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Central banks and financial crisis. A first assessment of the tools used for interventions

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Central banks and financial crisis. A first assessment of the tools used for interventions[*]

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Abstract

The paper tries to give a first assessment of the tools used by central banks for interventions from the starting of the financial crisis to end-March 2009 using the results of a research conducted through the analysis of the evolution of central banks' balance sheets.
The first part of the paper is devoted to the analysis of the operations carried out through the granting of last resort loans (LOLR) to specific financial institutions.
In the subsequent part the attention shifts to the operations carried out by central banks to ensure liquidity to the market. These operations have been much more important than those addressed to specific institutions and have taken place for amounts which are indeed extraordinary and with a variety of new tools of interventions. The analysis is based on a comparison between the action undertaken, respectively, by the Federal Reserve System and by the Eurosystem.
The paper concludes with some remarks on the exit strategies which will crucially depend on the policy action regulatory authorities will take in the immediately next future in a framework which requires a strong coordination between central banks and fiscal authorities, both at national and at international levels.

JEL Classification: G01; E58; E42
Key Words: Monetary Policy Operational Settings, Lending of Last Resort, Management of Financial Crisis

[*] This article is the first output of a research project conducted through the analysis of the balance sheets of four central banks (Federal Reserve System, Eurosystem, Bank of England and Swiss National Bank). The author has very much benefited of exchange of ideas with Daniel Gros and Emerico Zautzik and is very grateful to Erika Somma for her precious help in data elaboration.

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1. Introduction

The serious crisis that hit financial markets starting from the summer of 2007 has generated considerable instability in markets and institutions and required numerous radical interventions by the authorities charged with regulation and supervision.

Many tools can be used for the management of financial crises. Central banks interventions, deposit insurance and rescue operations conducted by the public sector are among the most important.[1] This article deals specifically with the methods of interventions used by central banks during the financial crisis. It is a first output of a research project which takes into consideration four central banks (Federal Reserve System, Eurosystem, Bank of England and Swiss National Bank).

The analysis presented here tries to give a first assessment of the tools used for interventions from the starting of the crisis to end-March 2009 using some of the results of the research conducted sofar mainly through the analysis of the evolution of central banks' balance sheets.

The first part of the paper (Section 2) is specifically devoted to the analysis of the operations carried out through the granting of last resort loans (LOLR) to specific financial institutions. The focus is on two financial institutions which have been the subject of particular attention: Northern Rock in the United Kingdom and Bear Sterns in the United States. Some considerations are also made on financial institutions which are based in the Eurozone.

In Section 3 the attention shifts to the operations carried out by central banks to ensure liquidity to the market. These operations have been much more important than those addressed to specific institutions and have taken place for amounts which are indeed extraordinary and with a variety of new tools of interventions. The analysis in this section is based on a comparison between the action undertaken, respectively, by the Federal Reserve System and by the Eurosystem.

The conclusions of the analysis made in the two sections are of very different nature.

[1] For a description of the different tools and of their interrelations see Porta 2008.

The main conclusion of Section 2 is that the academic analysis made in the literature which in recent years has dealt with LOLR needs a substantial revision and that the architecture of LOLR facilities and of many other aspects of financial regulation needs to be substantially modified. These problems are important and will have to be addressed by regulators in the years to come.

Section 3 shows that central banks' market interventions have reached an extraordinary size and outlights many problems which have to be addressed very urgently. The most important is that of the *exit strategy* on which the paper tries to make some considerations which are to be considered very preliminary for two reasons. The first reason is that they are based on a research project which is still underway. The second, and most relevant, reason is that we are now (end-March 2009) at a point of a crisis which has progressively reached dimensions never seen before and whose evolution will crucially depend on the policies actions regulatory authorities will take in the immediately next future in a framework which requires a strong coordination between central banks and fiscal authorities, both at national and at international levels.

2. Lending of last resort to specific financial institutions

The lending of last resort is a tool available to central banks to assist a specific financial institution in crisis. This tool was already subject of study in the theoretical literature of the early 19th century[2], which constantly emphasized the problems of moral hazard associated with its use. The existence of a lender of last resort can actually engender in financial institutions the belief that in crisis situations the central bank will always intervene to prevent their failure, which could therefore provide an incentive for risky conduct.

This problem becomes particularly important if lending of last resort is a discretionary intervention, managed in ways that are decided following the emergence of a crisis.[3]

[2] Discussed first by Thornton (An Inquiry into the Nature and Effects of the Paper Credit in Great Britain) in 1802. The subject was subsequently extensively explored by Bagehot in an 1873 book (Lombard Street. The Description of the Money Market). Both books discuss in particular the conduct of the Bank of England which had already, at those times, begun to act as a lender of last resort. For historical contextualization, see Humphrey and Keleher 1984.

[3] It has been observed in this regard that the system of ensuring deposits that establishes in advance that depositors are protected in the event of a crisis could be preferable to LOLR. This position was held by Milton Friedman who applied the same approach used by monetarism in the filed of monetary policy to issues of financial regulation. According to monetarism fixed rules are preferable to discretionary interventions. A system of ensuring deposits that establishes in advance that depositors are protected in the event of a crisis is part of a fixed rule and thus could be preferable to LOLR which is by definition discretionary, since it is employed only

In order to try to limit the risk of moral hazard associated with lending of last resort, certain principles have been identified over time to which central banks should adhere[4]. According to the traditional theory access to last-resort lending should, in the first place, be restricted to banks, which are considered deserving of particular attention because of their specificity, unlike non-banking intermediaries, which are not deemed worthy of similar protection. Lending of last resort should also have the following features: i) it should only be given to institutions experiencing temporary liquidity problems and not to institutions dealing with solvency problems; ii) the loan should be given at penalty interest rate; iii) the financial institutions should furnish adequate collateral to obtain the loan.

