1. CENTRAL BANK LIQUIDITY MANAGEMENT: UNDERWRITING STABILITY IN A CHALLENGING ENVIRONMENT

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ABSTRACT

Providing central bank money against good collateral has been understood as the operational – mechanical – part of monetary policy. Its purpose was to engineer effectively the policy rate which was deemed most appropriate to achieve the ultimate target of the central bank, in the case of the ECB: an inflation rate below but close to two percent. With interbank money markets becoming dysfunctional a second task came to the forefront: stabilizing highly vulnerable financial markets and containing possibly grave negative externalities. Over the course of the crisis this has led to substantial changes in the size as well as the composition of central bank balance sheets. Unconventional means had to be deployed and non-standard risks were run. Being extraordinary, these measures obviously have to be unwound, the challenge being that – under a strict inflation control constraint – financial stability is preserved.

1. INTRODUCTION

Modern central banks have a clear mandate and pursue a well-defined target: inflation control. Hence they are mainly, at least in the textbooks, institutions of macroeconomic policymaking. The objective of these institutions is the so-called policy rate, which, as a rule, translates into controlling a very short-term (overnight) interest rate. This operational target signals the course pursued in order to achieve the ultimate objective, thereby anchoring inflation expectations and, ultimately, inflation itself. The mechanics of engineering the policy rate close to a very short term market rate have been largely taken for granted, left to specialists in implementing policies through managing central bank balance sheets. In the ordinary course of business this became the dominant approach since it has proven to be successful in delivering what (macro-) monetary policy is assumed to provide: preserving the purchasing power of money. In the case of the ECB, the rate on its main refinancing operation serves as policy rate. And, though not officially endorsed, the stabilization of EONIA, an unsecured interbank market rate, around this policy rate is the implicitly acknowledged operational target. The procedures of liquidity provision, the operational framework, are conceived to keep this spread within in a fairly narrow band. In normal times, when markets work appropriately, i.e. policy impulses are translated smoothly through arbitrage along the yield curve, this is very much akin an engineering task, best left to technicians.

But, as the financial crisis erupting in the summer of 2007 has again demonstrated, markets do not always work seamlessly. For a host of reasons, they are prone to become dysfunctional at times. Hence, there is a second dimension to stability – the resilience, or lack thereof, of the financial system. This, of course, could not come as a surprise. There had been too many crises of a systemic dimension even during the last quarter of a century and even in OECD economies to ignore. In fact, their frequency as well as severity even increased.[1] Nonetheless, the current crisis, which was until the Lehman

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1 See for example Luc Laeven and Fabian Valencia (2008): Systemic banking crises: A new database, IMF Working paper 08/224.

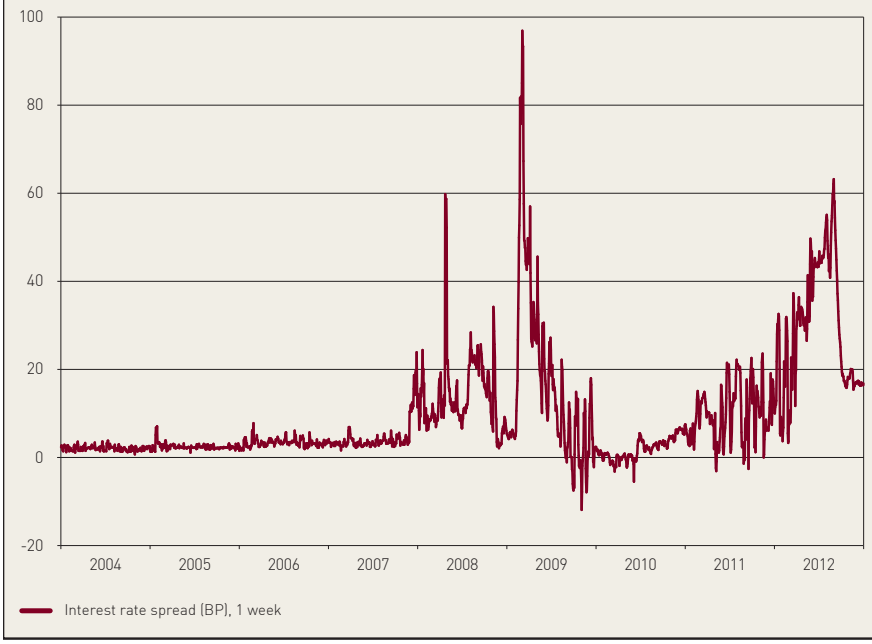
moment read as an ephemeral turbulence, deemed to fade away, is exceptional in its geographical perimeter as well as its far reaching consequences. It implied very significant social opportunity costs. To highlight but one effect: Still today, most economies concerned are below, often substantially, their output peak of half a decade ago. Indeed, in a number of economies output is still shrinking.

All of this bears witness to the fact why underwriting financial stability is so crucial. As a consequence, numerous efforts have been invested in the regulatory and supervisory domain to safeguard the financial system against future shocks. They are ongoing and entail institutional innovations, including, in the micro domain, the European Supervisory Authorities, as well as, acknowledging the macro dimension, the European Systemic Risk Board. Moreover, financial institutions will be, going forward, obliged to satisfy stricter capital as well as, for a first time, liquidity requirements, reducing maturity transformation.

This is all about future crisis prevention. It is an open issue whether these initiatives suffice. One is, for example, entitled to raise questions whether in Europe we do have a level of coordination amongst supervisors commensurate with the integration of our financial, in particular, banking markets. This leads to thorny, complex and highly politicized issues. Is there, for example, the need of a European bank resolution scheme? Does an integrated market imply a redesign of deposit insurance schemes? The prevailing coordination amongst supervisors, as it was conceived before the crisis, had shown, in any case, substantial room for improvement.

