The Federal Reserve System and Eurosystem's Balance Sheet Policies During the Financial Crisis: A Comparative Analysis

Philipp Bagus and David Howden

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THE FEDERAL RESERVE AND EUROSYSTEM´S BALANCE SHEET POLICIES DURING THE FINANCIAL CRISIS: A COMPARATIVE ANALYSIS

Philipp Bagus and David Howden[*]

Abstract:

The balance sheet developments of the Federal Reserve System have received increased attention during recent events. The Fed has expanded its balance sheet and also changed its composition in order to support the financial system. As a consequence the average quality of the assets have, on average, deteriorated. In a similar way, the ECB has recently implemented novel balance sheet policies. In this article we compare the balance sheet policies of these two central banks. We assess the differences in policy strategies and deduct consequences concerning the quality of the respective currencies, as well as future directions of monetary policy.

Keywords: *Central Bank Balance Sheets, Quality of Money, Balance Sheet Analysis, Monetary Policy, Subprime Crisis.*

JEL Classifications: E31, E52, E58, E59, M40

Introduction

The developments of the balance sheet of the Federal Reserve System (Fed) have recently been analyzed in light of the recent economic turmoil (Cecchetti 2009, Bagus and Schiml 2009a, Brunnermeier 2009, Hamilton 2009). In addition, the media have pointed out the deterioration of the balance sheet of the Fed with dissenting voices warning of this development. The Fed expanded its balance sheet and changed its composition in order to support a faltering financial system. Consequently, the average quality of the assets on average has deteriorated. Similarly, the ECB changed its balance sheet policies in order to support the European banking system. In this article we compare the balance sheet policies of these two central banks. We assess the differences of their policies and deduct consequences for the quality of their respective currencies. In particular we analyze which central bank has deteriorated its balance sheet, and thereby the quality of its currency, more strongly during the financial crisis between June 2007 and March 2009.

Phillip Bagus is at the Department of Applied Economics I, Faculty of Legal and Social Sciences, Universidad Rey Juan Carlos, Pso. Artilleros s/n, 28032, Madrid, Spain. E-mail: philipp.bagus@urjc.es

David howden is at the Department of Business Administration & Economics, St. Louis University, Avenida del Valle 34, 28003, Madrid, Spain. E-mail: dhowden@slu.edu

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The Economic significance of central bank balance sheets

The analysis of balance sheets and balance sheet policies is an established research field in business studies and a practice conducted by investors, auditors, rating agencies, and stock exchange supervisors. While the theory of balance sheet analysis in business is well developed the analysis has been widely neglected in economic theory. The theory of balance sheet analysis used in business and resultant ratios thereof are helpful concerning the analysis of the Federal Reserve and Eurosystem's actions during the recent financial crisis.[76] Specifically, the connection between the balance sheet analyses found in business studies and the *quality* theory of money is fruitful.

The quality theory of money claims that the value of money is primarily determined by its quality. The quantity of money is *merely one* of several factors that influences its quality.[77] The quality of money can be defined as the capacity of a good to fulfill money´s main functions, i.e., to serve as a medium of exchange, a store of value and a unit of account.[78] Some of the factors that affect the function of money as a store of value are recorded in the central bank´s balance sheet. Therefore, the evolution of the balance sheet of the central bank, in particular changes occurring on its asset side, are important in understanding shifts in the *perceived* quality of money. The central bank´s assets back the liability side of the balance sheet. In fact, assets represent the means that the central bank can use to defend the price of its currency internally and externally through sales against its liabilities, i.e., the monetary base. The assets can also be used in policies to support a struggling financial system and inject confidence into it.

When the central bank uses its assets to defend its currency, this procedure represents a *de facto* redemption. The holders of the currency "redeem" it against these sold assets. The higher the quality the assets that a central bank owns, the more assuredly it can guarantee the long-term value of its currency and its function as a store of value.[79] Moreover, in the extreme case of monetary reform, the assets a

[76] McKean (1949) provides an early exposition of the need to delve into the compositional holdings affecting the liquidity positions of central bank assets. Mishkin (1978) and Kiyotaki and Moore (2002) have provided more recent evidence that financial calamities are propagated and transmitted through balance sheet compositional shifts.

[77] The quality theory of money is found to date back to Mariana (1609), Menger (1871), and Jevons (1875). After a period of neglect following the popularity of the more conventionally used quantity theory of money, Hazlitt (1978), Cunningham (1992), and Bagus and Schiml (2009a) have brought forward renewed arguments for the former's superiority.

[78] For an intensive account on the quality of money and balance sheets see Bagus and Schiml (2008). For a case study concerning the quality of money during late eighteenth century America, see Bagus (2008).

[79] This distinction is different than the changes in the liquidity position. Negative qualitative shifts in asset holdings imply, for example, a shift from high to low quality bonds, while a shift in the liquidity

central bank owns can be used in order to sustain confidence in the reform and back the new currency. Hence, the evolution of the assets of a central bank determines the quality of a currency and, consequently, its purchasing power.

Thus, the analysis of a central bank's balance sheet is very important for the evaluation of the quality of the currency it backs. In fact, it is possible that the total of assets on the balance sheet *as well as* measured monetary aggregates do not change, while the composition of the balance sheet deteriorates substantially. This can cause inflationary pressures to build, as the assets backing the currency and consequently the currency´s quality deteriorate. Even in the face of quantitatively similar situations, qualitative changes can make remarkable differences in the overall value of a currency. As a result, it can also be seen that the balance sheet influences the foreign exchange rate. In our comparative example, the relative development of the balance sheet helps to explain part of the variations in the euro-dollar exchange rate.

Moreover, deterioration in the quality of central bank assets may indicate possible future developments of the monetary aggregates.[80] Thus, it is possible to read from the balance sheet the limits for swaps of good assets (i.e., high quality) against bad assets (i.e., low quality) to aid in stabilizing the banking system. When the amount of high quality assets shrinks, it becomes at some point necessary to expand the balance sheet to lend additional support to the banking system. This expansion will, in turn, influence the monetary aggregates. Furthermore, a deterioration of a central bank's balance sheet can indicate the necessity of an imminent recapitalization of the central bank by the government. The recapitalization entails the possibility of increases in the quantity of money to finance it, which may also negatively affect the quality of money.[81]

An analysis of the quality of the assets held by a central bank is especially useful in times when traditional tools to analyze monetary policy are limited. In fact, central banks of the world are now reaching what economists call "the zero-bound" of interest rates. The Fed has already reached the zero-bound while the Eurosystem is quickly approaching this point.[82] This makes an analysis of the central bank´s balance sheet increasingly important to aid future monetary policy as both qualitative and quantitative changes become the only policy tools available to the central banker to fight recession.

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position would entail a move from cash to bonds (Bagus and Howden 2009b). Note that while shifts in the liquidity position imply qualitative shifts, the converse need not necessarily hold true.

