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Changes in Central Bank Procedures during the Subprime Crisis and Their Repercussions on Monetary Theory

by

Marc Lavoie*
University of Ottawa

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Correspondence: mlavoie@uottawa.ca.

Levy Economics Institute
P.O. Box 5000
Annandale-on-Hudson, NY 12504-5000
http://www.levyinstitute.org

ABSTRACT

The subprime financial crisis has forced several North American and European central banks to take extraordinary measures and to modify some of their operational procedures. These changes have made even clearer the deficiencies and lack of realism in mainstream monetary theory, as can be found in both undergraduate textbooks and most macroeconomic models. They have also forced monetary authorities to reject publicly some of the assumptions and key features of mainstream monetary theory, fearing that, on that mistaken basis, actors in the financial markets would misrepresent and misjudge the consequences of the actions taken by the monetary authorities. These changes in operational procedures also have some implications for heterodox monetary theory; in particular, for post-Keynesian theory.

The objective of this paper is to analyze the implications of these changes in operational procedures for our understanding of monetary theory. The evolution of the operating procedures of the Federal Reserve since August 2007 is taken as an exemplar. The American case is particularly interesting, both because it was at the center of the financial crisis and because the U.S. monetary system and its federal funds rate market are the main sources of theorizing in monetary economics.

Keywords: Federal Funds Rate; Corridor System; Interest on Bank Reserves; Money Multiplier

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CHANGES IN CENTRAL BANK PROCEDURES DURING THE SUBPRIME CRISIS AND THEIR REPERCUSSIONS ON MONETARY THEORY

The subprime financial crisis that started in August in 2007, which was later called the global financial crisis, has forced several central banks to take extraordinary measures and to modify some of their operational procedures. These changes have made even clearer the deficiencies and lack of realism of mainstream monetary theory, as can be found in undergraduate textbooks as well as in most macroeconomic models. They have forced monetary authorities to publicly reject some of the assumptions and key features of mainstream monetary theory, fearing that, on that mistaken basis, actors in the financial markets would misrepresent and misjudge the consequences of the actions taken by the monetary authorities. These changes in operational procedures also have some implications for heterodox monetary theory, in particular for post-Keynesian theory.

The objective of the present paper is to analyze the implications of these changes in operational procedures for our understanding of monetary theory. To do so, having already studied the case of the Canadian monetary system (Lavoie and Seccareccia 2009), I shall focus on the case of the American monetary system, examining the evolution of the operating procedures of the Federal Reserve since August 2007. The American case is particularly interesting, both because it was at the center of the financial crisis and because the American monetary system and its federal funds rate market are the main sources of theorizing in monetary economics.

I start by recalling how the federal funds rate was determined prior to August 2007 and up to mid-September 2008. I then outline how the Federal Reserve lost control of the fed funds rate following the bankruptcy of the Lehman Brothers investment bank and what changes in operational procedures were undertaken to regain control. I then discuss the implications of these changes for mainstream monetary theory, in particular the efforts of officials at the New York Fed to steer observers towards a new understanding of monetary theory. This is followed by a discussion of the implications of these same changes for Post Keynesian monetary theory and possibly for fiscal policy.

TIMELINE 1 AT THE FED: CREDIT EASING WITH NEUTRALIZATION

As is well known, the beginning of the global financial crisis can be dated to August 9, 2007, when European banks stopped lending to each other, forcing the ECB to lend nearly 100 billion euros to commercial banks. This confidence crisis had immediate repercussions in other monetary markets, in particular in the United States and in Canada, where central banks also had to provide advances to banks so that the payment system could clear. The crisis quickly subsided, and most observers were led to believe that central bankers had cleverly avoided further financial trouble, that the self-regulating forces of the financial system were strong enough to make it resilient enough to face large losses, and that this would have no impact on the real economy. Furthermore, central bank and government officials, along with economists working at private banks, kept repeating their mantra—that the "fundamentals are sound."

Despite this however, in mid-September 2007 the Federal Reserve (the FOMC) felt compelled to make its first of a long list of reductions in the fed fund rate target. In addition to various sporadic and temporary injections of liquidity, the Fed also felt compelled to proceed to more permanent credit-easing operations, with the introduction of the so-called term auction facility (TAF) in mid-December 2007. The TAF allowed banks to take collaterized loans from the central bank for a period going roughly from one to three months—a much longer period than usual. This meant that the Fed was providing loans, that is, providing reserves and hence liquidity to the banks that were most keen in getting it, without having to borrow at the dreaded discount window.

These credit-easing operations, unless they were neutralized, would have led to a decrease in overnight rates within the peculiar American monetary setup that then existed. Indeed this is what occurred for about one month during the turbulences of August–September 2007, when the effective federal funds rate stood, on average, at 30 basis points below the target. To keep the actual federal funds rate around its target despite the provision of credit-easing operations, the Fed needs to conduct open market operations by engaging into the repo market and selling T-bills to the private sector. After September 2007 and until September 15, 2008, the expansionary effects of the advances being granted by the Fed were being roughly compensated by repo operations conducted by the Fed, thus keeping approximately constant the size of the balance sheet of the Fed. Actually, as a result of the combination of credit facilities with

compensating repo operations, the Fed, at the aggregate level, was simply swapping highly liquid assets—short-term Treasury bills—for less liquid ones, such as long-term government bonds or private securities, thus providing more liquidity to the banking system without having to give up its interest rate target. This could be achieved because the neutralizing operations kept the total supply of reserves in the system equal to its approximate required level or, more precisely, equal to the amount of compulsory reserves plus the desired amount of excess reserves at the target federal funds rate.

