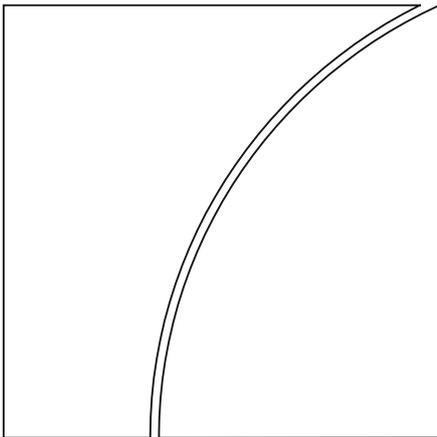




BANK FOR INTERNATIONAL SETTLEMENTS



BIS Papers

No 79

Re-thinking the lender of last resort

Monetary and Economic Department

September 2014

JEL classification: E58, F33

The views expressed are those of the authors and not necessarily the views of the BIS.

This publication is available on the BIS website (www.bis.org).

© *Bank for International Settlements 2014. All rights reserved. Brief excerpts may be reproduced or translated provided the source is stated.*

ISSN 1609-0381 (print)

ISBN 978-92-9131-727-1 (print)

ISSN 1682-7651 (online)

ISBN 978-92-9131-728-8 (online)

Contents

Overview

Rethinking the lender of last resort: workshop summary Dietrich Domanski and Vladyslav Sushko.....	1
---	---

Keynote paper

The lender of last resort and modern central banking: principles and reconstruction Paul Tucker.....	10
---	----

Lessons from the lender of last resort actions during the crisis

Central banks as lender of last resort: experiences during the 2007–2010 crisis and lessons for the future Dietrich Domanski, Richhild Moessner and William Nelson	43
Lessons from lender of last resort actions during the crisis: the Federal Reserve experience William Nelson.....	76
Lender of last resort operations during the financial crisis: seven practical lessons from the United Kingdom Andrew Hauser	81
Lending of last resort? A European perspective Francesco Papadia.....	93
Lender of last resort: actions, results and lessons from Mexico’s experience during the crisis José J Sidaoui	97
Lessons from Bank of Japan’s experience during the banking crises of the 1990s and the new dimension to LOLR stemming from the global financial crisis Hiroshi Nakaso	106

Post-crisis changes in the financial system and their implications for central bank liquidity policies

Why central banking should be re-imagined Perry Mehrling	108
---	-----

Is there a need to re-think the international lender of last resort?

International lender of last resort: some thoughts for the 21st century Jean-Pierre Landau.....	119
--	-----

Can emerging economy central banks be market-makers of last resort?	
Michael Dooley	128
Toward an international lender of last resort	
Stephen Cecchetti	131

Rethinking the lender of last resort: workshop summary

Dietrich Domanski and Vladyslav Sushko, BIS

Overview

Lender of last resort (LOLR) is perhaps a central bank's most controversial role. On the one hand, emergency liquidity assistance to financial institutions is a core responsibility of central banks. This is because of central banks' unique ability to create liquid assets in the form of central bank reserves, their central position within the payment system and their macroeconomic stabilisation objective. On the other hand, central bank LOLR is seen as very risky; as it potentially creates moral hazard on a massive scale, exposes the central bank to large financial risks, and blurs the boundary with fiscal policy. Moreover, liquidity assistance to individual institutions is typically deeply unpopular, creating reputation risks.

The financial crisis served as a reminder of the critical importance of the LOLR in restoring financial stability. But it also raised fundamental questions about the design of LOLR frameworks and the execution of LOLR policies. How to strike the right balance between limiting risks for central banks and ensuring that the LOLR function can be performed effectively when needed? Should central banks be ambiguous in public about the terms and conditions of liquidity support? Or is there a case for well-articulated LOLR policies, communicated *ex ante* as part of a broader financial stability framework?

This BIS workshop explored these issues, with a view to providing input into the discussions among central banks, and the public debate more generally. While there was broad agreement that liquidity support during the crisis was key in stabilising the global financial system, the discussions highlighted a number of challenges regarding LOLR policies. These included effective ways of dealing with stigma, questions regarding the design of LOLR policies in a market-based financial system, how to contain moral hazard, and issues of governance of LOLR policies, particularly against the backdrop of evolving financial stability frameworks. Finally, the question of optimal mechanisms for liquidity assistance in foreign currency remains an open one.

The workshop was organised in three sessions plus a working lunch.

The first session, chaired by Hiroshi Nakaso (Bank of Japan), reviewed the experience of major central banks with LOLR measures during the financial crisis. Bill Nelson (Federal Reserve) opened the discussion with an assessment of the Fed's actions during the crisis. Francesco Papadia (Bruegel) continued the panel with a discussion of how the European Central Bank (ECB) addressed interbank liquidity shortages and wider market dysfunction during the crisis. Andrew Hauser reviewed the Bank of England's experience during the crisis. José Sidaoui (former Bank of Mexico) provided the perspective of a major emerging market economy (EME), where the foreign exchange market served as a key transmission mechanism of liquidity stress. Hiroshi Nakaso concluded the first session with a review of Bank of

Japan experiences during the 1990s banking crises and new aspects of LOLR action that emerged during the recent financial crisis.

The second session, chaired by Claudio Borio (BIS), discussed how post-crisis changes in the financial system affected the central bank's role as LOLR. Perry Mehrling (Columbia University) led off with a discussion of new demands on LOLR associated with a market-based credit system. Lex Hoogduin (University of Amsterdam) discussed the relationship between the LOLR and self-insurance against liquidity risk. Morten Bech (BIS) presented several practical proposals for incorporating liquidity insurance through the central bank into bank liquidity regulation. Tim Lane (Bank of Canada) concluded the panel with a short summary of recent and ongoing work on collateral markets in the Committee on the Global Financial System (CGFS).

Sir Paul Tucker (Harvard University) delivered the keynote speech at the working lunch. The speech and the ensuing discussion focused on the issues of LOLR governance.

The third session, chaired by Hyun Song Shin (BIS), focused on the international dimensions of LOLR regimes. Jean-Pierre Landau (Sciences Po) opened the panel discussion with a proposal for a multilateral foreign currency liquidity arrangement that would reduce inefficient accumulation of foreign exchange reserves as a means to provide self-insurance. Giovanni Dell'Ariccia (IMF) discussed the relative merits of self-insurance through foreign exchange reserves, bilateral central bank swap arrangements, multilateral arrangements and IMF credit lines. Michael Dooley (University of California) then discussed the constraints that EME central banks faced in obtaining foreign currency insurance. Finally, Steve Cecchetti (Brandeis University) concluded the panel with a discussion of the implications of the US dollar's role as a reserve currency for the design of international liquidity support arrangements.

Summary of the discussions

Session 1: Lessons from lender of last resort actions during the crisis

The experiences of major central banks with the LOLR role since 2007 had some common characteristics. Major central banks expanded liquidity provision on an unprecedented scale and scope. As the crisis unfolded, LOLR measures evolved from traditional easing of terms at standing facilities to extraordinary actions targeting individual institutions and provision of system-wide support, including to non-bank intermediaries and markets, and liquidity provision in foreign currency. The stabilisation of the financial system since 2009 had allowed central banks to end, or considerably scale back, liquidity support. Overall, discussants characterised the support measures as effective and appropriate in dealing with the extraordinary liquidity stress during the crisis.

Yet, the comparison of experiences across major central banks also revealed significant differences. In particular, the design of existing operational frameworks was a key determinant of LOLR action taken by major central banks during the crisis.

The relatively narrow operating framework of the Federal Reserve required the innovation of new facilities to deal with evolving liquidity stress. Until the crisis, the Fed conducted monetary policy by buying and selling (outright or repo) only Treasury and agency securities with a relatively small set of large broker-dealers.

While the Fed also provided discount window loans to depository institutions against a very wide range of collateral, discount window lending was rare and depository institutions were reluctant to borrow from the Fed because of the considerable stigma associated with using the discount window. To respond to the crisis, the Fed needed to design novel means to extend credit not only to depository institutions but also, using its emergency authority, to non-bank financial institutions. Notwithstanding considerable time pressure and operational challenges, the Fed was able to design bespoke facilities as needed. However, the high-hurdle associated with providing emergency credit limited the ability to provide liquidity to the shadow banking system at an earlier stage.

The Bank of England's approach had evolved along similar lines to that of the Fed, whereby a narrower operating framework for normal times was augmented with liquidity assistance to markets as the crisis spread. The Bank's crisis emergency liquidity assistance programme also began with covert lending to individual financial institutions. However, like the Fed, the Bank of England had to invent a number of new, ad hoc operations, such as the Special Liquidity Scheme (SLS), in order to be able to provide large-scale liquidity support to entire markets.

At the other end of the spectrum was the Eurosystem's pre-crisis operating framework. The broad range of collateral and counterparties in normal operations limited the need to adjust the framework and facilitated the supply of central bank liquidity, effectively allowing the Eurosystem to become the main intermediary in interbank market at the height of the crisis. This elastic provision of liquidity to banks in response to gaps involved providing term lending: increasing the tenor of refinancing operations from three months to three years (Longer-Term Refinancing Operations, LTROs), addressing market dysfunction for a wider range of assets (Securities Market Programme, SMP) and providing FX liquidity (central bank swap lines).

There was some discussion about how to separate conceptually LOLR actions from the liquidity provision for the purposes of monetary policy operation. One view was that an elastic currency supply was a more useful concept than LOLR in the Eurosystem context as measures there reflected responses to fluctuations in liquidity demand. Indeed, the increase in the Eurosystem balance sheet between 2008 and 2011 matched exactly the amount of the crisis-induced liquidity shortage in interbank markets. Others emphasized that such elastic provision of liquidity inevitably gave rise to considerable moral hazard, which required strong conditionality in response.

For EMEs, the transmission of liquidity stress through foreign exchange markets called for a different type of LOLR response. In Mexico, the illiquidity in the foreign exchange market led to liquidity stress, exacerbated because of the hedging practices of Mexican corporates (eg options with knock-out clauses). In order to restore market functioning, the Bank of Mexico intervened in the foreign exchange market with more than a third of its foreign exchange reserves. However, confidence among market participants was only restored once the authorities arranged swap lines with the Fed and activated the Flexible Credit Line (FCL) with the IMF.

In addition, the Bank of Mexico and Mexican Treasury intervened in domestic financial markets. The operations included longer-term open market operations (OMOs), interest rate swaps, repos of government bonds and issuance of shorter-duration government paper. Specialised government agencies also provided credit to shadow banks and non-financial corporates.

For the Bank of Japan, the three main lessons from the banking crisis of the 1990s had influenced LOLR policies. First, “constructive ambiguity” can become counter-productive in periods of stress. Second, distinguishing illiquid from insolvent institutions is never easy. And third, the scope of the LOLR function is complementary to the reach of the existing safety net in the financial system.

The discussion following the panel presentation centred around three questions.

First, what did the crisis experience reveal about the **effectiveness** of different LOLR measures? Large-scale liquidity support arguably succeeded in stabilising the financial system, but there were challenges. In some cases, central banks needed to develop new arrangements to address liquidity needs outside the banking sector under considerable time pressure, leading to operational risks and communication challenges.

Moreover, the stigma associated with central bank lending worsened significantly. Stigma was a major impediment to discount window borrowing during the crisis and limited central banks’ ability to provide emergency liquidity effectively. Market-wide facilities that were used on a regular basis were seen as one way of reducing stigma. Some participants expressed concern that new disclosure requirements might add to stigma. For LOLR measures to be effective, central banks needed to maintain the ability for covert lending.

It was noted that there did not appear to be any stigma associated with borrowing from the Federal Home Loan Bank System (FHLB) in the United States even though the borrowing was reported on bank Call Reports. The absence of stigma was seen as possibly owing to the lower rates charged by FHLBs or simply because such lending was seen as normal and not associated with financial difficulties.

A more contentious aspect concerned the duration of emergency liquidity support. Some argued that liquidity support to solvent institutions extended to contain a crisis should be short-term and clearly defined: long-term liquidity support blurred the distinction with credit policy. In response, several central bankers expressed the view that liquidity support should be as short-term as possible but as long-term as needed to effectively contain liquidity stress.

Second, which **institutional and operational arrangements had worked particularly well** and why? Because the crisis required central banks to provide liquidity in new ways, it also required difficult choices about where to draw boundaries. Deciding on the systemic importance of individual institutions and markets was often challenging. Provision of emergency liquidity in many cases required that the central bank design and execute programmes jointly with the fiscal authority and develop risk-sharing arrangements.

There was broad consensus that distinguishing between insolvent and illiquid institutions was difficult in practice for at least three reasons. First, illiquidity tended to develop into insolvency crises the longer a crisis lasted; second, illiquidity and insolvency were not independent from the judgment of the authorities; and, third, solvency assessments by supervisors or analysts might be biased. Yet, these complications notwithstanding, some participants held the view that forecasting solvency in a bad state of the world was not fundamentally different from the macroeconomic forecasting that was part of central banks’ routine business.

All four central banks intervened in credit markets. Typically, such interventions aimed at alleviating constraints in the supply of collateral assets or at reducing

excessively high liquidity premiums. Liquidity support in a market-based financial system was clearly distinct from the traditional LOLR role in a bank-based financial system. Some participants argued that credit markets were driven by trust in collateral, not by trust in institutions, which made the system inherently unstable because the value of collateral was endogenous. To counter this, central banks engaged in collateral transformation, replacing private assets with their own liabilities on an unprecedented scale.

Third, how useful were the **paradigms that guided LOLR** policies prior to the crisis? Many participants expressed the view that ambiguity with respect to the provision of emergency liquidity to banks was not always constructive. Given the scale of liquidity stress, there were doubts that ambiguity had helped reduce moral hazard before the crisis. The lack of bank liquidity regulation, in turn, was seen as having contributed to moral hazard and the build-up of liquidity risk.

Moreover, ambiguity had impaired the effectiveness of LOLR actions during the crisis. Ambiguity made it harder for central banks to quantify potential risks and prepare for any responses (eg approaches to collateral, lending limits, legal duties etc). Ambiguity also kept banks from turning to the central bank for liquidity, thus exacerbating the propagation of the crisis: term interest rates continued to rise because banks did not view central bank funding as a reliable option in the early days of the crisis. And uncertainty about how central banks would respond to market stress led to swings from optimism to extreme pessimism.

Workshop participants viewed ambiguity as more constructive when associated with LOLR assistance to non-banks. In this view, while banks would have access to liquidity from the central bank so long as they were solvent and viable, it was argued that non-banks would face constructive ambiguity; with any decision to lend to be made in consultation with other government agencies and with ex-post consequences for the borrowing firms and the regulatory regime. Still, some participants judged that principles and responsibility must be defined as clearly as possible ex ante, and that the precise parameters should be kept open while maintaining the necessary flexibility to create new facilities.

Session 2: Post-crisis changes in the financial system and their implications for central bank liquidity policies

The discussion focused primarily on the design of liquidity insurance schemes and the implications of greater reliance on collateralised financing and market-based credit intermediation more generally.

Views differed widely on the role and optimal design of **liquidity insurance** going forward. A prominent view was that new bank liquidity regulation should strengthen self-insurance and, by implication, reduce the need for LOLR support. In addition to having explicit liquidity requirements, it was also suggested that a procedure should be put in place for replenishing liquidity buffers as part of the recovery plan. Some participants argued that liquidity regimes should be applicable to non-bank systemically important institutions. For example, participants noted that some central counterparties (CCPs) be able to hold deposits with the central bank in order to build liquidity buffer separate from the banking system.

One question concerned the potential role of an ex ante fee for central bank liquidity insurance. It was recognised that an upfront fee could alleviate stigma by introducing a business-as-usual element into the use of central bank liquidity. If

properly designed, such a fee could also help to contain moral hazard. One proposal was to base such a fee on a central bank dependence ratio (CDR), calculated as a percentage of the Liquidity Coverage Ratio (LCR). Several participants expressed concern that such a mechanism would be procyclical.

Other participants were not convinced that charging an insurance premium was a good idea to begin with. For example, banks could see the insurance premium as entitling them to LOLR support in case of liquidity problems. This could greatly constrain central banks in their LOLR role, including political pressure to extend liquidity support. More fundamentally, it was noted that systemic risk cannot be insured against. Hence, some participants held the view that banks, as providers of liquidity insurance to their liability holders, needed a credible liquidity reinsurer, which could only be the LOLR.

Workshop participants also discussed the importance of the evolving use of **collateral**. A brief review of recent work by CGFS study groups on collateral asset markets confirmed that the need for collateral assets was on the rise, but also highlighted that any overall shortage was likely to be small and temporary. Some of the increase in the demand for collateral assets was structural. The drivers included minimum haircuts on derivatives transactions as well as LCR-related high quality liquid assets (HQLA) set aside by banks. Other drivers of demand for collateral assets had been central bank operations themselves, since they affected the private availability of collateral. Eligibility policy was a key factor in this context. Since eligibility for central bank operations had been expanding, the private sector's willingness to accept certain assets as collateral had also been affected.

Increasing reliance on collateralised funding had implications for the LOLR function. In a system where the availability of collateral assets, rather than money market spreads, determined liquidity conditions, LOLR policies had to aim at changing the former in order to alleviate liquidity constraints. In other words, central bank collateral transformation was becoming an integral part of LOLR functions. This reflected a comparative advantage central banks had in taking collateral because of expertise, economies of scale, absence of counterparty risk for borrowers, and a longer time horizon. It was suggested that central banks could, in principle, ensure that collateral already accepted in the market remained liquid by standing ready to establish a floor under the prices of collateral assets. However, central banks would have to be able to appropriately manage the associated risks.

More generally, the move towards **market-based credit intermediation** raised questions about the role of interventions in credit markets as part of LOLR policies. One proposal was that central banks ex ante set an "outside spread" at which they would trade collateral assets, analogous to the penalty rate in discount window-type facilities. This would ensure continuity of the price of collateral assets. One participant noted that the ECB's OMT was conceptually similar to the outside spread option, as it offered a put option with an undisclosed price. Some workshop participants supported the idea of a market maker of last resort which traded at such pre-determined spreads.

However, many participants were more critical. Standing liquidity facilities targeting credit markets involved the risk of turning into a long-term credit policy. Interventions should, in principle, occur on both sides of the market selectively, and only to address temporary market malfunctioning. Hence, any market intervention for liquidity purposes could only be catalytic in nature.

The session ended with some reflections on the validity of **Bagehot's principles**. There was a sense that his dictum to lend freely at a penalty rate and against good collateral provided limited guidance for LOLR policies in case of a systemic liquidity shock. In case of such a shock, distinguishing insolvency and illiquidity was particularly hard both; correspondingly, it was difficult to tell credit risk from liquidity risk when valuing collateral assets; and charging above-market rates for liquidity support would be likely to exacerbate financial strains. However, the broad spirit of Bagehot's principles that central banks should do what is necessary to stem a crisis while protecting themselves against losses to the extent possible still provided a useful basis for modern LOLR frameworks.

Working lunch: keynote address and discussion

The keynote address and subsequent discussion focused on **governance and accountability** aspects of LOLR frameworks. A key message was that a failure of central banks to establish legitimacy in the sphere of LOLR governance could put central bank independence at risk. The political debate about the appropriateness of LOLR measures in a number of economies underlined the importance of this issue.

A properly defined LOLR mandate would underpin legitimacy with a clear statement of purpose, principles of delegation and monitoring by the legislature. Such a mandate could form the basis of a regime of constrained discretion, where constraints would be widely agreed and public, and where the exercise of discretion could be observed by legislators and be reviewed later.

Within such a framework, LOLR policies would be designed to address moral hazard, adverse selection and time consistency, and spell out the relationship with fiscal authorities. Judgments on solvency should be based as much as possible on a probabilistic solvency forecast. Transparent stress tests and a resolution regime would constitute the technical components of a policy of lending only to solvent institutions. Central banks should publicly communicate collateral policies in advance in order to deal with time consistency problems. While *de jure* banks should have access to central bank liquidity as long as they were solvent and viable, non-banks should face constructive ambiguity, with decisions to lend made in consultation with other parts of the government and with ex post consequences for the borrowing firms and the regulatory regime. In principle, however, the decision on whether a central bank would intervene to restore market functioning would need to be made ex ante.

While central bankers could get far in framing a defensible and workable LOLR regime, the involvement of elected politicians would be required to agree on a fiscal carve-out, a governance framework, accountability mechanisms and the trade-off between conflicting public policy objectives.

The discussion yielded several specific suggestions on the possible design of LOLR governance. First, LOLR decisions should be made by, or at least involve, supervisors: a decision to lend would be a positive signal that the recipient was fundamentally sound only if the central bank were known to have access to private supervisory information. Second, the LOLR decision should be made by a formally constituted committee of the central bank, applying the "one person, one vote" principle. Third, policymakers should increase transparency about LOLR actions through ex ante public hearings and through independent external or internal audit checks for decisions on allocation and publication of losses.

The shift to a more market-based financial system has made the issue of proper governance surrounding emergency liquidity provision even more acute. Any liquidity support to markets carries the risk of supporting insolvent counterparties indirectly, for instance by propping up prices of collateral assets. A perception that such support might involve lending to fundamentally insolvent institutions would expose the central bank to considerable criticism. Liquidity support to markets also carries a higher risk of eventually ending up engaging in credit policy. In order to draw a hard line between the two policies, liquidity support to markets should thus aim to be catalytic, and focused on addressing collective action problems in markets that are judged critical to financial stability or when the transmission of monetary policy is severely impeded. In such cases, central banks could, in principle, provide inventory risk reinsurance to the dealer community by taking some outright risk, but stay in the market no longer than necessary.

Session 3: Is there a need to rethink the international lender of last resort?

The last session focused on different mechanisms for international LOLR functions, namely, precautionary foreign exchange reserve holdings, IMF credit lines, central bank swap lines, and other bilateral and multilateral support arrangements.

Emergency liquidity provision in foreign currency was one key response to liquidity pressures in global markets. In particular, the extension of US dollar central bank swap lines across a wide range of time zones in the aftermath of the Lehman Brothers bankruptcy had arguably been a potent and appropriate remedy for the acute, global dollar shortage of international banks. In some jurisdictions, the announcement of swap arrangements with the Federal Reserve alone was apparently sufficient to bolster market confidence.

By the same token, the crisis experience had confirmed that central bank liquidity support in foreign currencies was fundamentally different from domestic LOLR. Ultimately, market perceptions of a country's solvency limit the ability of the central bank and of the government to provide liquidity insurance in foreign currency. This was especially an issue for EMEs with increasingly internationally integrated financial systems.

There was broad agreement that self-insurance through the accumulation of foreign exchange reserves was sub-optimal. It was costly, could complicate monetary and exchange rate policies in reserve countries and created excess demand for safe assets in the issuing country. The double-digit annual growth rate of EME foreign exchange reserves was also thought to be unsustainable. At the same time, private institutions were under-accumulating foreign currency liquidity; the thresholds for a minimum amount of foreign exchange reserves appeared to be moving with each new EME liquidity crisis, necessitating even larger chests of reserves; and the "second wave of global liquidity" was adding to concerns about capital flow reversals and to calls for strengthened arrangements for liquidity provision in foreign currency.

One participant proposed a multilateral liquidity support agreement with strict requirements for entry (prudential and other) and unconditional access once countries were admitted. Since a permanent arrangement of this type could lead to moral hazard, the arrangement should only be activated in times of crisis. The trigger should be global market conditions, rather than country-specific circumstances. Other participants questioned whether such an approach could

work. Weak conditionality and insufficient protection against moral hazard could lead to the build-up of significant risks.

Another participant suggested a reserve pooling arrangement. Countries with excess foreign exchange reserves would pool reserves and use them as collateral for foreign currency loans. The governance could be similar to that of the Chiang Mai Initiative Multilateralisation (CMIM). Existing multilateral arrangements such as the CMIM still required an IMF credit line for participants to draw funds beyond a certain threshold.

The IMF's Flexible Credit Line had been another source of foreign currency liquidity. While the participants acknowledged that FCLs worked when put in place, the uptake appears to have been limited due to stigma. Furthermore, a country still needed to accumulate comfortable foreign exchange reserves position to qualify for an IMF FCL. Overall, the strict conditionality of FCLs was seen as an obstacle to their use as foreign currency liquidity backstop. Some participants also noted that foreign currency liquidity support should be completely separate from balance of payments support.

Central bank swap lines worked well during the crisis. Some merits of the swap lines included the fact that credit risk to individual financial institutions was borne by the swap partner against eligible collateral. This put the responsibility of managing risks arising from foreign currency liquidity insurance with the central banks where the activity was taking place.

One participant suggested that the reserve currency-issuing central bank should be responsible for ensuring that banks outside its jurisdiction had the necessary access to its currency. Several participants cited the privilege of issuing US dollars as reserve currency, which allowed the United States to run a perpetual current account deficit while also enjoying a funding advantage in global financial markets. This would argue in favour of US monetary authorities assuming responsibility for liquidity insurance in dollars, subject to the necessary protections.

In practice, there appeared to be no obvious alternative other than to continue to rely on a combination of several mechanisms, perhaps as a part of a more formalised multilateral arrangement. Thus, the stock of foreign exchange reserves could be augmented with IMF lines of credit. Swap arrangements with the reserve currency-issuing central banks, in turn, could help enhance the credibility of such arrangements. For example, the Mexican authorities' use of foreign exchange reserves to stabilise the peso market in the aftermath of the Lehman collapse gained the necessary credibility only after both the swap lines with the Fed and an IMF credit line had been secured.

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

Paul Tucker¹

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

¹ Harvard Kennedy School and Business School.

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 Buiters 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.

Central banks as lenders of last resort: experiences during the 2007–10 crisis and lessons for the future¹

Dietrich Domanski,² Richhild Moessner³ and William Nelson⁴

Abstract

During the 2007–10 financial crisis, central banks accumulated a vast amount of experience in acting as lenders of last resort. This paper reviews the various ways that central banks provided emergency liquidity assistance (ELA) during the crisis, and discusses issues for the design of ELA arising from that experience. In a number of ways, the ELA since 2007 has largely adhered to Bagehot's dictum of lending freely at a penalty rate to solvent institutions against good collateral. But there were many exceptions to these principles. Those exceptions illuminate the situations where the lender of last resort role of central banks is most difficult. They also highlight key challenges in designing lender of last resort policies going forward.

Keywords: Banking crisis, central bank liquidity, lender of last resort

JEL classification: E58, F31, N1

¹ The views expressed are those of the authors and should not be taken to reflect those of the Federal Reserve Board or the BIS. The authors would like to thank Bill Allen, Mark Carlson, James Clouse and Burcu Duygan-Bump for helpful comments and discussions, and Magdalena Erdem and Amanda Ng for excellent research assistance.

² Bank for International Settlements.

³ Bank for International Settlements.

⁴ Federal Reserve Board.

1. Introduction

From mid-2007 until early 2009, central banks extended the equivalent of about \$4 trillion in major currencies in liquidity support to banks and non-banks, to individual institutions and markets, and in domestic and foreign currency. As a consequence of these actions, the aggregate size of central bank balance sheets in major currency areas more than doubled. Subsequently, until mid-2010, central banks wound down this liquidity support, but even so balance sheets continued to expand because of asset purchase programmes and, in the euro area, new support measures in response to the sovereign debt crisis.

During the financial crisis, central banks accumulated a vast amount of experience in the execution of the lender of last resort role. This contrasts sharply with the post-Second World War period, when emergency liquidity support had been provided rarely and almost always to individual banking institutions experiencing idiosyncratic and usually transitory difficulties. In a number of cases, central banks had not provided emergency liquidity support for decades.

The crisis experience has challenged commonly held views on how central banks should provide emergency liquidity support. The most widely held were those put forward by Walter Bagehot in his book "Lombard Street" – to stem a financial panic a central bank should lend freely at a penalty rate to solvent institutions against good collateral (Bagehot (1873)). By lending freely, the central bank could prevent a financial crisis and the associated fire sales of assets and disruptions to economic activity. But by lending at a penalty rate to solvent institutions against good collateral, the central bank avoided taking unnecessary risks and reduced moral hazard.

Another widely held view was that ex ante ambiguity about the provision of liquidity support can effectively contain moral hazard. "Constructive ambiguity" was a central piece of lender of last resort policies of many central banks before the crisis. Obviously, such ambiguity did not prevent the build-up of excessive maturity and currency mismatches in the global financial system. Nor is it clear how credible constructive ambiguity is now in light of the crisis experience of large-scale liquidity support.

In this paper, we review the various ways that central banks provided emergency liquidity assistance (ELA) during the crisis, and we discuss issues for the design of ELA arising from that experience. We try to show how the rules which governed central banks' provision of ELA during the financial crisis differed from those governing ELA pre-crisis. We do not judge the appropriateness of ELA provided during the crisis. Views differ on this issue,⁵ and we do not take a stand on this debate in our paper.

In many ways, the emergency liquidity support since 2007 has adhered to Bagehot's dictum of lending freely at a penalty rate to solvent institutions against good collateral. Even as the crisis became systemic, central banks aimed at acting in the spirit of Bagehot by taking decisive action to stem the crisis while avoiding unnecessary risks for central banks. As we will discuss, these were the situations where the lender of last resort role of central banks was most difficult.

⁵ Carlson et al (2014) includes a discussion of the varying views on the effectiveness and appropriateness of lender of last resort lending during the crisis.

Following Freixas et al (1999), we define the lender of last resort as the institution that provides liquidity to an individual financial institution (or the market as a whole) in reaction to an abnormal increase in demand for liquidity that cannot be met from an alternative source. Lender of last resort credit in these situations is often referred to as emergency liquidity assistance. In the standard conception of such lending, the financial institution in question would be solvent but illiquid; that is, its assets are more valuable than its liabilities, but it is unable to raise funds to meet short-term obligations. Last resort lending in these circumstances would prevent a costly and unnecessary default by the institution.

In the next section, we briefly survey the views on emergency liquidity assistance held by economists and central bankers going into the crisis. The third section provides a summary of the various ways that central banks provided ELA in 2007–10 and infers the rules that appear to have governed its provision. The fourth section discusses issues in the future provision of ELA to markets and institutions.

2. Pre-crisis views on the lender of last resort role

The role of lender of last resort is probably the most ambiguous function of a central bank. On the one hand, it is typically regarded as a core responsibility of central banks, given their unique ability to create liquid assets in the form of central bank reserves, their central position within the payment system and their macroeconomic stabilisation objective. On the other hand, if the availability of central bank liquidity were certain, individual banks would have reduced incentives to maintain sufficient stocks of liquid assets to cover their liquidity needs. Hence, to limit moral hazard, central banks have in many cases left open how they would respond to liquidity shortages at the level of individual institutions or the market as a whole.

Pre-crisis views on ELA reflect this inherent tension between the recognition that central bank liquidity support is unavoidable in certain situations and concerns about moral hazard. This section summarises the views in the literature and central bank approaches towards ELA.

2.1 Views in the literature

Freixas et al (1999) provide a comprehensive review of the literature on ELA, covering the need for ELA, central banks' responses to illiquidity problems via liquidity support to individual institutions and via lending to the market as a whole, and the costs of and moral hazard due to ELA.⁶

Reasons for providing ELA. The main reason identified by Freixas et al (1999) for ELA to individual banks is to avoid a solvent bank becoming illiquid because of inefficiencies in the interbank market, which may prevent such a bank from borrowing from other banks. The need for liquidity support arises from the existence of asymmetric information, which can lead to bank runs and a failure of

⁶ Freixas et al (1999) also discuss risk-capital support for insolvent banks and the costs of capital injections.

interbank markets; and negative externalities for systemic financial stability from the failure of a bank, due to contagion and interbank credit exposures.

ELA can also help to prevent contagion. Such contagion could occur for two primary reasons. First, an institution that had lent money to the defaulter could become insolvent because of losses on the defaulted obligations. Second, an institution could be viewed as having similar portfolios to the defaulting institution, and worried creditors could stop funding it. In either case, if an institution is unable to raise funds and is forced to sell assets at fire-sale prices, those lower asset values can push it and other institutions into insolvency. ELA can prevent unnecessary fire sales by providing liquidity to otherwise solvent institutions. For instance, the Federal Reserve took a number of steps to increase the liquidity available to financial institutions after the stock market crash of 1987 (Greenspan (1988), Carlson (2007)).⁷

Finally, ELA can also prevent a disorderly bankruptcy, which can in turn have disruptive effects on the wider financial system. It can do so either by enabling a solvent but illiquid bank to weather a transitory withdrawal of market funding, or by allowing financial authorities time to arrange an orderly failure.

