Central banks as balance sheets of last resort:

ECB's monetary policy in a flow-of-funds perspective

by Philippine Cour-Thimann* and Bernhard Winkler**[1]

May 2016

Just published in D. Cobham (Ed.), Monetary Analysis at Central Banks, Palgrave Macmillan

Abstract

This paper motivates and analyses the role of 'balance sheet of last resort' taken by a central bank in crisis times, as well as the associated notion of 'contingent easing'. At a time when the financing of the economy is impaired and other economic sectors are deleveraging, the central bank can leverage up and take on risk on its balance sheet. It can also promise to do so under certain conditions, and thus reduce risk in the economy, with measures of a contingent nature. In this respect, the paper reviews how the ECB and the national central banks used their balance sheet capacity over 2008-2015, provides a comparison with the US Federal Reserve, and analyses the transmission of the balance sheet measures using the flows of funds in the Euro Area sectoral accounts.

The paper makes three specific contributions to the literature. First, it proposes and motivate an extension of the concept of 'lender of last resort' to that of 'balance sheet of last resort'. Central banks took on risk on their own balance sheets while removing or reducing risk in parts of the financial system. In the Euro Area, the role of the central bank as balance sheet of last resort took a particularly large dimension in the crisis countries, as demonstrated by the imbalances arising from the flows of funds in the payment system named TARGET2. The second contribution lies in the modelling of balance sheet measures using three, not two, categories: beyond measures involving size ('quantitative easing') and composition ('credit easing'), central banks took recourse to 'contingent easing', using balance sheet measures of a contingent nature to provide monetary policy accommodation, which are not immediately reflected in the balance sheet. The third contribution is empirical: the paper exploits the flow-of-funds framework given by the Euro Area sectoral accounts to trace the impact of the central banks' balance sheet measures, duly classified according to the economic sectors issuing or holding the claims involved in the associated monetary policy operations.

---

[1] * European Central Bank and Institut d'Études Politiques de Paris, e-mail: philippine.cour@orange.fr

** European Central Bank, e-mail: bernhard.winkler@ecb.int

Views expressed are those of the authors alone and should not be attributed to the European Central Bank. We are grateful to Celestino Girón for data support and contributions to this paper; to David Cobham for his encouragement; to the discussant Bernd Hayo and other participants at the conference on 'Monetary analysis and monetary policy frameworks' in Edinburgh on 10 April 2014. Helpful discussions with Michel Aglietta, Olivier de Bandt, Philipp König, Hans-Helmut Kotz, Jean-Pierre Landau, Philippe Moutot, Philippe de Rougemont, and Guntram Wolff are also gratefully acknowledged.

While acting as a balance sheet of last resort, the way the central bank distributes funds is seen to matter for their further transmission: in the Euro Area, banks invested the central bank funds largely in sovereign bonds, while at the same time reducing corporate lending. This illustrates the limits of central bank measures acting via banks to reach the real economy in a context of deleveraging pressures, and motivates recourse to a broader range of measures. Outright purchases of assets held or issued by the non-financial private sector as well as the discounting of commercial bills – abandoned in the Euro Area only with the advent of the Euro – are means to provide central bank liquidity in closer link to the financing of the real economy.

Key words: monetary policy, flow of funds, monetary policy transmission, deleveraging, European Central Bank, US Federal Reserve, TARGET2 balances
JEL: E02, E40, E50, E58.

1 Introduction

Central banks took exceptional measures during the financial crisis that emerged in 2007-2008. They were exceptional both with respect to their amplitude and to the instruments employed: the central bank balance sheet became a prominent instrument of monetary policy. The long-standing use of the central bank balance sheet as a policy instrument had become almost forgotten when the policy interest rate became the main instrument in the 1990s. With a seemingly smooth financial market functioning, central banks appeared to be able to steer their economies by acting solely on the price instrument – the policy interest rates – and leaving aside the quantity instrument, traditionally represented by central bank money and more generally its balance sheet. Economic quantities like money and credit flows were assumed to respond to the price instrument, thus receiving little attention, in the belief that the economic information content was conveyed by prices alone. Monetary policy was characterised in econometric models and notably dynamic stochastic general equilibrium models solely by the interest rate instrument.

