

Liquidity Regulation, Extended Repo and the Real Economy

Franklin Allen
Imperial College London

Douglas Gale
New York University

Achieving Financial Stability: Challenges to Prudential Regulation
Federal Reserve Bank of Chicago
November 3-4, 2016

1. Introduction

- One of the reasons the 2007-2009 financial crisis was so severe was massive illiquidity in interbank and other markets
- These liquidity problems resulted in the Basel III accord introducing global liquidity standards for banks
 - The Liquidity Coverage Ratio is designed to ensure banks can withstand a stressed funding scenario for at least 30 days
 - The Net Stable Funding Ratio is designed to reveal risks that arise from significant maturity mismatches between assets and liabilities

These policy measures raise a number of questions:

- Why is the provision of liquidity that the market provides insufficient?
- What is (are) the market failures these regulations are designed to correct?
- Are the regulations proposed the best way of correcting the market failures?

As with much banking regulation, the answers to these questions are not entirely clear

- Willem Buiter (2007) made the following observation

“Liquidity is a public good. It can be managed privately (by hoarding inherently liquid assets), but it would be socially inefficient for private banks and other financial institutions to hold liquid assets on their balance sheets in amounts sufficient to tide them over when markets become disorderly. They are meant to intermediate short maturity liabilities into long maturity assets and (normally) liquid liabilities into illiquid assets. Since central banks can create unquestioned liquidity at the drop of a hat, in any amount and at zero cost, they should be the liquidity providers of last resort both as lender of last resort and as market maker of last resort...”

- In order to understand what the market failures might be, we need to have benchmark models where Adam Smith's invisible hand of the market works
- The Arrow-Debreu model does not contain a financial system with financial institutions and so cannot be the benchmark for studying bank liquidity while standard banking models are usually very special and do not have financial markets
- We therefore start with a model due to Allen and Gale (2004) that has both banks and financial markets where the efficiency of the market economy can be analyzed

2. Liquidity Provision in the Financial System

- The Allen and Gale (2004) benchmark framework distinguishes between two types of risk
 - *Idiosyncratic* shocks to individual preferences (e.g. liquidity preferences) that are non-contractible - institutions deal with these
 - *Aggregate* shocks (e.g. asset returns or aggregate liquidity needs) that are contractible - markets deal with these
- Two cases are considered: (i) *intermediaries* that use general contracts contingent on aggregate states and (ii) *banks* that use non-contingent deposit contracts
- The focus is on liquidity provision and the key role this plays

Benchmark case with complete contracts and complete markets

Result 1: The equilibrium is incentive efficient.

Case where the intermediaries are banks

- A bank is a special intermediary that uses a *deposit contract* where the payments promised are fixed for the period ahead is chosen - it is too costly for (small) depositors to enforce contracts where returns are explicitly contingent.

Result 2: The equilibrium is constrained efficient.

Comment 1: With general intermediaries there are no runs or crises but with banks runs and crises do occur.

Comment 2: There is no role for regulation in either case.

What are the market failures?

- While in practice there are markets for hedging uncertainty about asset returns, there are not for hedging liquidity shocks – in this case there is a role for liquidity regulation but it is not to prevent crises but rather to improve risk sharing
- There is a large literature on reasons for failures in interbank markets such as moral hazard, asymmetric information, and monopoly power but this literature by and large does not consider liquidity regulation as a solution (see, e.g., Freixas and Jorge (2008), Heider, Hoerova and Holthausen (2009), Bolton, Santos and Scheinkman (2011), Diamond and Rajan (2011), Acharya, Gale and Yorulmazer (2011), and Acharya, Gromb and Yorulmazer (2012))

3. The Role of Central Banks in Providing Liquidity

Real models

- Bagehot (1873) laid out his famous principles for how a central bank should lend to banks during a crisis:
 - Lend freely at a high rate of interest relative to the pre-crisis period but only to solvent but illiquid borrowers with good collateral (i.e. any assets normally accepted by the central bank).
 - The assets should be valued at between panic and pre-panic prices.
 - Institutions without collateral should be allowed to fail.
- Despite being written over 140 years ago, these principles are still widely quoted and used as the foundation for many central bank policies – Rochet and Vives (2004) provide a model to justify these

Monetary models

- In most models of banking crises banks contract with depositors in real terms, and government-injected liquidity is done using appropriate financial and fiscal instruments that have effects in real terms but this ignores the point made by Buiter (2007)
- Again a benchmark model is needed – Allen, Carletti and Gale (2014) provides a model with money, a central bank, commercial banks, consumers and firms

The model has the following features:

- A standard three-date banking model with aggregate liquidity and return risk but with nominal contracts
- The central bank passively supplies money in response to demand from the commercial banks
- Commercial banks take in deposits from consumers and make loans to firms to maximize profits
- Firms invest in a safe short asset and a risky long asset to maximize profits

The main results:

- A competitive equilibrium implements the same fully state-contingent efficient allocation as the planner's problem, not merely the non-state contingent constrained-efficient allocation, even though deposit contracts are non-contingent and involve a fixed claim (in terms of money) on the banks
- A central bank policy of passively accommodating the demands of the commercial banks for money is sufficient to eliminate financial crises and achieve the first best
- The quantity theory of money holds in equilibrium: the price level at each date is proportional to the supply of money extended to the commercial banks by the central bank and risk sharing is achieved through variations in the price level