Over recent years the issue of lending of last resort has been widely debated in the context of either abstract theoretical models or historical analysis of the behaviour of central banks during specific banking crises. The recent financial turmoil did not only produce significant tensions in financial markets, but it also translated in individual crises involving specific banking institutions that required *ad hoc* central bank intervention. Analysis of the ways in which these interventions have taken place allows to make considerations which are quite different from those emerging from the theoretical literature or from the analysis of banking crises which occurred long ago, when the structure of financial markets was very different from today.

The most significant episodes have been the rescues of Northern Rock in the United Kingdom and of Bear Stearns in the United States. Also in the Eurozone the crisis has affected specific financial institutions requiring central bank's intervention. The problems faced by these last institutions have been less important with respect to those affecting UK and US institutions, but their analysis is interesting because it allows to better understand the working of LOLR in the Eurosystem.

Northern Rock suffered a massive crisis which resulted in a run on the bank, when in August 2007, in the space of only three days, withdrawals were made for £3,000,000 (11% of the bank's retail deposits). On 14 September 2007, the Bank of England intervened in its capacity as lender of last resort and granted a liquidity support facility.

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subsequently to the appearance of a financial crisis.

[4] For a more detailed analysis of these principles see Lastra 2000.

The initial action of the Bank of England[5] was followed by wide-ranging series of interventions by the British government to insure the bank's deposits. After considering to sell Northern Rock to other banking institutions, on 18 February 2008 the government finally decided to nationalize the bank, emphasizing that this was to be understood as a temporary measure.

The crisis affecting the investment bank *Bear Stearns* occurred in March 2008. The institution's serious liquidity problems caused the Fed to intervene with a short-term loan of $29 millions to avoid systemic repercussions, and immediately commence a rescue operation on Bear Stearns involving JP Morgan Chase, and then to approve the proposal to acquire Bear Stearns within 90 days.

Several important lessons can be learnt by the analysis of the behaviour of central banks in these two cases.

One very important aspect are the difficulties central banks encountered when having to distinguish between temporary illiquidity and insolvency. It has often been emphasized[6] that, in many cases, what appears to be a temporary crisis can quickly turn into a major trouble, or that when a bank resorts to last-resort lending, there is a high probability that it will soon become insolvent. The Northern Rock and Bear Stearns crises confirmed this again, and showed how quickly illiquidity can become insolvency, with the consequent need for public intervention.

The Northern Rock crisis brought two important specific issues into focus. The first concerned the relationship between lending of last resort and deposits insurance. The second relates to the exercise of the function of last-resort lender in an institutional structure that increasingly sees authorities other than the central banks engaged in the supervision of financial markets. The British system of deposit insurance began in 1982 and was then reviewed in 1995 following the BCCI crisis of 1991. The recent crisis has

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[5] This first loan was granted, against appropriate collateral, applying a penality of 1.50% with respect to the bank rate, the reference rate established by the Monetary Policy Committee. Subsequent loans were granted according to conditions that grew gradually less rigorous. See Llewellyn 2008.

[6] Goodhart and Schoenmaker 1995 state the following: "with an efficient money and inter-bank market, a commercial bank that is generally believed to be solvent can almost always obtain additional money to meet its liquidity difficulties......the central bank will generally act as LOLR in circumstances where the solvency of the borrower is subject to doubt." The historical analysis of the US case confirms the fact that the intervention of the Fed as a lender of last resort has in many cases be in institutions that proved insolvent. See Schwartz 1992.

illustrated that strengthening the insurance system is essential. The report[7] presented jointly in January 2008 by the three authorities responsible for financial regulation (Bank of England, Treasury and the Financial Services Authority) proposed increasing the level of coverage, which is currently quite low, but in particular the introduction of swifter methods of intervention in the event of a run on banks. A system of insuring deposits structured in this way could avoid the need for the central bank to intervene in a substantial way with last-resort lending.

Turning to the second question, the Northern Rock case is important because for the first time it enabled a testing of the functioning, at a time of crisis, of a structure of supervision that distinguishes between responsibility for managing monetary policy (central bank) and authorities responsible for financial supervision. It has often been observed in the theoretical literature that the central bank can most easily carry out the role of lender of last resort when, in exercising the function of supervision of the banking system, has full information on the solidity of banks. When supervision is carried out by an institution other than central bank, close cooperation between the two institutions has to be established.

In the UK, when the Financial Services Authority (FSA) was created, it was given responsibility for supervision and regulation of all financial intermediaries. However, lending of last resort continues to be managed by the Bank of England. To ensure coordination between the two institutions, a Memorandum of Understanding (MOU) was signed in October 1997 between the Treasury, the Bank of England and the FSA. The recent crisis showed that there have been considerable coordination problems[8].