Notwithstanding these trends in the economics profession and among central banks, from its inception in 1998, the ECB has placed great emphasis on the analysis of money, its components and counterparts. The monetary analysis, a pillar of the ECB's monetary policy strategy next to the economic analysis pillar, was first based on the medium-to-long-term relationship between money and prices. Over time, this pillar has been

enriched and broadened to include the analysis of financial flows and balance sheets (see in particular Papademos and Stark, 2010, and Winkler, 2010). The analysis of money and credit, and hence the focus on quantities and the balance sheets of banks (including the central banks), has also informed the understanding of the financial crisis that erupted in 2007-2008 as well as the non-conventional monetary policy measures then taken. Other central banks also strengthened their monetary analysis during this period (see Cobham and Kang (2012) and Bridges et al. (2016) for the case of the Bank of England).

Against this background, this paper reviews the ECB's non-standard monetary policy from a broad flow-of-funds perspective and proposes to think of the central bank as providing a 'balance sheet of last resort' in a crisis, at times when other sectors are under pressure to deleverage and regular transmission of monetary policy via banks and financial markets is impaired. Throughout the paper, a comparison with the unconventional policies of the US Federal Reserve is provided, where useful, to illustrate the specificity of the ECB's non-standard measures in the Euro Area economic context.[2]

In using their balance sheet capacity to address the consequences of the crisis, central banks in the advanced economies – in the Euro Area, the United States, Japan, the United Kingdom or Switzerland – took on a number of last resort functions. As described in Cour-Thimann and Winkler (2012), these included the classical lender of last resort function (for solvent banks with liquidity shortages), the intermediary of last resort function (between private borrowers and lenders that no longer trusted each other in the interbank market), and the related function of market-maker of last resort (in fostering activity and price formation in the money market and specific asset markets where private activity was impaired).

In continuity with this description, this paper proposes a further interpretation of the role of lender of last resort played by a central bank during a crisis. The three functions above all relate to a 'flow' perspective on the central bank injecting liquidity in financial

[2] The term 'non-standard' (before the introduction of quantitative easing) rather than 'unconventional' also reflects this specificity.

institutions and financial markets to bridge disruptions to monetary transmission. From a 'stock' perspective, that is, when considering the cumulated changes in its balance sheet over time, the central bank can be interpreted as providing a 'balance sheet of last resort'. That is, the central bank expands (or commits to do so under certain conditions) its balance sheet and changes its composition (including through a lengthening in the maturity of its assets). It can take additional assets (outright or in the form of collateralised loans to banks) with the associated financial risks onto its own balance sheet (increasing its 'leverage') when other economic sectors are reluctant to take on risk and tend to deleverage. In this role, the central bank takes the further associated functions of the 'leverage-provider' and 'risk-taker' of last resort. Moreover, the central bank, without taking on additional assets immediately, can promise to do so under certain conditions: through a contingent use of its balance sheet, the central bank can thus take the further associated function of 'insurer' of last resort.

The 'insurer' of last resort function of a central bank is necessarily limited. As underlined by Brunnermeier and Sannikov (2012) in their analysis of the insurance role of monetary policy, any insurance mechanism is associated with issues of moral hazard. At the extreme, adverse incentive effects on the behaviour of economic agents and financial markets may over time increase the very risks that are being countered by the central bank intervention. Whether such natural limit to the 'insurer' of last resort function depends on the nature of the central bank mandate is unclear: the function implies acting *de facto* beyond the reduction of risks to price stability, even if it is to fulfil a price stability objective.[3] In making use (or potential, contingent use) of its balance sheet capacity and thereby taking risks on its balance sheet, the central bank aims to reduce aggregate risk in the economy – with respect to the central bank's mandate and beyond, such aggregate risk includes risks to price stability and financial stability as well as macro-economic risks.

[3] The questions whether the ability of the central bank to reduce risk in the economy depends on its mandate and whether the mandate should be changed are much debated. See for instance the volume coordinated by Bordes and Raymond (2014). Aglietta (2014) argues in this volume that monetary policy must be overhauled to recognise its multiple objectives and should use multiple instruments accordingly. By contrast, Cobham (2015) shows that whether the central bank pursues a single objective of inflation or constrained multiple objectives does not make any real difference for their economic performance (in terms of inflation and economic growth).

