

## Comment on “Regulatory Reform: Integrating Paradigms”

by Augusto de la Torre and Alain Ize

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Augusto de la Torre and Alain Ize argue for three policy proposals for financial regulatory reform in the context of four conceptual paradigms for understanding financial crises. They propose that supervisors should (a) regulate all leveraged financial intermediaries, not just those considered systemic, unless a financial intermediary only borrows from other regulated entities; (b) tax not only financial intermediaries’ short term borrowing when mismatched against long term assets, but also tax financial intermediaries’ short term lending to other leveraged financial intermediaries; and (c) promote guidance for more rational and well-informed financial markets.

In this discussion, I consider the proposed paradigms and evaluate the proposed policies using a simple analytical framework based on the model in Freixas, Martin and Skeie (2011), which incorporates some of the standard theoretical concepts that economists have used to study the recent financial crisis. The analytical framework highlights the merits of regulating leveraged financial intermediaries’ broadly and regulating their short term borrowing, but points out deficiencies in taxing financial intermediaries’ short term lending and excluding from regulation financial intermediaries that borrow from regulated entities. The framework also illustrates benefits of considering guidance for financial stability in the formulation of monetary policy in addition to direct supervision of financial intermediaries. Monetary policy has an important effect on macroprudential stability because interest rate policy determines the funding cost of the broad range of leveraged institutions that may escape direct supervision by regulators.

A major point of the paper is that conflicting conceptual paradigms can lead to conflicting policy implications for financial regulation. The asymmetric information paradigm considers informational frictions, which include not only hidden information, but also hidden actions, such as moral hazard. The authors argue that asymmetric information is the

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dominant paradigm currently used by policymakers, but that the primary systemic risks of the financial system and corresponding policy implications are better understood according to two alternative paradigms. The first alternative is the collective action paradigm, which focuses on coordination frictions. Individuals do not account for the externality that their actions impose on others even in the absence of informational frictions. The second alternative is the collective cognition paradigm, which incorporates costs of information, externalities, and bounded-rational behavior. The authors also briefly discuss the market segmentation paradigm, based on different investor and intermediary classes having different access to various markets and securities.

I consider a simplification of the model in Freixas et al. (2010), which develops a role for a regulator in short term funding markets for financial intermediaries. The model generalizes the problem of systemic liquidity risk propagated through interbank markets as developed by Bhattacharya and Gale (1987) and Allen et al. (2009), in the context of financial liquidity provision and instability with leveraged financial intermediaries begun in the seminal work of Diamond and Dybvig (1983). This framework can capture some of the main frictions of the collective action and collective cognition paradigms in a simple form and can give a method to analyze the policy proposals in a clear and consistent way.

In the analytical framework, there are a number of financial intermediaries with short term funding from depositors in the initial period at date 0. These financial intermediaries can be thought of as commercial banks, dealers, hedge funds, money market funds, and others that borrow with short term funding and hold long term illiquid assets. At date 1, each depositor has a privately-observed liquidity shock with probability  $\bar{\lambda}$ , which is also the fraction of all depositors having a shock. In normal times, designated by state  $i = 0$  that occurs with probability  $1 - \rho$ , banks have equal fraction of withdrawals of  $\bar{\lambda}$ . With probability  $\rho \in [0, 1]$ , a liquidity crisis occurs designated by state  $i = 1$  in which banks have varying liquidity needs and uncertainty over these needs. Half of banks have high withdrawals of  $\lambda^h = \bar{\lambda} + \varepsilon$  and half have low withdrawals of  $\lambda^l = \bar{\lambda} - \varepsilon$ , where  $\varepsilon$  represents the size of the liquidity crisis and  $j \in \mathcal{J} \equiv \{h, l\}$  represents a bank's shock type.

Deposits withdrawn at date 1 pay  $c_1$ , and those not withdrawn (or rolled over) receive at date 2  $c_2^{ij}$ , which is an equal share of the remaining goods at the depositor's bank  $j$ . A

depositor's expected utility is

$$E[U] = \bar{\lambda}u(c_1) + (1 - \rho)(1 - \bar{\lambda})u(c_2^{0j}) + \rho \left[ \frac{1}{2}(1 - \lambda^{1h})u(c_2^{1h}) + \frac{1}{2}(1 - \lambda^{1l})u(c_2^{1l}) \right],$$

where the utility of a depositor's withdrawal  $u(c)$  is increasing, concave, and has a coefficient of relative risk aversion greater than one, which provides a role for banks to provide risk-decreasing liquidity insurance.