[80] Beckhart (1940) makes note of this fact – as a central bank's portfolio takes on assets of lower liquidity it becomes unable to exercise control through monetary policy (either quantitatively or qualitatively).

[81] Bagus and Schiml (2008; 2009a) introduce the term "qualitative easing" to signify those balance sheet policies that deteriorate the average quality of central bank assets. Although qualitative easing has received scant attention in comparison to its quantitative counterpart, recent attention can be found in Buiter (2009a; 2009b), Bagus and Schiml (2009b) and Bagus and Howden (2009b).

[82] The Bank of Japan has meandered along the zero-bound since February 1999. More recently, the Bank of Canada and the Swiss National Bank have also succumbed to the limitations the zero-bound imposes.

Eggertsson and Woodford (2004) demonstrate that liquidity traps obtain only at the zero-bound, as interest rate policy becomes ineffective. In response, alternative policy measures must be implemented. However, while central bank communications are widely seen as increasingly effective policy response in the face of the zero-bound (Bernanke, Reinhart and Sack 2004, Güraynak, Sack and Swanson 2005, and Rosa and Verga 2008), the *credibility* of these statements adds an instrumental component.[83] The quality of a central bank's reserve assets, as recorded on its balance sheet, gains increased importance as these represent the credibility that the communicated policies will actually come to fruition.[84]

An historical account of the current crisis as reflected in the Federal Reserve System and Eurosystem's balance sheet policies

During the financial crisis the European Central Bank and the Federal Reserve System each acted as "lenders of last resort" on an unprecedented scale. The dimensions of these new monetary policies manifest themselves on the consolidated balance sheets of the Eurosystem, i.e., the balance sheet of the ECB and the central banks of the member states that have introduced the Euro, and the consolidated balance sheet of the Federal Reserve System.[85] Let us first look on the balance sheet of the Eurosystem and then at the Fed's. When we compare the asset side of the balance sheets in June 2007 before the crisis broke out with the more recent position of March 2009 we can observe important changes.

[83] The past 20 years have seen a veritable explosion in research concerning what constitutes appropriate and effective central bank communication. For brevity, the reader is referred to Blinder et al. (2008) for a summary of these developments.

[84] Additionally, Bernanke and Reinhart (2004) argue that future policy responses will depend on future exogenous shocks, implying that policy responses will be conditional. The credibility of these conditional responses will directly depend on the assets at a central bank's disposal to maintain such future positions.

[85] Serrano Cinca, Mar Molinero and Larraz (2002) warn that international comparisons of balance sheets are fraught with peril owing to diverse accounting traditions and standards which vary from country to country. Studies focusing on this approach must rely on homogenous and reliable data. Every attempt has been made here to make the data as directly comparable as possible by employing similar criteria for asset valuation. McLeay (1991), Choi and Mueller (1992) and Sherman and Todd (1997) provide additional critical assessments of international comparisons of accounting standards. Calls for homogenized accounting practices date back at least to Henry Bailey's 1888 pamphlet, "A paper on balance sheets and how to prove them", while more recently the International Accounting Standards Committee has strove to homogenize practices across international borders (Hanks 1997).

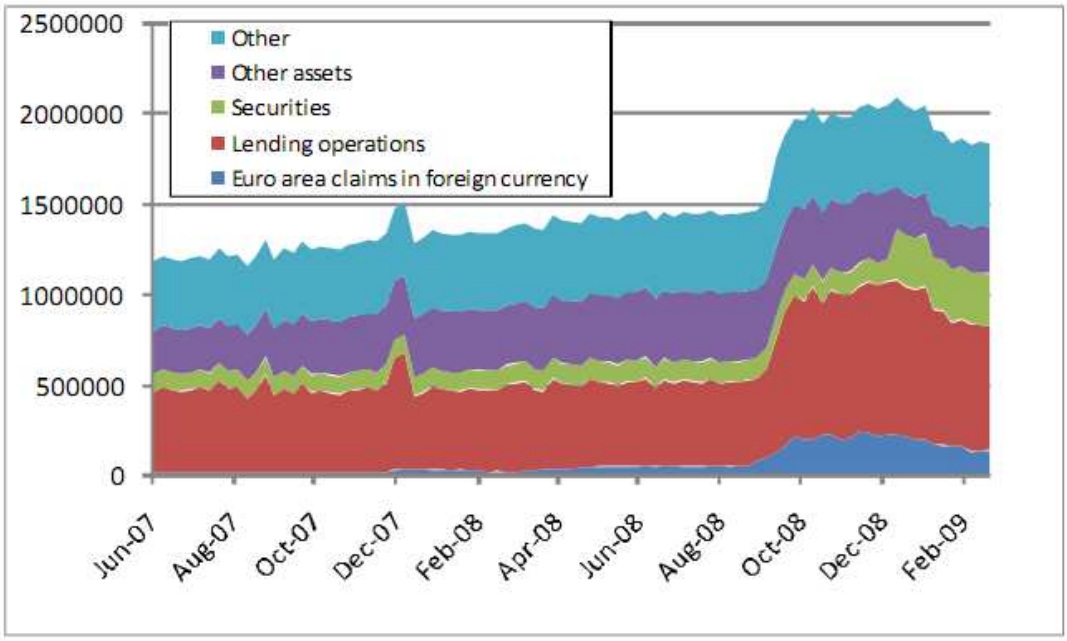

Figure 1: Asset side of the Eurosystem´s balance sheet (06/2007 to 03/2009) (weekly, millions Euros)
Source: ECB *(2009)*.

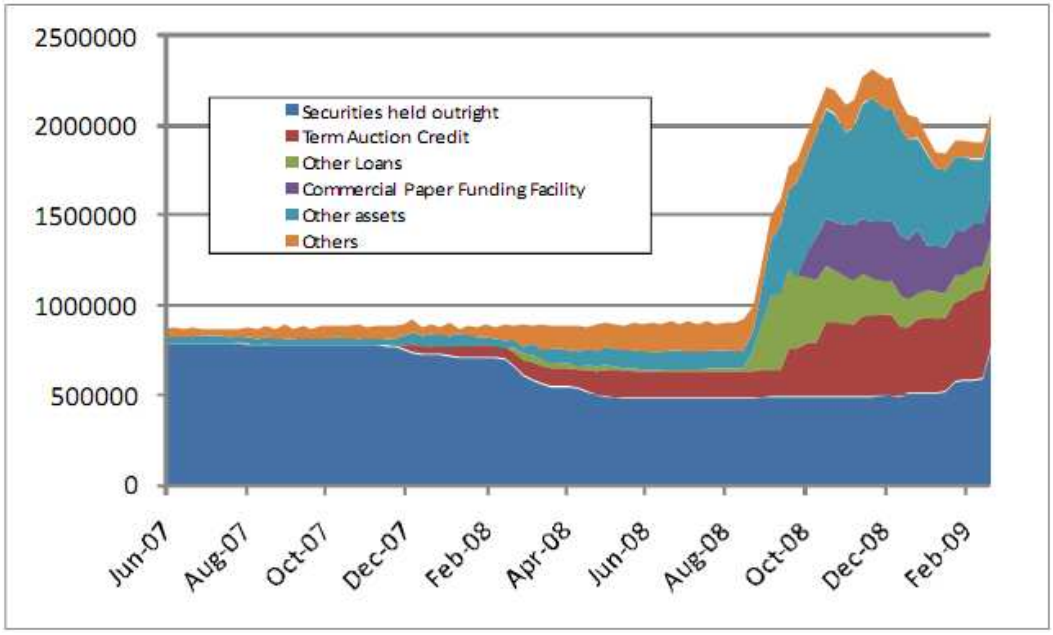

Figure 2: Asset side of the Fed's balance sheet (06/2007 to 03/2009) (weekly, millions dollars)
Source: Fed *(2009)*