The flow-of-funds framework sheds useful light on the central bank functions just reviewed. Whereas the flow perspective captures the central bank's role as a backstop for the financial side of the economy, the stock perspective extends it to a wider role in the economy, beyond the immediate (financial) counterparties in the monetary policy operations. Thus, when the flows are cumulated over time, this framework makes it possible to capture the central bank's role as balance sheet of last resort. The framework allows us to highlight how the balance sheet of the central bank interacts with those of other sectors in the economy and trace how the balance sheet measures worked their way across sectors and asset classes. Examining how the measures worked their way through to the non-financial corporate sector, especially, is particularly relevant in the case of the Euro Area: enhancing credit flows to the private sector was an explicit aim of the ECB from the start of the crisis (see, for instance, Trichet, 2010). All the non-standard measures of the ECB, including the most recent asset purchase programmes, were ultimately aimed at supporting the financing of the real economy, namely households and firms.

The core of the paper is organised around two specific questions. First, to what extent do central banks use their balance sheet as a policy instrument, in particular in an economic context of deleveraging? In this respect, Section 2 analyses the balance sheet as a policy instrument next to the central bank's policy interest rates and communication instruments, and proposes and motivates the notions of 'balance sheet of last resort' and of 'contingent easing'. It further analyses the evolution of the central bank's balance sheet size in the context of the changes in sectoral leverage in the economy as well as in the multi-country context of a currency area.

The second question deals with the concrete composition aspect of the balance sheet measures and their transmission to the economy: to what extent did the central bank support the flows of funds to the various economic sectors and to specific financial markets? In this respect, Section 3 reviews the balance sheet measures of the ECB and traces their transmission across sectors. It provides a typology of the balance sheet measures depending on the nature of the operation and its risk for the central bank as well

as the sectors concerned by the measures. It shows the limited extent to which the ECB's support to bank funding translated into bank lending to the corporate sector, as well as the indirect, but significant, support provided to capital markets and the financing of governments along the way. The section concludes with a discussion on the ability of central bank measures to reach the real economy – and the limits faced in the presence of stress in financial intermediation and increased reliance on financial markets. It also recalls that, in the past, instruments such as the rediscounting of commercial bills that have a more direct link to the financing of the real economy were part of the standard monetary operations toolkit.

2 The central bank balance sheet as a policy instrument

The balance sheet instrument in interaction with other central bank instruments

A central bank can be characterised as having three main instruments, which are interdependent, to influence the economy: policy interest rates, the balance sheet and, third, communication. Communication serves to shape expectations about future developments in the other two instruments or more directly in the policy objectives such as inflation. Central banks use those three instruments in different ways and combinations. This paper focuses on the non-standard or unconventional monetary policy measures [4] taken during the recent crisis, that is, the use of the balance sheet instrument as distinct from the standard (or conventional) policy interest rate instrument. Such a distinction matters to the extent that, beyond the information contained in prices, quantities matter in the transmission of monetary policy in the presence of imperfect arbitrage, segmented markets and balance sheet effects. This is particularly the case at times of financial crisis and debt overhang.

The use of the balance sheet instrument can differ with respect to its interaction with the other policy instruments. From May 2009 on, the US Federal Reserve used the balance sheet instrument essentially as a *substitute* for the instrument of the policy interest rates

[4] The ECB tends to call 'non-standard' its monetary policy measures aimed at supporting the proper transmission of its standard, policy rate, measures, reserving the wording 'unconventional' for active balance sheet expansion measures taken once the lower bound of policy interest rates was reached.

after it had reduced those to their lower bound. It used both instruments sequentially. By contrast, the ECB used both instruments simultaneously. It is only late in the crisis that the ECB's balance sheet instrument became a *substitute* for its policy rates instrument, when the ECB eventually made recourse to quantitative easing in early 2015. Until then, the ECB used the balance sheet instrument as a *complement*, to support the transmission of the signal from the policy rates (see for instance Praet, Cour-Thimann and Heider, 2014).

Indeed, in the wake of the crisis disruptions and a re-pricing of risks in the money and financial markets hindered the smooth transmission of the policy rates (notably the main refinancing rate in the central bank's lending operations with commercial banks) along the yield curve and through to the financing conditions relevant for firms and households. The ECB's non-standard measures then consisted in supporting this transmission (thus acting as a complement), essentially through an extension of the quantity and maturity of the lending operations and an extension of the range of eligible collateral. Through its lending operations, the ECB continued to act essentially via banks until 2014. The difference of action compared with that of the US Federal Reserve throughout this period reflects the bank-based structure of financing of the Euro Area economy (see also Section 3) and the continued solid anchoring of inflation expectations. It also reflects the challenges associated with large-scale purchases of assets, notably public assets, in the Euro Area political and institutional context.

