Discussion of "Firm Risk and Leverage-Based Business Cycles" by Sanjay Chugh

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Summary

- This is a very interesting paper on the role of "risk shocks" in explaining business cycle fluctuations.
- "Risk shocks": time variation in the cross-sectional distribution of firm level productivity.

1. Empirical part:
   - measure "risk shocks" based on US micro data.
   - measure cyclical fluctuations in the leverage cycle.
2. Theoretical part: analyze a DSGE financial-accelerator model.

- Argues that risk shocks explain a large share of financial fluctuations and a **small** share of real fluctuations.
  - for the benchmark model, risk shocks are procyclical.

Risk shock: overall effect

- The quantitative effect:

1. Magnitude of the shocks.
2. Propagation mechanism.

- Paper addresses both aspects.
- I will focus on the propagation mechanism.

Literature on risk shocks

- Aggregate stochastic volatility in a medium scale DSGE model (Justiniano and Primiceri (2007), Fernandez-Villaverde and Rubio-Ramirez (2007)): small first order effects.
- Stochastic volatility interacted with:

1. non-convex adjustment costs (real options): increase in uncertainty can lead to recessions through "wait and see" (Bloom (2009), Bloom, Floetotto and Jaimovich (2009), Bachmann and Bayer (2009)).
2. **financial frictions**:
   - Arrelano, Bai and Kehoe (2010) : high volatility increases the risk of costly liquidation $\rightarrow$ firms reduce scale.
   - Christiano, Motto and Rostagno (2009), Dorofeenko, Lee and Salyer (2008) are financial accelerator models: high volatility leads to recessions.

Empirical part of the paper 1: size of risk shocks

- Consider the following production function:

$$y_{i,t} = \theta_t \omega_{i,t} f(k_{i,t}, n_{i,t})$$

- Aimed at getting a measure of time variation in the volatility of $\omega_{i,t}$.
- There is a growing empirical work on measuring this time variation:
  - measures and conclusions differ.
- Here find (relatively) larger time-variation than the existing micro-data based literature: why is this approach better?

Empirical part of the paper 2: leverage ratios

- Leverage ratio, defined as book value of debt/book value of equity.
- Contribution: construct cyclical properties.
  - much larger cyclical volatilities during "Great moderation"
  - leverage is moderately countercyclical.
- Stylized fact from corporate finance lit.: firms issue equity over debt in booms (Korajcyzk and Levy 2003, Dittmar and Dittmar 2008).
- How easily can we test models against these findings?
  - countercyclicality of leverage seems to require a theory of firm's choice over capital structure (e.g. Levy and Hennessy (JME, 2007)).
  - difficult here: model allows only for issuing debt as external financing.
  - in the model: leverage ratio = value of debt/value of accumulated net worth (internal funds).

Theoretical model

- DSGE financial accelerator model with time-varying idiosyncratic productivity risk.
- Based on Carlstrom and Fuerst (ET, 1998): "output model".
  - firm (entrepreneur) produces consumption goods.
  - uses capital and labor.
  - needs external financing.
- Different from other financial accelerator models with time-varying risk shocks:
  - CF (AER, 1997) "investment model": in Dorofeenko, Lee and Salyer (2008).
  - BGG (1999): in Christiano, Motto and Rostagno (2009).

Risk shocks and investment: role of financial frictions

- With CSV, financial accelerator models result in a one period standard debt contract:
  - pay an interest to the bank if above a liquidation threshold $\overline{\omega}_t$.
  - default, turn over the assets and be monitored by the bank if below $\overline{\omega}_t$.
- In a standard debt contract, the lender faces only the downside risk.
- An increase in volatility of outcomes leads to a decrease in expected payoffs for lender
  - it shifts the loan supply curve upwards.
  - equilibrium: higher premium and less loans (investment).
- This mechanism is present in existing DSGE models:
  - makes risk shocks **countercyclical**.
  - procyclical leverage ratios.
  - depending whether friction on demand or supply of capital, it leads to a procyclical (countercyclical) price of capital.

Theoretical model: key differences from literature

1. The production function of the firm that needs external financing:
   - Here:
   $$y_{i,t} = \theta_t \omega_{i,t} k_{i,t}^{\alpha} n_{i,t}^{1-\alpha}$$
   - CF (1997) investment model and BGG (1999):
   $$y_{i,t} = \omega_{i,t} k_{i,t}$$
   - in all models $\omega_{i,t}$ is private information (Costly State Verification).
2. Friction in the supply vs. demand for capital.
   - here financial friction is on the input demand side (both labor and capital).
   - in BGG (1999): demand for capital.
   - in CF (1997): supply of capital.
   - what is the role of adding labor?

