

The lender of last resort and modern central banking: principles and reconstruction

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Central banks are celebrated and castigated in broadly equal measure for the actions they have taken (or not taken) to stabilise the financial system and wider economy since crisis broke in 2007. For every paean of praise for their innovations in injecting liquidity, keeping markets open and supporting macroeconomic recovery, there is a chorus of reproof censuring central banks for breaching a crucial boundary between central banking and fiscal policy. Those criticisms are essentially about political economy, and as such amount to an important challenge to the legitimacy of today's central banks.²

The terrain – and the object of the criticisms – covers three separable but linked areas: monetary policy, lender of last resort, and what has become known as “credit policy”. My focus here is lender of last resort (LOLR), where especially in the United States the atmosphere is probably most toxic, poisoning debates about central banking more generally. Once central banks are perceived as having overstepped the mark in bailing out bust institutions, critics look for overreach in their more overtly macroeconomic interventions too. That, more or less, is what has happened in the United States.³

The relative neglect of LOLR in the core literature on central banking over the past twenty years is a tragedy – one that contributed to central banks losing their way and finding themselves struggling for breath when faced with a liquidity crisis in 2007. That mainstream macroeconomics devoted so much effort to conceptualising the case for central bank independence and to articulating ever more sophisticated models of how monetary policy works while leaving out of those models the fragile banking system that called central banking into existence as a *liquidity insurer* in the first place warrants careful explanation – most probably by political scientists, sociologists and historians of ideas.

Of course, there wasn't complete silence on LOLR. The technical academic literature advanced,⁴ but was largely separate from policy debates, no doubt because LOLR was widely regarded as a relic of the past. With a few exceptions, prior to the crisis policy-oriented commentary was dominated, especially in the United States, by arguments for limiting or abolishing liquidity insurance and, indeed, central banking itself.⁵ As such, rightly or wrongly, those who remained

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² My thanks for comments to Darrell Duffie, Dietrich Domanski and Geoffrey Wood; and to Steve Cecchetti for conversations on issues addressed here.

³ See for example the film, “Money for nothing”.

⁴ Via the work of, for example, of Rochet and Tirole (1996); Holmström and Tirole (1998); Freixas, Giannini, Hoggarth and Soussa (2000); Freixas, Rochet and Parigi (2000, 2004); and Rochet and Vives (2004).

⁵ An exception is Laidler (2004), for example in “Central banks as lenders of last resort: trendy or passé?”.

engaged with LOLR, including within the Federal Reserve system, are often perceived to be politically partisan and, as such, pursuing a sectional interest. Nevertheless, that does not make a case for casting them and their arguments aside. Both they and events themselves have raised serious questions and challenges.

The most serious accusation from critics is that (some) central banks aided insolvent firms, and stretched beyond their legal authority to do so.⁶ The most serious practical challenge seen by central bankers themselves is that firms have become deeply reluctant to turn to the LOLR, especially via bilateral facilities such as the Discount Window, due to the stigma involved, leaving the financial system fragile in ways it is hard for regulation to undo. These sound like quite different problems. But I shall argue that they are closely linked, and outline a cure.

Only slightly less momentous are a host of questions brought to the fore by the 2007–09 phase of the crisis: should central banks lend against a wide or narrow class of collateral; should they provide liquidity assistance to non-banks; should they act as market-makers of last resort; what happens when the liquidity shortage is in foreign currency? Each issue presents distinct technical and governance challenges. None of them is covered by Bagehot, who needs updating if only for that reason. After addressing them in sequence, I will bring things together with some broader thoughts on the governance and democratic accountability of central banks in the area of liquidity insurance.

The underlying theme is legitimacy: how to ensure that the central banks' role of LOLR is legitimate in democratic societies where powers and responsibilities have in effect been delegated by the elected legislature. As a general matter, I have argued elsewhere that a regime for delegating powers to an independent agency needs to satisfy four design principles or precepts: high-level purposes, goals and powers need to be framed in primary legislation, or fleshed out by government under statutory authority; central banks need to operate within that domain according to reasonably clear principles; transparency needs to be sufficient, if only with a lag, for both the regime and the central bank's stewardship of it to be monitored and debated by the public and, crucially, the legislature; and there needs to be clarity about what happens, substantively and procedurally, during a crisis and, in particular, when a central bank reaches the boundary of its authority.⁷ What those design precepts entail in practice depends, of course, on the substance and purpose of the regime. Here the question is the LOLR function.

Four concepts shape the analysis of the LOLR: time consistency, moral hazard, adverse selection, and what I call the "fiscal carve-out" delineating the space in which an independent central bank can operate. How those concepts are handled shapes a jurisdiction's regime. A brief word on each is warranted.

Acting as the lender of last resort involves making commitments: to lend in order to stave off or contain systemic distress. Those commitments need to be credible, which requires amongst other things that they be *time consistent*. The regime won't work well if people believe a central bank will change its mind, or has no clear principles.

⁶ See, for example, Humphrey (2010) or, for a somewhat different view, Cline and Gagnon (2013).

⁷ The four "how to delegate" good-design precepts are set out in Tucker (2014a).

As with any kind of insurance, liquidity insurance creates incentives to take more of the insured risk, in this case liquidity risk. *Moral hazard* is a major issue that must be addressed if a regime is to serve society well over time. Unless care is taken, that can conflict with time consistency. If a central bank pledges not to provide assistance in some form or other (eg to insolvent firms) but then buckles in the face of systemic distress, future promises to the same end will probably not be believed, exacerbating moral hazard and putting the financial system on an unstable course. So ways have to be found to underpin the credibility of commitments designed to contain moral hazard.

Many types of insurance are plagued by a problem of *adverse selection*, with only the riskiest being prepared to take up the offer of insurance. That leaves the insurer exposed to bad risks. In the case of LOLR, which serves a public policy purpose, the consequential challenge is how to design a regime that firms are prepared to use before it is too late to contain the liquidity crisis and its wider costs to society.

Finally, there is no getting away from the fact that LOLR assistance is risky. However well protected, the central bank can in principle suffer losses. This isn't a theoretical point: losses have crystallised in practice. In the first instance, the central bank will cover its losses by drawing on its capital or by paying less seigniorage over to the government. Either way, that simply transfers the costs to government. Ultimately, losses are a fiscal issue. They must be covered by higher taxation (or lower public spending) or by higher seigniorage, ie resorting to inflation as a tax. The LOLR regime therefore needs to be framed by a broader *fiscal carve-out* defined for each jurisdiction's central bank. In most countries, this fiscal carve-out (FCO) is implicit or scattered across many statutes and agreements. It is my contention, articulated more fully elsewhere, that the FCO should be explicit, as complete as possible, and transparent.⁸

Those four concepts run through this analysis. But first, what is the LOLR, and why does it exist?

What is the lender of last resort?

Central banks provide liquidity insurance to the banking system, which in turn provides liquidity insurance to the rest of the economy (households and businesses). Thus, central banks are liquidity *re*-insurers. In each case, their capability to provide insurance stems from their liabilities being money.

Central bank money comprises notes held by the public and demand deposit balances held by banks (known as reserves). This money can be created by the central bank at will – at the stroke of a pen, as used to be said – so long as there is confidence in the stability of its value relative to goods and services (the goal of price stability). The private money of commercial banks comprises on-demand deposits held by the public and businesses. It too can be created at will *provided* there is confidence that it can be redeemed, ultimately into central bank money (the core goal of financial stability). Fragilities inherent in the workings of this private sector liquidity insurance system give rise to central banks' LOLR function.

⁸ Tucker (2014a) HKS Gordon Lecture, *ibid*.

Commercial banks provide liquidity insurance to customers in two ways, with payouts having different *first-round* effects on a bank's balance sheet (unless it takes offsetting action). First, current (or chequing) account deposits can be withdrawn at call. When the liquidity insurance is exercised, the balance sheet of the individual bank in question shrinks, and it becomes less levered. It must dispose of an asset to finance the redemption,⁹ or take offsetting action by going into the market to borrow. As such, the bank relies on asset liquidity or on funding liquidity, or both. What happens to the *banking system as a whole* depends on how the deposit is withdrawn. If the money is drawn by way of making a payment by deposit transfer, another bank's balance sheet expands. There is a redistribution of private sector monetary liabilities, but the aggregate size of the banking system's monetary liabilities – broad money – is unchanged. If, by contrast, the deposit is redeemed for currency (central bank notes), the balance sheet of the whole banking system shrinks; private money contracts. When a customer moves its deposit to another bank, it is in effect cancelling one liquidity insurance contract and entering into a new one with another bank. When the customer decides to hold cash (central bank notes) instead, it has lost confidence in the capacity of the commercial banking system as a whole to provide it with liquidity insurance. As I shall discuss, some economists think that this distinction should be fundamental to framing the role of central banks as liquidity (re)insurers: that they should provide liquidity only to offset a run into their own money, which of course they can't fail to do as they must supply the extra money if they wish to leave monetary conditions unchanged.

But demand-deposits are not the only mechanism through which banks provide liquidity insurance. The second liquidity insurance product is provided by banks entering into commitments to *lend* at call: known as committed credit facilities and overdraft facilities. Banks can offer this service provided that there is (at least transient) demand for their monetary liabilities. In other words, this is a derivative form of liquidity insurance; it could not be provided without the base deposit account insurance. When a committed line is drawn down, the balance sheet of the insurer (the bank) *expands*; its customer's deposit account is credited, it becomes *more* levered, and broad money expands.

Like all insurance contracts, liquidity insurance from commercial banks entails counterparty credit risk: will the insurer be willing and able to meet its obligations when the insurance is drawn upon? But with liquidity insurance there is a twist. The distinctive features of the system are twofold. First, the core liquidity service, providing demand deposits, entails households and firms placing some of their wealth with their bank; they have a debt claim, and so banks are levered. Second, this private money is *credit money*: bank deposits are "backed" by claims on firms and households. Indeed, deposit money is created by such loans, which are typically risky and illiquid. A bank holds only a fraction of its balance sheet in liquid assets, the most liquid of all being reserves balances at the central bank: hence the term "fractional reserve banking". In sum, banks provide liquidity insurance by undertaking liquidity and risk *transformation* on their balance sheets. Confidence in the ability of banks to redeem their monetary obligations, and more broadly make good their short-term commitments, depends upon perceptions of their solvency.

