Sources of Liquidity and Liquidity Shortages

Charles Kahn (University of Illinois - Urbana Champaign)

Wolf Wagner (Tilburg University)

AFA 2012

Motivation

- traditional banking models (e.g., Diamond and Dybvig, 1983): in a crisis resources flow from the banking sector to the non-bank sector (e.g., bank run)
- in reality flow of ressources of goes in the other way in a crisis, for example:
  - during crisis of 2007-2009 banks raised substantial amounts of equity
  - balance sheet of commercial banks lengthened during crisis (He, Khang, Krishnamurthy, 2010)
  - often inflows of deposits in stress times (Gatev and Strahan, 2006)
  -

To understand reverse flow we need to think about:

- provision of liquidity by non-bank sector in crises times
- initial allocation of ressources between bank and other sectors
- difference between non-bank sector liquidity and bank liquidity in crisis times

This Paper

- model with banking and non-bank sector
  - non-bank sector: uninformed investors (such as households) or informed investors (such as hedge funds)
- banks can raise liquidity from other banks but also from non-banks in order to meet random liquidity needs
- difference between bank and non-bank liquidity: banks can purchase assets from other banks, while non-banks cannot

Focus of Talk: Efficiency of Ex-Ante Allocation of Resources

Key results:

- familiar overinvestment in risky assets within banking sector
- new dimension of inefficiency arising from inefficient ex-ante resource allocation between banking and non-bank sector
- direction of the bias depends on
  1. elasticity of liquidity supply by non-banks
  2. the relative cost of raising liquidity ex-ante versus ex-post

Related Literature

- Role of supply of liquidity from outside the banking sector (Allen and Gale 2004, Acharya and Yorulmazer 2008, Acharya et al 2009, ...)
  - typically exogenous supply of outside liquidity in times of crises
  - no ex-ante problem of holding liquidity inside or outside banking system
- Bolton et. al. (2010): focus on informational advantages of raising liquidity ex-ante versus ex-post
  - here: focus on potentially limited outside liquidity
- Holmström and Tirole (1996): liquidity demands arise from asset side

Sketch of the Model

- there are three dates: 0,1,2
- non-bank sector: each agent endowed with liquid assets
- bankers (project owner): endowed with access to projects
- projects: require input at date 0, may require additional inputs at date 1, possibly return R at date 2

Date 0:

- a banker i decides on funds y_i to raise from non-banks
  - doing so incurs proportional costs δ_0 (e.g., agency problem in bank)
  - decides how much of the funds to invest in projects (x_i)
  - remaining part ($y_i - x_i$) held as liquidity
  - focus on choice of y_i (keeping x_i fixed): allocation of (liquid) resources between non-bank and banking sector
- non-banks decide whether to invest in banks or to store endowments

Sketch of Model

Date 1:

- the projects of some of the banks need a liquidity injection of I
- if liquidity injection not provided, projects cannot be continued and become worthless
- deficit banks have two ways to generate liquidity using projects
  - borrowing against project: limited, because fraction α of projects is not attachable
  - asset sales to other banks (transfer of ownership): value shrinks by factor β
- raising liquidity by borrowing from non-banks incurs deadweight loss δ_1 (eg, adverse selection)

Model endogenously generates sequence for generating liquidity at t=1: i) borrow from other banks, ii) borrow from households, iii) asset sales to other banks

Sketch of Model

Date 2

- continued projects return R or $(1-\beta)R$, depending on whether they have been continued at originating bank or not
- project returns and stored liquidity are used to pay bank owners and creditors

Equilibrium and Externalities

Central Question: Is the equilibrium amount of liquidity (y) held in banking sector at $t = 0$ socially efficient?

