Leverage, Securitization and Shadow Banking: Theory and Policy

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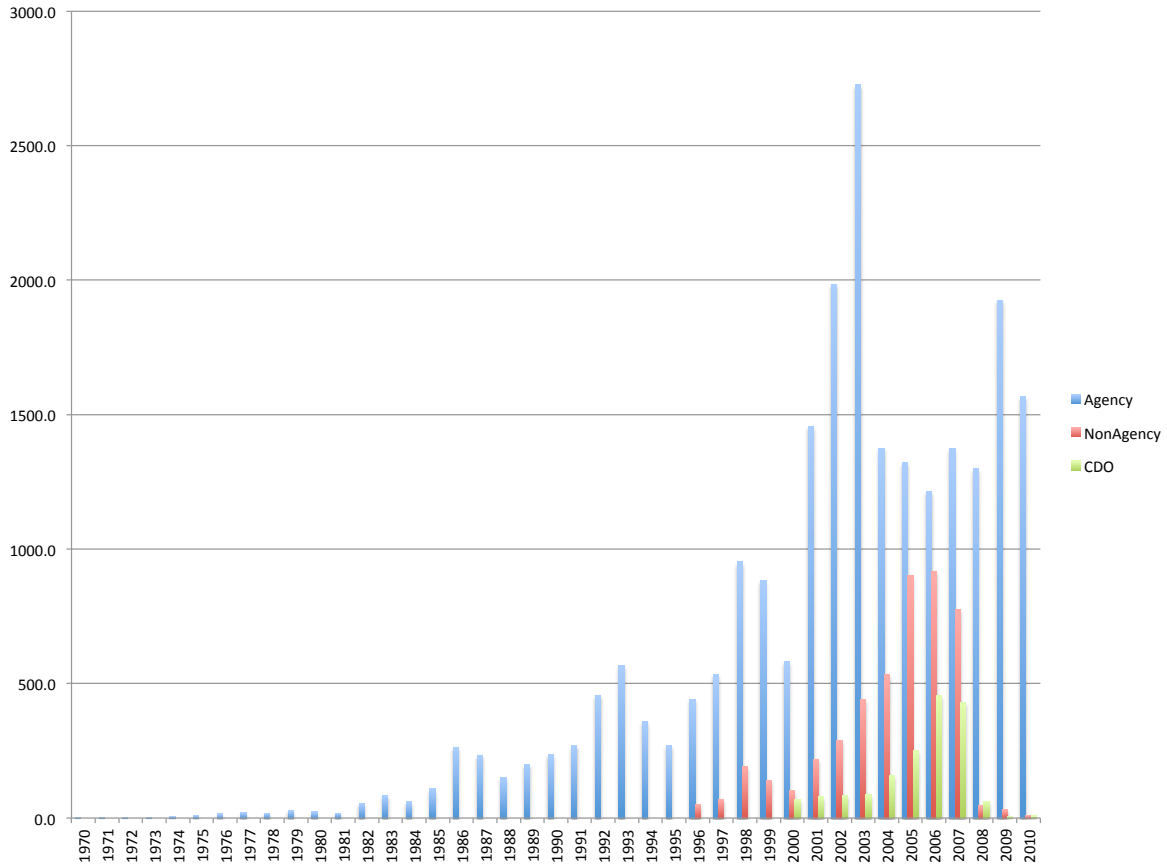
Outline

- Post-crisis regulatory reform concentrates on bank leverage and bank capital requirements.
- Leverage and securitzation also occur outside the banks, in the shadow banking system.

- Collateral and securitization are devices to make lending more attractive.
- Short term lending (repos) and securitization are indeed at the core of shadow banking activities.
  - similar to traditional banking: maturity transformation.
  - different from traditional banking: different regulatory framework and safety net.