⁹ In the simplest case, the bank runs down its reserves at the central bank. If that takes it below its required or targeted level of reserves, in a system of reserves-averaging over a, say, month-long maintenance period, it has the rest of the maintenance period to make good its reserves position.

Since most of their assets are illiquid and their balance sheets opaque, their solvency is hard for creditors to assess.

Those two features of the economy's liquidity insurance system – deposits being a store of value, backed by risky assets – have important consequences. With most types of insurance, the customer cannot draw on its insurance policy simply because it becomes worried about the ability (or willingness) of the insurer to make good its commitment; there is a defined "insurable event" and it has to occur before a claim can be made under the policy. For example, we can't claim on our house insurance simply because we have lost confidence in the ability or willingness of the insurer to pay out; I might decide to change insurer but I can't claim on my existing contract unless my house has burnt down or otherwise been damaged. Liquidity insurance is profoundly different. This is because bank deposits are a store of value as well as a medium of exchange. If a depositor thinks its deposit may lose value, it will want to withdraw the deposit while it can. In the case of committed credit facilities, the motives can be richer, with customers inclined to draw down credit lines in two sets of circumstances. First, if a customer thinks the deterioration in its *own* credit position may prompt the bank to withdraw (or refuse to honour) the facility; this is one manifestation of adverse selection as the weakest customers will draw on their insurance, weakening the quality of the bank's loan portfolio. If it thinks its bank is sound, the customer would prefer to hold a deposit with it than to rely on the commitment of the bank to extend it a loan in the future; the commitment to repay the deposit is unqualified. But second, the customer will draw on its credit line if the *credit standing of the bank itself* is thought to be deteriorating, so that it might not be able to honour its commitment to lend if the customer waits. In that case, the customer will both draw on the credit line *and* pay away the resulting deposit to another bank. Precautionary drawings are not imaginary. During at least one episode in the decade preceding the 2007–09 liquidity crisis, US securities dealers were thought to be drawing (or contemplating drawing) large amounts under committed lines from commercial banks as a precautionary measure, which could have put the banking system itself in jeopardy.

If a bank is faced with a surge of withdrawals, it may have to sell assets at discounted prices; either because it is straining the liquidity of asset markets or because it is treated as a forced seller. That will impair its solvency position. There is a first-come, first-served incentive for customers to draw on their liquidity insurance, by either simply withdrawing existing deposits or transferring deposits immediately after drawing down committed credit lines. Such runs will tend to occur whenever there is an actual or perceived *ex ante* solvency problem, but also when an *ex ante* solvent bank is liable to become *insolvent ex post* due to the fire sales necessary to meet withdrawals in what amounts to a self-fulfilling panic. A run on an *ex ante* sound banking system can, thus, undermine the private-banking liquidity insurance system.¹⁰

This can have major social costs. Since the private money system is based on credit money, the afflicted part of the banking system loses its capacity to lend unless its deposits are accepted as money. And if the crisis is widespread, other parts of the banking system might not be able to substitute seamlessly, or may even be pulled into the vortex themselves. Payments and loans – or if you prefer, the

¹⁰ This story is broadly captured in Diamond and Dybvig (1983).

monetary system and the credit system – are inextricably intertwined, surviving or falling together. Enter the central banks.

The central bank acts as a liquidity *re-insurer*: as a general matter, it does not provide liquidity insurance directly to everyone in the economy but rather to the private sector liquidity insurers, the banks. Standing at the apex of the payments system,¹¹ with banks settling claims amongst themselves across its books, it is not credible for a central bank to deny that it will ensure that, in their language, the clearings will go through. That being so, central banks can do good by not waiting until the last moment or by leaving their policy in doubt. In my preferred paraphrase¹² of Bagehot's famous dictum, central banks should make clear that they stand ready to lend early and freely (ie without limit), to sound firms, against good collateral, and at rates higher than those prevailing in normal market conditions. This is an integral part of a monetary economy with fractional-reserve banking.

In principle, it brings two benefits. *Ex ante*, knowing that the LOLR is there, banks' short-term creditors should be less inclined to run. *Ex post*, if nevertheless they do run, by providing liquidity the central bank reduces the need for a forced sale of assets that otherwise would depress values, causing avoidable insolvencies and knocking the economy as a whole onto an inferior equilibrium growth path. In other words, the LOLR can reduce both the probability and impact of runs. It helps to preserve stability in the face of unwarranted runs and contains the spread of panic to *sound* firms in the face of warranted runs on other, fundamentally bust firms. Its purpose or objective is to contain contagion.

Needless to say, this regime is not uncontentious. On the one hand, liquidity insurance based on liquidity and risk transformation reduces the need for households, businesses and other financial intermediaries to self-insure by holding stocks of liquid securities, releasing resources for use in the risky enterprises that generate growth and prosperity.¹³ But, on the other hand, like all insurance regimes, it incorporates problems of moral hazard and adverse selection. And since the LOLR liquidity re-insurance is provided by the state, it faces problems of credible commitment and of competence. The time-consistency problems cut both ways. Will central banks keep their promise to lend into a liquidity crisis? That was what preoccupied Bagehot in the middle of the 19th century. But also, will central banks lend when they shouldn't, when the *underlying* problem is one of solvency? In other words, will they *oversupply* liquidity re-insurance by setting soft terms? These issues have been debated, heatedly, for more than a century. They are back in play following 2007–08; the Bank of England was criticised for being slow out of the blocks, the Federal Reserve for lending when, some think, it should not have done. More generally, at one end of the spectrum of opinion, the inherent problems of LOLR liquidity insurance are seen as smaller than the benefits of fractional-reserve banking (FRB) to the economy as a whole. At the other end of the spectrum, the problems are regarded as insuperable. Either fractional-reserve banking should be

¹¹ A sentiment echoing Francis Baring in the same piece in which, in French, he coined the term lender of last resort. Baring referred to the central bank as "the centre or pivot, for enabling [the monetary and credit] machine to perform its functions". See F Baring (later Lord Northbrook) "Observations on the establishment of the Bank of England. And on the paper circulation of the country", 1797.

¹² See Tucker (2009).

¹³ If the likelihood of deposit withdrawals and credit facility draw-downs are not highly correlated, the aggregate benefits are greater: Kashyap, Rajan and Stein (2002).

banned or the central bank LOLR should be abolished in order to incentivise banks to internalise the costs of their liquidity risks, or both. In between those two extremes lies the challenge of designing an effective LOLR regime for the banking system we have; a regime designed to provide liquidity re-insurance not solvency support. That is the focus of this paper.

Four schools of thought on the LOLR

Broadly speaking, there are four schools of thought on LOLR, which in crude caricature are as follows:

- (1) The “free banking” school: abolish the central bank as a state LOLR.
- (2) The Richmond Fed view: lend only via open market operations to the market as a whole, and so do not lend bilaterally: ie abolish the discount window.
- (3) A view sometimes attributed to the New York Fed: lend to anybody, solvent or insolvent, and sometimes on soft terms, where necessary to keep the credit system going.¹⁴
- (4) The “classic” Bagehot view: lend freely to solvent but illiquid firms against good collateral at a high rate of interest.¹⁵

I shall address the first and second schools of thought only briefly. Although I dismiss them as practical policy positions, I do think they each raise important issues.

Free banking, market discipline and the abolition of central banks

Advocates of free banking maintain that removing a state lender of last resort – ie abolishing central banks, with money being issued by competing private firms – would leave “free” banks better incentivised to manage themselves prudently.

The big problem here is that the provision of liquidity insurance to the banking sector is about containing the negative externalities (or social costs) of bank distress. A private sector mechanism cannot be relied upon to do that. In this, LOLR insurance differs from most other types of insurance, where the costs are private.¹⁶ Advocates of free banking respond that the collective interest can, in fact, be captured by setting up a mutual-like clearing house. That won’t help much, however, when the run is universal. And even when localised, it relies upon clearing house member banks being *able* to make well informed judgments about the solvency of a liquidity-stricken peer, and being *willing* to lend to it.¹⁷ This is

¹⁴ See, for example, Salter (2013). It is irrelevant to my purpose whether or not the New York Fed recognises this as their policy or, indeed, whether the identification by Salter is fair. It is made and it is believed by some people. Using slightly different labels for the same four schools, some years ago Michael D Bordo attributed the view to Charles Goodhart; see Bordo (1990).

¹⁵ Some would describe the Richmond view as Bagehot’s position, but I don’t see how that can be so, as open market operations to meet the market’s *net* need for reserves didn’t exist in Bagehot’s day. So far as I am aware the system in his time was based on bilateral lending.

¹⁶ See Solow (1992).

¹⁷ For a description and advocacy of the clearing-house system, see Timberlake (1984).

charmingly romantic. As Fred Hirsch argued nearly 40 years ago, club-type structures work only where the core banks are homogenous and see that the collective interest is in their own interest.¹⁸ Today's banking systems don't match that ideal. We are a long way from the worlds in which Natty Rothschild or J P Morgan could corral their fellow bankers. Banks that are peers in one market know little or nothing about each other's activities elsewhere in the world, or in other markets.

Nor is it obvious that we should want to try to recapture those possible features of the past. Along with club-like homogeneity and solidarity come barriers to entry and impaired competition. That's to say, oligarchical power.

In addition, getting rid of the LOLR would *not* solve the moral hazard problem stemming from governments potentially providing a fiscal *solvency* backstop, a habit that hadn't developed in the 19th century. That being so, abolishing the LOLR might even exacerbate moral hazard as liquidity problems amongst sound firms would be more likely to evolve into solvency problems via fire sales of assets at heavily discounted prices. Some versions of free banking seek to guard against this via a requirement that private note-issuing banks back a specified share of their note or deposit liabilities with a safe asset, such as high-quality government bonds or, in some versions, gold. This overlooks two features of modern societies. First, regulatory arbitrage is endemic, and so welfare-threatening maturity transformation would be recreated elsewhere in the financial system; what matters is *de facto* banking not *de jure* banks. Second, compared with a century or so ago when a version of free banking and the gold standard prevailed in the United States, the citizens of full-franchise democracies have got used to and expect the state to use macroeconomic policy and other measures to insure them against bad states of the world. The degree of volatility in economic activity and employment tolerated then was greater than would be considered acceptable in a world accustomed to central banks deploying monetary policy to smooth economic fluctuations.¹⁹ So I don't see a return to a commodity money standard as part of an attempt to make private banking safe.

