Initiative for Policy Dialogue Working Paper Series

April 2009

Central Banks, Liquidity and the Banking Crisis

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Financial Markets Reform

CENTRAL BANKS, LIQUIDITY AND THE BANKING CRISIS[1]

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The origins of the "liquidity crisis"

One of the functions of financial intermediation is to liquefy illiquid investments. As Keynes put it in *The General Theory*:

> Of the maxims of orthodox finance none, surely, is more anti-social than the fetish of liquidity, the doctrine that it is a positive virtue on the part of investment institutions to concentrate their resources upon the holding of 'liquid' securities. It forgets that there is no such thing as liquidity of investment for the community as a whole … Capital markets provide liquidity to make investments which are 'fixed' for the community more 'liquid' for the individual.

In drawing lessons from the liquidity aspects of the international banking crisis that broke in August 2007, the benefits that Keynes identified must be kept in mind. It is quite natural that financial innovation has steadily pushed this "liquification" function further in the decades that have followed Keynes's remarks. In his day, only a limited range of debt instruments were traded in capital markets. Financial intermediation through banks largely took the form of non-traded and illiquid bank loans.

Since then, however, the balance sheets of banks have become more dependent on capital markets. On the liability side, banks have relied more on (typically short-term) funding in wholesale markets and less on retail deposits collected from households. Banks have become more dependent on continued access to wholesale markets and

households have increasingly placed their savings in lucrative capital market products, rather than in bank deposits. On the asset side, bank loans have been increasingly securitized and sold to other banks and to non-bank investors.

This long-run process dramatically accelerated from around 2003. Major commercial banks attracted non-bank investors (and other banks) to their securitized products by providing back-up liquidity through various capital market structures. At the same time, investment banks greatly increased their leverage, both directly on their balance sheets and indirectly through their holdings of products that were themselves leveraged. All this widened the apparent scope of capital markets, as a greater range of loans were securitized, and in forms that were increasingly complex. Because of their vast range and complexity, such products—left to stand alone—were unlikely to have liquid markets. These markets could appear to be liquid only because of the demand of highly geared financial institutions.

The crisis that broke in August 2007 was the result of a reckless acceleration of this process. As so often in the history of banking crises, pressures first became widespread in the wholesale markets where banks borrowed and in the markets where banks sought to sell their assets. Banks became unable to borrow or to sell their stocks of securitized assets. Hence it was on the evaporation of liquidity that attention first focused. This was Phase 1 of the crisis (Box 6.1).

But it soon became clear that liquidity strains were symptoms of the more fundamental question concerning the solvency of major financial institutions. The real issue was the scale of the failure of lending institutions to correctly assess and price credit risks across many business lines. Many firms had taken such risks because they assumed

(or hoped) they had hedged their risks by contracts with monoline insurers through imaginative but fragile hedging strategies, the use of credit default swaps or some other strategy (e.g. off-balance sheet structures) which gave the impression that the risk had passed to someone else.

The crisis dashed these hopes. The monoline insurers failed. Hedges proved imperfect. And it was of course the concentration of credit default swaps with a few major counterparties that prompted much recent action by central banks. It was felt that large-scale failures on such CDS contracts would have damaged the functioning of the whole system.[3] The implications of credit derivative markets for public policy action in a crisis are a major topic in its own right.

Banks had also under priced the liquidity services they provided, and this was reflected in the extremely tight pricing of many hedging products. Additionally, many banks had relied too much on short-term funding and had not issued enough straight fixed-term debt. The liquidity guarantees banks provided were opaque (e.g. terms of support in case a supposedly independent structure failed) and were in any case of uncertain value as bank default risk rose. In the event, the supposed liquidity of many products proved quite illusory. The realization that some banks were holding large portfolios of poor credit risks made lenders less willing to lend to them.

Because the pricing links with deeper markets were approximate (and in some cases non-existent), the true value of the securitized assets was uncertain and leverage meant that estimated values turned out to be extremely sensitive to general market developments. Neither banks nor supervisors were aware of the size of aggregate exposures, which in any case was heavily dependent on prospective macroeconomic

developments. The true scale of leverage was hidden and the ramifications of pervasive linkages between different market segments were underestimated. Losses from delinquencies on U.S. subprime mortgages engendered skepticism about the whole model and prompted the realization that potential liquidity demands on (as well as write downs by) major banks would be huge. This spilt over to money markets but did not originate in them.

The roles of the central bank, the regulators and the government

Given the path chosen by the financial industry in the major centers, it had been quite clear for many years that impossible-to-predict shocks could make it difficult for banks to sell assets and could put bank funding markets under exceptional strain. This could happen even if no major individual bank faced a solvency crisis. But nobody knew just when the break would come, and in the meantime banks found it profitable to push their securitization strategies to its limits. The sheer scale of the crash that followed came as a shock.

Among failures in policy framework that have been identified, three are of particular relevance for this chapter:

(1) The modalities of the emergency lending facilities of central banks.