Costs from providing ELA. One cost emphasised in the literature is direct losses resulting from lending to institutions that turn out to be insolvent while the ELA is not sufficiently collateralised. The other cost is more indirect, resulting from moral hazard. ELA can affect the incentives of banks to make their own provisions against liquidity problems in the future; that is, instead of making adequate provisions themselves, banks may rely on expected ELA as insurance. Moreover, an expectation that ELA will effectively insure all bank creditors, and not just those covered by deposit insurance, can weaken market discipline.

Against the backdrop of these benefits and costs of lender of last resort actions, the literature focuses on three main questions: (i) how to distinguish between liquidity and solvency problems? (ii) how to contain moral hazard? and (iii) what is the actual responsibility of central banks as opposed to that of other agencies?

Illiquidity vs insolvency: who should receive ELA? In Bagehot's view, institutions without good collateral should not receive ELA, being assumed to be insolvent. However, when decisions on ELA need to be made quickly in practice, there may not be enough time to determine for sure whether a bank is solvent; and an originally solvent bank may become insolvent over the course of ELA provision.

Another view is that ELA should be provided not to individual banks but only to the market as a whole via open market operations, since liquidity would then be allocated to individual creditworthy banks via the interbank market (Goodfriend and King (1988), Bordo (1990), Schwartz (1992, 1995)). The effectiveness of this approach rests on the assumption that the central bank has no informational advantage over interbank market participants.

⁷ As described in Carlson (2007), the Fed "eased short-term credit conditions by conducting more expansive open market operations at earlier-than-usual times, issuing public statements affirming its commitment to providing liquidity, and temporarily liberalizing the rules governing the lending of Treasury securities from its portfolio. [...] The Federal Reserve also encouraged the commercial banking system to extend liquidity support to other financial market participants."

How to contain moral hazard? Views in the literature differ on how to address moral hazard. Bagehot (1873) argued that ELA should be provided at penalty rates and against good collateral, so that it is indeed a last resort and banks do not expect to receive it “[...] as a matter of course”, reducing moral hazard. Bagehot’s rule of lending at a penalty rate was challenged later, and it was sometimes not applied to ELA (Goodhart and Schoenmaker (1995)); one reason given for this in the literature is that lending at a penalty rate could make the problems of a bank receiving ELA worse (Crockett (1996), Garcia and Plautz (1988)).

Another way to limit moral hazard is via “constructive ambiguity”. Maintaining uncertainty about whether ELA will be provided can in principle incentivise banks to act prudently (Corrigan (1990), BIS (1997)). The same can be achieved by leaving open the conditions attached to possible ELA (Crockett (1996)). Constructive ambiguity leaves a large degree of discretion in the hands of decision-makers, giving rise to time-consistency problems.

What is the role of the central bank vs that of other agencies? The ability to supply reserves as riskless (domestic) assets in, in principle, unlimited amounts makes the central bank the natural lender of last resort. In addition, the central bank may have an informational advantage over the market because of its access to supervisory data. Many authors see the boundaries of central bank responsibilities as reached when ELA exposes the central bank to a potential loss. In this case, ELA would require a government guarantee to cover the central bank’s exposure (Goodhart and Schoenmaker (1995)). Another view is that central banks do not need capital the same way as commercial banks (Stella (1997)) and can therefore shoulder some ELA-related credit risk.

2.2 Central banks’ pre-crisis approaches

Domestic approaches. In practice, central banks (and public authorities responsible for financial crisis management) were reluctant to set out their approaches to ELA because of concerns about serious moral hazard and adverse effects on market functioning. By end-2006, about half of the central banks of the G10 advanced economies had publicly released statements on their ELA policies. Generally, these statements set out broad guidelines or principles for ELA. Many central banks, particularly in the euro area, were deliberately vague about their ELA policies, emphasising the importance of constructive ambiguity.

The growing recognition of the role of central banks in financial stability spurred the development of more explicit arrangements for crisis prevention and management in the years before 2007. Although for many constructive ambiguity remained a guiding principle, several central banks had started to speak more openly about their policies regarding ELA.

Such increased ex ante transparency was seen as a means for central banks to manage market expectations concerning the potential availability of ELA, thereby reducing the problem of moral hazard. For instance, public communication prior to the crisis indicated changes in delimiting the borders of possible ELA. In particular, the Swiss National Bank viewed only systemically important institutions as being eligible for ELA (implying that the range of eligible banks does not extend to all deposit-taking institutions). Other ex ante clarifications of central bank policies aimed at ensuring that technical preconditions for the provision of ELA were in place.

In all cases public communication remained consistent with a central bank's retention of full discretion as to how a policy would be implemented in practice. When ELA was provided, eligibility criteria and terms and conditions were generally guided by Bagehot's principles. Only solvent institutions were eligible for ELA, collateralisation was mandatory, and policy rates were the minimum price for ELA.

International approaches. The issue of cross-border ELA emerged in 1974 in the wake of the Herstatt collapse. In September 1974, G10 Governors issued a press communiqué on their lender of last resort function in euro-currency markets (BIS (1974)): "The Governors also had an exchange of views on the problem of the lender of last resort in the Euromarkets. They recognized that it would not be practical to lay down in advance detailed rules and procedures for the provision of temporary liquidity. But they were satisfied that to that end means are available and will be used if and when necessary."

The main instrument for providing ELA in foreign currency has been central bank swap lines. Previously, following 11 September 2001, the Federal Reserve had established temporary central bank swap lines for a duration of 30 days with the ECB and the Bank of England, and temporarily increased an existing swap line with the Bank of Canada. Their purpose was different from that of the swap network established during the financial crisis of 2008–09, in that they had been set up to provide emergency US dollar liquidity following disruptions in the financial infrastructure (see Moessner and Allen (2010b)).⁸

3. ELA during the crisis

During the financial crisis, central banks provided ELA of three sorts. First, they extended credit to prevent the disorderly failure of individual institutions perceived as systemically critical. Second, they stepped in for the malfunctioning interbank markets. And third, they provided funding to increase liquidity in specific financial markets.

3.1 Credit to individual troubled systemically critical institutions

The character of ELA provided to troubled institutions evolved with the crisis.⁹ During a **first phase from September 2007 to August 2008** (before the Lehman default), ELA was provided to cover liquidity shortfalls due to an inability to obtain sufficient funding in interbank and other wholesale markets. Northern Rock, in September 2007, was unable to refinance securitised mortgages. In March 2008, Bear Stearns could not repay repurchase agreements (and other obligations) coming due the following day. The aim of ELA in these circumstances was to allow an orderly resolution of liquidity difficulties of financial institutions that were perceived as systemically important.

⁸ The cross-border provision of central bank liquidity in the form of currency swaps goes back to the 1920s and intensified in the 1960s (see Moessner and Allen (2010b) for an overview).

⁹ Annex 1 provides a more detailed description of the ELA provided to individual institutions from September 2007 to March 2009.

Already at this stage, ELA involved transactions with non-standard counterparties (see Table 1). In particular, the loan to Bear Stearns was the first time the Federal Reserve had used its authority to lend to non-banks since the 1930s. Moreover, the ELA entailed taking on what were likely to be greater than normal amounts of risk. While the collateral backing the loan extended to facilitate the acquisition of Bear Stearns by JPMorgan Chase consisted of investment-grade securities and performing loans and the loan was ultimately repaid in full, at times as the crisis worsened the value of the collateral fell below the amount of the loan from the Federal Reserve.¹⁰

In a **second stage of the crisis, following the collapse of Lehman Brothers**, central bank credit was provided in several cases – often in conjunction with government measures – to assist balance sheet restructuring. In September 2008, the Federal Reserve provided to American International Group (AIG) an \$85 billion line of credit secured by all the assets of AIG and its primary non-regulated subsidiaries. The firm was unable to raise funds to post collateral to cover exposures related to declines in the prices of mortgage-related assets, and also faced an imminent downgrade in its credit rating. The Federal Reserve determined that the failure of AIG – a large insurance company and diversified financial services company with assets of over \$1 trillion – only days after the failure of Lehman Brothers would have severely disrupted financial markets and “materially weakened economic performance”.¹¹

In October 2008, the Swiss National Bank (SNB) announced that it would finance the transfer of illiquid assets of UBS to a special purpose vehicle (SPV). UBS, one of the two largest Swiss banks, had announced record losses running into billions of Swiss francs at a time when the market’s confidence in the big banks had been seriously eroded. Prices for credit default swaps (CDS) increased sharply, share prices plummeted, ratings were downgraded and the big banks’ liquidity situation deteriorated (Swiss National Bank (2009)).

¹⁰ See the appendix for additional information on the Bear Stearns transactions. In addition, the specific collateral requirements for the loan extended to facilitate the acquisition are described in <http://www.newyorkfed.org/markets/maidenlane.html>; the value of the collateral and the amount of the loan outstanding at a point where the collateral value was below the loan value is provided in “Federal Reserve System Monthly Report on Credit and Liquidity Programs and the Balance Sheet”, June 2009, <http://www.federalreserve.gov/monetarypolicy/files/monthlyclbsreport200906.pdf>.

¹¹ “Report pursuant to Section 129 of the Emergency Economic Stabilization Act of 2008: Securities Borrowing Facility for the American International Group, Inc.”, October 6, 2008, p 2.

Characteristics of central bank support provided to troubled institutions
between 2007 and 2009

Table 1

Date	Institution	Problem	Central bank support measure			
			Measure / objective	Instrument	Collateral	Pricing
14 Sep 2007	Northern Rock)	Inability to refinance securitised mortgages	Provision of liquidity facility to bridge funding gap	Callable loan	Mortgage-backed securities	
13 Mar 2008	Bear Stearns	Unable to repay repurchase agreements	Avoid disorderly default/facilitate merger with JPMorgan Chase	Collateralised loan/loan to SPV that acquired assets	Performing residential or commercial mortgages; investment grade securities	Primary credit rate
16 Sep 2008 (restructured several times)	AIG	Unable to meet collateral calls, imminent downgrade	Allow for orderly sale of assets	Revolving credit facility	All assets of AIG and primary non-regulated subsidiaries	Libor + 850 bp, reduced to Libor + 300 bp
16 Oct 2008	UBS	Large-scale writedowns on illiquid assets	Finance removal of assets from balance sheet	Long-term loan	Illiquid securitised assets	1-month Libor + 250 bp
23 Nov 2008	Citigroup	Potential losses hampering ability to obtain funding	Protection against declines in troubled assets	Non-recourse loan if losses sufficiently high (never used)	Mortgage-related assets	OIS + 300 bp
15 Jan 2009	Bank of America	Potential losses hampering ability to obtain funding	Protection against declines in troubled assets	Non-recourse loan if losses sufficiently high (never used)	Mortgage-related assets	OIS + 300 bp

In November 2008 the Federal Reserve joined the US Treasury and the Federal Deposit Insurance Corporation (FDIC) in providing Citigroup with protection against declines in value on a \$306 billion pool of primarily mortgage-related assets.¹² In January 2009, the Federal Reserve, Treasury and FDIC provided similar protection for Bank of America on a \$118 billion pool of loans, mortgage-related securities, corporate debt and derivatives. Further losses "... could have resulted in other financial institutions experiencing similar funding problems, posed risks to financial stability, and increased downside risks to economic growth".¹³ Neither the Citigroup

¹² "Report Pursuant to Section 129 of the Emergency Economic Stabilization Act of 2008: Authorization to Provide Residual Financing to Citigroup, Inc. for a Designated Asset Pool."

¹³ "Report Pursuant to Section 129 of the Emergency Economic Stabilization Act of 2008: Authorization to Provide Residual Financing to Bank of America Corporation Relating to a Designated Asset Pool", p 3.

nor the Bank of America wraps were used, and the institutions paid exit fees to terminate the agreements.

In addition to providing credit to individual non-bank institutions under its emergency lending authority, the Federal Reserve System also provided ELA through the discount window to individual depository institutions that were experiencing financial difficulties. Institutions that are not financially sound do not qualify for the primary credit facility, but may be provided with secondary credit loans as a bridge to market sources of funds or to facilitate an orderly resolution. Secondary credit outstanding, which is usually zero, peaked at \$985 million on 27 January 2010 (weekly average).

3.2 Credit extended to address a malfunctioning of interbank markets

Between August 2007 and early 2009, central banks expanded the provision of liquidity in response to three types of liquidity problems in the banking system as a whole (Table 2). First, insufficient access to reserves within the banking system was addressed by broadening the range of counterparties and eligible collateral, and easing the terms on standing lending facilities. Second, as the supply of term funding evaporated in interbank markets in autumn 2007, central banks conducted exceptional long-term open market operations. And third, shortages of foreign currency reserves were addressed by the establishment of central bank swap lines.

The extent to which central banks expanded their intermediation functions depended importantly on the ***design of pre-crisis operating frameworks***. These frameworks, designed and operated to implement a desired stance of monetary policy (Borio and Nelson (2008)), involved different degrees of intermediation by central banks. For instance, prior to the financial crisis, the Federal Reserve conducted monetary policy primarily by engaging in purchases and sales, either outright or through repurchase agreements (repos), of government securities, with a small group of broker-dealers referred to as “primary dealers”. Primary dealers do not themselves have accounts at the Federal Reserve, so the initial impact of the open market operations is on the reserve balances of the banks where the primary dealers have accounts. Changes in reserve balances of primary dealers are distributed throughout the banking system using the interbank market and, in particular, the federal funds market.

In contrast, the ECB conducted its regular operations with a much broader range of counterparties and against a broad range of collateral. The main refinancing operations were repos with a weekly frequency and a maturity of normally one week, which are executed by the national central banks with a large number of counterparties against a range of marketable and non-marketable assets.

Measures taken to address liquidity problems in the banking system ¹							Table 2	
	AU	CA	EA	JP	CH	GB	US	
Insufficient access to reserves								
Broadening of counterparties						✓ ³	✓	
Broadening of eligible collateral	✓	✓			✓ ²	✓	✓	
Change in the standing lending facility						✓	✓	
Shortage of term funding								
Exceptional long-term open market operations	✓	✓	✓	✓	✓	✓	✓	
Shortage of reserves in foreign currency								
Central bank swap lines			✓	✓	✓	✓	✓	

AU = Australia; CA = Canada; EA = euro area; JP = Japan; CH = Switzerland; GB = United Kingdom; US = United States. ✓ = yes; blank space = no.

¹ Table reflects information up to end-April 2008. ² Entered into effect on 1 October 2007, but not linked to the turmoil. ³ Only for four special auctions of term funding announced in September 2007, for which, however, there were no bids.

Source: CGFS.

Addressing illiquidity in interbank markets. To facilitate an effective distribution of central bank funds, several central banks widened, either temporarily or permanently, the range of eligible collateral and counterparties. The Bank of England (BoE) offered four special three-month tenders in late September and October 2007 against a wider range of collateral and to a wider set of counterparties. As part of the coordinated central bank actions announced in December 2007, the BoE also widened the collateral list in, and increased the size of, its regular three-month repo operations.¹⁴ The Bank of Canada (BoC) announced special operations in August 2007 that accepted temporarily as collateral all securities that were already eligible for its standing liquidity facility, and conducted some term repo operations in December and early 2008 that accepted a wider than normal range of collateral.¹⁵ From September 2007, the Reserve Bank of Australia widened the list of collateral eligible for its regular repo operations and its overnight repo facility to include a broader range of bank paper, as well as residential mortgage-backed securities (RMBS) and asset-backed commercial paper (ABCP).

The Federal Reserve also eased, as one of the first responses to the crisis, the terms of access to the primary credit facility ("discount window"), its standing loan facility. Primary credit is intended to be used as a backup source of liquidity to address very short-term funding needs. Prior to the crisis, credit was typically extended on an overnight basis. The easing was intended to increase the liquidity of depository institutions and thereby support their ability to lend to businesses and households.

¹⁴ The widened collateral list includes AAA-rated RMBS and covered mortgage bonds.

¹⁵ As part of its ongoing review of collateral policy, the BoC also decided to broaden the range of securities acceptable under the Standing Liquidity Facility to include certain types of ABCP (end-March 2008) and US Treasuries (expected by mid-2008).

Stigma turned out to be a major impediment to the effectiveness of discount window lending in the United States (and, to some extent, that of the Bank of England's Discount Window Facility). Even before the financial crisis, some banks were reluctant to borrow under the primary credit programme; they were willing to borrow in the interbank market at interest rates above the primary credit rate rather than turn to the window. During the crisis, banks' reluctance to use the window intensified. Even though the Federal Reserve had always kept information about individual borrowers confidential, banks were reportedly concerned that market participants might learn about their borrowing and view it as a sign of a weak financial condition.¹⁶

Provision of term funding. Following the evaporation of term funding in autumn 2007, all major central banks conducted exceptional long-term open market operations. As part of the December 2007 joint central bank announcement, the Federal Reserve established the Term Auction Facility (TAF). The TAF was intended to address heightened bank funding pressures and the issues of stigma associated with the primary credit programme. Under the TAF, the Federal Reserve auctioned credit to depository institutions. The TAF was established using the Federal Reserve's standard discount window authority, not its emergency authority.

The Eurosystem increased the provision of term funding through special longer-term refinancing operations. In August 2007, the ECB started to conduct supplementary three-month refinancing operations, and in March 2008 it announced two six-month refinancing operations (ECB (2008)). In June 2009, the ECB conducted a 12-month refinancing operation. The ECB in late 2008 moved to full allotments at fixed rate refinancing operations, thereby essentially establishing a fully elastic supply of central bank reserves. Other central banks, including the Swiss National Bank (SNB), the BoE and the Bank of Japan (BoJ), also expanded their provision of term funds.

Provision of liquidity in foreign currency. Banks' dependence on cross-border funding had grown rapidly prior to the crisis. Using BIS international banking statistics, McGuire and von Peter (2009) document the rapid expansion of foreign claims of reporting banks over the preceding decade. European banks, in particular, accumulated foreign claims at a pace that outstripped domestic credit growth. At the same time, banks also took on more foreign liabilities, reflecting a growing dependence on cross-border funding. UK, Swiss, German and Dutch banks built up large net foreign positions denominated in US dollars. Since these banks tended not to have a sufficiently large onshore dollar funding base while their US counterparts tended to have no structural needs for European currencies, cross-currency funding (borrowing in one currency to fund assets in another) was needed to fill the gap.¹⁷

The disruption to the interbank markets also impaired the ability of banking institutions outside the United States to secure necessary dollar funding. Early in the crisis, efforts by European banking institutions to secure funds in the US market early in the trading session led to large intraday swings in the federal funds rate.¹⁸ Notwithstanding increasingly unfavourable borrowing conditions, the demand for

¹⁶ As discussed below, the Dodd-Frank Act requires the Federal Reserve to publish information on individual borrowing going forward with a two-year lag.

¹⁷ See CGFS (2010a) for a discussion of the need for foreign currency liquidity and the functioning of cross-border funding markets.

¹⁸ "Central bank operations in response to the financial turmoil", *CGFS Papers*, no 31, July 2008, p 4.

cross-border funding, particularly in US dollars, remained high in part because institutions with longer-term US dollar investments were either unable to sell their assets because of illiquid markets or were unwilling to realise the losses that might ensue from doing so (CGFS (2010) (a)).

In order to facilitate the provision of dollars to foreign banking institutions, the Federal Reserve entered into dollar liquidity swap lines with a number of foreign central banks. The first lines were established in December 2007 with the ECB and the SNB. Swap lines were subsequently established with 12 other central banks.¹⁹ Under the swap lines the foreign central bank would first purchase with its currency dollars from the Federal Reserve at prevailing market exchange rates; the dollars and foreign currencies were then swapped back at that same exchange rate at an agreed date in the future, as far ahead as three months. The foreign central bank paid the Federal Reserve interest, in many cases the interest it earned on its dollar loans or investments; the Federal Reserve maintained its foreign currency reserves at the foreign central bank and did not pay interest.

Shortages of foreign currency liquidity were largest in the US dollar, but also occurred in other currencies, and additional swap networks were set up between central banks during the 2007–09 crisis to relieve them, including a euro network under which the ECB supplied euros, a Swiss franc network and an Asian and Latin American network (see Allen and Moessner (2010)).

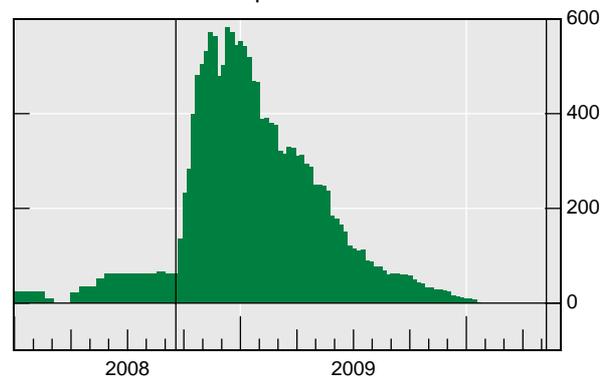
Central bank swap lines and US dollar swap spread

Graph 1

FX swap spread¹



Fed central bank swap lines²



¹ The first vertical line indicates the first expansion of the Fed temporary reciprocal currency arrangements (18 September 2008), the second indicates the reactivation of the Fed swap lines (9 May 2010). Spread between the three-month FX swap-implied dollar rate and the three-month USD Libor; the FX swap-implied rate is the implied cost of raising US dollars via FX swaps using the funding currency.

² Outstanding amounts, in billions of US dollars.

Sources: Central banks; Bloomberg.

Use of the US dollar swap lines peaked in December 2008 at over \$580 billion. In April 2009, the Federal Reserve established foreign currency liquidity swap lines with the BoE, ECB, BoJ and SNB that mirrored the dollar liquidity swap lines. The foreign currency swap lines, which were never used, would have allowed the Federal Reserve to acquire foreign currency to provide to US institutions. The dollar liquidity swap lines and foreign currency liquidity swap lines terminated on 1 February 2010.

¹⁹ The central banks of Australia, Brazil, Canada, Denmark, Japan, Korea, Mexico, New Zealand, Norway, Singapore, Sweden and the United Kingdom.

All loans were repaid in full (Graph 1). In May 2010, in response to the re-emergence of strains in short-term funding markets in Europe, the Federal Reserve reestablished dollar liquidity swap lines with the BoC, BoE, SNB, ECB and BoJ; on 31 October 2013, those lines were converted into standing arrangements that do not require periodic renewal.

3.3 Liquidity provision to specific markets

As the crisis intensified in 2008, and especially in the aftermath of the Lehman default, ELA to individual financial institutions and the banking system as a whole proved insufficient to contain liquidity problems. Central banks in the United States and Europe were confronted with three related developments:

- First, in late 2007 and especially in early 2008, haircuts on lower-quality collateral widened significantly and the range of collateral accepted in private repo transactions shrank (CGFS (2010b)). The combination of a preference for secured funding and greater demand for liquid assets on the one hand and growing reluctance (or even unwillingness) to accept private assets, especially securitised products, on the other, resulted in a substantial collateral scarcity in key repo markets.
- Second, there were liquidity pressures on institutions outside the banking system. A significant part of the intermediation between borrowers and lenders in the United States occurs outside the banking system in what is sometimes referred to as the “shadow banking system”.²⁰
- Third, key markets for securities products became illiquid, curtailing the access of non-bank borrowers to credit. Uncertainty about their underlying value greatly reduced the demand for structured products, including asset- and mortgage backed securities, as well as covered bonds.

Alleviating collateral constraints in private funding markets. Several central banks responded by broadening the range of collateral accepted in central bank operations. This increased banks’ scope for borrowing and, through collateral substitution, released higher-quality collateral for private market transactions. The Federal Reserve and the BoE introduced or increased securities lending programmes.

As noted above, the near failure of Bear Stearns and widespread counterparty credit concerns led to a severe disruption to the market for repurchase agreements, particularly those settled in the tri-party repo market.²¹ At the peak in 2008, there

²⁰ The shadow banking system was estimated by Geithner (2008) to have been comparable in size in early 2007 to the traditional banking system: “In early 2007, asset-backed commercial paper conduits, in structured investment vehicles, in auction-rate preferred securities, tender option bonds and variable rate demand notes, had a combined asset size of roughly \$2.2 trillion. Assets financed overnight in triparty repo grew to \$2.5 trillion. Assets held in hedge funds grew to roughly \$1.8 trillion. The combined balance sheets of the then five major investment banks totaled \$4 trillion. In comparison, the total assets of the top five bank holding companies in the United States at that point were just over \$6 trillion, and total assets of the entire banking system were about \$10 trillion.”

²¹ In the tri-party repo market, borrowers receive short-term, usually overnight, financing for securities by selling them with an agreement to repurchase them. The collateral in the tri-party market is held at a third party.

was about \$2.8 trillion in credit outstanding in the market, and it was a key source of finance for asset-backed securities (ABS) held by investment banks and securities lenders.²² The impairment in the market "...degraded the ability of primary dealers to provide financing to participants in securitization markets."²³ As a result, in March 2008, the Federal Reserve used its emergency authority to lend to non-banks to establish two credit facilities for primary dealers: the **Term Securities Lending Facility** (TSLF) and the **Primary Dealer Credit Facility** (PDCF).

Under the **TSLF**, established on 11 March 2008,²⁴ the Federal Reserve auctioned loans of US Treasury securities to primary dealers. In exchange it accepted other Treasury securities, agency debt, agency mortgage-backed securities (MBS) and non-agency triple-A rated private label MBS. On 14 September 2008, eligible collateral was extended to include all investment grade debt securities.²⁵ At its peak in October 2008, the Federal Reserve lent out over \$230 billion in Treasury securities under the TSLF. The TSLF was closed on 1 February 2010. All securities loans were repaid in full.

The **PDCF** was established on 16 March 2008 to provide further liquidity support to the tri-party repo market and the primary dealers. Under the PDCF, the Federal Reserve extended overnight loans to primary dealers. Initially, the eligible collateral was Treasury, agency and private investment grade debt securities, but on 15 September 2008, in the wake of the Lehman failure, the collateral was extended to include all securities eligible for pledging in the tri-party repo market, which includes some whole loans as well as below-investment-grade or even unrated securities. The credit extended under the PDCF peaked at around \$150 billion at the end of September 2009. The PDCF was closed on 1 February 2010. All loans were repaid in full.

In April 2008, the BoE introduced the **Special Liquidity Scheme**, a facility in which banks could swap temporarily illiquid assets for UK Treasury bills. The asset swaps had terms of one year (renewable to up to three years).

The ECB did not provide a collateral swap arrangement, but **broadened its collateral framework**, accepting a substitution of liquid collateral pledged in ECB operations with temporary illiquid assets, especially ABS. The eligibility of ABS originated by the pledging bank as collateral in Eurosystem refinancing operations supported ABS issuance in the euro area. The annual average share of ABS pledged with the Eurosystem rose from 6% in 2004 to 28% during 2008 (Cheun, Köppen-Mertes and Weller (2009)).

Liquidity provision to "shadow banks". On 16 September 2008, a prominent money market mutual fund (MMMF) announced that it had "broken the buck", that is, it would repay investments at less than dollar-for-dollar, as a result of losses on its holdings of Lehman debt. Over the following four weeks, investors withdrew

²² "Tri-Party Repo Infrastructure Reform Task Force Report", p 3. Appendix II to "Tri-Party Repo Infrastructure Reform, A White Paper Prepared by The Federal Reserve Bank of New York", 17 May 2010.

²³ "Report Pursuant to Section 129 of the Emergency Economic Stabilization Act of 2008: Primary Dealer Credit Facility and Other Credit for Broker-Dealers."

²⁴ "Report Pursuant to Section 129 of the Emergency Economic Stabilization Act of 2008: Term Securities Lending Facility."

²⁵ Press release, Board of Governors of the Federal Reserve System, 14 September 2008.

about \$450 billion in deposits from prime money funds – money funds that invest in high quality private money market instruments as well as government securities – whose assets equalled \$2.2 trillion just prior to the outflows. Prime funds responded by reducing their investments in money market instruments, including commercial paper, and shortening the maturity on the instruments they did buy.

In order to help money market investors meet redemptions and improve liquidity in money markets, the Federal Reserve established three credit facilities: the **Asset-Backed Commercial Paper Money Market Mutual Fund Liquidity Facility** (AMLF), the **Commercial Paper Funding Facility** (CPFF) and the **Money Market Investor Funding Facility** (MMIFF). A fourth facility, the **Direct Money Market Mutual Fund Lending Facility** (DMLF) was authorised but not implemented after the Federal Reserve received reports that money funds would be unwilling to use it.²⁶

The **AMLF** was authorised by the Federal Reserve on 19 September 2008.²⁷ Under the AMLF, the Federal Reserve extended credit to depository institutions, bank holding companies, and branches and agencies of foreign banks to finance their purchases of top-rated asset-backed commercial paper (ABCP) from MMMFs. The facility was intended to help MMMFs holding ABCP finance redemptions by investors. The Federal Reserve provided the funds on a non-recourse basis (that is, the borrower could surrender the collateral in lieu of repayment) and lent the full amortised cost of the ABCP (that is, there was no haircut). Consequently, the Federal Reserve took all the credit risk on the ABCP. The amount lent under the AMLF peaked at over \$150 billion at the beginning of October 2008. The AMLF closed on 1 February 2010. All loans were repaid in full.

On 7 October 2008, the Federal Reserve established the **CPFF**. Under the CPFF, the Federal Reserve lent to a special purpose vehicle (SPV) that in turn purchased top-rated three-month commercial paper directly from eligible issuers. By eliminating the risk that eligible issuers would be unable to roll over their CP, the CPFF was intended to encourage investors to be willing to hold longer-term CP. The SPV purchased ABCP discounted at a rate equal to 300 basis points plus the overnight index swap (OIS) rate, and 100 basis points plus the OIS rate for unsecured CP.²⁸ Unsecured CP issuers also paid a 100 basis point fee. The CP holdings of the CPFF SPV peaked at about \$350 billion in January 2009. The facility was closed on 1 February 2009. All commercial paper and loans to the SPV were repaid in full.

In addition, on 21 October 2008, the Federal Reserve established the **MMIFF**.²⁹ Under the MMIFF, the Federal Reserve would have lent to a series of SPVs to finance 90% of their purchases of certain high-quality certificates of deposit, banknotes and

²⁶ See Minutes of Meeting of Federal Reserve Board, "Financial Markets – Proposal to Provide Liquidity Directly to Money Market Mutual Funds through the Direct Money Market Mutual Fund Lending Facility (103 KB PDF)", 3 October 2008, pp 11–12, and "Bagehot's Dictum in Practice: Formulating and Implementing Policies to Combat the Financial Crisis", speech by Brian Madigan on 21 August 2009, p 7. <http://www.federalreserve.gov/newsevents/speech/madigan20090821a.htm>

²⁷ "Report Pursuant to Section 129 of the Emergency Economic Stabilization Act of 2008: Asset-Backed Commercial Paper Money Market Mutual Fund Liquidity Facility."

²⁸ OIS rates equal approximately the expected federal funds rate.

²⁹ "Report Pursuant to Section 129 of the Emergency Economic Stabilization Act of 2008: Money Market Investor Funding Facility."

CP from eligible money market investors – money market mutual funds or similar. For each dollar of assets purchased, the SPVs would have provided the money funds 90 cents plus a 10 cent claim on the assets of the SPV that was junior to the Federal Reserve's claim. The MMIFF was intended to be a source of liquidity for money funds. The MMIFF was never used, probably because there was no renewal of the severe outflows from money funds. It was closed on 30 October 2009.

Reducing illiquidity premia in credit markets. In the wake of the turmoil caused by the Lehman default and the turmoil in money markets, new issuance of ABS declined sharply in the third quarter of 2008 and virtually ceased in October 2008. The ABS markets historically have funded a substantial share of consumer and small-business loans. Similarly, the commercial mortgage-backed securities (CMBS) market, which had financed approximately 20% of outstanding commercial mortgages, came to a standstill in mid-2008. Continued disruption of these markets could have significantly limited the availability of credit to households and businesses, further weakening US economic activity.

