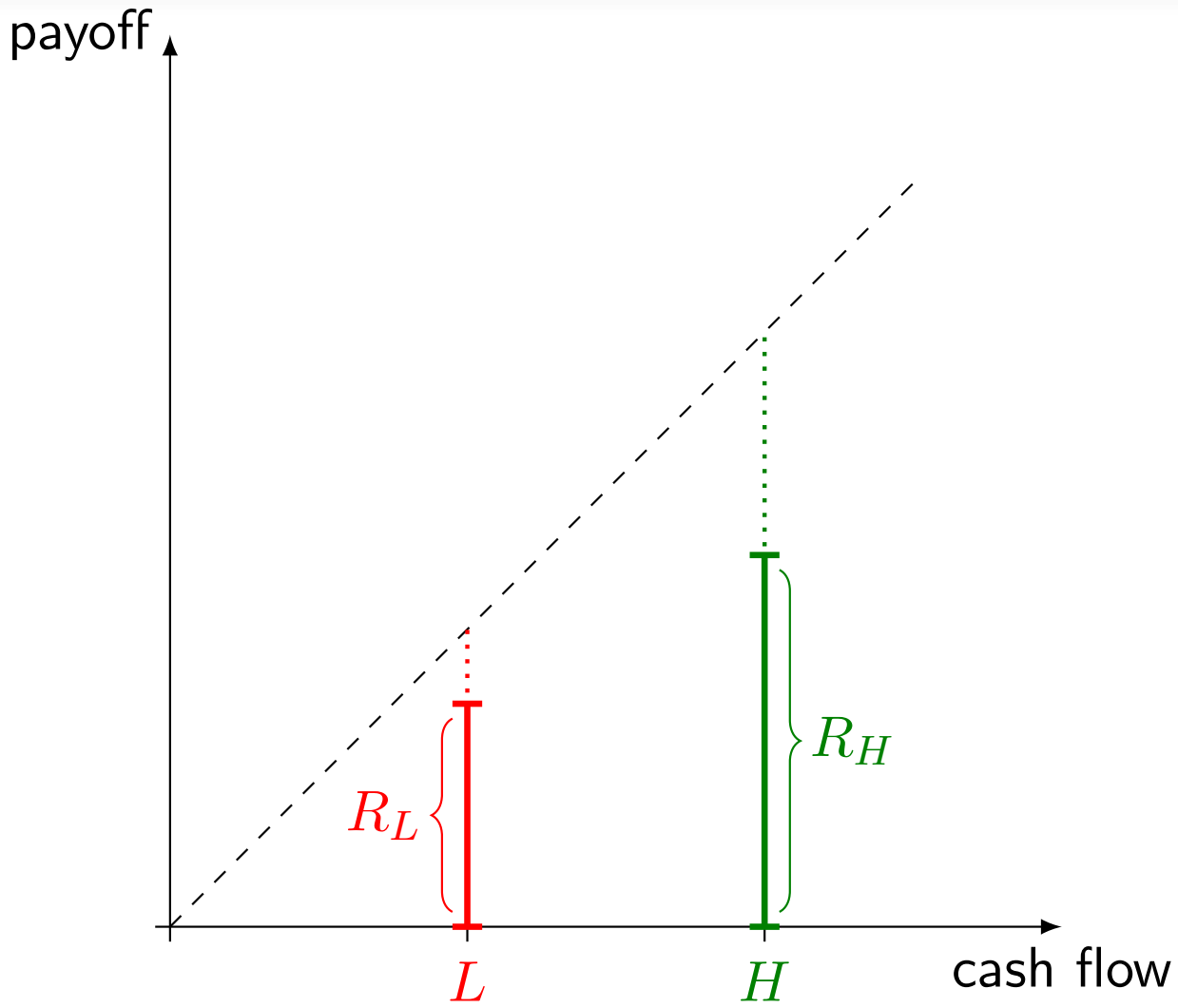
Any $\{R_H, R_L\}$ can be implemented by debt and (outside) equity.

- Debt with promised repayment D.
- Outside equity: a fraction α of the remaining cash flow.