Table 1 shows the standard deviation of the differential between the federal funds rate and the federal funds rate target for various time periods. Except for September 2001, as well as August and December 2007, it can be seen that the Fed was able to move the federal funds rate around its target rate with a great deal of success until the bankruptcy of Lehman Brothers in mid-September 2008, as the standard deviation between mid-September 2007 and 2008 stays relatively small, around 9 or 10 basis points on average, slightly higher than what occurred before the outset of the crisis and lower than in 2001.

The determination of the fed funds rate can be represented with the help of figure 1, which is based on the works of Whitesell (2006) and Ennis and Keister (2008). This figure illustrates the situation of a monetary system with compulsory reserve requirements and a multi-day reserve maintenance period, where banks are asked to hold a given level of reserves on average. More precisely, figure 1 illustrates the situation before the last day of the maintenance period, as the middle segment of the demand curve would have its standard downward-sloping shape during the last day. This figure also represents another component of monetary implementation in the United States before the crisis, as the rate of interest on deposits at the central bank (that is, the interest rate on bank reserves at the central bank) is equal to zero.

The demand curve for federal funds rate has three flat components. If the overnight interest rate were to tend to exceed the lending rate—the rate at which banks can borrow from the central bank—banks would instead borrow from the central bank, which explains the first flat portion. Similarly, once the fed funds rate falls to zero, banks become indifferent between holding excess reserves at the central bank or lending them out on the fed funds market. Finally, the middle flat segment corresponds to the federal funds rate which is expected on the following days, before the end of the maintenance period. This expected rate, if the central bank has previously shown that it is able to hit its interest rate target, ought to be equal or close to the

federal funds rate target. Obviously, the institution of an average multi-day maintenance period helps central banks to achieve their interest rate target. As long as expected and target fed funds rates do not diverge too much from each other, and as long as the monetary authorities are able to correctly forecast changes in the demand for reserves and autonomous changes in the supply of reserves, the actual fed funds rate should remain close to its target, and this is what is illustrated in figure 1.

TIMELINE 2 AT THE FED: CREDIT EASING WITHOUT NEUTRALIZATION

Despite the financial difficulties of the two huge government-sponsored enterprises (Fanny Mae and Freddie Mac), with these two giant mortgage finance companies put into federal conservatorship in early September 2008, the Fed was still able to keep good control over overnight interest rates, as they settled around the target 2% rate that had been in place since May 2008. This all changed however on September 15, when the Treasury and monetary authorities were unable to find a buyer for the failing Lehman Brothers bank, as they had in March 2008 for another investment bank rival—Bear Stearns—and as happened on that very same day in the case of Merrill Lynch. As we all know now, this was the beginning of the end, as the decision of government officials not to proceed to the only other option—full nationalization—sent a chilling message to the world financial markets, giving supporters of free markets a glimpse at the true meaning of unfettered markets: no counterparty was judged to be safe anymore, the commercial paper market became frozen and the repo market nearly frozen, while mutual money market funds were submitted to a "bank run" until a blanket deposit insurance was provided. In addition, the failure of Lehman Brothers created huge financial problems for all those that had sold credit default swaps, including the too-big-to-fail giant insurer AIG, which had to be bailed out. Once the Lehman Brothers investment bank was forced to declare Chapter 11 bankruptcy, banks once more declined to lend to each other and the demand for reserves rose precipitously, with the Fed losing any true control over the fed funds rate.

At first, the Fed underestimated the demand for liquidity, causing federal funds rates to rise much above their target level, while Treasury bill yields got completely disconnected from the federal funds rate, falling to near-zero levels as a wild stampede towards security brought the

government yields down. Then, during the following two weeks, the Fed injected huge amounts of liquidities, purchasing asset-backed commercial paper and other private assets. These reserve-creating operations were partially neutralized initially, as the Fed asked the Treasury to auction billions of dollars worth of government bills that got purchased by the financial markets. This was the so-called Treasury supplementary financing program (SFP). The proceeds of these Treasury bill sales were then repatriated in the form of government deposits at the Fed, thus neutralizing the reserve-creating use of the various credit facilities of the central bank.

Once again, the impact of such a scheme was a kind of swap, whereby the central bank took in illiquid private financial assets while the private sector acquired liquid short-term government securities. But this time, in contrast to what had occurred previously, the size of the balance sheet of the Fed rose precipitously: the rise in its holdings of private assets was not compensated by a decline in its holdings of government securities. Instead it was accompanied by a rise in its liabilities—at first mainly the increased deposits of the federal government at the central bank, and then later the increased amount of bank reserves at the Fed—when the Fed resolved to let bank reserves rise way above their required levels, as much as nearly a hundred times above their previous normal levels.