In this article we will however focus on the preceding phase, the crisis containment task – still ongoing. In doing this, we will sketch how the Eurosystem contributed to managing the crisis, as it unfolded, by using its balance sheet as a device to handle and absorb shocks. Initially, these dislocations became manifest in dysfunctional interbank money markets. Volumes were low and spreads between collateralized and unsecured interbank loans (the by far prevailing venue for liquidity management before the crisis) reached unprecedented levels. Over the course of time, the Eurosystem was obliged to engage in an ever larger intermediary role in the reallocation of funds between banks, a function which under standard conditions of course would be discharged in the interbank market. But this market never completely recovered. Against the background of an evolving substantial sovereign debt problem in a number of Euro Area countries and in view of a very significant roll-over risk in the first quarter of 2012 the ECB ultimately decided to launch two 3-year, long-term refinancing operations. Moreover, it felt obliged to further reduce the eligibility criteria for collateral it accepts in exchange for base money. Otherwise, the access to credit by households and firms would have been severely impeded in a number of Euro Area countries.

Figure 1
Tensions in the money market
Spreads between collateralized and unsecured interbank loans



These measures buy time to face up to the underlying root causes of imbalances in public-sector budgets as well as regional current account imbalances. But adjustment is unavoidable and it cannot be monetary. Quite obviously, these crisis containment measures come at a price. At the margin, they blur the distinction between technocratic (and therefore justifiably independent) monetary policy and democratically legitimized fiscal policies. They also run the risk that adjustment is delayed. As always, options have to be judged in view of next best available alternatives. In any case, the room for maneuver – for buying time – is diminishing.

2. CONVENTIONAL MONETARY POLICY IMPLEMENTATION PRE-CRISIS: STRIVING FOR A LEAN BALANCE SHEET

In response to the financial crisis the Eurosystem had to embark on a wide range of non-standard monetary policy measures. Otherwise financial intermediation in the euro area, access of firms and households to credit as well as, particularly important for monetary policy, the transmission mechanism of its impulses would have been impeded.[2] As a consequence, the composition and size of the Eurosystem's balance sheet changed considerably. Extraordinary times justify non-conventional steps. At the same time, larger balance sheets, almost as a logical corollary, imply higher financial risks which, in the case of the Eurosystem are (in principle) jointly shared amongst participating central banks.

All of this leads away from what (some) central banks optimally pursue: a balance sheet with a minimal size, as directly as possible derived only from its core function, the provision of central bank balances. Such a lean balance sheet thus follows a double minimalist ideal: one would like to have a minimal-efficient size as well as lowest-possible risk balance sheet. On the liability side, this translates into just serving the banking system's structural and aggregate need for central bank liquidity, i.e. reserves. Thus, a lean central bank balance sheet mainly consists of banknotes in circulation and minimum reserve requirements (or working balances for interbank settlement).[3] On the asset side, lean would imply domestic or foreign assets, exclusively reflecting monetary policy operations, the latter as they result from managing foreign reserves in pursuing monetary policy purposes. Thus, in normal times a central bank balance sheet would qualify as lean when banknotes in circulation largely determine the balance sheet total. A central bank's own funds, i.e. capital, reserves and provisions, should not significantly increase the balance sheet total.[4] Such a balance sheet is directly (and exclusively) derived from the primary (macro-) monetary policy objective: maintaining price stability. On the asset side lean would thus translate into mainly monetary policy operations, extending net credit to the banking system.

However, in reality, the balance sheet structure of most central banks is obviously quite different. This testifies to the fact that central banks, as a rule, perform (or had performed) various additional tasks. Indeed, historically, the remit of central banks, without any exception, always included a "second (micro-economic) function, of providing support (e.g., via Lender of Last Resort assistance) and regulatory and supervisory services to maintain the health of the banking system".[5] This required a potentially wider intervention capacity and thus broader refinancing options (in terms of counterparties as well as eligible collateral). In the same vein and responding to a variety of financial background conditions, in the case of the Eurosystem there is a substantial amount of legacy assets, outright investments which arose out of monetary or currency arrangements previous to EMU.

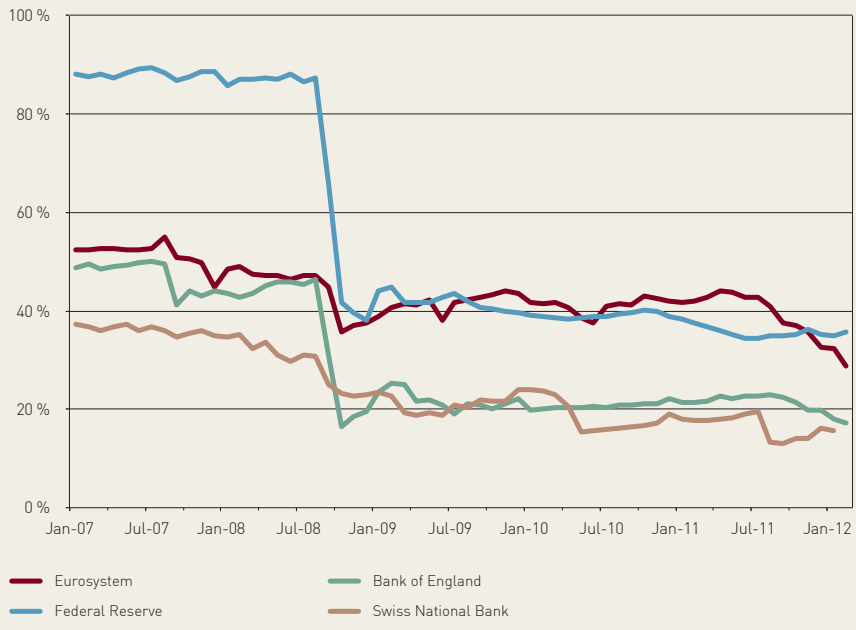
2 *ECB Monthly Bulletin, September 2011, p. 41*
3 *In the case of the Eurosystem, minimum reserve requirements amount to only some 25% of banknotes in circulation.*
4 *Daniel Gros and Franziska Schobert (1999) Excess Foreign Exchange Reserves and Overcapitalisation in the Eurosystem (CEPS Working Document No. 128), Brussels, Centre for European Policy Studies.*
5 *Charles Goodhart (1989): Why do Banks need a Central Bank?, in:* Money, Information and Uncertainty, *Oxford, 1989, p. 176. In addition, central banks frequently have been involved in payments and settlements systems, also a business line which could be performed by a separate institution. Usually, they are not, given the joint product (with issuance of money) and (to a degree) public good dimension of these lines of activities.*

