INSIDE AND OUTSIDE LIQUIDITY

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INTRODUCTION

(1) Liquidity (stores of value that keep their value in those contingencies in which one needs them) play fundamental role in *macroeconomics:*

- demand for Treasury securities
- monetary policy, transmission mechanism
- countercyclical policies

finance:

- liquidity premia (LAPM)/risk-free interest rate puzzle
- securitization and more generally creation of ST liquid instruments.

and prudential regulation:

- liquidity coverage ratio key feature of Basel III; emphasis on HQLA (high-quality liquid assets).

(2) Understanding (inside and outside) liquidity requires:

- departing from Arrow-Debreu (in which refinancing problems never arise)
- understanding agents' demand for liquidity
  - financial frictions make covering liquidity needs through funding liquidity difficult. Agents search for ex-ante insurance against credit rationing.
- understanding supply of liquidity
  - three sources of insurance: private (claims on other private sector agents), government, international market.

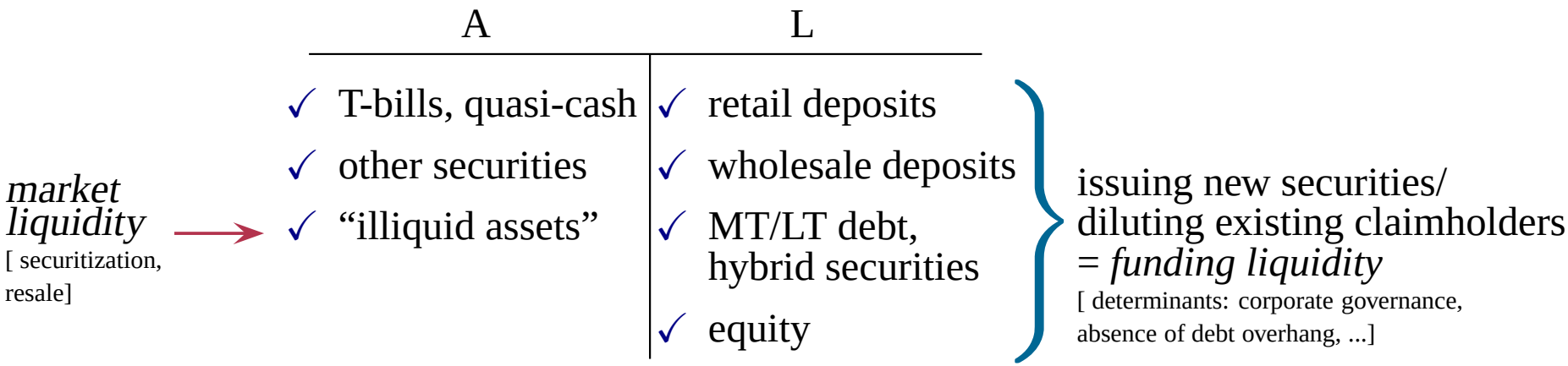
Our 1998 choices:

- (simple) microfoundations (wedge NPV-pledgeable income)
- no wasted liquidity: reshuffling of collateral, securitization, etc..
  - Keep simplicity of AD complete markets approach.
  - Understates shortage of liquidity, but clean first step.

  By contrast, adverse selection, fire sales waste liquidity (connects with market microstructure view of "liquidity" here). Andrea Eisfeldt and Adriano Rampini.

I. LIQUIDITY: THE MICRO VIEW

Funding and market liquidity



Others: risk management, reputation risk, ...

Hard to capture with a single statistics.

Demand for liquidity

(1) *Return to capital market* ("finance as you go")

Fine in Arrow-Debreu; no longer works if financial frictions/limited pledgeability.