The *Bear Stearns* crisis highlighted the opportunity to intervene at a time of crisis in institutions which, like the one in question, are engaged in a far broader range of activities than those traditionally carried out by commercial banks.

Lending of last resort historically arose from the intention to safeguard banks, which are considered deserving of particular protection because of their specificity. It was believed that similar protection was not necessary for intermediaries operating in the securities markets. The breaching of the barriers between banks and securities markets

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[7] The title of the report is *Financial Stability and Depositor Protection. Strengthening the Framework.* See Bank of England, HM Treasury, Financial Services Authority 2008.

[8] These problems are extensively dealt with in Bank of England, HM Treausury, Financial Services Authority 2008 were a proposal is made to increase the power of the Bank of England. A theoretical analysis reaching the same conclusions is presented in Ponce 2008.

posed the problem of extending such protection. During the stock market crisis of October 1987, the Fed intervened with large injections of liquidity into the banking system and declared its readiness to extend its support to other securities intermediaries[9].

The Bear Stearns intervention was a clear demonstration that in the financial structure created after the lowering of the traditional barriers of activity (and in particular between credit and securities markets) central bank intervention could only with difficulty be limited to the commercial bank segment. The extension of interventions to other financial intermediaries poses a wide range of problems. The most important of these is that, in the US structure, the central bank supervises only commercial banks and does not have information on other financial intermediaries. Extension to the financial intermediaries of lending of last resort requires, in the opinion of many, a broadening of the Fed's supervisory powers to the investment bank sector[10].

The issue of lending of last resort in the *Eurosystem* has been largely debated since the starting of the European Monetary Union in 1999. The recent financial crisis allows to better understand some of the issues which have been at the heart of the debate. With the birth of the EMU in 1999, to the European central bank was given only the responsibility for conducting monetary policies in all countries of the Eurozone. The Treaty that regulates the EMU does not assign to the ECB responsibilities for financial supervision. The task of supervising financial stability remains with national authorities , and the function of lender of last resort continues to be assigned to national central banks (NCBs). At the same time the Treaty gives to ECB primary responsibility with regard the stability of the payment system[11]. The role of NCBs and ECB has therefore been identified in the following way : i) in the case of a liquidity crisis affecting a national bank the NCB takes the decisions concerning the provision of *elasticity liquidity assistance (ELA)* to the institutions in its jurisdiction; ii) in the case of a general liquidity crisis resulting from a general gridlock in the payment system the intervention is made by the ECB through *open market operations.*

Many analysts have emphasised well before the

[9] On Monday 19 October 1987 the Dow Jones index fell 23%. The following day, before the market opened, the Fed announced it would supply liquidity to markets and would also intervene in favour of non-banking intermediaries. See Lastra 2000.
[10] Proposals in this regard are contained in US Department of Treasury 2008.
[11] For more details on the issue of allocation of LOLR responsbilities in the Eurosystem see Bini Smaghi and Gros 2000.

recent financial crisis the risks contained in this system of allocation of responsibilities[12] and have made a strong argument for a closer coordination between NCBs and ECB . Some have explicitely asked ECB should be given direct responsibility in LOLR management[13] .

What lessons can be drawn from the behaviour of the Eurosystem during the financial crisis? Interventions have been extensively made by ECB through open market operations, as we will see in par. 3.2. Also NCB's seem to have played a significant role in granting assistance to specific financial institutions of the Eurozone. The first serious problem took place in Germany in July-August 2007 with the crisis of IKB Bank and also in September –October 2008 the financial crisis affected many institutions of the Eurozone (among them: Fortis, Dexia and Hypo Real Estate).

There are reasons to believe that NCB's have provided temporary liquidity to those financial institutions probably through the instrument of elasticity liquidity assistance. To these interventions there has not given publicity and the problems of financial institutions have been very rapidily solved with capital injections coming from the public sector[14].

The behaviour of central banks in the granting of LOLR has been quite different. In the Eurosystem LOLR operations have been conducted very cautiously. In the United Kingdom and in the United States LOLR operations have been conducted in ways that, if scrutinised closely, ended up disregarding all the cautions that theoretical analysis usually imposes so as to avoid the problems of moral hazard associated with last-resort lending. The interventions of the Bank of England and the Fed in the recent crisis have reinforced the belief that in the event of a serious crisis it is almost certain that the central bank will intervene.

How then should the problem of moral hazard to be solved? In our view the recent crisis has shown that LOLR is only one among the instruments which can be used to deal with the crisis. The issue of moral hazard should therefore be addressed by measures taken

[12] The risk has been particularly emphasised in the two reports on the financial crisis (Brouwer Reports: Economic and Financial Committee 2000 and 2001). The central message of the second report was that there were no coordination mechanisms able to deal with a crisis situation. Following this report a Memorandum of Understanding (ECB 2003) was drawn up to deal with the problem, and was signed by the national central banks and the financial supervisory authorities of the EU nations.

[13] Opinion along these lines can be found in Vives 2001 and Boot 2006.

[14] IKB Bank and Hypo Real Estate have been saved by the intervention of the German Government. Fortis bank has been acquired by the Dutch Government. Dexia has received substantial capital injections from Belgian, French and Luxembourg governments.

upstream and downstream of last-resort borrowing.With regard to upstream measures, it is essential an effective ex - ante control system to minimize the possibility that a financial crisis can occur. Interventions downstream of last-resort lending involve the way in which bailout operations are undertaken by fiscal authorities after LOLR intervention. Before drawing any conclusion we have first to analyze central banks market interventions which in the more recent phase of the crisis have reached amounts which have been much more relevant than the assistance granted to LOLR interventions.