Obviously, there is also a revenue or income dimension involved in the size as well as the structure of central bank balance sheets. Banknotes are an unremunerated (non-interest bearing) liability. They provide, joint with the decision about the structure of the asset side, for seigniorage, that is, a central bank's net revenues resulting from its monopoly in issuing base money.[6] Maximizing seigniorage revenues is clearly not the objective of a central bank, however, a reliable stream of income is crucial for underwriting its financial independence. By force of accounting mechanics, larger refinancing operations compress the room for outright or non-monetary policy portfolios.

Amongst prospective Eurosystem members, before 1999, the balance sheet of the Bundesbank was closest to a lean central bank balance sheet (also accounting for the dollar position which arose out of monetary policy intervention obligations). This did not hold true for most of the other prospective members. And it was largely a consequence of the prevailing European exchange rate arrangement, the EMS. In order to defend the peg these central banks had to accumulate foreign reserves which exceeded banknotes in circulation by far. After joining the European Monetary Union, national central banks did not divest these assets, but held them as outright, non-monetary policy portfolios partly denominated in foreign currencies, partly in euro. Thus, the volume and composition of these portfolios are largely the upshot of a preceding monetary regime, in which national central banks intervened in the foreign exchange market or, infrequently, settled international transactions in gold.[7]

The consolidated financial statement of the Eurosystem bears witness to this historical trajectory. It accounts for the assets and liabilities held by the Eurosystem on the balance sheets of the 17 euro area national central banks (NCBs) as well as the ECB. Gross claims and liabilities between the NCBs and the ECB (intra-Eurosystem claims and liabilities) net out. Since the start of EMU the holdings of foreign reserve assets have slightly decreased over time. This trend, however, has been clearly overcompensated by large valuation gains (mainly on gold holdings), so that the value of foreign reserves recorded in the Eurosystem balance sheet has significantly increased. Prior to the crisis Eurosystem monetary policy operations exclusively consisted of so-called repurchase transactions, i.e. temporary (self-liquidating) Eurosystem credit operations against eligible assets as collateral. Around two thirds of the volume of monetary policy operations was thus made up by the appropriately named main refinancing operations (MROs). These were

Figure 2
Share of banknotes in circulation to total assets



6 *Base money consists of banknotes and reserves of banks held on accounts at the central bank. In the Eurosystem minimum reserves are fully remunerated and excess reserves can be transferred to the remunerated deposit facility. Thus, only banknotes in circulation are the unremunerated part of base money.*

7 *Germany's reserve assets, for example, were predominantly the result of intervention duties arising during the period of the Bretton Woods system with its obligation to dollar purchases when the anchor currency was weak. Deutsche Bundesbank (2003) Reserve assets: their development and importance in monetary union, Monthly Report, January, p. 18.*

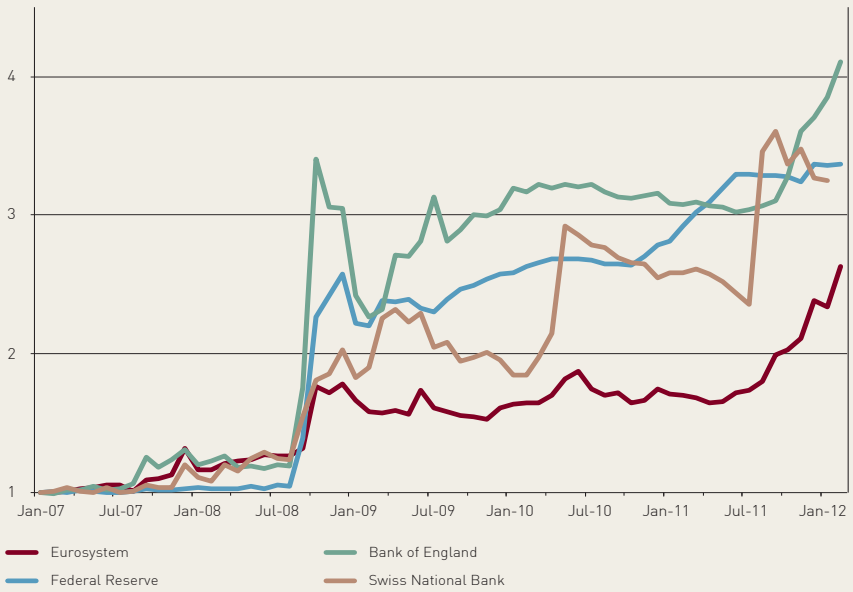
(are) operations with a one week maturity, while the remainder consisted of longer-term refinancing operations (LTROs) with a three-month maturity. Standing facilities, with which the Eurosystem offers to provide or absorb liquidity overnight at the initiative of counterparties, played a minor role on the balance sheet. But they are of course essential for the corridor-approach to managing a short-term market interest rate.

The share of banknotes in circulation to total assets might serve as an indicator of the degree of leanness. Chart 1 compares the Eurosystem's balance sheet to the Federal Reserve System, the Bank of England and the Swiss National Bank. In the Eurosystem banknotes comprised about half of the liability side of the balance sheet at the beginning of 2007, a similar share as for the Bank of England, though much less than in the balance sheet of the Federal Reserve Bank.[8] The balance sheet of the Swiss National Bank had by far the lowest share of banknotes to total assets due to its high foreign reserve holdings. According to the statutes of the Eurosystem and the Swiss National Bank, the central bank manages foreign reserves, while in the United Kingdom and the United States it is a shared task between the respective Treasuries and the central banks. At all four central banks the crisis led to a steep decline of the share of banknotes to total assets – mirrowing the heightened importance of the financial stability role assumed.

