Money as a Store of Value

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September 2013

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  - Money also stores value across states of the world: Bewley (1980,1983)
- But what if it's possible to trade claims on productive assets?
  - Unless dividends are very small (assets are unproductive), it seems money is redundant; see, Brock (1979), Scheinkman (1980), and Santos and Woodford (1997).

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- Precautionary savings demand can drive net returns below the growth rate.
- Hence, a role for money.
- Also a role for inflation; inflation tax + lump sum distribution of revenue distort saving but improves insurance.

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- Extensions - including rate of return differences.

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Agents

- Continuum of infinitely lived individuals, length N.
- Utility from consumption c given by

$$U_t^i = \mathbb{E} \sum_{\tau=0}^{\infty} \beta^{\tau} u(c_{t+\tau}^i).$$

Technology

- *Non-tradable assets:* Continuum of length N of infinitely lived trees each yielding y units of fruit per period.
- *Tradable assets:* Continuum, length A of trees with stochastic longevity, each yielding d units of fruit per active period.
- Each tradable tree survives to next period with probability $q < 1$. New trees arrive at rate $1 - q$. (Crucial.)

Model (cont.): Property rights and trade

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Allocation of new trees

- Every period, each agent obtains one of the new tradable trees with probability $(1 - q)A/N$.

Trade

- (i) Trade in claims to existing trees is costless. (ii) Claims to future trees not tradable. (iii) No borrowing (can be relaxed).

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Partial justification for (ii): Suppose a new tree is initially only observable to the assigned agent, and that the agent can hide the tree at modest cost. Then, only a small share of the tree can be credibly pledged to investors; generates similar lack of diversification.

Model (cont.): Money

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If money supply is fixed

- There is a continuum of length M of an infinitely-lived asset, yielding no dividend.

If money supply is flexible

- In any period t Government may:
  - Print $M_t - M_{t-1} > 0$ and purchase fruit to be divided equally among individuals.
  - Impose lump-sum tax to purchase money $M_{t-1} - M_t > 0$.

Model (cont.): Additional notation

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a_t^i	-	individual i's tradable assets coming into period t
ε_t^i	-	individual i's new tradable assets at t
m_t^i	-	individual i's money at t
p^a	-	price of tradable assets (fruit is numeraire)
p^m	-	price of money

Since we shall look for steady state, consider prices that are independent of t.

Let $\bar{a}_t^i = a_t^i / q$ be assets required to start next period with a_t^i.

Solving Individuals' Problem

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Choose $c_t^i, \bar{a}_{t+1}^i, m_{t+1}^i$ to maximize

$$U_t^i = \mathbb{E} \sum_{\tau=0}^{\infty} \beta^\tau u(c_{t+\tau}^i)$$

subject to the budget constraint

$$c_t^i = y + (p^a + d)(a_t^i + \varepsilon_t^i) - p^a \bar{a}_{t+1}^i + p^m \left(m_t^i - m_{t+1}^i\right)$$

and short-sale constraints

$$a_{t+1}^i \geq 0,$$
$$m_{t+1}^i \geq 0.$$

Yields behavioral relationships

$$c_t = \phi_c(a_t, m_t, \varepsilon_t),$$
$$\bar{a}_{t+1} = \phi_a(a_t, m_t, \varepsilon_t),$$
$$m_{t+1} = \phi_m(a_t, m_t, \varepsilon_t).$$

Deriving a Stationary Equilibrium

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Equilibrium in market for alienable assets requires

$$\int \phi_a(a, m, \varepsilon) d\Phi(a, m, \varepsilon) = A,$$

where $\Phi(a, m, \varepsilon)$ denotes the density of individuals with respective asset holdings.

Likewise for money, if value is positive,

$$\int \phi_m(a, m, \varepsilon) d\Phi(a, m, \varepsilon) = M.$$

Note, in steady-state, agents may have very different wealth.

First Calibration: Mostly Tradable Assets

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$$u(c) = \frac{c^{1-\mu}}{1-\mu}$$

$N = A = M = d = 1$
$\beta = 0.98$
$y = 0.1$
$q = 0.92$ (possibly even lower; Bartelsmann et al, 2013).