On 25 November 2008, the Federal Reserve and Treasury announced the creation of the **Term Asset-Backed Securities Loan Facility (TALF)** to promote renewed issuance of ABS, thereby increasing the availability of credit to households and small businesses.³⁰ The subsequent inclusion of CMBS as eligible collateral for TALF was intended to help borrowers finance new purchases of commercial properties or refinance existing commercial mortgages on better terms. Under the TALF, the Federal Reserve extended non-recourse loans to investors in certain AAA-rated ABS. The TALF initially accepted newly issued ABS backed by consumer loans and small business loans.

Over time, it was expanded to include certain other classes of ABS backed by business loans and newly issued and legacy CMBS. The TALF loans were collateralised by the securities purchased and were extended in amounts that were less than the value of the securities by haircuts that varied depending on the risk of the collateral. The loans were extended with maturities of three years or five years, on a non-recourse basis, and at interest rates chosen to be above those in more normal conditions. Specifically, the interest rates were mostly set at Libor plus 100 basis points or an equivalent fixed rate, although the spread was reduced to 50 basis points when the collateral benefited from a government guarantee.

The US Treasury Department – under the Troubled Assets Relief Program (TARP) of the Emergency Economic Stabilization Act of 2008 – provided \$20 billion of credit protection to the Federal Reserve in connection with the TALF. The TALF closed on 30 June 2009. When it closed, there was about \$43 billion in TALF loans outstanding. On 19 February 2014, there was \$96 million outstanding and all the securities backing the loans were AAA-rated.

On 6 July 2009 the Eurosystem initiated the covered bond purchase programme (CBPP), under which it intended to purchase eligible covered bonds, with a targeted nominal amount of €60 billion. Liquidity in the covered bond market, which is an important source of funding for European banks, had deteriorated substantially against the backdrop of mounting investor concerns

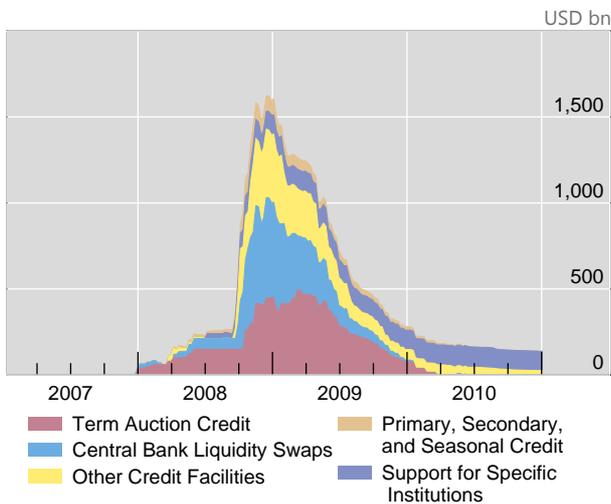
³⁰ "Report Pursuant to Section 129 of the Emergency Economic Stabilization Act of 2008: Term Asset-Backed Securities Loan Facility."

about collateral quality. The covered bond purchase programme was completed by end-June 2010 (Graph 2).

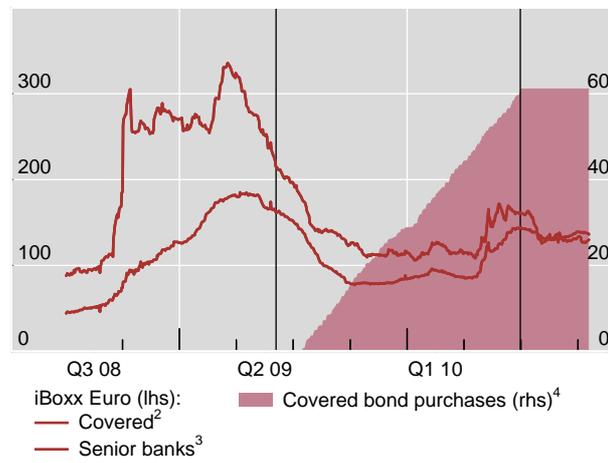
Central bank interventions in credit markets

Graph 2

Federal Reserve lending during the financial crisis



Eurosystem: covered bond purchases¹



¹ The first vertical line indicates the announcement of the programme, the second indicates its termination. ² Spread between the yield on a basket of euro-denominated covered bonds and interest rate swaps with a similar maturity, in basis points. ³ Spread between the yield on a basket of senior unsecured bank bonds and interest rate swaps with a similar maturity, in basis points. ⁴ In billions of euros; settled transactions only.

Sources: Federal Reserve; central banks; Freddie Mac; Bloomberg; Markit.

3.4 Observations and issues raised by ELA during the crisis

During the crisis, the provision of ELA evolved with changing perceptions of the sources and character of systemic risk. Yet in many ways central banks still exercised their lender of last resort function in a manner consistent with the pre-crisis views of the **objectives** of ELA, namely to avoid the costly failure of individual institutions and to limit the risk of contagion (Madigan (2009)). For example, by providing liquidity to help MMMFs meet withdrawals, the Federal Reserve prevented a fire sale of assets that would have driven down asset values further, leading to more money funds “breaking the buck” and yet more investor withdrawals. By providing abundant liquidity, the Federal Reserve was preventing a classic bank run.

Central banks also generally adhered to broad pre-crisis lender of last resort **principles** when providing ELA to individual financial institutions. In most cases, loans were backed by good collateral, were short-term, and were at rates that were a penalty to those that prevailed in normal times although below those that prevailed at the height of the crisis. All loans provided by the Federal Reserve were repaid in full or are expected to be repaid in full. Moreover, the use of many ELA facilities – including the Federal Reserve’s lending facilities and the dollar swaps provided by a number of central banks – declined rapidly as the financial situation normalised.

However, as the turmoil evolved into a systemic liquidity crisis it became increasingly challenging to adhere to Bagehot’s criteria. The value of financial assets became increasingly dependent on the perceived ability of financial institutions to

fund positions. In turn, the funding market access of financial market institutions was impaired by uncertainty about asset values and their solvency.

Distinguishing illiquidity from insolvency. In the course of the crisis it became more difficult, if not impossible, to distinguish between institutions that were illiquid but solvent, and insolvent ones. In part, this reflected the fact that solvency depended on the illiquidity discount of institutions' assets. In particular, an institution's assets might be worth less than its liabilities at fire-sale prices, but it could be viable as a going concern if a liquidity default could be avoided. For example, although AIG had insufficient liquid assets to meet its immediate obligations, the credit extended by the US government and the Federal Reserve (which was backed by substantial but illiquid collateral) allowed the firm to liquidate some of its assets over time, meet its obligations, repay the government loan and return to viability. Similarly, transferring illiquid UBS assets into the Swiss National Bank's SPV prevented fire sales of these assets.

Lending against good collateral. Central banks in some cases lent to systemically critical institutions against sufficient but illiquid and risky assets. In these cases, the benefit of the central bank actions depended, in large part, on limiting the concerns of market participants about the ability of the troubled institution to obtain funding or about the exposure of the institution to future losses on riskier assets. For example, the Bank of England lent HBOS and Royal Bank of Scotland UK Treasury bills against unsecuritised mortgage and loan assets.

In several instances, including the protection provided to Citi and Bank of America, the extension of credit to AIG and the TALF, the Treasury absorbed the lion's share of the credit risk with the Federal Reserve either latently or actually providing most of the funding. This arrangement appropriately put the risk with the fiscal authority and left the Federal Reserve with the virtually riskless obligations that are consistent with traditional central banking principles. Although these arrangements required cooperation between the Federal Reserve, Treasury and other agencies, a joint Department of Treasury – Federal Reserve press release on 23 March 2009 emphasised that the Federal Reserve had sole responsibility for maintaining monetary stability and set monetary policy independently.³¹

Finally, there are questions as to whether, in some cases, direct purchases of illiquid, high-quality securities would have been more effective than collateralised lending to financial institutions.³² For instance, when designing the AMLF, the Federal Reserve extended non-recourse loans to banks without a haircut to finance purchases of ABCP. From the perspective of risk, the transactions were virtually the same as if the Federal Reserve had bought the paper, except that the yield on the ABCP above the primary credit rate was earned by the commercial banks to give them an incentive to participate.

Lending at penalty rates. Lending at a penalty rate may have reduced the effectiveness of ELA in the early stage of the crisis at least in some cases. When providing additional liquidity as a backup, charging above market rates added to stigma at the Federal Reserve's discount window and, as noted above, possibly the

³¹ "The Role of the Federal Reserve in Preserving Financial and Monetary Stability. Joint Statement by the Department of the Treasury and the Federal Reserve", 23 March 2009, <http://www.federalreserve.gov/newsevents/press/monetary/20090323b.htm>.

³² The Federal Reserve does not have the authority to purchase private securities.

Bank of England's Discount Window Facility (see Fisher (2012) for a discussion). Hence, stigma significantly reduced the effectiveness of a principal tool for providing ELA. A discount window-type facility is not beneficial for relieving pressures in financial markets if institutions will go to extraordinary lengths to avoid using it.

Moreover, penalty rates may have been counterproductive when the central bank was providing a source of funding rather than a backup source of liquidity. For example, by providing credit at a market rate to commercial banks through the Term Auction Facility, the Federal Reserve sought to replace term funding that had evaporated, supporting the ability of the banks to provide credit to businesses and households. The ECB introduced a fixed rate full allotment tender procedure from October 2008, which provided eligible euro area financial institutions with unlimited access to central bank liquidity at the ECB's main refinancing rate, subject to adequate collateral (Cour-Thimann and Winkler (2013)).

Constructive ambiguity. At a certain point in the financial crisis, when the system became too fragile to withstand the disruption associated with a major failure, constructive ambiguity was seen as becoming impossible. That was true not only for banks, but also for bank-like institutions. In those circumstances, the list of institutions that were seen as too important to be allowed to fail expanded dramatically. It would probably not have been credible to attempt to limit moral hazard by indicating that there was a possibility that the central bank would withhold ELA that it was legally able to provide and allow a disruptive failure. Against this backdrop, it is questionable whether constructive ambiguity is a viable policy option in the future.

ELA in foreign currency. Lastly, given the international nature of financial institutions and markets, institutions can need ELA in foreign currencies, especially when foreign exchange markets are disrupted. The foreign currency swap lines were an efficient mechanism to provide central banks with the means to extend foreign currency ELA. A particular advantage of the arrangements was that the foreign central bank incurred any credit risk associated with lending to the foreign banking organisation and also made the lending decision.

4. A post-crisis view of ELA

The unprecedented scale and scope of the ELA provided in 2007–09 helped to prevent a collapse of the global financial system. But, as discussed in the previous section, it was not without costs and it presented a number of challenges. First, even though central banks have incurred only limited direct losses from ELA, the ELA lending was in many instances riskier than normal lending. Second, by taking on risk and by widening the range of institutions that received ELA beyond central banks' traditional counterparties, the lending risked increasing moral hazard. In light of the scale and scope of ELA, market participants, particularly those that were not previously seen as covered by the lender-of-last-resort safety net, may now see the odds of benefiting from ELA in the future as higher than before the crisis. Third, in some cases, central banks needed to develop new arrangements to address liquidity needs outside the banking sector in great haste, risking mistakes in execution and posing material communication challenges. Fourth, because the ELA required the central bank to provide liquidity in new ways, it also obliged it to make difficult choices about where to draw boundaries. Fifth, the provision of ELA in many cases

required that the central bank design and execute programmes jointly with the fiscal authority, and develop risk-sharing arrangements with the fiscal authority, arrangements that require careful consideration to ensure continued central bank independence with respect to monetary policy. And sixth, because the frequency and nature of ELA strengthened the view among investors, bank managements and supervisors that borrowing from the central bank was an indication that a financial institution was in trouble, and because of the unpopularity of ELA, the stigma associated with central bank lending worsened significantly.

The costs and challenges, as well as the important role of central banks in responding to the financial crisis, shaped the post-crisis view of financial institution liquidity, central bank lending in general, and ELA in particular.³³ Financial institutions, as well as the supervisors and regulators of financial institutions, have raised their assessments of the amount and quality of capital and liquidity necessary to keep the odds that ELA will be needed in the future acceptably low. Relatedly, the anticipated role of central banks in responding to a financial crisis has changed, with a reduced expectation that they would lend to individual institutions to address idiosyncratic problems, but perhaps an increased expectation that they would address systemic liquidity pressures throughout the financial system. The latter consideration extends to the need to provide liquidity in foreign currencies and also to the need to reduce stigma.

4.1 Self-insurance, regulation and moral hazard

The costs and risks incurred providing ELA during the crisis suggest that the financial system needs to be more resilient if the likelihood of needing ELA in the future is to be significantly reduced. International banks' capital buffers were too slim and of insufficient quality to absorb losses, let alone to reassure market participants of banks' soundness. Several factors arguably contributed to insufficient self-insurance before the crisis, including weaknesses in the assessment and management of liquidity risk by financial institutions; a regulatory framework that did not place sufficient emphasis on the adequacy of capital and liquidity buffers; and a lack of market discipline. The consensus that increased and higher-quality liquidity and capital levels are necessary at financial institutions has been reflected both in the behaviour of the private sector and in the new post-crisis regulatory architecture.

Assessment and management of liquidity risk. The financial crisis has shifted the focus of bank risk management and regulatory authorities to liquidity risk. This shift is evident in the increasing number of papers and guidelines on this topic, and the room devoted to liquidity in financial reports. The increased focus on liquidity risk is also visible in the change in the funding approaches of international banks, which aim at reducing liquidity mismatches and the reliance on unstable wholesale funding (BIS (2014)), and the accumulation of liquid assets well ahead of the introduction of the new liquidity standards

It is, however, an open question to what extent enhancements in liquidity risk measurement and management can take into account the endogenous nature of

³³ Carlson et al (2014) provide additional discussion of how the Federal Reserve's lending during the crisis illustrates why liquidity regulations are necessary despite the existence of a lender of last resort.

liquidity. Market and funding liquidity are dependent on the willingness of market participants to trade and provide funding. Hence, liquidity conditions are inherently fragile. Even conservative liquidity risk management may not fully capture this risk. For instance, the range of securities that can reliably be traded, and posted as collateral, in a systemic crisis may turn out to be much smaller than expected. Moreover, when an institution experiences a liquidity shortfall and pulls back from lending to other institutions, sells assets at fire-sale prices, or even defaults, it imposes costs on other institutions that it does not necessarily internalise. As a consequence, even though the financial crisis experiences have given each financial institution incentives to strengthen its capital and liquidity positions, there are good reasons to suspect that those individual efforts will fall short of the social optimum, pointing to the importance of a tightening of regulations.

Financial regulation. The substantial regulatory reforms that have been put in place since the crisis are likely to have reduced the odds of future crises and associated large-scale ELA. The Basel III capital and liquidity rules require banks to hold more and higher-quality capital (see BCBS (2010), and BCBS (2014) on implementation progress). Moreover, Basel III for the first time establishes a global minimum standard for bank liquidity. The Liquidity Coverage Ratio (LCR) defines minimum requirements in terms of liquid asset holdings, while the Net Stable Funding Ratio (NSFR) aims at containing maturity mismatches on bank balance sheets. More stringent capital standards should reduce the likelihood of bank funding strains because of counterparty risk concerns.

For regulatory measures to effectively reduce the need for ELA, at least two conditions need to be met. First, **liquidity regulation** needs to be designed in a way that encourages prudent liquidity management in tranquil periods and allows the use of liquidity buffers to cushion a liquidity shock. For example, the LCR aims to provide banks with the ability to sustain operations for 30 days by drawing down their buffer stocks of liquid assets rather than resorting to government assistance. In addition, requiring institutions to maintain strong liquidity buffers may also facilitate a wind-down without a need to draw on ELA.

Yet a systemic liquidity shock may require an infusion of liquidity into the financial system. For instance, banks may hoard liquid assets over and above those necessary to satisfy the regulatory requirement for precautionary reasons. And banks may be reluctant to use liquidity buffers and let the LCR drop because of fears of stigma (Stein (2013)). As a consequence, more stringent liquidity regulation can be expected to reduce the need for ELA in response to idiosyncratic events and to make systemic events less likely. But it is not clear to what extent such regulation would, or should be intended to, reduce the need for liquidity injections by central banks if a systemic liquidity crisis were to occur.

Second, the **perimeter of regulation** would have to cover institutions that can be the source of liquidity shocks with system-wide effects. For example, as discussed above and also concluded by Pozsar et al (2010), the Federal Reserve provided a backstop to credit intermediation by the largely unregulated shadow banking system, as well as to traditional banks for their exposure to the shadow banking system, by acting as lender of last resort through its liquidity facilities. The resulting increase in moral hazard may have been considerable because the ELA appeared to extend the safety net to a large new set of largely unregulated institutions.

Fundamental economic forces may contribute to the risk that ELA will be necessary for institutions outside the regulated sector. Households and businesses

have a large and inelastic demand for maturity transformation – eg, for demand deposits and long-term loans. Higher capital and liquidity buffers and limits on maturity mismatches make maturity transformation within the banking system more expensive and create incentives to provide it outside the regulated sector. As a result, financial regulators will need to continuously monitor developments in the financial system to identify where maturity transformation is taking place, consider the implications for liquidity risks in the financial system, and consider policy measures to contain moral hazard.

Moral hazard. The extent to which lender of last resort actions during the crisis have resulted in an increase in moral hazard that has not been checked by subsequent regulatory changes remains an open question. There are arguments on both sides. On the one hand, there is progress in policy initiatives that aim at internalising the effects of excessive risk-taking. Perhaps most importantly, there has been some progress in establishing bank resolution frameworks (Tucker (2014)). Effective bank resolution frameworks would strengthen market discipline and reduce incentives of bank management for risk taking.

On the other hand, it may be challenging to contain moral hazard in certain parts of the financial system. As mentioned before, non-bank entities that benefited from ELA may expect similar support in case of another crisis. Systemically important banks raise another set of issues. As pointed out by Tucker (2009), measures to contain risk-taking by such institutions, for instance a restrictive central bank collateral policy, may face a time consistency problem. This is because of the expectation that the central bank will have to relax these policies in case of a liquidity shock in view of contagion risk. This underlines the need to address the “too big to fail” problem in an effective and credible manner.

4.2 Mechanisms for providing ELA in the future

The review of central bank actions during the financial crisis points to some common principles that appear likely to characterise the design of the mechanisms through which ELA would be provided in the future if needed.

- First, greater resilience of the financial system as well as new mechanisms to resolve a troubled institution at lower cost appear likely to lead to a reduced role for the central bank in providing ELA to individual institutions on a discretionary basis.
- Second, changes in the role of non-bank, possibly unregulated, institutions and markets in providing liquidity may require considerable flexibility in dealing with system-wide liquidity strains. One aspect is to ensure that operating frameworks can deal effectively with interbank market stress. Another aspect concerns the potential need to support a broader range of institutions and markets, including the provision of credit in foreign currencies. Reducing the stigma associated with borrowing from the central bank is necessary for central bank lending to be an effective tool for addressing systemic strains.

The role of the central bank. On balance, post-crisis developments seem likely to reduce the role of the central bank in providing ELA to individual institutions. Stronger liquidity buffers should give authorities more time to assess the systemic implications of denying support and decide on ELA measures (Santos and Suarez (2014)). And the existence of workable bank resolution regimes would clarify the role of ELA when unwinding an institution that turns out to be insolvent. Indeed, in

the United States the FDIC now has the authority to resolve a failing systemically important institution in an orderly way and, with the approval of the Secretary of the Treasury, provide it with ELA if necessary.

However, the situation may be different in case of a systemic liquidity shock. In this case, the traditional arguments for the central bank acting as lender of last resort may be particularly important – it can create virtually unlimited funds instantaneously, while liquidity failures at systemically critical institutions can materialise in days or even hours.³⁴ This, in turn, may require closer cooperation between supervisory authorities and the central bank, especially for systemically important institutions, collective oversight arrangements or a reallocation of supervisory powers. In the United States, for instance, all non-bank financial companies that are determined by the new Financial Stability Oversight Council to be systemically significant are subject to consolidated supervision by the Federal Reserve.

Systemic liquidity stress. Central banks should be equipped to deal with a systemic liquidity crisis that requires the provision of ELA to markets. In terms of operational capabilities the crisis has demonstrated that operational frameworks can be adjusted quickly when needed. However, it might be useful for central banks to retain, and strengthen, measures that can mitigate immediate stress in interbank markets arising from a systemic liquidity shock (Domanski (2010)). These include (i) **standing lending facilities that are free of stigma**, (ii) a **regular provision of term funding**, and (iii) **a wider range of collateral in certain operations** that are likely to be of particular importance in stress situations, eg term funding operations.³⁵

ELA may also be needed to replace other malfunctioning markets. The provision of ELA to markets required central banks to expand their counterparties and the collateral they accept. All interventions entail boundaries, and it is critical that the boundaries are determined by principles, minimising credit allocation. For instance, since there are hundreds of different kinds of ABS, the TALF accepted the major categories but not some smaller types of ABS. Similarly, the TALF accepted legacy and new-issue CMBS, but not legacy or new-issue RMBS. The choice was governed by an objective of providing support for the market for ABS broadly, but also by what could safely and expediently be taken as collateral.³⁶

There also does not appear to be any reason apart from legal restrictions why the extension of credit should only be in the form of a loan. Purchasing a low-risk short-term security, as is done by many central banks, would appear to be an

³⁴ Legislation in the United States has moved in the direction of restricting the Federal Reserve's power to provide ELA to individual financial institutions in future. The recent amendment to Federal Reserve Act 13.3, enacted in 2010, prohibits the Fed from providing ELA to individual institutions. The 2010 amendment stipulates that "Such policies and procedures shall be designed to ensure that any emergency lending program or facility is for the purpose of providing liquidity to the financial system, and not to aid a failing financial company, and that the security for emergency loans is sufficient to protect taxpayers from losses and that any such program is terminated in a timely and orderly fashion." This amendment will prevent the Fed from acting as lender of last resort to individual non-depository institutions in a future crisis. It also requires the Fed to have prior approval of the Secretary of the Treasury for ELA under Federal Reserve Act 13(3).

³⁵ See Tucker (2009).

³⁶ Joint Press Release, Board of Governors of the Federal Reserve System and Department of Treasury, 3 March 2009.

equivalent and at times superior approach. These arrangements continue to be well-suited for lender of last resort credit provided by a central bank as a backup source of credit to sound institutions. Since such credit is typically provided either to support monetary policy operations or to meet late-in-the-day transitory funding needs, it can only be provided by the central bank because only central bank lending creates reserve balances and, as the operator of the payment system, the central bank is the payment platform that is last to close.

ELA need not be limited to loans extended with recourse to the borrower. One advantage of recourse lending is that repayment comes first from the financial resources of the borrower. If the recourse loan is collateralised, the collateral offers a secondary source of repayment. However, ELA may require lending to new counterparties whose financial condition cannot be readily assessed or in situations where it might be counterproductive for the central bank to expose the borrowers to the risk that the collateral would decline in value. Providing non-recourse loans in such circumstances may be economically nearly the same as purchasing the underlying collateral, and such purchases may at times be the superior option.

ELA in foreign currencies. As with the need for ELA in domestic currency, the best option would be to prevent international liquidity problems from occurring in the first place. This could be achieved in various ways, including (i) via capital and liquidity regulation, which is being tightened following the crisis, and which is likely to lead to reduced currency or maturity mismatches; and (ii) further strengthening foreign exchange market infrastructure (see CGFS (2010a) for a detailed discussion).³⁷ However, prevention may not be fully effective, so it is also important to consider how international liquidity could be provided in a future crisis (see Moessner and Allen (2010a)).

The extension of US dollar central bank swap lines across a wider number of time zones in the aftermath of the Lehman bankruptcy was arguably a potent and appropriate remedy for the acute, global-scale US dollar shortage at the time. In some jurisdictions, merely the announcement of having established a swap arrangement with the Federal Reserve as backstop was apparently sufficient to bolster confidence among market participants, making it unnecessary to draw on the swap line (eg in Brazil and Singapore).³⁸

Central bank swap or repo lines are one obvious candidate solution for systemic liquidity problems such as the global US dollar liquidity shortage observed in the recent crisis. For less systemic problems, however, it is less obvious that such arrangements would be part of the solution. There are different views as to how desirable it is for central banks to establish, ex ante, scenarios that might warrant such arrangements. While there may be value in having guiding principles for the use of such facilities that are generally understood among central banks, it is also important that inter-central bank arrangements should be kept flexible, allowing sufficient room to use discretion to respond to different situations. Recent

³⁷ See for example the new liquidity standards by the Basel Committee on Banking Supervision, self-sufficiency rules for liquidity purposes in the new liquidity regime of the UK Financial Services Authority, and proposed limits to banks' exposures in the European Commission's capital requirement directive (BCBS (2009, 2010), FSA (2009), European Commission (2008)).

³⁸ In some other countries (eg Canada), the swap lines were not drawn because US dollar liquidity shortages and the FX swap market disruptions were not as serious as elsewhere.

experience shows that when circumstances warrant, the swap arrangements can be put in place quickly and on a scale commensurate with the circumstances.

Stigma. Central bank lending can only be a useful tool for addressing systemic liquidity strains if financial institutions are willing to borrow from the central bank. Stigma is a serious impediment to such borrowing, and it is extremely difficult to reduce. During a financial crisis, almost by definition there are widespread doubts about counterparty liquidity and creditworthiness. As long as tapping central bank credit is seen as potentially signalling weakness, stigma will persist and will probably be severe in a crisis. The perception that borrowing will signal weakness does not need to be based on reality to cause stigma. If bank managements, investors and supervisors see the use of central bank liquidity as a signal that something is wrong, banks will avoid borrowing at the central bank. Indeed, given the use of central bank liquidity to fund weak institutions during the financial crisis, stigma may probably be worse going forward in the absence of additional steps to reduce it. Moreover, in the United States, the Federal Reserve is now required to disclose, albeit with a considerable lag, the identities of borrowers.³⁹

There are different ways that stigma can potentially be reduced. Borrowing from central banks can be made more regular and familiar to institutions – the Eurosystem largely avoided stigma during the crisis in part because borrowing is seen as unremarkable. The association between borrowing and historical instances of liquidity support can be weakened. And borrowing can be made less likely to be seen as an indication of weakness, for instance by lending against a narrower set of collateral.⁴⁰

³⁹ Loans to depository institutions will be disclosed after a two-year lag; loans to non-depository institutions extended through credit facilities established the Federal Reserve's 13(3) emergency lending authority will be disclosed one year after the credit facility is closed.

⁴⁰ See Tucker (2009) for a discussion of possible approaches towards dealing with stigma.

Annex 1: liquidity support to individual institutions, 2007–09

September 2007 – August 2008

On Friday 14 September 2007, the Bank of England established a liquidity support facility for **Northern Rock** that provided collateralised loans at a penalty interest rate. The decision to provide a liquidity support facility to Northern Rock reflected the difficulties the institution had accessing longer-term funding and the mortgage securitisation market, on which it was particularly reliant.⁴¹ The Treasury Committee characterised Northern Rock's problems as follows: "The high-risk, reckless business strategy of Northern Rock, with its reliance on short- and medium-term wholesale funding and an absence of sufficient insurance and a failure to arrange standby facility or cover that risk, meant that it was unable to cope with the liquidity pressures placed upon it by the freezing of international capital markets in August 2007" (House of Commons Treasury Committee (2008)).

The Governor of the Bank of England characterised Northern Rock's problems as follows: "It was the business strategy that was fatally flawed in this episode where, once those markets had closed in mortgage backed securities, they were absolutely unable to finance their wholly illiquid assets" (House of Commons Treasury Committee (2008)). He noted Northern Rock's insufficient liquidity insurance, and concluded that: "So when it came to the Bank of England for support, it was important that liquidity was not provided free" (House of Commons Treasury Committee (2008), King (2007)). The announcement of the liquidity facility stated that "This liquidity facility will be available to help Northern Rock to fund its operations during the current period of turbulence in financial markets while Northern Rock works to secure an orderly resolution to its current liquidity problems ... The FSA judges that Northern Rock is solvent, exceeds its regulatory capital requirement and has a good quality loan book" (Bank of England (2007a)). The Tripartite authorities, comprising the Bank of England, HM Treasury and the Financial Services Authority, viewed Northern Rock as posing a systemic risk (House of Commons Treasury Committee (2008)).

On October 9 2007, the Bank of England announced that it would make available additional liquidity support to Northern Rock (Bank of England (2007b)), and further information was given by the Treasury, which provided an indemnity to the Bank of England, on 11 October (HM Treasury (2007)). This support, without a specific borrowing limit and secured against all assets of Northern Rock, was provided to enable the firm to pursue a full range of restructuring options. The Northern Rock case was the first time for many years that the Bank of England had undertaken a lender of last resort operation for a major bank.

On Thursday March 13 2008, **Bear Stearns** informed the Federal Reserve that it was going to be unable to repay its repurchase agreements and other obligations coming due on the following day. At that time, Bear Stearns was one of the largest securities firms in the United States, and its default would have severely disrupted financial markets, particularly the critical market for repurchase agreements. On Friday March 14 2008, the Federal Reserve lent \$12.9 billion to Bear Stearns against

⁴¹ See "The run on the Rock", House of Commons Treasury Committee, 24 January 2008.

\$13.8 billion in collateral.⁴² The loan was extended at the then prevailing primary credit rate (the rate at which the Federal Reserve lends to financially sound banks, often called the discount rate) of 2.25%. The loan was provided to avoid a default by Bear Stearns on that day and provide time for a more permanent solution to the institution's difficulties. On Sunday March 16, the Federal Reserve extended \$29 billion against \$30 billion in collateral, again at the primary credit rate of interest, to facilitate the acquisition of Bear Stearns by JPMorgan Chase.⁴³ The loans to Bear Stearns were the first time the Federal Reserve had used its authority to lend to non-banks since the 1930s.^{44, 45, 46}

September 2008 – March 2009

On 16 September 2008, the Federal Reserve provided **American International Group** (AIG) with an \$85 billion line of credit secured by all the assets of AIG and its primary non-regulated subsidiaries. The firm was unable to raise funds to post collateral to cover exposures related to declines in the prices of mortgage-related assets, and also faced an imminent downgrade in its credit rating that would have resulted in additional collateral calls on the institution.⁴⁷ The loan was extended at Libor plus 850 basis points. On 10 November, "... in order to keep the company strong and facilitate its ability to complete its restructuring successfully, ..." the Federal Reserve restructured the loan, including by lowering the interest rate to Libor plus 300 basis points.⁴⁸ AIG was a large insurance company and diversified financial services company with assets as of 20 June 2008 of over \$1 trillion. The Federal Reserve determined that the failure of AIG only days after the failure of Lehman Brothers would have severely disrupted financial markets and "materially weakened economic performance".⁴⁹ The Federal Reserve was specifically concerned about the risk of contagion from an AIG failure. As described by Chairman Ben Bernanke in testimony before Congress on AIG:

⁴² See "Report pursuant to Section 129 of the Emergency Economic Stabilization Act of 2008: Bridge Loan to the Bear Stearns Companies Inc. through JPMorgan Chase Bank, N.A."

⁴³ See "Report pursuant to Section 129 of the Emergency Economic Stabilization Act of 2008: Loan to facilitate the acquisition of the Bear Stearns Companies Inc. by JPMorgan Chase & Co."

⁴⁴ That authority is authorised under Section 13(3) of the Federal Reserve Act, and such lending is therefore sometimes called 13(3) lending.

⁴⁵ Although the Term Securities Loan Facility (discussed below) was authorised on 11 March 2008, it was first used on 27 March, after the loan to Bear Stearns.

⁴⁶ On 30 June 2010, \$29 billion was outstanding on the loans extended to facilitate the acquisition of Bear Stearns by JPMorgan Chase and the collateral backing the loan had a fair value of \$29 billion. Most of the collateral was Federal agency-guaranteed MBS, but over 8% of the securities were rated below investment grade ("Federal Reserve System Monthly Report on Credit and Liquidity Programs and the Balance Sheet" (June 2009)). On 14 June 2012, the Federal Reserve Bank of New York announced that the loan had been repaid in full with interest.