What happened with respect to interest rates can be illustrated with the help of figure 2. During the week following the Lehman Brothers bankruptcy, the demand for reserves jumped up to the new dotted line. With the supply of reserves given by the S' vertical line, the federal funds rate jumped up, above the target rate. In the following weeks the Fed gave up on its attempts to fully neutralize its operations, providing a much greater supply of reserves, shown here with the S'' line. As Beck and Klee (2009: 8–9) say, "the intensifying financial turmoil over the course of 2008 required larger and larger injections of liquidity into the financial system and made it infeasible for the Federal Reserve to sterilize the resulting increases in reserve balances by redeeming or outright selling Treasury securities from the System Open Market Account portfolio." But this led to a federal funds rate that was much lower than the federal funds rate target. The Fed had lost its tight control over the federal funds rate.[1] Indeed, this case can be assessed with the help of table 1, which shows that the standard deviation of the spread between

[1] A detailed account of what happened to the balance sheet of the Fed and its implementation procedures can also be found in Fullwiler (2009). I only read it after having written the present paper, so as to obtain two independent accounts of what happened.

the effective and the target federal funds rates rose to unprecedented levels, 62 basis points, during the three weeks following the Lehman Brothers failure.

Determined to gain back this control, the Fed managed to get the authority to pay interest on required and excess reserves on October 6, 2008, implementing this decision on the 9th. Such an authority had been granted by Congress in 2006, but was supposed to be effective only starting in October 2011. The financial crisis induced the monetary authorities to implement this power three years earlier than planned. The ability to pay interest on bank reserves at the central bank thus allowed the Fed to adopt the corridor system which has been in existence for about 15 years in several central banks, among them, the Bank of Canada. Figure 3 illustrates what should have happened, at least under normal circumstances, with the adoption of the corridor, or channel, system. In the case of the symmetric corridor, the target overnight rate is set in the middle of the band, halfway between the lending rate (the primary credit rate) for credit facilities and the rate of interest on deposits at the central bank, which constitute the ceiling and the floor of the corridor. With the corridor, and an expected fed funds rate equal to its target, even if the monetary authorities provide an excessive amount of reserves, such as the S' line, the overnight interest rate should stay close to the target, somewhere between the target and the rate of interest on deposits at the central bank. Despite all this, between October 9 and October 29, when the federal funds rate target was at 1.50%, the primary credit rate at 1.75%, and the floor at 1.40% for compulsory reserves and 0.75% for excess reserves, the effective federal funds rate hovered between 0.67% and 1.04%, way below the target (as illustrated with the S'' curve in figure 3).

On November 6, 2008, no doubt in part as a response to this inability to control interest rates, the Fed moved on to a modified corridor system, the so-called floor system, whereby the central bank sets the target interest rate equal to the deposit rate. The floor system is illustrated in figure 4. Normally, the federal funds rate cannot fall any lower than the deposit rate, even if a large amount of excess reserves are being created, because banks that are in a positive position within the clearing and settlement system will prefer to deposit their funds at the central bank rather than lending them at a lower rate on the overnight market. Despite this, with the target rate and the deposit rate on both required and excess reserves set at 1%, the federal funds rate hovered between 0.10% and 0.62%.

The Fed then moved on to its last procedural change and to its last decrease in interest rates. On December 17, 2008, it set the primary credit rate at 0.50% and the deposit rate on all

kinds of reserves at 0.25%. It also finally recognized that it still did not fully control short-term interest rates by announcing that the federal funds rate target would stand somewhere between 0 and 0.25%. Indeed, ever since this announcement, the effective federal funds rate has stood at or below 0.25% (until June 2010, when this paper was revised). Checking table 1, one can see indeed that this last move has been successful: spreads between the effective and the target federal funds rates have been at their historical levels since the middle of December 2008.

An intriguing question of course is why the fed funds rate did not stay above or at the bottom of the corridor once the corridor and the floor systems were put in place? At the time, this was an intriguing question, and few answers could be provided. In Canada, in the wake of the financial crisis, in spring 2007, there had been a period where the actual overnight rate had stayed consistently below the target overnight rate, inducing the Bank of Canada to provide a negative aggregate amount of reserves in the monetary system (a negative amount of settlement balances) in an effort to bring up the overnight rate. Two reasons have been advanced to explain this phenomenon. The first is that financial markets, for a while, had taken the target to mean the uncollaterized overnight rate, whereas the Bank of Canada had the collaterized rate in mind. As a result, during that time period, the uncollaterized overnight rate had been close to the target, while the collaterized rate, the one targeted by the central bank, had been below the target. In the United States, the federal funds rate is an uncollaterized rate, so this explanation could not apply to the U.S. situation. The second reason is that some participants to the repo market borrow government securities and thus sometimes need to cover their position. It is claimed that in the spring of 2007 there was a shortage of Government of Canada securities, thus propelling up the prices of T-bills and driving down the repo rate.

In the case of the U.S. financial system, the major explanation is that not all participants to the fed funds market are eligible to receive interest payments on their reserve balances. In particular the GSEs, such as Fannie Mae or Freddie Mac, get nothing on their deposits at the Fed (Bech and Klee 2009). In addition, there are also foreign institutions that hold balances at the Fed but don’t get interest on reserves. All these institutions thus lack bargaining power and are being forced to lend some of their surplus balances at a rate below the floor. A similar explanation has been provided in Canada when the overnight rate fell by a few basis points below the overnight floor target of 25 basis points in 2009. It is said that some participants to the repo market cannot

deposit their funds overnight at the Bank of Canada, and thus "a small spread between the overnight rate and the deposit rate would not necessarily be arbitraged away."[2]

Before we move on to the implications of all this for monetary theory, we may discuss another possibility. Just as the monetary authorities can set the target overnight interest rate equal to the floor rate (the deposit rate) and provide an excessive amount of reserves, they could alternatively decide to fix the target rate equal to the ceiling rate, that is, equal to the lending rate of the central bank. This is illustrated in figure 5, where the supply of reserves is such that private banks are forced in the aggregate to access the discount window and borrow from the central bank. As mentioned above, this can occur even in countries where there are no reserve requirements so that banks normally have a zero demand for reserves. In this case, the central bank only needs to make sure that the overall position of the participants to the clearing and settlement system is negative, so that they need to borrow from the central bank in the aggregate in order to settle their position in the payment system.

