Information, Liquidity, Asset Prices and Monetary Policy

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Intoduction

- why hold money?
  - money plays the role as a medium of exchange
- why use fiat money rather than other assets?
  - recognizability $\rightarrow$ difference in liquidity
  asset as an imperfect substitute to money
- question of this paper:
  what causes the difference in recognizability?
  - asymmetric information rather than self-fulfilling prophecy

Setup

A modified version of Lagos and Wright (2005)

- discrete time
- a continuum of infinitely lived agents, of total measure 1
- two subperiod in each period:
- subperiod 1: decentralized market for heterogeneous goods
  - produce heterogeneous goods that meet others' want
  - random matching $\rightarrow$ partners
  - bilateral bargaining $\rightarrow$ terms of trade
  - medium of exchange: fiat money, and asset
- subperiod 2: centralized market for homogeneous good
  - agents produce homogenous goods
  - assets are claims to homogeneous goods in the future
  - walrasian market for the homogeneous goods and all assets

Asset

- fiat money: bears no fruit ; cannot be privately produced
- other asset
  - fake ones bearing no fruits can be mixed with good asset
  - cost of producing fake asset is zero
- importance recognizability
  - assets can be accepted a medium of exchange only when they are recognized to be good asset
    - in DM, fiat money are recognizable
      other assets recognizable with some probability
    - in CM, all assets are recognizable

Agents' period payoff

- period payoff:
  - payoff in subperiod 1: $u(q) - c(q')$, where $u(0) = c(0) = c'(0) = 0$, $U'(0) = u'(0) = \infty$
    q: consumption from purchase
    q': production for sales
  - payoff in subperiod 2: $U(X) - H$
    X: consumption of homogeneous goods
    H: cost of producing H units

Agents' expected payoff I

- payoff at time 0 $E_0 \sum_{t=0}^{\infty} \beta^t \{u(q_t) - c(q_t') + U(X_t) - H_t\}$
  - in DM each period:
    - * probability λ: produce and sell
    - * probability λ: buy and pay by money or asset
    - * probability $1 - 2\lambda$: no trade
    - * conditional on having a trade: payoff depends on
    - - asset holdings of buyer
    - - the recognizability of the assets in the portfolio

Recognizability of asset

- suppose there a n assets, numbered from 1 to n.
- agents recognize a subset of the assets $S \in 2^{\{1,\dots,n\}}$
- the type of meeting is the set of recognizable assets of buyers.
- the measure over the random type of meeting: ρ_S.
- trade in decentralized markets depend not on total wealth but on the total wealth of recognizable assets

Agents' expected payoff II

- $W_t(y)$ value function in CM; $V_t(\mathbf{a})$ value function in DM, ϕ_t asset price
- payoff at time t

$$
\begin{aligned}
V_t(\mathbf{a}) = & \ E_t \sum_{\tau=t}^{\infty} \beta^{\tau-t} \{u(q_\tau) - c(q'_\tau) + U(X_\tau) - H_\tau\} \\
= & \ \lambda \int \sum_s \rho_s \left[u(q_t(y_s)) + W_t(y - p_t(y_s))\right] dF_t(\tilde{\mathbf{a}}) \\
+ & \ \lambda \int \sum_s \rho_s \left[-c(q_t(\tilde{y}_s)) + W_t(y + p_t(\tilde{y}_s))\right] dF_t(\tilde{\mathbf{a}}) \\
+ & \ (1-2\lambda) W_t(y)
\end{aligned}
$$

- $y_S = \phi \cdot \mathbf{a}\mathbf{1}_S$, $y = \phi \cdot \mathbf{a}$

Agents' problem in the centralized market

Assume stationarity

$$
\begin{aligned}
& W(y) = \max_{X,H,\hat{\mathbf{a}}} U(X) - H + \beta V(\hat{\mathbf{a}}) \\
\text{s.t.} \quad & X = H + y - \textstyle\sum_j \phi_j \hat{a}_j + T \\
& H \in [0, \bar{H}] \\
& X \geq 0 \\
& a_j \geq 0
\end{aligned}
$$