⁴⁷ "Report pursuant to Section 129 of the Emergency Economic Stabilization Act of 2008: Secured Credit Facility Authorized for American International Group, Inc. on September 16, 2008", p 2.

⁴⁸ "Report pursuant to Section 129 of the Emergency Economic Stabilization Act of 2008: Restructuring the Government's Financial Support to the American International Group, Inc. on November 10, 2008", pp 4 and 6.

⁴⁹ "Report pursuant to Section 129 of the Emergency Economic Stabilization Act of 2008: Securities Borrowing Facility for the American International Group, Inc. on October 6, 2008," p 2.

Moreover, as the Lehman case clearly demonstrates, focusing on the direct effects of a default on AIG's counterparties understates the risks to the financial system as a whole. Once begun, a financial crisis can spread unpredictably. For example, Lehman's default on its commercial paper caused a prominent money market mutual fund to "break the buck" and suspend withdrawals, which in turn ignited a general run on prime money market mutual funds, with resulting severe stresses in the commercial paper market. As I mentioned, AIG had about \$20 billion in commercial paper outstanding, so its failure would have exacerbated the problems of the money market mutual funds. Another worrisome possibility was that uncertainties about the safety of insurance products could have led to a run on the broader insurance industry by policyholders and creditors. Moreover, it was well known in the market that many major financial institutions had large exposures to AIG. Its failure would likely have led financial market participants to pull back even more from commercial and investment banks, and those institutions perceived as weaker would have faced escalating pressure.⁵⁰

The credit extension to AIG was restructured several times. On 31 March 2010, \$15.3 billion of the credit was outstanding to an SPV – Maiden Lane II LLC – backed by assets worth \$16.2 billion. The assets were primarily private (non-agency) MBS rated below investment grade. In addition, \$17.3 billion was outstanding to another SPV – Maiden Lane III – secured by a range of ABS worth \$23.7 billion. Virtually all of those securities – 97% – were rated BB+ or lower. The loans to Maiden Lane II and Maiden Lane III were repaid in full with interest on 1 March 2012 and 14 June 2012, respectively.

HBOS and **Royal Bank of Scotland** (RBS) received ELA by the Bank of England on a large scale at the height of the financial crisis, with an intraday peak of £61.5 billion (Plenderleith (2012)). Plenderleith (2012) describes the Bank of England's ELA as follows: "HBOS first received ELA on 1 October 2008 and at peak on 13 November had drawn £25.4 billion. HBOS made final repayment of the facility on 16 January 2009; RBS first received ELA on 7 October 2008, initially in dollars, but subsequently from 10 October also in sterling. Its use of the dollar facility peaked at \$25 billion on 10 October, and of the sterling facility at £29.4 billion on 27 October. RBS made final repayment of ELA on 16 December 2008. ... The sterling ELA took the form of collateral swaps, under which the Bank lent the two banks UK Treasury bills (T-bills) against unsecuritised mortgage and loan assets. The structure was similar in form to the Special Liquidity Scheme (SLS), under which the Bank had been providing liquidity against an extended range of collateral on a market-wide basis since April 2008. The Bank charged a fee of 200 basis points on amounts drawn. The Bank received an indemnity from HM Treasury (HMT) for any additional amounts drawn after 13 October. Before that indemnity was put in place, the full £51.1 billion of the Bank's exposure at that date was not indemnified. Even after the indemnity was in place, the Bank remained unindemnified for £50.9 billion of its peak intraday exposure of £61.5 billion on 17 October. The ELA operation was conducted covertly; it was publicly disclosed on 24 November 2009, just over a year after it was initiated."

⁵⁰ Testimony of Chairman Ben Bernanke on American International Group before the Committee on Financial Services, US House of Representatives, 24 March 2009.

On 16 October 2008, the Swiss National Bank (SNB) announced that it would finance the transfer of illiquid assets of UBS to an SPV. UBS, one of the two largest Swiss banks, had announced record losses running into billions of Swiss francs, largely attributable to the poor performance of its trading business. In addition, the market's confidence in the big banks had been seriously eroded. After the collapse of Lehman Brothers, confidence weakened even further. As a result, prices for credit default swaps (CDS) increased sharply, share prices plummeted, ratings were downgraded and the big banks' liquidity situation deteriorated (SNB (2009)). The SNB Stabilisation Fund was set up to acquire illiquid assets from UBS up to a maximum amount of \$60 billion. The SPV was financed with a maximum of \$6 billion equity provided by UBS (taking the first loss position) and a secured long-term loan in an amount not exceeding \$54 billion. The SPV paid interest at one-month Libor plus 250 basis points.⁵¹

On 23 November 2008, the Federal Reserve joined the US Treasury and the Federal Deposit Insurance Corporation (FDIC) in providing **Citigroup** with protection against declines in value on a \$306 billion pool of primarily mortgage-related assets.⁵² Under the agreement, Citigroup absorbed any initial losses, followed by the Treasury and then the FDIC. If losses exceeded \$44 billion, the Federal Reserve would have provided to Citi a non-recourse loan backed by the remaining assets. If the losses continued, Citi could elect to surrender the collateral rather than repay the loan, subject to a 10% loss-sharing agreement.

On 15 January 2009, the Federal Reserve, Treasury and FDIC provided similar protection for **Bank of America** on a \$118 billion pool of loans, mortgage-related securities, corporate debt and derivatives. The pool was made up primarily of assets recently acquired by Bank of America in its acquisition of Merrill Lynch. Bank of America had posted material losses on the assets in the fourth quarter of 2008, which had hampered its ability to obtain funding. Further losses "... could have resulted in other financial institutions experiencing similar funding problems, posed risks to financial stability, and increased downside risks to economic growth".⁵³ If losses on the pool had exceeded \$18 billion, the Federal Reserve would have extended to Bank of America a non-recourse loan collateralised by the remaining assets, with the bank obliged to cover 10% of any additional losses.

Neither the Citigroup nor the Bank of America wraps were used, and the institutions paid exit fees to terminate the agreements.

In addition to providing credit to individual non-banking institutions under its emergency lending authority, the Federal Reserve System also provided ELA through the discount window to individual depository institutions that were experiencing financial difficulties. Institutions that are not financially sound do not qualify for the primary credit facility, but may be provided with secondary credit

⁵¹ Subsequently, the amount of UBS assets transferred to the SNB Stabilisation Fund was reduced to \$39.1 billion. Greater scope for transferring securitised assets to the banking book, which avoided valuation losses from reporting assets at market prices, allowed UBS to retain part of the assets on its own balance sheet (SNB (2009)).

⁵² "Report Pursuant to Section 129 of the Emergency Economic Stabilization Act of 2008: Authorization to Provide Residual Financing to Citigroup, Inc. For a Designated Asset Pool."

⁵³ "Report Pursuant to Section 129 of the Emergency Economic Stabilization Act of 2008: Authorization to Provide Residual Financing to Bank of America Corporation Relating to a Designated Asset Pool", p 3.

loans. Secondary credit loans are available as a bridge to market sources of funds or to facilitate an orderly resolution. The Federal Reserve is subject to legal restrictions on its lending to undercapitalised institutions. While such lending is not prohibited, lending beyond certain time periods – in particular, lending to a critically undercapitalised bank beyond five days – is subject to heightened Congressional scrutiny and subjects the Board to part of any resulting increase in resolution costs. Secondary credit outstanding, which is usually zero, peaked at \$985 million on 27 January 2010 (weekly average). The Federal Reserve has not in the past released information about the details on individual discount window borrowings by depository institutions, in part out of concerns that such information increases stigma. However, as required by the Dodd-Frank Act, the Federal Reserve is now publishing with a two-year lag details about all discount window loans including both primary and secondary credit loans made after the law was passed on 21 July 2010.⁵⁴

⁵⁴ Moreover, on 31 March 2011, in response to a request filed under the Freedom of Information Act, the Federal Reserve released additional information on normal discount window borrowing during the financial crisis.

References

Allen, W and R Moessner (2010): "Central bank co-operation and international liquidity in the financial crisis of 2008–9", *BIS Working Papers*, no 310, May.

Bagehot, W (1873): *Lombard Street: A Description of the Money Market*, London, H S King.

Bank for International Settlements (1974): Communiqué issued by Central Bank Governors of the Group of Ten and Switzerland, 9 September.

——— (1997): *Real-time gross settlement systems: a report prepared by the Committee on Payment and Settlement Systems of the Central Banks of the G10 Countries*, Basel.

——— (2014): *84th Annual Report*, Basel.

Bank of England (2007a): "Liquidity Support Facility for Northern Rock plc", news release, 14 September.

——— (2007b): "Northern Rock plc deposits", news release, 9 October.

Basel Committee on Banking Supervision (2009): "International framework for liquidity risk measurement, standards and monitoring", consultative document.

——— (2010): "Group of Governors and Heads of Supervision announces higher global minimum capital standards", press release, 12 September.

——— (2014): "Results of the Basel III monitoring exercise as of 30 June 2013", 6 March.

Bordo, M (1990): "The lender of last resort: alternative views and historical experience", *Federal Reserve Bank of Richmond Economic Review*, Jan/Feb, pp 18–29.

Borio, C. and W. Nelson (2008), "Monetary operations and the financial turmoil", *BIS Quarterly review*, March, pp 31–46.

Carlson, M (2007): "A brief history of the 1987 stock market crash with a discussion of the Federal Reserve response", *Federal Reserve Board Finance and Economics Discussion Series*, no 2007–13.

Carlson, M, B Duygan-Bump and W Nelson (2014): "Why do we need liquidity regulations when we have a central bank?", mimeograph.

Cheun, S., I. Köppen-Mertes and B. Weller (2009): "The collateral frameworks of the Eurosystem, the Federal Reserve system and the Bank of England and the financial market turmoil", *ECB Occasional Paper* no 107.

Committee on the Global Financial System (2010a): "The functioning and resilience of cross-border funding markets", *CGFS Papers*, no 37, March.

——— (2010b): "The role of margin requirements and haircuts in procyclicality", *CGFS Papers*, no 36, March.

Corrigan, E (1990): "Statement before U.S. Senate Committee on Banking, Housing and Urban Affairs", Washington DC.

Cour-Thimann, P and B Winkler (2013): "The ECB's non-standard monetary policy measures – the role of institutional factors and financial structure", *ECB Working Paper* no 1528.

Crockett, A (1996): "The theory and practice of financial stability", *De Economist*, vol 144(4), pp 531–68.

Domanski, D (2010): "Exit from unconventional monetary policy measures and the future of central bank operational frameworks", Austrian National Bank Economic Conference, pp 72–83

European Central Bank (2008), "Supplementary six-month longer-term refinancing operations and continuation of the supplementary three-month longer-term refinancing operations", Press release, 28 March.

European Commission (2008): "Proposal for a directive of the European Parliament and of the Council amending directives 2006/48/EC and 2006/49/EC as regards banks affiliated to central institutions, certain own funds items, large exposures, supervisory arrangements, and crisis management".

Financial Services Authority (2009): "Strengthening liquidity standards", Policy Statement 09/16, October.

Fisher, P (2012): "Liquidity support from the Bank of England – the Discount Window Facility", speech at the National Asset-Liability Management global conference, London, 29 March.

Freixas, X, C Giannini, G Hoggarth and F Soussa (1999): "Lender of last resort: a review of the literature", *Bank of England Financial Stability Review*, November, pp 151–67.

Garcia, G and E Plautz (1988): *The Federal Reserve: Lender of Last Resort*, Ballinger, Cambridge, MA.

Geithner, T (2008): "Reducing systemic risk in a dynamic financial system", remarks at the Economic Club of New York, New York City, 9 June.

Goodfriend, M and R King (1988): "Financial deregulation, monetary policy and central banking", *Federal Reserve Bank of Richmond Economic Review*, vol 74, no 3.

Goodhart, C and D Schoenmaker (1995), "Should the Functions of Monetary Policy and Banking Supervision be Separated?", *Oxford Economic Papers*, vol 47, pp 539–60.

Greenspan, A (1988): "Statement and comments of Alan Greenspan, Chairman of the Federal Reserve", in "'Black Monday', The Stock Market Crash of October 19, 1987," U.S. Congress Senate Committee on Banking, Housing, and Urban Affairs Hearing, 100 Congress 1 Session, Washington: Government Printing Office.

HM Treasury (2007): Press notice 107/07, 11 October.

House of Commons Treasury Committee (2008): "The run on the Rock", Fifth Report of Session 2007–08, Volume 1.

King, M (2007): Speech at the Northern Ireland Chamber of Commerce and Industry, Belfast, 9 October.

Madigan, B (2009): "Bagehot's dictum in practice: formulating and implementing policies to combat a financial crisis", speech at the Federal Reserve Bank of Kansas City's Annual Economic Symposium, Jackson Hole, Wyoming, 21 August.

McGuire, P and G von Peter (2009): "The US dollar shortage in global banking", *BIS Quarterly Review*, March.

Moessner, R and W Allen (2010a): "Options for meeting the demand for international liquidity during financial crises", *BIS Quarterly Review*, September.

- Moessner, R and W Allen (2010b): "Banking crises and the international monetary system in the Great Depression and now", BIS Working Paper no 333.
- Plenderleith, I (2012): "Review of the Bank of England's provision of emergency liquidity assistance in 2008–09", Report presented to the Court of the Bank of England, October.
- Pozsar, Z, T Adrian, A Ashcraft and H Boesky (2010): "Shadow banking", *Federal Reserve Bank of New York Staff Reports*, no 458.
- Santos, J A C and J Suarez (2014): "The role of liquidity standards in optimal lending of last resort policies", available at SSRN: <http://ssrn.com/abstract=2375735>.
- Schwartz, A (1992): "The misuse of the Fed's discount window", *Federal Reserve Bank of St. Louis Review*, September/October, pp 58–69.
- (1995): "Systemic risk and the macroeconomy", in G Kaufman (ed), *Banking Financial Markets and Systemic Risk: Research in Financial Services, Private and Public Policy*, vol 7, JAI Press Inc., Hampton, pp 19–30.
- Stein, J C (2013): "Liquidity regulation and central banking", remarks at the 2013 Credit Markets Symposium.
- Stella, P. (1997), "Do central banks need capital?", IMF Working Paper no WP/97/83.
- Swiss National Bank (2009), Financial Stability Report
- 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.
- (2014): "Regulatory reform, stability, and central banking", Brookings Hutchins Center on Fiscal and Monetary Policy Working Paper.

Lessons from lender of last resort actions during the crisis: the Federal Reserve experience

William Nelson¹

Thank you for this opportunity to address this workshop on rethinking the central bank's role as a lender of last resort. During the financial crisis we accumulated a vast amount of experience as a lender of last resort, and it is important to now take time to reflect on and discuss what we learned. Today I'll start by briefly reviewing the specifics of the Federal Reserve's authority to act as lender of last resort and its actions during the crisis and then I will discuss the lessons that I drew from our experience. Importantly, these are my perspectives on what we learned and do not necessarily reflect the views of the officials or staff of the Federal Reserve. My remarks draw in part on my paper with Dietrich Domanski and Richhild Moessner that was distributed as a background document for the meeting.²

I'll assume that we share a common view of what happened in the crisis and a common knowledge of how the Federal Reserve responded. My premise for these remarks, and my personal assessment, is that the Federal Reserve's lending during the crisis was necessary, effective and acceptably safe. The conclusion that the lending was acceptably safe is based in part on the observation that, despite making thousands of loans during a financial crisis that developed in several phases, each worse than the preceding phase, all Federal Reserve loans were repaid on time with interest. When preparing my remarks, I thought about whether, with hindsight, I would have had the Federal Reserve do anything differently. While a complete answer would more than take up my time, the short answer is "no, not really."

Background

The Federal Reserve's actions as a lender of last resort during the crisis were based on three different authorities. First, the Federal Reserve can buy, either outright or in a repurchase agreement, Treasury and Agency securities and foreign exchange. Using this authority, the FOMC conducts normal monetary policy transactions. Second, the Federal Reserve has the authority to lend to depository institutions (DIs), including commercial banks, against sufficient collateral. Using this authority, the Federal Reserve provides discount window loans through a standing facility in normal and crisis times against a very broad range of collateral including loans and securities. Lastly, in an emergency, the Federal Reserve has the authority to lend to anyone, not just DIs, against sufficient collateral, although it had not used its emergency authority since the 1930s. After the crisis, the Dodd-Frank Act required

¹ The views expressed are my own and not necessarily those of the officials or staff of the Board of Governors of the Federal Reserve System.

Deputy Director, Division of Monetary Affairs, Board of Governors of the Federal Reserve System.

² D Domanski, R Moessner and W Nelson, "Central banks as lender of last resort: experiences during the 2007–10 crisis and lessons for the future", in this volume.

that the Federal Reserve only provide emergency loans through broad-based facilities and never to help an individual troubled firm. It is also important to note that there are legal limits on the ability of banks to lend to affiliates within their holding company, so that the Federal Reserve cannot, for example, lend to a broker-dealer subsidiary of a bank holding company indirectly by providing a loan to the bank subsidiary.

Using these legal authorities, Federal Reserve lending during the crisis proceeded in five phases. Beginning in August 2007, the Federal Reserve executed a traditional LOLR response to a crisis and eased the terms at the discount window, its standing loan facility. Beginning in December 2007, the Federal Reserve took expanded action using its non-emergency authority by auctioning discount window credit and establishing currency swap lines with other central banks. In March 2008, the Federal Reserve used its emergency authority for the first time since the Great Depression, providing loans to facilitate the acquisition of Bear Stearns and establishing a standing loan facility and a securities swap facility for broker-dealers to backstop the triparty repo market. In September 2008, when Lehman failed, the Federal Reserve provided loans to support individual troubled firms and to provide liquidity support to money markets and the shadow banking system. And in the final phase, the facilities were closed as financial markets normalised and the loans were repaid.

Lesson 1: LOLR is unpopular

The first lesson I've taken from the Federal Reserve experience during the crisis is that lender of last resort actions are deeply unpopular. Regardless of the net social benefit, shielding banks from the consequences of their actions is unfair, especially at a time of widespread suffering caused in part by the banks' actions. In addition, lending to new counterparties in novel ways inevitably involves drawing lines, so there is always an element of credit allocation, of picking winners and losers. Lastly, the public does not like an independent agency making consequential spending decisions and expects, at a minimum, extensive oversight.

The consequences of the LOLR's unpopularity are not just that the central bank becomes disliked. The public backlash puts at risk central bank independence and effectiveness. For example, the backlash resulted in new disclosure requirements for all the loans made by the Federal Reserve, which conflicts with the need to mitigate the stigma associated with borrowing from the discount window. Risk-sharing arrangements with fiscal authority addressed some of the concerns around the Federal Reserve making credit allocation decisions and taking credit risk, and it expanded the range of lending options that were available. But working on lending facilities jointly with Treasury changed the nature of the relationship between the central bank and the fiscal authority, which also put at risk central bank independence.

Lesson 2: The LOLR cannot solve everything

The second lesson is that there are a number of problems that cannot be solved by the central bank providing lender of last resort support. First, although the classic

problem to be solved by a LOLR lending is a bank run, lending against collateral may not be able to halt a run when concerns about the riskiness of the bank's assets are the reason the investors are withdrawing funds. The LOLR lending concentrates the risk on the remaining investors, potentially accelerating the run. Such concerns put significant limits on the Federal Reserve's ability to halt or even slow a run on money market mutual funds without taking on risk. Second, because of the stigma associated with borrowing from the Federal Reserve, banks do not view the discount window to be a viable backstop source of funding. As a result, easing terms on primary credit at the outset of the crisis did not lead banks to become more willing to make term interbank loans. Moreover, the stigma makes the banks more reluctant to act as intermediaries to provide liquidity to counterparties of the banks, which was needed at times during the crisis. As a result of these limitations, responding effectively to the financial crisis required the involvement of the entire government – the Treasury's guarantee of money funds, the stress tests and capital injections in the banks, and the FDIC's guarantees of all bank liabilities.

Lesson 3: Mixed implications for who should normally have access to the discount window

In the United States, depository institutions have regular access to the discount window while other bank-like entities, including broker-dealers and money funds, do not. Access to the discount window was extended beyond Federal Reserve member banks to all depository institutions as part of the Monetary Control Act of 1980, when reserve requirements were extended to that broader set of institutions. With reserve requirements now less onerous given the payment of interest on reserves, it is unclear why DIs should have access to the discount window while other regulated bank-like entities do not. Similarly, experiences during the crisis provide no clear evidence on the appropriate set of institutions to have regular access.

Some of those experiences suggest that the current framework, in which only depository institutions have regular access, is reasonable. The narrower framework required the Federal Reserve to design a number of different mechanisms to get credit to different sectors of the financial system using our emergency authority, but creating those bespoke mechanisms worked fairly well. Moreover, markets generally reacted favourably when new facilities were created. And one advantage of a narrower framework is that it maintains constructive ambiguity and helps limit, at least to some extent, the moral hazard associated with providing regular access to a wider set of counterparties.

Other experiences suggest a wider set of counterparties might be desirable. First, the unpopularity of the Federal Reserve's LOLR lending appeared to be initially associated with new types of lending, particularly lending to support individual institutions, and only then broadened out to all lending. And second, while the perfect repayment experience during the crisis loans owes importantly to the conservatism and quality of the lending facilities, I suspect it also owes something to luck. It took several years to design the normal lending framework, which is fairly simple. During the crisis, we designed complex lending frameworks in a few months, and designing things so quickly runs the risk of making mistakes. If we had lost money on our lending, or even just if some of the loans had defaulted, the ongoing

public discussion would be even more negative about the Federal Reserve's LOLR responsibilities.

Lesson 4: Liquidity regulations and LOLR are both needed

The fourth lesson is that both a lender of last resort and liquidity regulations are needed. On the one hand, while liquidity needs are sometimes caused by a market failure that can be solved by an LOLR, they are also sometimes driven by concerns about solvency. In such cases, the social costs of LOLR lending in terms of moral hazard are higher, as are the risk of losses to the central bank. Requiring firms to hold adequate stockpiles of liquid assets buys time to assess the condition of the borrower and, if necessary, resolve the situation without lending. Moreover, liquidity regulations create a tax on an institution's liquidity risk-taking by making it hold a buffer of liquid but low-yielding assets. Liquidity risk entails the possibility that the bank would impose costs on others during a future episode of illiquidity, such as the costs associated with liquidity hoarding or selling assets at fire-sale prices. That liquidity regulation tax should encourage the bank to internalise the social cost of its risk-taking. Similarly, by simply making banks hold greater amounts of liquid assets, these regulations ensure that there are more resources that can be used to meet margin calls or funding withdrawals, thereby reducing the incentive for liquidity-hoarding or fire sales of assets, with all their destabilising effects.

But on the other hand, liquidity regulations do not eliminate the need for an LOLR. It is socially beneficial to have banks engage in liquidity transformation – the ideal bank is not funded entirely with equity and invested only in T-bills, so banks will, at times, encounter periods of illiquidity. Moreover, demand for liquid assets increases sharply in a crisis, when funding markets break down. In those situations, requiring banks to have high amount of liquid assets would not be sufficient and an LOLR is necessary to reduce the procyclicality associated with liquidity hoarding.³

Regulations should be designed to reinforce the beneficial role of an LOLR while reducing the likelihood of lending sparked by solvency concerns.⁴

Lesson 5: Moral hazard is a real problem

The final lesson is that moral hazard is not just an abstract concern; it is a real problem. Before the crisis, emergency lending by the Federal Reserve was almost never discussed. If it was discussed, it was always viewed as implausible and it would be noted that the Federal Reserve had not made an emergency loan since the 1930s. After the crisis, emergency lending comes up often both internally and

³ M Carlson, "Lessons from the historical use of reserve requirements in the United States to promote bank liquidity", Federal Reserve Board, *Finance and Economics Discussion Series Working Paper*, no 11, 2013, provides a good illustration of this view and highlights that individual bank liquidity during stress periods is inherently and intricately tied to the liquidity policies of the central bank.

⁴ This idea is further developed in M Carlson, B Duygan-Bump and W Nelson, "Why do we need liquidity regulations when we have a central bank? A perspective from Federal Reserve lending during the 2007–2009 U.S. Financial Crisis", mimeo, 2014.

externally. For example, officials in the money fund industry have noted that the Federal Reserve will provide liquidity if necessary, obviating the need for money fund reform. As a consequence, I'd emphasise that a workable resolution regime for systemically important institutions is essential so that institutions can be wound down at acceptable cost. And reform of the money fund industry – a perpetual source of risk to the financial system – is also critical.

A few words on Bagehot

Given the topic, I feel obliged to discuss at least briefly how I judge Federal Reserve lending during the crisis stacked up against Bagehot's dictum for acting as a lender of last resort. The catchphrase version of the dictum holds that the central bank should lend freely (ie without limit) at a penalty rate against good collateral. Based on this version, one could argue that lending was often inconsistent with the dictum. Overall, while Federal Reserve lent freely, it was often against risky collateral (albeit with conservative haircuts) and at interest rates that were below those then prevailing in the market. In fact, that was the point as the market rates had spiked up tremendously.

But, Federal Reserve lending was completely consistent with the principles that Bagehot explicitly credits with stopping the panic of 1825:

The success of the Bank of England on this occasion was owing to its complete adoption of right principles.[...] the Bank directors lent money by every possible means, and in modes which we had never adopted before; we took in stock on security, we purchased Exchequer Bills, we made advances on Exchequer Bills, we not only discounted outright, but we made advances on deposits of bills of exchange to an immense amount – in short, by every possible means consistent with the safety of the Bank.[...] and we were not on some occasions over nice. Seeing the dreadful state in which the public were, we rendered every assistance in our power.⁵

⁵ W Bagehot, *Lombard Street, A Description of the Money Market*, 1873, reprinted by William Clowes and Sons, 1915, pp 52 and 192.

Lender of last resort operations during the financial crisis: seven practical lessons from the United Kingdom

Andrew Hauser¹

Abstract

Drawing on the recommendations of the many public reviews of the UK's experience with lender of last resort (LOLR) operations during the financial crisis, this paper identifies seven practical lessons of wider interest to the central banking community and others. First, lender of last resort operations cannot tackle moral hazard single-handedly: effective alignment of incentives also requires strong microprudential liquid asset requirements and a credible bank resolution regime. Second, the lender of last resort must have a close understanding of the firms to which it might lend, the markets in which they operate and the collateral they have available. Third, ambiguity over the circumstances and terms of LOLR operations may not be as constructive as previously thought: it does not appear to have been effective in limiting moral hazard pre-crisis in the UK, and led to excessive swings in market expectations about the Bank's willingness to lend. Fourth, as a result, the UK has concluded that the LOLR regime should be richly specified, and embedded in a largely public framework. Fifth, central banks should only lend to solvent institutions – but as a practical matter, illiquidity and insolvency can be hard to distinguish in the midst of a crisis. That requires careful definition of the respective responsibilities of the central bank and the fiscal authority. Sixth, central banks should do all they can to reduce unnecessary stigma associated with their LOLR facilities, whilst recognising that some level of stigma is probably unavoidable. And, seventh, LOLR tools will need to evolve as the post-crisis structure of financial markets becomes clearer. Although some innovation will always be needed in the heat of a crisis, LOLR design can and should be more forward-looking than it was in the pre-crisis era. Key issues include the extent to which central banks should be willing to lend to non-banks, support capital markets and serve as the lenders of last resort in foreign currencies.

Keywords: Lender of last resort, central bank discount window, emergency liquidity facilities, constructive ambiguity, moral hazard

JEL classification: E58, F33

¹ Director, Markets Strategy, Bank of England.

Introduction

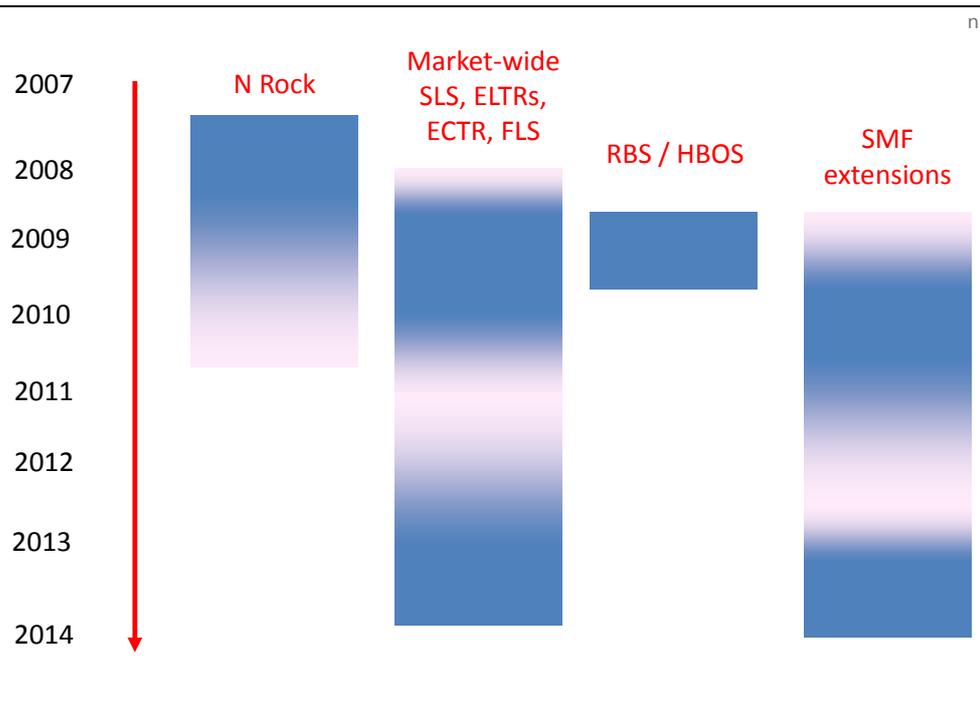
Few countries can have reviewed the exercise of lender of last resort (LOLR) operations during the financial crisis more thoroughly, or more self-critically, than the United Kingdom. The House of Commons' Treasury Committee's January 2008 report on the handling of the Northern Rock crisis, "Run on the Rock", set out a wide-ranging and enormously influential reform programme for every part of the UK official sector that still resonates today. The Bank of England consulted on (and subsequently implemented) a major overhaul of its published liquidity insurance framework in October 2008. Ian Plenderleith published a detailed review of the Bank's 2008–09 provision of Emergency Liquidity Assistance (ELA) in October 2012. Bill Winters undertook a similar review of the Bank's published (ie non-ELA) liquidity facilities, which led to another major package of reforms from the Bank, announced by Governor Mark Carney in October 2013. And work on some of the more far-reaching recommendations in those reports, relating to the appropriate principles and tools for ELA and other forms of liquidity insurance in a future financial system focused less on banks and more on multicurrency non-banks and capital markets, is well under way.²

This paper is not intended to add to these impressive reports. Instead, it draws out from their many recommendations seven *practical* lessons of wider interest to the central banking community. Those lessons are described in more detail in later sections of this paper. The rest of this introduction provides a brief overview of the UK crisis, and the principles that governed the provision of liquidity insurance in the run-up to that crisis.

Figure 1 divides the UK's crisis response into four separate but overlapping phases. The first phase is the failure of Northern Rock in the autumn of 2007, triggered by wholesale money market stresses associated with the shakeout in the US subprime mortgage market. Northern Rock received ELA from the Bank of England. But the Bank was accused of being slow to respond; and when news of the ELA was prematurely revealed by the press, a retail run occurred, which only abated after the announcement of a blanket government deposit guarantee.

The second phase began in the autumn of 2007 and the first part of 2008, when the Bank began providing large-scale liquidity to the market as a whole against broad collateral through a number of innovative but ad hoc operations, including extended long-term repos against wide collateral and the Special Liquidity Scheme (SLS). Taken together, those schemes were ultimately much larger in size than any of the bank-specific loans the Bank made. And, though the SLS was managed down through the course of 2011, further liquidity injections were required during 2012 and beyond in response to renewed tensions in Europe and continued weakness in the UK banking sector. That came through two new operations – the Funding for Lending Scheme (FLS), and the Extended Collateral Term Repo (ECTR) facility.