In turn, those specificities in the Euro Area contribute to explaining why quantitative easing was introduced by the ECB at a relatively late stage in the crisis compared with the cases of other central banks in single, marked-based economies such as the US and the UK. It was only in January 2015 that the ECB decided to purchase government bonds as part of an asset purchase programme; the first large-scale purchases started in March of that year. The context had changed: inflation expectations had declined and appeared no longer well anchored at levels in line with the objective of price stability, while the

policy rates had reached their effective lower bound.[5] Moreover, quantitative easing came only after the ECB had engaged in various other forms of easing with its balance sheet and communication instruments, which suggests that the ECB preferred to exhaust all its other instruments before turning to this measure of last resort.

The interaction between the balance sheet instrument and the other instruments can differ not only with respect to the policy rates instrument but also with respect to the communication instrument. Communication enhances the effectiveness of monetary policy, especially at times of crisis when expectational effects contribute in an essential way to the measures' impact on financial markets, albeit to a lesser extent as regards the macroeconomic impact (e.g. Engen et al., 2015). A key difference between the two central banks in the way communication accompanied the balance sheet measures during the crisis relates to the use of forward guidance (that is, an indication – typically conditional on the evolution of the economic outlook, rather than an unconditional promise – on the future path of policy rates). The US Federal Reserve introduced quantitative easing jointly with forward guidance, unlike the ECB. The ECB introduced forward guidance in May 2013, before policy rates had reached the lower bound and without, for quite some time, recourse to quantitative easing.

'Contingent easing' and the balance sheet of last resort

Although the literature typically distinguishes, and focuses on, two forms of balance sheet use – quantitative easing and credit easing –, they do not provide a complete description of the balance sheet instrument. When a central bank introduces quantitative easing, it takes an active stance on the size and composition of its balance sheet. When a central bank makes recourse to credit easing, it arguably changes the composition of its balance sheet, but typically with a less active or direct stance in terms of balance sheet

[5] This was acknowledged by the ECB President in September 2014 with a further cut in policy rates bringing the deposit facility rate to -0.20 basis points.

management.[6] However, there is a more passive way of using the balance sheet instrument, which also relates more directly to the role of the central bank as a balance sheet of last resort. This leads to the introduction of the notion of 'contingent easing'.

Certain balance sheet measures are of a contingent nature: they constitute a commitment by the central bank to provide liquidity in the future under certain conditions, and thus whether they will be reflected in the central bank balance sheet and to what extent is not known in advance. Non-standard measures of a contingent nature thus involve an interaction between the balance sheet instrument and the communication instrument. Such measures act through providing insurance, by changing the perceptions of risk in the economy or even addressing systemic risks. Through such contingent measures, the central bank acts as a balance sheet of last resort: it puts its balance sheet to use as a backstop for adverse economic and financial market developments. The possible concrete realisation of the measures can take any form of balance sheet change, notably an increase in lending operations or asset purchases. Thus, when a central bank acts as a lender of last resort, its balance sheet size and, to some extent, composition evolve endogenously (and thus not actively), according to the demand for liquidity by its counterparties.[7] When a central bank makes the promise to take an active stance on its balance sheet under certain conditions, the balance sheet size and composition have the potential to evolve – and this potential will be realised or not.

As a result, how the central bank uses its balance sheet instrument goes beyond modifying in a controlled way the size and composition of the balance sheet. It is thus proposed to extend the standard concepts of quantitative easing (based on measures that

---

[6] To recall, credit easing – in distinction to quantitative easing – is a way to offer support to the economy that involves a change in the central bank balance sheet composition rather than in its size. The literature focuses on the asset (or liability) composition of the central bank balance sheet, or the composition of the assets eligible as collateral in monetary policy operations. For a review see, for instance, Durré and Pill (2012). At the time this paper was finalised, the ECB (2015) published an article that considers quantitative easing and credit easing as active balance sheet policies and further discusses the notion of 'contingent balance sheet policies'.