3. Central banks market interventions

In normal times central banks' market interventions take place mainly through open market operations by which the central bank controls the quantity of liquidity made available to the system as a whole. These operations are normally supplemented by operations that can be activated at the initiative of counterparties through which the central bank gives loans to the institutions seeking them. These last operations are different from LOLR which is addressed only to a specific institution experiencing liquidity problems: the operations at the initative of the counterparties are open to all the eligible institutions which desire to utilize them.

Before the starting of the crisis in the *United States* open market operations were conducted as auctions several times a week primarily in the form of variable rate repurchase transactions of government securities, with a maturity ranging from one day to ninety days. Operations activated at the initiative of the counterparties were implemented through the discount window. Depository institutions were indeed quite reluctant to make recourse to this type of lending because of concerns that their borrowing might become known to market participants and considered as a sign of weakness. As a result, the volume of balances supplied through the discount window was generally a very small fraction of the total supply of monetary base.

In the traditional operational framework of the *Eurosystem* the most important operation was the weekly repurchase operation (called *main refinancing operation*) made with a week maturity. Additional liquidity was provided through the *longer term*

refinancing operations (repurchase transasction at a *three months* maturity). The operational framework was completed by two kinds of facilities left to the initiative of the counterparties: i) the *marginal lending facility* providing overnight credit to all eligible credit institutions at an interest rate above the base rate on main refinancing operations and ii) the *deposit facility* by which eligible credit instituions were allowed to deposit excess reserves fund at an interest rate below the base rate on main refinancing operations. The operations at the initiative of the counterparties were used for very limited amounts [15]

The operational settings in other industrial countries were quite different in some institutional aspects but they all showed the common element of being designed to regulate the amount of liquidity supplied through a mix of discretionary operations and stading facilities[16].

Since the starting of the financial crisis central banks in major advanced economies have taken a wide range of actions to address the tensions in the money markets. Key policy rates have been cut to very close to zero, their lowest rates ever. In all industrial countries there has been an increase in the size of central banks' balance sheets. This increase is documented by Table 1 and Figure 1 which show the evolution from end-2006 to end-2008 of total assets of four central banks (Bank of England, Federal Reserve System, Eurosystem and Swiss National Bank). The most relevant increase has taken place in the countries which have been most seriously hit by the crisis (UK and US). At end-2008 total assets of the Bank of England were about 2.78 times higher with respect to their value at end-2006. The increase was only slightly smaller for the Federal Reserve System (assets at end-2008 were 2.56 times higher with respect to end-2006). In continental Europe the rise has been less relevant: activities of the Swiss National Bank have increased by 1.92 times and those of the Eurosystem by 1.77 times.

The increase in the *size* of central banks' balance sheets has been accomplished through a substantial change in the types of intervention which has reflected itself in a very different *composition* of the balance sheets. In this section the focus is on the main changes which have taken place in the United States and in the Eurozone.

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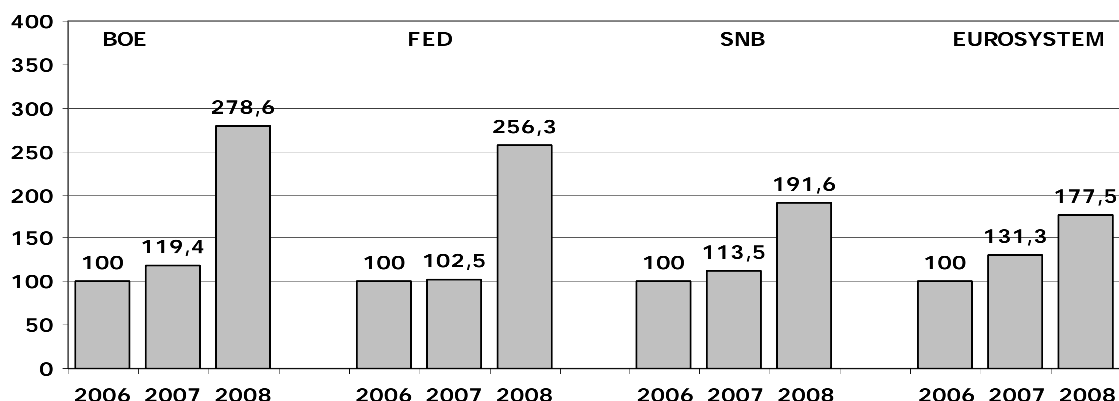
[15] More details on the traditional setting of the monetary polcy operational framework in the US and in the Eurozone can be found in Porta 2000.

[16] The main aspects of the operational framework in the main industrial countries are analysed in Borio and Nelson 2008.