(2) "*Reserves*"

self-hoarding
- low ST debt (relative to earnings)
- liquid assets on balance sheet
- resell, securitize less liquid assets
- projects that will pan out in short term

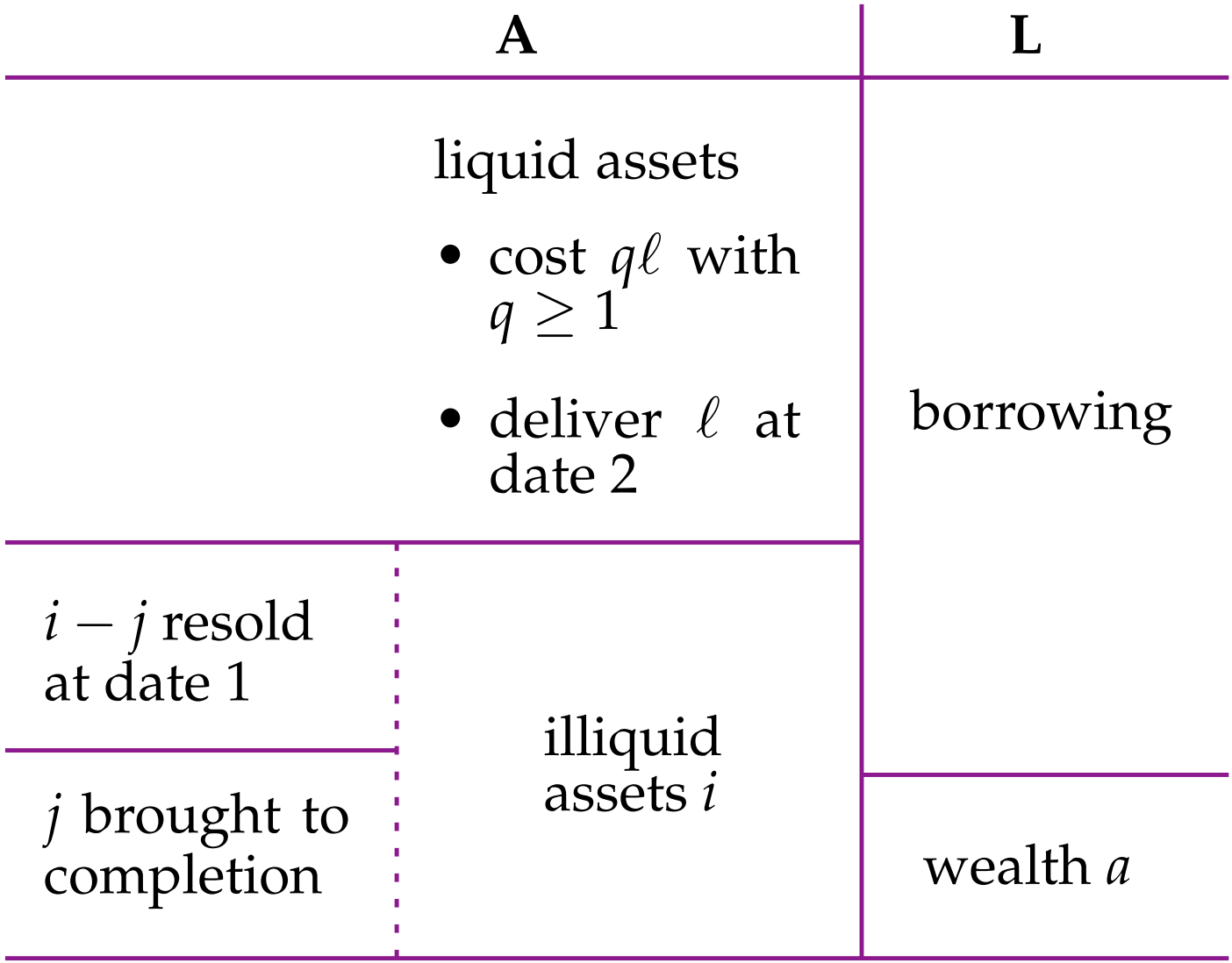
contracted for
- credit line, CDS, ...