² For the documents referred to in this paragraph, see: www.publications.parliament.uk/pa/cm200708/cmselect/cmtreasy/56/56i.pdf; www.bankofengland.co.uk/markets/Documents/money/publications/condococt08.pdf; and www.bankofengland.co.uk/about/Pages/courtreviews/default.aspx.



The third phase of the UK crisis was triggered by the failure of Lehman Brothers, which led quickly to the need to provide large-scale support to two of the UK's major banks – Halifax Bank of Scotland (HBOS) and Royal Bank of Scotland (RBS). Both were provided with substantial ELA in October 2008, accompanied by a large-scale government recapitalisation package. Usage of the SLS also increased substantially around that time. And from the spring of 2009, the Bank was also conducting large-scale QE purchases and smaller-scale private sector Market Maker of Last Resort (MMLR) operations as part of its monetary policy implementation.

The fourth phase, shown on the far right of Figure 1, illustrates one of the most distinctive aspects of the UK's response – in that the Bank has chosen, for a number of reasons, to formalise much of its liquidity insurance toolkit into a *public* document called the Sterling Monetary Framework (SMF). There have been various phases in this development, as discussed later in this paper.

By contrast, in the pre-crisis period, the Bank of England – in common with most other central banks – said relatively little about the circumstances under which it would provide LOLR assistance, cleaving closely to the principle of constructive ambiguity. The main, if not the only, guide to the Bank's approach was contained in Governor Edward George's 1993 London School of Economics speech,³ the key principles of which are shown in Figure 2. For the most part, they stick closely to the main tenets of (what is commonly thought to have been set out in) Walter Bagehot's *Lombard Street*. But they also elaborate on them in a number of respects. For example, lending freely, Governor George argued, should be done where the firm involved was judged to be systemically important, and where private sector options had been exhausted. And central banks should ensure there was a clear exit

³ See www.bankofengland.co.uk/archive/Documents/historicpubs/qb/1994/qb94q16066.pdf.

strategy to any LOLR operation, and might often initially need to conduct specific LOLR operations in secret.

Pre-crisis LOLR principles

Figure 2

Bagehot 1972	Eddie George 1993
<p>Lend freely and readily in times of panic...</p> <p>...at a very high rate of interest...</p> <p>...to 'solvent merchants'...</p> <p>...against good collateral</p>	<p>Only where there is systemic risk, and no private sector solution</p> <p>Terms as penal as feasible without precipitating collapse</p> <p>Central banks aim to provide liquidity – not (normally) solvency support</p> <p>Support should be structured so that losses fall on shareholders</p> <p>Identify a clear exit strategy</p> <p>Usually keep support secret at the time</p>

Although Governor George’s speech does not explicitly use the phrase “moral hazard”, it is permeated with the underlying principle of ensuring the central bank’s lending operations do not incentivise banks to take excessive risk. Whereas Bagehot has, to modern eyes, surprisingly little to say about this issue (as Jaime Caruana highlights in his preface to the new Spanish translation of Lombard Street),⁴ the 1993 principles discuss at some length the importance of not lending to insolvent banks, of ensuring that shareholders bear losses and of avoiding adverse incentive effects. Those concerns also appeared regularly in the Bank’s pre-crisis commentary, including the Bank’s revised money market framework published in 2006, and Governor King’s written statement to Parliament in September 2007.⁵

The extent and nature of moral hazard, and how best to tackle it, were central issues in the UK’s experience of the financial crisis, and underpin many of the seven practical lessons.

Lesson 1: LOLR cannot operate in isolation

The first lesson is that moral hazard is not a function of the availability and terms of LOLR assistance alone. When deciding how much risk to take, banks – and their investors – look to the overall set of incentives established by all aspects of public policy. The attitude of the central bank is important. But banks will also respond to: the incentives established by the supervisory regime to self-insure against liquidity risk; to the prudential and conduct priorities highlighted by the supervisory authorities; and to the ease with which banks can be credibly wound up if they fail, without requiring official support. Central banks globally have learned that unless all

⁴ See Caruana, J (2012): preface to W Bagehot, Lombard street : una descripción del mercado de dinero, translated into Spanish by M Martín, Marcial Pons Ediciones Jurídicas Y Sociales, pp 9-18, September..

⁵ See www.bankofengland.co.uk/markets/Documents/money/publications/redbook0506.pdf and www.bankofengland.co.uk/publications/Documents/other/treasurycommittee/other/paper070912.pdf.

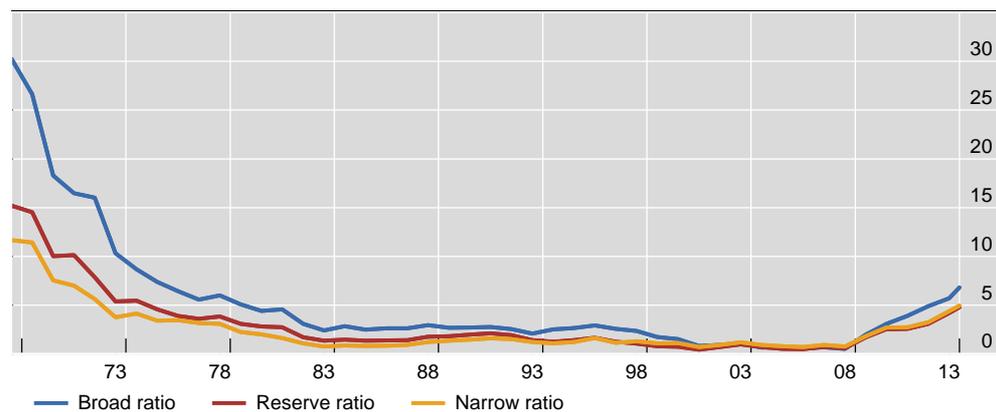
parts of the authorities' regime are pulling together, no matter how tough the lender of last resort aims to be ex ante, it may have little choice but to lend ex post. In such circumstances, LOLR principles risk being seriously time-inconsistent.

The Treasury Committee's report on Northern Rock gave poor marks to many aspects of the UK's regime, not least at the Bank of England. But it also highlighted the lack of a comprehensive framework for ensuring banks took out adequate self-insurance against liquidity shocks. Figure 3 shows just how low UK banks' holdings of liquid assets had got in the years ahead of the crisis.

UK banks' sterling liquid asset ratio

In per cent of total assets (all currencies)

Figure 3



Source: Bank of England.

The report listed many other necessary regulatory changes – including the need for a special resolution framework for banks so that banks could fail like other companies (Northern Rock was by no means obviously systemically important), an overhaul of the approach to *microprudential* supervision, the need for a stronger focus on the build-up of *macroprudential* risks, and the need for greater clarity over the division of responsibility between the central bank, the fiscal authority and the supervisor.

What is striking about this list is that nearly everything on it eventually came to pass – a much stronger liquidity regime with a strong family resemblance to the new Basel Liquidity Coverage Ratio was introduced in 2010; a bank resolution regime was enacted in the 2009 Banking Act; and the macro- and microprudential regulatory arrangements were reconfigured and given to the Bank of England. Though, of course, none of these changes can eliminate moral hazard, they do significantly rebalance the burden of dealing with it away from LOLR alone – a development that has been both helpful and necessary.

Lesson 2: "Know your customer"

The second lesson is that the lender of last resort needs a close understanding of the firms to whom it might lend, and the markets in which those firms operate. When crisis hits, the central bank cannot avoid being subject to a powerful public expectation that it will act rapidly and decisively – and that requires detailed and real-time knowledge. Part of that knowledge – on the risks in the banking sector,

the solvency and viability of the banks within it, and so forth – should be available from the microprudential supervisors. Institutional separation between the central bank and supervision, such as prevailed in the UK in the pre-crisis period, does not preclude the free flow of that information – but it can make it more challenging. And other information – in particular the highly granular data on the nature and quality of banks' available collateral needed to assess central bank lending capacity – is not typically collected by supervisors.

Taken together, these points have implications for the types of people and expertise that central banks need to have and retain, the personal relationships with decision-makers at banks and non-banks that they form, the data and analysis needed, and the sorts of institutional structures required. As the Treasury Committee, Plenderleith and Winters reports all make clear, the Bank of England had to innovate rapidly in the early phases of the crisis to plug some of these gaps. It invested heavily in a much-enlarged risk management function for its own balance sheet capable of assessing a wide range of counterparties and collateral at a highly granular level. The amount of collateral prepositioned at the Bank is now nearly £450 billion, three quarters of that in the form of raw loans, independently credit assessed and haircut by Bank staff. And bank supervision was brought back within the central bank. This new structure is not a panacea, and will certainly not be appropriate in every country, with different social, political and legal frameworks. The crisis reminded everyone of the importance of being humble in assessing optimal models for institutional design. But it does have a number of clear merits relative to the pre-crisis model.

Lesson 3: Ambiguity is not always constructive

The third lesson that the UK authorities drew from the crisis was that ambiguity about how the central bank would act in its LOLR capacity may not, after all, be constructive.

Ambiguity did not appear to do much to help reduce moral hazard ahead of the crisis – as Figure 3 powerfully shows, banks' minimal self-insurance betrayed a strong assumption that others would pick up the tab if liquidity risks crystallised.

Ambiguity led to significant – and ultimately damaging – uncertainty about the circumstances in which the Bank would lend, and the terms and conditions at which it would do so. Banks' expectations in this area swung from excess optimism about the prospects for central bank support in the pre-crisis period to excess pessimism later in the crisis period, even long after the Bank had demonstrated its willingness to provide truly exceptional amounts of liquidity.

And ambiguity bred uncertainty over the relative responsibilities of the UK authorities during crisis periods, something that was highlighted by the Treasury Committee.

Lesson 4: The LOLR toolkit should be rich and publicly stated

In the light of these concerns, and a broad consensus that the Bank needed a broader and more flexible LOLR toolkit, the UK has now gone further than arguably any other central bank in formalising its liquidity insurance facilities in a public framework: the SMF.

The provisions of the SMF are described in detail elsewhere – most notably in the Bank’s “Red Book”, available on its website.⁶ But at a high level, the toolkit contains, in addition to usual monetary policy Open Market Operation liquidity injection and draining tools, three further liquidity insurance facilities:

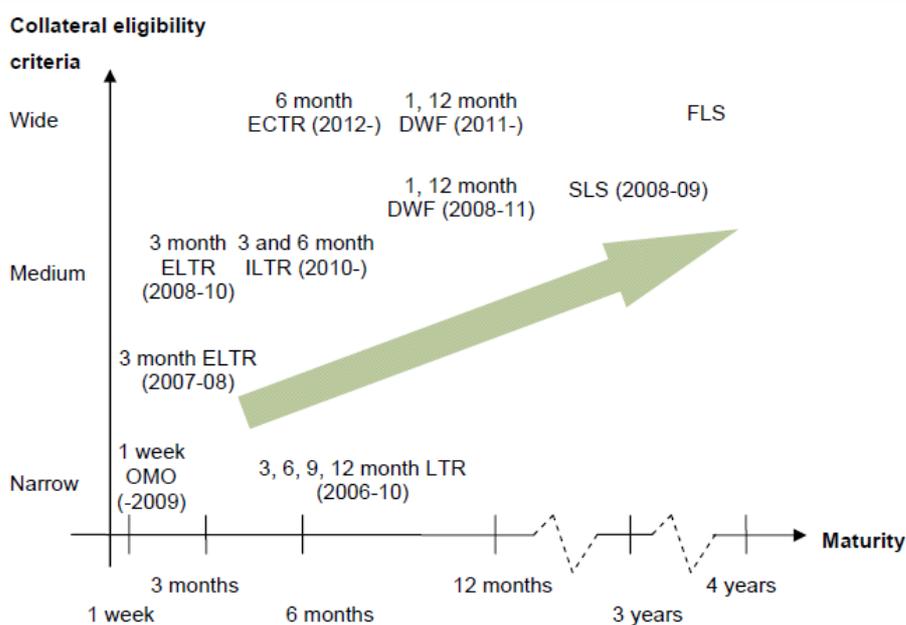
- the Indexed Long-Term Repo facility, a monthly market-wide auction of six-month money against the full range of Bank-eligible collateral, including raw loans, with the amount on offer depending on the degree of stress in financial markets;
- a bilateral on-demand Discount Window Facility for banks facing idiosyncratic shocks, providing rollable 30-day liquidity in the form of collateral swaps, with delayed disclosure arrangements; and
- a discretionary Contingent Term Repo Facility that the Bank can launch at any stage in response to a deterioration in market conditions, at a term and price of its choosing.

Development of this toolkit has taken place alongside a significant extension in the term and collateral eligibility of the Bank’s facilities, powerfully illustrated in a recent speech by Monetary Policy Committee member David Miles (Figure 4). Following the reforms announced by Governor Carney in October 2013, the pricing of the facilities, though still for the most part penal, has also been reduced materially.

The perceived benefits of this approach flow naturally from the drawbacks of ambiguity. Published facilities send a clear signal to the markets, government and the public of what the Bank will and will not do, channelling expectations and allowing banks to plan accordingly. Clearly, for this to be effective the commitments in the framework need to be credible. Some flexibility to innovate will always be required – one reason why the Bank decided not to hardwire every crisis-era facility into the SMF (eg the SLS, FLS and corporate bond MMLR facilities). Whether such innovation is necessary again in the future, or whether the core toolkit will suffice, only time will tell.

What is certainly true is that the facilities have allowed the Bank to take a major step forward in terms of its understanding of the risks in its counterparties’ business models and collateral – and they have helped differentiate more clearly between operations carried out at the Bank’s own risk – defined as anything contained in the Bank’s published facilities – and those requiring confirmation and possibly fiscal support from the government. Which leads to the next lesson.

⁶ See www.bankofengland.co.uk/markets/Pages/sterlingoperations/redbook.aspx.



Lesson 5: Solvency and liquidity can be hard to distinguish

Central banks should only lend to solvent and viable firms. But, as a practical matter, illiquidity and insolvency can be hard to distinguish in the midst of a crisis, requiring the central bank and the fiscal authority to work very closely together. For example, although the initial ELA to Northern Rock came from the Bank of England, the subsequent blanket guarantee and further support were underwritten by the government. The SLS and ELA loans to RBS and HBOS were either wholly or partially indemnified by the government. And the RBS and HBOS loans were made side by side with large-scale state recapitalisation plans. Even absent these facts, the sheer scale and longevity of these loans – up to four years in the case of the FLS – is a long way from the sort of support envisaged by either Bagehot in the 1870s or Governor George in the 1990s.

The legacy of these developments is still being worked through internationally. Who should judge a counterparty's solvency and viability? How should the respective responsibilities of the central bank and the fiscal authority be defined (the UK has formalised this in a Memorandum of Understanding⁷)? And what implications does that have for the appropriate level of central bank capitalisation (a point highlighted in both the Winters and Plenderleith reviews)?

⁷ See www.bankofengland.co.uk/about/Documents/mous/moufincrisis.pdf.

Lesson 6: Stigma matters

The stigma associated with being found to be using bilateral central bank support was a significant concern in the UK during the crisis. A relatively modest usage of the Bank of England's regular overnight standing facilities in August 2007, not disclosed by the Bank but rapidly sniffed out by a zealous media, led to febrile speculation about the underlying cause. A month later, the leak of the Bank's ELA to Northern Rock led to a retail run on the bank which had to be stemmed through a blanket government deposit guarantee.

By contrast, the ELA to HBOS and RBS remained covert for over a year, before being voluntarily disclosed by the Bank. That very different reaction in large part reflected the massive amounts of liquidity the Bank had publicly injected into the system through market-wide operations including the SLS, extended repo facilities and, later, its monetary policy QE operations.

The issue of stigma, and a suggestion that it had led banks to self-insure to an excessive degree, was a core theme of the Winters review, and was the subject of substantial analysis at the Bank as it formed its response to that report. Stigma has many potential sources – some of which can be tackled through facility design, some of which are just a fact of life. What is profoundly clear, however, is that banks prefer, wherever possible, to make use of market-wide rather than bilateral facilities, allowing them to say, "We're all in this together". That is why, across the globe, so much of the heavy lifting in the crisis was done through multilateral operations, in which the total amount provided, and the terms, were often publicly disclosed. In the UK, for example, large amounts of liquidity were injected through the SLS and extended repo operations in the earlier stages of the crisis – and later, the ECTR and FLS proved highly effective in helping to bring funding costs down after the euro crisis flared up in 2011–12.

But it seems very unwise to propose that we do away with bilateral facilities altogether – because doing so runs the risk of being unable to prevent a genuinely idiosyncratic shock becoming a systemic one without having to launch a market-wide facility, a process which could all too easily precipitate the very risk that central banks are seeking to avoid. That is why the Bank of England has worked so hard to try to reduce (though not eliminate) perceptions of stigma in its Discount Window Facility.

If bilateral lending is to remain effective, however, it is imperative that central banks retain the ability to keep such loans covert for a period when it is necessary to do so in order to maintain financial stability. This is a contentious and often misunderstood issue, particularly in the light of the experience during the crisis. The days in which central banks took a perverse pride in avoiding public scrutiny, if they ever existed, are long gone. Across everything they do, central banks now recognise and embrace the need for public accountability in their actions – not just as a quid pro quo for the exercise of their powers, but as an essential part of ensuring their effectiveness. In many cases, ELA *can* be delivered overtly: the effectiveness of any ELA associated with a bank in recovery following bail-in, for example, is likely to be enhanced rather than hindered by making it public. But there may be rare situations in which premature disclosure of support risks precipitating the very instability that lending is seeking to avoid. And in those cases there is a public interest in ensuring the central bank has the means to lend covertly. That power should be tightly circumscribed: central banks should be open about the criteria used to judge when lending will remain covert, and – importantly – when it will be subsequently

disclosed. There should be clear procedures for disclosure and liaison with the fiscal authority and with Parliament. And there should be clear ex post accountability once the lending has been disclosed. The UK has put in place substantially strengthened arrangements under each of these headings in recent years. But the authorities are likely to continue to have to make difficult judgments about the trade-off between the potential ex post benefits to financial stability from keeping some types of bilateral loan covert for a period and the clear ex ante benefits of market transparency, which has been such an important component of the post-crisis regulatory response.

Lesson 7: LOLR toolkits must continue to evolve

The scale and pace of innovation in LOLR toolkits across many countries during the crisis was truly extraordinary. To some extent, such within-crisis innovation is inevitable. But it does also raise the question of whether more can be done to predict future challenges caused by changes in the structure of financial markets and to hardwire them into current regimes, reducing the need for costly and potentially ineffective innovation at the heart of future crises. This theme of more continuous improvement was a key message from the Winters review in the UK.

Three themes stand out.

The first is central banks' capacity to provide liquidity assistance in foreign currencies. This is an important and politically sensitive issue, particularly for an international finance centre like the UK, and there are few easy answers. International swap lines are a substantial help – and the recent announcement by a number of central banks that crisis-era swap lines were being made permanent was a very welcome development. But the potential failure of a genuinely multicurrency bank or non-bank remains one of the most troubling scenarios facing LOLR practitioners.

The second issue is the potentially increasing need for central banks to be ready to lend to non-banks as the post-crisis regulatory response causes more intermediation to move away from banks. Lending to non-banks was not a major issue for the Bank of England during the most recent crisis, in contrast to the experience in the United States. But it could easily be so in the future, and recommendations that the Bank should prepare for that possibility were prominent in both the Plenderleith and Winters reviews. The Bank is working actively on those issues now – but an important issue, echoing the first lesson in this paper, is the need to ensure that access to central bank balance sheets and regulation go suitably hand in hand.

The third issue is the potential need to contemplate providing direct support to capital markets. This was also not something that the Bank of England did on any great scale during the crisis. But the Bank did successfully operate more modestly sized schemes to reduce liquidity premia in corporate bond and commercial paper markets. And the scope for the Bank's newly expanded monthly long-term repo operations to provide a backstop for collateral markets was a key theme of the Bank's October 2013 reforms to the SMF. The costs and benefits of outright purchase schemes, in particular, require further analysis – but on the face of it, many of Lord George's principles of not supporting non-viable markets and ensuring an

adequate exit strategy remain just as relevant in this area as they do to lending operations.

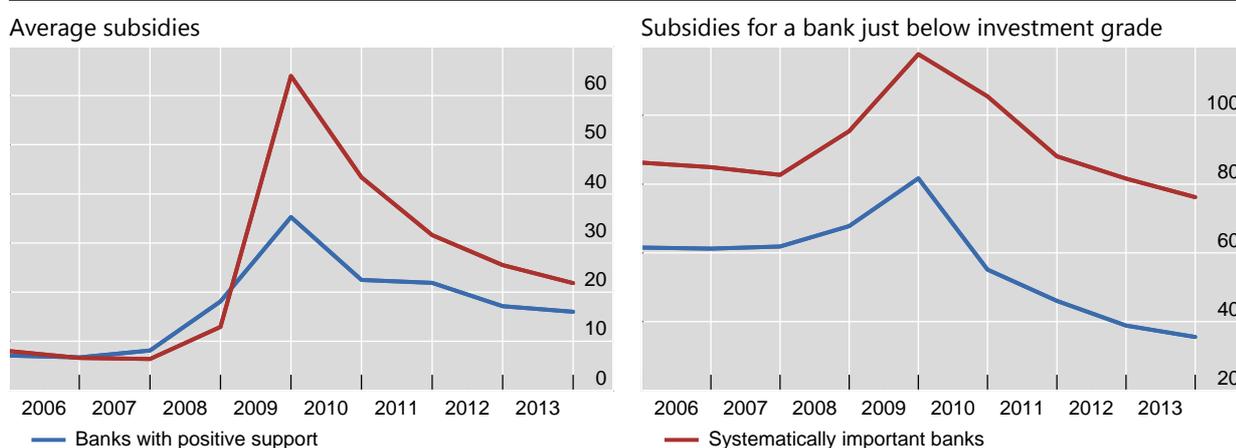
Conclusion

The most important question facing central banks and regulators is whether the post-crisis response, taken together, leaves the financial system more, or less, safe. At one level, the reforms to regulation and resolution have surely reduced many of the most egregious risks that crystallised in the pre-crisis period. But both the significant broadening and deepening in central banks' LOLR arsenals, and the demonstration effect that they were willing to use them in massive size, may to some extent have worked in the other direction.

Subsidies derived from credit ratings for UK banks¹

In basis points

Figure 5



¹ The estimate of threatening uplift is based on all of the sample using rating information only. Systematically important banks are defined as G-SIBs plus the largest banks by asset size.

Source: IMF GFSR report, April 2014.

Where does the balance lie? It is hard to get a clear read on how perceptions of the availability of central bank support compare with those pre-crisis. Figure 5, taken from the IMF's April 2014 *Global Financial Stability Report* (GFSR) and based on quantifications of the ratings uplift given for perceptions of support, suggests that the implied subsidy for UK banks has fallen back sharply since the crisis – but remains elevated compared with pre-crisis. That seems like bad news. But these measures are subject to many uncertainties. Most profoundly, it is unclear how meaningful the readings for the pre-crisis period are – many rating agencies did not include explicit support uplift at that time, and the broad mispricing of risk we now know to have then been prevalent suggests that this line may be significantly below its true level in 2005–06, leaving today's reading looking less worrying.

That potentially good news is given further support by Figure 6, taken from the same GFSR, which re-estimates the relationship under the scenario in which banks' ratings fall just below investment grade – and so give a crude estimate of the level of support a bank already in distress might be expected to receive. That line is more

clearly below its pre-crisis level – and gives perhaps some slight comfort that the collective efforts of the past few years have begun to have some effect. Central banks cannot, however, afford to be complacent: it is essential that the lessons of the recent crisis set out here, together with many others, be hardwired into our operating procedures before those memories fade.

Lending of last resort? A European perspective

Francesco Papadia

Apparently, I was invited to participate in this workshop on the strength of my experience in managing the liquidity operations of the ECB between 2007 and 2012. The brief was to “reflect on the usefulness (or practicability) of the classic pre-crisis LOLR principles and lessons for the design and conduct of liquidity support operations”.

The first thing to be said about my ECB experience is that I did not think much about LOLR at the time. This could be due either to my difficulties in conceptualising about it during the thick of the action, or to the fact that the LOLR concept was not very helpful in managing the ECB’s liquidity operations. Perhaps I would give more weight to the second of those explanations: LOLR was not the most useful concept in those circumstances, for two reasons:

- (i) LOLR is affected, as Goodhart argued in 1999, by ambiguities and misunderstandings that make the concept difficult to use in practice,¹ and
- (ii) if taken to correspond in ECB terms to bilateral Emergency Liquidity Assistance (ELA), LOLR is only a very small part of the ECB’s overall activities and, indeed, those of other leading central banks.²

Let me expand on the second point and explain why I prefer a narrow definition of LOLR and why, therefore, ECB action amounted to much more than LOLR. As defined by Goodhart, LOLR refers to bilateral funding for banks that are experiencing liquidity difficulties, and this has more to do with financial stability than with monetary policy. However, a broadly defined LOLR would be indistinguishable from monetary policy and would therefore lose its specific significance. If I have to think about an umbrella concept for what the ECB and other central banks did during the crisis, I am more persuaded by this quotation from the Fed: “The System, then, was to provide not only an **elastic currency** – that is, a currency that would expand or shrink in amount as economic conditions warranted...”.

For someone like myself, who learnt his central banking catechism from the Bundesbank, if only indirectly, the idea of a currency expanding or shrinking looked odd the first time I read it on the wall of the New York Fed’s vestibule. But I later came to understand that the concept of an elastic currency is totally consistent with

¹ See Goodhart (1999, p 339): “There are few issues so subject to myth, sometimes unhelpful myths, that tend to obscure rather than illuminate real issues, as is the subject of whether the central bank (...) should act as a lender of last resort (LOLR).”

² I take here clearly a narrower definition than the very wide one adopted by the issue note, which basically subsumes under the concept of LOLR the entire balance sheet expansion by central banks during the crisis: “From mid-2007 until early 2009, central banks extended the equivalent of about 4 trillion dollars in major currencies in liquidity support to banks and nonbanks, to individual institutions and markets, and in domestic and foreign currency.” I agree with Goodhart: “the distinction between lending by the central bank to an individual institution and OMO dealing with the market as a whole is simple, practical and self-evidently justifiable. In my view only the former should be described as LOLR.”

the essence of monetary policy as conducted by the Bundesbank or the ECB – as independent central banks devoted to price stability, which in no way requires a constant or constantly growing money supply.

In my opinion, the ECB’s actions were much closer to the macro concept of an “elastic currency” than to an LOLR action. Basically, I take the concept of providing “an elastic currency” as deriving from the idea that demand for liquidity, which is always variable to some degree, becomes extremely unstable in crisis conditions, and that central banks have been created to buffer this instability and thus reduce the intensity of crises, if not their frequency.

Lest you accuse me of *lèse majesté* towards two titans of central banking such as Thornton and Bagehot, let me say that I find little to disagree with in their writings, at least as I read them second-hand in Caruana’s preface.³ Indeed I do not believe that they were writing about a restricted LOLR concept, namely bilateral lending to banks in difficult conditions. Their references to merchants in addition to bankers show that, in my view, they were not thinking only of banks as needing comprehensive support from central banks in times of crisis.

The way I interpret the provision of an elastic currency by the ECB explains two extraordinary facets of the crisis: the reduction in the turnover and outstanding stock of the interbank market as well as the unprecedented expansion of the ECB’s balance sheet.

In the book that I published with Paul Mercier three years ago on the implementation of monetary policy in the euro area, there is a table that compares the two above-mentioned developments. The updated version of that table, as reproduced here, shows a nearly one-to-one relationship between the evaporation of liquidity in the money market and the corresponding expansion of the Eurosystem’s balance sheet during the crisis.

Contraction of money market and corresponding expansion of Eurosystem balance sheet, 2008–11

Table 1

Fall in unsecured turnover (EUR bn)	Increase in secured turnover (EUR bn)	Net fall in turnover (EUR bn)	Increase in Eurosystem balance sheet (EUR bn)	Substitution between Eurosystem and market intermediation (%)
(1)	(2)	(3) = (1) – (2)	(4)	(5) = (4) / (3)
327	212	115	113	98

On this interpretation, the ECB used its balance sheet to carry out the intermediation that the private sector was no longer capable of providing. And the ECB offered that liquidity at a non-punitive price, thus providing the required elastic currency.

Of course, if a central bank has to provide liquidity in order to replace an impaired market, it follows that not only short-term intermediation in the domestic

³ See Caruana (2012) preface to the new Spanish translation of *Lombard Street*.

currency is needed, but also intermediation over longer maturities and in other currencies. And this fits very well with the facts that the ECB has lengthened the maturity of its lending up to three years, and has also provided liquidity in US dollars through its swap agreement with the Fed.

The idea that central banks provide intermediation to substitute for impaired market functioning can be extended to encompass the first phase of the Fed's response to the crisis, ie before its Large-Scale Asset Purchases (LSAP). It also applies to the ECB's asset purchases (under its Covered Bond Purchase and Securities Markets (SMP) programmes). But the idea does not extend to the Fed's LSAP, which had a different logic and methodology.

From what I have said, you have already gathered that I do not find it useful to describe as LOLR for governments either the ECB's SMP, or the action it promises under its Outright Monetary Transactions (OMT). First, I have tried to give a restricted interpretation of the LOLR term, where the limitation to banks and to bilateral relationships is essential. Second, and more importantly, LOLR for sovereigns sounds to me like fiscal dominance, and I have seen too much of this in Italy during the 1970s and 1980s not to be dismayed.

There is one other point I would like to make: the provision of an elastic currency inevitably produces a certain amount of moral hazard – probably a significant amount, although perhaps less than commonly thought and further contained by new regulations. This risk needs to be managed and controlled, and the best way to do this is to make those that are incurring the risk pay for at least some of the consequences. As applied to banks, this means making shareholders, managers and lenders accountable for their decisions before the central bank lends to the troubled bank in question. As applied to countries, this means requiring them to correct past policy errors. One may question whether such “conditionality” was always appropriately applied to banks and sovereigns during the crisis. Still, it is fair to say that there has always been an awareness of the need for conditionality.

My penultimate point is about the international dimension of LOLR or, in my preferred concept, of an elastic currency: I find that this is just part of monetary policy and should be decided like all other monetary policy moves, with the only difference being that two or more central banks need to reach an agreement: the lender and the borrower(s). This implies that no permanent agreements should hamper the freedom – or independence – of the relevant central banks in deciding whether or not to engage into this particular form of monetary policy. I leave it open whether this principle was respected by the recently established permanent swap agreements.

My last point touches on the fact that central banks tend to earn profits when providing an “elastic currency”. I believe that this has been the case for the Fed, and it was certainly true of the ECB: whenever it has intervened – whether this was at the turn of the century in the foreign exchange market or during the crisis on covered bonds and peripheral government bonds – it has realised quite hefty capital gains. If you feel that such “commercial” gains are beneath the dignity of a central bank, let me propose two ways to dignify them. First, you can agree with Milton Friedman that interventions which bring profits to the central bank are macroeconomically good. Second, on the assumption that the economy has multiple equilibria, the central bank should receive a financial reward for nudging the economy from a bad to a better point of equilibrium. This paradigm also deals effectively with the question of what penalty rate banks should pay when they receive the elastic currency during a crisis: the applied rate should be higher than the rate that would

prevail under the good equilibrium but lower than the one prevailing during the crisis.

In conclusion, I find the concept of an elastic currency more useful than that of the LOLR, even if I agree with the prescriptions that are traditionally associated with the LOLR.

References

Caruana, J (2012): preface to W Bagehot, *Lombard street : una descripción del mercado de dinero*, translated into Spanish by M Martín, Marcial Pons Ediciones Jurídicas Y Sociales, pp 9-18, September.

Goodhart, C (1999): "Myths about the lender of last resort", *International Finance*, vol 2, no 3, pp 339–60.

Mercier, P and F Papadia (2011): The concrete euro – *The implementation of monetary policy in the euro area*, Oxford University press.