Table 1 - Total assets held by Central Banks

	Dec 2006	Dec 2007	Dec 2008
Federal Reserve System			
$ millions	896,867	919,694	2,298,625
as % of GDP	*6,8*	*6,7*	*15,9*
Eurosystem			
EUR millions	1,150,980	1,511,244	2,043,465
as % of GDP	*13,5*	*16,9*	*22,0*
Bank of England			
£ millions	85,593	102,241	238,490
as % of GDP	*6,5*	*7,3*	*16,5*
Swiss National Bank			
CHF millions	111,813	126,927	214,289
as % of GDP	*23,0*	*24,8*	*40,2*

Source: Central Banks



Source: Central Banks

3.1.Tools of interventions used by the Federal Reserve System

During the initial phase of the crisis the measures taken in the United States did not lead to a significant expansion of the size of the balance sheet of the Federal Reserve System. The increase in size has taken place after the failure of Lehman Brothers in September 2008 and has been realized by using a set of new tools of intervention which were never been used before and which have substantially changed the composition of both assets and liabilities of the Fed balance sheet.

Main changes in the asset side of the balance sheet

The composition of the *asset* side of the balance sheet at end-2006 fully reflected the traditional use of operational tools in the conduct of monetary policy. The main kind of assets were *securities held outright* (as a counterpart of open market operations) which accounted for 86.9% of total assets. The use of the discount window (registered in the balance sheet under the item *primary credit*) was negligible.

The asset side of the Fed balance sheet looks completely different at end-2008. There is a substantial change in the weight of the two traditional tools with a significant reduction in the amount of securities held outright and a relevant increase of the loans through the discount window.

In response to intensifying financial sector problems, Fed officials have created a lot of new lending procedures [17], the most important of which are shown in Table 2 and Figure 2, starting with the *Term Auction Facility (TAF)* which offers commercial banks funds through an anonymous auction facility that seeks to eliminate the stigma attached to normal discount borrowing.

Through the *Primary Dealer Credit Facility (PDCF)* lending rights have been extended from commercial banks to investment banks (technically to the 19 so-called primary dealers with whom the Fed does it daily open market operations).

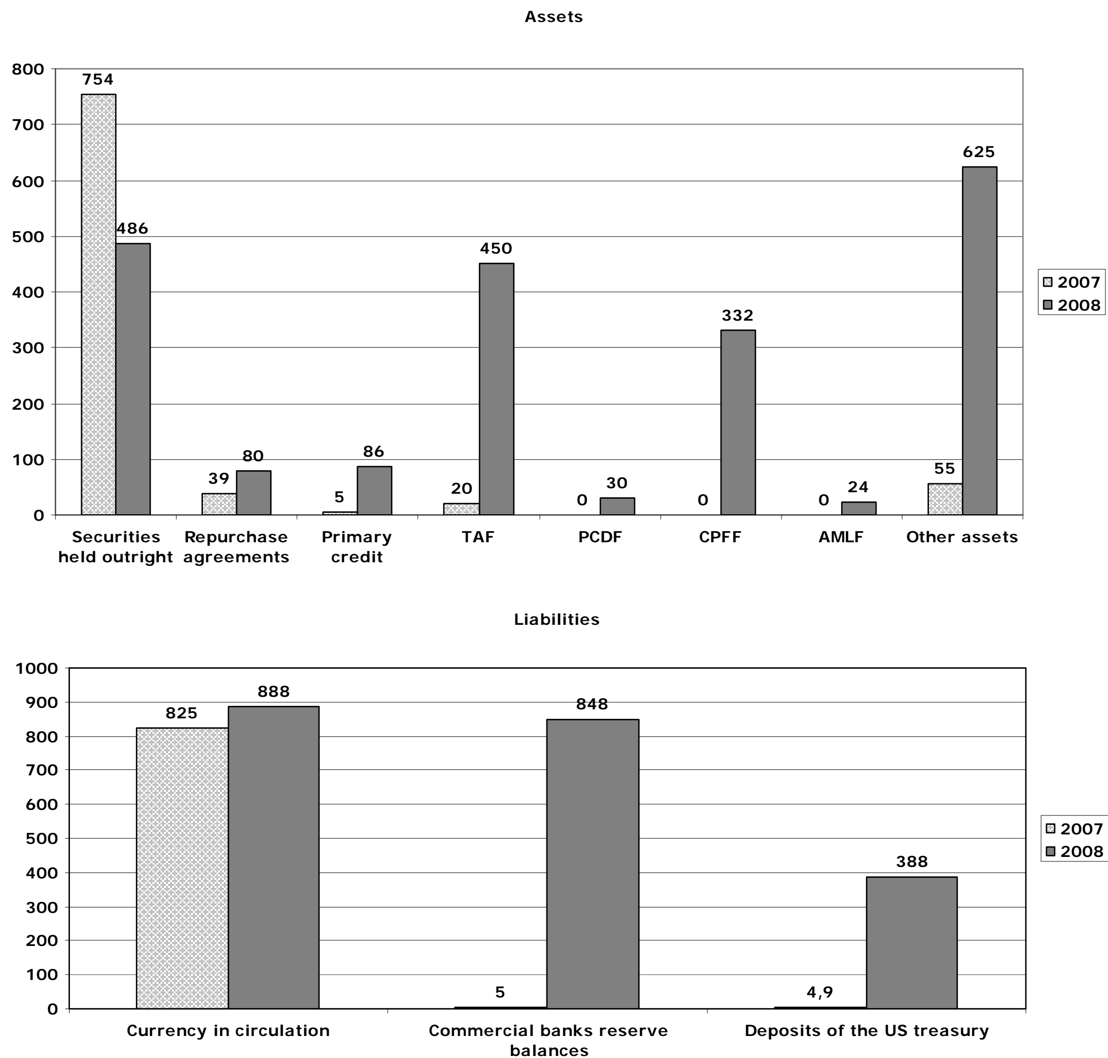
[17] These procedures are described in detail in the website of the Board of Governor of the Federal Reserve System. See also Bernanke 2009.

