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
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 constraints 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 → contracts between households & intermediaries.
  - Incentive compatibility constraint → constrains intermediary portfolio choices: endogenously incomplete markets (financial frictions)
  - Intermediaries lose money → incentive compatibility constraint tighter

- Incentive compatibility constraints and asset pricing
  - Small negative shocks to intermediary wealth → reduced risk sharing
  - Reduced risk sharing raises stock market return volatility, expected risk premium : more financial fragility
  - Danger zone ↔ 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
    - $\lambda_t$ under public investors’ beliefs
    - $\rho \lambda_t < \lambda_t$ under dealers’ beliefs
- Public agents: CRRA $\gamma$: $u(C) = \frac{C^{1-\gamma}}{1-\gamma}$
- Dealers: Disaster-dependent relative risk aversion (key assumption)

\[ \gamma_{D,t} = \gamma + \alpha \frac{\lambda_{\tau(n)} - \overline{\lambda}}{d_{D,\tau(n)}} \]  

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

\[
\sup_{C^P_t, C^D_t : C^P_t + C^D_t \leq C_t} u(C^P_t) + \zeta \eta_t + \xi_t u(C^D_t) = e^{\alpha \sum_{n=1}^{N_t} (\lambda_{\tau(n)} - \lambda_t)}
\]

- Solve for consumption sharing rule in terms of exogenous variables

\[
(C^P_t)^{-\gamma} = \zeta \eta_t \xi_t (C^D_t)^{-\gamma}
\]

- Market clearing: \( C_t^P + C_t^D = C_t \)

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

\[
\tilde{\eta}_t = \zeta \eta_t \xi_t
\]
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

$$\text{net public demand for disaster insurance} = e^{-d} \left( f(\tilde{\eta}_t^d) - f(\tilde{\eta}_t^-) \right)$$ (5)

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

\[ \frac{\lambda_t^Q}{\lambda_t} \]  

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

- Implied vol

\[ IVSlope_t = a_{IV} + b_{IV} PNBO_t + \epsilon_t \] (7)

- PNBO (public net buy orders): total open buy orders 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

\[ r_{t+j,t+k} = a + b PNBO_t + \epsilon_{t+j,t+k} \] (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
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

\[
\gamma_{D,t} = \gamma + \alpha \frac{\lambda_{\tau(n)} - \bar{\lambda}}{d_{D,\tau(n)}}
\]

(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 \(\lambda_t\).
Conclusion

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