

Central banks and financial stability: Back to the past or jump to the future?

Laurent Le Maux^{*} and Laurence Scialom[§]

Summary: During the so-called subprime crisis, central banks were much solicited as lender of last resort and their interventions were unusually lengthy and apparently innovative. The purpose of our paper is to determine and classify the main features of the central banks' operations during the 2007-08 financial turmoil and then to compare them to historical experience - especially in the classical period - in order to assess whether they constitute a complete break with past practices or just an inflexion driven by the evolution of the financial and banking structures. We point out strong similarities between past and present central bank practices, but also important divergences often conditioned by differences between the exchange and monetary system prevailing in the two periods. We also show that the recent debate on the market maker of last resort seems to be a mere rediscovery of the historical roots of central banking.

Keywords: Central bank policy, lender of last resort, financial stability, financial history

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Preliminary version

I. INTRODUCTION

In the face of the financial market turmoil that began in August 2007 (Gorton, 2008; Bank for International Settlements, 2009), central banks were dramatically mobilized in their capacity as lender of last resort and forced to adapt their tools and practices in accordance with the specific nature and depth of the financial distress. The systemic financial crisis combined shortages in central bank liquidity, market liquidity and funding liquidity with self-reinforcing dynamics (Cechetti and Disyatat, 2009). Market liquidity fell considerably for a wide range of assets and, in particular, secondary market liquidity became extremely thin for structured credit products. Besides, the adoption of new accounting rules (fair value) immediately validates market prices in the balance sheet of financial institutions. Market-wide events in the financial system are perceived simultaneously by all market participants, whose reactions are synchronized and fuel the price decline and the reappraisal of risks (Adrian and Shin, 2008). Market-to-market accounting means that changes in asset prices rapidly impair the net worth of all the participants. Consequently, a tightening in market liquidity quickly translates into changes in the banks' and market intermediaries' (shadow banks) equity base. In this context, liquidity of financial institutions interacts with their solvency. Indeed, if market participants have misgivings about the solvency of their counterparts, they cut off their access to funding and thereby cause the solvency problem that they fear. All market participants know the prevailing interrelationships between market illiquidity and funding illiquidity and thus the frontier is blurred between illiquidity and insolvency in a market-based financial

system. In 2007-08, such characteristics intensified liquidity crisis with a rise in uncertainty in the Knightian sense - unknown and non-measurable risk.

In this context, central banks' actions covered a broad spectrum, including extensive use of both existing and new tools for supplying central bank money to financial institutions (banks and nonbanks) and markets, as well as for reallocating liquidity among market participants. The evolution in the forms of central banks' efforts to lessen liquidity stress was conditioned by the characteristics of the different phases of the crisis. The Lehman Brothers failure unquestionably constituted a breaking point in the crisis and the ensuing central banks' actions (Bank for International Settlements, 2009). During the first stage between June 2007 and September 2008, concerns over losses on US subprime mortgage loans escalated into widespread financial stress. On 9 August 2007, the turmoil spread to interbank markets signalling the advent of a broader financial market crisis. From March to September 2008, investors' concerns turned more and more away from questions of funding liquidity toward those of bank solvency and they rationed particularly those financial institutions known to be highly leveraged and exposed to toxic assets. When, on 15 September 2008, Lehman Brothers filed for chapter 11 bankruptcy protection, the crisis entered its most intense stage, characterised by a global loss of confidence arrested only after unprecedented and broad-based policy interventions. Indeed, with the market in complete disarray, an increasing number of financial institutions were facing the risk of default, including US money market funds which were largely exposed to losses on short- and medium-term notes issued by Lehman Brothers.

As a result, central banks had been regarded as providing liquidity to the market in a "nonstandard way" in 2007-08 (Chailloux, Gray and McCaughrin, 2008). The question is then to detect what had been new or not in the practices and tools of the lender of last resort (LLR). In this respect, emergency measures in 2007-08 might be compared with actions and innovations implemented by central banks during financial crises all throughout the nineteenth century. The "classical" period constitutes a reference for at least three main reasons. First, during the period, Thornton (1802), Tooke (1848) and Bagehot (1873) devised a "classical" theory of lender of last resort and attempted to appreciate the innovative and adaptive action of the Bank of England under the gold specie standard¹. Second, markets of securities were for most part developed and even globalized - especially in the late nineteenth

¹ On the lender of last resort in theory and in history, Humphrey and Keleher (1984), Humphrey (1989), Kaufman (1991), Goodhart (1999), Freixas and *al.* (2000).

century - and hence, the financial environment presented similarities with the contemporary one (Bordo, Eichengreen and Kim, 1998; Bordo, Eichengreen and Irving, 1999; Eichengreen, 1996). Large amounts of commercial papers circulated among financial institutions such as bill brokers and discount houses. Interestingly, Bagehot (1873, p.196) described their central role in the British financial system noting that “in Lombard Street, the principal depositors of the bill brokers are the bankers, whether of London, or of Provincial England, or of Scotland, or of Ireland. Such deposits are, in fact, a portion of the reserve of these bankers; they make an essential part of the sums which they have provided and laid by against a panic. Accordingly, in every panic these sums are sure to be called in from the bill brokers; they were wanted to be used by their owners in time of panic, and in time of panic they ask for them”. Similarly, nonbank institutions such as hedge funds, market mutual funds or investment banks nowadays play a major role in the finance-based economy as well as in the financial crisis propagation process. Third, the central bank interventions during the classical period could be very impressive as had been the case during the current period - from the crash of 1987 until the post-Lehman Brothers failure in 2008². By contrast, during the period of the regulated banking system that prevailed after World War II until the financial liberalization in the early 1980s, financial collapse and central bank practices of lending in last resort were not so frequent and significant.