Debt-equity contract



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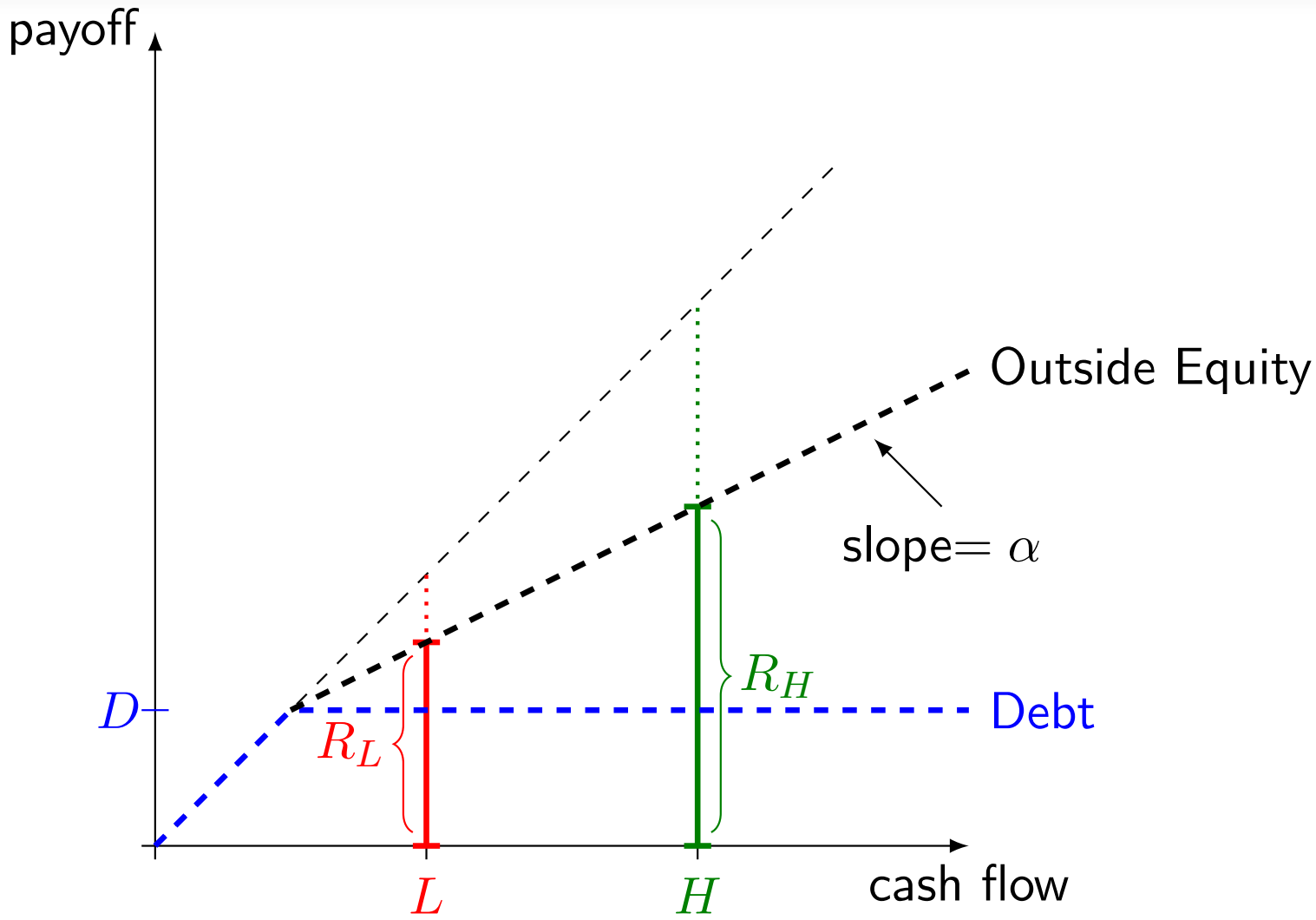

Incentive constraint limits the use of outside equity.