(2) The management of liquidity risks by banks. In theory, it is the banks themselves that have prime responsibility for ensuring that they manage their own increased liquidity risk effectively. In practice, however, there is a collective action problem: an individual

bank cannot reverse its positions if other banks also chose to do so at the same time. Because of this, there is a role for regulating the liquidity management of banks.

(3) Government support for weak banks. Once public confidence in banks is severely eroded, only the government has the capacity to reassure depositors and other creditors. But it takes time for governments to recognize that weak commercial banks need to be recapitalized and to build political support for aiding the banks. During the immediate aftermath of most banking crises, therefore, governments are tempted to expect too much of central banks.

This chapter will focus primarily on (1) Because central bank liquidity policies create moral hazard risks, (2) is also discussed below.

<Insert Box 6.1>

Emergency liquidity assistance by central banks

The issue of emergency liquidity assistance had been repeatedly discussed in general terms within the Committee on the Global Financial System (CGFS), a committee of senior central bankers that meets regularly at the Bank for International Settlements (BIS), but central banks did not work out in advance what specific measures they might take to address a liquidity crisis. Banks should manage their own risks and not count on the central bank to rescue them. Public debate about the lender of last resort (LOLR) function of central banks was therefore avoided. The European Central Bank's (ECB) Statute, for instance, does not explicitly consider its LOLR role.[4]

So, in the end, central banks had to work out pragmatically which steps to take as events unfolded from August 2007. The terms on which they provided liquidity (in terms of collateral, counterparties, maturity of operations and currency composition) widened more radically than scarcely anyone would have imagined before August 2007. Central banks contemplated, with government, even more far-reaching measures as the crisis deepened with major firms on the brink of failure.

During the first phases of this crisis (up to the bankruptcy of Lehman), however, total central bank balance sheets generally did not rise dramatically (Figure 6.1).[5]

<Insert Figure 6.1>

Press headlines of massive injections of central bank liquidity therefore tended to give the wrong impression: the subsequent re-absorption of liquidity as central banks strove to maintain their desired monetary stance and to limit lending was not properly understood. But central bank measures did lead to radical change in the composition of central bank balance sheets: the average maturity of central bank loans lengthened (Figure 6.2) and the nature of the collateral changed.

<Insert Figure 6.2>

Despite the radical scale and nature of central bank operations, the functioning of inter-bank money markets remained impaired. Although central banks managed to keep overnight rates close to their policy targets for most of this time, the spread between

overnight rates and the corresponding three-month Libor quotations has remained wide (Figure 6.3).

<Insert Figure 6.3>

Libor reflects the average of expected overnight rates over the maturity quoted plus a term premium plus a credit premium (because deposits by one major bank with another were typically unsecured). While banks were willing to quote rates when polled by those computing daily Libor averages, there was very little actual dealing beyond very short maturities between banks.

With the bankruptcy of Lehman Brothers, credit markets froze and inter-bank markets (i.e. in the sense of transactions between private institutions) virtually disappeared. Central banks were forced to be the counterparty even for non-banks on an extremely wide range of transactions ("market maker of first resort"). In addition to increased lending via the discount window and its primary dealer credit facility, the Federal Reserve provided indirect lending to money market funds and purchased commercial paper through special purpose vehicles. At the same time, many commercial banks deposited their surplus funds at the end of the day with the central bank rather than risk placement with another commercial bank: central bank liabilities and assets rose dramatically as central banks virtually replaced the normal inter-bank market. The combined assets of the Federal Reserve, the ECB, Bank of Japan and the Bank of England rose from just over $4 trillion in August 2008 to over $6 trillion by late October (Figure 6.4).

<Insert Figure 6.4>

Recommendations of the CGFS

A CGFS Study Group, working closely with the BIS's Markets Committee, analyzed money market developments and central bank liquidity actions during the early phases of this crisis (CGFS, 2008). Those responsible at major central banks for market operations took part in this Study Group so their report provides a unique insight into the operations conducted by central banks over the period from summer 2007 to June 2008.[6]

The debate about how central banks can be more effective in their actions is still very much alive and many issues remain to be resolved. Nevertheless, there was a consensus in the Study Group on seven recommendations that entailed a significant widening of central bank actions. These are summarized briefly:

(i) The operational framework should be capable of achieving the desired policy target even when faced with large and unpredictable shifts in the aggregate demand for reserves. The Study Group found that the measures required to stabilize overnight rates in extreme cases of market turbulence could even require central banks to replace the inter-bank market for overnight funds. This is not desirable in normal conditions: allowing inter-bank markets to distribute reserves has the benefit of encouraging banks to manage their own liquidity and making them test their names by seeking to borrow from peers.

(ii) In order to counter a misdistribution of reserves across banks, central banks may need to conduct operations with an extensive set of counterparties and against a broad range of collateral.

(iii) When some key financial markets become impaired, central banks should be prepared to expand their intermediation activities and, if needed, take steps that go beyond adjusting the aggregate supply of distribution of reserves. For instance, central banks could increase the maturities of their provision of term funds when term inter-bank money markets become impaired. Alternatively, they could add to their lists of eligible collateral some illiquid assets.