In fact, we can say that in the not-so-recent past, this was exactly the situation of many continental European monetary systems, and even of the British system when banks were said to be "in the Bank," being forced to borrow from the Bank of England. Clearly, in that case, the overnight rate of interest would tend to rise up to the lending rate, and hence the effective overnight rate would equal the target set by the central bank, as too many banks would be unable to find a counterparty on the overnight rate market. Such a system was gradually abandoned as advocates of free-market capitalism convinced central bankers of the advantages of a system based on open market operations. Some observers have claimed however that one could just as well get rid of the overnight market altogether by setting the deposit and lending rates nearly equal to each other, with the central bank both taking the deposits of any institution running a surplus position and granting credits to any institution running a deficit position in the clearing and settlement system (Fullwiler 2009, and the references found there). Those who still believe in the efficiency of financial markets would argue however that such a system would eschew the disciplinary effects of overnight markets and of auction markets. While the ECB does not have a ceiling system, it should be noted that banks in the Eurosystem are normally constantly

[2] Email from Timothy Lane, from the Bank of Canada, to Keith Newman, January 22, 2010. Thanks to Keith for providing me this information.

borrowing funds from the ECB, giving rise to the main refinancing rate, so that euro banks are indeed partly "in the Bank." [3]

IMPLICATIONS FOR MONETARY THEORY

Economists have for some time been aware that the overnight rate of interest and the amount of reserves *can* be divorced from each other. Thus, in contrast to the mainstream view, it is not necessary to augment bank reserves to decrease the overnight rate of interest: reserves are not the dual of overnight interest rates. This is well-known since the mid-1990s, when some central banks adopted the corridor approach. It is particularly obvious in the case of countries that have gotten rid of reserves requirements altogether, as in Canada. Without the corridor, as can be seen with figure 1, a change in the overnight rate of interest requires a change in the supply of reserves. However, as can be guessed from figure 3, with the corridor system, it suffices to change both the floor and the ceiling of the corridor to induce a move of the actual overnight rate towards the middle of the corridor, which ought to be the target overnight interest rate. However, with the standard corridor system, too great a departure of reserves from their normal level will lead to an increase or a decrease of the overnight rate. Indeed, this is why central banks such as the Bank of Canada must be careful to supply zero or close to zero reserves when reserve requirements are nil. In a sense the divorce is not complete; it is more like a separation.

The divorce between reserves and interest rates is fully consumed with the newly adopted floor system. In this specific variant of the corridor system, with the floor rate being equal to the target rate, the rate of interest can be raised simply by raising the lending and the deposit rates. In addition, once the supply of reserves largely exceeds the demand for reserves, central banks need not worry about fluctuations in reserves since the excess amount of reserves will keep the overnight rate at the floor level, and hence at the target overnight rate. This is what two economists at the Bank for International Settlements, Borio and Disyatat (2009), call the *decoupling principle*. The floor system has been briefly proposed by Woodford (2000: 255), Goodfriend (2002: 3), Fullwiler (2005), and Ennis and Keister (2008), and a more detailed argument in favor of this proposal can be found in Keister, Martin, and McAndrews (2008).

[3] Although, right now, so many reserves having been borrowed on a long-term basis from the ECB, the overnight rate has fallen to the floor, as in Canada or the United States.

Indeed both the Reserve Bank of New Zealand and the central bank of Norway had adopted a floor system *before* the financial crisis got underway.

Borio and Disyatat (2009: 3) claim that the decoupling principle has "far-reaching implications," presumably because the link between interest rates and the supply of reserves is completely severed. This means that the monetary authorities now dispose of two instruments instead of one. They can pursue an interest rate policy by acting upon the corridor or the floor, and if they adopt the floor system they can also have a supply of reserve policy, since the amount of reserves is completely disconnected from the overnight interest rate as long as there is a sufficient amount of excess reserves.

One may wonder however about the usefulness of an independent reserve supply policy. The main advantage that I can see is that the central bank need not proceed to neutralizing operations when a floor system has been adopted, and thus there is no need to forecast the demand for reserves; as a consequence, there should be less volatility in overnight interest rates. Thus, with a floor system, there is no need for compulsory reserves and the reserve-averaging system as means to stabilize interest rates in a financial system where banks and the central bank do not have perfect knowledge of their position in the clearing and settlement system.[4]

In the corridor system, if the central bank engages in credit-easing operations, purchasing illiquid private assets to prevent the prices of these financial assets from falling, it needs to provide liquid government securities in exchange, so as to neutralize the reserve-creating effects of its credit-easing operations. As we saw earlier, this can be done either by keeping constant the size of the central bank balance sheet, when the central bank engages into open market operations and repo operations, or it can be done by letting its balance sheet increase in size, by having the government agree to sell securities and accumulate deposit balances at the central bank. If the central bank starts to run out of Treasury bills, it will have to switch to the second option, letting its balance sheet increase. But this implies that the gross debt of the federal government is rising, which may arouse suspicions among financial market participants.[5]

[4] In Canada they do, so there is no need for reserve averaging in the standard corridor system.
[5] A third neutralization option, as is well-known in China and in some other East Asian countries, is for the central bank to issue its own central bank bills, thus swapping illiquid private financial assets for liquid central bank debt.