Most importantly, a dramatic quantitative expansion of both balance sheets occurred over the period. The balance sheet of the ECB increased approximately 60 percent from June 2007 to March 2009. The balance sheet of the Fed was expanded even more during the same period, by almost 240 percent. We can also see that both balance sheets commenced expanding at a much more rapid pace in September 2008, after the collapse of Lehman Brothers. Furthermore, both balance sheets reached their maximum size in December 2008 which has been followed by a slight contraction until the present. It is here where the similarities end.

Until September 2008 the balance sheet of the ECB increased while the Fed's remained constant, instead changing in composition. Thus, in the early stages, the ECB tried to fight the crisis by a balance sheet expansion and additional liquidity while the Fed fought the crisis by changing its balance sheet composition without injecting new liquidity but rather relying on injecting its liquid assets into the banking system, as can be seen in figure 3.

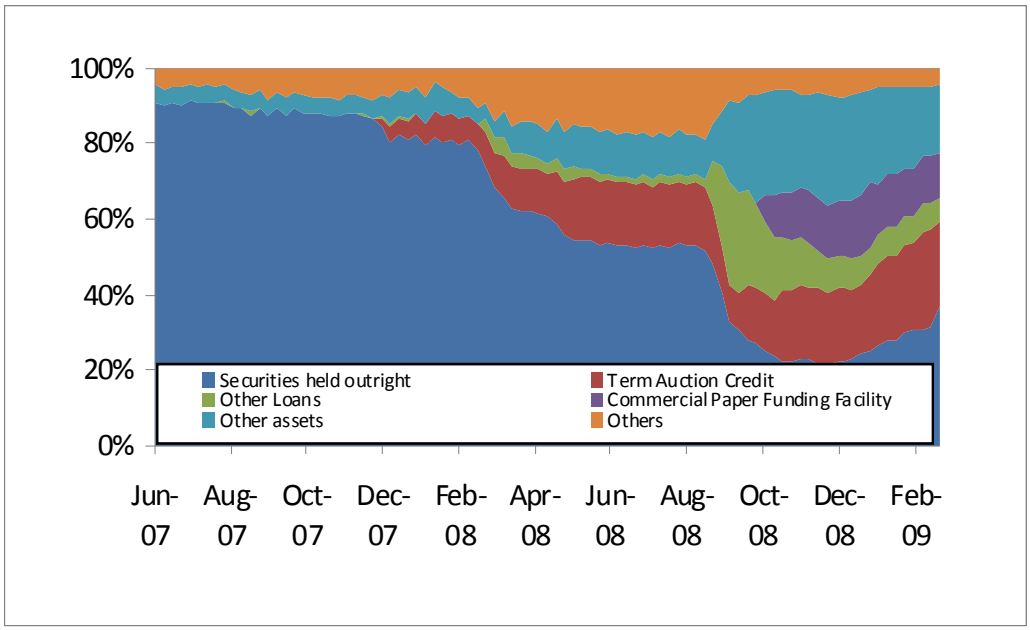

Figure 3: Asset side of the Fed's balance sheet (06/2007 to 12/2008)
(in %, weekly)
Source: *Fed (2008)*

In fact, from August 2007 to September 2008 the American central bank's balance sheet total did not undergo a substantial expansion (approximately 3 percent), while the quality of the balance sheet and, consequently, the quality of the currency backed by it, had been deteriorating considerably. This was the consequence of the Fed´s attempt to forestall a systemic crisis by deteriorating its balance sheet

through sales of its quality assets, in exchange for less credit worthy assets from the banking system. The amount of high-quality and very liquid assets remained either constant (i.e., in the case of gold) or was reduced dramatically (i.e., in the case of U.S. Treasury bonds). Furthermore, beginning on March 27th the "Term Securities Lending Facility" (TSLF) was installed.[86] In this facility primary dealers can borrow U.S. Treasury bonds from the Fed by pledging as collateral lower quality securities. Thus, the banking system was provided with U.S. Treasury bonds that banks could themselves offer as collateral. This measure further deteriorated the position of the central bank (replacing high quality with lower quality assets), even though the lending does not appear on the balance sheet itself but as a memorandum item.

While the Fed sold its high quality assets, this was compensated by the increase in low quality assets. For instance, as a consequence of the rescue of Bear Stearns, the Fed acquired the dubious and illiquid assets of Bear Stearns that JP Morgan Chase did not want to inherit and add to its own balance sheet. These assets can be found on the Fed balance sheet in the position "Net portfolio of Maiden Lane LLC." The most important low quality asset positions were the "term auction credits". These loans were granted to the troubled banking system primarily via the newly installed "term auction facility" (TAF). The term auction credits are 28 to 35 day loans to a broader range of counter parties and against a broader range of collateral than the more conventional open market operations.[87]

Thus, the average quality of the assets backing the dollar substantially decreased. The balance sheet total remained constant because the reduction of the liquid Treasury bonds was compensated by the increase in other more illiquid and lower quality items.

It was only after the bankruptcy of the investment bank Lehman Brothers on September 15th 2008 that the Fed stopped sterilizing new loan issuances by selling Treasury bonds. Simultaneously the Fed increased its lending of Treasury bonds to the banks. As a consequence of these policies the balance sheet total increased more than 100 % from the 4th of September to the 12th of November. In fact, during the Lehman Brothers incident, the point was reached where there was no longer enough Treasury bonds left for sale or loan. If the Fed wanted to issue more liquidity to the banking system, it had to commence expanding its balance sheet quantitatively.

The additional assets on the Fed´s balance sheet are of questionable quality as they represent loans to a troubled banking system backed by potentially illiquid collateral. For instance, its new assets contained rescue loans to the insurance company American International Group (AIG) which have an embedded risk of being returned at a significant loss to their book value. Moreover, the Fed started the direct purchase of debt by Fannie Mae, Freddie Mac and the Federal Home Loan

[86] The Term Securities Facility appears on the balance sheet the first time on March 27th 2008. Before that date, they had been called "securities lent to dealers" which had, to that point, been a fairly small position on the Fed´s balance sheet.