(iv) Global channels for distributing liquidity across borders may become impaired in times of financial turmoil [and] central banks should strengthen their capacity to counter problems in international distribution of liquidity (e.g. by establishing swap lines among themselves or accepting denominated assets or obligations booked abroad as collateral in their operations).

(v) Misinformation and misinterpretation of central bank actions are more likely and costly in times of stress. During such periods, central banks should enhance their communication with participants and the media.

(vi) Central banks should reduce the stigma associated with a bank's use of central bank lending facilities. Standing loan facilities are important central bank instruments for providing liquidity insurance to banks. However, the effectiveness of such facilities is undermined if banks worry that their use could send a negative signal about their health (the so-called "stigma" problem). Stigma tends to be greater in stressed times (because such borrowing can signal to others that the borrower is in difficulty).

(vii) The expectation that central banks will act to attenuate market malfunctioning may create moral hazard by weakening market participants' incentives to manage liquidity prudently. Central banks should carefully weigh the expected benefits of actions to re-establish liquidity against their potential costs and, where necessary, introduce or support safeguards against the distortion of incentives.

The major widening of the scope of central bank liquidity provision to banks took place almost by accident in response to an unexpectedly severe crisis. The measures taken were designed under intense time pressures. Several steps are explicitly temporary expedients, often designed as stop-gaps until government measures could be put in place. A number of emergency facilities are likely to terminate in their present form. Some of the measures of indefinite duration will be reversed. As the financial crisis deepened and as policy rates moved closer to zero (thus limiting further cuts—"conventional" policy instrument), central banks also contemplated actions that went well beyond liquidity provision to banks, taking policy into "non-conventional" territory. This could include central bank purchases of government bonds and of private sector debt instruments.

Nevertheless, in reviewing central bank liquidity actions it is important to think beyond the present crisis. Some of the recent extensions of scope are likely to become permanent features of central bank tools for liquidity provision.

Weighing the drawbacks

Any assessment of the desirability of various liquidity policies must begin with a consideration of possible downsides. What are the drawbacks of such radical extension of the scope of central bank liquidity provision? Six drawbacks are usually identified:

Contamination of monetary policy

The argument here is that massive injections of central bank liquidity (perhaps accompanied by a temporary deviation of the central bank policy rate from target) can send a signal that monetary policy has been eased. The CGFS Study Group reports that central banks during the early phases of this crisis have in general successfully prevented liquidity operations from contaminating monetary policy in this way.

A major difficulty, however, is that the measurement of the stance of monetary policy in a financial crisis is itself more difficult than in normal times. First, there is a wider-than-usual gap between the overnight rate (normally the target for monetary policy)[7] and three-month money market rates (which usually determine rates paid by borrowers in the real economy). Secondly, banks may wish to restrict lending and so do not pass on reductions in their funding costs. Thirdly, it is very difficult to assess how a banking crisis and a recession will affect inflation expectations. For instance, easing by the Federal Reserve between mid-2007 and mid-2008 appears very substantial when measured by the overnight rate deflated by headline inflation but much less so when the three-month Libor rate is deflated by "core" inflation (Figure 6.5).

<Insert Figure 6.5>

In these circumstances, it may be better for central banks to tolerate some volatility in the overnight rate than to constrain liquidity operations. The possible drawback of contaminating monetary policy, therefore, is not overwhelming and could be met by clear communication to the market.

The central bank taking the responsibilities of government

This is a much more serious drawback because actions that put at risk taxpayers' money are the responsibility of the elected government accountable to parliament. Point (iv) outlined below is one possible scenario—but there are many others. In addition, central banks will not usually be able to put at risk the taxpayers' money of a foreign government! This fact will inevitably constrain central bank actions. Without good assurances from the foreign government, they will not want to take large exposures to a fragile foreign bank operating within their jurisdiction.[8]

There may, however, be ways of designing policies that combine government assumption of credit risk with central bank liquidity provision. The Federal Reserve's Term Asset-backed Securities Loan Facility (TALF) announced in November 2008 is one such hybrid. In effect, $20 billion of funds voted by Congress under the Troubled Assets Relief Program (TARP) were leveraged to support non-recourse lending against $200 billion of AAA-rated Asset-backed securities (ABS) backed by recent consumer and small business loans. The design of such hybrids should incorporate a prudent assessment of possible credit losses.

Avoidance of credit losses

The valuation of collateral taken is key. Taking illiquid paper as collateral presents a problem because such paper has no reliable market price. Hence the central bank will have to use other valuation methods, and will often rely on an estimate of the capitalization of cash flows. It will also have to decide on the appropriate "haircut" to apply. Such haircuts should reflect the uncertainty over valuations, the volatility of market value and the liquidity risk of the instrument.

Inadvertent aid to a failing bank

The longer the term of central bank lending is, the greater the risk that the central bank will find itself lending to a bank that fails. Extending liquidity assistance to a failing bank can give that bank's other short-term creditors (e.g. in wholesale markets) the opportunity to escape without suffering the losses they would bear if the bank were forced to halt operations. This may increase the eventual cost to the government. The central bank would then have to justify this to the government, and perhaps to Parliament (on this, see Stiglitz's chapter in this book).