[7] Even in normal times, the operational framework of central banks entails tools pertaining to the lender of last resort function: the standard liquidity-providing standing facility and emergency facilities such as the Emergency Liquidity Assistance (ELA) in the case of the ECB. During the crisis, the function of lender of last resort was additionally realised in the case of the Federal Reserve through special lending facilities in 2007-2008, and in the case of the ECB through the change to a fixed rate full allotment procedure in its lending operations, by which the Eurosystem central banks would supply the liquidity demand of banks in full provided they had adequate collateral.

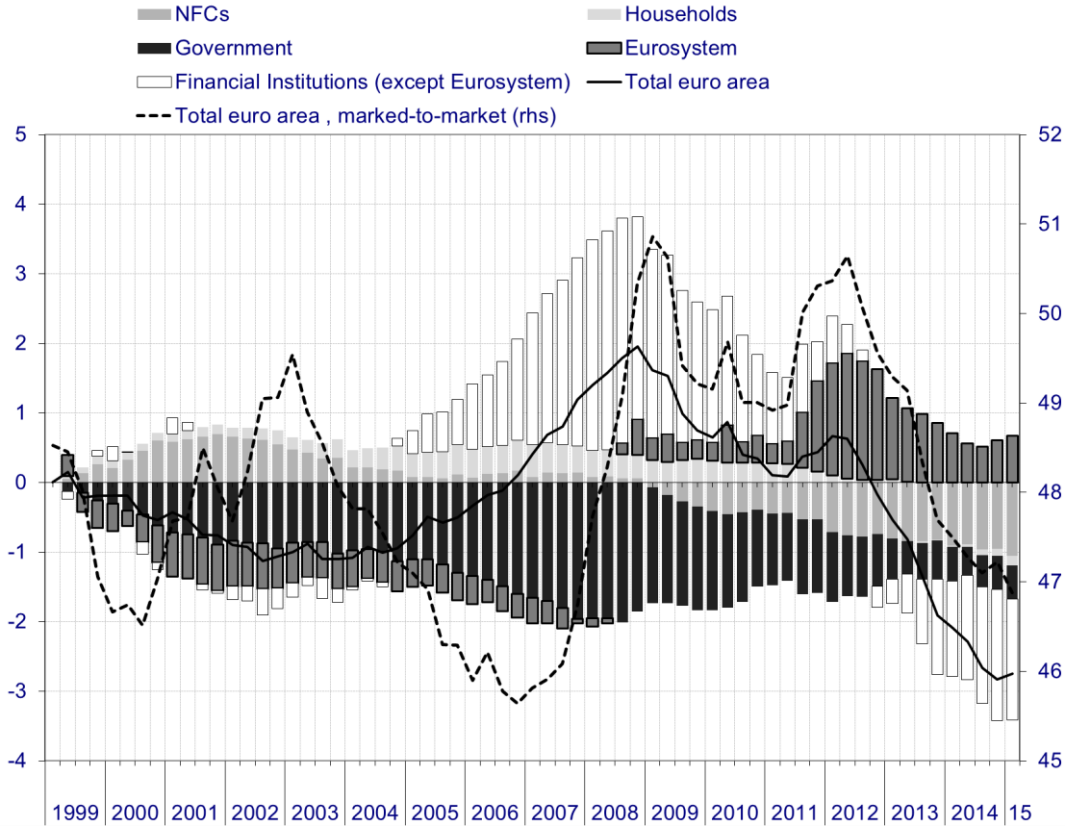
affect size) and credit easing (based on measures that affect composition) to include a new concept of 'contingent easing' (based on measures of a contingent nature). 'Contingent easing' characterises the use of the balance sheet instrument beyond its foreseeable size and composition dimensions, through balance sheet measures whose effects on the balance sheet are not known in advance. 'Contingent easing' provides monetary policy accommodation by entailing a promise to use the balance sheet capacity under certain adverse conditions.

The reminder of this section illustrates in the case of the ECB (and thus the Eurosystem) the evolution of the balance sheet over time and its interaction with the Euro Area economy, in both its sectoral and cross-country dimensions. It highlights the relevance of an endogenous and contingent use of the central bank balance sheet capacity and further provides a rationale for the move to a more active form of balance sheet expansion at the turn of 2015.