Table 2 - Assets and liabilities of the Federal Reserve System
($ millions)

	Dec 2006	Dec 2007	Dec 2008
Total (assets & liabilities)	896,867	919,694	2,259,356
Assets (main items)			
Securities held outright	778,951	754,605	495,994
Repurchase agreements	33,036	39,536	80,000
Loans:			
Primary Credit Facility	64	4,802	86,260
Term Auction Credit (TAF)		20,000	420,806
Primary Dealer Credit Facility (PDCF)			45,679
Commercial Paper Funding Facilitiy (CPFF)			325,796
Asset Backed Commercial Paper Money Market Mutual Funds Liquidity Facility (AMLF)			24,858
Other Federal Reserve Assets		55,445	625,741
Liabilities (main items)			
Currency in circulation	816,870	825,624	881,463
Commercial banks reserve bilance	6,817	5,865	784,607
Deposits of the US Treasury	5,241	4,910	387,829
of which: *Supplementary Financial Account*			263,600

Source: Board of Governors of the Federal Reserve System

Figure 2 Assets and liabilities of the Federal Reserve System ($ millions)



Legenda:
TAF: Term Auction Credit (TAF)
PCDF: Primary Dealer Credit Facility (PDCF)
CPFF: Commercial Paper Funding Facilitiy (CPFF)
AMLF: Asset Backed Commercial Paper Money Market Mutual Funds Liquidity Facility

Source: Board of Governors of the Reserve System

Besides providing ample liquidity to commercial banks and primary dealers, the Fed has developed another set of policy tools which involve the provision of liquidity directly to borrowers and investors in key credit markets. Notably, have been put in force facilities to purchase highly rated commercial paper (*Commercial Paper Funding Facility: CPFF)* and to provide backup liquidity for money market mutual funds (*Asset Backed Commercial Paper Money Market Mutual Funds Liquidity Facility: AMLF).* This facility effectively channelled liquidity to the funds, helping them to meet redemption demands without having to sell assets indiscriminately.

Table 1 shows also a very substatantial increase of *Other Federal Reserve Assets* which include, as the main item, *Liquidity Swap Lines with Foreign Central Banks.* To address the increasing demand for dollar funding by banks and other financial instituions abroad the Fed has authoritzed temporary reciprocal currency arrangements (swap lines) with other central banks around the world. These swap lines have been expanded throughot the crisis and currently (end-March 2009) stand at 328 billions of dollars. The expansion of the FX swap lines has reflected the dollar funding needs of banks abroad holding troubled US assets.

Main changes in the liabilities side of the balance sheet

In the liabilities side of the balance sheet three items deserve particular attention.

It must first of all be noted that the Fed's lending activities have not given rise to substantially increases in *Currency in Circulation*. The amount at end-2008 (888 $ billions) was only slightly higher with respect to end-2007 (825 $ billions).

A very large increase (from 6 $ billions to 785 $ billions) has taken place in the item *Commercial Banks Reserve Balances* due to a substantial rise of excess reserves held by banks. In a phase of great uncertainty banks have chosed to leave the great bulk of their excess reserves idle, in most case on deposits with the Fed.

An item which hase become increasingly important are *Deposits of the US Treasury.* The Fed is the fiscal agent of the U.S. Treasury and major outlays of the Treausury are

paid form the Treasury's general account at the Federal Reserve. With the dramatic expansion of the Fed liquidity facilities, the Treasury agreed to establish the *Supplementary Financing Program (SFP)* in order to assist the Fed in its implementation of monetary policy. Under the SFP, the Treasury issues short term debt and places the proceeds in this account at the Fed. When the Treasury increases the balance it holds in this account , the effect is to drain deposits from accounts of depository institutions at the Fed. In this way the implementation of the *SFP* can help offset, somewhat, the rapid rise in balances that result form the creation and expansion of the Fed liquidity facilities.

An evaluation of the FRS action

The aggressive action undertaken by the Fed undoubtedly contributed to the easing of post - Lehman tensions and it seems fair to say that money markets would have remained under extreme stress had the Fed not acted aggressively to ease the tensions. The various liquidity facilities introduced have significantly and substantially reduced key interest rate spreads [18] but they have not returned those markets to a normal level of functioning.

Looking to the liabilities side some observers have expressed the concern that , by expanding its balance sheet, the Fed is effectively printing money, an action that will ultimately be inflationary. As we have seen , the Fed's lending activities have indeed resulted sofar in a large increase in excess reserves held by banks. Consequently, the rates of growth of broader monetary aggregates, such as M1 and M2, have been much lower than that of the monetary base.

An important aspect to be taken into account in evaluating the FRS action is that the Fed announced in March 2009 the starting of the long-waited *Term Asset Backed Securities Loan Facility (TALF).* The need for and potential impact of the program is considerable given the bad conditions in these credit markets which collapsed to near zero post-Lehman.