Aid to a subsidiary of a failing foreign bank could be even more difficult to explain to the government. Such lending could in effect provide cash that the subsidiary can move to its head office ahead of an impending bankruptcy. This means that the local creditors of the subsidiary will get less in subsequent (local) bankruptcy adjudications.

In both cases, the central bank may have protected itself by taking good collateral with a prudent haircut, but its actions may have harmed its fellow citizens.

Central bank replacing the market

As Buiter (2008) has observed, central banks since the Second World War have moved away in their operations from purchasing or accepting as eligible collateral private sector securities. Instead, they have increasingly used for such purposes central government debt securities. One attraction in central banks accepting as collateral only such paper is that it has a large, liquid market. Hence central bank operations have only limited effects on the market prices of such paper. Using large markets can allow central banks to avoid giving preferential treatment for certain private borrowers (Kohn, 2008). If central bank operations were to come to dominate small, illiquid markets, price discovery would on the contrary be impaired. Keeping markets alive wherever possible is important because markets can discipline behavior and send very useful signals or information about changing economic conditions.

An additional consideration is that central bank operations that deviate from market prices expose the central bank to adverse selection risks. One particular aspect of this is that illiquid collateral should be more heavily discounted than liquid collateral because this is what the market would do. If the central bank does not do this, then it will tend to replace the market for the more illiquid assets.[9] This does not mean that the central bank should necessarily alter these illiquidity discounts if market liquidity conditions deteriorate as a crisis deepens. Indeed increasing haircuts as the crisis worsens

could defeat the very purpose of central bank action. Buiter (2008b) has made a good case for the central bank becoming in a crisis the market maker of last resort.

Moral hazard

Banks become too relaxed about making adequate provision for their own liquidity because they think they can rely on the central bank to rescue them. This requires consideration of:

(a) "Constructive ambiguity". On this argument, banks could be left unsure about whether and how liquidity assistance would be provided. This may argue in favor of central banks being sparing in the introduction and announcement of new semi-permanent arrangements. "Constructive ambiguity" has long been favorite words in the lexicon of central banks. But the recent crisis has strengthened a powerful counterargument: a well-thought-out framework announced in advance could create better incentives for banks than ad hoc and blanket measures decided upon in a crisis.

(b) Effective penalty pricing. There are several issues to consider. One difficulty lies in the reluctance for the central bank to risk being seen as signaling, by penalty pricing, a heightened risk of insolvency. A second is that the terms of liquidity support extended to a bank that has just taken over a failed bank may be more lenient—because moral hazard with respect to the new management is less. Nevertheless, it should be possible to incorporate into an announced liquidity facility definitions of schedules of access that imply progressively steeper charges as use of the facility rises.

(c) Greater regulation on (or supervisory guidance about) bank liquidity.

Historically, central banks used to require banks to hold a proportion of their assets in liquid instruments (usually deposits with the central bank and government bonds). Variation of such ratios was also often a major instrument of monetary control. In most advanced economies, however, such ratios have fallen into disuse. International agreements about bank regulation have instead focused on bank capital requirements. The next section explores this issue further.

Central banks and the regulation of bank liquidity

Up until the late-1970s, central banks generally relied on simple mechanisms (such as aggregate liquidity ratios and the requirement to hold reserves) to regulate the liquidity of the balance sheets of their banks. In many emerging markets, such mechanisms are still in place—although many have scaled them back considerably to lower the costs of bank intermediation and give banks greater flexibility in managing their liquidity.[10] Nevertheless, simple rules or ratios did help the authorities in several major EMEs (Emerging Market Economies) manage the severe liquidity shocks seen in September and October 2008. Brazil, China and India, for instance, were able to release liquidity into inter-bank markets by lowering required reserves held at the central bank.

During the 1980s, however, the emphasis of regulators in developed markets shifted from simple rules and ratios to encouraging banks themselves to better manage their own maturity-related risks. The regulatory ratios that remained were very low and often did not bind. It became clear after the crisis had broken that many banks had not

recognized the liquidity risks in complex products and off-balance sheet items and had not considered the possibility that wholesale funding markets would dry up. This experience focused the attention of both banks and regulators on bank liquidity issues. The crisis also raised for supervisors and regulators the controversial issue of the self-sufficiency of affiliates of foreign banks in the liquidity of their balance sheets.[11]

A consultation paper published by the Basel Committee in September 2008 on liquidity risk management (see BCBS, 2008a) laid out some principles to guide both bankers and regulators. This is an authoritative attempt to draw practical lessons from the crisis for the management of liquidity by banks. But there should be no illusion that prudential regulation can provide a simple solution because liquidity risks are notoriously hard to model and to assess. At least three dimensions are important: maturity mismatches between assets and liabilities; the liquidity characteristics of securities held as assets; and the retail versus wholesale sources of funding. As Kohn (2008) has observed, prudential regulation "requires difficult and necessarily somewhat arbitrary judgments about the types of liquidity stress scenarios that institutions should plan to confront without access to central bank credit and, correspondingly, those scenarios in which institutions in sound financial condition can appropriately rely on central bank credit."

