Discussion of "A Pigovian Approach to Liquidity Regulation"

Ernst-Ludwig von Thadden
University of Mannheim

The regulation of bank liquidity has been one of the most controversial topics in the recent debate about the reform of financial markets. The new regulatory framework for banks published by the Basel Committee on Banking Supervision on December 16, 2010, enters new regulatory territory on several fronts. But arguably the most daring and novel rules concern bank liquidity. The "net stable funding ratio," a requirement to be introduced until 2018, and the "liquidity coverage ratio," for implementation in 2015, are regulatory attempts to strengthen bank balance sheets against liquidity shocks, introduced under the impression that the sudden collapses of banks in the Great Financial Crisis were avoidable and systemically dangerous.

This impression is quite certainly correct, but there has been very little research in finance supporting the implementation of such instruments. The difficulties of formulating a theory of the systemic role of bank balance sheets are indeed considerable, ranging from the question of the transmission of idiosyncratic shocks in interbank markets to the questions of the costs and benefits of maturity transformation and the inefficiency of markets with cash-in-the-market pricing. In their paper (in this issue), Perotti and Suarez cut through all this maze and present a simple and powerful analysis of a basic externality underlying the regulation of bank liquidity.

They do this in the simplest possible model of banking regulation: a static, partial-equilibrium, one-good model of competing firms with one aggregate externality. This approach makes it possible to exhibit the market failure and the regulatory remedy very clearly. The simplicity of this approach is the strength of the paper and its greatest weakness at the same time, because the model is tailored to understand exactly the question it is supposed to highlight. This is very economical, but it makes it difficult to evaluate how other aspects of banking and financial markets interfere with banking liquidity and why the regulation of banking liquidity may, after all, be such a complicated and controversial problem.

To see the argument, one can consider the following model (which simplifies some of the math in the paper, such as replacing integrals with sums, without changing anything of the substance). There are n banks, with weights p_i that reflect size or systemic importance. Bank i creates an expected net present value (NPV) of $v_i(x_i, X)$, where x_i is short-term borrowing by bank i and $X = \sum_{i=1}^{n} p_i x_i$ is aggregate short-term borrowing. The crucial assumptions are that

$$\frac{\partial v_i}{\partial X} < 0 \text{ and } \frac{\partial^2 v_i}{\partial x_i \partial X} < 0, \tag{1}$$

i.e., that aggregate short-term borrowing reduces expected individual bank value overall and at the margin. The main specification given for this reduced form is

$$v_i(x_i, X) = \pi_i(x_i) - \varepsilon_i(x_i)c(X), \tag{2}$$

where π_i is bank value in the absence of crises, ε_i the probability that bank i is affected by a crisis, and c the expected cost of a crisis for a single bank.

In a competitive equilibrium, each bank chooses its short-term borrowing x_i^e to maximize its expected NPV, taking aggregate borrowing X^e as given. Under the appropriate concavity and boundary assumptions, this yields the first-order conditions

$$\frac{\partial}{\partial x_i} v_i\left(x_i^e, X^e\right) = 0 \tag{3}$$

that characterize the equilibrium.

A social planner, on the other hand, will choose borrowing levels x_i^* that take the aggregate externality into account, which yields the first-order conditions

$$\frac{\partial}{\partial x_i} v_i\left(x_i^*, X^*\right) + \sum_j p_j \frac{\partial}{\partial X} v_j\left(x_j^*, X^*\right) = 0. \tag{4}$$

By assumption 1, these conditions imply that $X^* < X^e$, hence that the competitive equilibrium involves too much short-term borrowing.

As in basic public finance, it is then simple to see that a linear (Pigovian) tax on short-term borrowing, to the tune of

$$\tau^* = -\sum_j p_j \frac{\partial}{\partial X} v_j\left(x_j^*, X^*\right), \tag{5}$$

perfectly aligns public and private incentives in equilibrium and thus achieves the socially optimal level of short-term borrowing at each bank. Furthermore, it can be seen easily that a quantity regulation of the sort

$$x_i \leq \bar{x}, \tag{6}$$

while generating the optimal aggregate borrowing level X^*, cannot restore first-best efficiency, because it would shift short-term borrowing from banks with a high marginal product to those with a low marginal product.

This brief account is a fairly complete summary of two-thirds of the analysis in the paper. Much of the value of the paper lies in the remaining third of the analysis, which applies the above simple model to several issues that are of central concern to bank regulators.

First, the authors discuss the "liquidity coverage ratio" of Basel III. This requirement can be modeled as requiring banks to hold a certain fraction ϕ of their short-term borrowing in liquid assets instead of investing it in (hopefully) positive-NPV projects. Holding an amount m_i in such liquid assets involves a cost of $\delta_i m_i$, which is the difference between the bank's borrowing rate and the safe rate at which it can hold the liquid asset. The bank's objective function then becomes

$$v_i(x_i - m_i, \hat{X}) - \delta_i m_i, \tag{7}$$

where $\hat{X} = \sum_{i=1}^{n} p_i(x_i - m_i)$. The bank maximizes (7) under the constraint $\phi x_i \leq m_i$, taking $\hat{X}$ as given. Although the liquidity coverage requirement is formally similar to imposing a tax rate $\tau_i = \frac{\delta_i \phi}{1-\phi}$, it is not difficult to see that the resulting equilibrium allocation is not first-best, even if the induced tax rate is set to the first-best level τ_i^*, because it involves a deadweight loss of $\tau_i^* X^*$ (proposition 6).