- $W(y)' = 1$ where $y = \sum_j (\delta_j + \phi_j) a_j$

Agents' problem in the decentralized market

$$V(\mathbf{a}) = W[y(\mathbf{a})] + \lambda \sum_{S \in P} \rho_S \{u[q_S(\mathbf{a})] - p_S(\mathbf{a})\} + \lambda K$$

- $(q_S(\mathbf{a}), p_S(q_s(\mathbf{a})))$ is decided by bargaining
  - and depends on $y_S = \phi \cdot \mathbf{a}\mathbf{1}_S$
- K: expected gain from trade as a seller
  - it does not depend on $\mathbf{a}$

Definition of equilibrium

Definition

A stationary equilibrium is asset holding $\mathbf{a}$ at the beginning of DM, asset holding at the beginning of CM, consumption and production in both subperiod, and prices ϕ_j given ϕ_j^- such that

- given ϕ_j, the allocation solves agents' problem in both subperiods
- market clearing in CM: $\mathbf{a} = \mathbf{A}$
- allocation satisfies the Transversality condition

Decision in the centralized market

$$
\begin{aligned}
& W(y) = \max_{X,H,\hat{\mathbf{a}}} U(X) - H + \beta V(\hat{\mathbf{a}}) \\
\text{s.t.} \quad & X = H + y - \textstyle\sum_j \phi_j \hat{a}_j + T \\
& H \in [0, \bar{H}] \\
& X \geq 0 \\
& a_j \geq 0
\end{aligned}
$$

where $y = \sum_j (\delta_j + \phi_j) a_j$

- FOC (assume $H < \bar{H}$):

$$
-\phi_j + \beta \frac{\partial V(\hat{\mathbf{a}})}{\partial \hat{a}_j} \leq 0, = \text{ if } \hat{a}_j > 0, \forall j
$$

- $W'(y) = 1$: agents with different $\mathbf{a}$ $\rightarrow$ same $\hat{\mathbf{a}}$

Decision in the decentralized market

$$V(\mathbf{a}) = W[y(\mathbf{a})] + \lambda \sum_{S \in P} \rho_S \{u[q_s(\mathbf{a})] - p_S(\mathbf{a})\} + \lambda K$$

bargaining outcome:

- If $y_S(\mathbf{a}) \geq y^*$, then
  - $p_S(\mathbf{a}) = y^*$, and $q_S(\mathbf{a}) = q^*$
  - $u'(q^*) = c'(q^*)$
- If $y_S(\mathbf{a}) < y^*$, then
  - $p_S(\mathbf{a}) = y_S(\mathbf{a})$, $q_S(\mathbf{a}) < q^*$
  - $y_S(\mathbf{a}) = z(q) = \theta c(q) + (1-\theta)u(q) < z(q^*)$
  - θ: bargaining power of seller
  - **A wedge between MU and MC**: $u'(q) > c'(q)$

Euler Equation

$$\phi_j^- = \beta(\delta_j + \phi_j)\left\{1 + \lambda \sum_{S \in P} \rho_S l(q_S(\mathbf{A}))\mathbf{1}_{j \in S}\right\}$$

$$l(q) = \frac{u'(q) - c'(q)}{z(q)}$$

- asset price depends on:
  - dividend: δ_j
  - search friction λ
  - recognizability: ρ_S
  - liquidity premium: $l(q)$

Trade-off of holding assets

- gain: dividend in CM
- loss: risk of being not recognized in DM

- as $\lambda \to 0$, $\delta_{\text{fiat money}} = 0 < \delta_{\text{other asset}}$
  - the price of fiat money decreases exponentially relative to that of other assets
- as $\rho_S \to 0$
  - liquidity premium goes down
- trade-off between recognizability and dividend gain

Comparative statics on liquidity premium

- if there is only one asset not perfectly recognizable:
  - liquidity premium decreases monotonically with asset supply
  - liquidty is "saturated" at certain point with zero premium
- if there are two assets: recognizable fiat money and equity
  - liquidity premium for more recognizable wealth is higher

Value of an asset

- value of a asset:
  - fundamental value
  - value as a medium of exchange
- value as a medium of exchange depends on
  - recognizability of the asset in DM

Information acquisition

- with information acquisition, ρ_S endogenized
- strategic complementarity between decisions of information acquisition
- possibility of multiple equilibria
- sensitivity of liquidity to asset supply or fundamentals

Conclusion

Thank you.