Is there some way of attenuating moral hazard by rewarding banks to hold more liquidity in normal times which can then give them greater or cheaper access to central bank liquidity in a crisis? Goodhart (2009) suggests a Preferential Access Scheme which would allow banks to "earn" cheaper access to central bank liquidity in times of stress. He envisages setting tranches for bank borrowing from the central bank for each bank

individually, with the amount of each bank's access predefined according to a variable that would depend on some base of liquid assets, on the nature of liabilities (e.g. the retail deposit base) and on a "score" based on the overall liquidity of the bank in preceding periods. This could encourage banks to improve their liquidity position in order to access cheaper funding.

Others argue for simpler forms of minimum liquidity requirement even if such measures cannot be perfect. Griffith-Jones and D'Arista put forward a proposal in this book. Leijonhuvfud (2009) suggests that reserve requirements on banks should be increased. Goldstein (2008) argues for the development of a definition of (narrow) regulatory liquidity and a quantitative benchmark of it. In any event, designing a simple liquidity ratio is very difficult in the modern banking system. Not only do different banks have very different exposure to possible liquidity shocks, but the funding policies and asset holdings of various institutions are also very diverse.

National regulators are at present actively reviewing the regulation of liquidity. The UK Financial Securities Agency (FSA) recently announced proposals for a new liquidity policy which would require banks to hold a higher amount and quality of liquid assets (FSA, 2008). They raised the possibility of banks in their jurisdiction being induced by such regulation to increase their holdings of government bonds to 6–10 percent of their total assets (compared with an average of 5 percent currently). As a minimum, such ratios should also be used as cross-checks by regulators: most regulators do indeed rely on various quantitative measures as useful complements. It would be very helpful to have a harmonized toolbox of metrics for regulators worldwide. Private sector counterparties dealing in opaque and complex firms have argued for publication of some

benchmark measures.[12] Certainly, the liquidity policies of central banks could benefit from the wide acceptance of quantitative benchmarks for banks. While it will be challenging to secure international consensus on benchmarks which reflect the liquidity position of a variety of different banks, this is an effort worth pursuing.

What will remain permanent?

Some of the new measures triggered by this crisis are likely to represent a near-permanent broadening of central bank liquidity operations. In some sense, exceptional measures nearly always create the expectation that they would be repeated in similar circumstances. So it is probably not possible for central banks to return the position that existed before the crisis even if specific liquidity schemes are phased out. Nevertheless some measures clearly suffer from the major drawbacks cited above, which would become more serious if they were to become permanent. While it is premature to draw any firm conclusions about any permanent changes to central bank operating frameworks, the issues involved merit debate.

Three permanent measures?

A case could be made that three measures could be considered a useful, permanent addition to tools of central bank liquidity policy—provided certain limits are kept in mind. These are:

Increased term financing

When term funding markets dried up, banks were forced to rollover term finance with overnight or very short duration borrowing. The volume of overnight liabilities thus snowballed. Such a shortening of liabilities made banks appear unnecessarily vulnerable. It also became clear as this crisis evolved that some part of the term premia in inter-bank markets reflected liquidity pressures rather than worries about the creditworthiness of banks seeking term funding. Central bank provision of term finance (not just overnight funds) is clearly justified in such circumstances.[13]

As for pricing strategies, it may be important to limit the magnitude of any divergence in the three-month inter-bank rate from the policy rate because it is the three-month rate that is a key pricing benchmark for other lending. Secondly, loss of money market liquidity (or extreme day-to-day volatility in pricing) has more serious effects than a loss of liquidity in markets for longer-term instruments because large amounts become due each day (Kohn, 2008).

As part of its extraordinary policy of quantitative easing in the early 2000s, the Bank of Japan went from pushing the policy rate to virtually zero to doing the same in term markets. It succeeded in driving term rates to very little above zero—but only at the price of finding itself on one side of virtually all inter-bank transactions, facing difficulties in reviving a genuine inter-bank market when quantitative easing ended.

Normally, however, the central bank cannot realistically hope to replace the market in determining with precision the three-month rate. Nor will most central banks want to fix the three-month rate too precisely because such an attempt would be read by

markets as indicating the future stance of monetary policy. For this reason, if central banks wish to indicate to the public their objective for a key money market rate (such as three-month Libor), they should do so as a range (as the Swiss National Bank does at present), or have a price schedule that rises as larger amounts are sought e.g. the Bank of England's new permanent "discount window facility."

Central banks to offer wider deposit arrangements for banks

At times of market stress, the central bank will find it very hard to assess how much liquidity the banking system needs. Central banks want to keep to a minimum the risk of undersupplying liquidity in their daily operations—which could dislocate the banking system or undermine confidence in banks. Hence the danger is that too much liquidity is supplied. Therefore mechanisms need to be in place to limit any unintended downward pressure on overnight rates that could result from an accidental oversupply of liquidity. One simple way to put a floor under rates is for the central bank to pay banks an interest rate on excess reserves deposited by the banks with the central bank.