Eurosystem balance sheet size and contribution to leverage in the Euro Area

A flow-of-funds framework is useful to assess the role of the central bank as a balance sheet of last resort in that it allows an interpretation of the evolution of central bank balance sheets jointly with that in the balance sheets of other sectors in the economy. A flow-of-funds framework is, however, insufficient given that flows of funds capture only actual transactions – and thus not potential future flows related to endogeneity in the design of certain monetary policy measures, nor the contingent use of the balance sheet capacity. At the same time, the picture of the interaction of the central bank balance sheet with the rest of the economy that emerges from the flows of funds is by itself useful for identifying the missing piece in the puzzle. The missing piece can involve balance sheet measures of an endogenous or contingent nature or even point to the need for the central bank to have recourse to additional measures to fulfil its mandate.

Figure 1: Leverage in the Euro Area: Cumulated changes in the debt-to-assets ratio of the Euro Area economy and the sectoral contributions



Source: ECB Euro Area Accounts and authors' calculations. Last observations: 2015Q1.
Notes: Cumulated changes in leverage are expressed in notional terms, obtained by adding to the initial value in 1999Q1 the cumulated sum of the quarterly transactions since then. The sectors' contributions to the cumulated change in Euro Area leverage are in percentage points (on the left-hand scale), each given by the ratio of the sector's debt (liabilities) to the total notional assets in the economy. For comparison, the dashed red line shows the marked-to market debt-to-assets ratio of the Euro Area economy (on the right-hand scale). Notional developments allow the analysis of the build-up of fundamental disequilibria in the economy.

The flow-of-funds framework underlies the construction of Figure 1, which uses a specific, but encompassing, balance sheet indicator: the leverage ratio, as measured here by debt to assets.[8] The figure shows the cumulated change in the debt-to-assets ratio of the Euro Area economy and the contributions of the various sectors since 2001.[9] The

[8] There are many ways to define the leverage ratio. The indicator in this paper takes a macroeconomic perspective based on national account conventions. It should not be confounded with regulatory leverage ratios used in Basel III based on business accounting, which involve Equity/Assets. Recognising that assets are equal to liabilities and liabilities are the sum of debt plus equity, the leverage ratio used in this paper is conceptually equal to 1 minus the Basel III leverage ratio.

[9] The figure extends, with a slightly different presentation, Figure 10 of Cour-Thimann and Winkler (2012).

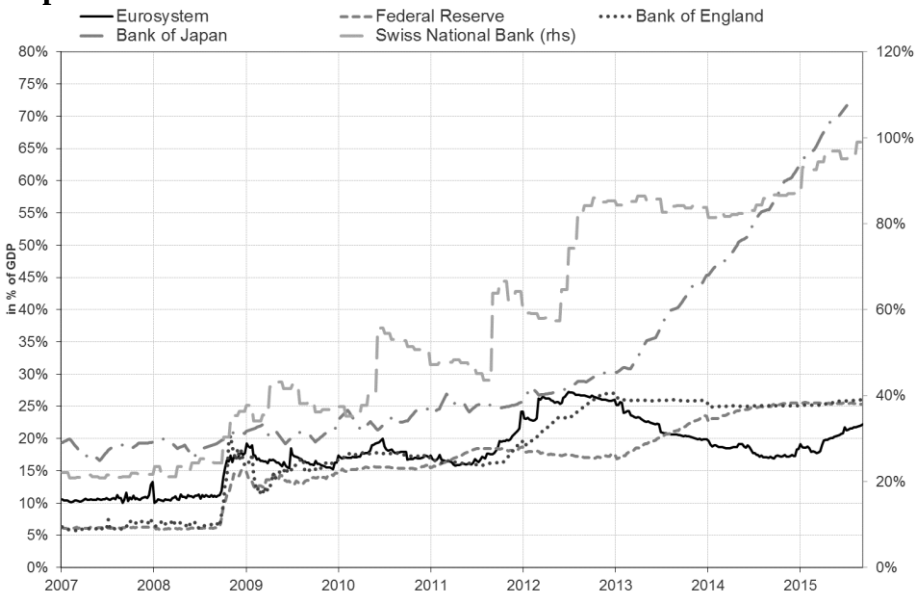
prices of debts and assets entering those ratios are notional: they are based on cumulated transactions and thus do not correspond directly to changes in market prices. After a period of subdued developments in the first years following the introduction of the Euro in 1999, underlying Euro Area leverage (solid line) increased between 2005 and 2008, before contracting again following the onset of the financial crisis marked by Lehman Brothers' insolvency in 2008 Q3. By 2010, the notional leverage ratio had returned to its initial level in 1999. For comparison, the headline debt-to-assets ratio using instead prices that are marked to market is also shown (dotted line). In this case, the leveraging-up in the Euro Area economy ahead of (and largely contributing to) the financial crisis is blurred by the impact of (pro-cyclical) valuation effects. Using such marked-to-market prices, the leveraging-up becomes visible only in 2007.[10] This is two years after the leveraging-up actually began, as observed using notional prices.