Banks compete for deposits at date zero by offering debt contracts  $(c_1, c^{ij})$  to maximize the expected utility of their depositors. Banks unverifiably invest  $\alpha$  fraction of their assets in long term illiquid investments paying  $r$  at date 2 or zero if liquidated early at date 1, and banks hold an amount  $1 - \alpha$  of liquidity that pays a return of one over a period. Bank  $j$  chooses to borrow  $f^{ij}$  liquidity on the interbank market at date 1 at the market clearing rate  $\iota^i$ , and to carry over  $\beta^{ij}$  liquidity at date 1. The banks budget constraints for dates one and two are:

$$\begin{aligned} \lambda^{ij}c_1 &= 1 - \alpha - \beta^{ij} + f^{ij} && \text{for } i \in \mathcal{I}, j \in \mathcal{J} \\ (1 - \lambda^{ij})c_2^{ij} &= \alpha r + \beta^{ij} - f^{ij}\iota^i && \text{for } i \in \mathcal{I}, j \in \mathcal{J}, \end{aligned}$$

and market clearing requires  $f^{ih} = -f^{il}$ , where  $i \in \mathcal{I} \equiv \{0, 1\}$  is the crisis state variable.

The first best allocation is for banks to hold optimal liquidity  $1 - \alpha^*$  and issue deposits providing perfect liquidity insurance by paying depositors with liquidity shocks  $c_1^* = \frac{1 - \alpha^*}{\bar{\lambda}}$ , such that the marginal rate of substitution for consumption equals the marginal rate of transformation for investment between dates 1 and 2:  $u(c_1^*) = ru(c_2^*)$ . To implement the first best, we consider a planner who can observe bank types and choose interbank transfers in the form of quantities and rates on interbank loans. The planner specifies that during a crisis, banks with high shocks borrow  $f^{1l} = i \varepsilon c_1$  from banks with low shocks on the interbank market at date 1 at an interest rate equal to the optimal implicit return on banks' deposits between dates 1 and 2, which is  $\iota^{1*} \equiv \frac{c_2^*}{c_1^*}$ .

In a market equilibrium, the results in Freixas et al. (2010) show that a continuum of rates will clear the interbank market at date 1. During a crisis, banks with high shocks have an inelastic demand for borrowing because their outside option for liquidity is only to liquidate assets. Banks with low shocks have an inelastic demand for lending because

their outside option is to store liquidity for a return of one. Expected interbank rates must equal the long term rate of investment in order for banks to be willing to hold a portfolio of both liquidity and investment at date 0. For a baseline market equilibrium without state-contingent rates, interbank rates are higher during a crisis than in the first best:  $\iota^0 = \iota^1 = r > \iota^{1*}$ . In comparison to the first best, banks provide less liquidity to depositors and hold excessive illiquid assets,  $a > \alpha^*$ . However, in a market equilibrium with optimal state-contingent rates set by a central bank, the central bank can set low interest rates at  $\iota^{1*} < r$  during a crisis and high rates  $\iota^{0*} > r$  during normal times. Monetary policy can be used to insure banks against liquidity risk during a crisis and induces banks to hold optimal liquidity  $\alpha^*$ . The appendix of Freixas et al. (2010) shows that such monetary policy can also be implemented using nominal interest rates following Skeie (2008). If a regulator can require banks to hold optimal liquidity  $\alpha^*$ , the central bank can set low rates  $\iota^{1*}$  during a crisis without needing to set high rates in normal times to create incentives for banks to hold liquidity.

In the paper, the first policy proposal is to include all leveraged financial intermediaries within the bounds of regulation, with an exception for intermediaries that borrow only from other intermediaries that are regulated. This proposal is based on the argument that current reforms focus on regulating large and systemic financial institutions, but this allows for financial firms created outside of the regulatory boundaries to attempt regulatory arbitrage. Regulation is constantly required to catch up. The current policy focus of creating narrow regulatory bounds reflects the past regulatory failure of focusing regulation on commercial banks. This past focus reflected the asymmetric information paradigm, under which regulation was designed to protect a certain lending class who had less information than the banks—namely bank depositors. Sophisticated lenders were considered not to suffer from asymmetric information problems and not in need of regulatory protection, which left non-commercial bank intermediaries unregulated. Under the collective action paradigm, there can be liquidity externalities even when there are no information problems. All leveraged firms need to be regulated, not just those labeled “systemic,” otherwise firms will find ways to arbitrage the regulation by leveraging outside of the "systemic" label but still producing collective action-based problems. An exception from regulation should be given to a financial intermediary that only borrows from

regulated financial intermediaries.