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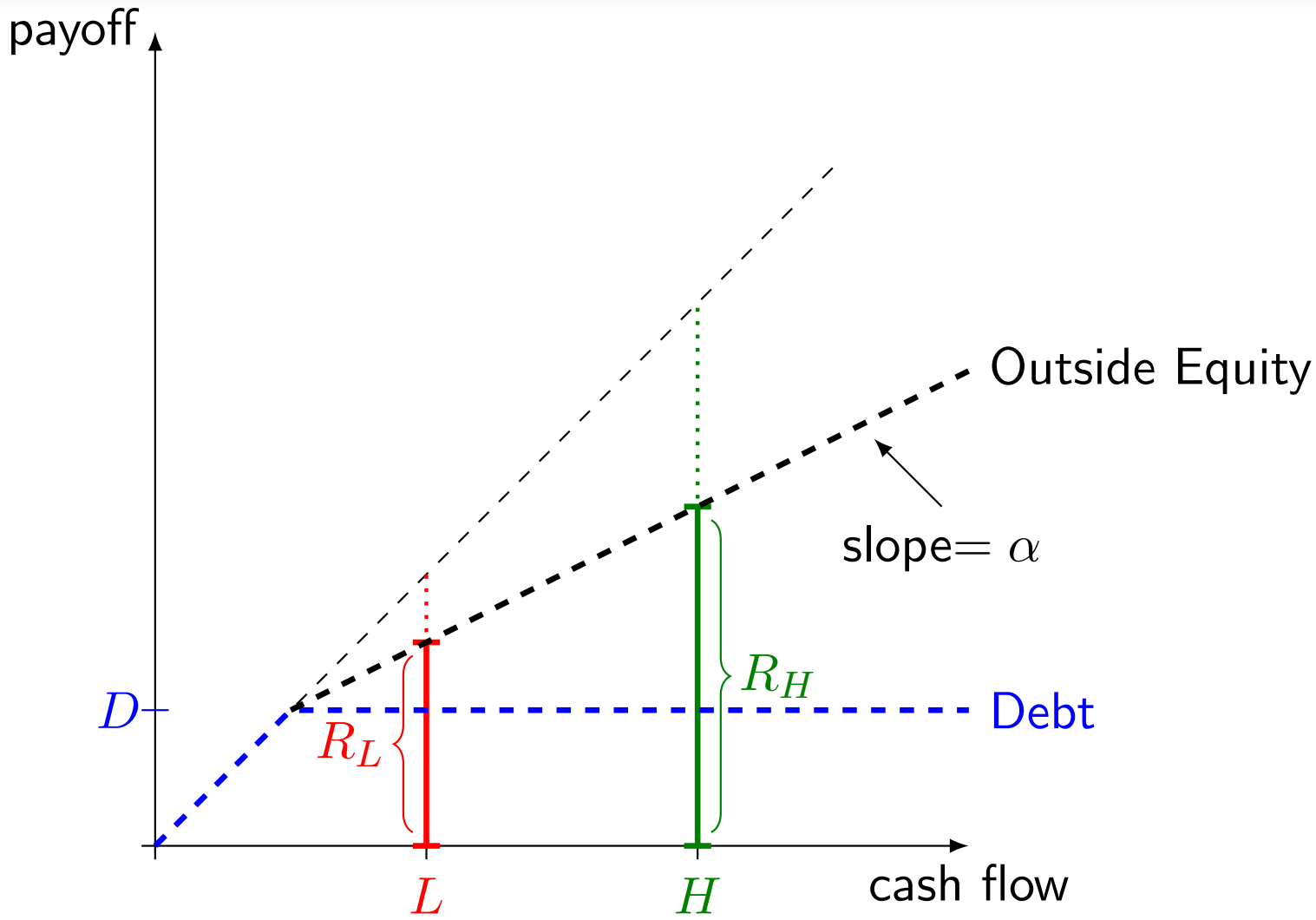
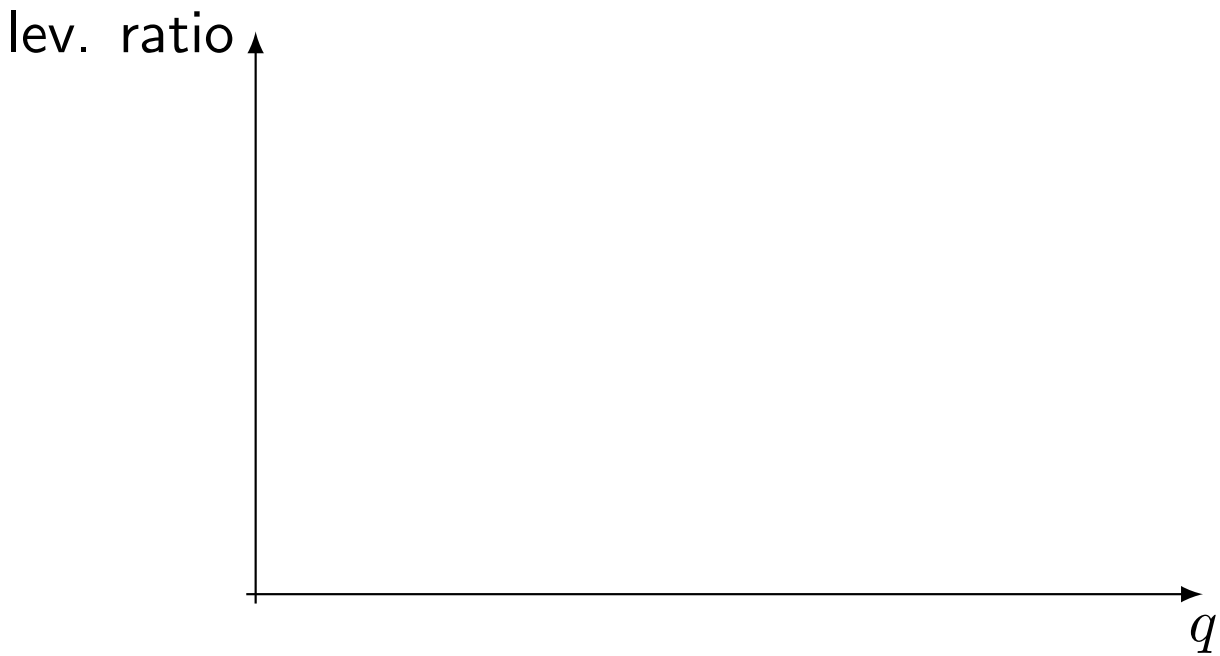


