Discussion of “Liquidity risk and the dynamics of arbitrage capital” (by Kondor & Vayanos)

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These are my private views and do not necessarily reflect those of the ECB or the Eurosystem

What the paper does

- Dynamic asset-pricing model
  - risk-averse hedgers have aggregate endowment risk
  - risk-averse arbitrageurs provide insurance

- Variation of arbitrageur wealth drives asset prices
  - arbitrageurs' inter-temporal consumption smoothing drives wealth
  - wealthier speculators become less risk averse
  - increases asset prices (and liquidity)
  - decreases profitability of arbitrage (and wealth)

- Many interesting results
  - closed-form, despite heterogeneous agents & general equilibrium
  - co-movement of liquidity and asset prices

Hedgers

- (Short lived)
- CARA utility
- Hedging motive: asset endowment u

$$v_{t+1} - v_t = rv_t + (D_{t+1} - \pi_t)x + D_{t+1}u$$

- Standard demand

$$x_t = \frac{E_t[D_{t+1} - \pi_t]}{\alpha Var[D_{t+1} - \pi_t]} - u$$

Arbitrageurs

- Long lived
- CRRA utility
- Chose how much to consume and invest

$$w_{t+1} - w_t = rw_t + (D_{t+1} - \pi_t)y_t - c_t$$

- Standard-looking asset demand

$$y_t = \frac{E_t[D_{t+1} - \pi_t]}{A(w_t)Var[D_{t+1} - \pi_t]}$$

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General equilibrium

- Market clearing

$$x_t + y_t = 0$$

- Trading the endowment *u*

$$\frac{E_t[D_{t+1} - \pi_t]}{\alpha Var[D_{t+1} - \pi_t]} + \frac{E_t[D_{t+1} - \pi_t]}{A(w_t)Var[D_{t+1} - \pi_t]} = u$$

- What is the "real-world" setting?
  - who are CARA and CRRA agents?
  - why does endowment *u* line up with CARA utility?

Asset prices

- Asset prices here

$$\pi_t = \bar{D} - \frac{\alpha A(w_t)}{\alpha + A(w_t)} Var[D_{t+1} - \pi_t] u$$

- Sanity check: *u*=0 (no reason to trade)
  - price equals expected asset pay-off, no risk-premium

$$\pi_t = \bar{D}$$

  - no trade

$$x = 0, \quad y = 0$$

Wealth and risk aversion

- Arbitrageurs' effective risk-aversion depends on wealth

$$A(w_t) = \frac{\gamma}{w_t} - \frac{q'(w_t)}{q(w_t)}$$

- *q* is the shadow price of wealth
  - if more consumption today, more utility today
  - but less wealth and less consumption tomorrow
  - effective risk-aversion increases if show price increases
  - shadow price price constant if log-utility (unit inter-temporal elasticity of substitution)

- Cases considered: risk-aversion decreases in wealth

Contingent claim analysis

- Stochastic discount factor (SDF) prices asset pay-off

$$p_t = E[m_{t+1} x_{t+1}]$$

- Risk premium given by covariance of pay-off with SDF

$$p_t = \frac{E[x_{t+1}]}{r} + Cov[m_{t+1}, x_{t+1}]$$

where the risk-free rate is given by

$$r = \frac{1}{E[m_{t+1}]}$$

Interpretation of pricing equation

$$p_t = \frac{E[x_{t+1}]}{r} + Cov[m_{t+1}, x_{t+1}]$$

$$p_t = \bar{D} - \frac{\alpha A(w_t)}{\alpha + A(w_t)} Var[D_{t+1} - p_t]u$$

- Wealth drives time-series variation of risk-premium (in short-lived case)
  - instead of covariance of asset pay-offs with SDF
- Variance of asset pay-off matters
  - normally idiosyncratic risk is not priced but *u* is an aggregate shock
- The (exogenous) risk-free rate matters only through wealth
  - instead of discounting at endogenous risk-free rate

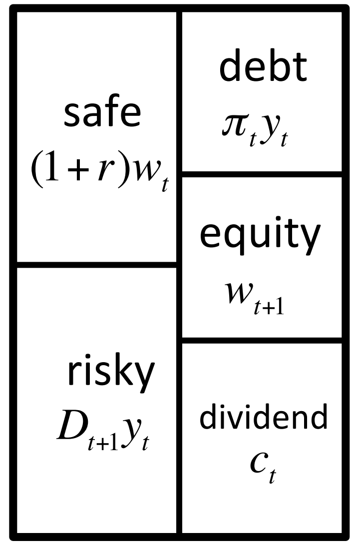
Illiquidity (short-lived asset)

- As in Kyle (1985)

$$\lambda_t = \frac{\frac{\partial \pi_t}{\partial u}}{\frac{\partial x_t}{\partial u}} = \frac{\alpha A(w_t)}{\alpha + A(w_t)} Var[D_{t+1} - \pi_t]$$

- More wealth, lower risk aversion, lower illiquidity

Wealth vs. margins



- Here:
  - no (binding) borrowing constraint, wealth changes risk-aversion
  - pecuniary externality but complete markets -> constrained-efficient allocation
- Biais, Heider, Hoerova (2016)
  - endogenous margins similar to endogenous wealth (safe asset)
  - risk-neutral, complete markets, but borrowing constraint (moral hazard)
  - pecuniary externality -> planner could do better