The analytical framework allows for considering the benefits of liquidity regulation for financial intermediaries broadly. Financial intermediaries can suffer from collective action problems because they tend to hold too little liquidity and to free-ride on liquidity provided by the interbank market. Underprovision of liquidity leads to worse financial stability during crises. First, consider the baseline market equilibrium in the model without a central bank and monetary policy. Banks will hold less liquidity than is optimal because they do not consider the positive externalities that liquidity provides in the interbank market during a crisis. In the model, a banking supervisor could require all banks to hold greater liquidity. Keeping deposit contracts unchanged, this would drive borrowing rates during a crisis down to one because there is an abundance of liquidity relative to the aggregate need. Low rates during a crisis allow for more optimal redistribution of liquidity, as those banks with large withdrawal shocks can borrow cheaply. It would be important to regulate banks broadly and not just those considered large and systematic. Unregulated banks would not hold additional liquidity and would free-ride off of the liquidity in the interbank market. In fact, bank supervision requiring greater liquidity holding among regulated banks would encourage unregulated banks to hold no liquidity at all, as they could always borrow cheaply even during a crisis from those regulated banks that have a relative excess of liquidity.

Banks that only fund themselves from other banks are no exception for regulation. Consider the model in which there are some banks that have investment opportunities but no source of depositors. It is efficient for them to be funded by regulated banks at date 0 so that they can invest. Based on the proposed policy, they are unregulated. During a crisis, the regulated banks with large withdrawal shocks from depositors will in turn withdraw greater amounts from the unregulated banks. These unregulated banks would face similar liquidity shocks as regulated banks but would not hold optimal liquidity. However, consider if the unregulated banks could be fully diversified against liquidity shocks by borrowing from a range of regulated banks. The regulated banks would still not hold liquidity because they would prefer to free-ride off the extra liquidity that regulated banks are required to hold. It may be worse for the supervisor to regulate the liquidity held by only a fraction of banks than to regulate none at all.

The second proposal in the paper supports regulating financial intermediary liquidity by taxing maturity mismatch and argues that short term lending as well as borrowing by leveraged financial intermediaries should be taxed. When financial intermediaries borrow short term and hold long term illiquid assets, they are susceptible to collective action problems. The authors argue that taxing short term borrowing that finances long investment is not sufficient. A financial intermediary that borrows and lends only short term and has no liquidity mismatch imposes a collective action problem onto those it lends to. The intermediary will withdraw its short term lending based on its own liquidity needs and neglect the externality it imposes on the borrower's needs to roll over financing. In the analytical framework, regulating banks' liquidity takes a step towards reducing banks' maturity mismatch from the asset side by reducing the amount of long term illiquid assets held. Taxing banks according to their maturity mismatch would similarly lead to an increase liquidity held.

Should even banks short term lending be taxed as well? Consider a modification of the analytical framework in which some banks have investment opportunities but no natural source of deposits. These banks borrow solely from banks that have depositors but no investment opportunities apart from lending to the borrowing banks (see also Acharya and Skeie (2010)). If short term funding is taxed for all banks, in order to include all banks in regulation as argued for above, then taxing short-term bank lending as well as bank borrowing is a double-taxation. Instead, only banks' short term borrowing should be taxed, but at a rate according to how stable the funding is. Short term borrowing from other financial intermediaries may be less stable because it is not rolled over in a crisis, such as Tri-Party Repo lending by money market funds to dealer banks that was withdrawn after the Bear Stearns and Lehman collapses (see Martin et al. (2010), Copeland et al.) and among commercial banks that relied on wholesale funding in the UK after the collapse of Northern Rock (see Ashcraft et al. (2010) and Goldsmith-Pinkham and Yorulmazer (2010)). Instead of trying to control the maturity mismatch and liquidity of leverage institutions by taxing banks who lend to them, it may be better to focus on the issue raised from the first proposal of including all leveraged financial intermediaries in the regulation, liquidity requirements, and taxing of short term borrowing. It may well be easier and more consistent to tax all short term borrowing equivalently, according to

the principal of regulating entities by function rather than by institutional type.