3. CRISIS-INDUCED OPERATIONAL ADJUSTMENTS ON THE EUROSYSTEM'S BALANCE SHEET

When financial turbulences erupted in early August 2007, in the wake of the unfolding US subprime crisis, tensions were primarily the result of a lack of confidence among market participants in interbank money markets as well as uncertainty about the financial soundness and liquidity of counterparties. This was reflected in a decline of lending activity in the secured interbank (term) but in particular in unsecured money markets. In order to reduce uncertainty about access to central bank balances, the Eurosystem initially responded by satisfying all existing demand at the policy rate, basically making quantity *within* the maintenance period endogenous. Concurrently, again to enhance certainty about the capacity of honoring requirements over the course of the maintenance period, liquidity provision was frontloaded. With the crisis evolving and the short-term yield curve becoming ever more fragile, the duration of liquidity-providing monetary policy operations was lengthened.[9] Still, aggregate liquidity provision through monetary policy operations, the size of the balance sheet, remained unchanged on average.[10] Moreover, in view of the tensions in short-term US dollar funding markets and on the

Figure 3
Crisis-related evolution of central bank balance sheets (Jan. 2007 = 1)



8 *The relatively low share of banknotes in the case of the Bank of England is the upshot of a voluntary reserves averaging scheme which has fostered fairly large holdings of banks' reserves.*

9 *This could be interpreted, given the shallowness of funding markets with longer tenor, reflecting the run of wholesale market on itself, as an attempt to establish focal points on a short-term yield curve where standard arbitrage did not hold anymore; see Hans-Helmut Kotz (2008): Finanzmarktkrise – eine Notenbanksicht, in: Wirtschaftsdienst, 5/2008, pp. 291-296.*

10 *See Deutsche Bundesbank (2009), Interaction between the Eurosystem's non-standard monetary policy measures and activity in the interbank money market during the crisis, in:* Financial Stability Review 2009, *pp. 87-99.*

basis of a swap agreement with the Federal Reserve System, in December 2007 the ECB also began to provide US dollar liquidity to Eurosystem counterparties against euro denominated collateral. This, however, only became important in size after the collapse of Lehman Brothers and the near-failure of AIG in mid-September 2008. Subsequently, the financial turmoil turned into a global financial crisis.

From October 2008 until early-2010 – "Collateralized lending". In the post-Lehman environment, characterized by unprecedented uncertainty, distrust and funding constraints in the interbank market, euro area banks heavily used the enhanced provision of liquidity offered by the Eurosystem at rapidly decreasing policy rates. Therefore, the size of the Eurosystem balance sheet increased substantially in October 2008. The increase, however, was dwarfed by the rising size of the Federal Reserve System's as well as the Bank of England's balance sheets. The stronger increase of the Swiss National Bank's balance sheet took place more gradually and later.

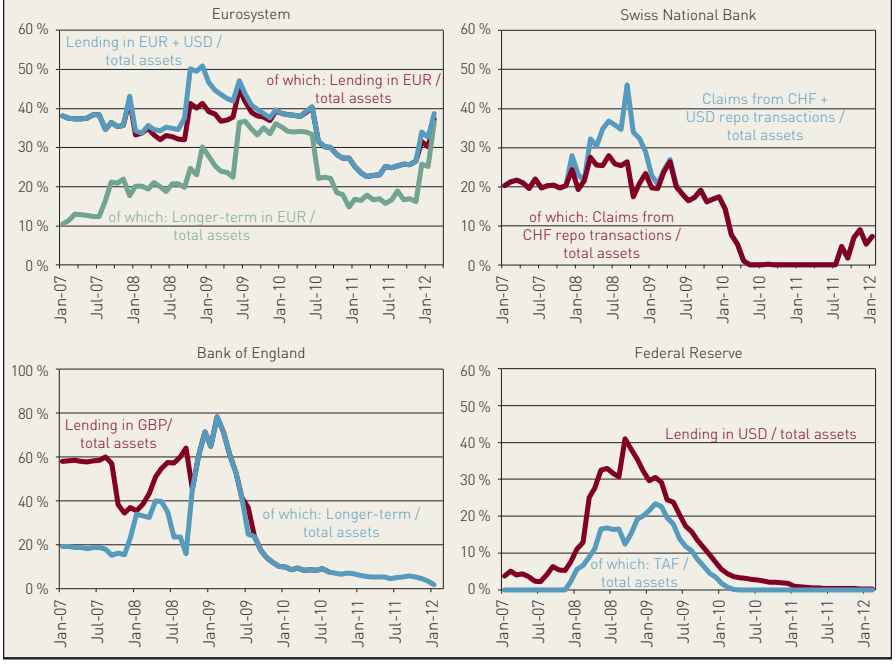
The Eurosystem's non-standard measures implemented between October 2008 and early-2010, coming under the heading of "enhanced credit support", included three key measures: First, ever since October 2008 the Eurosystem applied a "fixed rate full allotment" tender procedure in all refinancing operations, ensuring the provision of unlimited central bank liquidity to eligible euro area banks at the main refinancing rate and against adequate collateral. Second, the list of assets accepted as eligible collateral for refinancing operations was extended in order to further ease access to Eurosystem operations in an attempt to reduce asset-side constraints on banks' balance sheets. The Eurosystem, for example, expanded the list of eligible collateral to assets denominated in the USD, GBP and JPY issued in the euro area, it reduced the credit quality threshold to "BBB-" from "A-", while simultaneously augmenting haircuts to be applied.[11] Third, the Eurosystem conducted additional longer-term refinancing operations with a maturity of up to one year. The main aim of these operations was to promote the decline in money market term rates and to ease liquidity and funding conditions for banks. The longer maturities of liquidity provision enabled banks to reduce the duration gap between the investment side and the funding side of their balance sheet.[12] It implied a further enhancing of the intermediation role taken by the ECB.