With reference to the classical period, our paper focuses particularly on the Bank of England and on the US Clearing Houses. Unlike most European nations, the United States had no official central bank during the nineteenth century. After the severe crisis of 1907, Congress produced a kind of federal compromise in banking - the Federal Reserve Act of 1913. More precisely, under the National Banking System that prevailed before the Federal Reserve, central bank functions were fragmented and implemented by different institutions. Among them, the National City banks, especially those from New York, centralized part of money reserves, the Treasury attempted to smooth interest rates, especially during the Leslie Shaw administration as Treasury Secretary, and the Clearing Houses acted as lenders of last resort during crises (Timberlake, 1993). The New York Clearing House (NYCH) was probably the most sophisticated of the US Clearing Houses during the National Banking era

² Financial and banking crises and central bank interventions that were observed during the 1990s in Europe, Japan and United States seem too close to the recent period from a historical and economic point of view and they even reveal features - especially in the case of Japan - that have recently been at work. In other words, financial crises and central bank actions in the 1990s are part of the finance economy period that began in the 1980s and continued in the 2000s.

and acted as a quasi-central bank. It organized multilateral offsets of bank notes and cheques issued by commercial banks, controlled and monitored member banks and issued loan certificates that banking institutions used as interbank means of payment. These loan certificates were considered as a high-powered medium and could be issued in large amount during periods of liquidity pressures³.

Our paper aims to determine and classify the main features of the central banks' operations during the financial crisis of 2007-08 and then it presents a comparison - in nature and not in degree - with historical experience in order to assess whether these operations constitute a complete break with past practices or just an inflexion driven by the evolution of the monetary and financial frameworks. In section II, we discern in the 2007-08 crisis central bank policies which present similarities with central bank experience in the classical period. In section III, we explore recent radical innovations which are partly conditioned by the monetary system and illustrate that central banks endogenously adapt their practices to financial and monetary structures. In section IV, we discuss an apparently new debate in central banking, namely the market maker of last resort, and we emphasize that if the debate seems new the underlying practices are not so original.

I. SIMILARITIES AND CONVERGENCES BETWEEN PAST AND PRESENT

1) Liquidity injection and changes in the asset composition of central bank balance sheets

Since the onset of the financial crisis in 2007, central banks provided liquidity on interbank and other wholesale markets. The increase in the frequency and gross size of discretionary liquidity injection operations was a measure adopted by central banks. During the first phase, central banks' efforts to sustain liquidity were undertaken through changes in the asset composition of their balance sheets, while keeping the overall size nearly constant. Since financial troubles were exacerbated by the Lehman Brothers bankruptcy in September 2008, central banks' operations crossed a new threshold that involved a worsening deterioration in the quality of the assets side as the same time as the size of their balance sheets increased

³ Nevertheless, it should be noted that the Clearing Houses system can not be likened to a complete central bank for at least two reasons. On the one hand, the participation of banking institutions in regional Clearing Houses was not legally compulsory. On the other hand, the clearing system was not federally unified. Such a lack of unification in the US banking system was not completely resolved with the Federal Reserve Act (Wicker, 1996).

rapidly. The increase in central banks' balance sheets appraises the magnitude of the net liquidity injection that took after September 2008. Between June 2007 and December 2008, the total assets of the Eurosystem and the Federal Reserve grew considerably: by 90% and 160% respectively. The improvement in money market conditions in the first half of 2009 led to a reduction in total assets by about 20% for the Eurosystem and by 10% for the Federal Reserve (European Central Bank, 2009). The impact on the size of the central bank's balance sheet depends on how increases in specific types of claims on the assets side were "financed". In other words, until the failure of Lehman Brothers, net injections by central bank balances were effectively very small (near zero), because the increases in certain assets held by central banks were "financed" by running down other claims. By contrast, after the failure of Lehman Brothers, they were financed by the issuance of central bank liabilities (high-powered money) and by loans from the Treasury in the US.

During the nineteenth century, the increase in the balance sheets of central banks was not as spectacular as for some central banks in 2007-08. Nevertheless, despite the specie standard, the Bank of England actively intervened in favour of banks and financial institutions by issuing high-powered medium in significant amounts. The literature sometimes refers to the 1866 crisis as a turning point in the history of central banking in Britain, when the Bank gave assistance as a LLR (Schwartz, 1986; Eichengreen, 1996; Bordo, 1998). In fact, it reports Bagehot's analysis and its historical context. A more appropriate date would probably be the year of 1825, as pointed out by Tooke (1848, pp.329-48) and even by Bagehot (1873, p.150) himself when he stated that "the success of the Bank of England" in resolving the panic of 1825 "was owing to its complete adoption of right principles". Indeed, during the year of 1825, the Bank of England notes circulation went up 47%, rising from £17 million in late November to £25 million in late December (Parliamentary Papers, 1832). Furthermore, at the end of the nineteenth century, the Bank's liabilities in the form of deposits gained in significance and were chiefly used as a lending tool by the Bank during panics, notably because the Act of 1844 limited the quantity of Bank note issuance. As depicted by Collins (1992), during the 1878 crisis, the banker's balances at the Bank of England significantly increased (40% in three months), along with the other private deposits (45% in four months).

The Bank's intervention in 1825 promptly stopped the panic during the week following the injection of liquidity (MacLeod, 1866). The same result occurred with the Bank's intervention in 1847, 1857 and 1866 after the announcement of the relaxation of the Act of 1844 by the Government (Parliamentary Papers, 1848; Newmarch, 1866). These facts suggest that liquidity injection or even its mere announcement could be sufficient at that time to calm

down financial distress. During the 2007-08 crisis, central banks appeared unable to induce such a catalytic effect in the banking and financial community. In any case, after the central banks' intervention, the composition of the asset side became unquestionably riskier. As an illustration, between June 1824 and December 1825, the reserves of the Bank of England fell from £12 million to £1 million and, correlatively, the annual average amount of commercial paper under discount rose from £2.4 million in 1824 to £4.9 million in 1825 (Parliamentary Papers, 1832). Thus, even assuming an unchanged size of the balance sheet, the composition of the Bank's asset side would have been riskier due to its lending in last resort intervention.

2) The enlargement of the range of counterparts and the stigma problem

The first challenge faced by central banks since the onset of the subprime crisis was a breakdown in the usual liquidity distribution channels. In their open market operations, many central banks do not deal directly with all the commercial banks and securities firms but only with a pre-specified range of counterparts that redistribute the liquidity in the banking system. However the different components of the monetary operating frameworks (the maturity and frequency of discretionary operations, the counterpart arrangements and the range of eligible collateral, etc.) may vary considerably from country to country (Borio and Nelson, 2008). For instance, counterpart arrangements differed widely among countries. In the euro area as well as in Switzerland, the range of eligible counterparts was very broad and common across operations. At the other end of the spectrum, in the United States and to a lesser extent in Canada, the counterparts for discretionary operations were considerably fewer than those with access to standing facilities (lending and deposit facilities). Such a significant disparity in domestic monetary operational devices amply explains the differences in the lender-of-last-resort innovations needed to respond to the specificity of the inter-bank market disruption. Nevertheless, central bank interventions exhibit major similarities. In particular when the original operating monetary framework was too restrictive in the definition of counterparts, it has been relaxed, especially in the US.