[87] Additionally, on August 11th 2008 the Fed started to grant longer term auction credits of 84 days.

Banks and of mortgage backed securities issued by Fannie Mae, Freddie Mac and Ginnie Mae. By these purchases, the Fed has assumed a substantial amount of additional direct credit risk.

The strategy of the Eurosystem to aid the troubled financial system was starkly different. From the beginning it has pursued quantitative easing policies. Thus, it did not try to sterilize the new loans to the banking system by the sale of its high quality assets. Nevertheless, the composition of the balance sheet changed mainly by taking on proportionately longer-term assets as well as assets of lower liquidity as can be seen in figure 4.

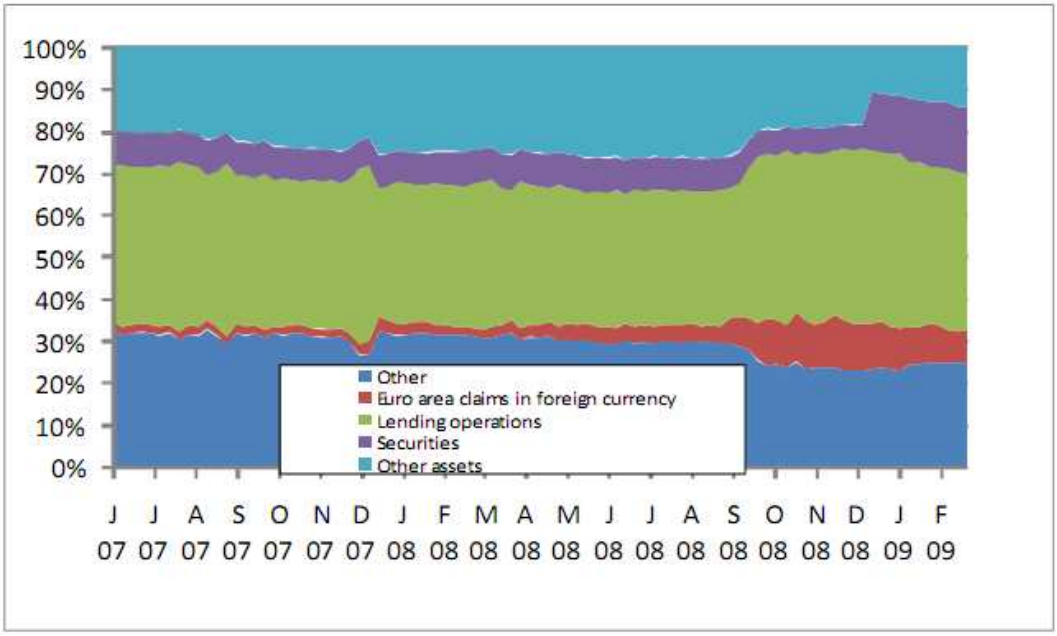

Figure 4: Asset side of the Eurosystem balance sheet (06/2007 to 03/2009) (in %, weekly)
Source: ECB (2009)

Moreover, and in contrast to the Fed, the ECB expanded upon existing credit operations instead of introducing new facilities in order to provide liquidity to the struggling banking system. Thus, the composition of the balance sheet varied as the amount of lending operations to Euro area credit institutions increased with a tendency towards longer-term financing. As the term length on loans was increased, the counterparty risk of default increased, resulting in a lower average liquidity of its balance sheet assets. In fact, the ECB gave these longer-term credits because the counterparties, namely banks, were already in trouble and in need of longer-term funding for stability. The change in the composition of the specific lending operations themselves can be observed in figure 5.

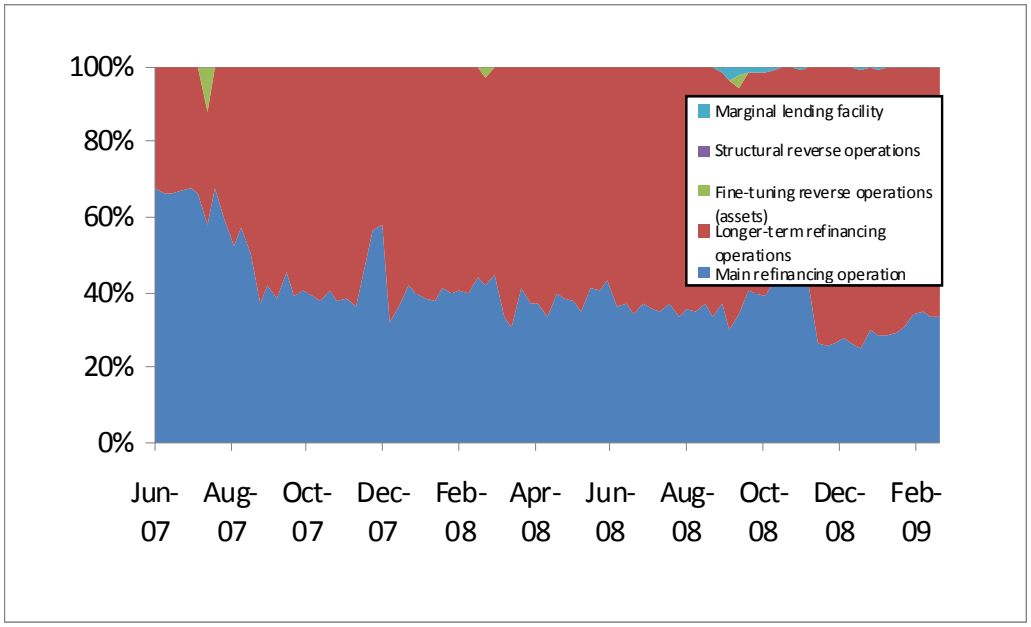

Figure 5: Lending operation to Euro area credit operation (06/2007 to 03/2009) (in %, weekly)
Source: ECB (2009)

The Eurosystem increased its longer-term refinancing operations while decreasing its shorter-term main refinancing operations resulting in a compositional change to this portion of the balance sheet. As a result we can observe in figure 5 that the portion of the more liquid main refinancing operations declined while the less liquid longer-term refinancing operations increased throughout the period. The Eurosystem also sold some of their high quality assets, though not to the extent of the Fed. Gold is a very liquid asset as it can be bought and sold in great quantities on the market even in times of crisis without strong increases in the bid-ask spread. The Eurosystem sold 42 tons of gold on November 30th 2007, followed by an additional 30 tons on June 30th 2008. Thus, the balance sheet policies of the Eurosystem deteriorated the average liquidity of the assets of the Eurosystem considerably during the first stage of the crisis until September 2008. These measures of increasing longer-term financing demonstrate the willingness of the Eurosystem to counter the tensions in the economic system with novel monetary policies.

