INTERMEDIARY LEVERAGE CYCLES AND FINANCIAL STABILITY
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2013
Outline

- Aim
- Why do we care?
- Model Summary & Results
- Comments
Paper’s aim:

- Study how **macroprudential policies** impact the systemic risk-return trade-off.
  - How does a specific macroprudential policy (leverage constraint on financial intermediaries) affect default rates and systemic risk?
  - How does this work in general equilibrium
  - Impact on social welfare
Macroprudential policies

- Macroprudential policies: focus on regulating and supervising the financial system as a whole.
- Until recently regulation focused on individual institutions – microprudential

- Why do we care about regulating the financial system?
- Why shift focus from microprudential to macroprudential policies?
Problems in the financial sector can damage the real economy

Cumulative output loss = 37% of pre-crisis GDP
New trends are not always good

Cumulative output loss = 139% of pre-crisis GDP
Only WWI was more costly
Post-crisis thoughts

- Are economies with sophisticated financial markets self-correcting?
  - Maybe/Maybe not. But if the correction involves lower trend in GDP growth, we are unhappy.

- Is low and stable inflation a guarantee of financial and macroeconomic stability?
  - Not this time!

- Was the existing prudential framework focused on individual institutions (microprudential) sufficient to ensure financial stability?
  - No. Did not insulate us from systemic shocks!

⇒ need a macroprudential policy framework
Macroprudential policy again

- Purpose of macroprudential policy is to reduce **systemic risk**.
- **Systemic risk**: the risk of developments that threaten the stability of the financial system as a whole and consequently the broader economy (Bernanke, 2009).
  - E.g., types of financial imbalances that led to the 2007-2008 bust.
- Two key aspects of **systemic risk**.
  - **time-series dimension**: the procyclicality of the financial system: excess risk-taking in booms and excess deleveraging in busts.
  - **cross-sectional dimension**: the risk of contagion due to simultaneous weakness or failure of financial institutions.
- Macroprudential policy is a set of tools that help reduce these two forms of systemic risk (Borio 2009; Bank of England 2011).

**This paper**: studies the effectiveness of bank leverage constraints as a macroprudential policy designed to reduce the time-series dimension of systemic risk.
Production economy

- Linear technology: \( Y_t = A_t \cdot K_t \)
  - no. of units of capital
  - \( a_t = \ln A_t \): \( da_t = \alpha dt + \sigma_a dZ_{at} \) \hspace{1cm} (1)

- Holding \( K_t \) units of capital gives you an output flow of \( Y_t \)
  - price of one capital unit: \( p_{kt} = E_t \left[ \int_t^\infty \frac{\Lambda_u Y_u}{\Lambda_t Y_t} du \right] \) \hspace{1cm} (2)

- Capital held by household and financial intermediary: only the financial intermediary can invest

- Capital accumulation equation
  - \( dK_t = (\Phi(i_t) \cdot k_t) - \lambda_k K_t) dt \) \hspace{1cm} (3)
  - no. of units of capital held by FI

- Change in log output
  - \( dy_t = da_t + \left( \Phi(i_t) \frac{k_t}{K_t} - \lambda_k \right) dt \) \hspace{1cm} (4)

- Investment-based growth stems from financial intermediary
Household

\[
\sup_{\{(c_t)_{t \geq 0}, (\pi_{kt})_{t \geq 0}, (\pi_{bt})_{t \geq 0}\}} E_0 \int_0^\infty e^{-\xi_t} e^{-\rho_h t} \ln c_t \, dt
\]  

s.t.

\[
dw_{ht} = r_{ft} w_{ht} + \pi_{kt} w_{ht}(dR_{kt} - r_{ft} \, dt) + \pi_{bt} w_{ht}(dR_{bt} - r_{ft} \, dt) - c_t \, dt
\]  

\[c_t \geq 0,
\pi_{kt} \geq 0, \pi_{bt} \geq 0\]
Financial Intermediary

\[
\sup \left\{ (k_t)_{t \geq 0}, (b_t)_{t \geq 0}, (i_t)_{t \geq 0} \right\} \quad E \left[ \int_0^{T_D} e^{-\rho t} w_t \, dt \right] ,
\]

\[
w_t = p_{kt} A_t k_t - p_{bt} A_t b_t
\]