The Federal Reserve and the Bank of England also provided central bank balances to banks on longer terms and against a wider collateral base after the collapse of Lehman Brothers.[13] At the Federal Reserve, the Term Auction Facility (TAF), established in late 2007, became the most important instrument. The TAF allowed for a wider range of counterparties while also accounting, through the tender procedure, for the perceived stigma of borrowing at the discount window. At the Bank of England, the 3-month lending operations provided liquidity on a large scale and substituted the regular 1-week lending operations.[14] At the Swiss National Bank the most important lending operation after the collapse of Lehman Brothers was in USD, which was also provided on the basis of a swap agreement with the Federal Reserve System.

With the inception of the Covered Bond Purchase Programme (CBPP) on 6 July 2009, the Eurosystem for the first time deployed outright monetary policy transactions – in addition to its full allotment monetary policy reverse transactions. The aim of the CBPP was to revitalize the primary euro area covered bond market, where issuing activity had basically ceased, and at the same time to reduce spreads in the secondary market, which were seen as excessive relative to normal (fundamentally justifiable) conditions. The CBPP was clearly communicated to be terminated after one year and had a total nominal amount of €60 billion. A second CBPP, with a planned volume of €40 billion, was started in November 2011.

11 *While the ECB Governing Council decided to continue applying the reduced credit rating threshold of "BBB-", the use of foreign currency denominated assets was phased out by 31 December 2010.*
12 *ECB Monthly Bulletin Oct. 2010: The ECB's response to the Financial Crisis, p. 66.*
13 *See for a concise overview Marlene Amstad and Antoine Martin (2011): Monetary policy implementation: Common goals but different practices, Fed New York: Current Issues, vol. 17, no. 7.*
14 *In 2007/2008, liquidity support for individual institutions partly substituted short-term monetary policy lending operations.*

Figure 3
Share of monetary policy lending to total assets



Since the start of the sovereign debt crisis in the euro area – "Outright purchases". In early-2010 tensions re-emerged in some financial market segments, in particular in the euro area government bond markets. The financial crisis, not at all without precedent, morphed in some of the countries concerned into a sovereign crisis. Spreads between ten-year government bonds of some euro area countries relative to German public sector bonds started to rise, mainly as a result of increasing market concerns about the sustainability of public finances in view of rising government deficits and potentially unsustainable debt positions. On May 10, 2010 the ECB announced the launch of its so-called Securities Markets Program (SMP), under which the Eurosystem can carry out interventions in the euro area public and private debt securities markets to ensure depth and liquidity in dysfunctional market segments with an eye on ensuring the proper functioning of the monetary policy transmission mechanism. Furthermore, in May 2010 the ECB Governing Council also decided to suspend the application of the minimum credit rating threshold for marketable debt instruments issued or guaranteed by the Greek government for the purposes of Eurosystem credit operations. It did so also with regard to Irish sovereign debt in March 2011 as well as Portuguese sovereign debt in July 2011.

Moreover, on December 8, 2011 the ECB Governing Council decided on additional enhanced credit support measures. These included the conduct of two longer-term refinancing operations with a maturity of three years with full allotment procedures.[15] These operations met unprecedented demand from banks, taking the amount of outstanding monetary policy lending to a record high of some €1 trillion. Moreover, in order to increase collateral availability, the criteria for ABS backed by pools of residential mortgages or loans to small and medium-sized enterprises were relaxed[16] and NCBs were individually given some discretion to accept additional performing credit claims. Any losses from the acceptance of such credit claims would need to be borne by the respective NCB, hence without the feature of standard programs, i.e. loss sharing. This was, of course, a procedure applied during the first years of EMU, before the introduction of the so-called single list in 2007.

In the course of the crisis both the Fed and the Bank of England started large scale asset purchase programs. The outright portfolios are significantly larger than in the Eurosystem, they are partly coordinated with the government and most importantly, there is only one government to coordinate with. The BoE established the Asset Purchase Facility Fund under the remit from the Chancellor of the

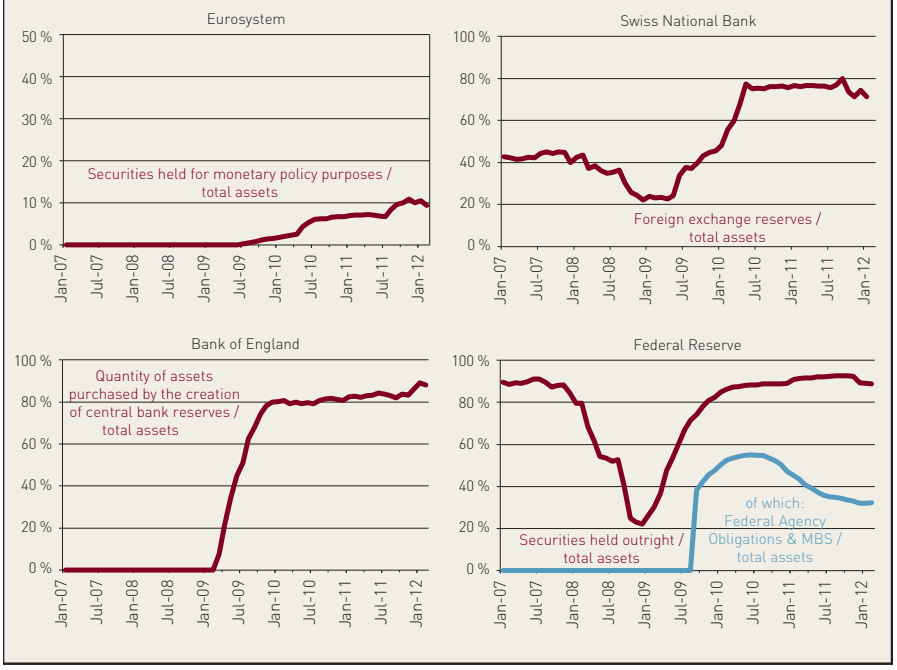
15 *The rate will be fixed at the average rate of the main refinancing operations over the life of the respective operation.*
16 *The cash flow generating assets backing the ABS must belong to the same asset class and they cannot be non-performing or structured, syndicated or leveraged. The counterparty or any third party to which it has close links cannot act as an interest rate swap provider in relation to the ABS and the transaction documents must contain servicing continuity provisions.*