A SIMPLE MODEL

- Three periods: $t = 0, 1, 2$.
  Investors are risk neutral, demand return $\begin{cases} 1 \text{ between 0 and 2} \\ R \text{ between 1 and 2} \end{cases}$
- Banking entrepreneurs' balance sheet: CRS technology
  - invest i at date 0, have only a
  - $\begin{cases} \text{no reinvestment need at date 1 : Prob. } \alpha \\ \text{1-for-1 reinvestment need at date 1 : Prob. } 1-\alpha \end{cases}$
- $j \leq i$ brought to completion $\Longrightarrow$ $\begin{cases} \rho_1 \text{ per unit} \\ \rho_0 < \rho_1 \text{ pledgeable} \end{cases}$

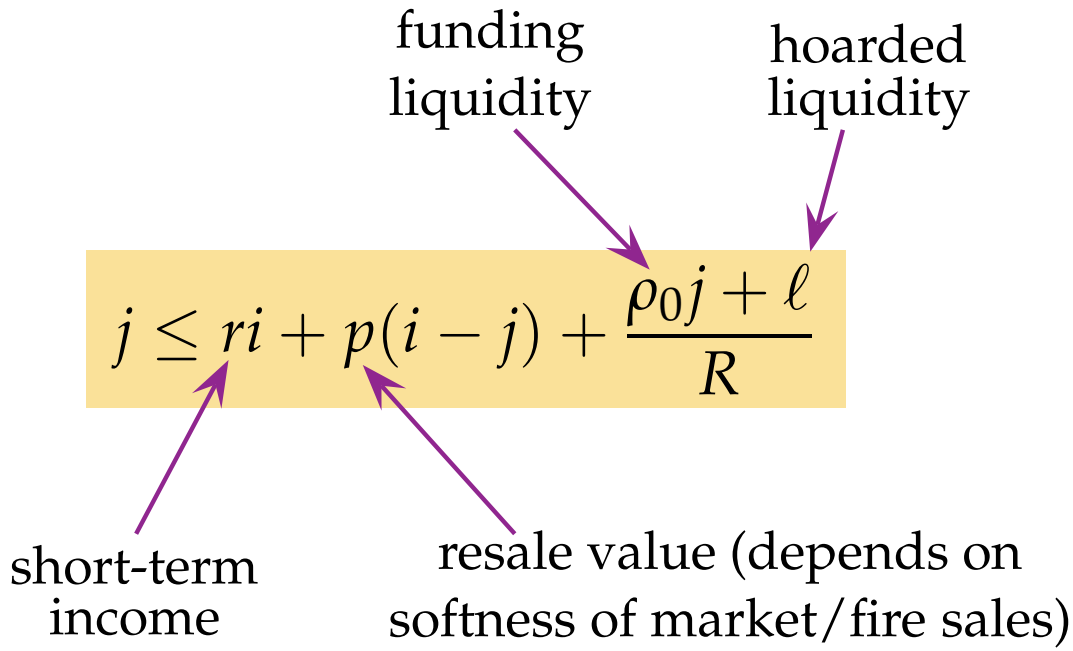
key difference with Arrow-Debreu

where ρ_0 measures quality of governance.
Entrepreneur's utility = $(\rho_1 - \rho_0)j$.


A
L
liquid assets
• cost $q\ell$ with $q \geq 1$
• deliver ℓ at date 2
borrowing
$i - j$ resold at date 1
j brought to completion
illiquid assets i
wealth a

Two equations

(1) *Liquidity* (date 1)



[constraint only if $\frac{\rho_0}{R} < 1 - r$; could add short-term debt: $(r-d)i$]

(2) *Solvency* (date 0)

$$i - a + q\ell = \alpha(\rho_0 i + \ell) \tag{2}$$

- Here optimal ℓ bang-bang:

  $\ell = 0$ or ℓ given by (1) with equality.*

  Trade off between liquidity (capital insurance) and scale:

  $$j = i \text{ iff } 1 \leq q \leq q^{\max}$$

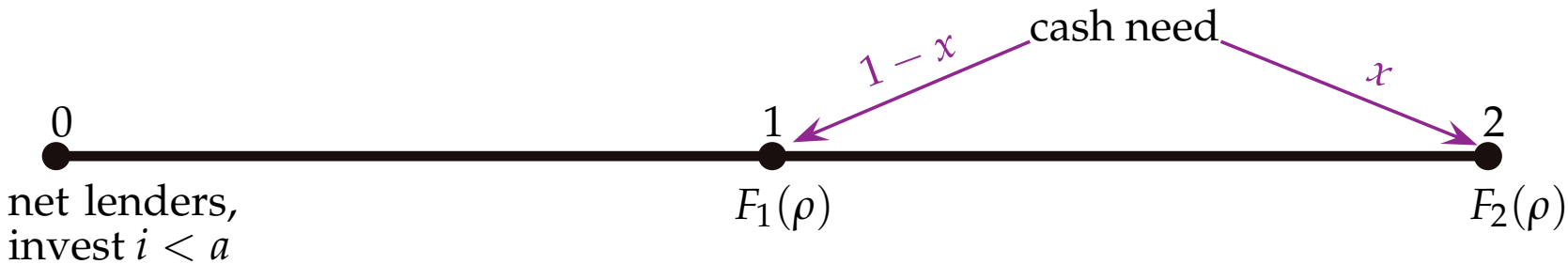
  [* If concave $\rho_1 h(j)$, then weak-balance-sheet firms – low a – purchase less insurance. Rampini-Viswanathan.]

- Pecuniary externalities : through p
  Securitization freezes

- *Relationship with Diamond-Dybvig model.* DD consumers
  - are net lenders: lend at date 0

    [counterpart with firms: Woodford 1990]
  - have no pledgeable income ($\rho_0 = 0$): consume all they have.

2011 book: Interpret firms as DD consumers:



ρ continuous instead of $\{0,1\}$. Cash need = ρj.

Secure credit line $\rho_t^* i$ in optimal contract.

$$\text{As if } \begin{cases} c_t \equiv \left[\int_0^{\rho_t^*} \rho f_t(\rho) d\rho \right] i & \text{(recall that } \rho_0 = 0) \\ u(c_t) \equiv F_t(\rho_t^*) \rho_1 i \end{cases}$$

- DD cross-subsidies
- Jacklin (only if balance sheet unmonitored by liquidity provider)

II. LIQUIDITY: THE MACRO VIEW

- *Result #1*: In this complete-markets world, *if no macro shock* (i.i.d. liquidity needs).

  $q = 1$ (plenty of liquidity/no need for outside stores of value)

  Suppose $q = 1$, then

  $$(2) \iff i - a + (1-\alpha)\ell = \alpha\rho_0 i$$

  Very general result if net borrowing:

  $$\underset{\text{(date 0)}}{\text{borrowing}} + \underset{\text{(date 1)}}{\text{liquidity need}} = \underset{\text{(date 2)}}{\text{pledgeable income}}$$

  $\Longrightarrow$ liquidity need $\leq$ pledgeable income
  (different story if net lender)