Incentive constraint limits the use of outside equity.

Some debt is necessary

Effect of leverage cap



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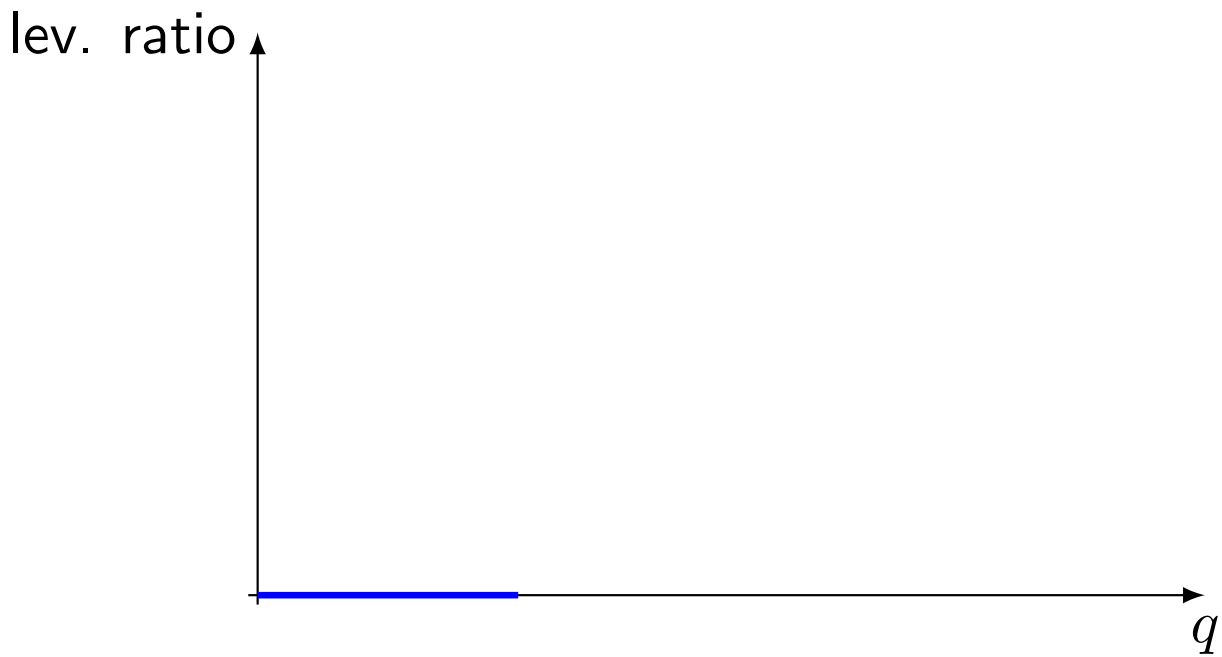

