

# FINANCIAL SECTOR STATISTICS AND SYSTEMIC RISK

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# Introduction

- The financial crisis revealed that –
  1. We do not currently collect the right data to understand crises.
    - Derivatives, liquidity
  2. We need to look at the data through models, because systemic risk is a general equilibrium phenomenon,
    - And, we need to build these models.

# Measurement and the Crisis

- Current systems (Bank Call Reports; Flow of Funds; FASB) are outdated.
  - ▣ They are based on measuring stocks of cash-assets
  - ▣ Derivatives and structured products render these systems less useful.
  - ▣ No measurements of or data on liquidity.

# “Leverage” Example

- Firm has:
  - ▣ \$20 equity and \$80 debt; the debt is 5-yr @4.5%.
  - ▣ firm buys \$100 of Treasuries and writes protection on 100 investment-grade US corps each with a notional of \$10; weighted average CDS premium 5%.
- Accounting leverage = 5X
  - ▣ But the risk in this firm is all in the CDS

# “Leverage” Example continued

- If 4 firms in the CDS portfolio fail with 50% recovery,
  - ➔ loss of \$20
  - ➔ equity wiped out.
- not picked up by current methods.
- Synthetic leverage
- Liquidity risk...

# Liquidity Risk Example

- A firm has:
  - \$20 of equity and \$80 of debt; half the debt is overnight repo financed at 1% and the other half is a 5-yr bond at 4.5%.
  - Assets are \$50 ABS, financed via repo at 0 haircut and a \$50 loan for 1-yr at 5%.
- Standard measures do not measure “liquidity” and so do not detect the sensitivity to, say, an increase in repo haircuts.

# Example-continued

- We propose a Liquidity Mismatch Index, based on liquidity weights.
  - ▣ The ABS weight may be  $\lambda_{\text{ABS}} = 0.9$ , so asset liquidity is \$45. On the liability side, the ABS bond is funded via repo, with  $\lambda_{\text{repo}} = 1.0$  or -\$50.
  - ▣ Net liquidity is -\$5.
- If repo haircuts suddenly increase to 20%, then  $\lambda_{\text{ABS}} = 0.8$  and the net position is -\$10.
- See Brunnermeier, Gorton, Krishnamurthy, “Liquidity Mismatch Index”

# Leverage/Derivatives continued

- CDS on 100 investment grade names
- Standard collateralization agreements require
  - ▣ If firm is downgraded, the firm will have to immediately come up cash to post as collateral
  - ▣ If credit risk on underlying firms increases, need for cash as collateral
- Liquidity risk:
  - ▣ Conceptually similar to the case that the firm faces funding difficulty in rolling over-night repo and needs to come up with cash.



# What data should be collected?

- Many possibilities, but -
  - ▣ Answer should be informed by theory
  - ▣ Should be publicly available for research
    - Suitably anonymized, and released with a lag
  - ▣ Should be useful for model building
- Systemic risk involves endogenous responses, feedbacks, to buildups of risk.

# Systemic risk

- Data question:

*How much will the commercial banking sector lose (through loans, derivatives, structured product holdings) if real estate values decline by 20%?*

- Systemic risk question:

*How might banks behave (shed assets, raise lending standards, hoard liquidity), with such a shock?*

*What is the resulting general equilibrium?*

# Models

- We need data to help inform the development of models with which to measure systemic risk
- Various proposed amplification mechanisms (Diamond and Dybvig; Bernanke, Gertler, & Gilchrist; Kiyotaki and Moore):
  - ▣ Net worth
  - ▣ Short-term debt
  - ▣ Leverage
  - ▣ Collateral value

***Liquidity  
Capital***

# Step 1: Collect Risk Management Data

- Elicit the response (delta) of firm value and liquidity to each stress scenario.
  - ▣ Report change in firm value and liquidity index when factor changes by 5%, 10%, -5%, -10%.
- Orthogonal scenarios:
  - ▣ Market factors: interest rates, FX rates, real estate prices, etc.
  - ▣ Idiosyncratic risks: Firm failures, counterparty failures, clearinghouse failure.
  - ▣ Liquidity risk scenarios: Repo haircuts increase; short-term debt markets freeze; can't issue debt.
- ▣ Note: Most financial firms do something along these lines currently, for internal risk management

# Step 2: System-Wide Response

- Risk measures aggregate across firms and sectors.
  - ▣ What is overall net sensitivity to a, say, 10% fall in real estate prices?
  - ▣ Risk change over the cycle?
  - ▣ How interconnected?
- Liquidity measures aggregate: “response indicator”
  - ▣ Banks net short liquidity.
  - ▣ But, to whom, and how much?

# Modeling systemic risk

- Collection of data regularly, over time, creates a panel data set for modeling of macro risk.
  - ▣ By regulators
  - ▣ By academics
  - ▣ By industry
- View data through lens of models to understand systemic risk
  - ▣ *What is the resulting general equilibrium?*

# Summary

- Existing measures outdated
  - ▣ Imperative to measure derivatives and liquidity
- We propose a measurement system
  - ▣ Builds from internal risk management reports
  - ▣ Data as suggested by theories of systemic risk
- Data should be publicly available
  - ▣ Essential for deepening understanding of systemic risk
  
- Brunnermeier, Gorton, Krishnamurthy: “Risk Topography”