The main problem for the FRS is the *exit strategy*. For the time being, the Fed's focus is predominantly on easing the crisis at hand, and rightly so. However, at some point,

[18] The spread between the three-month LIBOR rate and the three-month OIS (expected fed fund rate) has been

when credit markets and the economy will began to recovery, the Fed will have to unwind its various lending programs. To some extent, this unwinding will happen automatically, as improvements in credit markets should reduce the need to use short term Fed facilities. But purchases of longer-term securities and the granting of term lending under *TALF* present a greater challenge .

A final important consideration is that the intervention considered in this section can all play a very important role in keeping the system operating, but none of them address the fundamental solvency-based uncertainties that plague the financial system. A final solution of the problems faced by the US financial system is beyond the power of the Fed and lies much more in the hands of fiscal authorities.

3.2. Tools of intervention used by the Eurosystem

The increase in size of the balance sheet of the Eurosystem has been less relevant with respect to the Federal Reserve System. One important point to be noted (see Table 3 and Figure 3) is that it started earlier. Since the financial turmoil began in August 2007, the Eurosystem's actively operated to alleviate the tensions hampering the functioning of the money markets.

Main changes in the asset side of the balance sheet

At end-2006 the most important item in the assets side were the *main refinancing operations* which accounted for 28.7% of total assets and the weight of *longer-term refinancing operations* was substantially lower . At end-2008 the larger part of financing to credit institutions was granted through *longer-term refinancing operations*. Since the starting of the crisis the Eurosystem increased the number and frequency of these type of operations, conducting many additional refinancing operations per month (with maturities up to six months) and introducing a special-term refinancing operation with a maturity corresponding to the duration of the reserve maintenance period. In parallel, a new series of exceptional measures have been implemented seeking to *temporarily extend the list of assets* eligible for use as collateral in Eurosystem credit operations[19].

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considered in many empirical studies. See Deutsche Bank 2009.

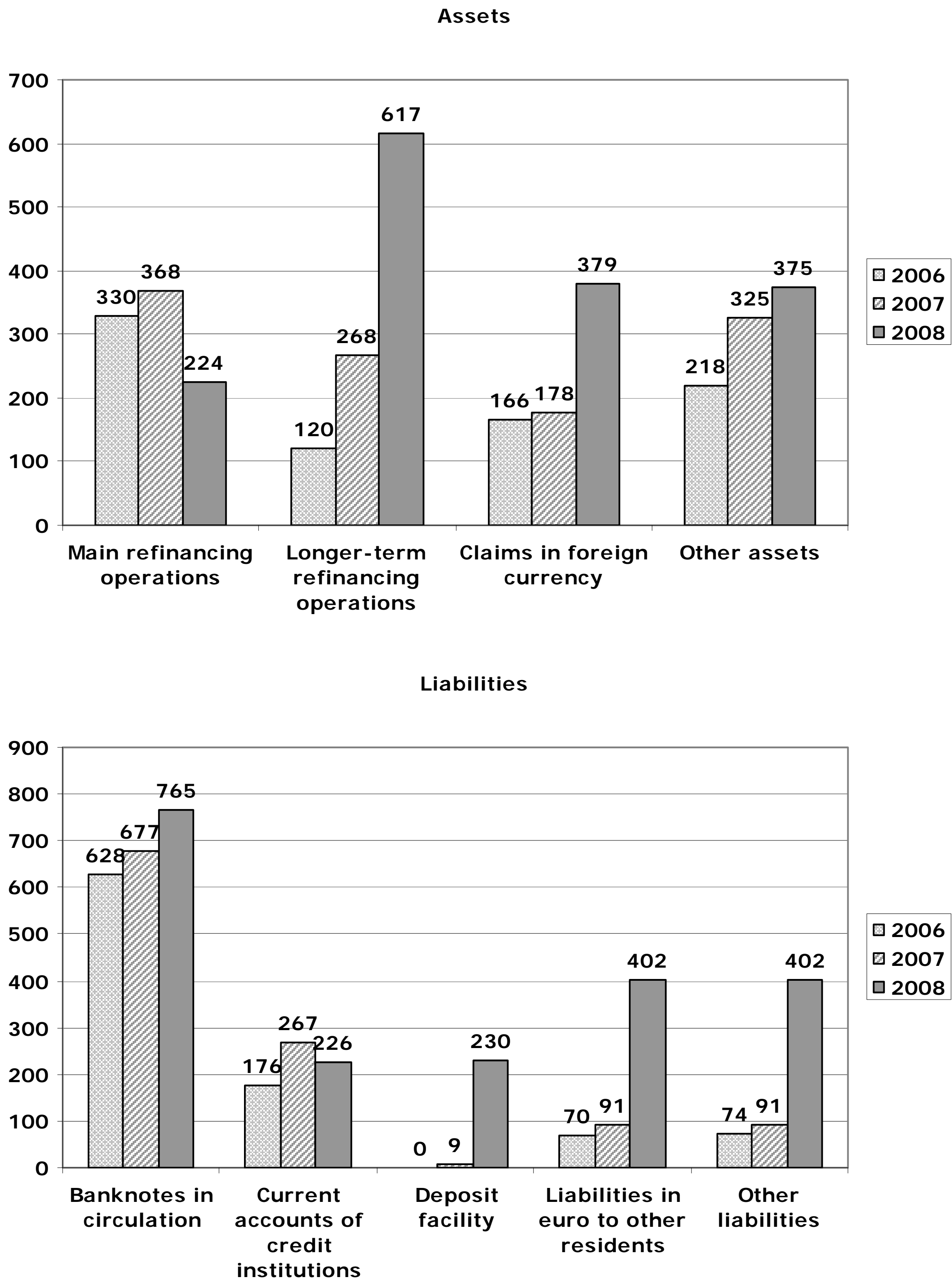
[19] The information presented in these section are mainly based on the analysis made in the Monthly Bulletin of the European Central Bank.