The free banking lobby is really after a much broader re-construction of the role of the state and a transformation in the expectations of citizens. I doubt that abolishing the LOLR is a plausible starting point for their project.

But if I dismiss their core policy prescription for central banks, we should take seriously their concern about moral hazard. If the state insures banks and others against liquidity risk, then how should society ensure that banks don't take on more liquidity risk; and how do we prevent central banks oversupplying liquidity re-insurance or, worse still, providing closet solvency support?

¹⁸ Hirsch (1977).

¹⁹ Eichengreen (1998) makes a similar point.

The Richmond Fed view: OMOs only

The core proposition of the Richmond Fed School²⁰ is that liquidity insurance should be provided only via open market operations (OMOs), accommodating “velocity” shocks to the demand for central bank money. On this view, bilateral liquidity assistance comprises an unnecessary and objectionable expansion of the mandate of the monetary authority.

They argue that it is *unnecessary* because to maintain monetary stability it will suffice to offset aggregate (velocity) shocks to the demand for central bank money, with the money markets distributing reserves to those sound individual firms in need. In its strongest variant, runs from the deposits of one bank (or group of banks) to another bank (or group of banks) do not warrant intervention. Instead, the LOLR need step in only when faced with a run from banking deposits into currency (notes and coin), with broad money shrinking. Bilateral assistance is, further, regarded as *objectionable* because bilateral lending, comprising as it does support for *specific* firms, takes the monetary authority into distributional issues, which is the proper preserve of the fiscal authority. Moreover, in common with the “free banking school”, Richmond believes that the market will do a better job of separating the solvent from the insolvent, because its participants are motivated by profits and losses.

The main problem with this *as an iron rule* is that it is hopelessly at odds with reality and the economics underlying stability problems. I quite agree that, where the money markets are working, providing liquidity assistance to the market as a whole, via OMOs, is preferable. Not least, it can help to overcome stigma problems. But in bad states of the world, the money markets cannot be relied upon to distribute reserves to sound but illiquid banks. Opacity impedes private assessments of solvency/insolvency. Indeed, money markets can fall prey to a “lemons” problem, bidding up for funds by even a sound bank being taken as a signal of fundamental distress. Starved of funds in the market and with their liquidity problems snowballing, the initially liquidity-stricken but sound bank might become fundamentally unsound if it is forced into fire sales and closing out of contracts. That not only exacerbates the bank’s own problems, it potentially spreads them elsewhere, leading to disturbances in the supply of and demand for broad money and in the demand for central bank money. A stable monetary regime – or, in the language of the Federal Reserve’s founders, an “elastic currency” – cannot be assured by open market operations alone. To deprive the central bank of the wherewithal to provide bilateral liquidity assistance would be perverse. Put another way and to introduce a test that will recur in my analysis, it would not be a time-consistent regime.

Nor, it should be said, does providing liquidity via OMOs rather than bilaterally via a discount window provide a safeguard against the central bank lending to fundamentally insolvent firms, as some advocates appear to think. The solvency of the counterparty depends on its balance sheet not on the central bank’s chosen operational technique.²¹

²⁰ See Goodfriend and King (1988). The key points have been made by current Richmond Fed President Jeffrey Lacker on a number of occasions.

²¹ Schwartz (1992) seems to make this mistake, as her underlying point was about purpose not technique.

Finally, given the weight placed by this school on monetary indicators, it is worth noting that in the short run the path of broad money is not always a reliable test of the system's underlying health. As already discussed, if they believe the system (and the economy more broadly) to be deteriorating but not yet terminally bust, businesses and other financial intermediaries have incentives to draw down credit lines in order to close off the possibility that they are refused access later. Broad money initially expands, with the system becoming more levered and exposed to credit risk. Technically, the demand for money has indeed risen, but only as a precursor to a fall. If, in the event, things do get worse, customers run down those elevated deposit balances, possibly in a run to cash, with broad money contracting. The initial expansion of broad money was a warning signal!

The Richmond School view echoes the argument of the early 19th century UK Currency School, pitted against the Banking School, that it is only the monetary *liabilities* of the banking system that matter to monetary stability. That's to say, we needn't be too bothered about the credit system. Recent years have, however, provided a painful reminder that monetary contraction can be driven by a collapse of confidence in the credit system; and that injecting more base money isn't an easy cure for a contraction in broad money when the credit system is fundamentally impaired; the "money multiplier" is much weaker in a banking system that is still solvent but has inadequate capital to cope with the risks that may lie ahead. Capital matters too! In a system of fractional-reserve banking, it is hard to unbundle money and credit. *Both* matter to stability.

But that does not entail that the authorities must try to offset every wobble in the credit system. Indeed, as with the "free bankers", the Richmond School highlights an important point: how to ensure that central bankers stick to central banking and don't re-invent themselves as an unelected fiscal authority in their eagerness to forestall problems in the credit system. That, rather than "OMOs versus the discount window", is really their central worry, and they're right to raise it.

Solvency, stigma and moral hazard: Bagehot re-affirmed and updated

By elimination, the choice of regime turns on whether to lend to insolvent firms, and on moral hazard more generally. It is not hard: Bagehot wins. The challenge is how to articulate and maintain a regime that does not slip (back) into supporting fundamentally bust firms.

The arguments against central banks lending to insolvent banks are legion. First, it is quite simply wrong for anyone knowingly to lend secured to a firm with negative net assets, as the lender is making others worse off; short-term unsecured creditors escape as bankruptcy is deferred, but longer-term unsecured creditors end up as claimants in bankruptcy with a call on a smaller pool of assets. Contrary to the doctrine of economists as diverse as Hawtrey, Schwartz and others, a central bank cannot guard against this solely by taking excess collateral, as the directors of the borrower might be indulging in fraudulent preference. Confusion on this point seems to run through the literature. Precisely because banks are highly levered, they could be rendered insolvent by a relatively small proportion of their assets proving to be worthless. Even if the rest of their portfolio was high-quality and therefore

acceptable to the central bank as collateral, that won't be enough to repay the firm's liabilities.²²

Second, if the state wishes to provide solvency support (which I am absolutely not advocating!), that is a decision for the elected government under the control of the legislature. Central bank independence is valuable to society, but it relies on boundaries. Central banks should not violate those boundaries, and governments should not press them to do so.²³

Third, solvency support creates moral hazard writ large. It undermines the incentives of bondholders and other unsecured, uninsured creditors to monitor, price and ration for bank riskiness. A market economy can't work properly if banking is subtly but substantively socialised.

And fourth, using or being suspected of using LOLR as a mechanism for bailing out fundamentally bust banks creates a massive stigma problem. If it is believed that the central bank will not turn away insolvent banks, then it becomes toxic for a solvent but illiquid bank to borrow from the central bank if there is any chance of that becoming known. Moreover, agency problems *within* banks, notably between senior management and the board, would make management unwilling to use the central bank's bilateral facilities even if they were certain it would not become public, because the board might conclude that management was hiding a solvency problem. I was in central banking for long enough to know that that is not some flight of fancy. It preoccupied not a few banks around the world.

Aversion to lending to bust banks is not a new doctrine. In perhaps the most famous 19th century case of a request for LOLR support being declined, in May 1866 the Bank of England turned away Overend Gurney, London's biggest bill broker, after receiving reports from a team put in to examine its soundness. Panic ensued, contained eventually by the Bank's visible assistance to the rest of the system; an act celebrated by Bagehot as recognition by the Bank of its LOLR responsibility.²⁴

Let me put it brutally. Developing a reputation, whether valid or invalid, for being prepared to lend to insolvent firms undermines the purpose and effectiveness of the LOLR. This is the essence of the stigma problem.

It cannot be solved by the central bank offering so-called *committed* lines of credit. If the line is truly committed, then it covers insolvent firms and so sound firms will not be prepared to use it or even sign up to it. If access depends on a test of solvency, then it is not really committed.

²² Imagine a bank with one unit of equity; a balance sheet of 100 units, ie 100 of assets and 99 units of debt liabilities; 10 units of risky assets and 90 of safe assets. Now imagine that all the risky assets prove worthless; and that the LOLR lends 30 against 30 units of safe assets, allowing 30 units of private debt liabilities to be repaid. In consequence, there are 60 units of assets to cover 69 units of unsecured liabilities (a payout of about 87%) rather than 90 to cover liabilities of 99 (payout of 90%). The central bank is repaid in full; that is not an indicator of borrower solvency.

²³ This is the central theme of the Tucker Gordon Lecture, 2014, op cit.

²⁴ See Kynaston (2011), Chapter 7 of the one-volume edition. The team that examined Overend Gurney's books comprised a former Governor and two private bankers. Although the point is disputed, this episode strongly suggests that Bagehot *did* grasp the point about not lending to fundamentally bust banks. If he did condone that, he was wrong.

During the crisis, central banks found solutions to this stigma problem by offering liquidity assistance via auctions to classes of counterparties, creating and exploiting a “pooling equilibrium”. This worked. But it is not a robust solution. In my experience it relies on the most obviously strong banks being prepared to participate and let it be known that they are participating. That might be more likely when the scale of the threat is *manifestly* systemic and existential, providing the basis for a large auction in which the weakest firms are not the only bidders. It might also rely on the character of the leaders of the strongest banks. Further, I suspect that this kind of solution requires constant innovation. Once it is known or suspected that an auction will be used by ailing firms, there is a risk that others will declare that they would not use that particular facility in future. They would be stupid to say that, but I saw quite a lot of stupidity driven by short-term thinking.

Just as in the 1970s central banks needed to bring about a regime change in the credibility of commitments to achieve low and stable inflation, so in broad analogy they now need to bring about a regime change by credibly committing to lend only to firms that are solvent and viable.

The credibility benefits would be material. Rather than use of the discount window being tantamount to being given the “Black Spot”, it could instead be a signal that the central bank was confident that the firm was fundamentally sound. In other words, mitigating the lemons problem afflicting the discount window would help to reduce the lemons problem in the private money markets.

This is, moreover, vital to the constitutional position of central banks. A – perhaps the – vital underpinning of central bank independence in the monetary policy sphere is “no monetary financing of governments”. Equivalently, the cardinal principle for independence in providing LOLR liquidity insurance should be “no lending to insolvent firms”. Amongst other things, that means that the central bank cannot be a vehicle for the executive branch of government to provide solvency support; if it wishes to take that course, government must do so on its own authority and with transparency to the legislature.

