Efficient Steady State in Money Search Model: A Mechanism Design Approach

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Main Result

This paper considers an infinitely repeated economy which consists of infinitely many agents. They are matched pairwise at random to exchange goods using divisible fiat money as a medium of transaction. From mechanism design perspective, this paper builds a trading mechanism which weakly implements only efficient first-best outcome with non-degenerate money holding distribution in the steady state. Under this trading mechanism, I showed the existence of Markov Nash equilibrium strategy which only derives nominal indeterminacy of stationary equilibria. In preceding studies, it was shown that when fiat money is divisible, there exists a continuum of single-price equilibria with different welfare levels, whenever one such equilibrium exists. Thus, this paper gives one approach to overcome with the problem of real indeterminacy of steady state equilibria.

Model

Economy consists of measure 1 of infinitely-lived agents and a social planner. There are $K \geq 3$ types of agents with equal numbers who consume and supply. Type k agents produce only type k good and consume only type $k+1$ good. Goods are divisible and non-storable so that they cannot be used as a commodity money. Assume that there exists unique first-best amount of production and consumption which maximizes total surplus of a given pairwise match. Social planner print and distribute fiat money without any cost. Money holding distribution is a common knowledge. In order to reduce friction due to randomness of match, there are countably many marketplaces $\{I, II, III, \ldots\}$ with physically identical sides X and Y. These marketplaces are used to avoid undesired match in the equilibrium.

Trading Mechanism

Let p be any positive real number. Trading stages are as follows:
Stage 1: Declare their not necessarily true money holdings to social planner.
Stage 2: Agents simultaneously choose a marketplace and which side to take.
Stage 3: An agent in one side randomly matched with an another in the opposite side. Transaction occurs only when both agree to follow social planner's rule. When agents follow social planner's rule, the only possible trade is the first-best amount of good for price determined by certain function.
Stage 4: With small exogenously given probability, money holding increases or decreases depending on the role experienced at Stage 3.

Stationary Equilibrium

In this trading environment, I showed the existence of stationary Markov Nash equilibrium strategy with non-degenerate stationary money holding distribution. I consider a Markov strategy σ^* as follows: if agent k cannot afford the price set by social planner's rule, then he goes to the marketplace k and choose side X, whereas if he can afford the price set by social planner's rule, then he goes to the marketplace $k+1$ and choose side Y. When money holding distribution is stationary, σ^* is a Nash equilibrium with price is given by p. When all agents are following σ^*, the stationary money holding distribution must have the same density function on $[0, p)$ and $[p, 2p)$. There is a continuum of money holding distribution satisfying this condition, but welfare is the same for all because the amount consumed and produced is fixed as the first-best amount and the measure of buyers and sellers are both $\frac{1}{2}$. Thus, σ^* implements only efficient or welfare maximizing outcome so that there is only a nominal indeterminacy of equilibria.