During the period of stress, the banks' reluctance to lend to each other inhibited a smooth distribution of reserves and led central banks to adapt their tools. The need for such innovations in central bank liquidity operations was reinforced by the banks' unwillingness to use standing facilities, discount windows or marginal lending facilities to avoid disclosing their financial weakness. The purpose of standing facilities is to support settlement in the payment system by providing collateralized overnight loans to direct participants in the payment system who are experiencing temporary shortfalls in their settlement balances.

Generally, banks pay a penalty rate for this direct source of liquidity, but the range of counterparts and the eligible collateral are wider for standing facilities than for open market operations. Nevertheless, using such bilateral lending was perceived by banks as a stigma which signalled their financial difficulties to the other market participants. Transparent provision of liquidity in such circumstances could be interpreted as a confirmation of vulnerability, causing their inter-bank counterparts to react exactly in the manner that the financial support is supposed to prevent. As a consequence, banks with liquidity needs attempted to avoid the stigma problem and there was relatively little use of standing facilities even on days when inter-bank rates rose above the interest rates on the facilities. In order to cancel the stigma associated with standing facilities and to promote efficient distribution of liquidity provision inside the interbank market, the Federal Reserve created a new discount window program in December 2007, the Term Auction Facility (TAF). This was a credit facility for terms of 28 or 35 days that allowed a depository institution to place a bid for an advance from its local Federal Reserve Bank at an interest rate resulting from an auction. It differed from open market operations because it involved all of the over 7000 commercial banks in the country rather than just the 20 primary dealers. Additionally, the accepted collateral (i.e. any collateral eligible to secure discount window loans) was much broader than with the standard repo. It also differed from the discount window because it offered anonymity to the bidders and thus escaped the stigma problem. Moreover, the TAF rules allow banks to pledge collateral that might otherwise have a very low market value. Through the TAF, the Federal Reserve was taking collateral at a price that was almost certainly above what the banks could get for it anywhere else (Cecchetti, 2008).

The history of the US Clearing Houses gave an interesting insight into issues of stigma. Because of their collective responsibility, they had strong incentives to monitor member banks and controlled them so as to evaluate the quality of their portfolio in accordance with their capital (Whitney, 1878; Cannon, 1910). As illustrated by the NYCH experience, information on member banks could be public in normal circumstances. However, during crises, the NYCH decided to suspend publications of individual bank balance sheet information as well as balance amounts at the clearings in order to protect weaker banks against stigma which would signal their liquidity shortage. As Gorton, (1985, p.280) points out, “the suppression of bank-specific information, an act completely contrary to the usual functioning of clearinghouses, avoided identifying ‘weak’ banks which might then experience a run which led to runs on other banks”. These facts show that informational transparency is

not the ultimate goal of the central bank as responsible for financial stability and could be infringed depending on the circumstances if the collective interest so requires.

Concerning the enlargement of counterparts, the most symptomatic measure had been the Primary Dealers Credit Facility (PDCF). In March 2008, the Federal Reserve announced the setting up of this new procedure, which was an overnight loan facility that provided funding to primary dealers⁴ in exchange for a large range of eligible collateral including all investment grade corporate securities, municipal securities, mortgage-backed securities and assets-backed securities for which a price was available. In the past, investment banks did not have access to either discount window borrowing or the TAF, which were both restricted to regulated depository institutions. However, this new facility granted to investment banks is authorized under paragraph 3 of section 13 of the Federal Reserve Act, which allows lending to nonbanks under “exigent and unusual circumstances”. Such a provision suggests that there was a fundamental difference between PDCF and the Federal Reserve’s normal operations. Indeed, the privileges for banks that come from belonging to the Federal Reserve System - access to emergency liquidity - come with regulation costs so that banks with direct access to Fed credit are supposed to limit their risk taking.

In extending the LLR umbrella in favour of investment banks, i.e. to financial institutions which had previously expanded a lot and were not considered as member banks of the central bank organisation, the Federal Reserve crossed the Rubicon. Obviously, these investment banks initially tried to escape the regulation that is required for central bank membership. They were not strongly controlled by the banking regulatory authorities, thus allowing regulatory arbitrage and finally free riding. This story is not new, as revealed by the US Trust Company collapse in 1907.

Trust companies emerged as financial intermediaries in the late nineteenth century. They were specialized in collateralized loans and could invest in real estate. In New York City, the trust companies’ asset side increased 2.5 times more than the National Banks’ during the decade preceding the 1907 crisis (Moen and Tallman, 1992). Under the Act of 1863, National Banks were federally regulated while trust companies were far less impacted by state regulation. In particular, New York City trust companies were less regulated on their reserves than New York National City Banks which had to meet a legal reserve ratio equal to 25%. Before 1903, the NYCH accepted some trust companies as member banks, but in June 1904 it

⁴ Primary Dealers are banks and securities brokers-dealers that trade in US government securities with the Federal Reserve Bank of New York.

required a reserve ratio between 10% and 15% in order to establish relative uniformity in regulation within its system. By taking this initiative, the NYCH was not only concerned with its own narrow interest but more generally by the preservation of banking stability in New York City. It should be noted that the NYCH requirement on trust reserves was not very strong in comparison with the federal requirement on National City Bank reserves. However, outside trust companies refused to apply these new entry requirements and some member trust companies decided to exit the NYCH so as to maintain their competitive advantages. Actually, the problem was not that the NYCH was too negligent (Wicker, 2000) or on the contrary too stringent (Freixas and Parigi, 2008): the true problem was the free riding behaviour from unregulated financial institutions. The latter did not want to participate in the consolidation of the banking system by accepting some regulations imposed by the clearinghouse, and preferred to capture each opportunity for profit that the absence of legal requirement could offer at the detriment of the financial and banking system as a whole.