Exchequer in January 2009 with the initial intention of improving the liquidity of the corporate credit market. In March 2009 the remit was extended to allow purchases of assets (actually mainly gilt-edged securities) in pursuit of monetary policy aims. The Fund is indemnified against losses by the Government and its accounts are not consolidated with those of the BoE. However, the BoE finances the Fund with loans reported on its balance sheet. Since March 2009, the loans have found an expression in increased reserves on the BoE's balance sheet.[17]

Outright purchases or sales of securities for the System Open Market Account (SOMA), the Federal Reserve's portfolio, obviously are a traditional or conventional monetary policy instrument of the Fed through which it provides the major share of liquidity. During the crisis, however, the composition of this portfolio changed substantially as did its size. It has become a crucial instrument in crisis containment, in particular by engineering credit easing, that is, accepting more risk on the balance sheet of the Fed. Specifically, in November 2008 the Fed announced to purchase agency mortgage backed securities as well as agency debt in order to improve conditions in private credit markets. On March 18, 2009, the FOMC launched a longer-dated Treasury purchase program again with the operating goal, to help, via portfolio effects, improving conditions in private credit markets. On November 3, 2010, the FOMC decided further expanding the Federal Reserve's holdings of securities in order to promote a stronger pace of economic recovery and to help ensure that inflation, over time, is at levels consistent with its mandate (in other words, to contain a potential deflation threat). As announced in June 2011 the reinvestment of maturing funds (as well as proceeds) should continue as Federal Reserve's holdings of domestic securities should be maintained at approximately $2.6 trillion.[18]

At the Swiss National Bank foreign exchange interventions became the dominating instrument with which it pursued monetary policy. It is reflected in the very substantial increase of foreign exchange reserves with which the central bank tries to control the exchange rate of the Swiss franc against the euro in order to avoid deflationary pressures and to support the domestic economy. On September 6, 2011 the SNB officially announced a minimum exchange rate of 1.20 CHF/EUR, buttressed with unconditional intervention intentions.

Figure 4
Share of monetary policy outright portfolios to total assets



4. CHALLENGES, GOING FORWARD

Some argue that the very substantial increase of central bank balance sheets, as produced by "quantitative easing" (QE) policies, implies by necessity commensurate inflationary risks. The term 'quantitative easing' is understood in a number of ways, reflecting the diverse backgrounds, and hence differing justifications,

17 *Paul Fisher [2009]: The Bank of England's Balance Sheet: Monetary Policy and Liquidity Provision During the Financial Crsisis, speech, http://www.bankofengland.co.uk/publications/speeches/2009/speech413.pdf.*
18 *http://www.federalreserve.gov/monetarypolicy/bst_openmarketops.htm.*

against which these policies have been adopted across central banks. The Bank of Japan's quantitative easing policy, as conducted between 2001 and 2006, set a target for the banks' current account balances (that is: reserves), thus it referred to the liability side of its balance sheet. By contrast, the Bank of England rather focuses its justification on the asset side. In its (large scale) purchase program it buys gilts in secondary markets from private investors and, in banking on a portfolio-effect, expects that the net injection of liquidity (i.e. the quantitative easing) will, by force of arbitrage, make other assets, such as corporate bonds and shares, comparatively more attractive. This should, concurrently, lower longer-term borrowing costs and thus encourage the issuance of new equities and bonds.[19] Common to both understandings of QE policies is the intended expansion of the central banks' balance sheet. But whilst using as point of impact different sides of the balance sheet differential effects are attempted. The BoJ approach was about re-starting credit intermediation through the bank-credit channel whereas the BoE targeted funding conditions more generally. In the reading of the Fed, and this is the third perspective, also focusing on the asset side, the easing crucially comes about through taking on more credit exposure. In essence, the Fed swaps with the private sector riskier assets, which it deems underpriced, against less risky assets.

Borio and Disyatat (2009) use the more general term "balance sheet policies".[20] To repeat, during normal times most central banks, of course including the Eurosystem, signal their monetary policy stance by deciding on the so-called policy rate. And they communicate their intents by controlling a short-term market rate. During the course of the crisis, however, in particular since the fall of 2008, operational targets undershot policy rates. This slippage was allowed on purpose. In the case of the Eurosystem it meant waiving the separation principle which, under normal circumstances implies a clear hierarchy: The thrust of monetary policy, defined to achieve the inflation objective, is defined by policymakers. And, taking its directive from there, it is the role of liquidity managers, the desk, to implement these instructions by engineering the appropriate quantity of central bank balances. Circumstance were however not normal: Given the high level of stress, as it transpired for example in spreads between secured (credit riskless) and unsecured funds, additional liquidity was urgently needed – to support a second function: safeguarding financial stability. Moreover, in a number of jurisdictions, in order contain negative externalities, additional measures were deemed unavoidable to support lending to non-banks, to contain risk spreads in specific markets or to limit appreciation pressure on the exchange rate. While the first three objectives for "balance sheet policies" were (and are) valid in the case of the Eurosystem, the Swiss National Bank or many central banks in emerging market countries are typical cases for the latter one.