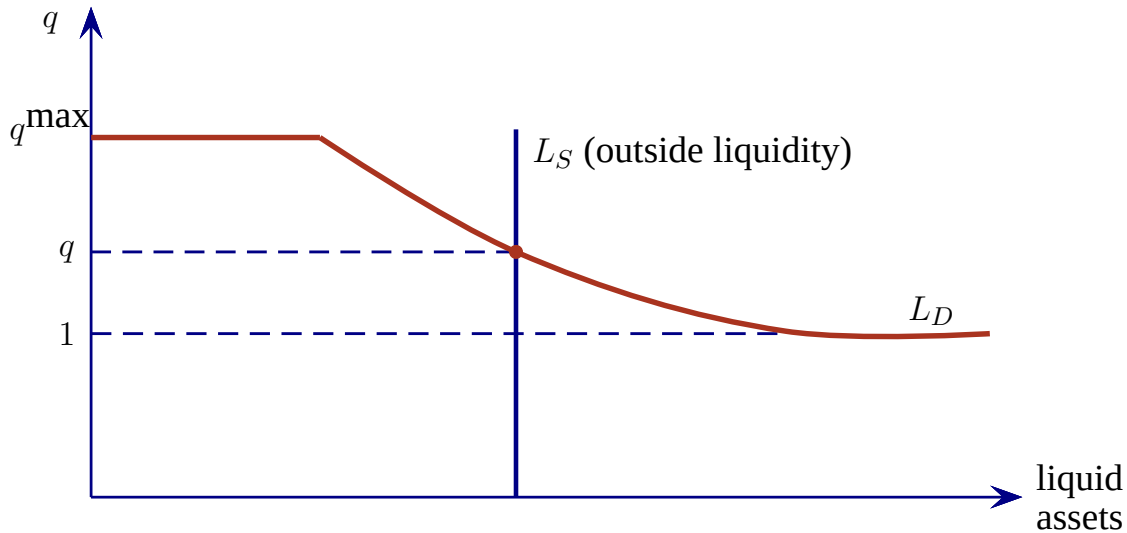
  $\Longrightarrow$ if liquidity is not wasted (efficient markets), then

  securities on corporate sector ("inside liquidity") suffice.
  No premium on outside liquidity.

- *Result #2: Liquidity premia.* Macro-shock. Simplest = perfectly correlated. Securities in other firms no longer insure properly.

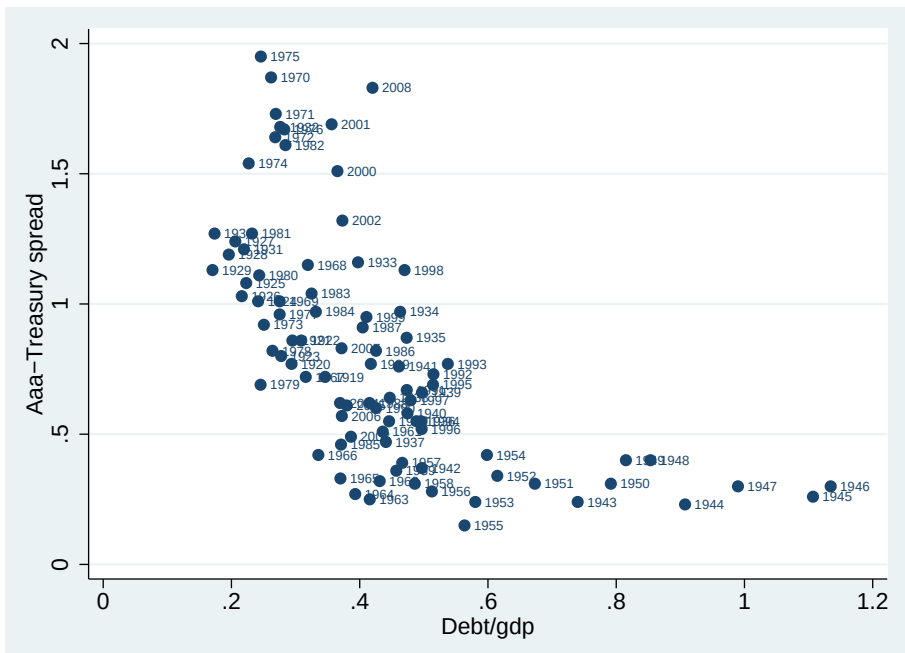
$q > 1$: demand for outside liquidity (stores of value)

$L^D = (R - \rho_0)i$ where $i = \dfrac{a}{1 + q(R - \rho_0) - \alpha R}$ (for $p = r = 0$).