During the panic of October 1907, the NYCH did not directly sustain trust companies but it granted loans to New York National Banks which then gave assistance to trust companies they had close ties with and could get information about. The NYCH was probably reluctant to lend directly to NY trust companies because of their free riding attitude in the early 1900s. Moen et Tallman (2000, pp.147, 161) convincingly show that participation at the Clearing House was the key factor for resolving crisis: “The clearinghouse took action to protect the payments system, but the clearinghouse’s method to contain panics relied on timely balance-sheet information of member institutions; information from non-member trusts was perceived as much less reliable. [...] The New York trusts’ isolation from clearinghouse (with its implicit monitoring, coinsurance, and liquidity provision functions) was the key element in propagating the massive runs on deposits. [...] These results indicate that further studies highlighting the extent of clearinghouse or central-bank coverage during crises will be useful in understanding the factors affecting the occurrence and severity of bank runs”. A number of institutions in trouble during the crisis of 2007-08 which had previously grown rapidly (investment bank, nonbanks, etc.) were not members of the Federal Reserve System. The extent of the central bank coverage was thus reduced and the central bank was forced to adapt its action and to take more risk than it has never done before.

In Britain, it may be noted that eligible counterparts were not as codified during the nineteenth century as today - for instance, several banks and financial institutions did not directly hold a current account in the Bank of England - and their range was far wider than that of institutions with which the Bank had current relationships. Bagehot (1873, pp.76, 135,

191, 198) mentions several times that, during crises, large amounts were advanced to bill brokers and even to dealers, and not only to banks. As an illustration, during the 1857 crisis, the Bank of England advanced more than £9,000,000 to bill brokers whereas the advances to London and Provincial bankers were £8,000,000.

3) Enlarged eligible collateral and longer-term maturity

When injecting liquidity - whether intraday for payment system purposes, short-term or long-term open market operation, or overnight in standing credit facilities - the standard practice for central banks is to take collateral. They do not take collateral in order to re-use it during the life of the operation but primarily to protect themselves against credit risk. The range of eligible collateral differs considerably across countries, not only in terms of accepted varieties but also in terms of whether collateral requirements vary across operations (open market or standing facilities). Since the onset of the market turmoil in 2007, the huge increase in demand for good quality, liquid collateral - primarily government or government-guaranteed - has increased the opportunity cost of using such collateral in operations with the central bank. To some extent central banks have willingly accommodated this. So, in order to overcome the impediments to a smooth distribution of liquidity, most of the central banks relaxed the requirements for eligible collateral⁵. By enlarging the range of qualified assets for repos or as collateral for loans from central banks, monetary authorities tried to reduce the liquidity premium that might otherwise be needed to encourage investors to hold those assets.

Central banks had dealt with liquidity disruptions through innovations such as the Term Securities Lending Facilities (TSLF) in the US and the Special Liquidity Scheme (SLS) in Britain⁶. The Federal Reserve and the Bank of England created new instruments to finance part of the overhang of illiquid assets by exchanging them temporarily with more easily tradable assets. However, these measures are in keeping with the same logic as the

⁵ The Federal Reserve, the European Central Bank, the Bank of England, the Bank of Japan, the Bank of Canada and the Swiss National Bank.

⁶ The TSLF announced by the Federal Reserve on March 11 2008 was a more precise tool for addressing the dislocations in the credit market by striking at the core of the financial problems, namely mortgage-backed securities. Under the TSLF, the Federal Reserve temporarily swapped more of its Treasury holdings for troubled private sector assets. On 21 April 2008, the Bank of England announced the SLS which seems quite similar to the TSLF. Indeed, this scheme allowed banks and building societies to swap some of their illiquid assets for Treasury Bills. Note that, as far as we know, no swaps of illiquid bonds for liquid bonds had been unambiguously observed in history.

enlargement of eligible collateral and are likewise used to tackle the dysfunction of interbank markets. Their purpose was to lessen strains in wholesale interbank markets, to restore proper functioning, and as a result to re-engage the banking sector in the intermediation process partly by affecting the market pricing of specific assets. Obviously, the outcome was a shift in the asset composition of central banks' balance sheets from liquid, safe assets towards illiquid, risky ones. Central banks clearly became exposed to important market and credit risks. Such a balance sheet policy was transmitted through two main channels: the signalling effect and the portfolio balance effect. The mere announcement that the central bank was engaged in operations involving illiquid assets could improve investor confidence in those assets and so reduce liquidity premiums. This signalling effect could be reinforced by a more direct effect on the composition of private sector portfolios. Thus, the swaps of illiquid private assets for risk-free public sector bonds improved the overall risk profile of bank balance sheets and therefore could limit banks' reluctance to lend mutually.

Strictly speaking, central banks did not “broaden” the range of eligible collateral in the early nineteenth century because they had not previously defined a narrow set of securities purchased during crisis lending⁷. In other words, since the beginning of lending of last resort in history, the spectrum of bills and securities purchased by central banks as well as the range of counterparts were quite wide. In this respect, the declarations of the directors of the Bank of England during the 1832 Parliamentary Inquiry are very suggestive. Indeed, one of them, J. Harman (PP, 1832, q.2217), answering a question on the way the Bank of England provided its assistance during the 1825 crisis, gave an instructive portrayal of the lender of last resort: “We lend it *by every possible means, and in modes that we never had adopted before*; we took in stock as security; we purchased Exchequer bills; we made advances on Exchequer bills; we not only discounted outright, but we made advances on the deposit 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 upon some occasions over-nice; seeing the dreadful state in which the public were, we rendered every assistance in our power” (italics added). Thus, as early as 1825, the Bank of England discounted outright and made advances against collateral on commercial papers, bills of exchange, stocks and Exchequer bills. In the same vein, Bagehot (1873, pp.151-2) mentioned that “the *amount* of the advance is the main consideration for the Bank

⁷ In the United States, according to the preamble of the Act of 1913, the Federal Reserve could grant loans to member banks by rediscounting commercial papers and short-term negotiable instruments issued as “real bills”, that is, for “agricultural, industrial, or commercial purposes”. See, Clouse and Small (2004).

of England, and not the nature of the security on which the advance is made, always assuming the security to be good” (italics original). If the Bank lent using new methods that it “never had adopted before”, in Harman’s words, it clearly showed that it could adapt its intervention to the circumstances of the financial turbulence. Obviously, the absence of convertibility into metallic currency, i.e. the fiat money system that prevails today, reinforces the discretionary ability of the central bank to proceed to the enlargement of acceptable collateral according to trickier financial circumstances.