In contrast to the Fed, the ECB did not change its strategy after the Lehman bankruptcy. In fact, it continued its extension of longer-term credit programs and liquidity provision through its balance sheet at a faster rate. From September 2008 the Eurosystem´s balance sheet expanded rapidly, making use of existing facilities while introducing regulatory changes that will be addressed shortly.

In sum, the evolutions of the balance sheets of the Eurosystem and the Fed during the crisis are quite different. Until September 2008 the Fed tried to assist the banking system by strong compositional changes to its balance sheet while the ECB pursued cautious quantitative easing while changing its composition moderately towards longer-term assets. From September 2008 the strategies of the Fed and the Eurosystem share the fact that both initiated more aggressive quantitative expansions. However, the Fed used new credit programs while the Eurosystem used existing ones, which were regarded as flexible enough to automatically absorb the lower quality collateral (Gray and Stella 2008). The composition of the respective balance sheets kept changing as the Fed increased its new positions and the Eurosystem increased the existing facilities most needed by the banking system. Finally, both central banks commenced periods of quantitative tightening from December 2008 to March 2009.

Regulatory measures affecting the balance sheet

Regulatory changes affected the quality of the assets of the respective central banks via changes in terms, collateral, counterparties and transparency. These changes are not reflected in the numbers of the balance sheets, nor in resultant balance sheet ratios. However, they indirectly affect the quality of the currencies. Even though a great deal of subjective interpretation is involved in these more qualitative changes, we do so by pointing out which monetary authority has deteriorated its position more severely.

1. Terms

Both central banks extended the maturity terms of existing credit programs. For instance on August 17th 2007 the Fed announced changes in its primary credit lending terms, extending the term of issued loans from overnight to up to 30 days. Moreover, concurrent with the measures to rescue Bear Stearns, effective March 16th the term of primary credit lending was again increased from 30 to 90 days.

As previously elaborated, the Eurosystem has made heavy use of existing facilities. It increased the 3-month refinancing operations and introduced for the first time a 6-month refinancing operation. Both are posted as the balance sheet positions "longer-term credit operations". The Eurosystem introduced two additional three-month longer-term refinancing operations of 50€ billion each and for the first time two six-month longer-term refinancing operations of 25€ billion each. Thereby, the trend towards longer-term assets on the Eurosystem balance sheet accelerated. The Eurosystem also introduced longer-term US-dollar funding. On October 13th 2008 the Eurosystem announced U.S. dollar funding at 7-day, 28-day and 84-day maturities at fixed interest rates for full allotment which meant that there was practically no limit on the amount of dollars to be used in swap lines. Thus, it seems that the Eurosystem, especially with the six-month facility, has increased the terms of their funding more than the Fed.

2. Collateral

Both central banks extended the range of accepted collateral in their credit operations. The Fed entered the crisis with more strict collateral rules, especially for its open market operations. In its repurchase agreements it accepted only Treasury securities, Federal agency debt, and mortgage backed securities *issued or fully guaranteed* by Federal agencies. Thus, at the beginning of the crisis the Fed was only accepting asset backed securities with a AAA rating or AAA rated Federal and Federal agency debts. To the contrary, the Eurosystem's rules on collateral were more flexible. Specifically, the rules allowed asset backed securities as collateral dependent on a case-by-case assessment of the haircut and a rating of at least "A -". Due to this flexibility, the Eurosystem in contrast to other central banks like the Federal Reserve did not have to introduce new facilities to allow for new types of collateral. The existing facilities of the Eurosystem were sufficient and flexible enough to satisfy the liquidity needs of troubled European financial institutions.

The Fed, due to its more strict collateral rules, had to institute new facilities in order to assist the banking system. For instance, on September 19th 2008 the Fed started the "Asset Backed Commercial Paper Money Market Mutual Fund Liquidity Facility" (AMLF). In this program "Asset Backed Commercial Papers" were accepted as collateral in order to sustain the liquidity of money market mutual funds. Hence, securities were accepted as collateral that were not traded anymore on the market or only traded at considerable discounts. On October 27th another credit program commenced, the "Commercial Paper Funding Facility" (CPFF), accepting unsecured commercial paper as collateral.

As the traditional collateral accepted by the Eurosystem was broader, the Eurosystem did not have to change its collateral rules. However, as the Eurosystem accepted lower quality collateral than other central banks, the danger for the Eurosystem was that during the financial crisis banks with international subsidiaries would use the relatively less strict rules and use their lower quality collateral to get financing from the Eurosystem.[88] As a result the Eurosystem announced a strengthening of it collateral rules on September 4th 2008, coming into effect on February 1st 2009. Thus, asset backed securities not denominated in Euros would be disallowed in order to prevent the shifting of lower quality assets on a world-wide scale by international banks to the Eurosystem. Moreover, the average haircut for asset backed securities was set at 12%. Finally the Eurosystem announced a penalty of an initial mark down of 5% for asset-backed securities and unsecured bank bonds valued according to a valuation model instead of by their posted market prices.

However, in contrast to these stated changes, after the deterioration of the financial markets in October 2008 the Eurosystem substantially increased the range of accepted collateral. On October 15th 2008 the list of assets eligible for credit operations was increased. For example, the Eurosystem started to accept as collateral

[88] Cochrane (2008) argues that asset-backed securities (ABS) were designed to receive financing from the Eurosystem.

in its credit operations marketable debt instruments denominated in currencies other than the Euro, namely the US dollar, the British pound and the Japanese yen, and issued in the Euro area coming into effect on November 14th provided that the issuer was established in the European Economic Area. An additional haircut of 8% was installed in order to compensate for currency risk.

Yet, the most drastic measure that the Eurosystem took, and which most strongly deteriorated the quality of the assets on the Eurosystem's balance sheet was as follows: The Eurosystem announced to lower the credit threshold for marketable and non-marketable assets from A- to BBB-, with the exception of asset-backed securities (ABS), and impose a haircut add-on of 5% on all assets rated BBB-. This move, which first came into effect on October 25th and was completed by November 14th 2008,[89] implied that all investment grade securities would be accepted as collateral in the credit operations of the Eurosystem. Moreover, the collateral framework was expanded further on November 17th by Euro-denominated syndicated credit claims.[90] Of course, the incentives for the banking system were to make liberal use of the less strict rules.

In sum, the Fed started from a sounder position because of its stricter rules concerning accepted collateral and term limits on loans. These stricter rules were broadened as the accepted collateral types were increased substantially. However, the Eurosystem´s acceptance of BBB- rated securities demonstrates that the Eurosystem continues to accept lower quality collateral than the Fed.

3. Counterparties

Both central banks increased the range of counterparties during the crisis. Thus, the Fed's term auction facility was installed with a broader range of counterparties than open market operations. Moreover, the primary credit dealer facility (PCDF) was installed. This facility enabled primary dealers to directly use the discount window. This was the first time that the Fed lent directly to investment banks. Finally, the "Money Market Investor Funding Facility" was established in order to provide increased liquidity to the money markets. This allowed money market mutual funds to receive indirect funding from the Fed.