The third policy proposal calls for a regulatory supervisor to help correct against systemic risk that arises in the financial system because of two primary frictions in the collective cognition paradigm. First, there are externalities to collecting information on fundamentals. Individuals will not pay the costs for acquiring the optimal amount of information because this will benefit others. The supervisor can internalize the benefits and pay to learn and publicly provide more information about economic and financial conditions. Second, financial markets either have bounded rationality or are irrational at times. The supervisor can recognize this and act to guide markets. Supervisors can use information collected and the supervisory role in a process like monetary policy to guide system.

The third proposal charges financial regulators with ensuring not only that all short-term funded entities are formally regulated and taxed according to the first two proposals, but in addition that such entities operate efficiently based on the fundamental state of the economy. How well can supervisors truly identify and tax all institutions that finance illiquid assets with short term funding? The term “shadow banking” exemplifies that such institutions were disguised despite their large size. And how well can supervisors guide bank behavior on an individual basis?

The analytical framework shows that both challenges to supervisors may be in part addressed by considering financial stability in the formulation of monetary policy. Monetary policy has an important effect on macroprudential stability because interest rate policy determines the short term funding cost of the broad range of leveraged institutions, including those that may escape direct supervision by regulators. The framework demonstrates how the central bank can set interest rates contingent on information gathered on the state of the financial system. Such policy can incentivize the financial system to hold optimal liquidity before a crisis and to provide optimal liquidity in the interbank market during a crisis. Monetary policy has the power to affect bank funding costs based on the aggregate state while still allowing banks to optimize their liquidity and funding behavior according to private information on their individual shocks. It may be difficult for supervisors to enforce or to tax all institutions in a complete and direct manner to accomplish the same outcome. During a crisis, the supervisor needs the weakest banks to be able

to borrow cheaply and the strongest banks to lend. Trying to dynamically regulate or tax liquidity quantity holdings and borrowing and lending decisions for individual banks requires detailed monitoring and sophisticated understanding of banks' various liquidity needs. The analysis highlights the important role that prices play through short term rates for incentives both to hold liquidity and to transfer liquidity in short-term borrowing and lending in the wholesale funding market.

## References

- [1] Acharya, Viral and David Skeie (2011). "A Model of Liquidity Hoarding and Term Premia in Inter-Bank Markets," *Journal of Monetary Economics*, forthcoming.
- [2] Allen, Franklin, Elena Carletti and Douglas Gale (2009). "Interbank Market Liquidity and Central Bank Intervention," *Journal of Monetary Economics* 56, 639-652.
- [3] Ashcraft, Adam, James McAndrews and David Skeie (2011). "Precautionary Reserves and the Interbank Market," *Journal of Money, Credit and Banking*, forthcoming.
- [4] Bhattacharya, Sudipto and Douglas Gale (1987). "Preference Shocks, Liquidity and Central Bank Policy" in: Barnett, W., Singleton, K. (Eds.), *New Approaches To Monetary Economics*. Cambridge Univ. Press, New York, Pp. 69-88.
- [5] Copeland, Adam, Antoine Martin and Michael Walker (2010). "The Tri-Party Repo Market Before the 2010 Reforms," working paper.
- [6] Diamond, Douglas and Phil Dybvig (1983). "Bank Runs, Deposit Insurance, and Liquidity," *Journal of Political Economy* 91, 401-419.
- [7] Freixas, Xavier, Antoine Martine and David Skeie (2011) "Bank Liquidity, Interbank Markets and Monetary Policy," *Review of Financial Studies*, forthcoming.
- [8] Goldsmith-Pinkham, Paul and Tanju Yorulmazer (2010). "Liquidity, Bank Runs, and Bailouts: Spillover Effects During the Northern Rock Episode," *Journal of Financial Services Research* 37, 83-98.
- [9] Martin, Antoine, David Skeie and Ernst-Ludwig von Thadden (2010), "Repo Runs," Federal Reserve Bank of New York Staff Reports no. 444.

- [10] Skeie, David (2008). “Banking with Nominal Deposits and Inside Money,” *Journal of Financial Intermediation* 17, 562-84.