The great question is, therefore, *how* to make a credible promise that central banks will lend only to solvent firms. And, moreover, how to do so via a regime that also credibly avoids *over*-supplying liquidity insurance to sound banks.

Making credible a policy of lending only to solvent firms: transparent stress testing and resolution regimes

The technical basis for a solution is, I believe, provided by the current reforms of the regulatory regime; in particular, stress testing and resolution.²⁵

Systematic, regular, *transparent* stress testing should make it much harder for supervisors and central banks to avoid facing up to a firm’s problems being fundamentally of solvency. Especially important are the so-called Asset Quality Reviews (AQRs), ie the assessment of solvency on the *central* (or expected) outlook for economic and financial conditions. Stress testing, broadly defined to include the AQR element, is a disciplining device on supervisors and the LOLR, as well as on firms themselves. Mechanisms are needed to ensure that domestic authorities don’t

²⁵ For an earlier, summary statement of these arguments, see Tucker (2014b).

cheat in conducting stress tests. For internationally active banks, involving significant host authorities in the process would help to keep everyone honest.

The incentives for the authorities to cheat will, moreover, be significantly reduced if, when faced with insolvency, they have realistic choices other than, first, bankruptcy and systemic distress or, second, going to the fiscal authority to seek taxpayer solvency support. Credible resolution regimes not only revolutionise the incentives of bondholders to monitor and price for risks in banks, they also transform the incentives of supervisors and central banks. As I have set out elsewhere, I believe that, with the necessary legislation now in place in the United States and the EU, credible resolution plans for the big global firms are within reach provided the authorities have the determination and energy.²⁶

In the past, central banks faced a dilemma if the condition of an initially solvent firm deteriorated after LOLR support had been extended. Faced with that situation in the future, galvanised by the knowledge that the firm's plight will be revealed by a forthcoming stress test, central banks should withdraw support and put the firm into resolution. With termination of liquidity assistance credible, there will be stronger incentives for borrowers to use the time provided by LOLR support to fix their problems.

Conversely, once a fatally wounded firm has gone into resolution, the central bank should be prepared to grant access to its discount window provided it is satisfied that the resolution is delivering a reconstructed business that is sound. Post-resolution provision of liquidity assistance by the central bank can, therefore, be a more powerful signal that solvency and basic viability are being restored.²⁷ Central banks need to make that clear in public statements of their LOLR principles.

Judgments on solvency: a probabilistic approach

None of this is to say that judgments on solvency are easy. The future is uncertain. Economic and financial conditions can turn out better or worse than expected. For that reason alone, a firm judged to be solvent at the point at which a loan is granted, might later become insolvent. Or the supervisors and central bank might have misjudged its initial position. That being so, a solvency judgment is inherently probabilistic. It would be sensible for central banks to frame their decisions on solvency in terms of *forward-looking* probabilities. Plainly, LOLR assistance should not be extended if the firm is insolvent today or the central expectation is that it will be insolvent tomorrow. Beyond that, society needs to decide what level of probability warrants support. Elected representatives of the people should probably determine that probability threshold.

The probabilistic forward-looking view would need to be kept up to date and would need to factor in the likely effects of the LOLR intervention itself. Particularly in a systemic crisis, the economy might move onto an inferior path of output, with a higher default rate and so greater banking losses. Liquidity assistance to the system as a whole or to individual sound firms might help the economy onto a better path.

²⁶ *Ibid*, echoing a statement I made shortly before retiring from office.

²⁷ US legislation permits the Federal Reserve to lend secured on a bilateral basis to banking businesses being returned to viability via resolution; and to lend to non-banks in similar circumstances via market-wide facilities.

Such judgments are difficult. But they are not completely foreign territory. When producing the economic forecasts that guide their monetary policy decisions, central banks have to make judgments that are similar in kind, including feedbacks from the credit system. The extra ingredient in forming probabilistic views on solvency is to cascade the macro forecast down, via asset classes, to individual firms. But that is what supervisors and macroprudential authorities are committed to doing in their asset quality reviews and stress tests.

Sometimes those forecasts will be turn out to be wrong *ex post* even though they stacked up *ex ante*. There is nothing novel in that. But the pre-conditions for trust in public bodies have evolved. What's needed today is the injection of the kind of formality, analytical rigour and transparency that transformed the practice, and legitimacy, of monetary policy during the 1990s. Central banks should articulate how they will do this.

Beyond solvency: mitigating moral hazard from the over-supply of liquidity

Even if we could be sure that central banks would never knowingly lend to insolvent firms, LOLR liquidity re-insurance would still create moral hazard problems: that firms will take too much liquidity risk, or just too much risk. While the Bank of England's decisive liquidity assistance to the market as a whole after letting Overend Gurney fail was celebrated by Bagehot in *The Economist*, former Governor Hankey saw the implied promise of support as a threat to "any sound theory of banking".²⁸

This is a problem inherent in insurance, and the orthodox solution is to combine (i) a process of *ex post* due diligence to verify compliance with conditions placed on the insurance, and (ii) a degree of co-insurance, so that some risk is left with the insured.

In the case of LOLR insurance, there has been argument, ostensibly going back to Bagehot, that moral hazard should be cured by setting a "penal" rate for the all-in price of the loan (ie the premium to the risk-free interest rate, taking into account the excess collateral, which cannot be used by the firm elsewhere). It is certainly essential to charge a premium over the rate prevailing in normal market conditions.²⁹ But relying *on that alone* to cure the moral hazard problem would be a mistake. First, quite apart from requiring very high rates of interest, exacerbating the stigma problem,³⁰ relying only on the incentive effects of a Pigouvian tax would be

²⁸ Kynaston (2011).

²⁹ As many commentators have observed, Bagehot does not use the term "penal" in *Lombard Street*. Moreover, the "high" rates he advocates might need to be seen in the context of the then gold-standard monetary regime, which could lead to an external drain of reserves during banking panics, requiring what we would call a high monetary policy rate to hold the parity. Under fiat money, the LOLR has more degrees of freedom provided that medium-term inflation expectations remain anchored. A "high rate" might, therefore, today be thought of as an inheritance from Hankey as well as from Bagehot. For a review of some of the history and literature, see Wood (2000).

³⁰ Broadly, if the "penalty" were the *only* instrument for addressing excessive risk-taking, it would need to leave banks indifferent between, on the one hand, giving up the running return from maturity transformation and lending, instead holding assets that are always liquid and, on the other hand, earning those term premia and credit spreads but facing a probability of having to borrow from the central bank. Depending upon one's view of the probability of liquidity risks crystallising, this can generate a very high rate for emergency liquidity assistance.

to put all the authorities' eggs in one basket. Precisely because the LOLR is a public body, the insurance can, and thankfully now again does, come bundled together with restrictions and monitoring. Prudential regulation and supervision are about making banks *self-insure* by holding levels of capital and liquid assets higher than they would choose if left to themselves. Whether or not it is the regulator, the central bank must have a formal say in framing and calibrating the regulatory regime. A completely arms-length regulatory agency cannot be expected to internalise the risks faced by the LOLR, especially if the regulator is given (or takes upon itself) a goal of sponsoring the industry or its competitiveness.

Some argue that the regulatory intervention should be confined to capital; that it is perverse to apply a liquid-assets requirement if a credible LOLR exists.³¹ A variant of this argument is that "liquid assets" should be defined to be whatever the central bank will take as collateral in its regular operations and facilities. The problem with this is that it implicitly transforms the central bank into the lender of *first* resort. Why should banks control their liquidity risk under such a regime? Further, it puts all the authorities' eggs in the basket of capital regulation. That seems unwise given the state of knowledge on these matters.

Beyond regulatory constraints, there is an important test for central banks themselves. Where they are going beyond their standard facilities in providing liquidity to a firm – exceptional liquidity assistance – they need to do more than satisfy themselves that the borrower is solvent. They should also be clear what *purpose* any exceptional assistance would serve; how it would help. It might solve the problem by dispelling unwarranted panic, averting a fire-sale of assets or containing a mark-down in asset prices in anticipation of a wave of selling. Or it might be to aid an orderly wind-down of a solvent firm; that seems to have been the Fed's motive in lending to the Lehman US broker-dealer in the week after the group holding company and the UK affiliate went into receivership. Certainly exceptional liquidity assistance to a badly distressed (but solvent) firm should bridge to a more fundamental solution, whether closure or sale or private sector rescue. Bridging to nothing is a recipe for disaster; blind forbearance.

Finally, it deserves to be said that a central bank should not enter into *bespoke* deals to lend to one firm in order to rescue another, as that amounts to favouring the acquirer against its competitors. If the authorities wish to finance such a transaction, perhaps the fiscal authority should conduct an auction; or the sale should take place out of resolution. Views might differ on this, but a country's position on it should be made clear in its public regime. Otherwise the central bank can come under pressure in the heat of the crisis. Some commentators think that explains the Fed's involvement in funding JP Morgan's purchase of Bear Stearns in spring 2008. Less than a year earlier, the Bank of England had declined to lend to Lloyds Bank to help it purchase Northern Rock. That decision is criticised by then Finance Minister Alistair Darling. My point is that these things should as far as possible be covered in the regime's design. And, of course, it is made considerably easier by the introduction of resolution regimes; today Northern Rock would go into resolution.

³¹ Jeremy Stein hints at this view in his speech entitled "Liquidity regulation and central banking": see Stein (2013).

Core principles for a modern LOLR

This is a useful point at which to take breath. Overall, the analysis thus far provides a basis for articulating some principles for a modern LOLR for the banking system.

Bagehot's dictum, adapted to a world of fiat money, stands intact: lend freely and early to sound firms against good collateral at a premium to the risk-free rate of interest. But to this can be added:

- Wherever possible, provide assistance to the market as a whole, via OMOs.
- Have a discount window facility for bilateral assistance.
- Do not inject additional central bank money (ie sterilise or, as I prefer to say, drain) except where there has been an increase in demand for reserves or currency. More generally, do not put in jeopardy anchored medium-term inflation expectations.
- Publish a framework explaining how OMOs (auctions) will be used alongside the discount window (bilateral assistance).
- Publish a framework for how soundness/solvency will be assessed, probabilistically and conditioned on reasonable assumptions about the effect of the liquidity operation on the path of the economy and default rates.
- Lend beyond standard facilities only if the operation is likely to work. That could be by dispelling the panic; or, in bilateral loans, by facilitating an orderly wind-down or otherwise bridging to a fundamental solution.
- Do not enter into special deals to finance one firm's purchase of an ailing bank. That's a realm best left to elected politicians.
- Put fundamentally bust firms into resolution or liquidation/bankruptcy. Explain whether/how firms restored to solvent through resolution could gain access to liquidity from the central bank.