It is true, in rather simple (and mechanical) textbook interpretations of central bank balances and the money multiplier large reserves (or central balances) signal imminent inflationary risks down the road. But, quite obviously, the multiplier is endogenous. Banks respond to an expected risk-return profile in their lending decisions. Hence, they do not mechanically translate more liquidity into more credit. This is accounted for in the Eurosystem's policy framework. In line with other central banks, the Eurosystem processes information with regard to future risks to price stability from a wide range of economic, financial and monetary indicators. In other word, in case the medium-run outlook for inflation deteriorated, i.e. inflationary risks emerged, it would be perfectly capable – indeed it would – to react by increasing its policy rate. This would increase the marginal opportunity cost of banks' reserve holdings. Since a loan or other investments of banks are made, at the margin, only when and if its expected return exceeds marginal cost, banks consequently will slow down business activities.[21] Under normal (conventional) condi-

19 *Shigenori Shiratsuka [2010]:* Japan's Experience of the Quantitative Easing Policy: Re-examination from the Viewpoint of the Size and Composition of the Central Bank Balance Sheet, *Policy Research Institute, Ministry of Finance, Japan, Vol. 99.*

20 *Claudio Borio and Piti Disyatat (2009): Unconventional monetary policies: an appraisal, BIS Working papers, No. 292; see also Stephen Cecchetti and Piti Disyatat (2010): Central bank tools and liquidity shortages, in: Fed New York, Economic Policy, Review, August, pp. 29-42.*

21 *Martin, McAndrews, Skeie (2011) A Note on Bank Lending in Times of Large Bank Reserves, Federal Reserve Bank of New York Staff Reports, No. 497, May.*

tions, when such a situation will arise, the policy rate (as well as the operational target rate) can be set independently of the amount of bank reserves in the system, the separation principle holds.[22] Thus, even when large bank reserves have emerged as a consequence of facing other tasks, the central bank can control short-term rates in line with its operational framework. The Fed or the Bank of England might, for example, fully remunerate excess reserves. Others such, as the Eurosystem, may offer a deposit facility.

Table 1

Bank reserves held at major central banks (end of period)

	EUROSYSTEM*	FEDERAL RESERVE	BANK OF ENGLAND	SNB
Jan 2007	EUR 176 bn	USD 27 bn	GBP 17 bn	CHF 5 bn
Feb 2012	EUR 912 bn	USD 1,607 bn	GBP 196 bn	CHF 220 bn

* Includes recourse to the deposit facility; Eurosystem data as of 2 March 2012.

Finally, it should be mentioned that central banks dispose of various instruments to effectively absorb surplus liquidity/reserves, if necessary. Depending on their operational framework they can conduct reverse repos, collect fixed term deposits, raise minimum reserve requirements, issue central bank debt certificates/bills or possibly even sell monetary policy outright holdings. All of the central banks presented in this article currently provide significant amounts of surplus liquidity, for financial stability reasons. When the crisis subsides at some point in the future and the non-standard intermediation role is no longer required, central banks will start to make active use of such liquidity-absorbing instruments. The length of this transition to a post-crisis monetary policy implementation will depend on the maturity of refinancing operations as well as the time to maturity of the crisis-related monetary policy outright portfolio holdings.

Balance sheet policies which go beyond the engineering of the policy rate but in addition try to underwrite financial market stability do accept potentially significant financial risks. Moreover, they do not necessarily have to be conducted by the central bank. Governments, for example, could by themselves purchase impaired assets or issue other forms of public debt, which then substitute part of the large bank reserves.[23] In the euro area, coordinating responsibilities with governments and banking communities across 17 jurisdictions is obviously far more challenging (see for example the debate about the European facilities: EFSF/ESM).

When conducting liquidity-providing monetary policy operations, central banks by necessity assume some (controlled) financial risk. And, rather evidently, such risks substantially increase in times of financial crises. This is justified from a policymaker's perspective by the potential for greater risks to monetary and financial stability were the central bank to remain inactive. Staying on the sideline would come at potentially prohibitive social costs.

Given the balance sheet developments resulting from the described array of non-standard monetary policy measures taken since October 2008, the risk exposure of the Eurosystem has considerably increased. This is, on the one hand, immediately related to the significant lengthening of the balance sheet, commensurate with the increased scale and maturity of monetary policy refinancing operations. On the other hand, this is also an inevitable and accepted consequence of the above mentioned effective relaxation of collateral requirements for monetary policy purposes. In fact, the amount of marketable

22 *See, from a US perspective, Todd Keister et al. (2008): Divorcing money from monetary policy, in Fed New York, Economic Policy Review, September, pp. 41-56.*

23 *Indeed, the German experience after World War II provides an example in which neither central bank nor government purchases of impaired assets were used, but equalization claim to banks holding these assets were offered; see Pontzen, Schobert (2007) Episodes in German monetary history – Lessons for Transition Countries? The Experience of Exchange Rate Regimes in Southeastern Europe in a Historical and Comparative Perspective, Proceedings of OENB Workshops, Oesterreichische Nationalbank.*

eligible collateral for Eurosystem credit operations increased from below €10 trillion in 2007 to almost €14 trillion in 2009, and has since decreased to some €13 trillion at the end of 2011, after the phasing-out of some non-standard collateral measures introduced in 2008. These developments, i.e. the greater volume of monetary policy lending and the lowering of the collateral requirements, thus entail both, more and higher risks for the Eurosystem.

This risk is, however, strictly monitored and managed, in particular by applying liquidity and credit-risk dependent haircuts. Nevertheless, from a risk management perspective, lower risks with smaller haircuts evidently would be preferable. Still it should be noted that for the Eurosystem to experience a loss, a default of both the counterparty *and* the deposited collateral at the same time is required (a double-default). If the underlying security, but not the counterparty, defaults, the Eurosystem can call for additional margins or – if required – unwind a credit operation. In case the counterparty defaults, the collateral can be sold into the market. As central banks do not face liquidity constraints, the Eurosystem could hold out until market conditions have been improving (normalizing) enough to avoid losses which would result from fire-sales. Thus what matters is not only the risk of a counterparty default and the risk of a collateral default, but the risk of these events occurring jointly and the correlation between them. Clearly, times of financial distress by definition are characterized by higher risk, currently especially concentrated in certain banking systems. Part of the correlation risk is addressed by prohibiting the counterparty from submitting collateral issued by an issuer to whom it has "close-links".[24] In sum, even if the risk exposure of the Eurosystem from monetary policy lending has increased since October 2008, stricter risk control measures applied and the fact that double-default has to take place for financial losses to effectively materialize offer the Eurosystem a high degree of risk protection.

