Discussion of "The I Theory of Money" by M. Brunnermeier and Y. Sannikov

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Overview

- A novel and interesting theory of money.
- Money plays an important role as a store of value.
- It is a substitute for intermediaries.
  - Intermediaries help channel capital to productive uses.
  - Their ability to do so depends on their wealth as compared to aggregate capital.
- The value of money depends on the extent of intermediation.

Model

- Households
    - Technologies are denoted by ω.
    - Production technologies $\alpha^{\omega} - i_t^{\omega}$.

    $$\frac{dk_t}{k_t} = (\Phi(i_t) - \delta^{\omega})\, dt + d\epsilon_t^{\omega}$$

    - The term $d\epsilon_t^{\omega}$ reflects Brownian fundamental shocks to technology ω.
    - Better types have higher α^{ω} and lower δ^{ω}.
- Continuous switching between technologies.
- Clever trick to ensure that the distribution of wealth across technology types is irrelevant.
- Log utilities.

Model

- Intermediaries
    - Log utilities.
    - Can lend to productive households.
    - Can invest in every technology.
    - A wedge between the rate of return of households and intermediaries equal to ϖ.
- Markets for Capital, money and consumption goods
    - A market for capital K_t.
    - A market for gold with price P_t.
    - Gold is fundamentally unproductive, but serves as a store of value.

Solution highlights

- Euler equation for the households

$$E[dr_t^\omega - dr_t^M] \leqslant \text{Cov}\left(d\epsilon_t^\omega + d\epsilon_t^q - d\epsilon_t^M, d\epsilon_t^M + \frac{\xi(\eta_t, \omega)q_t}{\theta(\omega)(q_t + p_t - \eta_t)}(d\epsilon_t^\omega + d\epsilon_t^q - d\epsilon_t^M)\right)$$

  - Does continuous changing of types imply that there is no intra-cohort heterogeneity?
  - Important point: A household of type ω can only invest in a technology of type ω and "money."

- Euler equation for intermediaries

$$E[dr_t^\omega - \varpi dt - dr_t^M] \leqslant \text{Cov}\left(d\epsilon_t^\omega + d\epsilon_t^q - d\epsilon_t^M, d\epsilon_t^N\right),$$

where

$$d\epsilon_t^N = d\epsilon_t^M + \frac{q_t}{\eta_t}\int_\Omega \zeta_t(\omega')\left(d\epsilon_t^{\omega'} + d\epsilon_t^q - d\epsilon_t^M\right)d\omega_t'$$

- Intermediaries invest in all technologies

Solution highlights

- Single state variable that characterizes the equilibrium
- The ratio of intermediary capital to aggregate wealth
- When intermediaries have a lot of capital
    - Value of money is small.
    - Lots of "inside" money.
    - They can "borrow" from unproductive households and channel funds to productive uses.
- When intermediaries have little capital
    - Value of money is high.
    - Little "inside" money.
    - Agents cannot invest as much in productive resources.

1. Riskless Bonds

- Money serves mainly one purpose in this model.
- It is a store of value.
- Would money still have value if agents can trade in a zero net supply, riskless bonds with dynamics

$$\frac{dB_t}{B_t} = r_t dt,$$

  where r_t is endogenously determined.
- It would be interesting if money had value, *even if* agents can trade in riskless bonds.
- Possibly the inequalities in the Euler equations could play a role?

2. Models of limited participation

- The paper (setup/results) resembles what we know about models of limited participation. (Saito, Basak and Cuoco, etc.)
    - More wealth in the hands of stock market participants:
    - More leverage in the economy,
    - Lower equity premium,
    - More investment, etc..
    - Less wealth in the hands of stock market participants:
    - Less leverage in the economy,
    - Higher equity premium,
    - Lower real rates etc.

- Indeed, any model where agents hold different portfolios will imply similar joint behavior of the equity premium and the interest rate. (Chan and Kogan, Garleanu and Panageas etc.)

- This underscores the need to emphasize that changes in the price level are not just alternative expressions of the real interest rate.

3. Welfare

- If money can be printed at zero social cost,
- Friedman concluded that equalizing the private marginal opportunity cost (nominal interest rate) with the social cost implies a zero nominal interest rate.
- What is the analogue here? Flood the world with money?
- Also, the usage of Markov, non-history-dependent policies may be quite limiting in terms of analyzing monetary policy. (Woodford)

4. The crisis and the existing models

- One striking thing about the recent crisis
    - This was a household credit crisis,
    - ... and then a government debt crisis.
    - Very low household savings rates fueled by rising real estate prices.
    - Ironically, during the period of the "savings glut", the corporate sector accounted for the large amounts of savings.
- Our existing models
    - attribute everything to mis-allocation of capital in the corporate sector.
    - There are good projects out there and they simply don't get financed.
    - ... But are corporations truly constrained in their investment given all the free cash flow that they have?