That is a first step. It needs, as I flagged at the outset, to be accompanied by a regime for governance and accountability. But before coming to that, some substantive issues remain outstanding.

The solvency issue is only the biggest of a series of questions about how to frame a time-consistent LOLR policy regime that does not have perverse moral hazard costs. Other issues a coherent regime must address include: what collateral the central bank will lend against; what types of firm it will lend to, and in particular whether it should be permitted in law and prepared in practice to lend to non-bank financial firms; whether it should act as a market-maker of last resort in any circumstances; and whether it can provide liquidity assistance in foreign currencies.

It is to those questions I now turn. The thread connecting the first three issues is that central banks should not maintain that they will not do things which *ex post* they end up doing; and so they should think through in advance *how* to do the inevitable, with credible boundaries and mitigants against moral hazard. The fourth issue, revolving around international LOLR cooperation, is the other way round: a central bank should not hold out that it will be able to act to meet a foreign currency liquidity crisis unless it really could do so. The moral, again, is the need to design, publish and commit to regimes.

Collateral policy

A pledge to lend against only a narrow class of very high-quality collateral, whatever the circumstances, is not credible. It is the essence of liquidity stress that a firm has exhausted its options for raising funds in the market or will make things worse if it appears to beg for funds in the market. Given the negative externalities of bank failures, it does not serve society for a central bank to refuse to lend to a solvent firm against a wide range of assets. *Ex post*, it will lend.³²

But, and it is a pretty big “but”, a central bank has no business lending against assets that it cannot understand, value and manage. It has to lend on the basis that it could manage the assets as an outright owner if, notwithstanding its initial assessment of solvency, the firm deteriorates and goes into either bankruptcy or a formal resolution proceeding. Anticipating that means that central banks’ collateral teams need to be expert. (I am not a fan of central banks relying on outside private sector agents to do the work for them.)

Valuations and haircuts (the excess of collateral over the loan) matter hugely. There should be no room for closet solvency support via soft terms. Rightly or wrongly, there are suspicions of central banks indulging in that in the past. For this reason alone, central banks should make public not only a schedule of their core haircuts, but also as much as they can about how they go about valuing collateral and setting haircuts.³³ They should, however, retain discretion to set higher haircuts in the circumstances of any particular case, including judgments about the counterparty’s current and prospective solvency margin.

What is clear, then, is that collateral management is a *core* central bank function. Having banks pre-position collateral with the central bank helps operationally, as it gives the central bank time and space to evaluate it, as well as providing insights into the banks’ portfolios and risk management.

But this is about more than protecting the central bank against risk, vital though that is. It is also about surveillance of valuation practices in the market and of the infrastructure for clearing and settling the instruments eligible in central bank operations. If the supervision of critical market infrastructure did not already exist, central bankers in their role as LOLR, and thus as contingent holders of assets, would need to invent it (as, in fact, they largely did in many countries).

As public authorities, this gives central banks wider responsibilities to society. What they do to protect themselves as actual or contingent lenders gives them information that can and, I believe, should be used for wider macroprudential purposes. Just as many central banks got into the prudential supervision of banks through managing their counterparty risks, so the control of their collateral risks makes them a *de facto* monitor of the state of the underlying asset markets. In particular, as and when a repo market becomes large, as ABS repo surely did in the run up to the 2007 liquidity crisis, central banks can’t really avoid taking a view on whether the supposedly “safe assets” being used as collateral are indeed safe. If

³² This does not entail that all central bank lending facilities should be against wide collateral. I see merit in any overnight facility designed to accommodate payments system glitches being against narrow, very high-quality collateral, in order to reduce the probability of even the most vanilla facility being stigmatised.

³³ For a step in this direction, see Breeden Whisker (2010).

they're not safe enough for the central bank, then the authorities should be worried about whether the money market's liquidity is sustainable. On this view, the central bank's LOLR function makes it a *de facto* monitor of "safe" assets and of some systemically significant markets. That's exactly the role played by the Bank of England in the old bill market over the century or more in which it operated primarily by buying and lending against bankers' acceptances. It is an issue that remains neglected in the post-crisis reform programme.³⁴

Whether to lend to non-banks

Another perennial question that, following the crisis, can no longer be dodged is whether central banks should ever lend to non-banks. Obviously, some central banks, especially the Federal Reserve, did so. Were they wrong? Again, the challenge is how to construct a regime that is time-consistent and disciplined.

It is not credible to hold that a central bank will never lend to an entity that is not a *de jure* bank. At times, as well as being significant lenders to the real economy, non-banks combine some or all of maturity transformation, leverage, credit, the provision of monetary-like services, and complex interconnections with the rest of the system. As such, they can form part of the *de facto* monetary system, occasionally posing similar systemic threats to banks. An obvious case is the major US securities dealers. In 2008, they suffered a massive liquidity run when hedge funds and others withdrew idle balances. Quite simply, prime brokerage services include basic banking; the dealers were very obviously in the liquidity insurance business. Either that should be stopped, or those dealers should be regulated as banks, with access to the window. More generally, jurisdictions must face up to the facts when intermediaries regulated as non-banks are, in fact, conducting banking. As with so much in this field, the point is not new, having been made by Henry Simons as long ago as the 1930s.³⁵

Moreover, it is a mistake for central banks to rely on a small group of non-banks to be counterparties in their core monetary operations. That leaves the central bank with little choice but to come to their aid when distressed, as otherwise the efficient distribution of reserves to the banking system would be impeded. Better to conduct OMOs with a wide group of banks. On this view, some central banks, including the Federal Reserve, should reform their operations. The UK put through such reforms in the mid-1990s. They help to address one source of moral hazard: too indispensable to fail.³⁶

But those measures would not be sufficient to address the LOLR's dilemma. At root, the challenge is that finance is a "shape-shifter".³⁷ With the re-regulation of *de jure* banks, some of the economic substance of banking will inevitably re-emerge elsewhere: shadow banking. For example, anybody holding low-risk securities can build themselves a shadow bank by lending out ("repo-ing") their securities for cash

³⁴ See Tucker (2014b).

³⁵ See Simons (1936).

³⁶ A similar point is made Selgin (2012).

³⁷ Tucker (2014b).

and investing the proceeds in a riskier credit portfolio. And they can do so very quickly. Sometimes, their liquidity fragility and the systemic significance of their collapse will be identified only *ex post*. But if solvent non-banks could be confident of being able to borrow while escaping unscathed, the incentives to enter shadow banking would be even greater, and with it the consequent moral hazard.

A coherent policy regime would look something like this:

- where a firm is obviously conducting banking-type functions, make it become a *de jure* bank, giving it access to the window;
- state publicly that where a non-bank's liquidity distress would be expected to create a systemic crisis, then the central bank will in principle be prepared to lend; but
- the decision will be case by case in the light of the circumstances;
- as the central bank would be exercising discretion to extend the domain of its LOLR function, it would consult the executive branch of government, and would (with suitable delay) provide an account to the legislature;
- the management and senior non-executive directors (or trustees) of any such firm would be removed; and would be punished if it turned out that they had deliberately or knowingly been running a *de facto* bank in non-bank clothing;
- the business model of the firm (and, crucially, any firms substantively like it, whether or not they had turned to the central bank to borrow) would have to change to exclude *de facto* banking or, alternatively, that type of business would become re-regulated as a bank, ie the perimeter of banking regulation would shift, catching up after the fact. The statutory framework for the regulatory regime would need to be set up in a way that made this a credible threat.

Summarising, under this regime, *de jure* banks would definitely have access to liquidity from the central bank so long as they were solvent and viable, but *non-banks* would face both "constructive ambiguity" and consequences. In order to borrow, a non-bank would not only need to be solvent but, in addition, their distress would need to pose a material threat to systemic stability, on which the central bank would consult elsewhere in government. There would be *ex post* consequences for the borrowing firm and for the regulatory regime for similar firms. The reality of shadow banking cannot be denied, but it doesn't have to be embraced.

I wish we could stop there. Unfortunately, we can't: the reality of the world won't let us.

Market-maker of last resort

Markets matter too. They are likely to matter more in the future as re-regulation of banking induces disintermediation. This has prompted a debate about whether the authorities should act as a market-maker or dealer of last resort.³⁸

³⁸ See Mehrling (2010), as well as an earlier attention to this question by Buiter and Sibert (2008).

Markets rely on market-makers, or at least traders, for liquidity. Where the key intermediaries are not themselves banks, they rely on banks for liquidity insurance. Those funding backstops are vital because market-makers are exposed to the risk of having to hold, and therefore fund, inventory of indeterminate size. So far, this fits comfortably within the set up I have been describing. If *solvent* dealers have a liquidity problem, they should turn to the *private* banking system. If the banking system strains to meet that demand, it can in turn resort to *its* liquidity re-insurer, the central bank LOLR. If, by contrast, a dealer cannot perform its economic functions because it is insolvent, it should go into bankruptcy or resolution. So far, the classical LOLR regime needs no elaboration.

There are two interesting cases. The first arises where market participants become radically uncertain about how to value the underlying instruments. Something like that happened in 2007, when liquidity in the asset-backed securities (ABS) and ABS repo markets dried up as confidence in the reliability of credit rating agency (CRA) ratings evaporated. In the jargon, they flipped from being “information-insensitive” to being highly “information-sensitive” as investors and traders suddenly wanted to examine the contents of the underlying collateral bundles.³⁹ The authorities entering the market as a bidder could in principle help in those circumstances *if* they were more confident about the value of the afflicted instruments; that is, *if* they knew something the market didn’t, but for some reason releasing that information and analysis could not do the trick. An underlying driver would be the same as for a classic LOLR operation: just as by lending the LOLR can signal that the beneficiary(ies) is in fact OK, so by purchasing securities they could signal that fears about an asset class were misplaced. But the authorities might well face the same problem as the market – they really just don’t know – in which case dealing in the market would at best be a bluff. Any offers to purchase securities would *not* be designed to help solve a problem of information asymmetry. They might instead be serving other objectives; for example, propping up asset values or, through purchases of new issues, extending credit to the real economy. I would not define those as market-maker-of-last-resort (MMLR) operations. Strikingly, no central bank dealt in private sector ABS during the height of the liquidity crisis.