Financial Innovation in the form of Securitization:

- Pooling
- Tranching



(Fostel-Geanakoplos (2012))

- Forces behind securitization:
  - Crucial role of collateral: it stretches scarce collateral.
  - It creates contingent assets (not just safe assets).
  - Others: Regulatory arbitrage and Risk sharing.

- Collateral and Leverage crucial to understand these markets and their fragility.
- Theoretical foundation for the study of corporate finance leverage, like Bernanke-Gertler (89), Kiyotaki-Moore (97), Holmstrom-Tirole (97), is based on borrower moral hazard and skin in the game.
- Theoretical foundation for leverage like Geanakoplos (97), is based on the idea that default happens when collateral is worth less than the promise. This applies to most of shadow banking where borrower has no control over the payoff of the asset.

Outline

General Equilibrium Theory of Leverage

- Standard GE theory: supply equals demand determines interest rate.
- Collateral GE theory: once we consider collateral, also leverage is determined in equilibrium even without consideration of moral hazard. (Geanakoplos 97).
- In Binomial Economies (and Brownian motion limit): absence of default. But borrowing limit set by fear of default. (Fostel-Geanakoplos 2012)

General Equilibrium Theory of Leverage

- In Binomial economies *asset LTV* given by tail risk.
- Equilibrium *asset LTV* is given by

$$LTV = \frac{worst\ case\ rate\ of\ return}{riskless\ rate\ of\ interest}$$

General Equilibrium Theory of Leverage

Though simple and easy to calculate, our formula provides interesting insights:

- it explains which assets are easier to leverage (the ones with low tail risk).
- it explains why changes in the bad tail can have such a big effect on equilibrium even if they hardly change expected payoffs: they change leverage.
- the formula also explains why (even with rational agents who do not blindly chase yield), high leverage historically correlates with low interest rates.

General Equilibrium Theory of Leverage

- In special cases the tail risk formula can be equivalently expressed as:

$$\textit{margin} = k \times \textit{Volatility of collateral payoffs}.$$

- *LTV* moves with volatility.
- However this is not general. In general what matters is *tail risk.*

Asset Prices and Bubbles

- When assets can be used as collateral pricing changes.
- New asset pricing (FG 2008):

