“What Can We Learn from ContingentClaims Analysis”
by Dale Gray

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Macro Financial Modeling Meeting
Starting point: nonlinearity is a first-order issue in understanding and measuring macro financial risks.

Example: leverage vs. default risk

CCA offers a transparent and operational framework to quantify these nonlinearities.

Use Merton-style models to capture the optionality and nonlinearity embedded in financial claims.

Connect information from the financial markets with accounting information.

CCA risk indicators can be used in macroeconomic models.

A very important research agenda
Comments

1. Challenges in implementing CCA with Merton-style models
2. How to capture interconnections in the macro economy
3. Market incompleteness
Comment 1: Merton models

- Basic idea:
  - Market-based balance sheets are not entirely observable.
  - Merton (1973): equity is a call option on the assets.
  - Combined with balance sheet information, one can compute the implied asset value and asset volatility using equity data.
  - We can then construct a variety of risk indicators based on the model.

- Many extensions of the Merton model. Which should we use?

- This choice is subtle but important for its quantitative implications.
Merton models

∗ Can Merton models match observed credit spreads when they are calibrated to match historical average default prob and recovery rates?
∗ “The credit spread puzzle” (Huang and Huang 2003)

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Comment 1: Merton models

- Implied asset value properties are model dependent.
  - Incorporate stochastic volatility, jump risk, time-varying risk premium, comovements between risks and risk prices ...
  - Not a “cheap shot.” Missing these elements could lead one to wrongly attribute the sources of risks.
  - Example: debt is risky not because asset volatility is high on average, but that it is high in aggregate bad times.

- Adding more financial assets might help (options, credit default swaps), but might not be sufficient, especially for “latent” risks.
  - Macro models can help us better understand the mechanism.

- Cross section: exposures to common risk factors are key to measuring systemic risk → a joint estimation?
  - This is also model dependent
Comment 2: Interconnections

Households

Firm

Financial Intermediary

Government

Asset

Debt

Equity

Debt

Asset

Guarantee

Equity

Debt

Asset

Guarantee

Equity

Hui Chen (MIT)

Discussion

09/2012 7/11
Comment 2: Interconnections

- Bank credit risk depends on government guarantees
- Government guarantees depend on government debt, tax revenue from private sector
- Households credit risk depends on bank lending capacity

\[ V(\text{bank debt}) = D_B(\text{bank assets, bank asset vol, bank debt, gov } B/S) \]
\[ V(\text{gov debt}) = D_G(\text{gov assets, gov asset vol, gov debt, bank } B/S, HH B/S) \]
\[ V(\text{HH debt}) = D_H(\text{HH assets, HH asset vol, HH debt, bank } B/S) \]
The problem becomes more challenging when considering the interconnections of the balance sheets for households, firms, financial intermediaries, and sovereigns.


Next steps: How to make these models operational? Incorporate dynamic effects of intermediary and sovereign balance sheets via the CCA? Adrian, Moench, Shin (2010), Adrian and Shin (2010)
Comment 3: Incomplete Markets

- Can we extend **CCA** to cases where markets are incomplete?
  - Government entitlement programs
  - Emerging markets

- “Good-deal” bounds
CCA is a powerful framework to connect asset prices with accounting information to construct forward-looking risk indicators.

Many interesting extensions. Use insights from macro models to guide modeling choice.

More integration between macro and finance.