Lender of last resort: actions, results and lessons from Mexico's experience during the crisis

José J Sidaoui

Abstract

The note describes the process of contagion from the International Financial turmoil to domestic markets, the transmission mechanism through the FX market, and how the high volatility of the foreign exchange rate became a risk to financial stability. It explains the dependency of the Mexican financial system on the ability of markets to work without disruption. The main actions taken by policy makers to restore stability to the system are outlined and reviewed. The last section provides the author's assessment of the effectiveness of the different actions taken, the tools used and lessons learned.

Keywords: Foreign exchange rate, interbank lending, liquidity, systemic risk, central bank interventions, FX swaps, lender of last resort

JEL classification: E58, F42

I. Introduction

The lender of last resort function has attracted little enough notice in the literature over past decades. The recent financial crisis, however, has reminded us just how important the function is for central banks. It has also called attention to how difficult it is to achieve the necessary balance between preserving financial stability and avoiding increased moral hazard by removing credit risk decisions from private markets. These challenges add considerably to the fascination of central banking as a profession.

Some background on the economy and financial markets is needed to give context to the actions taken by policymakers during the crisis in support of the financial system and the tools they used in carrying out the LOLR function.

By the end of the third quarter of 2008, the Mexican economy enjoyed strong macroeconomic fundamentals. It had a relatively small public deficit, a low ratio of government debt to GDP, and significant foreign exchange reserves. The financial system was sound. Banks held high capital ratios of 15–18%, with healthy credit portfolios and almost no toxic assets. Shadow banking accounted for only a small portion of financial intermediation, and it was confined to non-banks supplying mortgages, home-building credit and auto loans. All financial markets were functioning without disturbance and enjoyed ample liquidity. There were no imbalances within the perimeter of applicable regulation, or any asset price bubbles.

However, Mexico is a small open economy. Trade comprises over two thirds of GDP, and the capital account is completely open under a floating exchange rate regime. Thus, the country is very much exposed to international shocks, in particular those coming from the United States.

After the collapse of Lehman Brothers, there was an immediate increase in investors' risk aversion, leading to massive capital outflows from emerging markets. Indeed, it was precisely through the forex market that the contagion from the international market turmoil was transmitted to the Mexican financial system.

ELA: Emergency liquidity assistance

Fed: US Federal Reserve

Forex: Foreign exchange

IMF: International Monetary Fund

LOLR: Lender of last resort

MMLR: Market-maker of last resort

NAFTA: North American Free Trade Agreement

USD: US dollar

The peso suddenly fell by almost 25%, a depreciation that was warranted as it emerged that the country's terms of trade would soon deteriorate. Looming on the horizon were lower exports to the US of both manufacturing goods (which account for 80% of total revenue) and of oil. In addition, less income was foreseen from workers' remittances (a large proportion of these workers being involved in the US construction industry), and a severe drop in tourism income was expected due to the outbreak of the AH1N1 pandemic. Moreover, all sources of foreign financing seemed to be closed as international markets became completely illiquid. However, even after the massive depreciation of the currency, high volatility prevailed, fuelled by an unusually large demand for dollars from significant domestic corporations.

As it turns out, several large Mexican corporations had engaged in highly leveraged derivative operations that generated short dollar positions which grew exponentially along with the peso's depreciation. These positions triggered recurrent and significant losses to corporates, leading to dollar demand that further pushed currency depreciation, in turn driving more demand for dollars. Exchange rate volatility became a matter of public concern and fuelled even more negative expectations for the future value of the currency. The adverse dynamics of the exchange rate became a systemic risk for the financial system and for the real economy.

Furthermore, as domestic investors realised that important corporations were in financial distress, panic spread because these firms had issued large amounts of commercial paper on domestic and international markets. Consequently, the Mexican debt markets saw massive asset sales and a flight to high-quality assets, mainly domestic treasury bills. Commercial paper market and money market mutual funds were hit particularly hard. Although no money market mutual fund "broke the buck", investors, after seeing what was happening in other countries, immediately started withdrawing in large numbers. Soon afterwards, all domestic financial markets suffered from contagion. Trading in the commercial paper market practically ceased, the interbank market was severely impaired, and the markets for government bonds and quasi-government paper (bonds issued by the government to pay for the 1994 banking crisis) became illiquid.

Mexican banks, especially those owned by foreigners, immediately reduced their counterparty risk exposures. Although most banks had no liquidity problems, a handful of small niche banks were completely dependent on interbank markets for funding. These banks experienced severe liquidity constraints.

The failure of the interbank market to supply funding to the small banks (caused to a large extent by the industry's extreme risk aversion) became a real threat to financial stability. By the last week of October 2008, the whole financial system faced significant liquidity pressures, and high volatility prevailed in most of the domestic financial markets.

Moreover, some foreign banks even required their Mexican subsidiaries to provide funding to head offices as the disruption of the interbank markets in advanced economies led to an increase in demand for liquidity from any source, including emerging market countries. As documented by the central bank, the net exposure of banks domiciled in Mexico with foreign counterparts increased significantly in 2008 and 2009.

II. The institutional setting prior to the crisis

Domestic currency

The Bank of Mexico provides daily liquidity to the system through open market operations. After the market closes, a standing facility is open from which any bank can borrow at a high penalty rate. Banks borrow from the facility if they are unable to meet their daily liquidity needs through open market operations during business hours. Therefore, the recurrent use of this facility does come with some stigma attached to it.

The LOLR function was carried out at the full discretion of the central bank. Although the Bank of Mexico's governing Board has the legal authority, internal protocols, and rules and regulations to implement the function, the Bank chose not to make these factors public. Instead, the LOLR function was conducted with "constructive ambiguity".

Foreign exchange market

Since the adoption of the flexible exchange rate regime, the Bank of Mexico has tried to avoid direct interventions in the market. However, bouts of international financial turmoil, such as the Brazilian, Russian, and Asian crises, severely reduced liquidity in the forex market, resulting in very high volatility. Under those circumstances (high exchange rate volatility together with a sudden change in risk aversion leading to market instability and posing a risk to the domestic financial system), the Bank intervened. In order to provide liquidity, the Bank of Mexico pre-announced to the market that it would conduct a daily auction of US\$200 million with a minimum price equal to the previous day's closing rate plus 2%. The objective was not to defend any particular exchange rate level, but to mitigate volatility by offering some dollars at times when the supply had suddenly stopped. This mechanism, however, was not in place at the moment Lehman Brothers collapsed.

The central bank, under the mandate of the Exchange Commission,¹ accumulated a significant amount of foreign exchange reserves, equivalent to 8% of GDP, incurring high costs. In spite of the fact that Mexico has a free-floating exchange rate regime, the level of international reserves then was regarded by some rating agencies as insufficient when compared with the levels of other countries.

The Bank of Mexico had currency swap arrangements in place with the Federal Reserve System and the Bank of Canada to support the level of its international reserves. The swaps had been in place with these countries for many decades and were renegotiated with the signing of NAFTA in 1994. However, they were more a sign of good will and cooperation among the financial authorities of the three

¹ The Exchange Commission determines the foreign exchange regime and has the authority to decide the level of forex reserves. It is composed of six members, three from the central bank and three from the Finance Ministry. Should a tie occur after a vote is cast, the final decision is made by the Finance Minister.

countries than an effective mechanism to supply foreign currency to the Bank of Mexico.

Strong macroeconomic fundamentals, a sound domestic financial system, high levels of international reserves, and swap arrangements were intended to protect the economy from contagion and to serve as a deterrent to speculative attacks.

III. Actions to provide liquidity during crisis

Foreign exchange market

As the financial crisis deepened, it became evident that the traditional automatic mechanisms that the Bank of Mexico had in place to supply liquidity were insufficient. The most pressing problem was in the forex market. It was imperative to address the very high volatility of the exchange rate to reverse negative public expectations for the future value of the currency. Thus, the central bank, as the MMLR, decided to supply a large amount of dollars to the market. For that purpose, the bank used several mechanisms: daily, pre-announced auctions with a minimum price were again put in place and increased twofold, to US\$400 million. In addition, US\$100 million were auctioned daily without a minimum price. Furthermore, extraordinary auctions of dollars were carried out whenever the central bank deemed it necessary, and direct sales were made to specific banks that were short of liquidity. Market interventions during the crisis were massive and drained significant international reserves from the central bank. In the course of its actions, the Bank made it clear to the market that it was not defending any specific level of the exchange rate and that all such operations were fully sterilised. Domestic currency liquidity issues were dealt with by other means.

BoM USD sales in the open forex market, 8 October 2008–31 December 31 2009

(Billions of US dollars)

Table 1

Type of intervention	2008	2009	Total
Extraordinary auctions	11.00		11.00
Auctions with minimum prices (2%)	4.18	4.16	8.34
Unconditional auctions		10.25	10.25
Discetionary sales		1.84	1.84
Total	15.18	16.30	31.41

Notes: See BIS Working Paper No 429.

Sources: Bank of Mexico.

Although the massive forex interventions were successful in stabilising the market, as soon as the public realised that international reserves were rapidly falling, the use of reserves became a matter of concern. The announcements that the Federal Reserve had provided Mexico with a currency swap line worth US\$30 billion, and the IMF a flexible credit line for US\$50 billion were meaningful developments for market participants. Importantly, the support of the Fed and the IMF increased the resources available for foreign reserves by 100% and sent a powerful message

to investors that the country was carrying out sound economic and financial policies.

To provide guidance to the public, the Finance Minister and the Governor of the central bank published a detailed, one-year forecast for the balance of payments. The announcement disclosed that the government had already hedged its oil revenues for the next 18 months.

Liquidity in local currency

As domestic financial markets became illiquid, some were completely impaired; they posed an important systemic risk and a potential threat to the effective implementation of monetary policy. To provide liquidity to debt markets, several measures were taken.

To restore market confidence, the central bank became MMLR in several local financial markets. Daily liquidity, provided by the Bank of Mexico through open market operations, was lengthened in maturity to mitigate interbank market pressures. To ease financial conditions, the central bank carried out several auctions to purchase long-term government bonds in pesos and bonds linked to the CPI. In addition, the Bank of Mexico became the buyer of last resort by engaging in direct purchases of quasi-government paper and offering swaps of fixed for floating interest-rate instruments.

The Treasury modified the structure of its regular weekly auctions. Issuance of long-term bonds was reduced sharply, giving precedence to short-term government bonds offered to investors eager for liquid, risk-free, peso-denominated assets.

To support the emerging mortgage-backed securities market, the Federal Mortgage Agency purchased a significant amount of these assets and extended credit to some of the main non-bank financial intermediaries.

The bank supervisor temporarily allowed money market mutual funds belonging to a financial group to be supported by the bank's parent. Such support was given either through purchase of the fund's paper or by bringing the entire fund to the bank's balance sheet. Pension funds were allowed to expand their risk-taking through a change in VAR methodology with a view to preventing fire sales.

To make credit readily available to banks, the Bank of Mexico opened a discount window facility from which any bank could borrow. The operating procedures, interest rates charged, the wide variety of assets accepted as collateral, haircuts and other information were made public, and banks were invited to use the window. All this was done in the expectation that banks that required liquidity would overcome their reluctance to incur a stigma by borrowing from the central bank.

Measures to restore credit

Government development banks actively granted credit to the most affected sectors of the economy, automobile manufacturing and housing.

Meanwhile, the Bank of Mexico, using the Federal Reserve currency swap lines, auctioned US\$4 billion to the banking system so that the banks could offer dollar financing to their clients. Banks took US\$3.2 billion in loans of up to 88 days.

IV. Lessons for Mexico in handling liquidity disruptions during the crisis

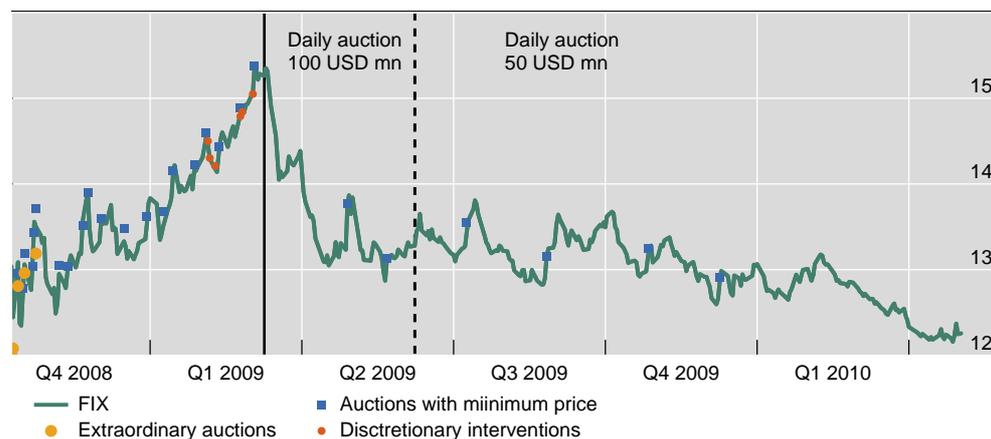
The global, system-wide nature of the recent crisis and trends in international and domestic financial development show how dependent modern financial systems are on the ability of markets to function without disruption. Of particular importance are the interbank, debt and derivative markets. Moreover, for emerging countries, in particular small open economies, disruptions in the forex market can rapidly become a risk to financial stability and to the real economy.

The dependence of financial system stability on market behaviour is so significant that it has changed the role of LOLR for many central banks. All around the world, monetary authorities have deviated from traditional doctrine in dealing with the recent crisis, abandoning the old paradigms that used to guide their policies.

Exchange rate and forex interventions

Mexican pesos per US dollar

Graph 1



The continuous black vertical line correspond to 09 March 2009, the dashed black vertical lines correspond to 08 and 09 June 2009.

Source: Central Bank of Mexico; author's calculations.

During the crisis, policymakers used several tools to support the financial system, with different degrees of success. The most effective were those aimed at resolving issues of illiquidity, both in foreign and domestic currency. In particular, the most pressing matter in mid-crisis was to restore confidence to the forex market in order to reverse public expectations of continued depreciation. The two most effective tools to cope with this problem were the role played by the Bank of Mexico as a credible MMLR in supplying a massive amount of foreign currency, and a good communications strategy – all in the context of strong macroeconomic fundamentals.

In domestic money markets, financial conditions were eased by reducing the duration of government paper held by the public and institutions via direct purchases of long-term government bonds, quasi-government paper and interest rate swaps. Direct bond purchases and interest rate swaps rapidly and effectively restored liquidity. The regulatory forbearance granted by the banking supervisor to temporarily allow the money market mutual funds that belong to a financial group

to be supported by the bank's parent group prevented them from "breaking the buck" and helped the industry regain public confidence. In addition, the regulation issued by the pension funds supervisor temporarily allowing intermediaries to increase their risk-taking effectively prevented fire sales of assets, in particular sales of long-term paper.

The importance of coordination among the financial authorities cannot be understated – both local and international. At the local level, investors welcomed the support given to money markets by the coordinated actions taken by the Treasury, the central bank, and the banking and the pension funds supervisors.

Regarding international cooperation, the flexible credit line granted by the IMF not only provided real resources, but also gave support to the economic and financial policies undertaken during the crisis, and was an explicit recognition of the country's strong macro fundamentals and sound financial system. In this respect, the swap lines offered by the Fed sent an additional powerful signal to market participants as to the extent of the US commitment to backing up the Bank of Mexico by providing liquidity in US dollars, thus making the central bank a credible MMLR in the forex market.

On the other hand, traditional liquidity support, through open market operations or the discount window, was less effective. The former did not guarantee that those banks requiring liquidity from the central bank would get it, and the latter did carry the previously mentioned stigma, which continues to be a real problem. In addition, determining a systemically important institution carries the risk of time inconsistency.

The crisis highlighted the need to improve regulations governing liquidity, collateral, derivative operations and bank resolution procedures. It also underscored the additional work that is required to address liquidity provision during the resolution process of an international bank, where cross-border cooperation is necessary.

The LOLR function has changed for good, and the distinctions between monetary and financial stability functions are very difficult to discern in times of crisis. Thus, another important task is to be prepared to carry out the ELA function in a modern, market-dependent, interconnected global financial system. The Bank of Mexico should have the legal authority, the protocols and procedures ready to act as LOLR, MMLR and as buyer of last resort when responding to an emergency. The function of LOLR inevitability exposes the central bank to losses, and if they materialise, they should be covered by the Bank's capital or by a reduction in seignorage payments to the government. Since central bank losses are ultimately a fiscal issue, it is of the utmost importance to have risk-sharing agreements with the Treasury in case such an event occurs.

A transparent, consistent communications strategy proved to be an important tool in restoring confidence. Therefore, the central bank and all agencies involved in ELA should also be prepared to communicate and be accountable to public opinion for their actions. The central bank needs to reinforce its macroprudential surveillance, research, analysis and market intelligence capabilities in order to respond wisely to a crisis and to avoid overreacting and creating moral hazard.

Some lessons were learned with regard to crisis prevention. Domestic financial authorities have to make it a permanent task to improve upon the information provided to the markets. They have to ensure that the information required to assess credit risk is timely, comprehensive and accurate. Regulation perimeters must

be frequently revisited as markets, operations and intermediaries evolve continuously. In addition, macroprudential regulations should be strengthened so that the emergence of black swans may be identified ahead of time. The globalised financial system poses additional challenges for crisis prevention, as the monitoring of global institutions and markets requires constant information-sharing. In order to achieve this objective, international cooperation among financial supervisors is needed.

I believe there is one lesson yet to be learned, relating to the conclusions from the cost-benefit evaluation of how the crisis was handled. The ELA provided to intermediaries and markets was effective in preventing a major disruption in the Mexican financial system. In spite of the fact that the fiscal costs were negligible, and that the central bank produced large profits, state intervention in the financial system modified the incentive structure for all participants. It remains to be seen if the benefits will outweigh the effects of moral hazard, which is the true cost of the actions that were taken.

Lessons from Bank of Japan's experience during the banking crises of the 1990s and the new dimension to LOLR stemming from the global financial crisis

Remarks by Hiroshi Nakaso¹

Lessons from the Japanese banking crisis of the 1990s

During the Japanese banking crisis of the 1990s, the Bank of Japan (BoJ) extensively exercised its lender of last resort (LOLR) function. Three main lessons emerge from this experience. First, "constructive ambiguity" can become counterproductive, or even destructive. Once a crisis erupts, we should be quite clear about the conditions on which LOLR support is extended. If ambiguity persists, depositors will run and interbank lenders will back away. Thus, ambiguity can fuel market disruptions. This is why the BoJ established principles that guide the provision of LOLR support. One set of principles aims at protecting the central bank as the provider of liquidity support, including the principle that that systemic risk must be imminent when such action is undertaken. Another set of principles reflects the idea that beneficiaries of liquidity support should be penalised in order to contain moral hazard. These latter principles include replacing the management of a failed bank; and wiping out the existing shareholders. The conditions set out in these principles are publicly known and still hold today.

The second lesson is that distinguishing illiquid from insolvent institutions is not easy. Conventional wisdom says that only solvent but illiquid banks should obtain LOLR support. However, in practice, most, if not all, bank failures start with liquidity problems that later develop into solvency problems. We have also learned that it is not only banks that can trigger a systemic crisis. Indeed, we were forced to recognise that non-bank financial institutions, such as security firms and insurers, can be the source of a market-induced systemic crisis.

The third and related point is that the scope of the LOLR function depends on how wide the existing safety net in the financial system is. The safety net arrangements in Japan during the 1990s were underdeveloped and lacked mechanisms to deal with undercapitalised banks and with problematic non-bank systemic institutions. For this reason, the BoJ's responsibility for financial system stability became that much larger and the scope of the LOLR function correspondingly wider. The BoJ provided some ailing banks with capital; it created a bridge-bank on its own; and it provided liquidity to a troubled non-bank security firm. We took these decisions because we judged they were necessary to maintain financial stability. However, the BoJ ended up by incurring credit losses in excess of 200 billion yen (2 billion dollars). Since then, Japan's financial safety net has been

¹ See also "Financial Crises and Central Banks' Lender of Last Resort Function," Remarks by Hiroshi Nakaso, Deputy Governor of the Bank of Japan at the Executive Forum Hosted by the World Bank, 22 April 2013, www.boj.or.jp/en/announcements/press/koen_2013/data/ko130423a1.pdf.

reshaped by a series of legislative measures, so that today the scope of the BoJ's LOLR function has become much narrower.

The global financial crisis and LOLR

Let me now move on to the new dimensions that the recent global financial crisis has added to the LOLR function. Let me focus on two aspects.

The first is the role of what may be called the *market-maker of last resort*. During the crisis, it became clear that systemic risk can be magnified through mutually reinforcing declines in funding and market liquidity. A prime example is the developments in autumn 2008, when money markets become dysfunctional because of heightened concerns among market participants about counterparty credit risk. In response, central banks provided liquidity in key funding markets through various forms of open market operations. These included the Fed's provision of liquidity to issuers of commercial paper (CP) and holders of asset-backed securities (ABS), and the BoJ's outright purchases of CPs and corporate bonds. In the same vein, at the height of the euro area sovereign debt crisis, the European Central Bank (ECB) conducted large-scale long-term refinancing operations (LTROs) on a full allotment basis to address market fragmentation. As these measures substituted for the intermediation function of markets, we can probably say that a central bank's LOLR function has evolved to encompass the role of market-maker of last resort.

The second dimension I would like to highlight is the role of what may be called the *global lender of last resort*. The global financial crisis demonstrated that systemic risk can spill over across national borders. Deepening financial globalisation has been associated with financial institutions broadening their intermediation activities into non-home currencies. During the recent financial crisis, US dollar liquidity shortage became an acute concern, especially among European banks. In response, the ECB and the Swiss National Bank each entered into swap arrangements with the Federal Reserve at the end of 2007 to obtain dollars for onward transmission to financial institutions operating in their respective markets. The BoJ, the Bank of England, and the Bank of Canada joined in after the collapse of Lehman Brothers. With the deepening of Europe's sovereign debt problem, this arrangement was reinforced in 2011 into a network of bilateral swap arrangements that provides the six participating central banks with access to the major currencies other than the US dollar, should a liquidity crunch occur in these currencies. This is now an open-ended arrangement. I think one can say that this provision of non-home currencies under central bank cooperation embodies the role of a global lender of last resort.

Having lived through these eventful years, my observation is that, although the importance and the essential nature of a central bank's LOLR function has remained the same, the ways in which this function is exercised have evolved. Bagehot's principles may well have to be rewritten in the new context. I think the central banking community needs, perhaps more than ever, to work closely together in order to constantly refine their LOLR tools with a view to meeting the potential challenges arising particularly from globalisation and thus better withstanding future shocks.

Why central banking should be re-imagined

Perry Mehrling¹

Why does central banking need to be re-imagined?

The urgency of the task arises from the experience of the Global Financial Crisis, during which central banks intervened in dramatically new ways and to a dramatically greater degree than ever before, at least in peace time. Central banks invented new tools on the fly, because the familiar old tools were not working. Now the crisis is over comes the important intellectual task of understanding how these new things fit within the standard pre-crisis toolkit. Just so, Borio and Disyatat (2009) distinguish between the old “interest rate policy” and the new “balance sheet policy”, urging us to understand the latter as, on the one hand, nothing more than an extension of traditional techniques of FX intervention to a broader asset class and, on the other hand, nothing more than use of the central bank balance sheet to implement debt management policy that is more traditionally undertaken by the Treasury. The present paper can in part be understood as a critical but sympathetic reconsideration of this early appraisal.

But the challenge of re-imagining central banking is not just because of the crisis. In retrospect, the crisis can be viewed as the first full-fledged test of the emergent system of financial globalisation, which had been building bit by bit for three decades at least. The “financial” dimension of this construction has involved ever-increasing integration of capital markets with money markets; so-called “shadow banking”, which is to say money market funding of capital market lending, is the quintessential institutional form of this new construction (Mehrling et al (2013)). Meanwhile, the “globalisation” dimension has involved ever-increasing integration of funding markets with the central dollar funding market. Not only is the dollar the world’s reserve currency, but the dollar money market is also the world’s funding market, and the dollar money market is linked to all other funding markets through the foreign exchange markets, all of which are backstopped to varying degrees by national central banks (Mehrling (2013)). Either of these developments alone would have warranted re-imagining central banking, even had there been no crisis.

A great deal of what needs to be re-imagined concerns narrowly technical matters, of course, but it is important to appreciate that the challenge of re-imagining central banking is not merely technical. Indeed the political economy challenge is just as great, perhaps even greater. In the heat of the moment, central banks acted substantially on their own, and the backlash from this perceived overreach has been significant and may even be gathering strength. In the United States, in particular, central banking has always been a highly suspect enterprise, embodying as it does the three biggest bogeymen of American politics: Big Finance, Big Government, and the Big Wide World. Other countries face their own political economic challenges, but the central role of the dollar in the global funding system, and the central role of the US Federal Reserve System as ultimate backstop of that

¹ Institute for New Economic Thinking, and Barnard College, Columbia University.

system, renders the US political economic challenge of larger global concern. The task of re-imagination is also a task of re-legitimation.

In peacetime, when the special role of central banks in facilitating war finance recedes from memory, the legitimacy of central banking derives from its success in putting bounds on what Ralph Hawtrey famously called the “inherent instability of credit” (Hawtrey (1913)). Before the business cycle, there was the credit cycle, in which a credit-fuelled economic upturn tended to feed upon itself on the way up in a euphoric but unsustainable expansion until it hit some supply constraint or other, whereupon a self-reinforcing downturn would commence. The most fundamental task of central banking is to put a floor on such downturns, so sustaining economic activity during the period of necessary restructuring that follows any boom; this is the classic “lender of last resort” role. A more refined task is to “lean against the wind”, with the idea of slowing unsustainable booms in order to reduce their euphoria-driven inefficiency and extend the period of expansion, while shortening the period of contraction on the way down; this is classic “monetary policy”.

In classic central banking, instability is an endogenous feature of the credit system, a feature inherent to all forms of credit and the central justification for expert management in the public interest. A perennial challenge for that management is the tendency of the specific mechanism of instability to change over time as the institutional structure of the underlying economy changes. Just so, Hawtrey (1932) was primarily concerned with a cycle driven by credit-financed trade inventories, while Hyman Minsky (1986) was concerned with a cycle driven by credit-financed business investment. For our own times, the bank-loan channel of credit has been substantially replaced by a capital-market channel, while free international capital flows provide global funding for domestic credit expansion. And yet, despite these institutional changes, the inherent instability of credit clearly survives, as the financial crisis so abundantly proved. The challenge for modern times is to devise mechanisms of stabilisation, both last resort and monetary policy, for expert management of the modern mechanism of instability.

The ever-present danger, in our own time just as much as in Hawtrey’s, is the prospect of rewarding bad behaviour. This is a technical problem, of course, but also a political economy problem. Bankers inevitably urge the systemic importance of their own personal survival in the downturn, even while they resist purportedly misguided interference on the way up. The political economy challenge was bad enough back when the cycle was bank-based and domestic; with practice we learned how a public-spirited central bank could, at least in principle, bring to heel the self-serving agendas of profit-seeking banks. But the problem is much more difficult in modern times when the cycle involves capital market finance at a global level. Individual national central banks, however public-spirited they might be, are no match for the self-serving agendas of globe-straddling modern banks, much less their non-bank penumbra, and anyway what is public interest at the national level may be quite a different thing from public interest at the international level.

The dream of a full-fledged global analogue to domestic political equilibrium between the money interest and the public interest seems likely to remain just that, a dream. But partial analogues are not only possible but also seem actually to be emerging in various sub-global organisational forms for central bank cooperation, both at the top of the hierarchy (central bank swap lines) and farther down (regional cooperation such as Chiang Mai and the European Monetary System). For the purposes of this paper, we take these emerging structures of a new international

monetary system for granted, and focus instead on the re-invention or re-imagination of the role of individual central banks within that system.

What do central banks do?

Discussion about the role of central banking commonly distinguishes three areas of responsibility: lender of last resort, regulation and supervision, and monetary policy for macroeconomic stabilisation. It is natural therefore to organise the re-imagination task by asking how emergent financial globalisation challenges the role of central banks in each of these three dimensions.

Lender of last resort

In previous work, I have characterised the evolution of central bank last resort intervention during the crisis as a matter of three stages (Grad et al (2011)). First came aggressive monetary easing as the Fed cut the Fed Funds target from 5% to 2% in the months before Bear Stearns; then came lender of last resort as the Fed liquidated its holdings of Treasury bills and lent the proceeds to a wide variety of counterparties against a wide variety of collateral; and then, after Lehman and AIG, came a stage that I have called dealer of last resort (Mehrling (2011), see also Buiter (2007) and Tucker (2009)).

In this third stage, the Fed finally put a floor on the crisis by intervening as a market-maker, first in the short-term money market, where it served as the central counterparty standing between borrowers and lenders who were no longer willing to do business bilaterally, and then in the long-term capital market, specifically in the market for mortgage-backed securities where the Fed was for a while purchasing 90% of all new issues in an effort to get that market going again. In the process, the Fed's balance sheet ballooned to three times its pre-crisis size, even while private bilateral credit markets shrank by even more. This third-stage dealer of last resort intervention is the biggest new thing that requires re-imagination.

In an important sense, dealer of last resort is merely a modern version of the classic Bagehot Rule for lender of last resort, which famously urged lending freely at a high rate against security that would be good in normal times. The natural analogue for today's dealer of last resort would urge trading freely at a wide bid-ask spread, against good security in the money market and in the class of good securities in the capital market. Analogously to the high rate of the Bagehot Rule, the purpose of the wide (or outside) spread is to ensure that the intervention is only supporting, not replacing, the market until it recovers and begins to trade again at a narrower (inside) spread.² Such intervention is thus, in principle, self-liquidating; after the crisis is over, counterparties on both sides of the central bank balance sheet should be able to find better pricing by doing business with each other directly. And as counterparties find one another, private credit should expand in line with central bank balance sheet contraction, in principle eventually back to normal.

In some respects, this self-liquidation channel for exit was operative, as for example in the case of the Commercial Paper Funding Facility. But it was hard to

² Last resort trading at prices away from fundamentals also works to mitigate moral hazard problems.

notice that exit in the aggregate data because it was overwhelmed by other interventions, specifically so-called quantitative easing, which sought to stimulate the economy more generally by pushing around interest rates and asset prices. This latter kind of intervention is monetary policy, not lender of last resort, and so requires separate discussion. The important point for now is simply to appreciate the consequence of dealer of last resort intervention for both the size and the composition of the central bank balance sheet.

The Fed's balance sheet, before and after the crisis, is shown below:

Federal Reserve (4 July 2007), in trillions				Federal Reserve (6 July 2011), in trillions			
Assets		Liabilities		Assets		Liabilities	
Treasury securities	\$.79	\$.82	Currency	Treasury securities	\$ 1.6	\$ 1.0	Currency
		.01	Reserves	Mortgage securities	1.0	1.6	Reserves
Other	.12	.08	Other	Other	.2	.2	Other
TOTAL	\$.91			TOTAL	\$2.8		

Here we see both the tripling in the overall size of the balance sheet, and the change in composition by the addition of mortgage securities. But the dealer function of the central bank does not emerge very clearly in this way of presenting the numbers.

To see the connection between central banking and modern financial markets it is more illuminating to present the numbers as a series of swap exposures, by adding short-term T-bills and long-term T-bonds to both sides of the balance sheet, and rearranging as follows:

Federal Reserve (6 July 2011), in trillions, restated			
Assets		Liabilities	
[Treasury bills	\$2.6	\$2.6	Currency/reserves]
[Treasury bonds	\$2.6	\$2.6	Treasury bills]
[Risky securities	\$1.0	\$1.0	Treasury bonds]
Other	.2	.2	Other

In this way of looking at the numbers, three fundamental risk exposures can be distinguished. The first line shows a kind of overnight index swap, in which the Fed receives the three-month T-bill rate and pays an overnight money rate. The second line shows a kind of interest rate swap, in which the Fed receives a fixed long rate and pays a fluctuating short rate. And the third line is a kind of credit default swap, in which the Fed receives the risky rate and pays the risk-free rate.³ In all three cases, the Fed has taken on risk exposures, and so made prices for those risk exposures, at a time when private profit-seeking dealers were unable or unwilling.