\[
dw_t = p_{kt} A_t k_t \cdot \underbrace{dr_{kt}}_{-p_{bt} A_t b_t dR_{bt}} - p_{bt} A_t b_t dR_{bt}
\]

\[
= dR_{kt} + \left( \Phi(i_t) - \frac{i_t}{p_{kt}} \right) dt
\]

extra return to compensate for the cost of investment

- extra return is partially passed on to the households as coupon payments on the intermediaries debt
- intermediaries issue floating rate debt, with coupon rate \( C_{bt} A_t \) until maturity
- debt is retired at rate \( \lambda_b \) and issued at rate \( \beta_t \)

\[
db_t = (\beta_t - \lambda_b) b_t dt
\]

leverage: \( \theta_t = \frac{p_{kt} A_t k_t}{w_t} \)
Default and Restructuring

Exogenous default policy:

\[
\tau_D = \inf_{t \geq 0} \left\{ w_t \leq \bar{\omega} \left( \underbrace{p_k Y_t}_{\text{aggregate wealth}} \right) \right\}, \quad (12)
\]

i.e. \( \tau_D = \inf_{t \geq 0} \left\{ \theta_t \geq \frac{1}{\bar{\omega}} \frac{k_t}{K_t} \right\} \quad (13) \)

Default \( \Rightarrow \) restructuring: \( \theta_{\tau_D+} = \frac{p_{k\tau_D} A_{\tau_D} k_{\tau_D}}{w_{\tau_D+}} = \theta \)
Leverage constraint

\[ \theta_t = \frac{1}{\alpha} \frac{1}{\sqrt{\frac{1}{dt} E_t \left[ \left( \frac{d(\rho_{kt}A_t)}{p_{kt}A_t} \right)^2 \right]}} \]

- \( \frac{1}{dt} E_t \left[ \left( \frac{d(\rho_{kt}A_t)}{p_{kt}A_t} \right)^2 \right] \) is the instantaneous variance of percentage changes in the price of one unit of capital
- higher variance \( \Rightarrow \) lower leverage
- higher \( \alpha \): stricter macroprudential policy
Equilibrium

\[ K_t = k_t + k_{ht} \]  \hspace{2cm} (15)

\[ b_t = b_{ht} \]  \hspace{2cm} (16)

\[ \pi_{kt} + \pi_{bt} = 1 \]  \hspace{2cm} (17)

\[ Y_t = c_t + A_t i_t k_t \]  \hspace{2cm} (18)
Key-Tradeoff in Model

- Keeping leverage constant: avoid default
- Allowing for time varying leverage (subject to leverage constraint):
  - Benefit: better investment policy $\Rightarrow$ welfare gains
  - Cost: possibility of financial distress

![Graph showing welfare and distress probability against leverage factor $\alpha$. The welfare graph shows an initial increase followed by a decrease, while the distress probability decreases significantly.]
Is the constant leverage case the correct benchmark?
- It is a stricter constraint than the constraint linking leverage to the variance of percentage changes in the price of one unit of capital
- Existing results suggest that the looser variance constraint is better

What about no constraints as a benchmark. Does that reflect the state of pre-crisis macroprudential policy?

If so, then introducing the variance based leverage constraint may make things worse in terms of welfare.
Comments – Big Picture

- Only one financial intermediary: all risk is system-wide
  - Model can only address the time-series dimension of systematic risk
- More focus on time series implications of model
  - Using a suitable benchmark, simulate output, consumption, asset returns etc for benchmark model and model with VaR based leverage constraint
  - What are the differences, in particular for trend output?
  - More bluntly, what does your model have to say about this?
Objective function for financial intermediary: maximizing expected value of integral over a stock of wealth wrt time. Units don’t make sense.

Appendix contains a model where this not an issue: use this model in main text.
Comments – Other Papers

- This is a growing literature
- How does the this paper compare with: Miles, Yang, & Marcheggiano (2012), DiTella (2012), etc.
Comments – Stylistic

- Make paper accessible to more (discrete-time) people
- Is there a quick way of outlining a recursive method of solving for equilibrium?
Summary

- Interesting research question
- Impressive technically
- Think about how to model pre-crisis macroprudential policy: setting the correct benchmark
- Time series implications for trend output relative to benchmark