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 $\omega$.
  - 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 $\omega$.
- Better types have higher $\alpha^\omega$ and lower $\delta^\omega$.

- 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 $\omega$.

- 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

\[
E[dr^\omega_t - dr^M_t] \leq \text{Cov} \left( d\epsilon^\omega_t + d\epsilon^q_t - d\epsilon^M_t, d\epsilon^M_t + \frac{\xi(\eta_t, \omega)q_t}{\theta(\omega)(q_t + p_t - \eta_t)}(d\epsilon^\omega_t + d\epsilon^q_t - d\epsilon^M_t) \right)
\]

- Does continuous changing of types imply that there is no intra-cohort heterogeneity?

- Important point: A household of type \( \omega \) can only invest in a technology of type \( \omega \) and “money.”

- Euler equation for intermediaries

\[
E[dr^\omega_t - \omega dt - dr^M_t] \leq \text{Cov} \left( d\epsilon^\omega_t + d\epsilon^q_t - d\epsilon^M_t, d\epsilon^N_t \right),
\]

where

\[
d\epsilon^N_t = d\epsilon^M_t + \frac{q_t}{\eta_t} \int_\Omega \zeta_t(\omega')(d\epsilon^\omega'_t + d\epsilon^q_t - d\epsilon^M_t) d\omega'_t
\]

- 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?