Financial innovations - such as securitization nowadays - partly explained the enlargement of the range of qualified collateral. As an example, during the 1860s, a financial innovation was widely used for financing the railways in Britain. The new financial instrument consisted of a contract by which the railway builder accepted shares and/or debts issued by the railway companies instead of cash. In this way, the railway builder took the default, credit and liquidity risks and then transferred them by selling stocks and securities to credit and finance institutions. Newmarch (1866, pp.230-1) described this process as “a system of extravagant agency and commission” which was “pushed off with success in various avenues of the money-market”. At the same time, the Company Act of 1862 authorized firms in general and financial institutions in particular to substitute unlimited liability for limited liability and, as a consequence, created incentives to increase their leverage, which was conducive to financial instability. In September 1866, after the credit crisis in May and the ensuing intervention of the Bank of England, some commentators worried about the fact that the Bank could hold railway securities (Bank of England, 1866). Bagehot (1873, p.151) did not share this cause for concern and believed that the Bank could reasonably hold a large range of securities (commercial bills, public debts, India securities, and railway debenture stocks) in times of liquidity pressure.

As regards funding maturity, at the beginning crisis in 2007 central banks faced a changing maturity composition in banks’ demand for funding liquidity, with an increase in the net demand for term funding relative to overnight funding. In their asset-liability management to reduce the impact on their liquidity mismatch, banks sought to obtain term funding from the central bank. This phenomenon was mainly driven by perceived liquidity and counterpart risk concerns. Some market participants purchased assets from or extended credit to the off-balance sheet vehicles that they had created and the money market funds that they managed, even though they had no contractual obligation to do so (Basel Committee on Banking Supervision, 2008). Such decisions might reflect reputation concerns. Lending in difficult circumstances for very short maturities involves a rollover risk and remains ineffective in

forestalling panic. In order to deal with this problem, to a varying degree all central banks increased the availability of longer term funding supplied to the market through discretionary operations⁸. Longer-term liquidity offered by central banks aimed to offset the impact on the yield curve of the lack of availability of unsecured money market term lending.

The lengthening of maturity for liquidity provision was not so frequent during the classical period. On the contrary, under specie standard, central banks often used to reduce the maturity of the bills they discounted to manage the level of their reserves. Nevertheless, in the case of Britain, when the Bank of England decided in December 1825 to put an end to the panic, the Court agreed to advance at 5% against “long bills - beyond 95 days - which it did not usually discount” (Clapham, (1944, II, pp.99-100).

In sum, all these measures to ease the conditions for the provision of reserves by enlarging the range of eligible collateral and increasing the funding maturity complemented the enlargement of the range of counterparts for discretionary operations.

II. THE DIVERGENCES BETWEEN PAST AND PRESENT

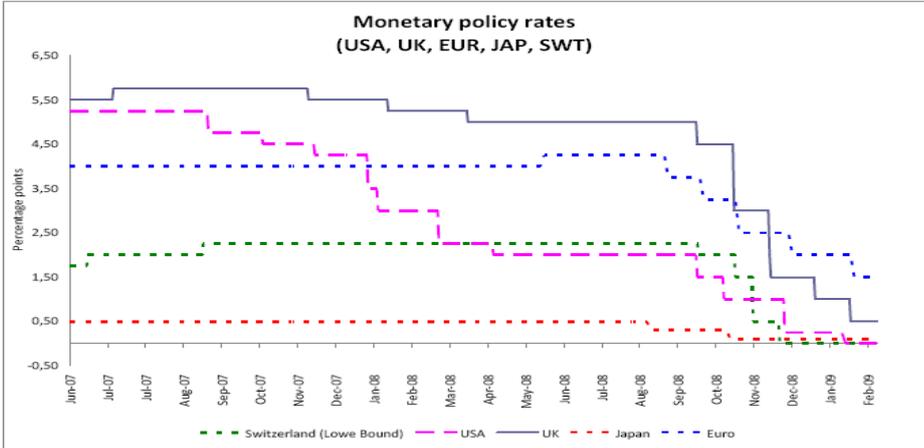
I) Interest rate cut policy

The Federal Reserve began to ease monetary policy before the other main central banks and reduced the target for the federal funds rate from September 2007 as may be seen in graph 1. The Open Market Committee continued to respond to the crisis bringing down its target for the fed funds rate by a cumulative 325 base points by spring of 2008. Usually, interest rate policies are not coordinated among central banks. However, the intensification of financial trouble after the Lehman Brothers bankruptcy led to the unprecedented response of a rate cuts policy, and cooperation took place on 8 October 2008 when six major central banks simultaneously announced a coordinated policy of rate cuts. Then, central bank rates in many countries reached historically low levels. From January 2009, the Federal Reserve, the Bank of Japan and the Swiss National Bank had brought interest rates close to zero and in mid-2009 they had caught up with the Bank of England. The European Central Bank lowered its main

⁸ For instance, during the first phase of the financial turmoil, the main change to the Eurosystem’s approach to liquidity management was the increase in the ratio of Long Term Refinancing Operations (LTROs) to one week refinancing operations, with LTROs constituting one third of the total outstanding refinancing before the financial turmoil and two thirds in September 2008. The outstanding amount of LTROs went up from €150 billion in June 2007 to over €600 billion at the end of 2008.

interest rate by 3.25 % between September 2008 and May 2009 but stopped well before it reached the zero lower boundary. The goals of these sharp reductions in interest rates were twofold. On the one hand, they contributed to contain contagion through a reassessment of the net present value of investment projects and therefore created a force thwarting the effects of liquidity shortage on asset prices. On the other hand, they directly reduced the cost for banks to obtain liquidity from central banks and thus reduced a potential source of bank losses. More generally, they reduced the strength of the so-called adverse feedback loop in which economic weakness and financial stress became reinforcing.