In a country like the United States (and also in the euro zone), there is a second advantage to the floor system. The U.S. payment system is based on a gross clearing and settlement system that requires large amounts of clearing balances during the day. A payment cannot go through unless the bank who is the payee has enough clearing balances to avoid holding negative balances or unless the payee can obtain daylight credit from the central bank (for a fee or with the help of collateral, as is done elsewhere). In normal times, the central bank is thus constrained to be part of a balancing act, "expanding the supply of reserves during the day and shrinking it back overnight" (Keister, Martin, and McAndrews 2008: 47). Making use of the floor system and providing large amounts of reserves at the deposit rate helps to remove the credit risk of the central bank on its daylight advances as these advances become unnecessary, and it removes the risk of delayed payments leading to gridlocks. This problem does not exist in Canada because banks can be in a negative position (half of the banks normally are in such a position) within the clearing and settlement system during the day (up to a certain limit, determined every morning by the participants to the clearing system themselves).

The third advantage of the floor system in times of recession, according to some mainstream economists, is that large excess reserves will induce banks to make more loans. Some observers have claimed that the Fed was pursuing quantitative easing during the subprime financial crisis, adding reserves to the banking system in the hope that some of these reserves would be lent out to the productive sector, thus breaking up the credit crunch. Indeed, several mainstream American economists kept recommending quantitative easing to the Japanese monetary authorities when they were caught in their own depression before the occurrence of the global financial crisis, not understanding why the Bank of Japan declined to follow such advice for a long time. My reading of the papers of the officials at the New York Fed leads me to believe otherwise. The creation of reserves was a by-product of the credit-easing policies, and its intent was not an expansion of the supply of reserves. Indeed, New York Fed staff members Keister and McAndrews (2009: 8) write that "It is important to keep in mind that the excess reserves in our example were not created with the goal of lowering interest rates or increasing bank lending significantly relative to pre-crisis levels. Rather these reserves were created as a by-product of policies designed to mitigate the effects of a disruption in financial markets. In fact, the central bank paid interest on reserves to prevent the increase in reserves from driving market interest rates below the level it deemed appropriate given macroeconomic conditions." Thus

Keister and McAndrews (2009) clearly object to the proposals that have been put forward to discourage banks from holding their excess reserves, such as a special tax on excess reserves or the elimination of the interest payment on excess reserves, as they reject the notion that private banks are hoarding funds and refusing to make loans to loan-hungry customers. Unfortunately, this idea of idle reserves, associated with credit-rationing banks, is also rampant among some Post Keynesian economists (Palley 2010). Paying interest on reserves does not have anything deflationary. It does not discourage banks from lending to firms or households. Taxing reserves will not encourage banks to make more loans to the nonbanking sector. It will only lead to a reduction in the fed funds rate, as the alternative, holding reserves, now has a lower rate of return.

Ever since the explosion of its balance sheet, the Fed has been at pains to explain that only part of this increase was associated with an increase in reserves and also that increases in reserves did not imply increases in the money supply. The textbook story, based on the money multiplier, says that excess reserves will feed into additional loans and deposits, thus leading to excess money creation and inflation. Old-time monetarists such as Allan Meltzer have come out of their closets, trying to instil fear in the heart of rentiers and market observers. Even Keynesian economists, brought up on the standard IS/LM model, believe that more reserves lead to lower interest rates and, hence, higher aggregate demand and more inflation. Fed officials have had to wage two battles. First, Fed officials had to explain that, because of the decoupling principle, the central bank could raise the target rate and fed funds rates despite the presence of excess reserves. The corridor system certainly provides such an explanation. Secondly, they had to convince market observers that the money multiplier story is invalid and that private banks will not create money at will just because they are holding excess reserves.

American central bankers have been keen to convince financial experts and portfolio managers that previous monetary theory is wrong and that excess reserves are not inflationary. As said by William Dudley (2009: 1), the President and CEO of the New York Fed, "it is not the case that our expanded balance sheet will inevitably prove inflationary. It is important that this critical issue be well understood."[6] As Borio and Disnyatat point out (2009: 22), among

[6] A similar statement can be found in Cohn (2010: 17): "Most policymakers do not tend to put too much stock in the very simple theories relating excess reserves to money and inflation. But we are aware that the size of our balance sheet is a potential source of policy stimulus, and we need to be alert to the risk that households, businesses, and investors could begin to expect higher inflation based partly on an expanded central bank balance sheet."

policymakers "there is a concern that markets may at some point, possibly based on the 'wrong model,' become excessively concerned about the potential inflationary implications of these policies," the reserve-creating credit-easing policies. Such expectations would undermine the efforts of the monetary authorities to ease conditions in credit markets, in particular long-term assets, as they would lead to higher long-term interest rates. Incidentally, this concern puts in jeopardy all models based on rational expectations that assume that all agents believe in the same macroeconomic framework and the same macroeconomic causal mechanisms.