³ Compare Borio and Disyatat (2009, Table 1, p 7) which proposes a typology of balance sheet policy that distinguishes between "Bank reserves", "Public debt/securities", "Private debt/securities", and "Foreign exchange". In the swap exposure typology, "Foreign exchange" exposure would be booked as an FX swap.

The point to emphasise here is that these exposures, and their scale, arose as a consequence of dealer of last resort intervention (Mehrling (2011)). Even more, they arose in more or less this order, the money market swap first and then the capital market swaps afterwards. In both cases, the Fed in effect quoted an outside spread, and then let its balance sheet absorb the inventories of risk exposure. The first stage concerned the term funding market, whose acute dysfunction was tracked by the LIBOR-OIS spread (Swagel (2009)), until it was backstopped by expansion of the Fed's OIS swap exposure. As money markets recovered, however, the OIS exposure was not allowed to run off but rather was rolled over and expanded by replacing short-term loans with longer-term and riskier bonds in an attempt to backstop dysfunction in the RMBS market.

Subsequently, all three exposures were expanded by quantitative easing to arrive at the current balance sheet, which is shown below for completeness, although discussion of monetary policy is deferred to a later section. The important point to emphasise for now concerns the fourth line of the restated balance sheet, which shows the Fed's current reverse repo "exit strategy" combined with the Treasury General Account (swollen temporarily on account of the tax season). The restated balance sheet shows clearly how the Fed's current exit strategy is in effect focused on reducing its overnight index swap position, *not* the interest rate swap or credit default swap positions, which apparently it intends to hold to maturity.⁴ Observe that, if the Fed actually held any Treasury bills outright, it could easily reduce its OIS position simply by selling those bills, but it does not hold any Treasury bills. As a consequence it is forced to resort instead to term borrowing that, in effect, nets out against its implicit Treasury bill exposure. All of this is much clearer in the swap exposure accounts than in the standard accounts.

Federal Reserve (23 Apr 2014), in trillions				Federal Reserve (23 Apr 2014), in trillions, restated			
Assets		Liabilities		Assets		Liabilities	
Treasury securities	\$2.3	\$1.3	Currency	[Treasury bills	3.9	3.9	Currency/reserves]
Mortgage securities	1.7	2.6	Reserves	[Treasury bonds	4.2	4.2	Treasury bills]
		.2	Reverse repo	[Mortgage securities	1.7	1.7	Treasury bonds]
		.1	Other	[Treasury bills	.3	.3	Reverse repo/other]
TOTAL	4.2						

The central question raised by looking at matters through a swap exposure lens is whether the exit strategy *should* be focusing on the OIS position first, or whether it might better focus on the IRS and CDS positions.⁵ From a purely operational standpoint, of course, swapping bonds for bills first (ie exiting IRS) would make it easier to exit the OIS position second. But from a deeper point of view as well, it might be argued that a market-based credit system requires market pricing of

⁴ An alternative interpretation of the reverse repo facility is that it is intended to provide direct liquidity support to the non-bank sector, rather than relying on indirect support through bank intermediation.

⁵ Borio and Disyatat (2009) in effect endorse exit from OIS first, on two grounds. First, such exit would enable desired reversion from Scheme 2 (market interest on reserves) to Scheme 1 (below-market interest on reserves). Second, liquidation of the other swaps would likely involve taking capital losses, with unknown political economy repercussions.

capital assets as a prerequisite for market funding. The assets are collateral for the funding, and if the market does not believe the asset prices then it's going to be pretty hard to get the funding, and if the private sector won't fund private holding of the Fed's asset positions then exit is *de facto* impossible. During the crisis, the Fed was essentially forced to bring the shadow banking system onto its own balance sheet and there it will remain until private balance sheets are willing to take it back.

So far, our discussion has focused on the balance sheet of the Federal Reserve in isolation from other central banks, but in fact most of the other important central banks experienced similar balance sheet changes, because the crisis was global. The crisis was global because money market funding is global, but the collapse of shadow banking onto the traditional banking system was local (national), depending on which particular nationally domiciled bank had the responsibility of rolling over the money market funding of a given shadow banking entity. Behind each of these nationally domiciled banks was a national central bank, which found itself responsible for rolling over funding in a foreign currency. The crisis thus made it apparent that financial globalisation requires a *global* lender (and dealer) of last resort.

Because the funding of the global shadow banking system was reliant on the Eurodollar market, the question of global lender of last resort was really a question about backstop for that market. Although spot Eurodollars never broke the buck against spot Fed Funds, term Eurodollars did diverge strongly. After Bear Stearns, that divergence was capped for a while, presumably through foreign central bank support with implicit Fed backstop. But then, after Lehman and AIG, the implicit Fed backstop got triggered and became explicit to the tune of \$600 billion in central bank liquidity swaps.

It is thus clear that re-imagining central banking requires at a minimum building out this central bank swap facility, and the first steps in that direction have already been taken. The decision in October 2013 to establish permanent unlimited swap lines between the C6 – the Fed, the European Central Bank, the Bank of Japan, the Bank of England, the Swiss National Bank and the Bank of Canada – is part of that re-imagining, as also is the Bank of England's new expanded liquidity insurance facilities (Bank of England (2013))⁶. What is emerging is a dealer of last resort system for the world money market that operates through a consortium of central banks, not exclusively the Fed. Given the swap line backstop, there is now nothing to prevent any central bank from lending in dollars to its own nationally domiciled banks by creating its own dollar liabilities.⁷ The next step is to integrate other currencies into this system, not so much by expanding membership in the C6 as by implementing bilateral swaps with particular members of the C6, or with the IMF. There remains a lot of work to be done, but the experience of the crisis has given clear direction for re-imagining the lender of last resort function for a financially

⁶ Quite properly the new liquidity insurance facilities are characterised as experimental. It is important to appreciate that the most important dimension of experimentation concerns pricing. Here the idea that central banks want to be providing an outside spread, not an inside spread, is crucial for avoiding mispricing.

⁷ It should perhaps be noted that the emergent system appears *not* to be the multipolar system imagined by many academic authors. It is still very much a dollar system, but with responsibility for backstop distributed across the C6 rather than exclusively held by the Fed. The crisis has made clear to everyone that no individual central bank, including the Fed, is prepared to serve as global lender of last resort.

globalised world. This emergent system recognises the essential fact that liquidity is a public good, indeed a global public good.

Regulation and supervision

Acceptance by central banks of their role in providing this vital public good inevitably provides the lens through which questions of regulation and supervision will be viewed henceforth. Central banks now recognise that any financial crisis in the new market-based credit system will inevitably land on their own balance sheets, so they have an incentive to build supervisory and regulatory structures that reduce the likelihood of financial crisis in the first place. To date, the main thrust of policy discussion has been to find ways to increase capital buffers throughout the system so as to safeguard the public purse, including quite significant global coordination to head off regulatory arbitrage across jurisdictions. This effort is well intentioned, and in places necessary, but it is quite definitely not sufficient. Capital buffers do little to safeguard against a liquidity-driven downward spiral, and currently the existing buffers seem to be operating mainly to suppress credit expansion. Re-imagining central banking means going beyond capital buffers.

The figure below provides one framework for thinking about the underappreciated liquidity dimension of the problem (Mehrling et al (2013, Figure 1).

A market-based credit system

Capital funding bank		Global money dealer		Derivative dealer		Asset manager	
Assets	Liabilities	Assets	Liabilities	Assets	Liabilities	Assets	Liabilities
RMBS	MM funding	MM funding	"deposits"	CDS	CDS	"deposits"	Capital
CDS				IRS	IRS		CDS
IRS				FXS	FXS		IRS
FXS							FXS

In this idealised map of the shadow banking system, money market funding of capital market lending takes place in so-called capital funding banks. To focus attention on liquidity issues, we suppose that the solvency issues of capital funding banks have been resolved by a robust system of risk transfer using derivatives. By construction, the CFB perfectly hedges all credit risk, interest rate risk, and foreign exchange risk, so that the only remaining risk is rollover funding risk.

As the figure makes clear, in a market-based credit system, the key to funding rollover is the dealer system that makes markets, including both the global money dealer, who makes money markets, and the derivative dealer, who makes the risk markets that establish the price of collateral. The recent regulatory move to organise the trading of swaps on exchanges, with explicit clearing house backstops to guarantee performance, represents a positive first step toward increasing the robustness of the private dealer system. The central argument for this move has been the importance of price transparency, but it should be clear that the same move is also important from a liquidity point of view. Centralisation of risk is key to management of risk; one lesson of the global financial crisis is that decentralisation of risk is not the same thing as diversification of risk!

In a market-based credit system, one wants to backstop asset markets, not individual institutions. A clearing house that guarantees the performance of its members has the incentive to put into place regulations that ensure that performance, as well as to hold sufficient liquidity reserves and backstop credit lines to enable it to continue to perform even if individual members fail; the central bank stands in the wings as lender/dealer of last resort. (Pricing of the central bank backstop is key to avoiding moral hazard.) The too-big-to-fail problem comes substantially from the fact that, until now, there has been no central clearing mechanism, so that the only way to backstop markets (a legitimate public good) has been to backstop individual dealers (not a legitimate public good). In future, given adequate support of the dealing system as a whole, individual dealers can be allowed to fail without fear of triggering downward liquidity spirals.

The move toward central clearing counterparties is however only a first step. At present the system of risk transfer in the real world is far from the perfection assumed in the figure for the ideal case; indeed, if any one flaw can be singled out as the Achilles heel of the pre-crisis shadow banking system it would have to be the system of risk transfer, which largely involved re-purposing instruments and mechanisms, such as tranching and securitisation, that had originally been designed with quite different uses in mind. Not surprisingly, the resulting Rube Goldberg machine collapsed once it came under pressure.

In this respect, the move in regulatory circles toward reducing complexity is clearly on the right track, although it is perhaps insufficiently appreciated that derivatives may be part of the solution, not just part of the problem. (Just as, in my idealised shadow banking system, derivatives are assumed to effect perfect risk transfer so that the capital funding bank is perfectly hedged.) Keeping in mind the overarching objective of facilitating market pricing of the key dimensions of risk could help give direction to an otherwise unfocused attack on the overgrown financial shrub, an attack that otherwise risks pruning away essential stems instead of just unnecessary deadwood and congestion. There is a legitimate need for risk transfer; the challenge is to find better ways to effect that transfer.

Stabilisation

Before the crisis, the debate about stabilisation policy had achieved an extraordinary degree of refinement, and also of consensus focused narrowly on the use of interest rate policy to achieve an announced inflation target. Inflation targeting was supposed to work by stabilising expectations of the long-run price level, thus providing an anchor whereby private credit markets could find equilibrium. Unfortunately, this consensus wound up losing sight of the inherent instability of credit, a phenomenon ruled out by assumption in the general equilibrium models that guided policy. Meanwhile the crisis amply demonstrated that market-based credit is just as much prone to instability as bank-based credit. The first answer to the crisis involved re-imagining the lender of last resort, followed by supervision and regulation to ensure the robustness of private lenders of first resort. The task of re-imagining monetary policy comes next.

In a world of highly developed financial markets, there is a very real question why central banks have any leverage at all in ordinary non-crisis times. Indeed, the standard Brainard-Tobin framework depends crucially on market imperfections. As Tobin (1969, p 26) himself states explicitly: "If the interest rate on money, as well as the rates on all other financial assets, were flexible and endogenous, thenthere

would be no room for monetary policy to affect aggregate demand.” But this is a feature of their model, not the world. The framework of Borio and Disyatat (2009) importantly diverges from Brainard-Tobin in one crucial respect, by introducing the settlement constraint in the payments mechanism, a constraint that the central bank can relax because the ultimate means of payment is its own liability. Even in a world of developed financial markets, this feature is the key source of central bank leverage over the overnight interest rate, since the overnight rate is simply the price of putting off settlement for a single day.

Here’s how it works. Every day, agents who are in deficit at the clearing have to find a way to convince agents who are in surplus to help them settle, either by buying one of their assets (at a price) or by extending them credit (at a price). By targeting the overnight rate, monetary policy works essentially by relaxing or tightening the ultimate payment constraint, which is to say by making it easier or harder for deficit agents to delay settlement. Arbitrage then connects the overnight rate to longer-term rates, and also connects the rates in one currency to the rates in other currencies.⁸ Control of the overnight rate is thus the source of indirect influence over financial markets more broadly, and arbitrage is the essential transmission mechanism for that influence.

This much, while perhaps not explicit in the treatment of Borio and Disyatat, is fully consistent with what they say. Going beyond Borio and Disyatat, it can also be argued that the central bank’s special position in the payments system is also a potential *direct* source of leverage over other asset prices, not just the overnight rate, simply because the central bank can always buy an asset simply by paying with its own liabilities. This is the essence of typical war finance, when the central bank pegs the price of government debt, and makes good on that peg by buying debt as needed using its own liabilities. It is also the essence of so-called quantitative easing. In both war finance and quantitative easing, the central bank operates as dealer of first resort (not last), setting the inside spread (not the outside spread), directly making markets rather than supporting private dealers in their own efforts.

From this point of view, one can make a sharp distinction between dealer of last resort and quantitative easing. What central banks did when they took collapsing money markets and dysfunctional capital markets onto their own balance sheet was to become dealer of last resort, and can be understood and justified as the provision of a public good, namely liquidity. Central banks became the market because the market disappeared; they expanded their balance sheets and became public shadow banks as a way of putting a floor on the collapsing private shadow banking system. Had they stopped there, exit would have been relatively easy once the private market recovered. But they did not stop there.

The current exit problem has arisen not because of dealer of last resort, but rather because of quantitative easing. Under pressure to stimulate the economy, central banks have sought to drive market yields lower, not just on short-term funding but also on longer-term bonds, both risky and otherwise. In doing so, central banks became the market because policymakers preferred different, ie higher, prices. The mental model behind this policy was essentially Tobin-Brainard, but the world in which the policy was implemented was the modern one of financial

⁸ To avoid possible misunderstanding, let it be clear that arbitrage is, in practice, not sufficient to enforce either the expectations hypothesis of the term structure or uncovered interest parity. These too are properties of idealised models, not properties of the real world.

globalisation, not the model world of market imperfection. In the real world, the sine qua non for exit from balance sheet policy is exit from policy-imposed levels of asset pricing.

Conclusion

The global financial crisis has revealed to all the necessity of last resort support for the emerging new system of market-based credit. In normal times, such support involves establishing a bid-ask spread outside the spread quoted by private profit-seeking dealers. In normal times the central bank supports the market; only in crisis times does it become the market.

Embracing this new responsibility inevitably involves embracing also the responsibility for ensuring robustness of the private dealer system through regulation and supervision, in order to reduce the probability that last resort support will be needed. Whereas in the bank-loan credit system regulation focused naturally on banks, in the modern system it focuses naturally on dealers. Continuity of price, both the price of capital asset collateral and the price of money market funding, is the key to avoiding crisis.

These first two steps toward re-imagining central banking are by now well under way. But the third, which involves the reconceptualisation of monetary policy, remains in its infancy. The zero interest rate policy, quantitative easing and also so-called forward guidance are all policies that derive their analytical legitimacy from an outdated theoretical framework that was devised to address the operations of the older bank-loan based credit system. That framework now requires significant updating for the modern world. Money does matter, notwithstanding flexible and endogenous asset prices and funding rates. The central bank's position at the apex of the clearing system gives it leverage over short-term interest rates. The challenge facing us is to reconceptualise how to use that leverage in the public interest, toward the goal of stabilisation.

Finally, re-imagining central banking is a technical challenge, requiring sustained engagement with the institutional realities of modern money markets, both domestic and international. But it is also a political economy challenge. Re-imagining central banking is fundamentally about re-imagining the interface between the central bank backstop and the private profit-seeking dealer system, as well as the interface between each individual central bank and the larger international monetary system. It is about re-imagining the interface between the money interest and the public interest, as well as the interface between national and global public interest.

References

- Bank of England (2013): "Liquidity insurance at the bank of England", www.bankofengland.co.uk/markets/Documents/money/publications/-liquidityinsurance.pdf.
- Borio, C and P Disyatat (2009): "Unconventional monetary policies: an appraisal", *BIS Working Papers*, no 292, November.
- Buiter, W and A Sibert (2007): "The central bank as market maker of last resort", *Willem Buiter's mavericon* (FT blog post), *Financial Times*, 12 August, <http://blogs.ft.com/mavericon/2007/08/the-central-banhtml/#axzz36xE5UokT>.
- Grad, D, D Neilson and P Mehrling (2011): "The evolution of last-resort operations in the global credit crisis", unpublished mimeo, http://papers.ssrn.com/sol3/papers.cfm?abstract_id=2232348.
- Hawtrey, R (1913): *Good and Bad Trade; an inquiry into the causes of trade fluctuations*, Constable and Co.
- Hawtrey, R (1932): *The Art of Central Banking*, Longmans, Green.
- Mehrling, P (2011): *The New Lombard Street, How the Fed became the Dealer of Last Resort*, Princeton University Press.
- Mehrling, P, Z Pozsar, J Sweeney and D Neilson (2013): "Bagehot was a shadow banker: shadow banking, central banking, and the future of global finance", in S Classens, D Evanoff, G Kaufman and L Laeven (eds), *Shadow Banking Within and Across Borders*, World Scientific Publishing Company.
- Mehrling, P (2013): "Essential hybridity: a money view of FX", *Journal of Comparative Economics*, no 41, pp 355–63.
- Minsky, H (1986): *Stabilizing an Unstable Economy*, Yale University Press.
- Swagel, P (2009): "The financial crisis: an inside view", *Brookings Papers on Economic Activity*, Spring, pp 1–63.
- Tobin, J (1969): "A general equilibrium approach to monetary theory", *Journal of Money, Credit, and Banking*, vol 1, no 1, pp 15–29.
- Tucker, P (2009): "The repertoire of official sector interventions in the financial system – Last resort lending, market-making, and capital", Remarks at the Bank of Japan International Conference "Financial system and monetary policy: implementation", Tokyo, 27–28 May 2009.

International lender of last resort: some thoughts for the 21st century

Jean-Pierre Landau¹

How should international liquidity be provided and by whom? Does the world need an international lender of last resort (ILLR)? These questions have been at the centre of debates over the international monetary system for many decades (see the seminal article by Fischer (1999)). They have taken on a new flavour and importance in the last few years, with the significant expansion of both private gross cross-border capital flows and international balance sheets. The financial crisis and subsequent turbulence have confronted emerging market economies (EMEs) with severe tensions and difficult trade-offs for policymakers.

The policy challenge, also, has changed. For a long time, only countries facing specific balance of payments difficulties were confronted with foreign currency shortages. The policy problem was to find the right mix between external financing and domestic adjustments. Conditionality, as defined and implemented by the IMF, was key in this context. While this framework, is, of course, still valid, the problem has become broader. A novel priority is to avoid liquidity disruptions in the global financial system, where private financial institutions engage into cross-border maturity transformation, with flows denominated mainly in a few major currencies.

The aim of this paper is to revisit the issue in the context of modern capital markets with deep financial integration, strong macrofinancial linkages and the expansion of privately created global liquidity.

Reasons to reconsider the issue

Over the last decade, foreign exchange reserves have increased at a broadly constant rate of 13–15% a year. Despite temporary deviations, the persistence of the trend is remarkable and largely independent of the changing economic environment. The growth rate in foreign exchange reserves may be one of the most robust empirical regularities in modern international economics.

No model satisfactorily explains that phenomenon. The ratio of international reserves to other economic and financial indicators of external financing needs has steadily increased, whether the reference is imports, GDP, net or gross external positions, or external debt denominated in foreign currency (the so-called Greenspan-Guidotti rule). All empirical and theoretical models have been powerless to account for this evolution.

¹ Sciences Po-Paris.

Self insurance

The most common explanation – unless, perhaps to invoke China – is “self-insurance” (see, for example, Obstfeld et al (2010)). It is worth exploring why it may lead to a continuous increase in foreign exchange reserves.

During the 2008-2009 crisis, even countries with flexible exchange rate regimes and very high levels of reserves felt the need to enter into foreign currency swaps with the Federal Reserve. Hence, no other buffer seemed big enough to protect a financially open economy against a systemic shock.

There are four main explanations for such behaviour.

First, the nature (and size) of liquidity needs is changing. During the crisis, foreign exchange reserves were used as a tool for ensuring internal – as well as external – financial stability. National central banks acted as lenders of last resort (LOLR) to their domestic institutions in foreign currencies, especially the US dollar. Foreign exchange reserves were used to help not only banks but in some instances also non-bank corporates who faced funding shortages due to sharp cutbacks in cross-border bank lending. In many cases, those needs put huge strains on available reserves (for instance, the ECB’s reserves would not have sufficed to fund its dollar liquidity provisions operations without the swaps from the Federal Reserve (see Allen and Moessner (2010)).

Second, the nature of global capital flows is changing. The model of global banking is rapidly evolving towards more segmentation with a shift from branches to locally regulated and funded subsidiaries. Cross-border banking flows have diminished compared with portfolio flows. We may be entering a “second wave” of global liquidity” (Shin (2013)), whereby global funds and asset managers drive the volume and direction of capital flows. Those flows may prove even more fickle than bank credit. Studies show that their sensitivity to risk aversion appears to have increased since the crisis (Ahmed and Zlate (2013)). The change may be partly attributed to the growing importance of EME-dedicated funds (open-ended) that allow investors to move in and out quickly, creating strong volatility and putting significant pressure on exchange rates. Receiving countries may want to keep the option to smooth out the adjustment through reserve accumulation and depletion.

Third, and more broadly, liquidity shocks are self-amplifying and perpetuating. Once an institution (or a country) is perceived as vulnerable, the probability of a squeeze or a run increases exponentially. Perceptions become self-fulfilling. Therefore, thresholds matter as they influence perceptions. Thresholds, in turn, may be relative. Reserve holders appear to be judged - by investors and credit rating agencies alike – by the size of their reserves relative to others. Countries may thus feel compelled to accumulate ever-higher reserves, irrespective of their estimated needs (CGFS (2011)). Hence, the apparent disconnect between the demand for reserves and country-specific macroeconomic and financial variables.

Fourth, liquidity shocks are very costly. Once a country runs out of foreign currency, the only option is conditional support from the IMF. Apart from the political difficulties arising from an externally negotiated adjustment, a strong stigma is attached to such a situation, at least in the short run. This stigma may further aggravate the liquidity shortage while the programme is being discussed.

Overall, countries’ incentives are very different – indeed opposite – from those of private institutions. For private financial institutions, there is a tendency to

underestimate liquidity needs in normal times, with the expectation that the lender of last resort will bail them out if a shortage occurs. For countries, the bias goes in the other direction. Without an ILLR, precautionary motives will lead to an over-accumulation of liquidity by the public sector. There is good evidence that this logic is internalised by markets: looking at different countries, especially in times of stress, there appears to be a strong differentiation in sovereign spreads and exchange rate movements according to the level of their foreign exchange reserves (see Aizenman et al (2014) and Bussière et al (2014)).

Costs

Accumulation of foreign exchange reserves, however, comes at a cost to the system. While these costs are not fully internalised by countries (which can be both holders and issuers of reserves), they may be significant.

First, there is an impact on long-term interest rates. Reserve accumulation by EMEs, and their reinvestment in advanced countries public debt, create a worldwide shift in preferences for risk-free assets that may be enough to keep real rates at low levels. Some would argue that this feedback loop creates a permanent disconnect between market rates and the Wicksellian natural rate of interest (see Borio and Disyatat (2011)), and may be partly responsible for the build-up in financial imbalances.

At the very least, the build-up and reinvestment of reserves have a short-term impact on dollar long-term rates. Recent empirical studies (see Beltran et al (2013)) estimate that, if foreign official inflows into US Treasuries were to fall in a given month by \$100 billion, then five-year Treasury rates would rise by about 40–60 basis points in the short run. Once the reaction of private investors to the yield change is taken into account, the long-run effect would be about 20 basis points.

To the extent that central banks care about long-term rates, reserve accumulation does not occur in isolation from monetary policy. It is hard to tell whether future policymakers will show the same activism towards the long end of the yield curve as they do now, or whether the “benign neglect of long-term rates” (see Turner (2013)) will resume as in the preceding decades. Should long-term rates become a permanent part of the set of policy variables, disruptions introduced by movement of foreign exchange reserves may become extremely material.

Second, abrupt withdrawals of reserves have the potential to create significant financial disruptions in advanced countries’ capital markets and banking systems, and did so for brief periods in 2009–10 (Nakaso (2013)). Those disruptions also affect reserve holders, whose reserves may depreciate in value in case they are massively and simultaneously used. Reserves do not represent true “outside liquidity” and reserve holders may be victims of a fallacy of composition (Obstfeld and Rogoff (2009)). Countries might find themselves poorly protected against widespread, aggregate, liquidity shocks.

Finally, one might want to think about the true nature of global capital markets when a significant part of gross cross-border assets and liabilities are located on the balance sheets of public entities whose behaviour may differ from the canonical model of risk-return-maximising financial intermediaries. Foreign official holdings of US Treasuries amount to over a third of the total outstanding. “Such large players can make for substantial interactions even in a very large market..... A world in which

officials hold large portions of the largest bond markets does not strike me as an ideal one" (Caruana (2012)).

The rest of this paper, therefore, is based on the assumption that the central banking community is looking for ways to mitigate, at least partially, the systemic issues raised by reserve accumulation.²

Prospects and thoughts

Two considerations should be kept in mind while exploring the scope for multilateral arrangements for liquidity provision between central banks.

First, the lender of last resort is not meant to provide balance of payment support or ease capital account tensions. Its *raison d'être* is to prevent financial panics and self-perpetuating liquidity spirals. It should not substitute for other institutions and for mechanisms with different purposes. For instance, it is not clear that an ILLR should help a country fend off speculative attacks against its currency. There is still need in the international financial system for a conditional balance of payment support mechanism, as currently provided by the IMF. And there is room for countries to build buffers against country-specific shocks generated by their own policies or even the external capital markets.

Second, there are natural asymmetries in the system. Ultimately, official liquidity, one that is accepted as a medium of exchange by all central banks, is necessarily denominated in one of the reserve currencies. So any lending of last resort function, however symmetrical in design, is likely to involve an asymmetrical increase in exposures between central banks that issue a reserve currency and those that do not. It may therefore carry an element of risk with potential fiscal or quasi-fiscal costs for some participants.

In a domestic setting, the risk incurred by LOLR is eliminated, or reduced, through the provision of collateral. With some exceptions,³ swaps between central banks are unsecured.⁴ This is a major difference between the domestic and the international LOLR role, one that may significantly constrain the design of a

² The president of the New York Fed recently said that he thinks "there is another area we need to work on, an area where very little has been done to date. We need to collectively devise a better international mechanism for facilitating adjustment when the direction of capital flows changes abruptly. The current regime strikes me as inefficient and often ineffective. Holding large cushions of foreign exchange reserves is expensive, drawing down those reserves is often unattractive because of the potential adverse signal that this sends, and EMEs are loath to turn to the International Monetary Fund for resources to cushion the adjustment process. It seems to me that we could design a better global solution of collective insurance – access to liquid resources in times of stress that were not stigmatized and that could and would be used to facilitate adjustment. This could help reduce market volatility and dampen the size of foreign exchange and other adjustments. This is a topic, in my opinion, that deserves greater attention from central bankers around the world."

³ The ECB has concluded repo operations with the central bank of Hungary. See Allen and Moessler (2010, p 70).

⁴ Technically, central bank swap lines are secured with the currency of the swap partner. However, to the extent that the convertibility of foreign, especially EME, currencies may come under question, their value as collateral may fall short of a truly secured transaction.

permanent architecture, and should be a major issue for common work and cooperation in the future.

Experience and lessons from the crisis

The consensus amongst policymakers is that cooperation through central bank currency swap agreements during the crisis has been extremely successful. That consensus is corroborated by subsequent empirical studies (see, for example, Goldberg et al (2011)). This success has fuelled the appetite for more permanent arrangements and revived the aspiration for a “global safety net” in the form of a multilateral network of swap agreements.

However, the crisis experience provides only limited guidance for the future.

In some cases during the crisis, swaps were extensively and effectively used (notably between the Federal Reserve and the ECB). In other cases, such as Mexico, the mere signalling effect of the establishment of a dollar swap line seems to have played a major role.⁵ As such, for most EMEs the clearest positive market moves were observed when the swaps were announced, not when they were drawn down. Here again, the situation is very different from a domestic LOLR. The use of central bank facilities, particularly discount window lending, often carried a stigma during the crisis, whereas the establishment and use of swap lines had confidence-building effects.

The importance of signalling derives from threshold effects (the perceived level of available foreign currency increases suddenly), but also from the symmetrical commitment of both central banks. Just as for foreign exchange interventions, the signal is much more effective when it is bilateral.

However, it does not follow that, because signalling was so important during the crisis, the effect will be the same in the future. It remains to be seen how matters would play out if a permanent regime were to be put into place.

The design of an ILLR: challenges and trade offs

Starting from scratch, and with no political constraints, ILLR arrangements would ideally meet what could be called the “three U” criteria: they should be (i) unconditional, (ii) unlimited and (iii) unsecured. This is obviously unrealistic. One important choice for central banks is to decide which criteria are most important, balancing imperatives and constraints between reserve and non-reserve currencies.

A second choice relates to the structure of the agreement: would a multilateral arrangement be in place permanently (for normal times) or activated only in a crisis? The design would be different for each case. Permanent arrangements would mean that swaps would effectively substitute for reserves. However, a permanent lack of conditionality would magnify problems of moral hazard, potentially resulting in the misuse of such arrangements to delay structural adjustments or to finance unsustainable balance of payments situations. Arrangements valid only in crisis times, in turn, would pose different design issues, particularly for the triggering mechanism, which, if they went unsolved, would not sufficiently reduce the incentive to accumulate reserves.

⁵ See Sidaoui, J (2014): “Lender of last resort: actions, results and lessons from Mexico’s experience during the crisis”, in this volume.

With these trade-offs in mind, some thoughts can be presented on different options for the future.

From the point of view of non-reserve countries, the key is to dramatically reduce the incentive to accumulate reserves. Here, we have one certainty and one question.

The certainty is that swap arrangements must be absolutely and unambiguously unconditional. This does not preclude some prior conditions for membership in a multilateral agreement, but there should be no further obstacles to accessing liquidity as provided for in the agreement once the membership has been granted. This is a key condition if swaps are to fully substitute for reserves during a liquidity crisis. The relevant distinction here is not about the nature of conditionality (ex ante vs ex post, light or intrusive), but whether it exists at all. In the recent past, attempts have been made to address the issue and detach liquidity provision from the mechanisms used to provide balance of payments support. For example, the IMF has multiplied precautionary and flexible facilities with clearly defined ex ante conditionality.⁶

The question relates to potential limits on the amounts made available. According to the pure theory of LOLR, liquidity should be available in unlimited quantities, but against good-quality collateral. As long as swaps remain unsecured, therefore, it is likely that most agreements will have limits. The question then becomes empirical. Do limits matter if amounts are significant in proportion to capital flows? Most likely not, according to evidence drawn from the crisis.⁷

Most existing swap agreements have been subject to both time limits and maximum amounts (those between the ECB-Federal Reserve became unlimited). That may have reflected political economy constraints but does not seem to have reduced their effectiveness. In the future, limits must be perceived as high enough, taking into account the circumstances. Above all, limits may have to be adjusted quickly, without political constraints. This is something that central banks are usually able to do, unlike international institutions such as the IMF.

Moral hazard risk and liquidity

While the absence of conditionality determines the attractiveness of liquidity arrangements for potential beneficiaries, the moral hazard issues and fiscal implications are of paramount importance for reserve-issuing countries. Moral hazard problems may not be insurmountable, provided that the ILLR is activated only in a crisis. The real challenge, in the long run, will be to get a grip on the quasi-fiscal implications of international liquidity provision.

One way to deal with moral hazard would be to distinguish explicitly between the two different risks facing a country: on the one hand, there is idiosyncratic risk, created by national policies and country-specific shocks; on the other hand, there is “systemic” risk, stemming from aggregate liquidity shocks occurring on a broader

⁶ Goodhart (1999) for example, focuses on the potential of international bodies, such as the IMF, to play greater role as ILLR.

