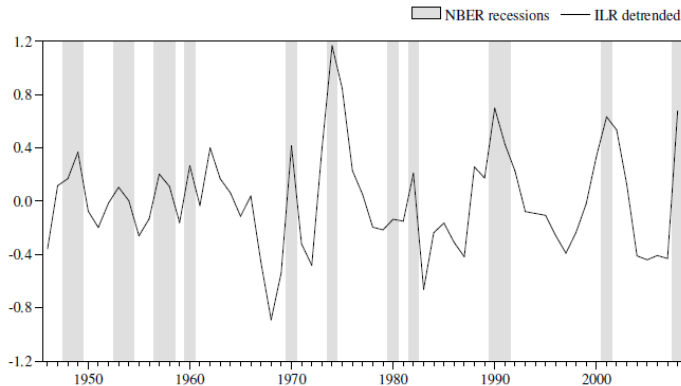# A Theory of Endogenous Liquidity Cycles

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October 2010

Liquidity and the Business Cycle


Source: Næs, Skjeltorp, and Ødegaard (*Journal of Finance*, forthcoming)

Contributions of This Paper

- Develops a theory of liquidity cycles
  - Fluctuations in liquidity are driven by endogenous changes in economic activity and the availability of informed capital
  - Length of liquidity cycles is stochastic

- Liquidity is procyclical
  - Increased liquidity is associated with high economic growth
  - Causality runs in both directions
    - Liquid asset markets attract more investment
    - Larger investments make liquidity provision more profitable

- Liquidity dry-ups result from imperfect monitoring
  - Information collection efforts are unobservable

Motivation
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Model
●

Equilibrium
○○○

Repeated Game
○○○○

Conclusion
○

The Model
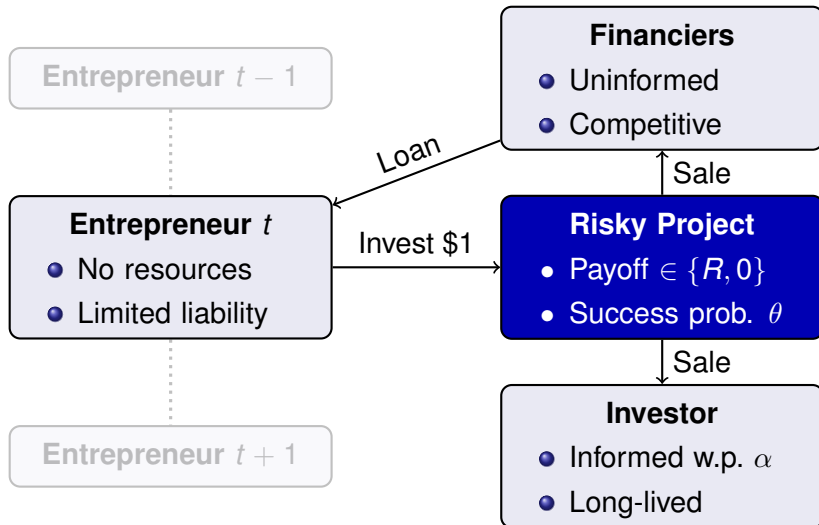
Asset Sales

- Sale of successful project generates surplus $\mu R > 0$
  - By avoiding asset substitution problem

- Assets are illiquid due to adverse selection
  - Entrepreneurs have informational advantage over buyers
  - Degree of adverse selection depends on endogenous information structure: $IL = R - \mathbb{E}[P] \propto 1 - \alpha$

- Bargaining game
  - Projects are sold only to informed investor
  - Investor and entrepreneur split surplus

Equilibrium of the Stage Game

- Entrepreneurs invest more when liquidity is high
  - Entrepreneurs' profit increases in $\mathbb{E}[P]$
  - Invest if project quality $\theta \geq \theta_c$, where $d\theta_c/d\alpha < 0$
  - Economic activity is positively related to liquidity

- Investor collects more info when more projects are sold
  - Utility depends on entrepreneurs' investment decisions:

$$\pi(\alpha, \theta_c) = \int_{\theta_c}^{\bar{\theta}} \frac{\alpha \, \theta \, (R - P)}{\bar{\theta}} \, d\theta - \phi(\alpha)$$

  - Unique solution α^* if cost function ϕ is sufficiently convex

Investor's Commitment Problem

- Increase in α^* has two effects
  - Increases probability of an informative signal
  - Increases likelihood of an asset sale (reduces θ_c)

- Second effect plays no role in the investor's decision
  - Information choice is not observable to entrepreneurs

- Commitment to $\alpha > \alpha^*$ leads to Pareto improvement
  - Increases entrepreneurs' expected profit
  - . . . as well as investor's expected utility

Infinitely Repeated Game

- Self-enforcing implicit agreement
    - Investor chooses a level of information production above α^*
    - Entrepreneur invests in projects with quality below θ_c^*

- Imperfect monitoring
    - Deviations cannot be unambiguously detected
        - Entrepreneurs can't be sure whether the investor complied
        - E.g., the outcome of the bargaining game for a failed project does not reveal whether the investor is informed

Trigger-Strategy Equilibrium

- Game alternates between normal phases and punishment phases; starts in normal phase.
- In *normal phases*, investor chooses $\alpha_n \geq \alpha^*$ and entrepreneurs invest if $\theta \geq \theta_c(\alpha_n)$.
- Play remains in normal phase as long as investor accepts offer to buy successful project; otherwise, it switches to punishment phase for T periods.
- In *punishment phases*, entrepreneurs and investor play the equilibrium strategies of the stage game.

Proposition

If the investor is sufficiently patient, there exist trigger-strategy equilibria with $\alpha_n > \alpha^*$.

Liquidity and Investment

- Liquidity fluctuates over time
  - High-liquidity periods alternate with low-liquidity periods

- Length of these cycles is stochastic
  - Depends on entrepreneurs' return and investor's information production technology
  - Low-liquidity regime is triggered by a failed sale of a successful project

- Liquidity is procyclical
  - Increased liquidity is associated with high economic growth
  - Causality runs in both directions
    - Liquid markets attract investment
    - Larger investments make liquidity provision more profitable

Motivation
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Model
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Equilibrium
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Repeated Game
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Conclusion
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Liquidity and Economic Output
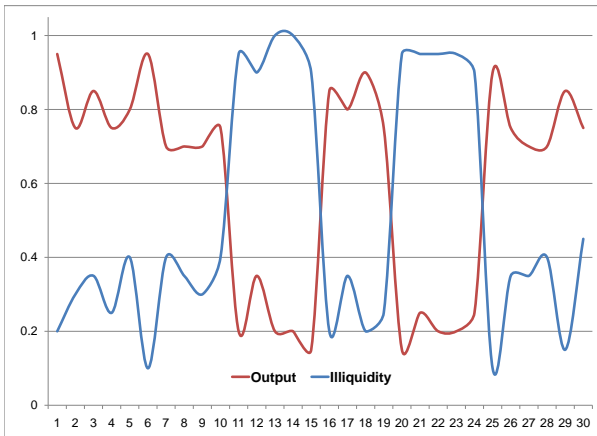
Conclusion

- Model of liquidity provision as repeated game
  - Assets are illiquid due to adverse selection
  - Degree of adverse selection depends on endogenous information structure

- Stochastic liquidity cycles
  - Due to imperfect public monitoring
  - Trigger-strategy equilibria

- Liquidity is procyclical
  - Increased liquidity is associated with high economic growth
  - Causality runs in both directions