Discussion of

Incentive Constrained Risk Sharing, Segmentation, and Asset Pricing

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Question

- **What are asset pricing implications of collateral constraints?**
  - Simple, clean model with **endogenous constraints**

- **Results**
  - Assets trade at **discount** due to limited collateralizability
  - **Segmentation** of asset holdings by risk aversion
  - **Expected returns concave in** β

- **Novel features**
  - All assets **tradeable but limited collateralizability**
  - Heterogeneity in preferences

Outline

- **Model**

- **What is friction?**
  - Incentive compatibility, diversion, and borrowing constraint
  - Deriving collateral constraints from limited enforcement

- **Law of one price – does it hold or fail?**
  - Basis vs. discount and collateral premium

- **How general are results?**
  - Expected returns concave in β
  - Segmentation

Model

- **Simple and clean**
  - Static
    - Two dates 0 and 1
    - Consumption only at date 1
    - States $\omega \in \Omega$
  - Pure exchange economy (no production)
  - **"Canonical GE model"**
- **Motive for trade**
  - **Heterogenous preferences**
    - Mostly 2 types with CRRA $0 \leq \gamma_1 \leq \gamma_2 \leq 1$
  - Initial endowments share of aggregate endowment at date 1
- **Assets**
  - Tradeable trees (or "assets") pay non-negative dividends $d_j(\omega) \geq 0$
  - Limited collateralizability (or pledgeability) (see below)

What is Friction?

- **Incentive compatibility constraint** – "imperfect recoverability"
  - Agent "can make a take-it-or-leave-it offer to ... creditors"
  - Creditors "can only seize fraction $1 - \delta \in (0, 1]$ of ... assets"
  - See Kiyotaki/Moore (1997)'s motivation for collateral constraint

- **Notation** – **collateralizability** θ, where $\theta \equiv 1 - \delta$; Kiyotaki (1998)

- Alternative motivation: **Diversion** – agents "can divert" $1 - \theta$
  - As in Bolton/Scharfstein (1990), Holmström/Tirole (1997), DeMarzo/Fishman (2007), DeMarzo/Sannikov (2006)

What is Friction? (Cont'd)

- **Strategic default**
  - Agent who strategically defaults "obtains fraction $1-\theta$ of his *long* positions in trees and Arrow securities," so

$$\hat{c} = (1-\theta)\Big[\int d_j dN_j + a^+\Big]$$

where dependence of agent's type i and state ω is suppressed

- **Incentive compatibility constraint**

$$c \geq \hat{c}$$

- **State-contingent borrowing constraint**
  - Using budget constraint and substituting into IC, we get

$$\theta\Big[\int d_j dN_j + a^+\Big] \geq a^-$$

where a^- is short position with net position $a = a^+ - a^-$

  - Weakly optimal to choose either $a^+ = 0$ or $a^- = 0$ (Lemma 1), so

$$\theta \int d_j dN_j \geq -a$$

What is Friction? – Limited Enforcement

- **Risk sharing and asset pricing with limited enforcement**
  - Kehoe/Levine (1993), Kocherlakota (1996), Alvarez/Jermann (2000)
  - Default with exclusion (autarky as outside option)
- **Limited enforcement without exclusion (1)**
  - Chien/Lustig (2010), Lustig/van Nieuwerburgh (2005)
  - Trees/houses perfectly collateralizable but not labor income
- **Limited enforcement without exclusion (2)**
  - Rampini/Viswanathan (2010, 2013, forthcoming, 2018)
  - **Imperfect collateralizability** of capital/houses but not cash flow
- **This paper: Only imperfectly collateralizable trees**

Deriving Collateral Constraints from Limited Enforcement

- **Derivation à la Rampini/Viswanathan**
  - **Limited enforcement (LE)**: Agents can default on promises and abscond with $1-\theta$ of any **trees** they hold

$$u(c) \geq u(\hat{c}) \tag{LE}$$

where

$$\hat{c} \equiv (1-\theta) \int d_j dN_j$$

- **Agent's problem**

$$\max_{c,a,N_j} E[u(c)]$$

subject to (LE), $\forall \omega \in \Omega$, and

$$\begin{aligned} w &\geq \sum_{\omega \in \Omega} q(\omega) a(\omega) + \int p_j dN_j \\ a + \int d_j dN_j &\geq c, \qquad \forall \omega \in \Omega \end{aligned}$$