However, the situation is different with respect to outright holdings incurred in the implementation of the monetary policy. They result in the context of the SMP and, to a lesser extent, through the implementation of the CBPP.[25] Here the Eurosystem is clearly exposed to higher risk. This is due to the fact that by purchasing securities and holding them on its balance sheet, the Eurosystem fully bears the default risk of the issuer without protection. Since the Eurosystem intends to hold all securities purchased to maturity, market, interest and liquidity rate risk does not apply. In fact, the Eurosystem will, in case credit risk does not materialize, realize significant profits on its securities holdings over time. Still the large amount (around €220 billion) of purchases of long-term sovereign bonds issued by euro area countries facing high debt burdens may require Eurosystem central banks to make adequate provisions in order to take into account potential default risk in line with prudent accounting principles. This implies that Eurosystem central bank profits transferred to euro area governments may be significantly lower for an extended period of time. In fact, this can be considered as a risk protection measure: By holding back the distribution of potential profits the Eurosystem can effectively provide for the higher credit risk it is exposed to due to the crisis-related monetary policy outright purchases.

So what does this mean for central bank capital? The assets that were purchased outright by the Eurosystem during the euro area sovereign debt crisis reflect a transfer of risk from the private sector to the public sector. The accumulation of foreign reserves, as is for example the case for the Swiss National Bank, also entails such transfer of risk, here arising from interventions to prevent a further appreciating of a currency. Such a response is, however, regularly interpreted as a signal of strength. Hence, write-downs and resulting central bank capital erosion, reflecting an appreciating (home) currency, can be communicated

24 A close-link is defined as either the counterparty or the collateral issuer having a stake of at least 20% in the other or a third party holding at least 20% of both. The Eurosystem furthermore sets proportional limits within the collateral pools of its counterparties for the amount of uncovered bank bonds issued by banking groups.

25 The risk exposure is lower on the CBPP holdings as Eurosystem covered bond purchases are very diversified covering all covered bond markets in the euro area, and because covered bonds are based on a cover pool of assets which serves as protection in case the issuer default. However, the legal frameworks for covered bonds and the implied protection for investors significantly vary among jurisdictions in the euro area.

more easily. In fact, both at the Deutsche Bundesbank in the 1970s as well as recently at the Czech National Bank, such losses ultimately depleted central bank capital, leading to a significantly negative capital position. However, in both cases, the central bank did not need to ask the government for recapitalization, but decided instead to wait for future net revenues to eventually cover the loss carry-forward. Unlike a private company, a central bank can in principle (almost) never become illiquid and hence bankrupt in a technical sense (again, barring the extreme case of hyperinflation in which such a central bank's money loses all its functions). Therefore, assets bought outright can be held to maturity. Thus, the central bank is exposed to credit risk only, but not to liquidity or interest rate risk. Losses, however, can have a negative effect on a central bank's reputation, which is of course crucial for achieving its ultimate target(s). In some cases they entail unpleasant discussions with the Ministry of Finance on missing profit transfers, which do harm independence – they imply fiscal dominance in a very concrete sense. Therefore, own funds of a central bank are essentially a signalling device for political independence, reputation and credibility with respect to monetary policy implementation, rather than an absorber of potential financial shocks. Eventually, in case of losses, credible communication (in view of the ultimate target) is what matters in order to safeguard the public's confidence in a central bank's willingness and ability to perform its primary monetary policy task to maintain price stability, whilst accounting for financial stability – a necessary condition.

Concerning its mechanics or engineering side, from here a number of important questions about monetary policy implementation arise. They are in fact old ones and have to deal with how central banks should account for changing background conditions, again, with an eye on how to most effectively achieve their objective(s). This is obviously reasoning from a functional perspective, as most clearly exposed by James Tobin.[26] Insofar as non-bank banks or near-bank banks (i.e. what we recently have become used to call shadow banks) discharge functions which were traditionally deemed to be banks' exclusive remit (frequently of course enforced by law), they possibly might be addressed by monetary policy tools directly. Given, for example, the importance of repurchase markets in an environment where intermediation has become more broadly based institutionally,[27] this entails for instance the question of whether the repo rate should be an operational target of monetary policy implementation. The more transaction-driven, market-based the management of risk (credit, liquidity) becomes – and this is the way banking and its functional substitutes have moved for more than a quarter of a century[28] –, the more reliant intermediation (performed under whatever institutional guise) becomes on liquidity management. The adage – what credit risk, it's ultimately liquidity risk – is emblematic of this environment.

In brief and to conclude, in a crisis environment, central bank balance sheet management is by necessity (has historically as a rule been) about underwriting financial stability. This is crucial since it highlights, given the joint-product dimension of liquidity management and financial stability, the role central banks rather naturally play in containing systemic risk. Liquidity management under unconventional circumstances therefore has to be conducted in light of containing systemic risks. Thus, risk management in central banks cannot focus on minimizing its "private" risk. It is, instead, about providing a public good. But this can only go so far. As John Hicks famously remarked: "The social function of liquidity is that it gives time…". Ultimately, real solutions have to be found.

26 *See in particular James Tobin and William Brainard (1963): Financial intermediaries and the effectiveness of monetary controls, in: American Economic Review, vol. 53, no. 2 (PaP), pp. 383-400.*

27 *See in particular Gary Gorton and Andrew Metrick (2011): Securitized banking and the run on repo, in: Journal of Financial Economics, March, see also the recent work of the CGFS, in particular CGFS (2010): The role of margin requirements and haircuts in procyclicality, CGFS Paper No. 36.*

28 *On this has insisted for example and for a long while Anthony Saunders (1997): Financial institutions management. A risk management approach, New York: Mc Graw Hill. The point was also made early on and forcefully by Alfred Steinherr (1998): Derivatives. The wild beast of finance, Chichester: John Wiley.*