Demand for Crash Insurance, Intermediary Constraints, and Stock Return Predictability by Chen, Joslin & Ni

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Outline

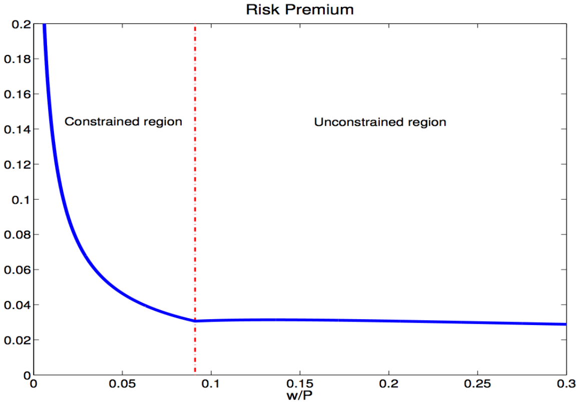
- Aim
- Why do we care?
- Model Summary & Results
- Comments

My View of Paper's Aim

- **Main question**: do intermediary constraints matter for aggregate asset prices?
- Use data on demand for deep OTM puts to infer whether intermediary constraints matter for aggregate asset prices
- Study how intermediary constrains impact aggregate asset prices in a theoretical model

Intermediary-based asset pricing

- He & Krishnamurthy (series of papers)
- Drops in intermediary wealth can push financial markets into a danger zone.
- In the danger zone: small negative shocks to intermediary wealth lead to dramatic rises in risk prices, expected market risk premium and conditional return volatility.



Underlying economics I

- Moral hazard & incentive compatibility constraints
  - Moral hazard between households and intermediaries $\rightarrow$ contracts between households & intermediaries.
  - Incentive compatibility constraint $\rightarrow$ constrains intermediary portfolio choices: endogenously incomplete markets (financial frictions)
  - Intermediaries lose money $\rightarrow$ incentive compatibility constraint tighter
- Incentive compatibility constraints and asset pricing
  - Small negative shocks to intermediary wealth $\rightarrow$ reduced risk sharing
  - Reduced risk sharing raises stock market return volatility, expected risk premium : more financial fragility
  - Danger zone $\iff$ region of reduced risk sharing

Underlying economics II

- Intermediary constraints and policy
    - Policy recommendations being made assuming that intermediary constraints matter
    - Some of these recommendations involve using a great deal of money. In the subprime crisis, the U.S. Treasury purchased \$ 205 bn of preferred shares in the intermediary sector through the capital purchase program.
- But are intermediary constraints that important?
    - We should find out before reallocating resources to cure the ills stemming from such constraints.

Model Summary

- Aggregate consumption
  - constant jump size $\overline{d}$
  - stochastic jump arrival frequency
    - λ_t under public investors' beliefs
    - $\rho\lambda_t < \lambda_t$ under dealers' beliefs
- Public agents: CRRA γ: $u(C) = \frac{C^{1-\gamma}}{1-\gamma}$
- Dealers: Disaster-dependent relative risk aversion (key assumption)

$$\boxed{\gamma_{D,t} = \gamma + \alpha \frac{\lambda_{\tau(n)} - \overline{\lambda}}{d_{D,\tau(n)}}} \tag{1}$$

1. Disaster intensity increase: higher RRA
2. Similar to way incentive compatibility constraint works ?
   - $\alpha = 0$ (no intermediary constraints)
   - $\alpha > 0$ (intermediary constraints)
3. But in the model markets are dynamically complete ...