[Note: could have upward sloping private supply of liquid assets. Substitutes with L_S]

Krishnamurthy-Vissing Jorgensen [*JPE* 2012]:



Low ρ_0 creates shortage:

- increases demand for liquidity
- reduces supply

Boom-bust mechanics: $a \uparrow \implies i \uparrow$

$\implies$ lower coverage in bad state.

PUBLIC SUPPLY OF LIQUIDITY

- Provision: OMO/discount window, bailouts, guarantees, automatic stabilizers, ...
- Foundations (what is it that the government can do that the private sector can't?)

regalian taxation power $\Longrightarrow$ re-create missing market between consumers (can't pledge their future endowment) and firms.

- State-contingent provision of liquidity more efficient

Substantial benefit relative to private provision of stores of value.

Formula: Suppose costs $q > 1$ to the government to produce

non-contingent bond's benefit:

AD price

$$\alpha(1-q) + (1-\alpha)(s-q)$$

contingent bond's benefit:

$$\alpha \cdot 0 + (1-\alpha)(s-q) \qquad \text{is higher}$$

HT98 prediction: optimal private liquidity supply leaves firms exposed to exceptional aggregate shocks. Government has comparative advantage in providing liquidity in low-probability events.

EXTENSION I: LOCAL SHORTAGE OF LIQUIDITY IN A FINANCIALLY INTEGRATED WORLD?

- *Why can't domestic firms acquire liquidity abroad?*
  Answer: There is a limit to that:
  - country may strategically default
  - country may have limited amount of tradables

    Countries themselves have limited pledgeable income
  - local liquidity

- *Externalities*

  If government internalizes in part welfare of corporate sector (say because economic activity hinges on loanable funds), then may want to subsidize liquidity and prevent foreigners from free-riding on it (targeted vs. general purpose public liquidity provision).

EXTENSION II: MONETARY BAILOUT

[Farhi-Tirole *AER* 2012]

Back to: $$j \leq ri + p(i-j) + \frac{\rho_0 j + \ell}{R}$$

Lowering R facilitates refinancing. Macroeconomic costs, including

- huge transfer savers $\longrightarrow$ borrowers
- sows the seeds of next crisis.

- Collective moral hazard: strong strategic complementarities (reverse CAPM: want to be exposed to same shocks as others).
- Widespread gambling on low short-term interest rates before crisis.

EXTENSION III: BUBBLY LIQUIDITY

[Farhi-Tirole *REStud* 2012]. Bubbles are a form of liquidity.

(i) Two effects of outside liquidity:
- leverage effect (competes for savings with productive investment)
- liquidity effect.

[Bubbles affect firms differently. Liquidity effect dominant for firms with low pledgeability/low recourse to leverage.]

(ii) Bubbles more likely to exist/larger when firms need liquidity:
- agency costs more severe (high demand for liquidity)
- outside liquidity is scarce and firms' net worth is high.

(iii) Crash of bubble $\Longrightarrow$ low interest rates, high leverage $\Longrightarrow$ bubble carries liquidity premium even in risk neutral environment.

Globalization (for financially developed countries)

Countries with underdeveloped financial systems create excess demand for assets in countries with developed financial systems when capital mobility is introduced and so bubbles in latter countries may emerge

[Basco 2011. Inspired by Ventura 2003/2012, but focus on capital mobility, rather than bubbles as substitute for capital mobility.]

Reminiscent of Caballero-Gourinchas-Farhi (*AER* 2008)

Bailouts

[Hirano-Inaba-Yanagawa 2012, Martin-Ventura 2012.]

Impact of (exogenous) bailouts: for example, bailouts

- relax condition for existence of bubbles
- initially crowd in most productive investments (good for workers); but if too generous, crowding-out effects (bad for workers, who furthermore must pay for the bailouts). Partial bailouts best for workers.