Discussion
'P2P Lending: Information Externalities, Social Networks and Loan's Substitution'
by Faia and Paiella

discussed by Linda Schilling - Ecole Polytechnique CREST

May 24, 2018

Summary

Aim: Analyze adverse selection in the P2P market when lenders have an outside option (deposit financing)

- Risk-averse households save intertemporally by investing in deposits or P2P lending
- Heterogenous borrowers finance risky project via banks or P2P
- Bank: finances risky projects (can screen perfectly) and makes deposits, bank is risky
- P2P: Public, imperfect signals on borrower quality, cannot screen as well as bank

How do

- information externalities
- average borrower default risk
- liquidity risk in the banking sector

impact loan spreads in P2P market?

Summary - Households

How many?

$$\max_{C_t, X_t, W_t, \alpha_t} \mathbb{E}_0 \sum_{i=0}^{\infty} \beta^t u(C_t) \tag{1}$$

subject to

$$C_t + r_t X_t + D_t \leq Y_t + X_{t-1} + \bar{\theta}_{t-1} R^d_{t-1} D_{t-1} \tag{2}$$

average haircut on deposits

$$\bar{\theta}_t = \theta\zeta + (1 - \zeta_t) \tag{3}$$

Via FOC: No arbitrage condition

$$r_t = \bar{\theta}_t R^d_t \tag{4}$$

Summary - Borrowers

$i \in [0, 1]$

- Need to raise cash I_t to invest
- Asymmetric information: price information on project success quality

$$p_t^i \sim U[\overline{p} - \frac{\varepsilon}{2}, \overline{p} + \frac{\varepsilon}{2}], \qquad \forall t \tag{5}$$

- Public signal on borrower quality

$$\sigma_i = \begin{cases} p^i, & p = \lambda \\ s^i \sim U[\overline{p} - \frac{\varepsilon}{2}, \overline{p} + \frac{\varepsilon}{2}] & p = 1 - \lambda \end{cases} \tag{6}$$

- Updated belief on project quality

$$\mathbb{E}[p^i | \sigma_i = s^i] = \lambda s_i + (1 - \lambda)\overline{p} \tag{7}$$

- Public signal in P2P market or its preciscion cannot be influenced by the borrower

Summary - When do Households fund P2P?

From no arbitrage condition: $r_t = \bar{\theta}_t R_t^d$
Households fund all projects with signal σ_i where

$$\underbrace{\mathbb{E}[p^i|\sigma_i]\, R_t^l}_{r_t} \geq \bar{\theta}_t R_t^d \tag{8}$$

How deep are households pockets, how many households are there? That is if

$$(\lambda s_i + (1-\lambda)\overline{p})\, R_t^l \geq \overline{\theta}_t R_t^d \tag{9}$$

- LHS increases in signal s_i: $\Rightarrow$ Cut-off signal $\hat{s}$ exists: project in P2P financed if signal above $\hat{s}$.

$$\hat{s} = \frac{\overline{\theta}_t R_t^d - (1-\lambda)\overline{p} R_t^l}{\lambda R_t^l}, \tag{10}$$

Need assumption on the range of parameters since you want $\hat{s}$ to be interior in $U[\overline{p} - \frac{\varepsilon}{2}, \overline{p} + \frac{\varepsilon}{2}]$ for doing comparative statics in $\hat{s}$

Summary - Characterizing adverse selection

Define $\quad \bar{\omega} = \mathbb{E}[p^i | \sigma_i = \hat{s}^i]$

$$\underbrace{(\lambda \hat{s}_i + (1-\lambda)\overline{p})}_{\bar{\omega}} = \frac{\overline{\theta}_t R_t^d}{R_t^l} \tag{11}$$

Likelihood of not being funded: $F_\sigma(\hat{s}) = \mathbb{P}(\sigma_i < \hat{s})$

Lemma: If $\bar{\omega} > \bar{p}$

- $\hat{s}$ declines in $\bar{p}$,
- $\hat{s}$ declines in λ

Define metric for value of information

$$\Theta = F_\sigma(\hat{s}) - \lim_{\lambda \to 1} F_\sigma(\hat{s}) > 0 \tag{12}$$

Measure of borrowers who had obtained funding under full information but do not obtain funding under information dispersion

Lemma

The information premium Θ declines in $\bar{p}$ and λ for $\bar{\omega} > \bar{p}$.

Summary - When does Bank fund project?

- Bank is fully deposit financed
- Bank observes p_i perfectly
- screening cost μ
- The bank is in perfect competition and breaks even in expectation

$$\bar{p}R_t^l - R_t^d - \mu \leq 0 \tag{13}$$

The bank is in perfect competition but all project returns go to the bank.
The average project quality the bank admits may be different from $\bar{p}$ (selection effect)!
Suggestion: The bank observes p^i:

$$\text{lend to } i \Leftrightarrow p^i \overline{\theta}\, R^l - \mu - R^d \geq I_t$$

Discussion

1 (major): The paper talks about adverse selection but potentially the lemons market is missing

By ass: Borrowers make zero profit independently of whether they borrow from bank or P2P lender

$\Rightarrow$ Borrowers indifferent between funding opportunities.

$\Rightarrow$ What guarantees that high signal- low quality types actually borrow via P2P?

$\Rightarrow$ Is this individually rational from the perspective of the bank which only finances low signal projects? (her average quality pool is not $\bar{p}$ but $\mathbb{E}[p_i|\sigma_i < \hat{s}]$)

Idea:

- Bank perfectly screens, may pay small return to high quality types
- A low type gets rejected by bank
- low type with high signal prefers P2P where he pays low interest due to his favourably high signal (pooling within P2P)

Discussion

2 (major): **Given the lemons market exists, how prevent it from crashing/preserve pooling equilibrium?**
High types with medium high signals (and access to P2P) may have an incentive to opt for a bank loan since the bank can perfectly screen the high type and is maybe cheaper than P2P (classic lemons market problem)

3 (major): Paper focuses on case $\bar{\omega} > \bar{p}$.

- Q3a: When does $\bar{\omega} > \bar{p}$ hold?
- Q3b: What happens for $\bar{\omega} < \bar{p}$?

Discussion

Q3a: When does $\bar{\omega} > \bar{p}$ hold?

$$(\lambda \hat{s} + (1-\lambda)\overline{p})\, R_t^l = \overline{\theta}_t R_t^d \tag{14}$$

It holds

$$\{\bar{\omega} > \bar{p}\} \Leftrightarrow \{\hat{s} > \overline{p}\} \Leftrightarrow \{\overline{\theta} R^d > \overline{p} R^l\} \tag{15}$$

Discussion

Q3b: What happens for $\bar{\omega} < \bar{p}$?

$$\{\bar{\omega} < \bar{p}\} \Leftrightarrow \{\hat{s} < \bar{p}\} \Leftrightarrow \{\bar{\theta} R^d < \bar{p} R^l\} \tag{16}$$

- $\hat{s}(\lambda)$ increasing in λ (**not decreasing**)
- $F_\sigma(\hat{s})$ increases **(signal precision now lowers willingness to fund)**
- Redefine metric for value of information

$$\tilde{\Theta} = -\left(F_\sigma(\hat{s}) - \lim_{\lambda \to 1} F_\sigma(\hat{s})\right) > 0 \tag{17}$$

  Then, $\tilde{\Theta}$ is measure of borrowers who had obtained funding under dispersed information but do not obtain funding under full information

- **Always:** $\hat{s}(\bar{p})$ decreasing, likelihood of funding goes up in average project quality $\bar{p}$