Collateral Constraints Derived à la Rampini/Viswanathan

- **Limited enforcement (LE) $\Leftrightarrow$ Collateral constraints (CC)**
  - Budget constraint next period binds so write (LE) as

$$u\Big(a + \int d_j dN_j\Big) \geq u\Big((1-\theta)\int d_j dN_j\Big)$$

  - Since $u(c)$ is strictly increasing, write equivalently

$$a + \int d_j dN_j \geq (1-\theta)\int d_j dN_j$$

    and rearrange to get **collateral constraint (CC)**

$$\theta \int d_j dN_j \geq -a \tag{CC}$$

- Directly determines net promise $(a = a^+ - a^-)$
  - Long positions in collateralized claims fully collateralizable so

$$\theta \int d_j dN_j + a^+ \geq a^-$$

  - θ does not multiply a^+ – Lemma 1 not required
  - Timing: first, agents' default decisions; then payments implemented

Alternative Implementation with Short Sale Constraints

- **Implementation: fully levered trees and short sale constraints**
  - "Hedging implementation" in Rampini/Viswanathan
  - Suppose lever all trees fully $-\hat{a} \equiv \theta \int d_j dN_j$
  - Then buy back collateralized claims (if necessary) $h \equiv a - \hat{a}$
  - Rewrite collateral constraint as **short sale constraint (SSC)**

$$a + \theta \int d_j dN_j = a - \hat{a} = h \geq 0 \qquad \text{(SSC)}$$

- **Agent's problem**

$$\max_{c,h,N_j} E[u(c)]$$

subject to (SSC), $\forall \omega \in \Omega$, and

$$\begin{aligned} w &\geq \sum_{\omega \in \Omega} q(\omega) h(\omega) + \int \wp_j dN_j \\ h + (1-\theta) \int d_j dN_j &\geq c, \qquad \forall \omega \in \Omega \end{aligned}$$

where **down payment** $\wp_j \equiv p_j - \theta \sum_{\omega \in \Omega} q(\omega) d_j(\omega)$

Law of One Price – Does it Hold or Fail?

- **Law of One Price does not hold due to basis**
  - Define $M(\omega) \equiv \frac{q(\omega)}{\pi(\omega)}$ and $A_i(\omega) \equiv \frac{\mu_i(\omega)}{\lambda_i \pi(\omega)}$ then

    $$p_j \geq \mathbb{E}[M d_j] - (1-\theta)\mathbb{E}[A_i d_j]$$

    so basis relative to replicating portfolio

- **Two pricing kernels!** (One agent-specific)
  - Pricing kernel for collateralized claims $M(\omega)$
  - Pricing kernel for non-collateralizable part $M_i(\omega)$

    $$M_i(\omega) \equiv \frac{u_i'(c(\omega))}{\lambda_i} = \frac{q(\omega)}{\pi(\omega)} - \frac{\mu_i(\omega)}{\lambda_i \pi(\omega)}$$

    and therefore

    $$p_j \geq \theta \mathbb{E}[M d_j] + (1-\theta)\mathbb{E}[M_i d_j]$$

  - Collateralized claims premium (non-collateralizable part discount)

    $$M(w) \geq M_i(\omega)$$

  - Here: non-collateralizable part still tradeable – clever

How General are Results?

- **Results for 2-by-2 case: 2 agent types and 2 states**
  - Asset structure

$$d_j(\omega) = (1 - j)\mathbf{1}(\omega_1) + j\mathbf{1}(\omega_2)$$

    where ω_2 is high aggregate endowment state

- **Segmentation – do not hold market portfolio!**
  - Less (more) risk averse hold high (low) consumption beta assets
  - Intuition seems general – can we say more?
  - Would intermediate type hold intermediate assets or all assets?
  - First best with heterogeneity in risk aversion similar (Dumas (1989))?

- **Concavity in consumption beta** (Black (1972))
  - Less (more) risk averse discounts low (high) state more

$$M_1(\omega_1) < M(\omega_1) \qquad \text{and} \qquad M_2(\omega_2) < M(\omega_2)$$

  - Intermediate assets have higher returns – general?

Conclusion

- **Clever model**
  - **Limited collateralizability of perfectly tradeable assets**
  - No idiosyncratic risk instead heterogeneity in risk aversion
  - Interesting implications – segmentation and concave expected returns

- **Suggestions**
  - Friction? – Embrace **limited enforcement**
    - Derive collateral constraints à la Rampini/Viswanathan
    - Diversion is a diversion
  - Generality?
  - Dynamics?