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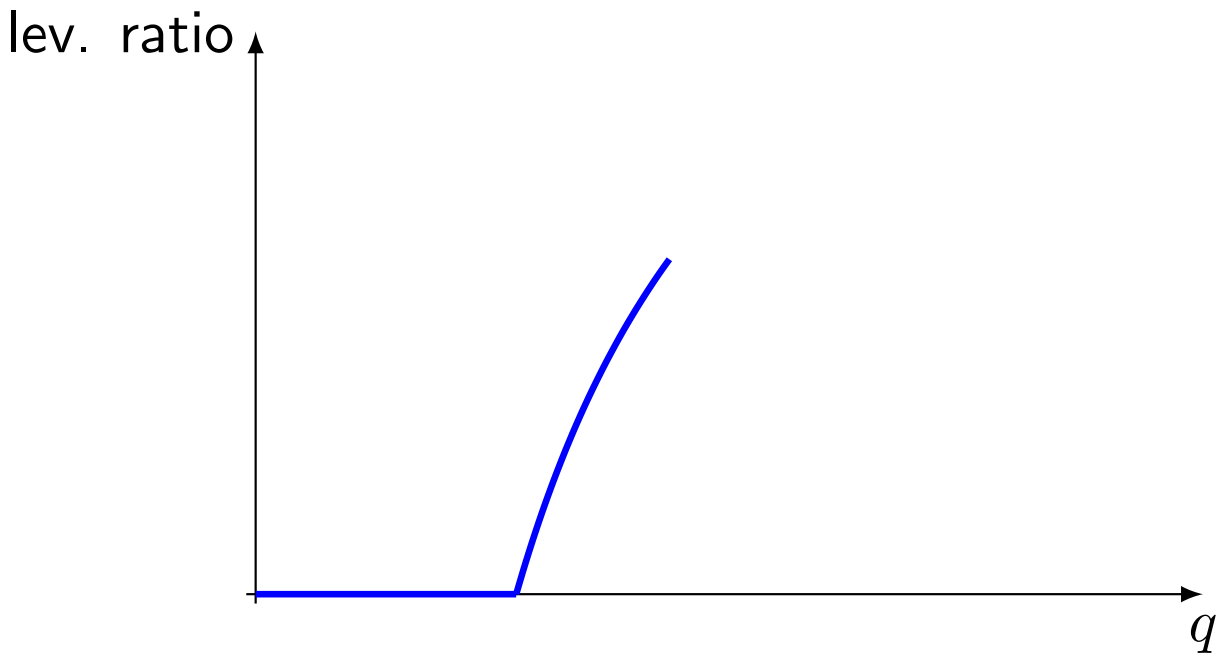

