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.

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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- Current systems (Bank Call Reports; Flow of Funds; FASB) are outdated.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.

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“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

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“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...
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”

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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.

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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?

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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

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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.
  - 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

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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?

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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”