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Banks Are Where The
Liquidity Is

by

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What is Unique About Banks?

- At least since Fama (1980) scholars have asked what is so special about banks.
- Starting with his dissertation Raghu has very important contributions on this topic
 - “The paradox of liquidity” with S. Myers 1998
 - “Liquidity Risk, Liquidity Creation and Financial Fragility” with D. Diamond, 2001
 - “Banks as Liquidity Providers” with Kashyap and Stein 2002.
- Not only do I want to compliment his work, but also to complement it.

Transactional Demand for Liquidity

- Transactional demand is probably the oldest justification why banks exist.
- In a world with slow communication, high transportation costs, etc., it is obvious why people need banks for transaction purposes.
- But today, why people with transactional needs keep their money in a bank and not in an index fund?
- Can this explain why banks are unique?

Outline

1. Present a super simple general equilibrium model where there is need for liquidity
2. Show that people with liquidity needs will want to hold a disproportionate part of their endowment in riskless debt.
3. Show how banks satisfy this need
4. Show that a negative shock to banks is particularly costly from a macroeconomic point of view because hits people who need liquidity the most.

The Framework

- We consider an economy that lasts 4 dates:
1 -----2-----3-----4
- There are two types of agents in equal numbers: doctors and builders.
- In the paper: fully symmetric
- In the presentation: the doctors go first.
- Doctors want to consume building services at date 2 and builders want to consume doctor services at date 3.
- At date 1 both doctors and builders have an endowment of wheat equal to e .
- Agents can consume wheat at date 4.

- We write agents' utilities as:

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

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

w_i = sum of wheat consumed at time 4 by ind. $i=d,b$;

b_d = quantity of building services consumed by doctors;

l_d = labor supplied by the doctors;

d_b = quantity of doctor services consumed by builders;

l_b = labor supplied by builders.

- 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 competitively.
- There is no simultaneous double coincidence of wants: the builder a doctor buys from cannot buy from this doctor at the same time or requires the doctor services of another doctor.
- We normalize to 1 the price of wheat at time 4.

Supplies

- Doctors solve max $U_d = w_d + b_d - \frac{1}{2}l_d^2$ s.t. $w_d + p_b b_d \leq p_d l_d + e$

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

- Builders solve max $w_b + d_b - \frac{1}{2}l_b^2$ s.t. $w_b + p_d d_b \leq p_b l_b + e$

$$\Rightarrow l_b = \frac{p_b}{p_d} \text{ if } p_b < 1. \text{ Net utility} = \frac{1}{2} \left(\frac{p_b}{p_d} \right)^2$$

- If doctors can pledge their future labor income to pay the builders, then

$$p_b = p_d = 1 \quad d_b = b_d = 1 \quad U_b = U_d = e + \frac{1}{2}$$

- If future labor income is not pledgeable, then the endowment becomes important.
- To transfer wheat from date 1 to date 4, there is one risky technology.
- Even when invested, the wheat is fully pledgeable.
- The problem is the expected value of that endowment when it needs to be pledged.
- If agents learn about the aggregate state of the world between periods 1 and 2, then
- if $2Re \geq 1$, economy operates at the optimal level.
- if $2Re < 1$, economy operates below the optimal level: liquidity becomes important.

- In the paper there are n states of the world, here there are only two: H and L
 - The state of the world H or L is verifiable => Arrow securities that pay contingent to the state
- ⇒ Complete market model with a twist
- Intermediaries manufacture these securities
 - The lack of pledgeability creates a need for liquidity in some states that distorts asset prices
 - Let $q^{L,H}$ be the price of the Arrow security for the low (high) state, then

$$q^H < \pi / \bar{R}, \quad q^L > (1 - \pi) / \bar{R}$$

Doctors' Goal

- The doctors represent the people with liquidity needs, who will buy first.
 - They need at least 1 unit of wheat to buy their optimal amount of building services.
 - Extra liquidity is of no use.
 - Thus, even if they are risk neutral, de facto they become risk averse against fluctuations in their endowment
- => They will demand proportionately more in the worst state

Builders' Goal

- They are paid before they need to buy.
 - Thus, their liquidity needs are limited to the difference between their purchasing needs (1) and what they get paid (≤ 1).
 - Thus, they are much more interested in the return of their investments.
- ⇒ They demand proportionately more in the high state

Demand of securities

Doctors choose x_d^L and x_d^H to maximize

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

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

- Profit maximization + constant returns to scale
=> zero profit: the value of the return stream of each technology cannot exceed the cost of investing in that technology (i.e., 1).

$$q^H R^H + q^L R^L = 1$$

Market clearing conditions

- Arrow securities: $x_d^H + x_b^H = 2eR^H$

$$x_d^L + x_b^L = 2eR^L$$

- Builder and doctor services:

$$\frac{x_d^H}{p_b^H} = \frac{p_b^H}{p_d^H} \quad \text{if } p_b^H < 1$$

$$\frac{x_d^L}{p_b^L} = \frac{p_b^L}{p_d^L} \quad \text{if } p_b^L < 1$$

$$\frac{x_b^H + x_d^H}{p_d^H} = p_d^H \quad \text{if } p_d^H < 1$$

$$\frac{x_b^L + x_d^L}{p_d^L} = p_d^L \quad \text{if } p_d^L < 1$$

- We solve for the equilibrium and we show that

$$x_d^L > x_b^L$$

$$x_d^H < x_b^H$$

- In fact, with n states we can show that both x_d^i and x_b^i are monotonically increasing in i with

$$x_d^1 > x_b^1$$

$$x_d^n < x_b^n$$

Debt and Equity

- In a two state case, it is trivial that doctors' demand of Arrow securities can be satisfied by a quantity of debt equal to x_d^L and a quantity of equity equal to $x_d^H - x_d^L$.
- The demand of builders instead would be satisfied by x_b^L in debt and $x_b^H - x_b^L$ in equity.
- It follows that that the doctors will hold more debt than equity and the builders more equity than debt.

Arrow securities through tranches

- It is straightforward to generalize this result with n states of the world, when the quantity of Arrow securities demanded is monotonic (as in this case).
- Imagine n securities in order of seniority with 1 the most senior and n the most junior
- Then, the doctors (in need of liquidity) will always hold more of the most senior securities and the builders more of the least senior.

Why Tranches?

- While there are many ways to manufacture the Arrow securities needed, this way is particularly convenient because it is robust to managers destructing the payoff to favor one side or the other.
- If an individual gets paid only if the state of the world is i , when the state of the world is $i+1$ he will be tempted to corrupt the manager to pretend it is i .
- The same problem does not arise with tranches

A Madoff Shock

- Assume now that one of these funds has an accounting fraud and faces some losses.
- Which fund's losses will have the worst impact on the economy?
- The shock on the most senior fund, because it is held by the people with the highest liquidity needs.

What is Special About Banks?

- Banks can be interpreted as the fund composed of the most senior security.
- This will allow us to explain what is special about bank: the people who deposit in them.
- This will also allow us to explain why the default of a bank is worse than the default of a similarly-sized company: it impacts more liquidity constrained people.

Conclusions

- We explain why in a complete market framework with pledgeability constraints, there is a demand for relatively safe asset for transaction purposes.
- We explain why agents in need of liquidity invest disproportionately in this asset
- and why losses in this type of asset has disproportionately impact on the economy

Conclusions - 2

- The characteristic of this asset is to be a super senior fund
 - quite similar to modern banks
- ⇒ The essence of banks is that people in need of liquidity disproportionately hold them.
- ⇒ Banks are where the liquidity is