Risk shocks and investment: "Hartman-Abel" effect

- Here the "output model" assumption makes a big difference.
- Take for example competitive factor prices and the prod.fct:

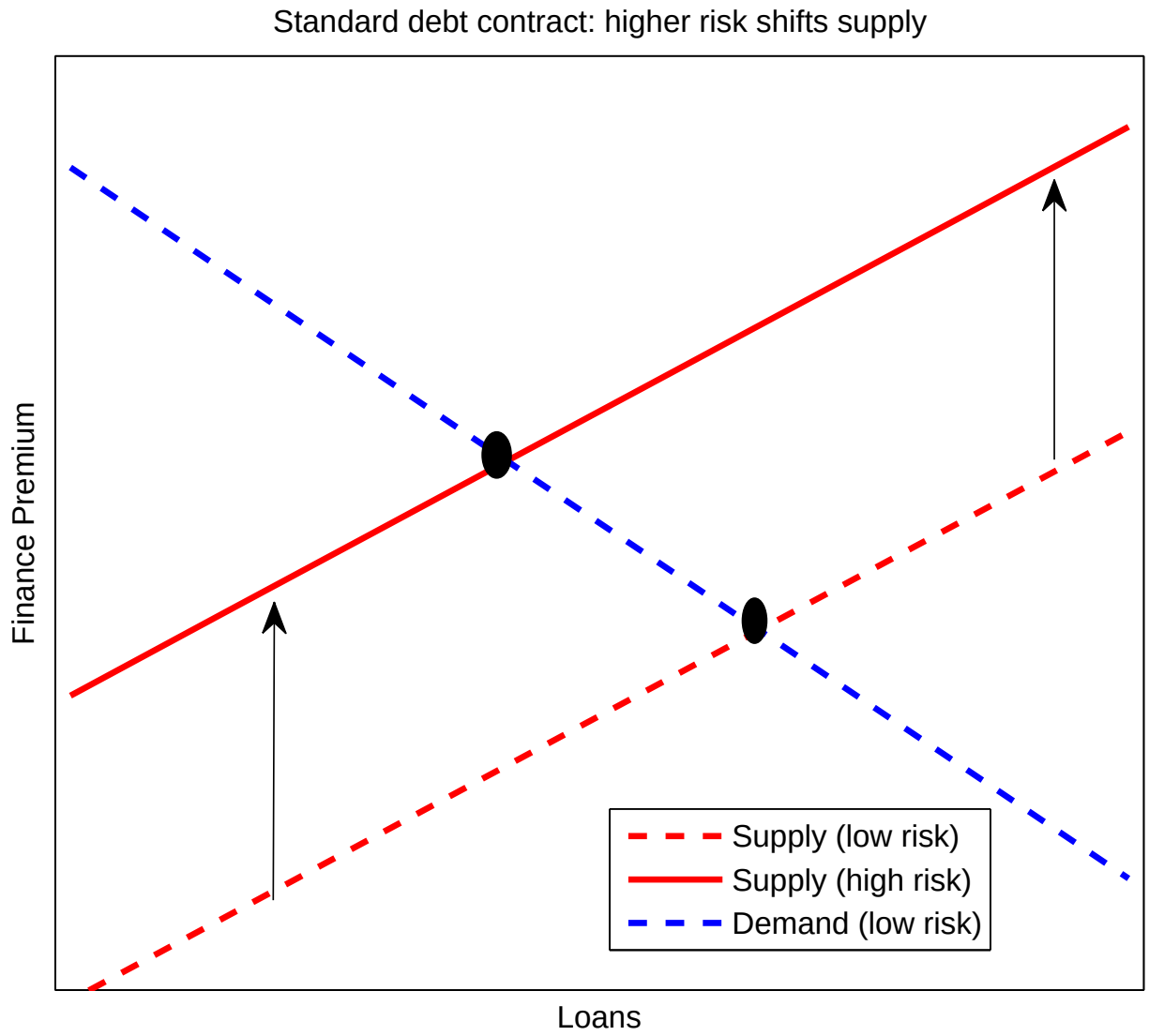
$$y = Ak^{\alpha}n^{v},\ \alpha + v < 1$$

- "Hartman-Abel" effect: an increase in the volatility of technology leads to an increase in demand for inputs $\rightarrow$ risk shocks **procyclical**.