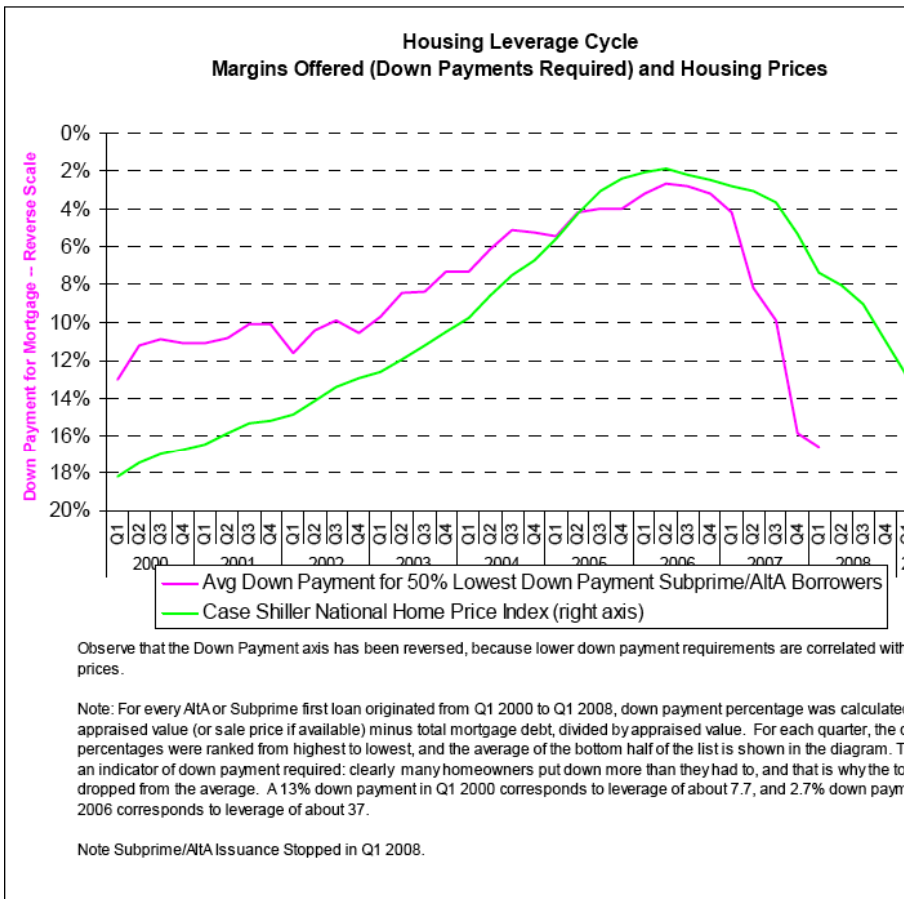
$$p = PV + CV$$

- Collateral values can create bubbles.
- Leverage and securitization (tranching) increases asset prices because Collateral Value increases. (FG 2012)

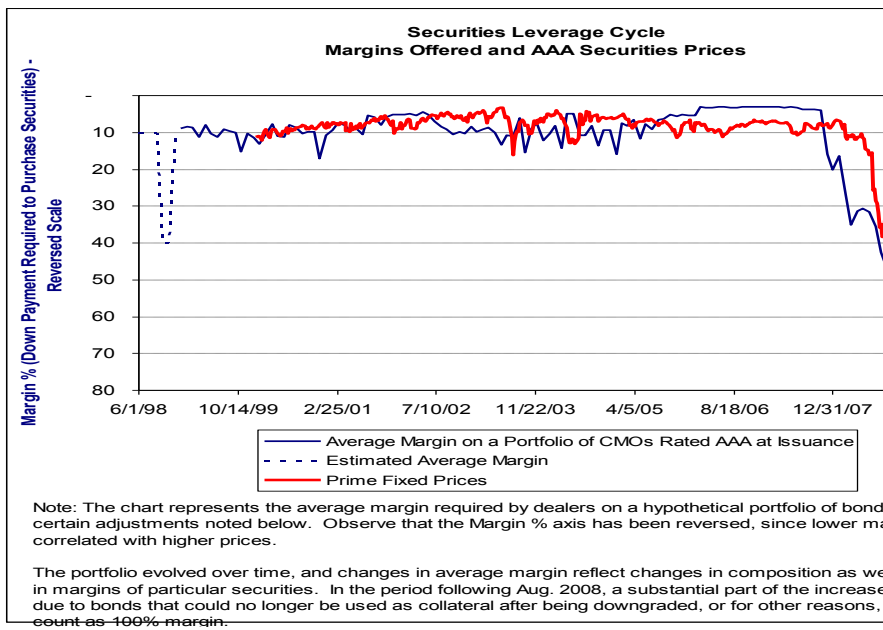
Time Series: Leverage Cycle

- Time Series properties: Leverage Cycle. (Geanakoplos 2003)
  - leverage $\Longleftrightarrow$volatility (low tail risk) $\Longleftrightarrow$ asset prices.

Time Series: Leverage Cycle



Repo Market Leverage



Geanakoplos (2010)

Leverage Cycle

During ebullient times the combination of high prices, high leverage and low volatility (or low tail risk) creates an illusion of prosperity.

Leverage cycle crashes always occur because of a coincidence of three factors:

- The bad news itself lowers the prices.
- The reduction in wealth of the leveraged buyers.
- If the bad news also creates more uncertainty, then credit markets tighten and leverage will be reduced.

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Credit Cycle vs Leverage Cycle

- The Leverage Cycle is not the same as a Credit Cycle.
- A Leverage Cycle is a feedback between asset prices and leverage, whereas a Credit Cycle is a feedback between asset prices and borrowing.
- Of course a leverage cycle always produces a credit cycle. But the opposite is not true.