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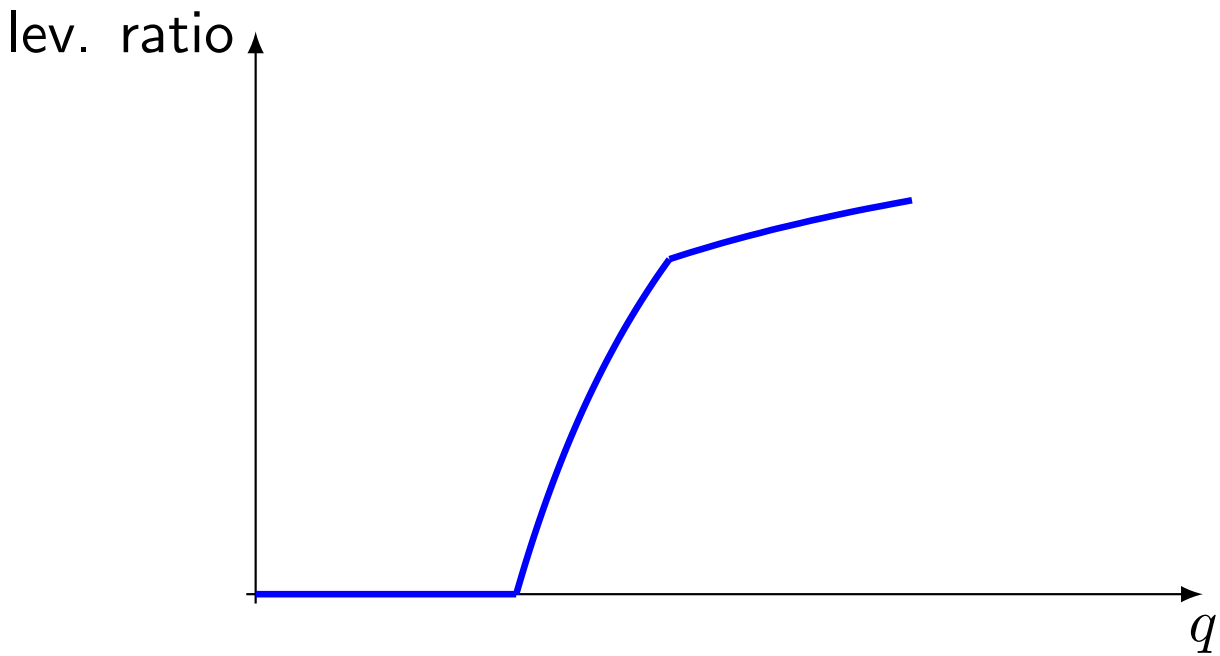

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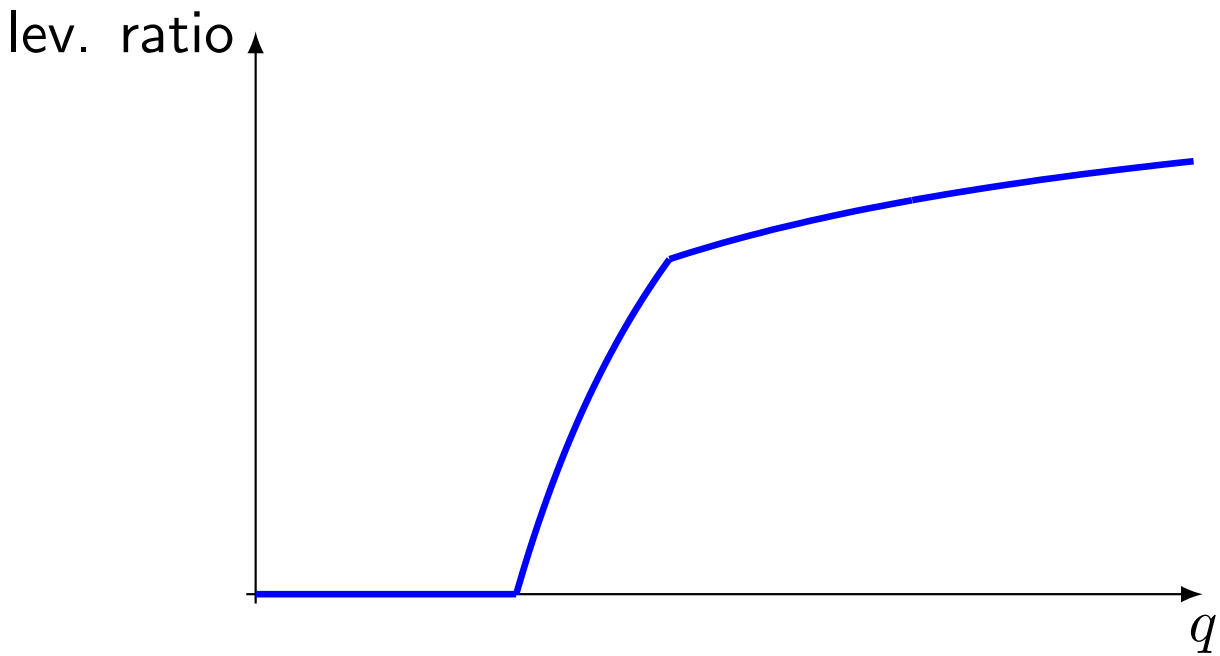