The ECB had a broad range of counterparties both for the standing facility and open market operations, i.e., all banks holding minimum reserves with the relevant national central bank. Thus, counterparties were relatively more broadly defined than with the Fed. On October 3rd 2008, the ECB increased eligible counterparties for fine-tuning operations as all institutions eligible for open market operations based on standard tender were also made eligible for quick tender, the standard procedure for fine-tuning operations.

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[89] See REGULATION (EC) No 1053/2008 OF THE EUROPEAN CENTRAL BANK of 23 October 2008 on temporary changes to the rules relating to eligibility of collateral (Eurosystem/2008/11).

[90] This extension was subsequently suspended on November 26th 2008.

It is interesting to note that both central banks have each other as counterparties as they have entered into currency swap agreements and that both have assumed additional currency risk through these programs. In a common effort central banks around the world tried to improve dollar liquidity and instituted swap lines with the Federal Reserve. The average quality of the Eurosystem´s assets deteriorated further by the introduction of swap lines with central banks whose currencies were depreciating such as the Hungarian and Polish Central Banks. The Eurosystem also established a swap line with the Danish central bank exposing it to further currency risks.

In sum, the Eurosystem had a broader range of eligible counterparties prior to the crisis. During the crisis both central banks increased their eligible counterparties to similar extents. In absolute terms, the Eurosystem continues to accept a broader range of counterparties for its monetary policies.

4. Transparency

Both central banks lack transparency in their balance sheet positions and policies. The lack of transparency of current policies increases the uncertainty concerning the quality of the assets backing the currency and contradicts a basic principle of accountability.[91] Thus, one characteristic of the Fed's term auction facility (TAF) is its low transparency, which negatively affects the perceived quality of these credits. In fact, the exact quality of the accepted collateral remains unclear and names of borrowers have, to date, still not been released. The TAF has, consequently, led to complaints about the insufficient transparency of Fed policies.[92] Other new programs by the Fed are faced with similar problems. However, the Fed makes allowance for a minimal level of transparency, by posting new positions on the balance sheet.

In contrast, the ECB does not install new positions on its balance sheet, creating more problematic transparency issues than its American counterpart. Instead of posting new clear-cut credit programs, the ECB makes use of existing positions to extend their credit operations without separating new positions from old, thus exasperating the issue. Moreover, during the current crisis, the Eurosystem's positions of "other assets" and "securities" increased. The position "securities" entails marketable securities, which may potentially be used for monetary policy operations and entails a very broad range of securities of very different and potentially weak qualities. Likewise, the position "other assets" fails to provide more transparency. According to the ECB glossary it incorporates items used in the course of settlement, member State coins and other financial assets like equity shares,

[91] Hayek (1925) criticized the accounting practices of the Fed regarding their transparency as early as 1924. Rothbard (2000) advances a similar critique in regard to the accounting practices during the Hoover administration. Recently, Dincer and Eichengreen (2009) argue that central bank transparency has increased substantially during the past decade, becoming the "greatest change in the conduct of monetary policy."

[92] See Pittman, Ivry and Fitzgerald (2008) and Pittman (2008) for a look at issues surrounding the nontransparency of current Fed policies.

participating interests, investment portfolios related to the central bank's own funds, pension funds and severance schemes or securities held due to statutory requirements. The position also contains tangible and intangible fixed assets, revaluation differences of off-balance-sheet instruments as well as accruals and deferred expenditures. Thus, these two positions lack transparency and *may* contain relatively low quality assets. In sum, the transparency of the Eurosystem´s balance sheet is lower than the Fed`s. This weighs negatively on the quality of the Euro in comparison with the dollar as the balance sheet entails the possibility of substantial unknown quality risks.

Comparison of balance sheet ratios

The changes in the balance sheet can also be analyzed calculating certain central bank balance sheet ratios as developed by Bagus and Schiml (2008). These ratios concentrate on important characteristics of the balance sheet and can, consequently, aid with the analysis. One of these ratios is the "defense ratio." This ratio portrays the capacity of a central bank to defend its own currency in the international currency markets by selling foreign reserves. It is calculated by dividing the amount of foreign reserves by the balance sheet total. In calculating this ratio for the Fed and the Eurosystem we did not count foreign currency swaps or gold as foreign reserves. The evolution of the defense ratio is depicted in figure 6:

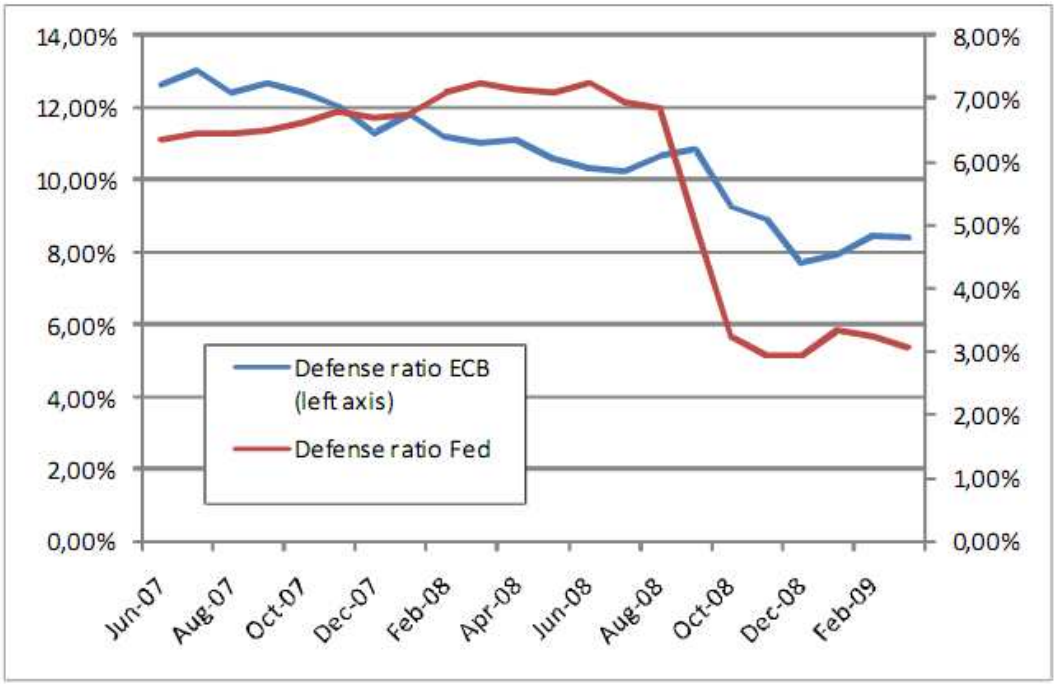

Figure 6: The defense ratios of the Eurosystem and the Fed (06/2007 to 03/2009)
Source: Fed (2009) and ECB (2009)