The second extension of the paper is a simple model of moral hazard. Moral hazard is modeled as an exogenous propensity to borrow at the expense of outside stakeholders, such as the deposit insurer. This propensity is measured by a parameter θ that modifies the special objective function (2) as follows:

$$v_i(x_i, X, \theta) = \pi_i(x_i) - (1 - \theta)\varepsilon_i(x_i)c(X). \tag{8}$$

Hence, a type θ bank ignores a fraction θ of the expected losses it generates. If there is unobservable heterogeneity in θ, a Pigovian tax no longer achieves first-best, because the tax rate would have to condition on θ. However, if θ is the only source of unobserved heterogeneity—that is, if all v_i are identical—then the quantity restriction (6) achieves the first-best. This is straightforward, because now the first-best borrowing amount x_i^{**} is the same for all banks, which the regulator can simply impose as an upper limit (that will of course be attained).

The baseline model and the second extension therefore represent two extremes in which two extreme forms of regulation are optimal. In the baseline model, a price regulation (via linear taxes) is optimal; in the second extension, a quantity regulation is optimal. The optimal regulation in the general case, with unobserved heterogeneity in bank profitability and bank propensity to moral hazard, is an open issue. As the authors conjecture in the introduction, it may follow a similar trade-off as the classic analysis of Weitzman (1974).

The model is simple and exhibits an important externality in banking very clearly. Yet, by focusing on short-term borrowing as the sole source of bank funding, it oversimplifies and makes it difficult to interpret the results in terms of regulatory recommendations. Clearly, banks are funded through a variety of liabilities, not just short-term debt. Incidentally, deposits, which are a classical form of very short-term borrowing, have proven to be a highly reliable source of funding in the recent crisis. But more importantly, bank value is created also by long-term borrowing or equity, two elements that are also absent from the reduced-form profit functions (2) and (8). In these formulations, any interference with short-term borrowing x_i automatically impacts the bank's asset side, because there is nothing else to fund the assets. Regulation in practice, of course, does not necessarily aim at the asset side, but rather tries to make sure that assets are funded through a more resilient liability structure.

To see this issue more clearly, consider the following simplified bank balance sheet:

		d	deposits
m	liquid assets	x	short-term market funding
y	productive assets	b	long-term borrowing
		e	equity

A regulation such as the net stable funding ratio of Basel III does not primarily intend to influence y, but targets the bank's potential maturity mismatch by relating b and e to y. Short-term borrowing x may be used by the bank as an instrument to achieve a net stable funding objective, but x is not mechanically targeted by this type of regulation, as the present paper assumes.

This immediately raises the next question: why do banks use short-term funding and what types of short-term funding are used in what way in the value-creation process? Clearly, maturity transformation is the central feature of short-term borrowing and of significant economic benefit. As argued by Diamond and Dybvig (1983) for the case of commercial banking and by Martin, Skeie, and von Thadden (2010) for the case of dealers and investment banks, short-term borrowing can be a viable source for long-term value creation. By limiting the use of short-term market finance, regulators can improve the stability of banks (Martin, Skeie, and von Thadden 2010), but this will have consequences for the amount of maturity transformation banks can provide. Is there a stability-profitability trade-off? The present paper yields an unambiguously positive answer to this question, because the trade-off is hard-wired into the objective function (2). It would be interesting to see whether such an assumption can be microfounded by a more detailed model.

Similarly, the assumption about the impact of aggregate borrowing in (1) is a rather extreme one. According to this assumption, aggregate borrowing reduces expected bank profitability and marginal expected profitability at the bank level. This assumption is not very plausible in "good" times (which is in line with the authors' thinking), but whether the possible negative impact in "bad" times is as dominant as the authors assume depends on the functioning or malfunctioning of financial markets under stress. A key problem in the 2008 crisis, as in the looming European banking crisis of 2011, has been the failure of the interbank market. Is this failure simply a consequence of too much short-term borrowing? Or is it possible that safeguards or interventions on the interbank market (such as transparency requirements or liquidity assistances) can remedy such imperfections more efficiently than liquidity constraints on banks? Is it rather secured interbank lending or unsecured interbank lending that has the potential to destabilize the market (Heider and Hoerova 2009)? In this perspective it is rather unfortunate that the paper almost completely abstracts from prices. Even the analysis of competitive equilibrium works only with equilibrium quantities and describes profits in reduced form. This suggests that either asset supply is completely elastic or that the analysis is only partial equilibrium and thus ignores potential feedback effects. Both of these alternatives are not entirely convincing.

While I believe that the thrust of the argument that the authors formulate so simply and elegantly is correct, I would like to see a more detailed description and analysis of the underlying frictions that yield the reduced form that they present. In this sense, the present paper is rather a first step to our understanding than a final treatment of the complex issues that make short-term finance a systemic problem in modern financial markets.

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