4. Literature on Liquidity Regulation

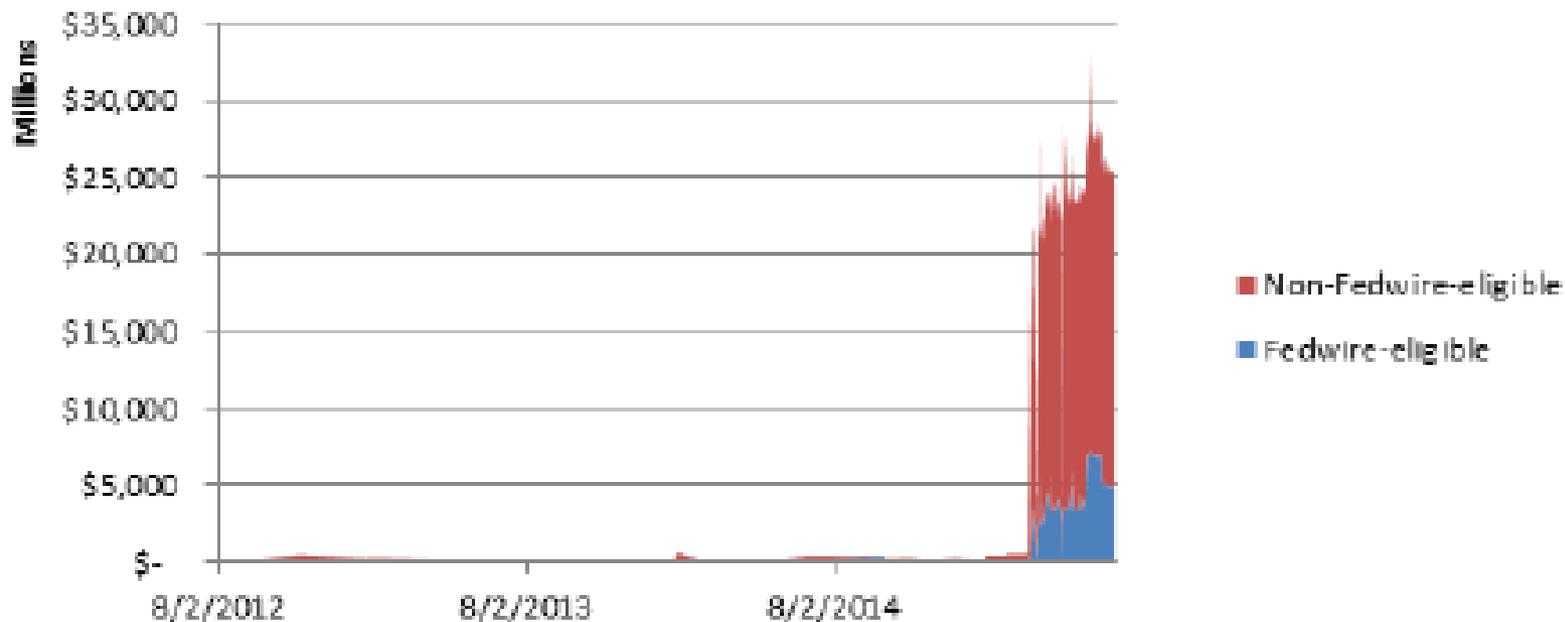
- Rochet (2004, 2008)
- Perotti and Suarez (2011)
- Stein (2013)
- Bech and Keister (2013)
- Bouwman (2014)
- Diamond and Kashyap (2016)
- There is no widely agreed framework for considering liquidity regulation

5. Evergreen Funding and Extendable Repos

- Allen and Gale (2016) argue that even if there was agreement on the reasons for liquidity regulations, one of the main problems with them is that innovations involving ‘evergreen funding’ such as ‘extendable repos’ are already being used to circumvent the LCR ratio
- The LCR looks at ratio of short term assets to liabilities maturing in the next 30 days
- In standard repo agreements investors buy bank assets and the bank contracts to buy them back at a particular date - when that date is within 30 days, they count towards the LCR ratio.

- With evergreen funding and extendable repos the repos are continually renewed by mutual agreement and the notice period is longer than the 30 days mentioned in the regulations so they do not count as short term liabilities
- Alloway (2015) provides evidence that there was a surge in the issuance of extendable repos when the LCR regulations began to come into force in 2015

U.S. Tri-party Repo Evergreen Loan Values



Source: Markit

A Model

- Allen and Gale (2016) develops a simple model of evergreen funding with an extended notice period to show that this does not prevent bank runs and financial instability
- Time is continuous and at each date a flow of investors enters the market
- Each investor has one unit to invest and discounts the future
- The investor waits for an investment opportunity that arrives according to a Poisson process
- The banking industry is competitive

