Questions about Financial Stability Policy

- Systemic distress of financial intermediaries raises questions about financial stability policies:
  - How does capital regulation affect the tradeoff between the pricing of credit and the amount of systemic risk?
  - How does macroprudential policy function in equilibrium?
  - What are the welfare implications of capital regulation?
- We develop a theoretical framework to address these questions
Our Approach

- We use a standard macro model with a financial sector and add one key assumption:
  - Funding constraints of financial intermediaries are risk based, so intermediaries have to hold more capital when the riskiness of their assets increases

- This assumption is empirically motivated and it allows us to capture stylized facts about:
  - Procyclical leverage of intermediary balance sheets
  - Procyclical share of intermediated credit
  - Relationship between asset risk premia and intermediary leverage
Summary

Our DSGE model features:

- Nonlinear amplification of shocks with endogenous volatility
- Endogenous systemic risk
- We match linkages between intermediaries and assets prices that have been observed empirically
- The model generates the volatility paradox

Conceptual framework for financial stability policy:

- Tighter equity requirements lower systemic risk, shift the equilibrium risk-return tradeoff, and lower consumption growth
- Financial intermediaries aid consumption smoothing, output growth, and capital allocation ... at the cost of periods of systemic distress
A Sample Path of the Economy

- Output
- Consumption
- Wealth
- Leverage
- Return on debt

Financial Crisis Triggers Recession
Benign Financial Crisis

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Economic Structure

- Total output evolves as $Y_t = A_t K_t$, where $A_t$ is productivity which is subject to random shocks, and $K_t$ is capital.

- Households have log preferences, but their discount factor is subject to random shocks $\xi_t$, which we call liquidity shocks.

- Financial intermediaries are risk neutral, but face a risk based funding constraint:

$$\alpha \ast asset \ volatility = intermediary \ equity$$

- Financial intermediaries are the only agents that can transform output into capital, subject to quadratic adjustment costs.
Equilibrium Interactions
Systemic Distress

- Restructuring is triggered when intermediaries’ equity falls below a threshold

- Restructuring is an instance of systemic crisis as the whole financial sector is in distress

- Intermediaries are forced to delever, which generates a negative return to households
Equilibrium

An equilibrium in this economy is a set of price processes, a set of household decisions, and a set of intermediary decisions such that:

1. Taking the price processes and the intermediary decisions as given, the households optimally choose their consumption and savings allocation to capital, intermediary debt, and riskfree debt
2. Taking the price processes and the household decisions as given, the intermediaries optimally choose investment of new capital and intermediary leverage, subject to the risk based capital constraint
3. The capital market clears
4. The risky bond market clears
5. The risk-free debt market clears
6. The goods market clears
Related Literature

- **Leverage Cycles:** Geanakoplos (2003), Fostel and Geanakoplos (2008), Brunnermeier and Pedersen (2009)

- **Amplification in Macroeconomy:** Bernanke and Gertler (1989), Kiyotaki and Moore (1997)

- **Financial Intermediaries and the Macroeconomy:** Gertler and Kiyotaki (2012), Gertler, Kiyotaki, and Queralto (2011), He and Krishnamurthy (2012a,b), Brunnermeier and Sannikov (2011, 2012)
Solution Strategy

- Equilibrium is characterized by two state variables, leverage $\theta_t$ and relative intermediary net worth $\omega_t$.

- Equilibrium dynamics are highly nonlinear, generating endogenous volatility and endogenous systemic risk.

- We solve the model in closed form.
Shock Amplification

Adverse Shock

- $A_t$ decreases
- $p_{kt}$ decreases

- $\omega_t$ decreases

Decreased Investment

- $p_{kt}$, $p_{bt}$ decrease
- $\theta_t$ decreases
Volatility Risk

\[ y = 0.15 - 0.0067x \]
\[ R^2 = 0.088 \]
Intermediary Balance Sheet Adjustments

\[ y = -0.071 + 0.76x \]
\[ R^2 = 0.46 \]

\[ \alpha \uparrow \]

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Equilibrium Asset Pricing

- The pricing of risk varies as a function of intermediary leverage and intermediary wealth, consistent with the evidence presented in Adrian, Moench, and Shin (2010).

- Risk factors can be expressed in terms of shocks to output and shocks to intermediary leverage.

- The price of risk of leverage is always positive, indicating procyclical leverage, consistent with the empirical evidence of Adrian, Etula, and Muir (2011).

- The price of risk of output generically fluctuates between positive and negative, indicating that cross sectional tests of the unconditional CCAPM would fail in this economy.
Expected Excess Returns

\[ y = 0.12 - 0.31x \]
\[ R^2 = 0.17 \]

\[ y = 0.011 - 0.049x \]
\[ R^2 = 0.063 \]
Term Structure of Systemic Risk
Volatility Paradox

Distress probability vs Local volatility

Distress probability vs Price of leverage risk
Constant Leverage Benchmark

- Constant expected output and consumption growth
- But lower level of output and consumption growth
- Constant investment and price of capital
- Liquidity shocks have no impact on real activity
Household Welfare

![Graph showing the relationship between welfare and the parameter α. The graph indicates that welfare initially increases with α, reaching a peak, and then decreases as α increases further.]
Conclusion I

- Dynamic, general equilibrium theory of financial intermediaries’ leverage cycle with endogenous amplification and endogenous systemic risk
- Conceptual basis for policies towards financial stability
- Any change in prudential policies has general equilibrium effects
- Impact the pricing of financial and nonfinancial credit, the equilibrium volatilities of financial and real assets, as well as the allocation of consumption and investment goods

- Framework allows us to directly study the impact of prudential policies on systemic liquidity and solvency risks
- Systemic risk return tradeoff: tighter intermediary capital requirements tend to shift the term structure of systemic downward, at the cost of increased prices of risk today
Assumptions of the model are empirically motivated, capturing important stylized facts:

1. Volatility and Leverage
2. Procyclical Intermediary Leverage
3. Procyclicality of Intermediated Credit
4. Financial Sector Equity Return and Intermediary Leverage Growth
5. Financial Sector Bond Return and Intermediary Leverage Growth
6. Exposure to Intermediary Leverage Shocks is a Powerful Cross Sectional Pricing Factor