Graph 1: Interest rate cuts (USA, UK, EUR, Japan and Switzerland)

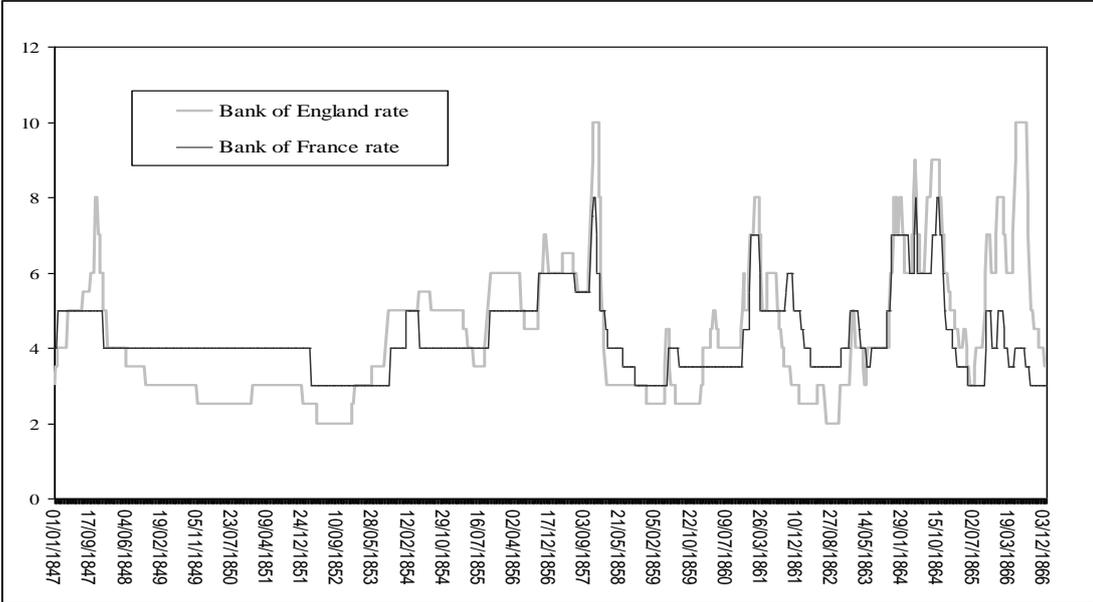


Source: Freixas (2009)

The general decrease in interest rates in 2007-08 was possible because of the flexible exchange rate system and fiat standard. The recent interest rate cuts should not be compared with the discount rate policy of Banks of Issue in Europe during the classical period. At best, the specie standard was characterized by a lack of coordination in that each central bank set its discount rate without consideration of others. At worst, as graph 2 shows, it could be destabilized by rivalry among central banks, which generated important changes in central bank discount rates and pushed them to very high level. During international crises, central banks used to increase their interest rates simultaneously and competitively in order to limit external drains of precious metal. This was especially the case since 1847 in the relationships between the Bank of England and the Bank of France. The paroxysm of noncooperation

occurred during the 1857 crisis and entailed a “bank war” across the Channel through telegraph lines (Patterson, 1866).

Graph 2: Bank of England rate and Bank of France rate, 1847-1866



Source: Hawtrey (1938), Clapham (1944)

The main argument of Bagehot’s (1873) recommendation for “very high” interest rates is directly linked to this historical context in which a high level of interest rate was supposed to generate deflation and thus to restore the balance of trade and import of precious metals. A second Bagehot’s argument (*ibid*, p.147) involves the domestic interbank market and claims that the rule of very high interest rate would “prevent the greatest number of applications by persons who do not require it”. In other words, the rule gives strong incentives for banks to exhaust all the alternative sources of funding before asking for central bank liquidity. In claiming this argument, Bagehot implicitly relied on the ability of the interbank market to reallocate liquidity efficiently among banking and financial institutions in such a way that only few banks would have to ask for liquidity at a very high interest rate. Nevertheless, the problem of reallocating liquidity that the interbank market met in 2007-08 challenges this assertion.

2) Towards an international lender of last resort?

Interbank markets are global in scope and linked across countries by activities and funding needs of banks that achieve cross-border business on a large geographical scale and hold

assets and liabilities denominated in a variety of currencies. In addition to domestic operational responses in 2007-08, central banks had then strengthened their cooperation via foreign currency markets and provided arrangements to supply foreign currency to domestic counterparts. This was particularly and systematically the case from September 2008 when the Federal Reserve announced a significant expansion of reciprocal currency arrangements with foreign central banks, including an approximate doubling of the existing swap lines with the European Central Bank (ECB) and the Swiss National Bank (SNB)⁹ from \$120 billion to \$240 billion. A notable feature of the cross-border Term Auction Facility procedure was that the Federal Reserve provided dollars without needing to take a look at the ECB's or SNB's collateral policies. Indeed, these arrangements provided foreign banks access to dollar term funding at US market determined rates, but using European-based collateral. In September 2008, in response to continued strains on short-term funding markets, ten central banks announced further coordinated policies to expand the capacity to provide dollar liquidity. The alleviation of dollar shortage of foreign banks helped the Federal Reserve to reinforce its control over the rates paid for dollar funding in money markets and limited "fire sales" of dollar denominated assets by foreign financial institutions and pressures on dollar assets prices. Shortages in foreign currency funding for domestic counterparts reveal central bank's inability to get international liquidity. So when they faced a global liquidity shortage in foreign currencies, central banks were confronted with the intrinsic limits of their LLR power which is exclusively restricted to domestic currency. Through their coordinated program of swap lines which ended foreign currency funding shortages in interbank markets, central banks as a whole behaved like a sole international lender of last resort.¹⁰

Under the specie standard, central bank cooperation with respect to international lending could take place through transfers of bullion but remained exceptional (Viner, 1937; Flandreau, 1997). For instance, in 1839 a pool of twelve Parisian banks with support from the Bank of France gave assistance to the Bank of England. In the same vein, in 1860 a swap of

⁹ The US dollar Term Auction Facility started in December 2007. The ECB agreed with the Federal Reserve to grant loans in dollars to euro area banks. The scope of this facility was expanded with the decision on 18 September to start providing dollar funding to European counterparts also on an overnight basis and to increase the amounts offered in existing operations at longer maturities. Fourteen Central Banks were involved in these bilateral currency swap agreements with the Federal Reserve.