The crucial issue here is whether it is true that "an expansion of bank reserves endows banks with additional resources to extend loans" (Borio and Disnyatat 2009: 18). If it does, then it must be the case that banks need reserves to make loans or to be induced to make more loans. Then, "either bank lending is constrained by insufficient access to reserves or more reserves can somehow boost banks' willingness to lend" (Borio and Disnyatat 2009: 19). But as Borio and Disnyatat (2009: 19) write, lending officers don't make their lending decisions after having checked the reserve position of their bank at the central bank. Rather these two authors point out that "the amount of credit outstanding is determined by the banks' willingness to supply loans, based on perceived risk-return trade-offs, and by the demand for loans"—a simple statement of the credit-led endogenous money view so popular among Post Keynesians. Thus a bank that has easy access to free reserves will not necessarily provide more loans than a bank that has to borrow them, since the lending decision depends on whether the banks are able to find a creditworthy borrower. Borio and Disnyatat further point out that the availability of reserves cannot constrain bank lending simply because "central banks supply reserves *as demanded by the system*"—a claim long made by horizontalists, as is the next point made by Borio and Disnyatat, that is, the claim that reserve requirements and the degree of reserve remuneration are not a quantitative constraint but affect instead the cost of intermediation.[7]

Here the main issue is not what happens when the central bank supplies exactly the amount of reserves demanded by banks, but rather what happens when, as is the case now in several countries including the United States, the central bank supplies a large excess amount of reserves. The graphical apparatus that we developed in the previous sections gives us a quick answer. With no interest remuneration on reserves, the overnight rate will drop to zero. This

[7] Borio and Disyatat (2009: 19), who incidentally cite Basil Moore (2006), add that "the main exogenous constraint on the expansion of credit is minimum capital requirements," a (questionable) claim also made by some Post Keynesian authors such as Descamps and Soichot (2003).

should lead to lower interest rates throughout the short-term spectrum, and hence it should induce both lenders and borrowers to engage in credit operations, unless banks are determined to keep the credit crunch going. If there is a corridor system, the overnight interest rate should drop to the level set by the deposit rate at the central bank. With a floor system, the overnight interest rate will remain where it was, at its floor level, and nothing else will happen.

Keister and McAndrews (2009: 8) provide a story that underlines the effect of excess reserves on interest rates, undermining their quantitative effects. Banks holding excess reserves when reserves carry no remuneration:

> [w]ill seek out to lend out those reserves at any positive interest rate, and this additional lending will lower the short-term interest rate. This lending also creates additional deposits in the banking system and thus leads to a small increase in reserve requirements [...]. The process then repeats itself, with banks making more new loans and the short-term interest rate falling further. The multiplier process could continue until excess reserves are eliminated—that is, until the increase in lending and deposits have raised required reserves all the way up to the level of total reserves. If this happens the money multiplier will be fully operational. However the process will stop earlier if the short-term interest rate reaches zero. When the market interest rate is zero, the opportunity cost associated with holding reserves disappears. At this point, banks no longer have an incentive to lend out their excess reserves, and the multiplier process halts.

The story provided by Keister and McAndrews is interesting, as it implies that the money multiplier story is unlikely to be fully operational, but in my view it yields too much to the standard money multiplier view. Here is what I wrote to Keister:

> You seem to imply that the textbook multiplier still applies when reserves earn no interest. I think that this is a misleading statement [...]. It implies that there is a bunch of agents out there, waiting for banks to provide them with loans, but that they are being credit rationed because banks don't have access to free reserves. This contradicts your September 2008 article [Keister, Martin, and McAndrews 2008] where you show that the Fed normally tries to supply the reserves demanded by the banking system at the target interest rate. So it means that if banks make more loans, hence create more deposits, and need more reserves, the Fed will supply them to keep the fed funds rate on target. Rather what happens when excess reserves are being provided with no remuneration of reserves is that the fed funds rate drops down, as banks with surplus reserves despair to find banks with insufficient reserves, having no alternative but a zero rate. The drop in the fed funds rate may

> induce banks to lower their lending rates, and hence induce new borrowers to ask for loans or bigger loans, but it really has nothing to do with the standard multiplier story. If there is no change in the lending rate, new creditworthy borrowers just won't show up. There is never any money multiplier effect.[8]

Keister's response was the following:

> I agree with you on the money multiplier, but I would state things in a slightly different way. In order for the money-multiplier story to make sense, it must be the case that it (implicitly, at least) works through lowering interest rates. The process must go just as you described, with the increase in reserves lowering market rates, which makes more potential projects profitable. I understand your comment to be that this mechanism is not the 'money multiplier' as commonly described. We decided to be more generous to the textbooks and say that this mechanism must be what they had in mind, even if they left out the part about interest rates to simplify things for the students. Importantly, I think we agree on the point that discussions of the money multiplier have done more harm than good in terms of helping people understand what is going on.[9]

Thus it is clear that Keister and McAndrews do reject the quantitative money-multiplier story. Their story is in line with what Davidson (1972: 227) called the portfolio-change process and in line with what I have argued in the past, when claiming that the increase in bank reserves had an impact on loans and money deposits through the interest rate channel: "Loans may increase because the general fall in interest rates has induced an increase in borrowing: at the new interest rates, more projects are profitable. This has nothing to do with the deposit multiplier" (Lavoie 1992: 183).