The other possible case for a MMLR intervention is where the dealer community is solvent but potentially capital-constrained when faced with a surge of selling. In those circumstances, wishing to avoid the capital strain of allowing their balance sheets to expand, dealers widen their bid-offer spreads to deter trade or, in the extreme, “don’t pick up the phones” as used to be said. A collective action problem kicks in, as it is more risky to be a market-maker if you think your peers are withdrawing. In those circumstances, the authorities cannot restore market liquidity by themselves lending to the dealers. Funding isn’t the constraint; and liquidity insurance, whether from commercial banks or from the central bank in the kind of emergency operation described in the previous section, doesn’t help. This

³⁹ The importance of information-insensitive securities, epitomised by money-market instruments, is stressed in a series of papers by Gary Gorton and Bengt Hölmstrom. See, for example, Hölmstrom (2008) comment delivered at Jackson Hole on a paper by Gorton (2007). Some central banks examined ABS collateral bundles very carefully when, as ABS repo dried up during the crisis, they widened the instruments eligible in their liquidity insurance operations to support banking system liquidity and funding. But none stepped in as a MMLR in those instruments.

happened in the sterling corporate bond market at the height of the crisis over 2008–09. The Bank of England stepped in as a market-maker of last resort.⁴⁰

A reparable market malfunction is only a necessary condition for a MMLR intervention, not a sufficient condition. The authorities would need to be satisfied that other conditions were met: that there were not better solutions, such as quickly letting in new dealers, or lending secured to a wider class of market participants which were funding but not capital constrained;⁴¹ *and* that the closure of the market, absent intervention, would be materially harmful to broader welfare. That last condition might in principle be satisfied in a range of circumstances. For example, it might matter if the effect of a market's closure would be to starve part of the real economy of working capital finance, as was threatened by problems in the commercial paper market in 2008–09. Or it might matter if, cut off from an ailing banking system, healthy real-economy borrowers would be able to fund projects from longer-term savings institutions only if the secondary market in bonds came back to life. In those circumstances, with large macroeconomic costs threatened by evaporating asset market liquidity, as basically sound dealers stepped back from intermediating for some reason, the authorities would face the choice of whether or not to act as a market-maker of last resort.

A MMLR provides *inventory-risk re-insurance* to the dealer community. That description brings out that there is more going on here than liquidity re-insurance. Unlike LOLR assistance where the collateral can be revalued every day, more collateral can be called to maintain the initial margin of excess collateral (haircut), and the haircut can be increased if the counterparty becomes weaker or the underlying asset market more volatile, each MMLR purchase is a one-shot event. The central bank takes outright risk.

But *none* of this entails putting a floor under (or ceiling on) the market price: the MMLR would follow the market down or up from day to day. And once it has acquired securities, it should post a selling price, ie stand on both sides of the market.

In common with the standard LOLR function, the structure and terms of any MMLR regime need to be carefully constructed. LOLR assistance is charged at a premium to normal market lending rates (for the relevant collateral), but at a discount to the rates prevailing in the liquidity crisis. The central bank interposes itself between the normal price and the shadow price. Similarly, a MMLR should set its bid-offer *inside* that prevailing in the crisis conditions but *wider* than typically prevails in peacetime. It should also structure its operations to avoid being exploited. In practice, that means using auction structures that are not vulnerable to the "winner's curse". It should stay in the market no longer than necessary; and the time must be used by regulators to ensure that any underlying capital shortage in the dealer community or design problems in the underlying market are addressed. Where a market is no longer viable, smooth transition to substitutes or orderly wind-down should be the goal, not restoration come what may.

Prosaically, a MMLR must have an unconstrained capacity to increase its balance sheet *within* the day; it is no good offering to pay only on condition that a Treasury bill auction, possibly an usually large one, goes well. So, if the MMLR function is to be provided at all and I doubt it can be ruled out, the central bank

⁴⁰ See Tucker (2009) and Fisher (2010).

⁴¹ I understand that my former colleague Mark Carney has made a similar point.

must either be the MMLR or provide on-demand monetary financing to a fiscal authority operation. The latter course runs into fundamental design principles of a robust monetary regime: no monetary financing of government.⁴² But since acting as MMLR entails unavoidable financial risk, with losses flowing one way or another to the taxpayer, the operation must be within the scope of any pre-existing regime approved by the fiscal authority or approved in the light of the particular circumstances.

That being so, it is really important that agreed principles should be found if central banks are to be accountable and enjoy legitimacy in this area. Some major central banks having acted as MMLR in 2008–09, there won't be an excuse for again making things up as they go along. In that spirit, I offer the following:⁴³

- (1) MMLR interventions should be exceptional. When launched, the purpose and terms should be clear. The intervention should come within a pre-existing published regime agreed with the fiscal authority/legislature or, alternatively, operations should be specifically approved by the elected government, under procedures and constraints pre-agreed by the legislature.
- (2) The MMLR intervention should be motivated by a need to repair a malfunctioning market in order to head off or contain serious economic costs. In particular,
 - The MMLR should aim to be catalytic, helping to kick-start the market or, if the intervention fails, to bring about the market's orderly closure rather than to substitute itself for the market.
 - The MMLR should avoid propping up markets that would not be fundamentally viable once peacetime returns.
- (3) The MMLR should charge a penalty (eg buy at a discount) to the fundamental value of an asset. Put another way, its bid-ask spread should be unattractive relative to peacetime conditions in private markets but better than those available in crisis conditions.
- (4) Any purchase (auction) mechanism should be designed to reveal information about the state of the market and the fairness of prices paid, and should avoid the winner's curse. Any reserve price should change as values change.
- (5) The MMLR must not over-reach its capital resources, including any special underpinning provided by the fiscal authority.
- (6) Having intervened, the central bank should make clear to market regulators and any macroprudential authority what more fundamental remedial action is needed.

Any central bank that is not *credibly* ruling out MMLR interventions should, within constraints set by the legislature and government, set out the regime in which it would conduct any such exceptional interventions. It should be publicly accountable for sticking to that regime and for its costs and benefits in particular

⁴² Nor, more broadly, should a central bank engage in MMLR operations if injections of cash would interfere with monetary policy. But that constraint should rarely bind in modern monetary operating systems, with the policy-rate of interest paid on reserves, various techniques for draining any "excess" reserves etc.

⁴³ These principles update a version set out in Tucker (2009).

cases. These are big issues. MMLR interventions are distinguishable from broader *credit policy operations* undertaken to stimulate aggregate demand in the economy, but the central bank *does* take outright risk.⁴⁴

International LOLR co-ordination: liquidity re-insurance in foreign currencies

Having reviewed principles for a policy regime covering standard LOLR lending to banks, exceptional liquidity assistance to non-banks and exceptional MMLR operations, it is time to raise our eyes to the world.

Forty years ago, a generation of central bank governors changed the face of global finance as they grappled with the failure of Herstatt bank and its cross-border spillovers. Famously, they created the Basel Committee and set in train a process of convergence in bank regulation standards and supervision. Rather less discussed but at least as important, they thrashed out a momentous agreement on the division of labour amongst their central banks on LOLR assistance. Trace evidence of this is to be found in the later Basel Concordat on the division of labour amongst home and host supervisors of internationally active banks: basically, home authorities do solvency, hosts do local liquidity.⁴⁵ But the LOLR construction went beyond monitoring; it was about central bank actions.

That group of governors was catching up with the consequences of more profound changes in the international monetary system. The collapse of Bretton Woods, moves to full currency convertibility for capital account as well as current account transactions and the associated progressive lifting of capital controls in the “advanced economies” saw a ratchet in the gradual rebirth of international banking. Branch networks mushroomed, currency trading ballooned. If and when a liquidity crisis hit, which central bank should lend? The 1974 agreement, reflected in a statement to the press running to all of a couple of paragraphs, was broadly that the host central bank should lend.

They said less about a closely related issue: what if the local liquidity shortage is not in the domestic currency? This wouldn’t have been hypothetical. With a dominant world reserve currency in the dollar, and banks holding foreign currency-denominated assets financed short-term in the markets, it was quite likely that a central bank would face a local banking system short of foreign currency liquidity. That this seems not to have preoccupied Arthur Burns, Gordon Richardson and their colleagues probably owes something to the network of foreign currency swaps that then existed amongst the major central banks, echoing the gold swaps and loans of a still earlier era. Those swap lines persisted until the mid-to-late 1990s when, except within NAFTA, they were suspended by the Federal Reserve on grounds of low usage and the advent of the euro area.

⁴⁴ Credit policy is the central subject of P Tucker, “The only game in town? A new constitution for money (*and credit*) policy”, Myron Scholes Lecture, Chicago University Booth School of Business, 2014.

⁴⁵ It is greatly to be regretted that the Concordat was later buried in the BCBS Principles of Banking Supervision. A generation of senior central bankers had never contemplated these issues until the crisis.

Lo and behold, they were revived by my generation during the height of the recent crisis. Some authors have misleadingly cast this as the Fed playing the role of a *risk-taking* lender of last resort to the rest of the world.⁴⁶ This is based on fundamental misunderstandings. The Fed was not exposed to the borrowing firms.

Narrowly, the United States is bound to be the final lender of dollars to the rest of the world, and that is a meaningful prospect so long as the dollar is the world's key reserve currency. Although conceivably forgotten, that is part of the flip side to the "exorbitant privilege" of issuing the world reserve currency. But it is not a one-way street. There is nothing in principle to rule out US-based firms building up, say, euro-denominated dependencies. If that is less likely, it owes something to persistently easy dollar monetary policy over the past decade or so, together with habit persistence within the United States.

But whether the shortage is in dollars, euros, yen or whatever, the issuing central bank does *not* take exposure to the beneficiary(ies) of the LOLR operation. The system works as follows. The *local* central bank decides whether it is prepared to extend LOLR assistance to particular firms. It makes the loan, takes the risk, and takes collateral to mitigate that risk. It borrows the money from the issuing central bank, providing its own currency as collateral. In the language of insurance, the local central bank is the liquidity re-insurer for the local banking industry, but it in turn relies on re-insurance from the country of issue; in insurance circles, such chains of re-insurance are sometimes referred to as "retrocession".