As a matter of general principle, it is desirable that central bank operations at the margin (and on both sides of the balance sheet) take place at rates that are related to market prices in order to minimize possible distortions. Several conflicting considerations will have to be balanced on the size of the spread between the policy rate and the rate of interest paid on commercial bank deposits at the central bank. On the one hand, a narrow spread will set a floor under overnight rates that is close to the policy rate. On the other hand, to encourage banks to place funds with each other (and not the central

bank), the spread should be significant. If not, there will be a substantial expansion of central bank balance sheets. The central bank becomes the counterparty for most transactions. This is not desirable.

The crisis has also highlighted another aspect of central bank liabilities policies. As central banks lengthen the size and maturity of their lending operations (i.e. assets), they may need increased flexibility on the liability side—for example by widening the range of deposit facilities offered or by floating central bank bills. The Bank of England, the Riskbank and the Swiss National Bank started in October 2008 to issue one-week bills (mainly to the banks).

The ECB announced a similar scheme. The wider the range of deposit instruments or bills at the disposal of the central bank, the easier are "mopping-up" operations. By December 2008, bank deposits with the ECB had reached €200 billion. To encourage banks to trade with each other, the ECB lowered the interest rate on deposits to restore the usual width in the corridor (i.e. between the standing lending facility and the deposit facility).

Better cross-border provision of liquidity

International banking business involves usually three central banks: the central bank where the bank conducts this business; the central bank where the bank is headquartered; and the central bank of the currency used. Which central bank should take responsibility for emergency liquidity has always been a thorny question. The 1983 Concordat on the roles of host and home supervisors was:

> "never intended to be an agreement about the provision of lender of last resort facilities to the international banking system … there is no automatic link between … responsibility for supervision and the assumption of a LOLR role" (Bank of England, 1981).

Indeed, this issue had been extensively discussed among central banks in the early 1970s. After the sharp increases in oil prices, it became likely that the oil exporters would deposit large surpluses with international banks in the highly liquid Eurodollar market.[14] Banks would re-lend at longer maturities. Hence international banks could, as a group, face a general liquidity problem if there was a significant withdrawal of short-term funds. What would such a liquidity crisis mean for the responsibility of central banks as lenders of last resort to the Euromarkets?

There was a worry that central banks would not be able to react quickly because of unresolved disagreements among them. Central banks at that time therefore examined whether it would be possible to reach some prior working agreement about the division of responsibilities among them. After much debate, the conclusion was that [with reference to the problem of the lender of last resort in the Euromarkets, "it would not be practical to lay down in advance detailed rules and procedures for the provision of temporary liquidity".[15]

Although this formal position has remained in place ever since, informal understandings among central banks have evolved. For instance, discussions among central banks in the preparations for Y2K confirmed the general presumption that the

host country central bank would have the initial responsibility for providing liquidity support to a foreign bank. But it was also recognized that the home country central bank might become responsible very soon after such support became necessary.

The recent crisis has again demonstrated the importance of the cross-border dimension. To understand why, it is useful to review the currency funding strategies of banks before the crisis. During the period 2000–07, European banks in particular had taken advantage of extremely liquid currency swap markets to expand their U.S. dollar assets by borrowing Euros (or other currencies) while using swaps to hedge the resultant exchange rate exposures. This meant they were holding longer-term or comparatively illiquid dollar assets financed by short-term euro borrowings which had to be constantly rolled over. As long as these markets work smoothly with minimal spreads, such rolling over is not problematic. But during the recent turmoil, forex swap markets dried up because the underlying liquidity in national term inter-bank markets evaporated. This meant European banks were searching for dollars to rollover their positions.

To mitigate such a problem, cross-border swap operations between central banks can be particularly useful for both borrowing and lending central banks. Swap operations allow central banks which hold limited forex reserves to lend foreign currency on a large scale to their banks. Even central banks with large holdings of forex reserves are helped because the use of a swap allows them to avoid withdrawing local currency liquidity from the domestic financial system.[16] The central bank whose currency is in demand also benefits: a foreign bank which cannot liquefy its dollar assets in its own market would be forced to do in U.S. markets—and thus aggravating pressures there.

In this crisis, swap operations among the major central banks were used on a very large scale to very good effect. The initial step took place when the Federal Reserve's term auction facility (TAF) announcement in December 2007 was linked to a swap operation with the ECB and the Swiss National Bank (SNB). The central bank in the jurisdiction the borrowing bank is operating in assumes the credit risk (and manages collateral).

The failure of Lehman aggravated the global shortage of dollar funding. The three-month overnight spread for dollars rose by early October to 350 basis points—well above that of other international currencies (Figure 6.6).