⁷ The argument was used by Fisher in his 1999 paper to argue that the IMF could be an efficient ILLR, even without any money creation power and given the constraints on its resources. But that was prior to the expansion of global capital flows.

(global or regional) scale. At the moment, foreign exchange reserves are meant to cover both risks. Ideally, if systemic risk is defined in such a way that it is truly independent of the behaviour or policies of individual countries, protection through a multilateral mechanism would not create any moral hazard.

It may therefore be possible to define and build a framework around the following principles. To address idiosyncratic risks, countries would self-insure by holding a sufficient amount of reserves. Protection against systemic risk, on the other hand, would come from a multilateral mechanism.

Such a mechanism would have the following characteristics.

First, the trigger for activation should depend only on global – not country-specific – conditions. A set of pre-defined market indicators could be agreed ex ante as creating a presumption for systemic stress calling for the activation of the agreement. Or there would be an automatic trigger.

Second, when the agreement is activated, there should be no discrimination between participants to a multilateral agreement whatever their situation at this moment.

Third, there would be preconditions of a “structural” (not a macroeconomic) nature such as the quality of domestic financial supervision and adhesion to globally accepted norms and standards for financial stability. This should avoid the possibility of any country free-riding on the agreement while acquiescing in fragilities within its own financial sector.

Coming now to the quasi-fiscal dimension, we like to think of the LOLR as an independent function, separate from other monetary and fiscal policies. And, if well managed, it should be costless. By lending against “good collateral”, the LOLR should never have to incur a loss. That comforting view makes it difficult to understand the true challenges facing an international provider of official liquidity.

During the first phase of the crisis, most of the questions raised about liquidity provision by central banks related to its potential interference with monetary policy. Beyond the inflation risk trumpeted in the media, there was some concern that liquidity provision could not be fully separated from interest rate policy. These concerns were quickly allayed, in particular when the Federal Reserve was authorised to pay interest on banks’ reserves.

The fiscal implications surfaced only later, when central banks started accepting some credit risk either by softening collateral requirements (as in the euro area) or through specially designed facilities (as in the United States). An old truth resurfaced: because “the line between solvency and liquidity is not determinate during a crisis” (Fischer (1999)), the LOLR necessarily involves some ex ante risk taking.

From the viewpoint of a reserve currency-issuing central bank, a swap is basically an unsecured claim on a non-resident. It therefore entails the risk of a loss. Quantitatively, the issue is not trivial. At its peak, albeit only for a brief period, the outstanding swaps extended by the Federal Reserve amounted to 35% of its balance sheet, and they stayed at over 15% for approximately six months. A global safety net would mean that issuers of reserve assets would potentially accept ex ante a significant expansion of their balance sheet for the benefit of other central banks, with the possibility of quasi-fiscal losses down the road. That fiscal dimension has always been there. It could easily be forgotten when public debt was low or declining. But, in an era of high indebtedness, it can no longer be ignored.

The fiscal dimension of liquidity provision naturally finds its way into the political process. In the United States, Congress and the public have shown great interest in identifying the foreign institutions that benefited from the Federal Reserve's liquidity programmes. In most countries, constitutional arrangements require that any increase in IMF quotas and Special Drawing Right (SDR) allocations be formally approved by parliaments. Even on a domestic basis, it is noticeable that Dodd-Frank has significantly limited the ability of the Federal Reserve to provide exceptional liquidity support to US financial institutions in times of crisis.

Taking a very speculative view, one possible area for further cooperation would be for central banks to cooperate in the definition and setting up of a pool of cross-border collateral that could be used to underpin and secure the expansion of multilateral swap arrangements.

One option would be for participants to build up stocks of collateral in the jurisdiction of the reserve country. Central banks could, for instance, accept foreign (reserve currency) collateral in their domestic liquidity operations. That collateral could, in turn, be "rehypothecated" to the reserve currency-issuing central bank in order to secure swap arrangements.

Regional arrangements

Another approach would privilege regional arrangements, either for pooling reserves or redistributing them through permanent swap agreements. In particular, Asian countries are working on and progressively implementing such schemes through the Chiang Mai Initiative. It should be noted that regional pooling is efficient only when countries are facing asymmetric liquidity shocks within the region. Pooling brings no additional benefits when shocks occur on a global scale and all countries are hit simultaneously.

Nevertheless, there seems to be considerable scope for regional arrangements to prosper in the future. One can expect regional financial integration to proceed, especially in those parts of the world where huge pools of savings are available and are currently intermediated through financial systems located outside the region. With deeper financial integration, the probability of significant portfolio shifts inside one region increases markedly, creating the potential for asymmetric liquidity shocks. The establishment of regional liquidity arrangements may therefore appear very useful as a way of underpinning the development of regional financial markets.

References

- Ahmed, S and A Zlate (2013): "Capital flows to emerging market economies: a brave new world?", Board of Governors of the Federal Reserve System, *International Finance Discussion Papers*, no 1081.
- Aizenman, J, Y W Cheung, and H Ito (2014): "International Reserves Before and After the Global Crisis: Is There No End to Hoarding?" *NBER Working Papers*, no 20386.
- Bussière, M, G Cheng, M D Chinn, and N Lisack (2014): "For a Few Dollars More: Reserves and Growth in Times of Crises", *NBER Working Papers*, no 19791
- Allen, W and R Moessner (2010): "Central bank co-operation and international liquidity in the financial crisis of 2008–09", *BIS Working Papers*, no 310, May.
- Beltran, D, M Kretchmer, J Marquez and C Thomas (2013): "Foreign holdings of U.S. Treasuries and U.S. Treasury yields", *Journal of International Money and Finance*, vol 32, pp 1120–1143.
- Borio, C and P Disyatat (2011): "Global imbalances and the financial crisis: Link or no link?", *BIS Working Papers*, no 346.
- Caruana, J (2012): "International monetary policy interactions: challenges and prospects", speech at the CEMLA-SEACEN conference on "The role of central banks in macroeconomic and financial stability: the challenges in an uncertain and volatile world", Punta del Este, Uruguay, 16 November.
- Committee on the Global Financial System (2011): "Global liquidity – concept, measurement and policy implications", *CGFS Papers*, no 45, November.
- Fischer, S (1999): "On the need for an international lender of last resort", *Journal of Economic Perspectives*, vol 13, no 4, pp. 85–104.
- Goldberg, L S, Kennedy, C, and Miu, J (2011): "Central Bank Dollar Swap Lines and Overseas Dollar Funding Costs", *Federal Reserve Bank of New York Economic Policy Review*, vol 17, no 1.
- Goodhart C (1999): "Myths about the lender of last resort", *International Finance*, vol 2, no 3, pp 339–60.
- Nakaso H (2013): "Financial crises and central banks' lender of last resort function", remarks at the Executive Forum "Impact of the financial crises on central bank functions", hosted by the World Bank, Washington DC, 22 April.
- Obstfeld, M and K Rogoff (2009): "Global imbalances and the financial crisis: products of common causes", *CEPR Discussion Papers*, no 7606.
- Obstfeld, M, J Shambaugh and A Taylor (2010): "Financial stability, the trilemma, and international reserves", *American Economic Journal: Macroeconomics*, vol 2, no 2, pp 57–94.
- Shin, H-S (2013): "The second phase of global liquidity and its impact on emerging economies", keynote address at the Federal Reserve Bank of San Francisco Asia Economic Policy Conference, November 3–5.
- Turner, P (2013): "Benign neglect of the long-term interest rate", *BIS Working Papers*, no 403.

Can emerging economy central banks be market-makers of last resort?

Michael Dooley¹

Market-maker of last resort (MMLR) is not an extension of the lender of last resort (LOLR) function; it is a completely new role for the central bank. The implicit model behind the classical LOLR function is that credit markets are driven by trust in solvency of banks and non-bank intermediaries. When that trust evaporates, the central bank can step in and save the day. In some long-departed monetary system, this may have been the whole story.

The implicit new model is that credit markets are driven by trust in collateral rather than trust in banks. The working assumption is that all observed credit transactions between counterparties with unequal credit ratings require collateral from the weaker party. When the endogenous value of collateral evaporates, the system is inherently unstable.

Again, the central bank can save the day by temporarily supplying its own safe assets to replace those that are being used as collateral but whose value is under suspicion. It does this by replacing private assets with its own liabilities. The scale of such transactions is very large.

The central bank's liabilities are useful as collateral as long as its solvency is unquestioned. This ultimately depends on the solvency of the government that owns the central bank and the government's willingness to underwrite potential losses. The "carve-out" must be credible.

For EM central banks, neither condition is met for dollar-denominated central bank liabilities. EM central bank dollar liabilities are not safe assets. Potential real exchange rate changes are just too large to make EM central bank and government solvency credible. This can be partially overcome by accumulating large dollar reserves. At the national level, the underlying trade is goods for dollars. This allows leverage, that is, two-way balanced gross capital flows. In my view this has permitted the recent entry of EMs into the system (see Appendix below). Moreover, I think this limited participation has been very beneficial to EM countries. The reserve base can be augmented by international lines of credit from the IMF and the Federal Reserve. But it seems to me unlikely that these will be unlimited and unconditional.

Conclusions? Since the ability of EM central banks to provide dollar collateral is limited, they must limit the scale of their residents' participation in international credit markets. My preference is for old-fashioned prudential regulation; new-style macroprudential regulation is just disguised taxation of financial intermediation and is too easy to avoid.

¹ Professor of Economics, University of California Santa Cruz; Research Associate, National Bureau of Economic Research; International Research Fellow, Kiel Institute of World Economics. These remarks were prepared for the BIS workshop "Rethinking the lender of last resort", Basel, 15 May 2014.

Appendix: Foreign exchange reserves are collateral to encourage FDI²

Within the Bretton Woods II system, the role of net capital flows (current account imbalances) is to support the pattern of gross capital flows needed for China's growth strategy. The logic here is that private capital flows that balance in an accounting sense generate an imbalance in political risk between countries. As a result, balanced private capital flows are likely to be constrained in magnitude. What is needed then is some form of protection or collateral for gross private capital flows to poor countries. Rich-country gross private claims on residents of poor countries do not provide the needed protection.

The only credible protection has been net goods already exported from the poor country. The powerful fact is that, in a severe political clash, rich countries can keep these goods by refusing to repay their net debt to poor countries. The most likely vehicle for such action would be to freeze the assets of the poor country's government that are held in rich countries, in particular, their international reserve assets. Our conclusion is that the net foreign assets of poor countries support risk-taking by foreign investors. Thus, the pattern of current account imbalances we observed was key to the success of the export-led growth strategy. We were perhaps overly optimistic in expecting this argument to be accepted, but continue to regard this as the most important analytical contribution of our Bretton Woods II papers.

That current account surpluses in the form of official reserves served as collateral was the most controversial and least accepted part of our analysis. Reserves are an important part of the story because they are the most likely type of geopolitical collateral, and they reflect the efforts of poor countries to distort the real exchange rate.

Indeed, this innovation of gross FDI flows to China and still larger gross capital outflows from China was vital to the system because of the potentially problematic geopolitical relationship between a large, geopolitically unsatisfied, and ever more powerful communist China and its trading partners. The "uphill net capital flow" serves de facto as a \$3.8 trillion hostage in case of a geopolitical break, and it underpinned the willingness of foreign capital to commit to China.

This was the only way to get China's development model to work on such a scale. The economic sanctions and threats to Japanese capital in China even in the minor disputes over the Senkaku/Diaoyu Islands underscore the vital role of current account surpluses in China's current development model. Similarly, conflicting claims among countries with coasts on the East and South China Seas signal the potential for geopolitical strife. The net flows were vital to get the gross flows moving, and it was the supply side effects of the gross flows that generated the

² Excerpt from "The Revived Bretton Woods System's First Decade," Deutsche Bank Global Research, July 2014, by Michael Dooley, David Folkert-Landau and Peter Garber

industrial flowering. Thus, we had a theory that intimately connected gross and net capital movements.³

In 2004 we put together a “collateral table” where we assumed a 50% initial margin and 100% variation margin on FDI inflows. These collateral requirements were drawn from commercial rates for actively traded EM bonds. We arbitrarily assumed a steady 10% annual capital gain on FDI to determine the variation collateral required. With these assumptions, China’s reserves roughly matched the collateral a private entity would have required for the observed stock of foreign direct investment in China. We also extended this methodology to direct investment in all emerging markets and found similar results.

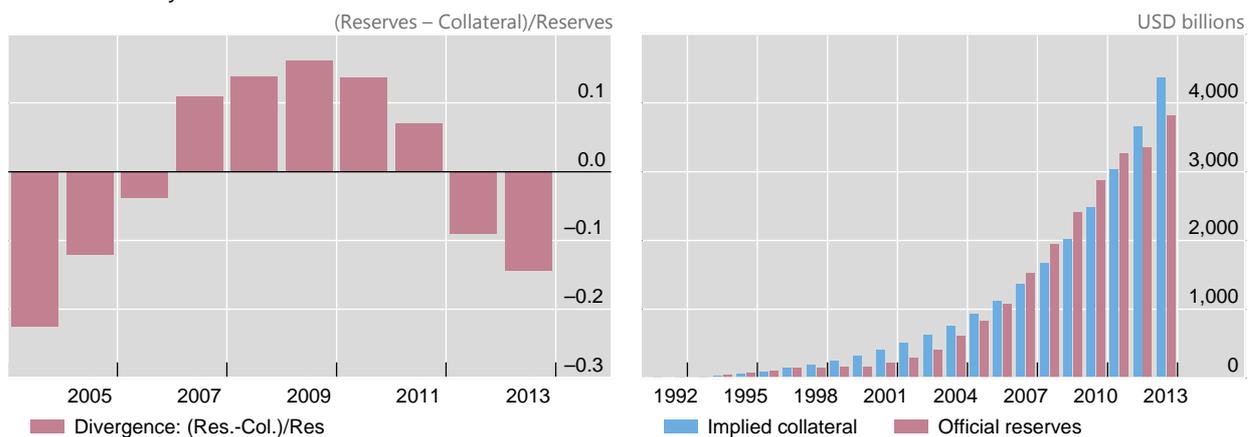
The left-hand panel of Graph 1 presents an updated collateral-reserves relationship.⁴ In this thought experiment, we assume that the collateral theory is true. Then we solve for the constant annual capital gain under which the implied collateral best matches the actual reserve accumulation. For each rate of capital gain, there is a path of implied collateral. We can then observe the percentage deviation of actual reserves from this implied amount, ie $(reserves - collateral)/reserves$. We searched over a range of possible rates of capital gain from 0.1 through 0.15, and found the one that minimised the sum of squared deviations net of the mean deviation. The least-squares minimising rate is 13.7%. In the right-hand panel of Graph 1 we show the levels of reserves against implied collateral for 1993–2013, as well as the percent deviation for the same period and the percent deviation for the period 2004–13. An average return of 13.7% does not seem unrealistic and is quite close to the arbitrary 10% we used earlier. Some snapshot estimates from around 2005–06 put the returns to FDI at 20–25% per annum.

China’s foreign exchange reserves as collateral for FDI

Graph 1

Deviation of actual reserves from amount implied by the collateral theory

Collateral versus reserves



Sources: Dooley, Folkerts-Landau, P Garber (2004); author’s calculations.

³ This is in contrast to the textbook model, which gets the net flow moving as a consumption-smoothing phenomenon, while the gross flows are an afterthought, tacked on from theories of financial diversification, that adds little to the growth story.

⁴ M Dooley, D Folkerts-Landau and P Garber, “The Revived Bretton Woods System’s First Decade”, *NBER Working Paper*, no 20454, 2014.

Towards an international lender of last resort

Stephen G Cecchetti¹

In his insightful and comprehensive review of the lender of last resort, Paul Tucker frames the discussion as one of how to best structure the provision of liquidity reinsurance.² Because banks provide liquidity insurance in the form of both demandable deposits and callable credit lines, their funding structure puts them at risk of asset fire sales, runs and failure. These have externalities. Fire sales, runs and failures all damage the system as a whole. This creates the need for a liquidity reinsurer. And the only credible reinsurer, the sole entity that can provide liquidity in all states of the world, is the central bank – the lender of last resort.

As fraught as it is, the lender of last resort is an essential element of a financial system that can withstand significant stress and continue to provide services to the economy at large. As Tucker describes in detail, it is possible to design a system that meets society's financial stability objectives. One that mitigates the moral hazard that leads institutions to sell too much liquidity insurance; moderates the adverse selection that arises from the fact that you only borrow from the central bank if you are desperate; and limits the central bank's temptation to use access, collateral and haircut rules to allocate credit. That is, it is possible to design a *domestic* reinsurance system – one in which there is a backstop for intermediaries providing liquidity insurance in the currency of their domestic central bank.

What about transactions in foreign currencies? What if an intermediary issues demandable deposits in a currency other than their domestic money? Who provides the reinsurance then?

During the financial crisis of 2007–09, authorities addressed this need for foreign currency liquidity in two ways. In the first, domestic authorities utilised their often substantial foreign exchange reserves. Intermediaries in their jurisdiction were eligible to borrow in foreign currency from the central bank. Argentina, Brazil, Korea and the Philippines provided US dollars to foreign exchange swap markets, repurchase agreements in which currency was provided in exchange for foreign currency denominated receivables or securities, and outright loans. But the finite size of foreign exchange reserves limited the degree of insurance the local central bank could provide.

This brings us to the second solution: swap lines between central banks. Here, the domestic central bank acts as the intermediary, borrowing from the issuing central bank and lending on to the domestic institution in foreign currency. Foreign currency liquidity reinsurance is being provided to intermediaries by the domestic

¹ Professor of International Economics, Brandeis International Business School; Research Associate, National Bureau of Economic Research; and Research Fellow, Centre for Economic Policy Research. These remarks were prepared for the BIS workshop "Rethinking the lender of last resort", Basel, 15 May 2014. I wish to thank Dietrich Domanski, Paul Tucker and Kim Schoenholtz for discussions that helped clarify my thinking on the issues discussed here. All errors are my own.

² P Tucker, "The lender of last resort and modern central banking: principles and reconstruction", in this volume.

central bank in the first instance, with reinsurance at the government level provided by the issuing central bank in the second.³

The most prominent (and effective) version of this second solution involved the use of the Federal Reserve's central bank liquidity facilities. Beginning in December 2007, central banks borrowed US dollars, secured by their own currency, and then lent the proceeds on to institutions in their jurisdictions. As the crisis progressed, the central banks with access to the swap facilities eventually expanded to 14.⁴ Since one was the ECB, and the euro area included 15 members at the time, you could say that nearly 30 countries had access to dollars directly from the Federal Reserve. That access peaked at borrowings of \$553 billion in December 2008.⁵

The provision of foreign currency liquidity by central banks during the crisis was creative and effective. But the programmes were devised and implemented under significant pressure, so it is worthwhile, with the benefit of time, to step back and think through the issue more carefully. How should we manage the risks arising from the fact that intermediaries offer liquidity insurance in foreign currency?

There are five possibilities:

1. ban or restrict the activity through domestic prudential actions;
2. make reinsurance the responsibility of the authorities where the activity is taking place;
3. supply reinsurance through regional pooling of foreign exchange reserves;
4. obtain reinsurance from a supranational institution such as the IMF; or
5. make reinsurance the responsibility of the central bank that issues the currency.

We can go through each of these in turn, starting with the first. Banning intermediaries from offering foreign currency accounts is not only naïve, it is foolish. It is naïve because people will find ways to transact in foreign currency regardless of the rules we might make, and it is foolish since it would dramatically reduce cross-border financial activity. On the first, I note that the eurodollar market developed both in response to capital controls and the Soviet Union's fear of US government seizure.⁶ Foreign currency transactions arise as a form of tax and regulatory arbitrage, so effective enforcement of such restrictions would require a degree of international coordination that is nearly impossible to imagine. As for the second, as international diversification has grown, so have gross cross-border asset positions. Today, these are on the order of 150% of GDP, something in the range of

³ See R Moreno, "Central bank instruments to deal with the effects of the crisis on emerging market economies", *BIS Papers*, no 54, December 2010, for a complete discussion of tools used.

⁴ Until 1 February 2010, the list included the Reserve Bank of Australia, the Central Bank of Brazil, the Bank of Canada, Danmarks Nationalbank, the Bank of England, the ECB, the Bank of Japan, the Bank of Korea, the Bank of Mexico, the Reserve Bank of New Zealand, the Central Bank of Norway, the Monetary Authority of Singapore, Sveriges Riksbank and the Swiss National Bank. Since then, the list has been Bank of Canada, the Bank of England, the ECB, the Bank of Japan and the Swiss National Bank.

⁵ These needs arose from the dollar funding needs of banks outside the US; particular those in Europe banks, which by mid-2007 were well in excess of \$1 trillion. See G von Peter and P McGuire, "The US dollar shortage in global banking", *BIS Quarterly Review*, March 2009, pp 47–63.

⁶ The original eurodollar market is an example of this. For a brief description, see S Cecchetti and K Schoenholtz, *Money, Banking and Financial Markets*, 4th edition, 2014, pp 335–36.

\$120 trillion at market prices. Someone has to bear the exchange rate risk that is embedded in these cross-border transactions. Precluding banks from being a part of this would surely be catastrophic.

This means that in order to ensure that we continue to reap the benefits of global finance, we have to allow banks to provide liquidity insurance in foreign currency.⁷ And if there is private insurance there must be public reinsurance.

Short of an outright ban, domestic prudential measures definitely have their place. The analogue to liquidity regulation, which is typically framed in terms of domestic currency, is apt. It is natural for regulators to place limitations on combined maturity and currency mismatches on bank balance sheets. But, in the end, restrictions of this sort will be limited to the degree that a country wishes to benefit from participation in the global system.

Moving to the second possibility, should we simply make foreign currency liquidity reinsurance the responsibility of the central bank where the activity is taking place? If the Bank of England lets intermediaries in London create liabilities in US dollars, or the Bundesbank allows banks in Frankfurt or Berlin to do the same, isn't it their problem? Since the reinsurer has to have a reserve fund to pay off in the case of an insurable event, this approach implies that the responsible central bank should have sufficient reserves to meet the liquidity demands in their financial systems in the event that there is significant stress. Keep in mind that the issue is not what to do in the event of an idiosyncratic shock to a single institution, but what happens when there is stress on the system as a whole.

The desire to have sufficient foreign exchange reserves on hand to manage such a systemic event is surely one reason for the very dramatic accumulation over the past decade. Aggregate foreign exchange reserves are now close to \$14 trillion, or nearly 20% of global GDP. The cost of this is extraordinary. For each percentage point that the real return on these reserves is below the global marginal product of capital, someone is paying 0.2% of global GDP per year! And, those that are paying are primarily low-income countries.⁸

It is in an effort to reduce these costs that countries have worked to form regional reserve pooling arrangements. If countries have access to one another's reserves through multilateral agreements like the Chiang Mai Initiative,⁹ then they will have less need to hold precautionary reserves of their own. Two issues arise immediately. First, how can the group ensure that it has sufficient collective resources should there be a global, systemic event? And second, is there really a sufficient reduction in the cost to warrant the complex governance structure needed to make such an agreement work? It is surely better than every country going its own way; but because the fund will have to be quite large, it seems unlikely to be

⁷ It is worth noting that, if central counterparties (CCPs) engage in the clearing and settlement of foreign exchange-denominated derivatives, they will be providing a form of liquidity insurance as well. Given this, CCPs may also require liquidity reinsurance. I will not consider this separately, as it is a simple extension of the process for meeting the needs of banks.

⁸ Granted, countries hold foreign exchange for a number of reasons, including defending their exchange rate. But in the end, these are held to manage capital outflows that will occur when their economies and financial systems are under stress.

⁹ Initiated in 2000 and enhanced in 2007, the Chiang Mai Initiative is a multilateral swap agreement among 10 countries in East Asia – the ASEAN+3 – that draws on a reserve pool that is currently \$240 billion.

much better. And, in the end, it is hard to see how the size of such an insurance fund can be big enough without the ultimate support of the issuing central bank.

The fourth approach is to have supranational institutions managing shortages in foreign currency. The IMF's Flexible Credit Line (FCL), created in 2009, is an example. The FCL provides qualified countries with guaranteed access to financing for a fee. At this writing, Colombia (\$6.2 billion), Mexico (\$73 billion) and Poland (\$33.8 billion) have obtained committed lines of credit through the FCL – lines that none of them have drawn. In thinking about the future of such arrangements, the natural question is whether the IMF can obtain sufficient resources to offer a programme that would be big enough when it is really needed. Could the IMF have supplied the nearly \$600 billion that was drawn through the Federal Reserve swap facilities in late 2008? Unless there is a way to ensure resources that are nearly unlimited – as the swap lines are – it is hard to see how a supranational institution would be able to meet the demand for foreign currency in the case of a truly systemic event.

This brings me to the final option: the central bank of issue provides the liquidity reinsurance across borders. As we have seen over the past six and a half years, central bank swap facilities are a practical solution. And, I would assert, since the problem is likely to occur only in the currency of a large country whose currency is broadly used for both cross-border transactions – current and capital account – it will be impossible to commit to *not* provide the reinsurance. The reason is that the collapse of the foreign market for the reserve currency will inevitably reverberate through the economy of the country of issue. That is, the currency use itself is a globally systemic activity, whose collapse has an effect on everyone.

I should emphasise that in discussing my list of five solutions to the financial stability risks posed by foreign currency-denominated intermediation activities, I do not mean to suggest that the items are somehow mutually exclusive. That is, adopting one or even two of the solutions does not preclude implementing a third or fourth. They are clearly complementary. For example, if a country and region were to take up options 2 and 3 – domestic and regional foreign currency self-insurance – this in no way stops them from pursuing a swap line as described in option 5. In fact, following the insurance analogy to its logical conclusion, the external reinsurer may even require some self-insurance in order to reduce the moral hazard inherent in the arrangement. The same logic applies to reinsurance provided by a supranational institution – some self-insurance may be a prerequisite.

So far, I have tried to make points that are fairly general. It is now worth turning to the specific case that we face today: the extensive offshore use of the US dollar and the role of the Federal Reserve in providing liquidity outside its national borders. There is broad agreement that the United States benefits from the fact that so many transactions are denominated in dollars. The status of the dollar in global trade and finance both insulates the US economy from fluctuations in the value of its currency and provides a large demand for dollar-denominated assets. The value to the United States is absolutely enormous. We can do a few simple computations to get some sense of the size.

The reserve currency issuer benefits in two ways. First, there is a constant demand for securities issued by the country. And second, the country faces reduced financing costs. The current consensus seems to be that the United States receives a

financing benefit in the range of 0.5% of GDP per year.¹⁰ As big as this is, it pales by comparison with the demand for securities. As is described elsewhere, this appears to be between 2% and 2½% of US GDP.¹¹ Adding these together, I conclude that the US gross benefit from being the issuer of the reserve currency is around 2½ to 3% of US GDP per year. Since the United States represents 23% of world GDP, this equals something in the range of 0.6% of global GDP.

There are also costs to being the issuer of the reserve currency. Primary among them is that this demand for reserve currency assets tends to push the value of the currency up and encourage borrowing from abroad. This flip side of the currency account deficit has distortionary effects on the domestic economy. It creates sectoral imbalances, disadvantaging both export industries and domestic import competitors, and it encourages borrowing from abroad. As we saw during the recent financial crisis, the latter can be particularly damaging if and when the leveraged asset prices turn from boom to bust. But it is difficult to see these as being on the same order of magnitude as the benefits.¹²

In fairness, the rest of the world does gain from the existence of a reserve currency. The easiest benefit to see comes from the fact that the reserve currency is the de facto international numeraire. What this means is that, instead of having $n(n-1)/2$ currency markets, we only need $(n-1)$ with the US dollar as the other side of each. For a world with at least 150 currencies, that's the difference between 149 markets and 11,175. This is why the US dollar accounts for one side of nearly 90% of foreign exchange transactions.¹³ Even if there were no reserve currency, the market would create one simply as a way to reduce transaction costs. But it is hard to see these benefits as being anything close to the costs.

Here's where we stand. To a large extent, the global financial system is running on US dollars. Enormous benefits accrue to the United States, while the rest of the world bears large costs. Given this, should the United States help reduce these costs?

So far, the Federal Reserve has set up swap lines that meet its domestic interests. If a country or jurisdiction is systemically important *for the United States*, then it has been offered a dollar swap line. We can see this in the list of central banks that have unlimited access to liquidity swaps. Since early 2010, the

¹⁰ This number is in substantial dispute. I have used the very conservative estimate of 50 basis points from S Curcuru, T Dvorak and F Warnock, "On returns differentials", Board of Governors of the Federal Reserve System, *International Finance Discussion Papers*, no 1077, April 2013. Dividing foreign holdings of \$14.6 trillion from the TIC data by 2014 GDP of \$17.1 trillion and multiplying by 50 basis points yields 0.5%.

¹¹ See S Cecchetti and K Schoenholtz, "How big can the US current account stay?", www.moneyandbanking.com, 5 June 2014.

¹² A few years ago, a group of researchers at the McKinsey Global Institute put everything together and concluded that the net benefit to the US is in the range of 0.5% of GDP. Their estimate seems quite small as a consequence of the fact that they treat the current account deficit as primarily a cost to exporters and import competitors who supply less, rather than a benefit to households that can consume more (for a very long time). See R Dobbs, D Skilling, W Hu, S Lund, J Manykia and C Roxburgh, "An exorbitant privilege? Implications of reserve currencies for competitiveness", McKinsey Global Institute, December 2009.

¹³ See the BIS Triennial Central Bank Survey of foreign exchange and derivatives market activity in 2013.

programme has included only five central banks: the Bank of Canada, the Bank of England, the ECB, the Bank of Japan and the Swiss National Bank.¹⁴

Would it also be in the US's enlightened self-interest to provide dollar liquidity beyond this rather short list of countries during a crisis? If it wishes to maintain over the long run the benefits of having the US dollar as the reserve currency, the answer is yes.

However, things get complicated immediately. There are problems analogous to those faced by the domestic lender of last resort: moral hazard, adverse selection and overstepping of one's mandate. On the first, if they have a backstop, countries will be tempted to allow their banks to provide too much foreign currency liquidity insurance to facilitate trade and capital flows. Controlling moral hazard will require a combination of international standards that restrict activity and a sufficiently high price charged by the Fed for the dollars – a penalty rate à la Bagehot. On adverse selection, there will have to be some mechanism for ensuring that the least creditworthy countries aren't the ones at the head of the line asking to swap their compromised currencies for dollars. Something similar to the IMF's prequalification mechanism may ultimately be required. And, since relying on an external organisation is likely to be even more politically charged than doing it at home, one of the costs of being the supplier of the reserve currency may be that the Fed will have to employ a small staff of people who evaluate whether a country qualifies for a swap line. As for stepping on other people's toes, the US president may well view providing dollars to a foreign central bank, and hence to a foreign country, as foreign policy. Some people already view swap lines as beyond the bounds of the Fed's agreed activities. Political support for a broader extension of dollar liquidity provision is not in evidence.¹⁵

Among the many lessons that we learned from the events of the last decade is that a financial system requires a lender of last resort. Domestic financial stability requires having a central bank that can provide domestic currency to ensure the system remains liquid. By the same token, if we are to continue to benefit from the movement of goods, services and capital across borders, then we need a system that efficiently allocates the foreign exchange risk arising from the transactions that support these activities. And the facilitation of cross-border transactions and the allocation of the associated risks inevitably require that banks provide liquidity insurance in foreign currency. In the vast majority of cases, this means dollar liabilities. Ensuring financial stability in such circumstances requires that, when they face a liquidity crisis, banks outside the United States have access to dollars. So long as the global financial system runs on dollars, something that is likely to be the case for some time to come, it is to the benefit of the United States that the Federal Reserve finds a way to provide such access.

¹⁴ See footnote 3 for those central banks with access at the height of the crisis.

¹⁵ There is also what I would consider to be a legal detail. The swap lines are the responsibility of the FOMC, and they require annual reauthorisation as a matter of law, so permanence cannot be assumed.