Both defense ratios declined during the crisis, however, he ECB started and ended at a better level implying a greater amount of foreign reserves available to inject into the monetary system during times of need.[93]

One important group of central bank balance sheet ratios are liquidity ratios that indicate the portion of liquid assets on the balance sheet in comparison to the total assets of a central bank. We define here the liquidity ratio as the sum of gold and foreign reserves in relation to the balance sheet total. The rationale for liquidity ratios is to show how high the portion of high quality assets is in relation to the whole of the balance sheet. These high quality assets tend to retain liquidity in times of crisis and can be used to maintain the value of the currency. For instance, gold is very liquid even in times of panic and historically increases in value during periods of increased uncertainty. Most foreign reserves also tend to be highly liquid assets. The development of the liquidity ratios are depicted in the following figure 7:

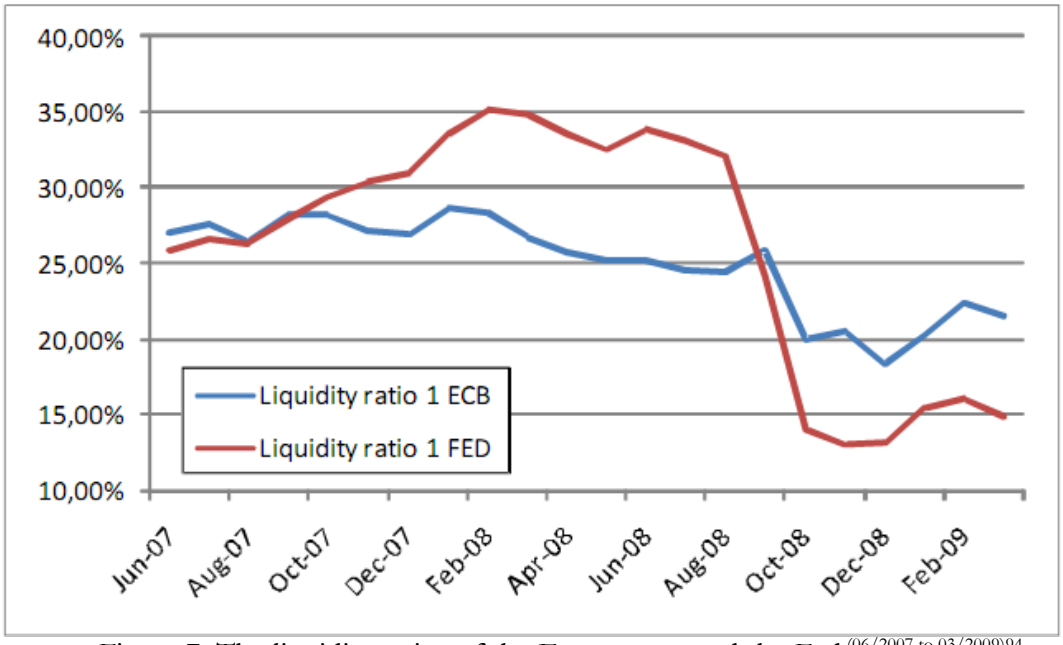

Figure 7: The liquidity ratios of the Eurosystem and the Fed (06/2007 to 03/2009)[94]
Source: Fed (2009) and ECB (2009)

[93] These foreign reserves also become important in providing liquidity for financial entities with foreign-denominated debt. Iceland's recent financial crisis was exacerbated due to a lack of a central bank capable of functioning as a lender of last resort in the foreign exchange which dominated the banking system's liabilities (see Bagus and Howden 2009).

[94] Both gold positions are valued at market. The Fed typically vlaues its gold position at $42.22 an ounce and not at the market price, as does the ECB.

As these liquidity ratios demonstrate, the Eurosystem performs somewhat better than the Fed. The portion of the most liquid assets of the balance sheet total remains higher with the ECB throughout the end of 2009Q1.

A last important ratio is the equity ratio which indicates the leverage of a central bank. Its importance lies in the function of equity to cushion losses. When the central bank suffers losses on their assets, equity can be utilized to absorb and offset the impact. A low or negative equity ratio makes a recapitalization by the government likely. This recapitalization would lead to an increase in the government deficit and enhances the probability of the monetization of this debt. The monetization of government debts increases the quantity of money and, thereby, negatively affects the quality of money.

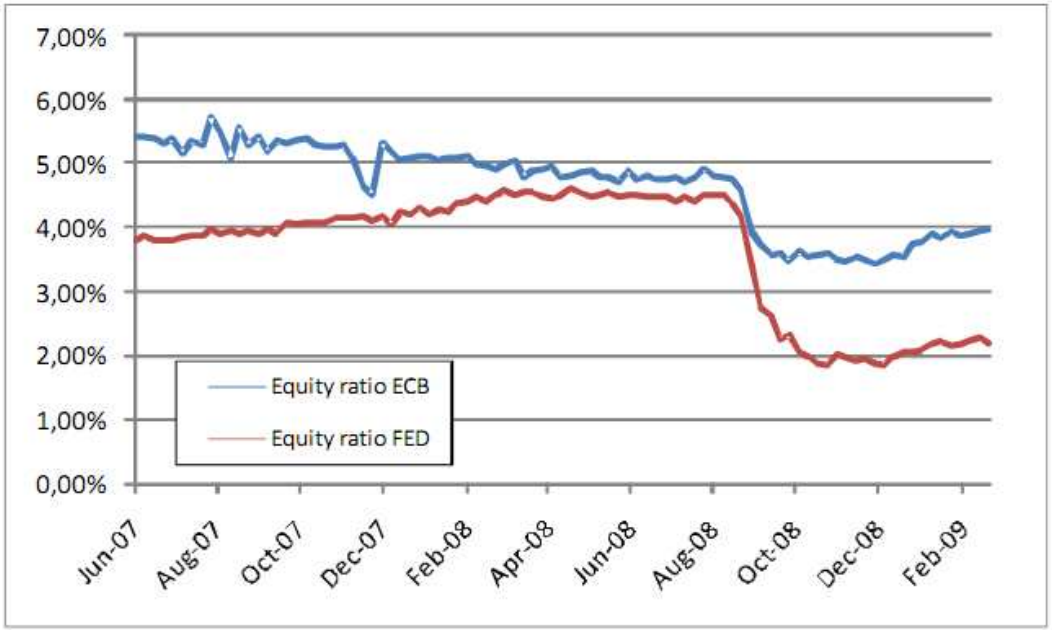

Figure 8: Equity ratio of the Fed and the Eurosystem (6/2007-03/2009)
Source: ECB (2009), Fed (2009)

Both equity ratios deteriorated during the crisis and are currently very low. If the Eurosystem and the Fed suffer losses of only 4 or 2 percent of their respective assets, a recapitalization will become necessary.[95] Yet, both balance sheets contain (in some cases hidden) reserves that can cushion or increase the equity ratio. Thus, the balance sheet of the Eurosystem includes a revaluation account that contains unrealized gains related to price changes on foreign exchange rate movements. The Fed values its gold reserves at $42.44 per troy ounce implying considerable hidden reserves. If we adjust the equity ratio of the ECB with the revaluation accounts and the Fed's equity ratio to account for the hidden gold reserves at current market prices, we get a more realistic and comparable picture as depicted in figure 9.

