Types of Distortions

- **Belief distortions**
  - Match “belief surveys”  \((BGS)\)

- **Incomplete markets**
  - “natural” leverage constraint  \((BruSan)\)
  - Costly state verification  \((BGG)\)

+ **Leverage constraints**
  - (no “liquidity creation”)
    - Exogenous limit  \((Bewley/Ayagari)\)

- **Collateral constraints**
  - Next period’s price  \((KM)\)
    \[ Rb_t \leq q_{t+1} k_t \]
  - Next periods volatility  \((VaR, JG)\)
  - Current price

- **Search Friction**  \((DGP)\)
Overview

- Types of distortions/frictions

- Run-up phase
  - Distorted beliefs
  - Concentration of risk

- Crash phase
  - Fire-sales
  - Paradox of Prudence
  - Spillovers

- Recovery phase

- Endogenous volatility dynamics – volatility paradox

- Welfare/Regulation
Run-up 1: Beliefs “Distortions”

- **Representativeness heuristic/Diagnostic beliefs:**
  - As if error terms followed AR(1)
  - Overestimate of productivity after good shock
  - Bubbles/overinvestment driven by *level of beliefs* a la Miller (1977)
    - AS: Surveys consistent with each other, mutual fund flows

- **Heterogeneous beliefs:** optimists and pessimists

  “consensus beliefs” ≠ marginal buyer’s beliefs
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  - + limited commitment \( \Rightarrow \) Leverage cycle
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- **Switching** heterogeneous beliefs ⇒ Speculation
  (Resale option a la Harrison-Kreps/Scheinkman-Xiong):
  - optimist/pessimist “switching” + short-sale constraint
  - ⇒ Bubbles, volatility, and transaction volume
Run-up 2: Concentration of Risk

![Graph showing concentration of risk between HH and Experts]
Run-up 2: Concentration of Risk

- **Belief extrapolation:**
  - No risk concentration necessary

- **Financial frictions models:**
  - “Experts” hold most of aggregate risk in good times
  - Low volatility, but risk builds up in background
  - **Credit cycle:** (BGG/KM/BruSan)
    - **Leverage cycle:** (JG/BruPed) extreme leverage in cts. time limit
Run-up 2: Concentration of Risk

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- **Financial frictions models:**
  - “Experts” hold most of aggregate risk in good times
  - Low volatility, but risk builds up in background
  - **Credit cycle:** (BGG/KM/BruSan)
    - Experts save their way out of constraint *after string of good shocks*
    - Buffer against crisis
  - **Leverage cycle:** (JG/BruPed)
    - Most concentrated risk *after string of good shocks*
    - 2 key differences (besides hetero. beliefs):
      - More than two groups
      - Bubble don’t burst, but deflate
        - Worst case moves up
        - Higher debt capacity
Crash 1: Fire Sales

- Definition: Assets transferred to second-best users
- BGG: No second-best user
- KM: Negative shock ⇒ Experts sell to HH (gatherers), “Market illiquidity”
- Shleifer-Vishny (1992):
  - Fire sales ⇒ GE debt capacity matters
  - Restructuring > Fire sales
- Are fire-sales good or bad?
  - BruSan: Two competing effects
    - Ex-post: Fire sales stabilize economy in crisis, but misallocation
    - Ex-ante: Lead to excessive leverage (fire-sale/pecuniary externality) (Stein et al.,...)
Crash 2: Paradox of Prudence

- “Micro-prudence” of bank is “macro-imprudent”
Crash 2: Paradox of Prudence

- “Micro-prudence” of bank is “macro-imprudent”
- Two “spirals” amplify
  - Liquidity spiral  (price of capital)
  - Disinflationary spiral  (price of money)
Crash 2: Paradox of Prudence