¹⁰ The use of the term "international lender of last resort" to define mutual swap operations could be controversial. Actually, there is no international currency used universally by central banks, but a small number of national currencies used mutually in an international context as an exchange reserve.

English gold against French silver was contracted in order to contain gold drains due to the undervaluation of silver in France. Furthermore, in 1890 the Bank of England asked for a loan in gold from the Russian State Bank. Hence, the recent program of swap lines by contemporary central banks seems far more cooperative and unprecedented and is no doubt easier due to the fiat money system.

3) The process of reallocating liquidity

Goodfriend and King (1988) uphold a concept of the LLR considering that the existence of a fully collateralized repo market allows central banks to provide the adequate amount of liquidity only through the repo market. They assume that interbank market participants are able to distinguish between illiquid and insolvent institutions, and that the market as a whole is able to distribute liquidity efficiently between banks with a surplus and those with a deficit. However, during the 2007-08 collapse, incomplete connectedness had led to patterns in which pockets of unused liquidity co-exist with regions of liquidity shortage. These interbank market failures to allocate liquidity invalidate Goodfriend and King's view. As a result, central banks had to go beyond lending of last resort, reorganize interbank markets and *reallocate* liquidity from banks with a surplus to those with a deficit. This "reallocation of liquidity" has to be distinguished from "crisis management". As defined by Fischer (1999), a "crisis manager" organizes the equalization of reserves from a pool of banks with a surplus to those with a deficit. In the end, such a pool formally remains at the discretion of banks with a surplus even if the crisis manager might use "moral suasion" to induce cooperative behaviours. By contrast, the "reallocation of liquidity" as observed in 2007-08 may imply a change of high-powered money. Thus, the central bank intervenes between banks with a surplus and those with a deficit by liquidity absorbing mechanisms such as reverse repo operations and deposit facilities.

In 2007-08, central banks carried out the process of reallocating liquidity and did not play a simple crisis manager role. At the same time, they acted as LLR, massively increasing liquidity provision and relaxed their operational monetary frameworks by enlarging the range of counterparts and eligible collateral and by providing longer-term liquidity. They *also* absorbed excess liquidity by means of different instruments such as deposit standing facilities, reverse repos, current accounts for reserve requirements and excess reserves etc. In doing so, they increasingly interposed themselves between banks which were short of liquidity and those which were long. The massive increase in liquidity provision on the asset side of the balance sheet, concomitant with the liquidity absorption on the liability side testifies that -

particularly in the months following the collapse of Lehman Brothers - central banks partially replaced the money market which was not functioning properly, becoming the central counterpart of the market.

As mentioned previously, the size of the Federal Reserve's balance sheet did not increase significantly between June 2007 and September 2008 because the gross liquidity injection through the new lending facilities was mainly compensated by the sale and redemption of Treasury securities. This was no longer possible after the Lehman Brothers episode. From September to December 2008, the Federal Reserve balance sheet more than doubled and the liability side was greatly modified. The credit institutions' current account balances which cover minimum reserve requirements and excess reserves increased dramatically from \$20 billion in January 2007 to \$860 billion in December 2008 (see annexe). This was partly due to the introduction in October 2008 of the remuneration of excess reserves which enabled banks to hold them at no cost. Reserves were mostly voluntary: indeed, the penalty for holding reserves instead of lending on the federal funds markets disappeared once the interest rates on both became similar. In the same period, the Federal Reserve reached an agreement with the Treasury according to which the latter would issue securities and deposit the proceeds in a special account with the Federal Reserve. Concerning the ECB, the deposit facility was the main liquidity absorbing instrument and it rose from €1 billion at the end of June 2007 to over €300 billion at the end of 2008. The Bank of England and the Swiss National Bank began to issue central bank bills.

Historically, central banks could occasionally intervene as crisis managers as defined above. The action of the Bank of England during the Baring collapse in 1890 is commonly mentioned. However, the Bank acted most of the time as a lender of last resort by issuing high-powered medium during panics. In United States, the evolution of the way the Clearing House functioned is instructive. At its beginnings, during the 1860, 1861 and 1873 crises, the NYCH was a crisis manager. It had to organize the equalization of reserves through the transfer of reserves from banks with a surplus to those with a deficit. Historical evidence clearly shows that the equalization of reserves took place at the discretion of associated banks (Sprague, 1910, p.94; Wicker, 2000, p.124). However, it was a very uncertain method and, as a consequence, it progressively replaced loan certificate issuance (Sprague, 1908). As described previously, in the case both of the Bank of England and the NYCH, injection of liquidity was generally sufficient to end liquidity stress and to exempt central banks from reallocating liquidity in the banking community. Yet, Bagehot (1873, p.203) noted that in financial stress situations banks were worried about maintaining their reserves in the Bank,

and that “at such moments all bankers are extremely anxious, and they try to strengthen themselves by every means in their power; they try to have as much as it is possible at command; they augment their reserve as much as they can, and they place that reserve at the Bank of England.” However, Bagehot did not specify if that disruption could occur in spite of massive injection of high-powered medium. In sum, the process of liquidity reallocation through voluntary absorption of liquidity did not seem to have been effective during the classical period.

III. CONCLUDING INSIGHTS INTO THE MARKET MAKER OF LAST RESORT

From an operational point of view, Buiter (2007) defines the market maker of last resort function as being fulfilled in two ways: “First, outright purchases and sales of a wide range of private sector securities; second, acceptance of a wide range of private sector securities as collateral in repos, and in collateralised loans and advances at the discount window.” As seen in the second section, during the classical period, central banks significantly implemented such practices that could implicitly be discussed inside the institution. For instance, in September 1866, some of the shareholders of the Bank of England doubted that the duty of the Bank was to support a segment of the money market by holding railway company securities and they wanted to know “whether any of those debentures come from railway companies that had since been able to meet their obligations” (Bank of England, 1866, p.1106). Indeed, they worried that rumours outside the Bank stated confidently that large amounts of bills had not yet been returned. The Governor of the Bank answered with reassuring words that the Bank held “no debentures except those of first class railway companies” (*ibid*). In any case, the fact is that the central bank held private securities purchased on markets which were previously in difficulty. As a result, the LLR at that time presented similarities with the MMLR function and both seemed intrinsically linked. Afterwards, in the post-World War II period, eligible securities were codified and their range narrowed in comparison with the classical period. For this reason, the enlargements of the spectrum of eligible collateral observed during the current period were interpreted as an innovation announcing a new MMLR paradigm. In fact, the historical roots of central banking have just been rediscovered since the recent financial collapse.