<Insert Figure 6.6>

The scale and scope of central bank swap lines therefore widened dramatically after September 2008: see Table 6.1. Four central banks then got unlimited access to dollar swaps with the Federal Reserve, allowing them to conduct what was termed "full-allotment U.S. dollar operations at fixed rates". This meant that commercial banks could borrow as many dollars as they pleased and at a fixed rate. By end-October, outstanding usage of forex swap lines by the ECB, the Bank of England and the Swiss National Bank exceeded $300 billion. Inter-central bank swap lines of this magnitude are quite unprecedented. Towards the end of 2008, the three-month/overnight spreads for the international currencies had again converged, with the spread in both euros and dollars falling to around 100 basis points. While lower than at the worst of the crisis, this spread remains much above earlier historical norms.

<Insert Table 6.1>

Another possibility for enhanced cross-border cooperation is that major central banks could provide liquidity assistance against a common list of high-quality government bonds denominated in the major international currencies. The central banks of two European countries with large international banking activities (the Bank of England and the Swiss National Bank) routinely accept foreign collateral. The reluctance of other central banks to accept foreign collateral seems to have diverse roots: nervousness about undermining liquidity in their own government bond markets; greater familiarity in operations with local counterparties; and tradition.

One further issue deserves a mention. If central banks apply differing collateral terms, the international banks operating in various jurisdictions can be expected to arrange their business so that the central bank with the most lax collateral standards can be expected to end up holding the collateral of the lowest quality. This point is quite general: whenever central banks offer different conditions in their liquidity operations, they must expect to be "gamed" by international banks.

Caution about other measures

Central banks have a clear public policy role to do what is needed to keep markets operating during extreme periods of risk aversion and flight to liquidity. The financial crisis that began in August 2007 is clearly such a case, and central banks have responded

accordingly.[17] Nevertheless, many of the recent extensions of central bank operations do have major disadvantages. Measures therefore should be designed so that they are used only in exceptional circumstances. Exceptional measures could include:

Willingness to accept illiquid paper as collateral

Banks will continue to hold good credit (i.e. with better lending standards than applied to U.S. subprime mortgages) but illiquid assets. When markets as a whole have been hit by a flight to liquidity, the central bank may be the only institution in a position to accept such illiquid assets as collateral. Provided such assets are priced conservatively, the risks to the central bank can be limited. Accepting illiquid collateral makes it even more important for the central bank to be able to be sure that its counterparty is creditworthy.

In normal (i.e. non-crisis) circumstances, however, it is not the job of the central bank to liquefy any form of illiquid asset that banks choose to hold. It is possible that imposing very conservative valuation standards would make it unattractive for banks to use such facilities in normal times.

Adopt a wider range of counterparties

A similar argument applies to widening the list of counterparties. In normal conditions, liquidity provided to major commercial banks can be expected to spread almost automatically throughout the system so there is no need for the central bank to conduct operations with every bank. But in a crisis, the normal flow of funds through the

financial system can become blocked. Hence the central bank may have to deal directly with many and more diverse financial institutions.

One reason for limiting the range of counterparties is the cost for the central bank in monitoring the viability of banks that are their counterparties. If the central bank has direct supervisory responsibilities for such banks, such monitoring will be required in any case. Broadening central bank lending to other financial institutions such as mutual funds, insurance companies and so on can be seen as desirable only as a short-term response to a crisis. One apparent justification of recent action—to prevent the seizure of credit derivative markets —raises the question of the need for alternative policies to ensure that the functioning of such markets is not held hostage to the survival of a few, highly leveraged firms.

Lending against assets with credit risk

The Federal Reserve's Treasury Security Lending Facility (TSLF, created in March 2008) and the Bank of England's Special Liquidity Scheme (in April 2008) broke new ground in that they were based not on central bank reserves operations but on swapping illiquid assets with credit risk (especially mortgage-related paper), such assets could not be used in normal market repo transactions. As the Bank of England statement made clear, this represents a quasi-fiscal operation for which the government takes responsibility.

Outright purchase of private sector assets

Assets that central banks have bought in recent months include private sector assets such as equities, commercial paper, corporate bonds and asset-backed securities. The outright purchase of assets by the central bank may have a significant impact on prices, particularly when markets are thin. There are two reasons why purchasing assets is a much more radical step than accepting such assets as collateral for loans. One is that with outright purchases the central bank assumes fully the market and credit risks of buying such assets (unless special structures are designed to transfer the risk to the government). Assessing credit risks is a major challenge for a central bank. In practice, they tend to rely on external credit ratings; while this could appear to create an objective process of risk limitation, any uncritical reliance on such ratings does have drawbacks.

Another concern is the exit strategy. While there is an automatic exit from lending on the repayment date, asset acquisitions reverse automatically only when the instrument matures.

Outright purchase of government bonds

The central bank purchase of long-term government debt matched by the issuance of short-term liabilities would tend to flatten the yield curve—because the private market is being asked to take less duration risks. But a policy can be only a temporary expedient because it entails the public sector assuming greater interest rate risk (and, for some countries, refinancing risk). In the short term, however, it can serve to signal a policy intention to hold interest rates low for some time. In addition, interest rates on some

loans and other debt contracts may be linked to the yields on certain benchmark maturities of government bonds. Such effects are likely to be transitory. A change in government debt issuance policy (e.g. reducing issuance of long-term bonds and increasing the issuance of short-term bills) would have a similar effect.