The issuing central bank typically places its foreign currency collateral on deposit with its counterparty central bank; there is no monetary expansion in that currency, consonant with no increase in demand for that currency. First round, there is an expansion in the monetary base for the issuing central bank. That might be accommodated to the extent that it reflects increased demand or otherwise does not affect overnight interest rates, or it might be drained. Given current monetary operational techniques, that is not the big issue for the issuing central bank. Its big issue is whether it likes the credit exposure to its counterparty central bank and its currency.

And that is also the issue where the regime could benefit from some fleshing out. Because where a swap line is *not* available, the local central bank and prudential authorities need to ensure that their local banking system does not take foreign-currency denominated liquidity exposures that they, the *local* authorities, would not be able to cover from their FX reserves or by going into the FX markets themselves to raise the liquidity.

That should not be a matter of indifference to the issuing central bank. If its currency is used on a massive scale in a foreign banking system with whose authorities it declines to agree a swap line, how can they make it credible that they would not lend *ex post*? In the face of prospective systemic distress in the global financial system that could engulf their own economy, they would be faced with a nasty choice between, on the one hand, letting the crisis erupt and trying to mop up at home and, on the other hand, changing their minds and lending to the country after all in an attempt to prevent a global conflagration. Thus, in this area there lurks a moral hazard issue; and it probably gets greater the larger EME economies become.

⁴⁶ For example, Lawrence (2012).

The upshot is that the Bank for International Settlements governors and the IMF, in its bilateral and multilateral surveillance of risks, need to ensure that:

- a network of swap lines exists between relevant countries, and is not permitted to fold again; and
- where an issuing country exercises its right not to extend a swap line, for risk reasons, the necessary regulatory steps are taken to prevent unsustainable foreign currency-denominated liquidity exposures in the local financial system and economy.

Governance for the central bank LOLR

This paper has reviewed a range of important technical issues not contemplated when Bagehot wrote about the LOLR. But technical solutions are never enough. Building credible institutions and policies relies upon incentives crafted from carefully constructed checks and balances: governance and accountability. The aim is to underpin the central bank's capability and, crucially, its incentives to reach fully informed, unbiased decisions in exercising whatever discretion it is permitted by elected representatives.

First, a central bank's decision to lend will not be a positive signal that a recipient is fundamentally sound unless the central bank has, and is known to have, access to private information. Conversely, it is liable to err if it does not have more information than the market. This is a critical element in the case for central banks being involved in banking supervision; the private information comes largely from supervision. I don't think it is absolutely essential that the central bank is the regulator. But in a regime with a separate regulator, it is *absolutely essential* that society does not rely on cooperation and information-sharing between regulator and central bank being the product of goodwill or enlightened self-interest; the capacity for turf problems knows no bounds in the public sector. So if not the *de jure* regulator, the central bank *must* have direct access to individual firms and a right to require information from firms materially relevant to its function as LOLR (and, more broadly, as monetary authority). Japan operates a regime along those lines.

Further, whether or not it is formally the regulator, the central bank must have a formal say in framing and calibrating the regulatory regime. A separate supervisor cannot be expected to internalise the risks faced by the LOLR, especially if it is given or takes upon itself a goal of sponsoring growth in the industry. Moreover, a liquidity re-insurer cannot sit silently if it believes the regulatory regime is fundamentally flawed. So a credible LOLR regime entails that the central bank must be involved in regulation and supervision.

Second, the decision to lend should not be taken by the supervisors, even when they are part of the central bank. I have never seen a case of firm failure without accusations of supervisory incompetence, fairly or unfairly. Anticipating that, depending upon their character, supervisors can understandably be tempted by forbearance, financed where necessary by central bank assistance. The decision to lend needs to be based on hard-headed assessments of solvency, the prospect of getting the money back and, in exceptional circumstances where the central bank goes beyond its standard regime, whether the assistance would serve a useful purpose. Supervisors should be involved but should not decide.

Third, decisions should be taken by a formally constituted committee of the central bank, reaching decisions on a one person-one vote basis, and with each member publicly accountable. The committee should, within the constraints set by government and legislature, flesh out the regime and take difficult cases of non-routine operations or assistance. It should be accountable for any other decisions taken under its authority. That kind of structure will help to give bite to internal deliberations and aid accountability.

Fourth, the central bank needs to be able to demonstrate *ex post* that its view on solvency etc was properly grounded and defensible. Drawing on the new stress-testing ventures, work is needed to articulate the framework used to make probabilistic assessments of solvency. The framework employed should be covered in internal *ex post* reviews by audit committees or independent examiners (or whatever similar internal structure exists). That framework can then be held up to the light: whether it was robust, employed with integrity etc.

Fifth, information on any losses from LOLR should either be published or at least disclosed to key members of the legislative committee that oversees the central bank.

Accountability: the *fiscal carve-out*

Central bankers are not elected. That is the point of them. They are intended to be technical experts insulated from *day-to-day* politics, from the short-term imperative to be popular and win elections. Delegation can make sense when, amongst other things, the executive branch of government faces powerful incentives to depart from the public good.⁴⁷ But it *is* a delegation, and central banks must be held accountable for their stewardship of their LOLR responsibility.

But how can they be held accountable if the liquidity insurance regime is left unspecified? A broad goal of “maintain financial stability” gives them too much license. As I have stressed in my technical discussion, central banks are exposed to loss, they might be found to have lent to fundamentally insolvent firms, and they have to make choices between firms and sectors. This obviously shades into the fiscal realm, and so a *fiscal carve-out* for independent central banks must be framed to cater for the LOLR function.

A jurisdiction's *fiscal carve-out* for its central bank needs to cover: the kind of assets it can lend against; the kind of assets it can buy, in what circumstances, and whether subject to consultation with the executive government or legislature; how losses will be covered by the fiscal authority, and how communicated to government and legislature. On this view, the form of a central bank's “capital” resources is important for reasons of political economy. At one end of the spectrum, the fiscal authority gives a formal blanket indemnity against loss, but dictates the population of assets eligible in the central bank's operations and, thus at least indirectly, the scope and form of its market operations. At the other end of the spectrum, the central bank is given a pot of capital and a statement of purposes, and has freedom to choose the form and scope of its operations. There are myriad points in between those poles. My point is that society should know where it stands.

⁴⁷ For a more general treatment of this high-level issue, see Tucker (2014a).

How much of this is done via legislation might reasonably vary from country to country depending upon its constitutional rules and norms. But I suggest that cross-party support is needed for the regime. Then, elected representatives can be held accountable for the highest-level parameters of the regime, and the central bank can be held accountable for the regime's detailed articulation and implementation.

Even with a regime, how can we have proper accountability without transparency? Here there is a dilemma: how can LOLR operations succeed if the fact of liquidity assistance is always broadcast to the world?

The United States is seeking to square this circle by requiring, under Dodd-Frank, public disclosure after two years. Many wise heads think this may well backfire horribly, hurting the American people, and perhaps the world given the country's responsibilities as the provider of the dominant reserve currency. Another possible solution would be to provide, via statute, for the relevant committees of the legislature to hear evidence *in camera* and subject to a duty of secrecy, where but only where they were satisfied that national welfare would be materially jeopardised by public disclosure. That warrants debate. Accountability mechanisms should no more be built on the hoof than emergency central banking operations.

Summing up: independent central banking and the LOLR

My tour of the LOLR function serves to illustrate a very big point about modern central banks. For all the care taken in academia and the policy world in analysing and constructing monetary constitutions in the 1980s and 1990s, the core LOLR function was often neglected. For central bank independence to be sustainable, they need a regime that bestows legitimacy on their role as liquidity re-insurers.

But, haven't I been making a big assumption: that the LOLR should be the central bank?! Well, yes I have, and it's not one that goes unchallenged. Some – in truth, a few – argue that all LOLR decisions should be taken by the elected government, on the advice of a prudential supervisor located outside the central bank, which would simply implement the decisions.⁴⁸ This is profoundly wrong-headed. The finance ministry is even more exposed to time-consistency problems than the central bank in promising not to lend to fundamentally bust firms; it has incentives to dress up a true solvency bailout as liquidity assistance. Separating the two functions helps to overcome that problem: if the central bank declines to lend on grounds of insolvency, the government still has the bailout option, *if* it doesn't trust its resolution regime. That it's a bailout should be clear to legislators and the public. Further, as an advisor on whether to lend, prudential supervisors are conflicted, because the time bought by lending might avoid their own failings surfacing; that is sometimes what forbearance is about. Their advice is needed, but it can't be definitive. Finally, LOLR assistance affects monetary conditions; the central bank has to decide whether to accommodate an aggregate shock to the demand for money or whether to address a problem in the distribution of reserves, which requires a monetary judgment. It was the cognitive denial of the links between monetary policy, LOLR policy and banking system stability that helped lead the world to the crisis from which it is still recovering.

⁴⁸ Both Clive Briault and Willem Buiter have argued this.

My central point is that things cannot, must not, just be left there. This should not be a case of “oh, let’s trust the central bank to do the right thing”. Even in those jurisdictions that have some components of a framework for the LOLR function, they are rarely brought together in a coherent and digestible whole. I repeat: that is unsatisfactory and unsustainable if, as it must, central banking is to enjoy legitimacy. If that is not addressed, sooner or later the legitimacy of an independent monetary policy will be compromised. A generation ago, Alan Meltzer called for rules for the LOLR, as a mechanism to combine commitment with control of moral hazard. I agree that a regime is needed; a regime of *constrained discretion*, where the constraints are widely agreed and public, and where the exercise of discretion can be observed by legislators and reviewed *ex post*.

Three things are needed; a substantive regime, a governance framework, and accountability mechanisms. The regime must balance the need for time consistency, avoiding adverse selection problems, addressing moral hazard problems, and providing a clear “fiscal carve-out” within which the central bank can act, taking some risk, on its own authority but not venture beyond. The last of those is vital to keep central bankers to central banking and, thus, to circumscribe their power, while also confining political decisions to where they are truly needed.

In this paper, I have outlined a possible substantive regime, a governance framework and accountability mechanisms (for a summary see Annex). A few points warrant underlining.

