Ross Prize Presentation

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Liquidity Asset Pricing Model (LAPM)

States and prices:

- ω - the state of nature revealed at date 1
- $f(\omega)$ - the probability of ω
- $s(\omega)f(\omega)$ - the date-0 price of liquidity delivered in state ω (at date 1)

Firms:

- J firms indexed by j
- Investments I_j at date 0 and $i_j(\omega) \leq I_j$ at date 1 in state ω
- Production technologies described by $\{\rho_{j0}(\omega), \rho_{j1}(\omega), \rho_j(\omega)\}$, where $\rho_{j0}(\omega)$ is pledgeable date-2 return, $\rho_{j1}(\omega)$ is total date-2 return, and $\rho_j(\omega)$ is reinvestment cost at date 1 – all per unit of continuation investment $i_j(\omega)$. Key assumption: $\rho_{j1}(\omega) > \rho_{j0}(\omega)$ (non-pledgeable wedge)

Outside liquidity:

- Exogenously given assets $\{L_k\}$, $k = 1, ..., K$, providing liquidity $L_k(\omega) \geq 0$ in state ω.
- *Aggregate supply of liquidity in state* ω is

$$L_S(\omega) = \sum_j \rho_{j0}(\omega) i_j(\omega) + \sum_k L_k(\omega). \tag{1}$$

- *Aggregate demand for liquidity in state* ω is

$$L_D(\omega) = \sum_j \rho_j(\omega) i_j(\omega). \tag{2}$$

Equilibrium

- Set of prices $s(\omega) \geq 1$, and firm plans $\{I_j, i_j(\omega)\}$ such that net aggregate liquidity demand by the corporate sector satisfies:

$$\sum_j [\rho_j(\omega) - \rho_{j0}(\omega)] i_j(\omega) \leq \sum_k L_k(\omega), \qquad \forall\ \omega. \tag{3}$$

with an equality whenever $s(\omega) > 1$.

- Given prices $\{s(\omega)\}$, firm j solves the following problem:

$$\max_{\{I_j, i_j(\cdot)\}} \quad \sum_\omega [\rho_{j1}(\omega) - \rho_j(\omega)] i_j(\omega) f(\omega) \tag{4}$$

subject to

$$(i) \quad \sum_\omega [\rho_{j0}(\omega) - \rho_j(\omega)] i_j(\omega) s(\omega) f(\omega) \geq I_j - A_j \tag{5}$$

$$(ii) \quad 0 \leq i_j(\omega) \leq I_j, \quad \forall \omega.$$

Main Theorem: Equilibrium exists and is constrained efficient.

Key idea: Instead of viewing firm as choosing a continuation scale $i_j(\omega)$ have it choose the demand for liquidity $\ell_j(\omega)$:

$$\ell_j(\omega) \equiv [\rho_j(\omega) - \rho_{j0}(\omega)] i_j(\omega). \quad (6)$$

Transforms model to a standard exchange economy without production.

Asset prices

- *Date-0 prices of exogenous assets.*

$$q_k = \frac{\sum_\omega f(\omega) L_k(\omega) s(\omega)}{\sum_\omega f(\omega) L_k(\omega)} \geq 1 \quad (7)$$

- *Date-0 prices of equity shares* (defined as the amount that firm j can raise for investment at date 0 per unit of expected return at date 1):

$$q_j = \frac{\sum_\omega f(\omega)[\rho_{j0}(\omega) - \rho_j(\omega)] i_j(\omega) s(\omega)}{\sum_\omega f(\omega)[\rho_{j0}(\omega) - \rho_j(\omega)] i_j(\omega)}. \quad (8)$$

Comments:

- Minor deviation from AD-type framework. Disciplined. Still some interesting implications with robust logic.
- Easy to expand on: more than one technology per firm, income shocks, etc (Jean's book)
- Highlights simultaenous liquidity and risk management
- Pricing of liquidity guide for optimal use of liquidity: (i) private sector, (ii) government, (iii) international liquidity
- State-contingent use of collateral proxied by repo market
- No link between consumers and producers, no dynamics (but see LAPM paper)