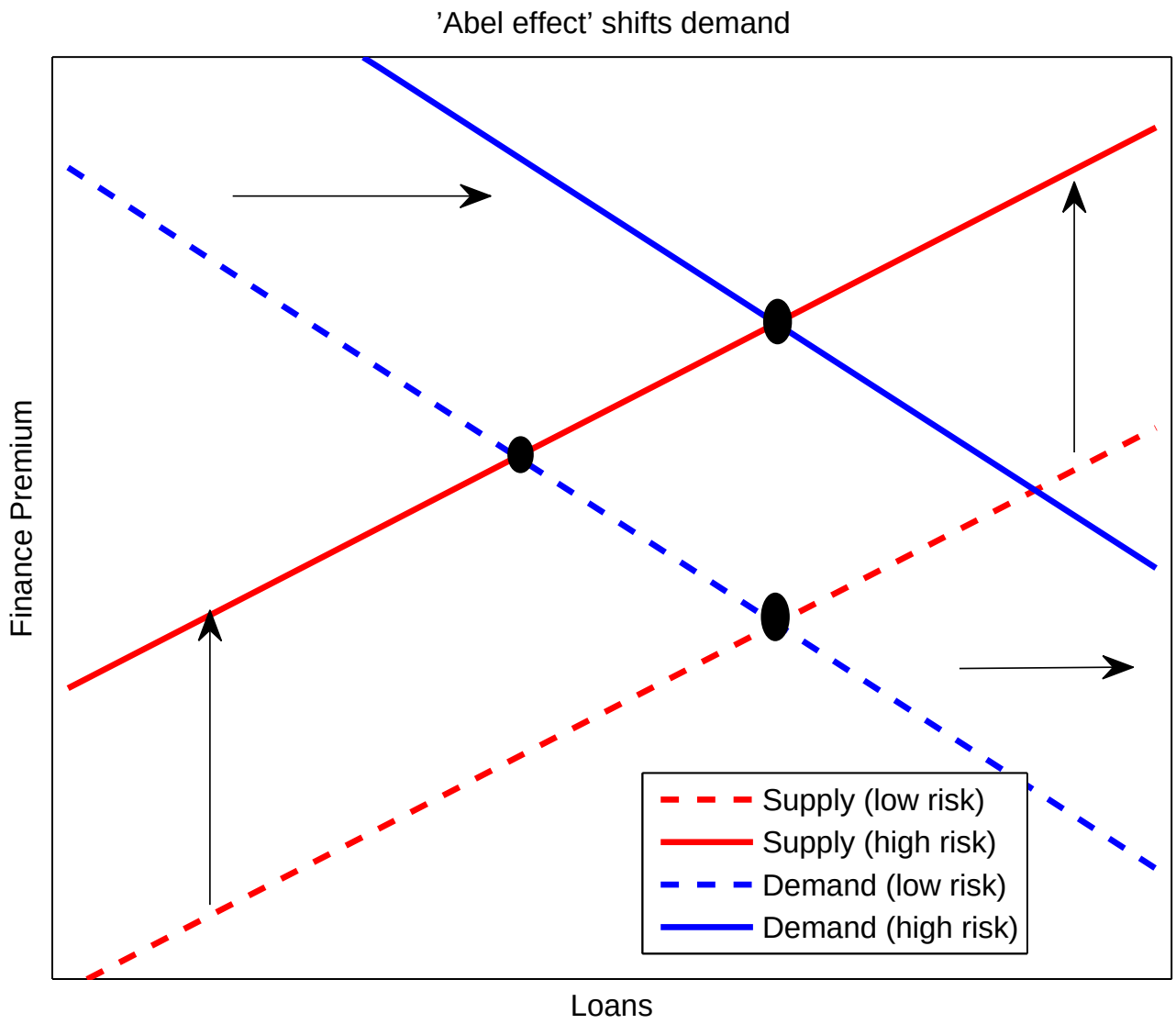
$$k^{*} = \phi_1 A^{\frac{1}{1-\alpha-v}};\ n^{*} = \phi_2 A^{\frac{1}{1-\alpha-v}}$$

  - optimal input choices are convex in technology.
- can be eliminated with a re-normalization of $A \rightarrow A^{1-\alpha-v}$.
- Here, production function is constant returns to scale $(\alpha + v = 1)$.
  - agency costs show up as an endogenous markup $p_t > 1$ paid by firm.
  - it effectively makes the resulting prod. fct look like DRS.
- Effect is **absent** in CF (AER, 1997) or BGG (linear prod.fcts.)

Effect of higher risk: role of financial frictions



Effect of higher risk: role of Abel effect



Conclusion

- paper studies risk shocks and financial frictions in a DSGE model.
- the consumption good producer is subject to the financial friction.
- propagation mechanism: effect of higher risk is a combination of two general forces:
  - financial frictions: produces recessions.
  - Hartman-Abel effect: produces booms.
- Suggestion on the model: shut down (temporarily) the Hartman-Abel channel.
  - would help to better understand the contribution of adding labor demand to the financial friction.