Table 3 - Assets and liabilities of the Eurosystem
(EUR millions)

	Dec 2006	Dec 2007	Dec 2007
Total (Assets and liabilities)	1,150,980	1,511,244	2,043,465
Assets (main Items)			
Lending to credit institutions:			
Main refinancing operations	330,452	368,607	224,400
Longer-term refinancing operation	120,000	268,476	616,901
Marginal facility	88	91	1,820
Claims in foreign currencies	165,697	177,082	379,168
Other assets	217,679	324,609	374,969
Liabilities (main items)			
Banknotes in circulation	628,238	676,677	765,415
Liabilities to credit institutions:			
Current accounts	176,259	267,335	225,947
Deposit facility	19	8,831	229,785
Liabilities in euro to other residents	69,968	91,263	402,067
Other liabilities	73,788	124,377	161,162

Source: European Central Bank

Figure 3 Assets and liabilities of the Eurosystem
(EUR millions)



Source: European Central Bank

An important point to be noted is that in mid-October 2008 the Eurosystem took the quite exceptional step of adopting a *fixed rate tender procedure with full allotment* for all its weekly main refinancing operation and its longer-term refinancing operation. This will remain in place for as long as is necessary given the situation in the markets.

A relevant increase has taken place also in C*laims in foreign currencies*. Under this item are considered swap and refinancing operation (made mainly in US dollars and Swiss Francs).

Also the item *Other assets* has shown a very relevant increase. It must be noted that the analysis made in this section is based on the consolidated financial statement of the Eurosystem, which presents a balance sheet which is much more synthetic with respect to that published by the Federal Reserve System. To better understand the meaning of this item (and of other items which appear also in the liabilities side) is necessary an analysis of balance sheets of NCB's which is underway but is still at a preliminary stage.

Main changes in the liabilities side of the balance sheet

Also for the Eurosystem the increase in *Banknotes in circulation* has been quite limited.

The larger expansion, following a pattern similar to that registered in the US, has taken place in the *Liabilities to credit institutions.* The policy of full allotment led to large amounts of excess liquidity in the banking system at the aggregate level, resulting in a significant use of the *Deposit Facility* which has gone up (from 19 EUR millions at end-2006 to 230 EUR billions at end-2008).

An evaluation of the Eurosystem's action

The first thing to be noted comparing the Eurosystem's action with that undertaken by the Federal Reserve System is that the ECB has started the expansion of liquidity at the beginning of the crisis (September 2007) and has conducted the expansion with

more graduality with respect to the Fed which has begun its interventions only after the Lehman crisis in October 2008.

In the Eurozone, because the banking system has a more dominant role in the financing of the public sector than the capital market, measures taken by the ECB have been sofar focused only on the banking system with a substantial difference with respect to the United States were the central bank has been extending loans to many different types of intermediaries (investment banks, mutual funds, etc.).

The financial crisis has affected sofar the Eurozone to a smaller extent if compared with the United States. The problems are anyway becoming quite serious. Also the ECB has made announcements in March 2009[20] that it will probably intensify its action.

Potential measures could include an extension of the maturity of the central bank liquidity provided to banks and purchases of private debt securities in the secondary market in order to improve its liquidity and reduce the cost of funding the real economy, thus helping its recovery.

These measures, if they will implemented, can create also to the ECB relevant *exit problems*, with anyway seem to be much smaller than those facing the US authorities.

4. Conclusions

Drawing conclusions is indeed quite difficult for the reasons outlined at the beginning of the paper.

The recent financial crisis has shown that instruments, like deposit insurance, which were thought to be very important have proved to be quite ineffective. The most important role has been played by central banks through LOLR operations but mainly with their market interventions.

Before the crisis LOLR has been the subject of many theoretical analysis which need to be reconsidered in the light of the recent experience, which has shown that the moral hazard issue is indeeed very difficult to deal with.

[20] The possibility of making use of new instruments have been prospected by Lucas Papademos, Vice President of the ECB in a speech given on March 26, 2009. See Papademos 2009.

The bulk of central banks interventions has taken place through market operations. The analysis made in this paper for the Federal Reserve System and for the Eurosystem shows that these operations had some effects in easing the tensions in money markets but that there is a need to continue intervention in the near future.

The intensification of central banks interventions will make increasingly difficult the problem of the exit strategies.

The difficulty is particularly serious in the case of the Federal Reserve System and will require a close coordination with the action which has been undertaken by the Treasury mainly through the *Trouble Asset Relief Program (TARP).*

In the Eurozone the action of the ECB has been sofar less intensive with respect to that undertaken by the Fed in a situation in which fiscal authorities of different European countries have put in to place rescue plans which have been quite relevant. Also the ECB will have to face relevant exit problems that to be efficiently dealt with will need a much closer coordination of the actions undertaken by national governments of the countries which are part of the Eurozone.

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