This rejection becomes clearer when the floor system, with interest on reserves, is considered. They write: "Most central banks now pay interest on reserves. When reserves earn interest, the multiplier process will not continue to the point where the market rate of interest is zero. Rather it will stop when the market rate reaches the rate paid by the central bank, since if these rates are the same, banks no longer face an opportunity cost of holding reserves. If the central bank pays interest on reserves at its *target* interest rate, [...] then banks never face an opportunity cost of holding reserves and the money multiplier does not come into play" (Keister

[8] Email to Todd Keister, January 5, 2010.
[9] Email from Todd Keister, January 7, 2010.

and McAndrews 2009: 8). Thus, in this case, the higher level of reserves induces no change in interest rates, and hence no change in lending behavior. The money multiplier story vanishes entirely. As a consequence, it cannot be claimed that large excess reserves have a potentially large inflationary effect. The causal mainstream link between reserves, money, and prices is thus broken.

IMPLICATIONS FOR POST-KEYNESIAN MONETARY THEORY

The financial crisis has certainly vindicated post-Keynesian theory at large and its Minskyan Wall Street component in particular. What about monetary theory? New Consensus followers—a mixture of New Classical and New Keynesian economics—had already adopted the endogenous view of money by removing from its main equations the exogenous stock of money. What about the link between the central bank and the rest of the financial system? Post Keynesians usually represent the supply of high-powered money as a horizontal line, set at the target overnight rate. This representation can also be found in some money and banking textbooks (Cecchetti 2008: 463). This is meant to represent the claim that between meetings of the interest-setting committee of the central bank (the FOMC in the United States), the monetary authorities will supply any amount of reserves that corresponds to the demand for reserves at the given target overnight interest rate. The shape of this supply curve was the subject of an intense debate among Post Keynesian economists, as many argued that the central bank reaction function ought to make it upward-sloping when several periods came to be considered. By contrast, in this paper, we have taken the view that from a daily perspective, the supply of reserves can be considered as a vertical line, as the central bank has substantial control (as in the United States or Europe) or perfect control (as in Canada) over the supply of reserves.[10]

In some of my own past writings, this distinction was not always made clear. For instance, in Lavoie (1992: 181–186), my main point was that central banks had little control over the supply of reserves, first, as argued here, because the main focus of central banks was the interest rates, but also because if the central bank was providing too many reserves, banks that had taken advances at the central bank would use these extra reserves to reduce their

[10] This may fit the neo-chartalist distinction between the vertical and horizontal components of money. See Wray (1998).

indebtedness vis-à-vis the central bank—the case of overdraft economies—thus getting the supply of reserves equal to the demand for reserves.

What should now be clear is that if the central bank is ready to let the overnight rate of interest drop to zero, or if there is corridor system, it is then possible for central banks to control the amount of reserves in the system, as long as it willing to accept that the target rate of interest be set at the deposit rate on bank reserves at the central bank. There can thus be a supply of reserves that far exceeds the amount of required or demanded reserves. In systems with no compulsory reserves, similarly, the central bank can have a supply of reserves that is way beyond zero. In that sense, the supply of reserves is not necessarily equal to the demand for reserves. There is nothing that banks can do in the aggregate to remove excess reserves as long as they are not indebted towards the central bank. As Fullwiler (2005: 549) points out, "banks cannot use reserve balances for anything other than settling payments or meeting reserve requirements; reserve balances do not fund additional lending." Even in an overdraft economy, as in the Eurosystem, banks cannot remove excess reserves (immediately) if advances from the central bank were taken on a long-term basis.

There are fiscal implications to this finding. If central banks can control both the rate of interest and the amount of reserves, instead of one or the other as we were long led to believe, it becomes clear that the deficits of federal governments can be nearly indifferently financed either by issuing government securities or by forcing banks to hold reserves at a deposit rate that is close to the interest yield on Treasury bills. This certainly requires some more thinking.

CONCLUSION

The financial crisis and the reaction to it are bound to have an impact on monetary theory. Already, the New Consensus view, popular among central bankers, had introduced the notion of endogenous money and the idea that interest rate steering was the appropriate way to model monetary policy or central bank reaction functions (Bindseil 2004). The financial crisis has made these features of the real world even more obvious and it should make clear that nearly all of mainstream monetary theory as applied to central banking is nearly worthless, as is for instance the infamous money multiplier fable and the presumed causal relationship running from bank reserves at the central bank to price inflation.