From a theoretical point of view, the concept of MMLR was not shared or even formulated by central bankers during the classical period. Despite the fact that the Bank of England was

operating as a supplier of high-powered medium during periods of pressure, the responsibility of LLR was far from being unanimously accepted among directors and was by no means officially announced by the Bank of England. In the beginning of the twenty-first century, the huge development of financial instruments and the aftermath of the central bank's management of liquidity revealed the need to reconsider the MMLR function. However, the MMLR has not clearly been defined in the contemporary literature.

The market makers intermediate between end-users of the financial system but, unlike general financial intermediaries, they do not act as agents for end-users. Instead, they act as principals, buying and selling assets for their own account, at the bid price and the offer price respectively. In an organized financial market, the role of a recognized market maker is to provide continuous and effective two-way prices (bid and offer) under all market conditions. The market maker has the responsibility of keeping an orderly market by smoothing out price fluctuations. Thus, a market maker of last resort acts in this way, but when financial markets are in such disorder that this function cannot be carried out any more by the usual market makers. If such a definition is held to be true, it seems evident that central banks not only acted as lenders of last resort in 2007-08 but also as market makers of last resort. Indeed, they accepted to commit themselves more directly to preserve market liquidity.

This category of policy responses was activated mainly after the financial crisis deepened in September 2008 through outright asset purchases or special lending facilities. Central banks targeted more specific segments of the private debt and securities markets by supplying funds to nonbanks to improve their liquidity position and reduce the risk spread on a specific market (commercial papers, asset-backed securities, and corporate bonds, etc.). The Federal Reserve focused mainly on the nonbank credit market as well as on operations involving private sector securities and initiated a series of programs - the Commercial Paper Funding Facility (CPFF) and the Term Asset-backed securities Loan Facility (TALF). It aimed to improve the functioning of key credit markets by lending directly to market participants, including ultimate borrowers and major investors (Bernanke, 2009). The commercial paper market is a key source of short-term financing for US corporate firms. Following the failure of Lehman Brothers, commercial paper rates spiked even for the highest quality firms. Moreover, most firms were unable to borrow for periods longer than few days and were exposed to noteworthy rollover risks. The CPFF was specifically conceived as a backstop for commercial issuers and intended to address rollover risk and to improve the functioning of the commercial paper market. In the same vein, the TALF aimed at restoring securitization markets, which threatened to close and thus worsened credit rationing. Eligible investors

could then borrow to finance their holdings of the AAA-rated tranches of selected asset-backed securities (ABS). More directly, the Federal Reserve bought direct obligations of, and mortgage-backed securities backed by, housing-related government sponsored enterprises (Fannie Mae and Freddie Mac).

Unlike the Federal Reserve and the Bank of England, the ECB mainly focused its policy on the banking system through the Enhanced Credit Support which included outright purchases of bank-issued covered bonds. It also improved the banking system's liquidity by conducting fixed-rate full-allotment refinancing operations with maturities of up to 12 months.

In so doing, central banks interposed themselves between private sector lenders and borrowers aiming to improve credit flows. Such a policy transferred private sector risk to the central bank and led to lower prices of risk and more accommodative financial conditions. A signalling channel could also influence public expectations about key factors influencing assets' market valuation. The mere existence of a facility which indicated to the market central banks' willingness to replace the market - if necessary - could improve prices, assist market functioning and stimulate private trading activity. By this catalytic effect, central banks helped to bring private players back into the market. Through this last category of action, central banks acted as asset buyers of last resort rather than lenders of last resort. They bypassed the financial system by directly purchasing assets on secondary markets and so they aimed to reduce the spreads on targeted markets. For instance, by purchasing mortgage-backed securities the Federal Reserve attempted to release the credit standards in the mortgage market in the US. In so doing, as they replaced private sector intermediation by influencing relative prices, central banks could favour some borrowers to the detriment of others and thus lost their position of neutrality with regard to private agents.

During this period central banks also implemented outright purchase of government debt to influence benchmark yield. This was true of both the Federal Reserve and of the Bank of England. The latter gave greater emphasis to public sector securities compared to private assets by concentrating its Assets Purchase facility primarily on government bonds. With this policy central banks seek to affect risk premiums on government securities (benchmark risk-free rate) and so they indirectly attempt to influence asset prices and credit conditions for the private sector.

ANNEXE: Balance Sheet of the Federal Reserve (billions of dollars)

January 3, 2007 (representative of the decade before)

ASSETS		LIABILITIES AND CAPITAL	
<i>Securities held outright</i>			
US Treasury securities	778,9	Federal Reserve Notes	781,3
Agency debt	0	Commercial bank reserves	20,0
Repurchase Agreements	39,8	US Treasury Deposits	6,2
Direct loans	1,3	Reverse Repurchase agreements	29,7
Gold	11,0	Other liabilities	10,6
Foreign Reserves	20,5	<i>Total liabilities</i>	847,9
Other assets	16,7	Capital	30,6
TOTAL	878,5	TOTAL	878,5

December 31, 2008 (in the middle of the crisis)

ASSETS		LIABILITIES AND CAPITAL	
<i>Securities held outright</i>			
US Treasury securities	475,9	Federal Reserve Notes	853,2
Agency debt	19,7	Commercial bank reserves	860,0
Repurchase Agreements	80,0	US Treasury Deposits	365,4
Direct loans	193,9	Reverse Repurchase agreements	88,4
Gold	11,0	Other liabilities	56,8
Foreign Reserves	579,8	<i>Total liabilities</i>	2223,8
Other assets	40,3	Capital	42,2
<i>New asset categories</i>			
Term Auction Facilities	450,2		
Commercial Paper Funding Facility	334,1		
Maiden lane	73,9		
TOTAL	2265,9	TOTAL	2265,9

Source: Board of Governors of the Federal Reserve, Credit and liquidity programs and the balance sheet, Factors affecting reserve balances, H.4.1. Components may not sum to totals because of rounding.

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