- To answer this question, study whether *externalities* are present

There are two types of constraints at t=1: *individual* and *aggregate*

- individual constraint: borrowing capacity of a deficit bank may exceed its liquidity shortage
- aggregate constraint: liquidity that can be raised by entire banking sector exceeds its liquidity shortage
- aggregate constraint can become binding for two reasons:
  1. insufficient borrowing capacity of banking sector
  2. insufficient liquidity supply by non-banks

First Case: Elastic Liquidity Supply by Outsiders

- Suppose non-bank sector large relative to banking sector: liquidity supply by outsiders is then elastic at $t = 1$
- In this case the first aggregate constraint is the one that matters

Proposition

The equilibrium amount of liquidity held in the banking sector at $t = 0$ is less than the efficient one (bank liquidity is underprovided).

Intuition

- there is a positive externality from holding liquidity in the banking system which runs through the first aggregate borrowing constraint:
  - if a bank raises more liquidity at $t = 0$ from non-banks, liquidity needs in the banking sector are lowered at $t = 1$
  - this tends to relax the aggregate constraint
  - price of assets in the interbank market rises (prise of liquidity falls)
  - benefits deficit banks as they have to sell fewer assets to generate liquidity
- due to positive externality, there is a tendency for the banking system to raise insufficient liquidity at t=0

Note: reminiscent of results from traditional banking models (e.g., Bhattacharya and Gale, 1987)

Second Case: Inelastic Liquidity Supply by Outsiders

- Suppose non-banks are relatively small: liquidity supply at $t = 1$ is then inelastic
- In this case, supply of liquidity from outside the banking sector can be the constraining factor at $t = 1$ (second aggregate constraint becomes binding)

Proposition

Inside liquidity is (i) underprovided if $\delta_0 < \delta_1$ *and (ii) overprovided if* $\delta_0 > \delta_1$.

Recall that there are costs of raising liquidity from non-banks ex-ante at date 0 (δ_0) and ex-post at date 1 (δ_1)

Intuition

- when an individual bank raises more liquidity from households at date 0, this increases inside liquidity at date 1 but now it also reduces supply of liquidity from outside the banking system
- net impact on aggregate constraint depends on the relative ability of inside and outside liquidity to generate liquidity at t=1:
  - Inside liquidity: raise liquidity at t=0 and store for t=1: one unit of endowment generates $1-\delta_0$ liquidity at t=1
  - Outside liquidity: store liquidity at non-banks at t=0 and raise at t=1 (if needed): one unit of endowment generates $1-\delta_1$ liquidity at t=1

- Thus, if $\delta_0 > \delta_1$ holding liquidity inside the banking system reduces the capacity of the banking system to deal with liquidity problems at t=1
- In this case inside liquidity tightens the aggregate constraint and causes a negative externality, resulting in inside liquidity to be overprovided

When Can We Expect Liquidity to be Oversupplied?

The model shows that liquidity may be oversupplied if two conditions are met:

1. outside liquidity is scarce
2. the relative cost of raising liquidity ex-post is low

These conditions do not apply to liquidity supply by uninformed investors (households). However, they arguably apply to informed investors (hedge funds, sophisticated private investors) because:

- their resources are small relative to banking sector $\Rightarrow$ inelastic supply
- raising liquidity from them ex-post is relatively less costly since they are informed (can more easily value assets in crisis times)

$\Rightarrow$ suggests that banks raise ex-ante too much liquidity from informed investors (but too little from uninformed investors)

Policy Implications

- The traditional focus of ex-ante policies is to influence the allocation of resources within banking sector. For example, capital requirements aim at correction the mix of risky and safe investments at banks
- This paper suggests that we also have to be concerned about the allocation across sectors
- In addition, we also have to differentiate according to where banks are raising liquidity from.

Summary & Conclusions

- We have developed a model in which banks can raise liquidity from outside the banking system when they have liquidity problems.
- In this model, aggregate shortages of liquidity may arise for two reasons
  1. insufficient borrowing capacity of the banking system
  2. insufficient liquidity supply by non-banks in a crisis

- The model suggests a new allocation problem: ex-ante allocation of resources between bank and non-bank sector
- We highlight two factors in determining whether ex-ante allocation is efficient:
  1. elasticity of non-bank liquidity supply
  2. costs of raising liquidity ex-ante versus ex-post