A Theory of Endogenous Liquidity Cycles

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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
The Model

- Entrepreneur $t - 1$
  - No resources
  - Limited liability

- Entrepreneur $t$
  - Investment $\$1$

- Risky Project
  - Payoff $\in \{R, 0\}$
  - Success prob. $\theta$

- Loan

- Financiers
  - Uninformed
  - Competitive

- Investor
  - Informed w.p. $\alpha$
  - Long-lived

- Sale
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 $\alpha^*$ if cost function $\phi$ is sufficiently convex
Investor’s Commitment Problem

- Increase in $\alpha^*$ has two effects
  - Increases probability of an informative signal
  - Increases likelihood of an asset sale (reduces $\theta_c$)

- 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 $\alpha^*$
  - Entrepreneur invests in projects with quality below $\theta^*_c$

- 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
Liquidity and Economic Output

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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

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  - Causality runs in both directions