- “Micro-prudence” of bank is “macro-imprudent”
- Two “spirals” amplify
  - Liquidity spiral (price of capital)
  - Disinflationary spiral (price of money)
    - Banks issue less inside money (& diversify less risk)
    - HH demand more money

\[ \text{BruSan “The I Theory of Money”} \]
Crash 3: Spillovers Across Assets

- Belief extrapolation: No spillovers
  - Unless “baked-in” in beliefs

- Net worth channel:
  - BGG/KM BruSan: Expert net worth affects all assets
  - Diamond-Rajan (2005)
  - JG-Leverage cycle: Spillovers from “crossover” investors
    - Margins spike in one market
    ⇒ Crossover investors transfer capital from other markets
  - BruPed: Multiple equilibria:
    Joint jump in price across assets
    - Even assets with uncorrelated payoffs jump together
    - Could also be integrated in a DD-model

- Measurement: CoVaR
Speed of Recovery

- Speed of Recovery
  - KM: deterministic
  - BruSan: Length of recession is stochastic
    ⇒ precautionary savings
Mean & Leverage Dynamics

- Impulse Response curves:
  - Amplification

- Credit cycle: (Loss spiral)
  - Constant volatility exogenous shocks
  - Countercyclical leverage
  - Underinvestment (second best user problem)

- Leverage cycle: (Margin spiral/Repo run)
  - Exogenously time-varying volatility
  - ARCH/Scary bad news
  - Destabilizing margins
  - Pro-cyclical leverage

Evidence: Pro- vs. countercyclical leverage depends on
- investor type, book vs. market, new vs. average
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- Evidence: Pro- vs. countercyclical leverage depends on
  - investor type, book vs. market, new issuance vs. overall
**Endogenous Volatility & Volatility Paradox**

- **Endogenous Risk/Volatility Dynamics in BruSan**
  - Beyond Impulse responses
  - Input: constant volatility
  - Output: endogenous risk, time-varying volatility
  
⇒ **Precautionary savings**
  - Role for money/safe asset

⇒ **Nonlinearities in crisis** ⇒ endogenous fain tails, skewness

- **Volatility Paradox**
  - Low exogenous (measured) volatility leads to high build-up of (hidden) endogenous volatility  
    (Minsky)
Financial Regulation/Welfare Criterion

- Important macro-prudential tools:
  - Countercyclical buffer, liquidity regulation, LTV, DTI, spillover metric,

- Belief extrapolation (mean dynamics):
  - Paternalistic: lean against price movements (all the time)

- Heterogeneous beliefs
  - JG: Financial innovation causes boom & bust (no welfare loss risk-neutral)
  - Speculation: Tobin tax insufficient?
  - Welfare criterion (BSX)

- Fire-sale externality/spillovers (CoVaR measure)
- Loosen borrowing constraints \textit{in bad times} (BGG/KM)
- Also control concentration of risk \textit{in good times} (JG/BruSan)
Conclusion

- “Run-up”, “Crisis”, and “Recovery”-mechanisms
  - Belief-focused (representative + heterogeneous)
  - Friction-focused, where risk is central

- Risk concentration, fire-sales, spillovers, ...

- Paradox of Prudence

- Volatility Paradox
  - Mean-Amplification, Exog. ARCH, Endog. Volatility Dynamics

- Macro/Monetary models with financial sector should include
  - physical investment
  - inside money creation
Extra Slides
Recovery from Crisis/Resilience

- Belief extrapolation: Recovery speed determined by belief persistence
  - Perceived AR(1) coefficient on errors

- BGG/KM: Recovery in tandem with experts’ balance sheets

- JG: Recovery with experts’ balance sheets & disagreement/volatility
  - Less disagreement ⇒ Lower margins ⇒ Higher marginal buyer

- BruSan: Length of recovery is stochastic
  ⇒ additional precautionary savings
Extra Slide: Pro- vs. Counter-cyclical Leverage

- Adrian-Shin (2014): **Book vs. market leverage**
  - Intermediaries finance new assets with debt ⇒ Procyclical

- Geanakoplos-Pedersen (2014): **New vs. old leverage**
  - Margins spike in crisis ⇒ Procyclical

- He, Kelly, Manela (2017): Different constraints
  - “Equity constraint”: BGG/BruSan, countercyclical leverage
  - “Debt constraint”: Leverage cycle, procyclical leverage
  - Book/market leverage positively correlated for dealers
  - Evidence from HFs in Ang et al. (2011)
    - HFs procyclical, investment banks countercyclical