[95] On the possibility of insolvency of central banks see Fry (1992) and Buiter (2008).

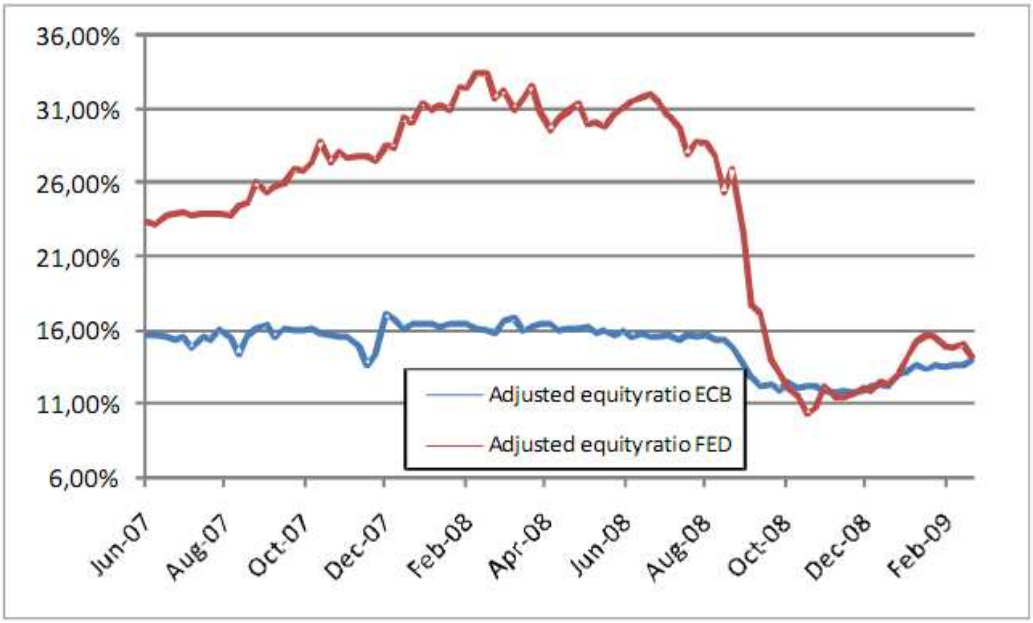

Figure 9: Adjusted equity ratio of the Fed and the Eurosystem (6/2007-03/2009)
Source: ECB (2009), Fed (2009)

Additionally, the balance sheet of the Eurosystem includes a revaluation account that contains unrealized gains related to asset price and foreign exchange rate movements. These gains can be due to the increase in the value of the gold reserves. In fact, the increase of the value of the gold reserve during the observed period was higher (78€ billion) than the amount of the Eurosystem´s capital itself (72€ billion). In other words, if the price of gold fell back to its pre-crisis level, an amount higher than the actual capital of the Eurosystem would be erased. The reserves hidden in the revaluation accounts would enhance the equity ratio if included in the capital position. The adjusted equity ratio as depicted in figure 9 would then be approximately 13%, indicating a much higher quality of the Euro than appears at first sight (i.e., approximately 4% as shown in figure 8).

As we can see, the Fed started from a better position than the ECB and maintained or increased its advantage until September 2008. The expansion of the Fed´s balance sheet in the last quarter of 2008 equilibrated the equity ratios of the Fed and the Eurosystem. Yet, there is still a very important advantage of the Fed's position in comparison with the ECB's. The Eurosystem faces a serious political problem when it comes to recapitalization. There is a sharing rule among the 16 national central banks (that, together with the ECB, make up the Eurosystem) concerning the sharing of losses incurred in the conduct of the common monetary and liquidity management policy. Yet, this sharing rule affects only the distribution and not the total amount of capital in the Eurosystem. In contrast to the Fed, where the Treasury ultimate provides backing, it is not clear how the Eurosystem would be

capitalized if the need arises. This process would pose a political problem and the success of this endeavor is not ensured, implying severe problems for the Euro's long-term existence if the current situation persists. Therefore, the development of the equity ratio is problematic in relation to the value and the trust in the Euro.

Conclusion

Recent developments in monetary policy make the qualitative analysis of central banks' balance sheets important. New analytical tools are necessary for the evaluation of these policies, which have moved beyond the more conventional quantitative measures of the past. One such tool is the comparative balance sheet analysis such as is undertaken in this article. While the Fed`s balance sheet analysis has attained more attention, an analysis of the Eurosystem's positions has been neglected.[96] Our comparative analysis of the balance sheets of the Fed and Eurosystem from the beginning of the crisis in June 2007 to March 2009 has filled this gap and provided important insights pertaining to the quality of the respective currencies. While the Fed´s balance sheet policies certainly have been radical, the Eurosystem´s changes are no less so, even though they may appear so at first sight if concentration is focused solely on the quantitative expansion of the balance sheet. The changes in the balance sheet policies of the Eurosystem are more subtle by maintaining the established programs and softening collateral rules.

The Fed tried during the first stage of the crisis to stem a liquidity crunch with strong compositional changes only, while the ECB increased its balance sheet size and moderately changed its composition. In September 2008 both central banks started to expand their balance sheets while the Fed did so at a substantially faster rate.

These developments are also reflected in the observed balance sheet ratios. The defense, liquidity and equity ratios have declined for both central banks, especially during the second stage of the crisis. The Fed performs slightly better at the equity ratio, while the Eurosystem has a more advantageous position with the liquidity and the defense ratios. Hence, the Eurosystem has relatively more foreign exchange reserves to defend its currency and relatively more liquid assets available than the Fed. However, the Eurosystem has relatively less equity to cushion possible losses.

By only focusing on quantitative issues it appears as though the ECB has emerged marginally better throughout the crisis than its American counterpart. However, when it comes to the non-numerical regulatory questions, such as terms, collateral, counterparties and transparency, the Eurosystem´s balance sheet looks to be in much poorer shape than the Fed´s. In particular two issues weigh on the Eurosystem's balance sheet quality. First is the broadening of the accepted range of collateral (except for asset backed securities) in credit operations from A- to BBB-. Second, the problem of recapitalization can be much easier solved by the Fed than

[96] One notable exception may be found in Bagus and Howden (2009b).

by the ECB. These two issues took on increased importance after September 2008 when accepted collateral was broadened and the balance sheet expansion drove down the equity ratio accordingly. In fact, the stylized facts in our article suggest that during the first stage until September 2008 the Fed´s balance sheet deteriorated more than the ECB´s due to its massive compositional changes, while it was the other way around after the collapse of Lehman Brothers.

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