"What Can We Learn from Contingent Claims Analysis"

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Macro Financial Modeling Meeting

Summary

- 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

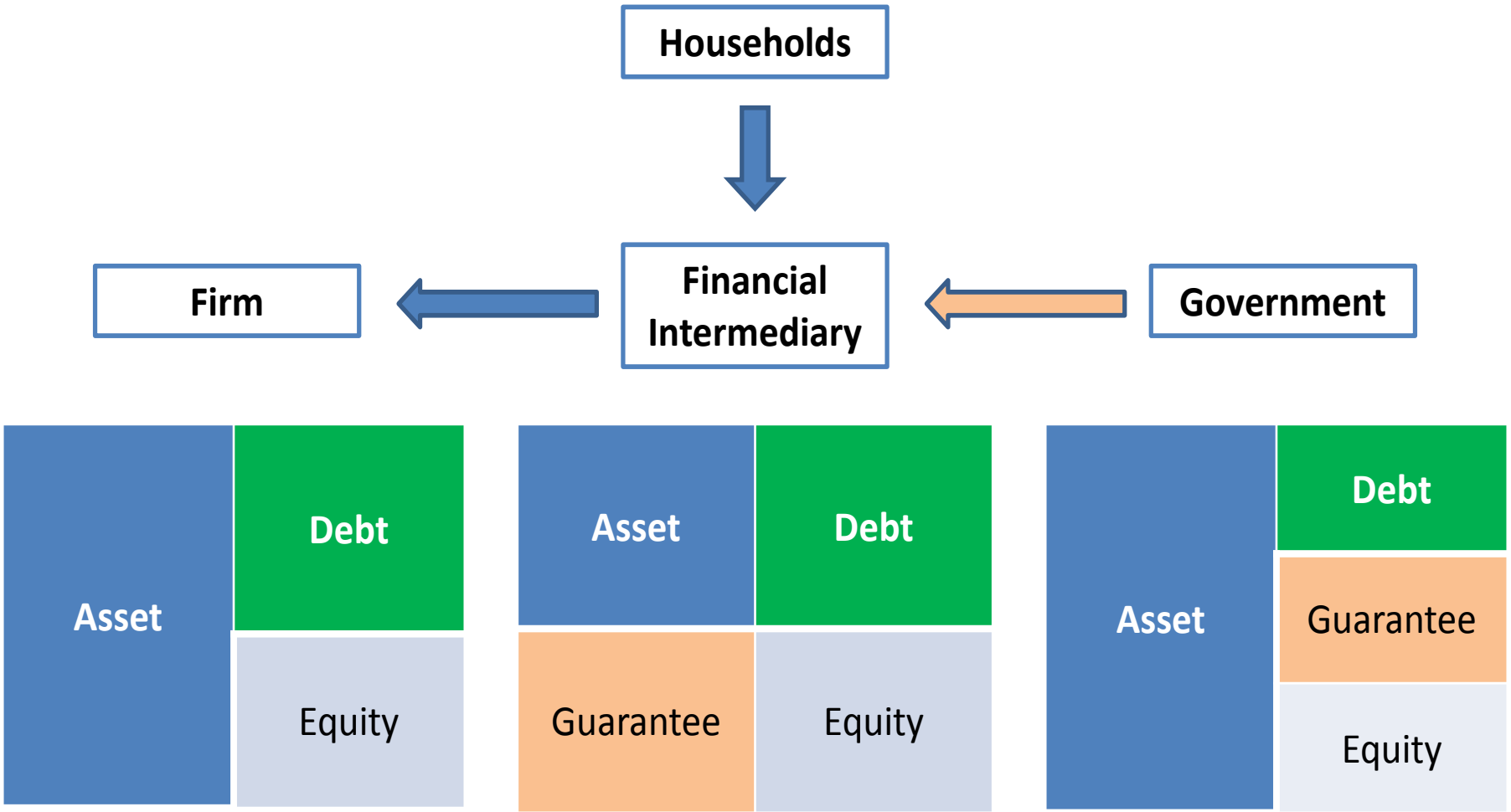
- Can Merton models match observed credit spreads when they are calibrated to match historical average default prob and recovery rates?
- "The credit spread puzzle" (Huang and Huang 2003)

	Data	Model				
Rating		LS	LT	CG	TR	JD1	JD2
Aaa	63	10	37	11	13	11	53
Aa	91	14	34	14	18	16	73
A	123	23	38	23	29	26	102
Baa	194	57	59	52	65	61	155
Ba	320	192	165	183	202	199	263
Ba	470	388	408	372	392	395	465

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 $\Longrightarrow$ a joint estimation?
  - Kelly, Lustig, Van Nieuwerburgh (2011), Giglio (2012)
  - This is also model dependent

Comment 2: Interconnections



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

$$V(\text{bank debt}) = D_B(\text{bank assets}, \text{bank asset vol}, \text{bank debt}, \text{gov B/S})$$

$$V(\text{gov debt}) = D_G(\text{gov assets}, \text{gov asset vol}, \text{gov debt}, \text{bank B/S, HH B/S})$$

$$V(\text{HH debt}) = D_H(\text{HH assets}, \text{HH asset vol}, \text{HH debt}, \text{bank B/S})$$

Comment 2: Interconnections

- The problem becomes more challenging when considering the interconnections of the balance sheets for households, firms, financial intermediaries, and sovereigns.
- Macro models help demonstrate the mechanism: Kiyotaki and Moore (1997), Bernanke, Gertler, and Gilchrist (1999), Brunnermeier and Sannikov (2011), He and Krishnamurthy (2012)
- 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

Conclusion

- **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.