Conclusion

The financial crisis that started in August 2007 led to a quite unexpected expansion in the central bank's toolkit for conducting liquidity operations. A bigger toolkit seems always better, provided those using its potentially dangerous tools are fully cognizant of the attendant risks. Only central banks can provide the assurances of liquidity often needed in a financial crisis. In the extreme conditions prevailing in autumn 2008, it was natural that fighting the crisis received priority. Before the crisis, nobody expected the scale of operations central banks were drawn into. Many measures will probably be permanent. This chapter suggests three areas where changes decided on during this crisis are likely to endure: increased term financing; wider deposit arrangements at the central bank; and better cross-border provision of liquidity.

But many other operations will at some point have to be unwound. Many of the exceptional measures taken recently have significant adverse side-effects which are likely to be felt in an uncertain way at some point in the future. Reversing such exceptional policies in good time may not be easy, because the size and the timing of the impact of very large changes in central bank balance sheets on the real economy are not known

with any precision. Central banks will be cautious about reversing these policies, particularly when the banks are still weak.

A final danger is that highly visible central bank operations can distract attention from fundamental credit problems that central banks cannot resolve. Public confidence in banks holding large volumes of bad assets can be restored only by some form of government guarantee or by the government taking such assets off bank balance sheets. It took the virtual seizure of credit markets in September 2008 to convince most governments and their legislatures of the need for an overall strategy to address this issue.

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[1] This chapter reflects my own views and not necessarily those of the BIS. I am very grateful for comments and suggestions from those involved in the work on a recent CGFS report – Dietrich Domanski, François-Louis Michaud and Bill Nelson. Thanks to Stephen Cecchetti, Mary Craig, Charles Goodhart, Stephany Griffith-Jones and Már Gudmundsson for helpful comments. Thanks too to Gert Schnabel and Garry Tang for the graphs and Clare Batts for secretarial assistance.

[2] Bank for International Settlements.

[3] On this, see Mehrling (2008) who in this book argued that credit default swaps need their own discount facility. In Bagehot's day, he argues, a bank's acceptance of a bill of exchange made, given the central discount facility at the Bank of England, an illiquid asset liquid. He has argued in favor of an "official CDS backstop": by setting the prices of a few key insurance contracts, the government could give Bagehot's "lend freely but at a penalty rate" dictum a modern guise.

[4] Good descriptions of the inherent difficulties of the LOLR role of central banks are Stevens (2008) and White (2008).

[5] Note, however, that this graph does not include the extraordinary operations taken from March 2008 as several large firms faced failure. As discussed at the end of this note, such operations have clear fiscal dimensions under the Federal Reserve's TSLF and the Bank of England's SLS (see below). In September 2008, the US Treasury issued new bills to facilitate an increase in the size of the Federal Reserve's balance sheet in order to cope with a widening of the central bank's counterparties.

[6] See also Cecchetti and Disyatat (2009) for a discussion of how the principles that should govern the lender of last resort function of central banks depends on the precise nature of the liquidity shortages.

[7] One notable exception, however, is the Swiss National Bank (SNB), which has a target range for the three-month Libor rate for the Swiss franc rather than an overnight rate.

[8] Buiter (2008) points out that the lender of last resort function in the euro area is assigned to the national central banks.

[9] Chailloux et al (2008) refers to Gresham's Law of Collateral: when central bank collateral policies differ from market conditions, banks will exploit the arbitrage possibilities thus created such that the average quality of collateral provided to the central bank will fall.

[10] The construction of "maturity ladders" – of assets and liabilities – over selected maturity dates (next day, next week etc) was one simple tool which encouraged early action to close prospective liquidity gaps. See BIS (2000) and BCBS (1992) for discussions of various earlier approaches.

[11] On this, the UK FSA (2008) noted that the default of an international financial firm can put the creditors and customers of its local affiliates at a disadvantage. They concluded that, "the starting point of our new liquidity regime is that a UK regulated firm or branch must be self-sufficient for liquidity purposes". Any waiver from this new regime would be subject to stringent criteria.

[12] See Davies (2008). Several comments during the consultative period of the Basel Committee's *Principles for Sound Liquidity Risk Management and Supervision* made this point. For instance, the Institute of Chartered Accountants noted a need "… in the longer run … for some form of quantitative requirements, agreed with the regulator. It is undesirable for too great a range of regimes to persist across countries." (Basel Committee, 2008b).

[13] CGFS (2008) notes banks eagerly took up offers of central bank term finance. The fact that auction stop-out ratios were high suggests that the banks' underlying funding needs were only partly met. See also Michaud and Upper (2008).

[14] "Eurodollar" means dollars traded outside the United States, and is not to be confused with the European currency.

[15] Communiqué of G10 Governors, 10 September 1974, BIS.

[16] Selling forex reserves to the banks by contrast drains liquidity from the domestic banking system.

[17] In addition, but not considered in this chapter, quantitative measures may be needed to effect further easing of monetary policy once nominal policy rates are close to zero.