

Risk
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Infectious Leverage

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Motivation

- High bank leverage makes financial system more fragile (e.g., Allen and Gale (2008), Bhattacharya and Thakor (1993), Freixas and Rochet (1997), and Gale and Özgür (2005)).
- Yet, we know little about the dynamics of bank leverage:
 - ⇒ What affects the dynamics of bank leverage?
 - ⇒ Is it a coincidence that borrower leverage also increased substantially prior to the current crisis (e.g., Gerardi, Lehnert, Sherlund and Willen (2008))?
- If there are economic forces that induce bank and borrower leverage cycles to be *correlated*, then there is a potentially *multiplicative* effect on financial fragility.
- Goal is to understand interrelationships between bank leverage, borrower leverage and real asset prices in a model in which leverage ratios and asset prices are *endogenously* determined.

Key Questions

- How is bank leverage affected by values of assets used as collateral for bank loans?
- How are asset values affected by bank leverage?
- What is the relation between bank leverage and borrower leverage?
- How does individual bank leverage affect other banks? That is, are there potential leverage externalities?
- How do ex ante bank capital requirements compare with ex post capital infusions following a crisis?

Time Line and Model Summary

$t=1$	$t=2$	$t=3$
<ul style="list-style-type: none">• Each atomistic first-period consumer chooses whether to buy a house or not. Consumers attach value to home ownership. Maximize $U_i = hB_i + C_i + E(C_{i+1})$.• Banks compete to lend to first-period homebuyers. Banks atomistic. Two goods: money (numéraire) and houses.• All loans secured by houses.• First-period house price, P_1, endogenously determined• Each bank chooses its first-period capital structure.• Complete deposit insurance, costly bank equity and costly bank default	<ul style="list-style-type: none">• First period homebuyers sell their houses.• Each second-period consumer chooses whether to buy a house or not.• Second-period house price, P_2, determined endogenously by second-period housing demand, second-period housing supply and second-period credit supply.• Bank loans to first-period homebuyers are settled.• Each bank experience loss/profit and consequent equity capital shock.• Banks compete to lend to second-period homebuyers.• Each bank chooses its second-period capital structure.	<ul style="list-style-type: none">• Second-period homebuyers sell their houses.• Banks' loans to second-period homebuyers are settled.

Overview of Main Results

The results we seek are in 6 broad categories:

- In markets where banks finance housing purchases through loans collateralized with houses:
 - *Infectious Leverage*: Leverage ratios of banks and borrowers move in unison:
 - ⇒ Both are higher when house prices are higher
 - ⇒ This makes the banking system and the housing market more sensitive to future house price declines
 - *Bank Leverage Externality–Idiosyncratic Shocks may Become Systematic*: Higher bank leverage subsequently leads to
 - ⇒ Lower expected future house price
 - ⇒ Greater sensitivity of an individual bank's credit risk exposure to the leverage choices of other banks
 - ⇒ Greater likelihood that an idiosyncratic shock to a subset of banks will magnify to systematically affect all banks

Overview of Main Results

- **Asset Prices and Intermediation “Thinning”:** Higher Asset Prices mean that
 - ⇒ Higher bank leverage and higher portion of bank's payoff arises from collateral value
 - ⇒ If bank's expertise is in screening borrower on cash flow generation capability, then higher leverage may dilute screening incentives
 - ⇒ “Thinning” of intermediation at higher asset prices
- **Leverage Externality and Social Welfare Analysis:** Individual banks do not internalize the effect of their leverage on second-period house prices:
 - ⇒ Collectively higher bank leverage lowers second-period house prices and increases price volatility
 - ⇒ Exacerbates second-period shocks to bank capital since second-period house prices affect repayment on first-period bank loans
 - ⇒ Adversely affects second-period credit supply
 - ⇒ Lowers borrower surplus and welfare
 - ⇒ Borrowers would be collectively willing to offer to pay the banking system a lump-sum tax at $t = 2$ (conditional on being able to repay loans) that would be provided only if *each* bank in the system chose lower leverage at $t = 1$ than its private optimum

Overview of Main Results

- ***Capital Requirements and the Interconnectedness of Banks:*** Standard view of bank capital requirements is that they restore appropriate risk-taking incentives for banks, i.e. they deal with *idiosyncratic* risk choices . . . AND interconnectedness among banks is viewed as a somewhat distinct *systemic* risk issue:
 - ⇒ Our analysis shows that banks' leverage choices, by impacting the underlying value of "common collateral," engender an *interconnectedness* among otherwise-independent banks
 - ⇒ That is, each individual bank's credit risk exposure at $t = 2$ depends on the first-period leverage choices of other banks, and the credit risk exposure becomes larger when other banks choose higher leverage ratios
 - ⇒ Capital requirements can be used to diminish interconnectedness and extent of systemic risk
 - ⇒ Interconnectedness and capital requirements are "connected"
 - ⇒ New Role of capital requirements in prudential regulation
- ***Ex ante Capital Regulation vs. Ex post Capital Infusion:*** Capital requirements may lower initial house prices (by decreasing bank profits) but will also lower house price volatility. Ex post capital infusion probability induces banks to increase their leverage ex ante and this amplifies the effect of future shocks that adversely affect bank capital, thereby making ex post capital infusions more attractive for the government
 - ⇒ Self-fulfilling prophecy!

Conclusion and Expected Contribution

- Dynamics of bank leverage in secured-lending markets are very interesting
- The leverage decisions of borrowers and banks may move in unison – banks choose to become more highly levered when their borrowers are more highly levered \Rightarrow *Multiplicative effect on fragility* of housing and banking markets. This happens when house prices are relatively high \Rightarrow Fragility is higher at higher levels of real asset prices.
- The probability distribution of the value of the collateral is affected by the aggregate lending behavior of banks, which in turn is dependent on their earlier capital structure decisions \Rightarrow *feedback loop* that generates *interconnectedness* among otherwise-independent banks and may convert idiosyncratic risk into systemic risk.
- Markets such as the one examined in this paper are also characterized by *bank leverage externality* – higher leverage ratios chosen by banks at a given point in time tend to increase volatility of future house prices. Because individual banks do not internalize this externality, each bank's leverage exceeds the social optimum.