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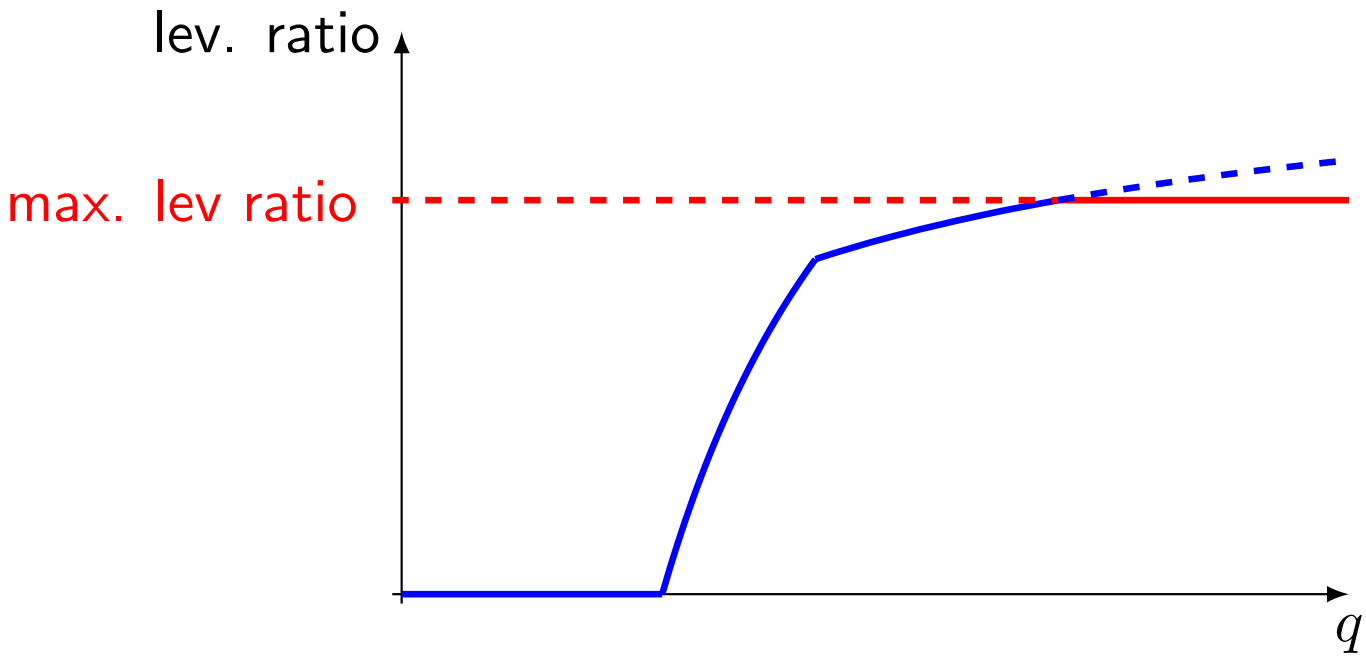

