Discussion of Fu and Krishna (2015):

**Dynamic Financial Contracting with Persistent Private Information**

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The paper

Question

- Can optimal contracting explain firm dynamics?
  How do predictions depend on persistence of shocks?

Strategy

- Augment Clementi and Hopenhayn (2006) to allow for persistence
  - Shocks to revenues are positively correlated over time
  - Implies persistent private information

Results

- New predictions match data better
  - Growth dynamics are robust
  - Dynamics for *mature* firms are now in accordance with data
The model

\begin{align*}
\text{t} & \quad \text{Lender advances} \quad k_t(h^{t-1}) \\
& \quad \text{Nature draws} \quad s_t \in \{0, 1\} \\
& \quad \text{Entrepreneur reports} \quad \hat{s}_t \\
& \quad \text{Entrepreneur pays} \quad m_t(h^{t-1}, \hat{s}_t) \\
\text{t+1} & 
\end{align*}
The model

- Revenues at $t$ are $s_t R(k_t)$
  - Exp. discounted cash flows to entrepreneur (lender) is equity (debt)
  - Investment at $t$ is $k_t - k_{t-1}$

- Two frictions: asymmetric information and limited liability
The model

- Revenues at time $t$ are $s_t R(k_t)$
  - Expected discounted cash flows to entrepreneur (lender) is equity (debt)
  - Investment at $t$ is $k_t - k_{t-1}$

- Two frictions: asymmetric information and limited liability

- Innovation: $s_t$ follows first-order Markov process
  - For $p_s \equiv \text{Prob}(s_t = 1|s_{t-1} = s)$, assume $p_1 - p_0 > 0$
Solution

- i.i.d. shocks: Recursive representation with equity $v$ as state variable
  - Maximize firm value subject to IC, LL, and promise-keeping

- Persistent shocks: Use contingent equity $v = \{v_0, v_1\}$ and last report
  - Needed because agent has private info on dist. of states tomorrow

- Adapt techniques of Fernandes and Phelan (2000)
  - Used, e.g., in Halac and Yared (2012) and Farhi and Werning (2013)
  - Here use interim rather than ex-ante promised utilities for interpretation
Results: i.i.d. shocks (Clementi and Hopenhayn 2006)

- Firm grows to efficient size or is liquidated, so size increases with age
- Investment is positively correlated over time
- No dividends to entrepreneur when firm is young
- No investment to cash flow sensitivity in mature firm
- Entrepreneur holds fixed equity share in mature firm
Results: i.i.d. persistent shocks

- Firm grows to efficient size or is liquidated, so size increases with age
- Investment is positively correlated over time
- No dividends to entrepreneur when firm is young
- No investment to cash flow sensitivity in mature firm
- Entrepreneur holds fixed equity share + stock option in mature firm
Comments: Very nice paper!

- Important question
- Simple and elegant setting
- Interesting analysis
- Predictions consistent with evidence
Comment: Persistent private info or persistence?

- Persistent \( s_t \Rightarrow (i) \) dynamic info rents, (ii) time-varying FB investment
- Are new results due to persistent private info or just persistence?
- Important question since dynamics already present in i.i.d. model
  - And most new predictions are for mature firm
Comment: Persistent private info or persistence? (cont.)

- Assume revenues are $\eta R(k)$ with prob. $p$ and 0 with prob. $1 - p$
  - Where $\eta$ is observable, follows AR(1), has bounded support

- Similar dynamics + investment to cash flow sensitivity in mature firm
Assume revenues are $\eta R(k)$ with prob. $p$ and 0 with prob. $1 - p$
  
  - Where $\eta$ is observable, follows AR(1), has bounded support

Similar dynamics + investment to cash flow sensitivity in mature firm

However, fixed equity share in mature firm

  - Entrepreneur’s report does not affect efficient investment tomorrow
  - Hence, lender cannot extract payment while investing efficiently
  - Continuous issuance of equity is nice result of persistent private info!
Comment: Quadrini (2004)

- Quadrini (2004): similar model, renegotiation-proof contracts

- Studies persistent shocks in extension
  - Density of shock is \( p(z, s) \) where \( z \) follows finite state Markov chain
  - Considers \( z \) public (like previous slide) and private info (like this paper)

- But present paper provides more predictions (and detailed analysis)
  - Quadrini stresses similarities with i.d.d. and with \( z \) public/private
  - Provides no predictions on equity holdings in mature firm
    - Result on equity particularly nice as depends on private info!
More comments

- Decomposing the effects: private info only about future shocks?
  - Idea: entrepreneur observes if $R$ due to “good luck” or persistent shock
  - Quadrini reversed: $z$ private info while $s$ public info

- Importance of commitment to long-term contracts
  - Clementi-Hopenhayn: implement with ST contracts if high collateral
  - How is requirement affected by persistence?
More comments (cont.)

- Are effects of persistent private info general?
  - DeMarzo and Fishman (2007) show i.i.d. results hold in various settings
  - Includes partial depreciation

- These models predict firm converges to efficient size or dies
  - So “mature” means “efficient size”, but is that so in the real world?
  - What would generate convergence to inefficient size/no convergence?
Thank you!