- In the long run steady state, the inflow and outflow of investors are balanced at each point in time and the population remains constant.
- There are two assets, a short asset that earns a zero return and a long asset that earns a flow return.
- Only banks can invest in the long asset – in equilibrium they put all of their funds in the long asset to maximize the return to depositors
- Banks promise depositors an interest rate based on what they can pay

- We model the use of extendable repo to get around the effect of liquidity regulation by assuming that deposits backed by long assets require a notice period of 1
- Thus, if an investor unexpectedly receives an investment opportunity at time t , he must wait until $t+1$ to invest.
- There is a cost to this delay since investors discount the future

Bank Runs

- There are many ways to model runs – here for simplicity we assume a Diamond-Dybvig type structure for bank runs with recovery rates less than one, a sunspot coordination device and a zero probability of runs
- With the notice period, if, at any date the depositors decide to run, they will have to wait one period
- But if everyone gives notice at the same time, the bank will not be able raise enough money by liquidating assets and the bank will fail in just the same way as without runs

- Recovery rates less than one ensure that anyone who does not join the run will be worse off
- The fact that a bank has a breathing space might appear to lessen the chances of the bank failing, but only if the bank reveals the run and asks the central bank for help
- The history of the Great Financial Crisis does not suggest that banks are eager to reveal their difficulties until forced to do so

Implications of Innovation for Liquidity Regulation

- The possibility for innovations such as extendible repos means that it is difficult to produce regulations that achieve the desired effect of ensuring banks hold liquid portfolios
- It's not obvious how to change the regulations to achieve the desired end
- One way to do it would be to specify the kind of securities that can be used in the regulations but this has the long term downside of ossifying financing structures

6. Concluding Remarks

- The literature on liquidity regulation is still at an early stage
- There is no clear analysis of whether liquidity should be thought of as corresponding to short term real assets or to monetary instruments and what are the market failures justifying such regulation
- Even if there is agreement on what liquidity regulation is trying to achieve, there is the problem of writing regulations that are immune to financial innovation and achieve the desired aims

References

- Acharya V, D Gale and T Yorulmazer (2011), 'Rollover Risk and Market Freezes', *Journal of Finance* 66(4), pp 1177–1209.
- Acharya V, D Gromb and T Yorulmazer (2012), 'Imperfect Competition in the Interbank Market for Liquidity as a Rationale for Central Banking', *American Economic Journal: Macroeconomics* 4(2), pp 184–217.
- Allen, F, E Carletti and D Gale (2014), 'Money, Financial Stability and Efficiency', *Journal of Economic Theory* 149, 100-127.
- Allen F and D Gale (2004), 'Financial Intermediaries and Markets', *Econometrica* 72(4), pp 1023–1061.
- Allen F and D Gale (2016), 'Liquidity Regulation, Extended Repo and the Real Economy,' working paper, Brevan Howard Centre, Imperial College, London.
- Alloway, T (2015), 'This Chart Shows the Incredible Increase in Extendable Repos', Bloomberg Markets, December 8, 2015, <http://www.bloomberg.com/news/articles/2015-12-08/this-chart-shows-the-incredible-rise-in-extendable-repos>
- Bagehot W (1873), 'Lombard Street: A Description of the Money Market,' London: H. S. King.
- Bech M and T Keister (2013), 'Liquidity Regulation and the Implementation of Monetary Policy', BIS Working Paper No. 432.
- Bolton P, T Santos and JA Scheinkman (2011), 'Outside and Inside Liquidity', *Quarterly Journal of Economics* 126(1), pp 259–321.
- Buiter, W (2007), 'Maverecon', *Financial Times*, December 13, 2007.
- Diamond DW and RG Rajan (2011), 'Fear of Fire Sales, Illiquidity Seeking, and Credit Freezes', *Quarterly Journal of Economics* 126(2), pp 557–591.
- Diamond DW and AK Kashyap (2016). 'Liquidity Requirements, Liquidity Choice and Financial Stability,' *Handbook of Macroeconomics*, forthcoming.
- Freixas X and J Jorge (2008), 'The Role of Interbank Markets in Monetary Policy: A Model with Rationing', *Journal of Money, Credit and Banking* 40(6), pp 1151–1176.
- Heider F, M Hoerova and C Holthausen (2009), 'Liquidity Hoarding and Interbank Market Spreads: The Role of Counterparty Risk', ECB Working Paper No 1126.
- Perotti, R and J Suarez (2011), 'A Pigovian Approach to Liquidity Regulation', *International Journal of Central Banking* (December), pp. 3-41.
- Rochet J-C (2004), 'Macroeconomic Shocks and Banking Supervision', *Journal of Financial Stability* 1(1), 93-110.
- Rochet J-C (2008), 'Liquidity Regulation and the Lender of Last Resort,' *Financial Stability Review* 11(February), pp. 45-52.
- Rochet J-C and X Vives (2004), 'Coordination Failures and the Lender of Last Resort: Was Bagehot Right After All?', *Journal of the European Economic Association* 2(6), pp 1116–1147.
- Stein J (2013), 'Liquidity Regulation and Central Banking', Remarks made at 'Finding the Right Balance', 2013 Credit Markets Symposium, Federal Reserve Bank of Richmond, Charlotte, NC.