Equilibrium Asset Prices

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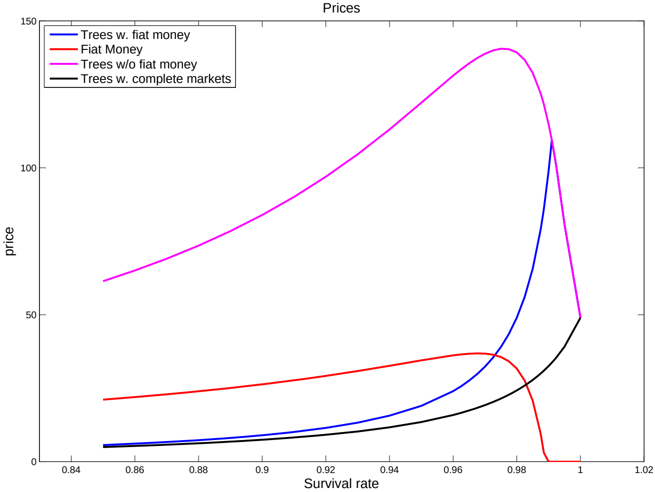

Interpretation

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Think about economy with no money, but durable fruit.

How much fruit would be stored in steady state? (Lots!)

Pareto-improving monetary reform: Give people money in return for storage. Distribute collected fruit lump-sum.

Quantitative problem: In this example, money stock is 25 times GDP, and too large welfare improvement.

Second Calibration: Fitting Labor Share

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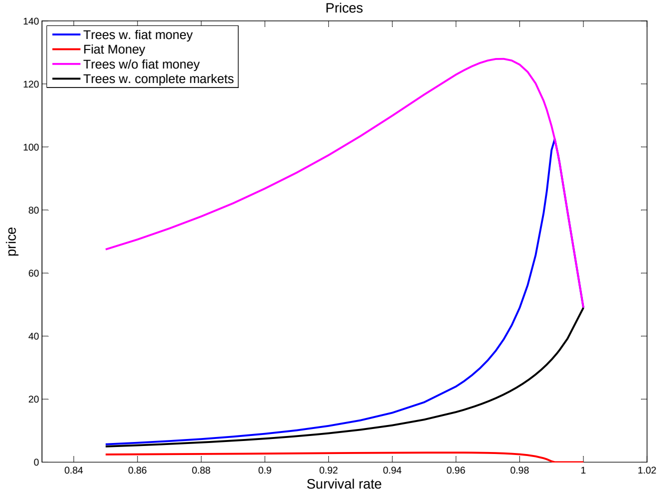

Third Calibration: Fitting More Data

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Choose parameters as follows:

- Tree composition and returns to fit labor share and wealth Gini.
- Growth 1.5 percent.
- Inflation 1.5 percent

Then, $p_m/(d+y) = 1.71$ (compared to M2/GDP=1.73 in Euro area).

Gain from introducing money instead of perfect storage now corresponds to permanent welfare increase of 2.5 percent.

Optimal Monetary Policy

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Previous literature advocates increasing or constant real value of money.

- Friedman (1969)
- Brock and Scheinkman (1980)
- Bewley (1980,1983)

Not so here. Let Government print money, buy fruit, and distribute lump-sum. (With better targeted policy, optimal inflation will be higher.)

- *Loss:* Distortion of saving (self-insurance).
- *Gain:* Additional public insurance.

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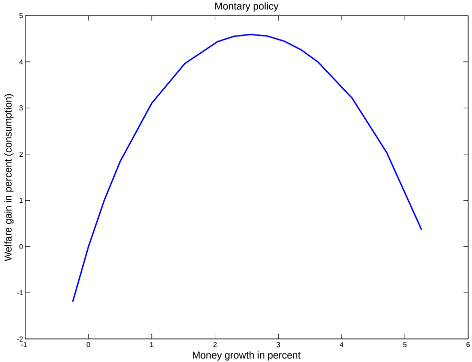

Growth 1.5%, so optimal inflation is here 1.1% (2.6-1.5).
Additional welfare gain is 4.6% of permanent consumption.

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   - Regulation needed to allocate money rents in welfare-maximizing fashion; otherwise handed to private intermediaries, transferred to savers, or dissipated in wasteful competition.
3. Allow transaction costs; yields rate-of-return differential. (So does reserve requirements.)