Liquidity and Inefficient Investment

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- The Great Recession and the ensuing policy debate on the fiscal stimulus have spurred a renewed interest in some basic questions:
- Does a market economy provide the right amount of liquidity ? If not does it provide too little ? Too much ?
- To the extent that there is an inefficiency can the government improve matters? Is there a role for fiscal/monetary policy ?

- These questions have been analyzed in a number of recent contributions. See particularly Holmstrom-Tirole (1998,2011) and Lorenzoni (2008).

- These works focus on firms' liquidity needs
- In this paper we emphasize consumer liquidity

- Consumer liquidity seems germane given the growing evidence (Kahle and Stulz (forthcoming) and Mian and Sufi (2012)) that during the Great recession firms had plenty of liquidity while consumers were severely constrained.
- Other differences: In HT firms’ cash flow is not fully pledgeable and consumers cannot pledge future endowments, whereas we assume only that consumers cannot pledge future labor income
- We stress transaction demand for liquidity

The Framework

- We consider an economy that lasts 4 periods:

  1 ----------------2-------------------3-------------4

- There are two types of agents in equal numbers: doctors and builders.
- Equal chance to be a doctor or builder. Learn type in period 1.
- Doctors want to consume building services in period 2 and builders want to consume doctor services in period 3.
- No discounting.

We write agents' utilities as:

Doctors: $$U_d = w_d + b - \frac{1}{2} l_d^{\,2}$$

Builders: $$U_b = w_b + d - \frac{1}{2} l_b^{\,2}$$

b = quantity of building services consumed by doctors;

l_d = labor supplied by the doctors;

d = quantity of doctor services consumed by builders;

l_b = labor supplied by builders.

w_i = wheat consumed by ind. *i=d,b in period 4;*

- Constant returns to scale:
  - 1 unit of builder labor yields 1 unit of building services
  - 1 unit of doctor labor yields 1 unit of doctor services.
- There are many doctors and many builders, and so the prices for both services are determined <u>competitively.</u>
- Ignoring wheat the Walrasian equilibrium is

$$p_b = p_d = 1 \qquad d = b = 1 \qquad U_b = U_d = 1/2$$

- But if labor income is not pledgeable, given no double coincidence of wants, no trade

Firms can provide liquidity

- Each agent has a period 1 wheat endowment e>=1
- Two verifiable states of the world. In period 1 wheat can be invested in two projects:
  - a riskless project (storage): one unit of wheat is transformed into one unit of period-4 wheat
  - a risky project: 1 unit of wheat is transformed into R^H >1 units of period-4 wheat with probability π and $R^L < 1$ units with probability $1-\pi$, where 0<π<1
  - and $\overline{R} = \pi R^H + (1-\pi) R^L > 1$

The returns of the various risky projects are perfectly correlated

- Two Arrow securities exist in period 1:
  - paying 1 unit of wheat in period 4 in H (price q^H)
  - paying 1 unit of wheat in period 4 in L (price q^L)
- These Arrow securities are supplied by firms. They will be collateralized by the project returns in each state and so there will be no default in equilibrium (asset returns cannot be stolen by firms' managers).
- Normalize price of wheat in periods 1 and 4 to be 1.

- Learn state of the world at end of period 1=>only one type of Arrow security has value in periods 2 and 3. Normalize so that this Arrow security worth 1; other one worth zero

Labor supplies (in state H or L)

- In period 3 doctors solve max $p_d l_d - \frac{1}{2} l_d{}^2$

=> $l_d = p_d$ if $p_d < 1$. Net utility = $\frac{1}{2} p_d{}^2$

- In period 2 builders solve max $\frac{p_b}{p_d} l_b - \frac{1}{2} l_b^2$

=> $l_b = \frac{p_b}{p_d}$ if $p_b < 1$

Net utility= $\frac{1}{2}\left(\frac{p_b}{p_d}\right)^2$

- **Market clearing conditions in the builder and doctor markets in periods 2 and 3 in each state are (roughly):**

$$\text{If } p_b^H < 1, \text{ then } \frac{x_d^H}{p_b^H} = \frac{p_b^H}{p_d^H}.$$

$$\text{If } p_b^L < 1, \text{ then } \frac{x_d^L}{p_b^L} = \frac{p_b^L}{p_d^L}.$$

$$\text{If } p_d^H < 1, \text{ then } \frac{x_b^H + x_d^H}{p_d^H} = p_d^H.$$

$$\text{If } p_d^L < 1, \text{ then } \frac{x_b^L + x_d^L}{p_d^L} = p_d^L.$$

Demand for Arrow securities in period 1

Doctors choose x_d^L and x_d^H to maximize

$$\pi\left[\frac{x_d^H}{p_b^H}+\frac{1}{2}\left(p_d^H\right)^2\right]+(1-\pi)\left[\frac{x_d^L}{p_b^L}+\frac{1}{2}\left(p_d^L\right)^2\right]$$

s.t.

$$q^H x_d^H + q^L x_d^L \leq e$$

- Similarly, builders maximize

$$\pi\left[\frac{x_b^H}{p_d^H}+\frac{1}{2}\left(\frac{p_b^H}{p_d^H}\right)^2\right]+(1-\pi)\left[\frac{x_b^L}{p_d^L}+\frac{1}{2}\left(\frac{p_b^L}{p_d^L}\right)^2\right]$$

s.t.

$$q^H x_b^H + q^L x_b^L \leq e$$

Supply of Arrow Securities

CRS =>

- $q^H + q^L \leq 1$ where $y^s = 0$ if inequality strict

- $q^H R^H + q^L R^L \leq 1$ where $y^r = 0$ if inequality strict

Market clearing conditions in period 1

- Arrow securities: $x_d^H + x_b^H = y^s + y^r R^H$

  $$x_d^L + x_b^L = y^s + y^r R^L$$

- Wheat: $y^s + y^r = 2e$

- In the first best(or full Arrow-Debreu eq), economy operates at full capacity and all wheat is invested in risky project
- $q^H = \pi / \bar{R},$

  $q^L = (1-\pi) / \bar{R}$

Proposition 2:

Second-best competitive equilibrium:
Prices of both goods equal 1 in H state

If $2eR^L < \left(\frac{1-\pi}{\pi} \frac{1-R^L}{R^H - 1} \right)^{\frac{4}{3}}$ *investments and trading in labor services are both inefficient: the riskless technology is operated at a positive scale and trade is inefficiently low.*

- Turn now to second-best optimality..
- The planner maximizes $U^d + U^b$. (Why?—not a missing insurance market)
- Planner can do better by restricting investment in safe project.
- Planner can also do better by handing government bonds to doctors in period 2 in the low state, backed by future sales tax receipts in period 4(cf. Woodford, Holmstrom-Tirole)

Summary

- We study consumer liquidity in a complete markets model where the only friction is the non-pledgeability of human capital. We show that
- 1. the competitive equilibrium is constrained inefficient: too little risky investment.
- 2. Fiscal policy following a large negative shock can increase ex ante welfare.
- 3. If the government cannot commit to the promised level of fiscal intervention, the ex post optimal fiscal policy will be too small from an ex ante perspective.