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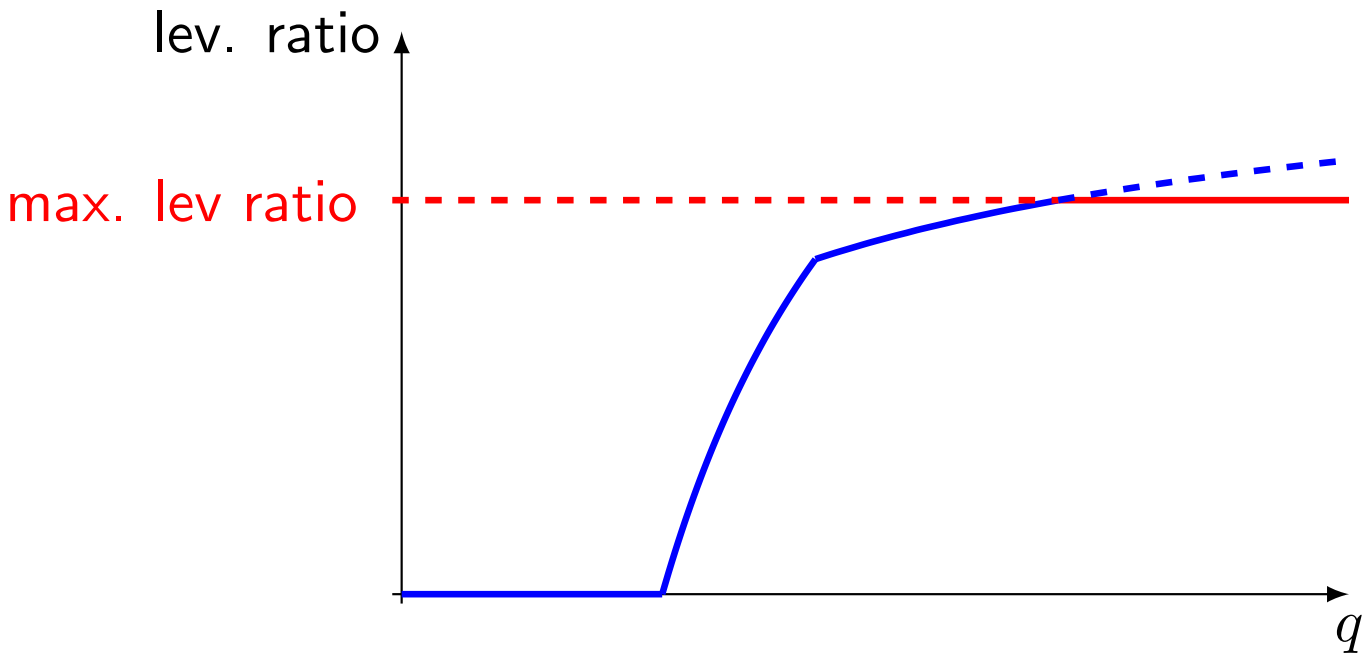

Tightening leverage requirement reduces

- liquidity for large trades, intermediation volume hence welfare.

Consistent with Bessembinder et al (18,JF)

Brokers or Dealers

Choi and Huh (2017, WP), corporate bonds.

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Extension in the model:

- with some probability π Laëtitia arrives early $\Rightarrow$ brokered trade
- If unconstrained, $\frac{\text{brokered trade}}{\text{intermediated trade}} = \frac{\pi}{1-\pi}$
- If constrained, this ratio goes up, more so for larger trades and riskier bonds.

Related literature (selected)

Internal funding of dealers/arbitrageurs on liquidity:
Gromb+Vayanos ('02), Brunnermeier+Pedersen ('09), Anderson+Duffie+Song ('18)
we endogenize margin constraint and capital structure, able to study impact of policy, new implications

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On the sources of illiquidity:

- Ho+Stoll (83): inventory cost
- Kyle (85), Glosten Milgrom (85): adverse selection
- Duffie+Garleanu+Pedersen (05): search frictions

we show dealer's financing frictions as a source
(a micro-foundation for inventory cost)

Conclusion

Static model of market making with optimal financing contracts

- Dealers use their balance sheet to provide immediacy
- External financing is limited due to moral hazard
- Key idea: pledgeable income $\Rightarrow$ market liquidity of assets

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- Predictions consistent with recent evolution of U.S. corporate bond market

THANK YOU!