Cross-Section: Multiple Leverage Cycles

- Many kinds of collateral exist at the same time, hence there can be many simultaneous leverage cycles.
- Collateral equilibrium theory not only explains how one leverage cycle might evolve over time, it also explains some commonly observed cross sectional differences and linkages between cycles in different asset classes: (FG 2008)
  - Flight to Collateral
  - Contagion
  - Drastic swings in the volume of trade of high quality assets.

Multiple Leverage Cycles: Flight to Collateral

- When similar bad news hits two different asset classes, one asset class often preserves its value better than another.
- This empirical observation is traditionally given the name Flight to Quality, because it is understood as a migration toward safer assets that have less volatile payoff values.
- FG (2008) emphasized a new channel which they called Flight to Collateral: After volatile bad news, collateral values widen more than payoff values, thus giving a different explanation for the diverging prices.

Multiple Leverage Cycles: Contagion

- Multiple leverage cycle can explain contagion.
- Leverage cycles in one asset class can migrate to un-related asset classes since it affects agents discount factor (liquidity wedge) when liquidity becomes scarce.
- Also a Portfolio Effect.

Multiple Leverage Cycles: Swings in High Quality Volume

- Flight to collateral combined with informational asymmetries generates such a big drop in good issuance, even though the news is almost equally bad for both assets.
- The explanation is that the bigger price spread between types caused by the flight to collateral requires a smaller good type issuance for a separating equilibrium to exist.

Lessons from the GE Collateral Theory

1. Leverage is endogenous and fluctuates with the fear of default.
2. Leverage is therefore related to the degree of uncertainty, volatility or low tail risk of asset markets.
3. Increasing leverage on a broad scale can increase asset prices.
4. The scarcity of collateral creates a collateral value that can lead to bubbles in which some asset prices are far above their efficient levels.
5. Multiple leverage cycles can explain important phenomena like Flight to Collateral, Contagion and violent swings in volume of trade.

Outline

Managing Leverage

- As we saw in the theory part, leverage is a crucial variable that affects asset pricing, and real variables.
- Monitoring and managing leverage can be even more important than monitoring interest rates (point made by G 2010, Garlaunu-Pedersen 11, Geanakoplos-Pedesen 11).
- Construct a public data base on investor and asset leverage.

Managing Leverage

- Restricting asset leverage ex-ante can be Pareto improving. (GK 2011, FG 2013).
- Main intuitive reason why limiting leverage can cause Pareto improvement is that it raises asset prices in future, reducing number of defaults.
- How should leverage be managed:
  - asset based vs investor based
  - old vs new leverage

Investor based vs Asset Based Approach

Investor-based leverage:

- Balance sheet approach. It acually reflects borrower's ability to repay.
- Can lead to regulatory arbitrage.
- Can generate bias toward more risky securities (than can be leveraged less).
- It can create measurement problems since is data (even at current market prices) on old loans.

Investor based vs Asset based approach

Security-based leverage:

- It is agent-independent.
- Leverage vs *diluted* leverage: measurement also for those asset classes with 100% margin to avoid bias. It is important to keep track which assets are being used as collateral. This also provides important information about credit conditions.
- It should be properly aggregated by asset class.

Old vs New Leverage

Old vs new:

- Leverage of old loans and new loans go in opposite directions:
  - when market conditions deteriorate leverage on old loans goes up whereas on new loans collapses.
- Problem with Reinhart-Rogoff: de-leveraging begins 2 years after crisis. Balance sheet approach on old loans:
  - De-leveraging is a key element of a crisis not a lagged consequence!
- Hence, data on leverage should be recorded every time an asset is used as collateral.

Managing Leverage

- Access to this type of public data of leverage at the institution and security level (properly aggregated) can be very valuable for crisis prevention, detection and post-management.
- Model-free measure of systemic risk.

References

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