Just as “no monetary financing” is absolutely necessary for an independent monetary policy, so “no lending to fundamentally insolvent firms” must be the cardinal principle of an independent LOLR. Never again should major central banks find themselves in a position where they cannot firmly rebut accusations of “You bailed out firm X”. Liquidity assistance to sound firms is not a bailout. In achieving this, it helps a lot that the incentives facing central banks are being transformed by potentially revolutionary shifts in regulatory technology, notably transparent stress testing and credible resolution regimes and strategies. They should help to underpin the operational independence of central banks (and other supervisors), shielding them from the day-to-day political interventions that would be hard to avoid if the only credible backstop were a taxpayer bailout of bondholders and other uninsured creditors.

Mechanisms for internal governance and for accountability to legislators have much to learn from advances made over the past quarter of a century in the monetary policy sphere. As much effort should now go in to establishing good structures in this area. Some progress was made during the crisis, but more is needed. Central banks should expect to have to talk more about this part of their mission.

But I end with a plea, on behalf of (but, to be clear, without the licence of) the central bankers and securities regulators around the world with whom I worked for many years. There is a troubling and potentially explosive conflict between the public goals of, on the one hand, financial system stability and, on the other hand, transparent markets. Charged with the former, central bankers typically resist early disclosure of exceptional liquidity assistance. Charged with the latter, securities regulators, reflecting the legislation they enforce, have a reflex response in favour of early disclosure; firms with publicly traded securities should disclose materially relevant information. There is a profound tension here that, sooner or later, will lead to disaster; a central bank will extend assistance only to find that the crisis spreads when the recipient feels bound to disclose. It is an elephant in the room. It must be

tackled. Not by central bankers or regulators, but by elected politicians, legislators. Only they can make the trade-off, and defend it to the people. The choice will be better for being made during peacetime, so that the financial system and the various official sector agencies can adjust accordingly. Central bankers can get so far in framing a defensible and workable LOLR regime, but only so far. The fiscal carve-out, the mechanisms for accountability, and the trade-off between conflicting public policy objectives must be provided by elected politicians. Then the LOLR system can begin to recover the legitimacy it needs.

Annex: outline of a public LOLR regime for an *independent* central bank

This paper has suggested that a LOLR regime would have the following components:

Substance:

- *de jure* banks should have access to liquidity from the central bank provided that they are solvent and viable;
- this liquidity insurance should be offered via a discount window with clear and publicly observable terms and conditions, and via auction-based open market operations;
- a cardinal principle must be: no lending to fundamentally insolvent firms;
- solvency should be assessed probabilistically, conditioned on judgments of the effects of the liquidity assistance on the prospective path of the economy;
- non-banks should face “constructive ambiguity” in that they would not only need to be solvent but, in addition, their distress would need to pose a serious threat to systemic stability, on which the central bank would consult the executive government;
- any non-bank financial institutions running a quasi-banking business entailing material maturity or liquidity mismatches should be recast as banks or change their business. The central bank should be active in pursuing such cases, even when under the jurisdiction of other regulators, not waiting for the worst to happen;
- any non-bank that, nevertheless, received exceptional liquidity assistance should face consequences, including being re-regulated as a bank and the dismissal of its top management and key non-executive directors (or trustees). Firms or funds with a similar business model should become banks;
- the central bank should publish how it values collateral and sets haircuts;
- for both banks and non-banks, if they became insolvent during the life of liquidity assistance, the central bank would be under a duty to initiate resolution; and
- the central bank could be authorised to act as a MMLR in exceptional circumstances where a viable market had closed due to coordination problems, where the objective was to catalyse a re-entry of market-makers, and where the operation was expected to be short-lived and where there would be material costs to the economy of not intervening. But central banks should not put a floor on asset values that is invariant to fundamentals.

Governance framework:

- the central bank should publish a comprehensive account of its regime;
- the regime should be approved by the relevant central bank policy board;
- delegations should be clear;

- any important or difficult cases should be decided on a one-person, one-vote basis by the policy board; votes should be disclosed with a suitable lag;
- board members should not have conflicts of interest;
- microprudential supervisors should advise, disclosing all relevant information, but not vote;
- the executive branch of government should be consulted where provision of liquidity assistance is being contemplated outside the published framework or, even within that framework, to non-banks or via a MMLR intervention;
- compliance of the operation of the regime with the published framework should be subject to independent internal audit. Those audits should place special emphasis on the integrity of solvency tests; and on whether or not valuations or haircuts had been shaded to deliver soft terms in secret as a form of closet solvency support.

Accountability regime:

- the central bank should be subject to an explicit fiscal carve-out (FCO) covering, for example, the extent to which it could take risk by lending against or purchasing assets, how losses and profits would be transferred and transparency;
- the high-level parameters of the FCO should be set by elected politicians;
- the terms of that FCO should be public. In parliamentary democracies, the executive branch would be accountable to Parliament for its adequacy;
- the central bank should testify to the legislature at least annually on the adequacy of the regime and, in general terms, on its operation;
- losses should be disclosed to the legislature, with a suitable lag; and
- there should be provision for key members of the relevant committees of the legislature to be briefed *in camera* on liquidity assistance to specific firms. Given the potentially perverse adverse consequences of such information being released, jurisdictions should explore whether to enact legislation for parliamentary/congressional committees to meet *in camera* along the lines of committees overseeing intelligence and defence.

References

- Bordo, M (1990): "The lender of last resort: alternative views and historical experience", *Economic Review*, Federal Reserve Bank of Richmond, January issue, pp 18–29.
- Breeden, S and R Whisker (2010): "Collateral risk management at the Bank of England", *Bank of England Quarterly Bulletin*, Second Quarter.
- Buiter, W and A Sibert (2008): "The central bank as the market-maker of last resort: from lender of last resort to market-maker of last resort", *The First Global Financial Crisis of the 21st Century*, CEPR Publication, pp 171–78.
- Cline, W and J Gagnon (2013): "Lehman died, Bagehot lives: Why did the Fed and Treasury let a major Wall Street bank fail?", Peterson Institute for International Economics, no PB13-21.
- Diamond, D and P Dybvig (1983): "Bank runs, deposit insurance, and liquidity", *Journal of Political Economy*, vol 91, no 3, pp 401–19.
- Eichengreen, B (1998): *Globalizing capital: a history of the international monetary system*, Princeton University Press.
- Fisher, P (2010): "The corporate sector and the Bank of England's asset purchases", Association of Corporate Treasurers, Winter Paper.
- Freixas, X, C Giannini, G Hoggarth and F Soussa (2000): "Lender of last resort: what have we learned since Bagehot?", *Journal of Financial Services Research*, Springer, vol 18, no 1, pp 63–84.
- Freixas, X, J-C Rochet and B Parigi (2004): "The lender of last resort: a twenty-first century approach", *Journal of the European Economic Association*, vol 2, no 6, pp 1085–115.
- Freixas, X, B Parigi and J-C Rochet (2000): "Systemic risk, interbank relations, and liquidity provision by the central bank", *Journal of Money, Credit and Banking*, vol 32 no 3, pp 611–38.
- Goodfriend, M and R King (1988): "Financial deregulation, monetary policy, and central banking", *Economic Review*, Federal Reserve Bank of Richmond, May issue, pp 3–22.
- Gorton, G (2009): "Slapped in the face by the invisible hand: banking and the panic of 2007", paper prepared for the Federal Reserve Bank of Atlanta's 2009 Financial Markets Conference: Financial Innovation and Crisis, 11–13 May.
- Hirsch, F (1977): "The Bagehot problem", *The Manchester School of Economic & Social Studies*, University of Manchester, vol 45, no 3, pp 241–57.
- Holmström, B (2008): "Discussion of "The panic of 2007" by Gary Gorton", In *Maintaining Stability in a Changing Financial System*, Proceedings of the 2008 Jackson Hole Conference, Federal Reserve Bank of Kansas City.
- Holmström, B and J Tirole (1998): "Private and public supply of liquidity", *Journal of Political Economy*, vol 106, no 1, pp 1–40.
- Humphrey, T (2010): "Lender of last resort: what it is, whence it came, and why the Fed isn't it", *Cato Journal*, vol 30, no 2, pp 333–64.

- Kashyap, A, R Rajan and J Stein (2002): "Banks as liquidity providers: an explanation for the coexistence of lending and deposit-taking", *The Journal of Finance*, vol 57, no 1, pp 33–73.
- Kynaston, D (2011): "City of London: the history", Random House, Chapter 7.
- Laidler, D (2004): "Central banks as lenders of last resort – trendy or passé?", University of Western Ontario, *Economic Policy Research Institute Working Papers*, no 20048.
- Lawrence, B (2012): "The Federal Reserve as global lender of last resort, 2007–2011", Winner: Best Paper Award, International Political Economy Society (IPES), University of Virginia, 9–10 November.
- Mehrling, P (2010): "The new Lombard Street: How the Fed Became the dealer of last resort", Princeton University Press.
- Rochet J-C and J Tirole (1996): "Interbank lending and systemic risk", *Journal of Money, Credit and Banking*, vol 28, pp. 733–62.
- 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*, vol 2, no 6, pp 1116–47.
- Salter, A (2013): "Robust political economy and the lender of last resort", George Mason University, mimeo.
- Schwartz, A (1992): "The misuse of the Fed's discount window", *Review*, Federal Reserve Bank of St Louis, September, pp 58–69.
- Selgin, G (2012): "L Street: Bagehotian prescriptions for a 21st century money market", *Cato Journal*, vol 32, no 2, pp 303–32.
- Simons, H C (1936): "Rules versus authorities in monetary policy", *Journal of Political Economy*, vol 44, p 1.
- Solow, R M (1982): *On the lender of last resort. Financial crises: theory, history and policy*, Cambridge University Press.
- Stein, J (2013): "Liquidity regulation and central banking", speech at the Credit Markets Symposium sponsored by the Federal Reserve Bank of Richmond, Charlotte, North Carolina, April.
- Timberlake, R Jr (1984): "The central banking role of clearinghouse associations", *Journal of Money, Credit and Banking*, vol 16, no 1, pp 1–15.
- Tucker, P (2009): "The repertoire of official sector interventions in the financial system: last resort lending, market-making and capital", presentation at the Bank of Japan 2009 International Conference: Financial System and Monetary Policy: Implementation.
- (2014a): "Independent agencies in democracies: legitimacy and boundaries for the new central banks", the 2014 Gordon Lecture, Harvard Kennedy School.
- (2014b) "Regulatory reform, stability and central banking", *Brookings Institution Working Paper*.
- Wood, G E (2000): "The lender of last resort reconsidered", *Journal of Financial Services Research*, vol 18, no 2–3, pp 203–27.