Benefits of Dynamic Completeness

- Static optimization problem

$$\sup_{C_t^P, C_t^D : C_t^P + C_t^D \leq C_t} u(C_t^P) + \overbrace{\zeta}^{\text{Pareto weight}} \underbrace{\eta_t}_{=\frac{d\mathbb{P}_D}{d\mathbb{P}_P}} \overbrace{\xi_t}^{=e^{\alpha \sum_{n=1}^{N_t} (\lambda_{\tau(n)} - \lambda_t)}} u(C_t^D) \tag{2}$$

- Solve for consumption sharing rule in terms of exogenous variables

$$(C_t^P)^{-\gamma} = \zeta \eta_t \xi_t (C_t^D)^{-\gamma} \tag{3}$$

- Market clearing: $C_t^P + C_t^D = C_t$

$$\frac{C_t^P}{C_t} = f(\tilde{\eta}_t) = \frac{1}{1 + (\zeta \eta_t \xi_t)^{\frac{1}{\gamma}}} \tag{4}$$

$\tilde{\eta}_t = \zeta \eta_t \xi_t$

Measuring net public demand

- $\tilde{\eta}_t^d$ is $\tilde{\eta}_t$ cond. on disaster at time t
- $f(\tilde{\eta}_t^d) - f(\tilde{\eta}_{t-})$ is change in consumption demand stemming from the disaster

$$\text{net public demand for disaster insurance} = e^{-\overline{d}}(f(\tilde{\eta}_t^d) - f(\tilde{\eta}_{t-})) \quad (5)$$

- no intermediary constraints: net public demand for disaster insurance independent of disaster frequency λ_t
- with intermediary constraints: net public demand for disaster insurance drops as disaster frequency λ_t rises – dealers more constrained and less willing to share disaster risk by selling disaster insurance

Disaster risk premium

$$\frac{\lambda_t^{\mathbb{Q}}}{\lambda_t} \tag{6}$$

- no intermediary constraints – disaster risk premium independent of λ_t
- with intermediary constraints – as λ_t rises dealers more constrained and less willing to share disaster risk by selling disaster insurance – disaster risk premium rises with λ_t. For sufficiently high λ_t, dealers purchase disaster risk insurance.

Empirical Results

- Implied vol

$$IVSlope_t = a_{IV} + b_{IV} PNBO_t + \epsilon_t \tag{7}$$

  - *PNBO* (public net buy orders): total open buy orders of of all DOTM SPX puts ($K/S \leq 0.85$) by public investors less open-sell orders
  - Intermediary constraints $\Rightarrow b_{IV} < 0$
  - Demand pressure theory $\Rightarrow b_{IV} > 0$
- Return forecasts

$$r_{t+j,t+k} = a + b\mathrm{PNBO}_t + \epsilon_{t+j,t+k} \tag{8}$$

  - $b < 0$, consistent with intermediary constraints

Suggestions: Model & Empirics

- Connect model and empirics more
  - Specify assets needed to get dynamically complete markets: risk-free bond, stock, options
  - compute option prices, IV, returns
  - compute option demands
- Simulate data from model and run empirical analysis
- Can use above results to simulate $PNBO_t$, etc.

Suggestions: What more do we learn about intermediaries and aggregate asset prices?

Further compare results with

- He & Krishnamurthy
- Adrian & Shin

Suggestions: Model & Stationarity

- Need to ensure both dealers and public investors survive in the long-run
  - Derive dynamics of $\frac{C_t^P}{C_t} = f(\tilde{\eta}_t)$
  - Look at behavior at boundary (theory from Karlin & Taylor – applied for eg in Borovica)

Suggestions: Model

No explicit intermediary constraints in the model. Key assumption is

$$\boxed{\gamma_{D,t} = \gamma + \alpha \frac{\lambda_{\tau(n)} - \overline{\lambda}}{d_{D,\tau(n)}}} \tag{9}$$

All reduced form – dynamically complete markets – no frictions
But intermediary-based asset pricing is all about the frictions!

- Why not explicitly model constraint?
- Even better: derive it from incentive compatibility within an optimal contracting framework?

Need to check that consumption shares and disaster risk premium still depend on λ_t.

Conclusion

- Important question
- Do more to link theory and empirics
- Check that intermediary constraints lead to λ_t – dependence