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Table 1. Standard Deviation, in Basis Points, between the Effective Federal Funds Rate and the FOMC Interest Rate Target

Period	2001	2002	2003	2004	2005	2006	2007-01-01 2007-08-08
Standard deviation	17.7	5.2	6.1	3.9 4.2*	7.1	5.4	2.9
Peak monthly value	50.1 (Sept)	8.4	13.2	7.0	10.9	8.3	3.4
Period	2007-08-09 2007-09-14	2007-09-17 2007-12-31	2008-01-01 2008-09-14	2008-09-15 2008-10-08	2008-10-09 2008-11-05	2008-11-06 2008-12-05	2008-12-16 2010-04-30
Standard deviation	18.8	10.8 15.6*	9.0	62.8	16.9	19.4	4.1
Peak monthly value		23.5 (Dec)	11.0				5.2

*Includes the large spread that occurred in year-end

2007-08-9: Start of subprime crisis

2007-09-17: Apparent end of tensions in money markets

2008-09-15: Lehman Brothers declares bankruptcy

2008-10-09: Fed starts paying interest on reserves

2008-11-06: Federal funds rate target equals interest paid on reserves

2008-12-06: Federal funds rate target is set between 0 and 0.25% (the target is assumed to be at 0.125% until 2009-02-19, when it is assumed to be 0.19%, as the primary credit rate is pushed from 0.50 to 0.75%)

***Source*:** Federal funds rate and FOMC target taken from the data bank of the Federal Reserve Bank of Saint-Louis.

Note: Friday deviations are counted three times

Figure 1. Fed Funds Market, with Reserve Averaging and No Interest on Reserves

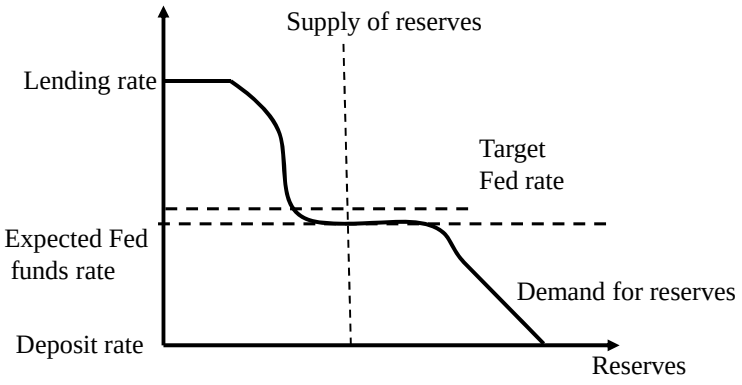

Figure 2. The Impact of the Lehman Brothers' Bankruptcy on the Fed Funds Market

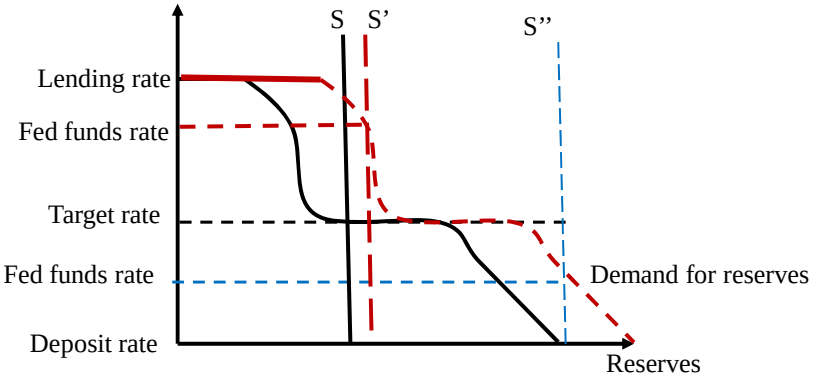

Figure 3. Fed Funds Market, with Reserve Averaging and the Corridor System

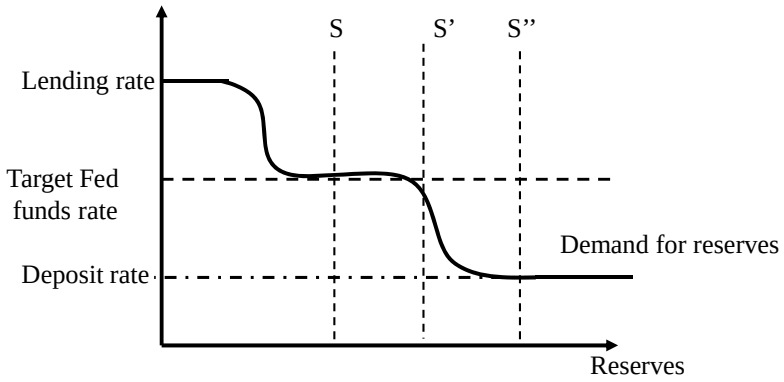

Figure 4. The Floor System, with the Fed Funds Target Equal to the Interest Rate on Reserves

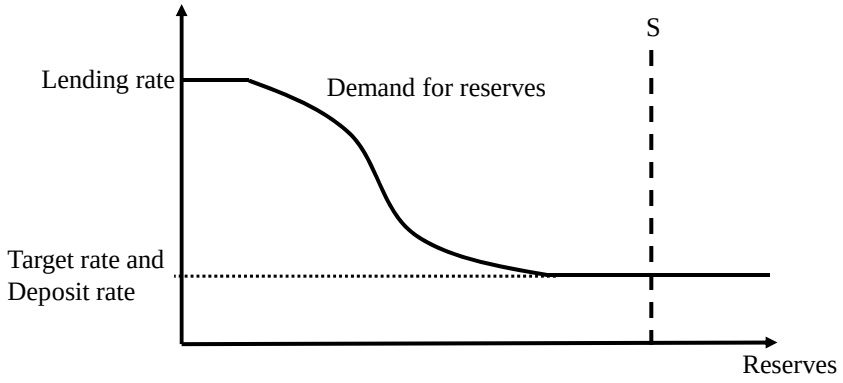

Figure 5. A Ceiling System, with the Fed Funds Target Equal to the Interest Rate on Advances