The cumulated change in leverage for the overall Euro Area economy is decomposed into the contributions of the various economic sectors. The leveraging up ahead of the financial crisis is seen to be entirely due to financial institutions (white framed bars), while the government sector was deleveraging (dark bars). After the start of the financial crisis in 2008 Q3, financial corporations deleveraged, at a pace similar to that at which they leveraged up prior to the crisis. Partly compensating this development, the public sector (the dark plain and the dark framed bars taken together) took on leverage at that time – first, the government, notably through bank rescue packages, and later, the central bank (dark framed bars), through the expansion of its balance sheet (at constant capital).[11] Between mid-2011 and mid-2012, central bank and government leverage more than compensated for the deleveraging in the financial and non-financial private sectors.

[10] This comparison also illustrates how the practice of marking to market (favoured by international accounting rules) can hinder the proper assessment in real time of the mispricing of risks at the origin of the financial crisis.

[11] The increase in total assets in Figure 1 also corresponds to a more than proportional increase in debt, and thus to an increase in the debt-to-assets ratio, since assets are equal to liabilities, which as mentioned are themselves the sum of debt plus equity, and central bank equity was broadly unchanged in the crisis.

Figure 2: Central bank balance-sheet size: Total assets, in % of GDP of the respective economies



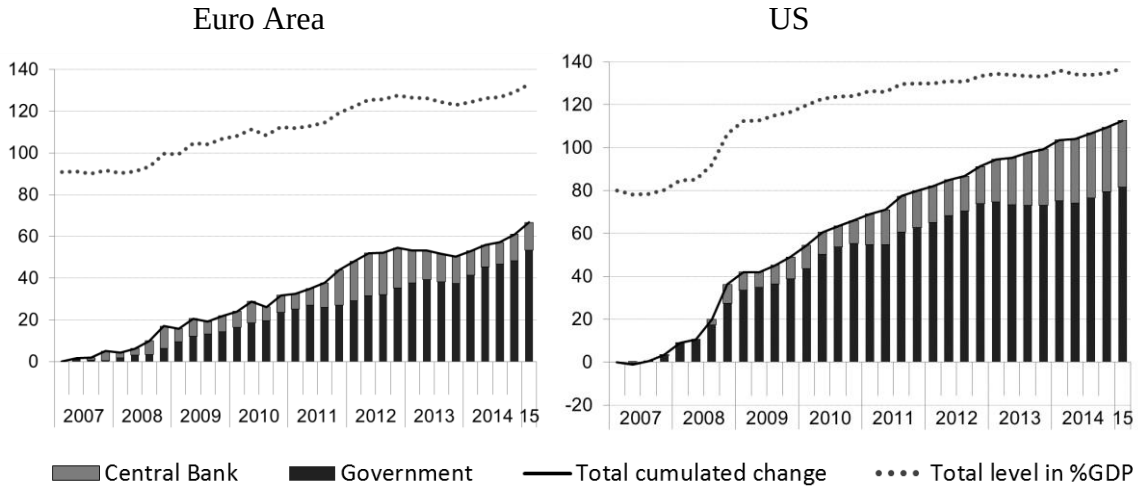
Last observations: data as of end-August 2015, except for Bank of Japan (end-June 2015).
Source: ECB, Federal Reserve, Bank of England, Bank of Japan.

Similar developments were observed in the US and other advanced economies to those in the Euro Area, until mid-2012 when leverage in the Eurosystem started to decline. The contraction in the balance sheet of the Euroystem (that is, the ECB plus the National Central Banks of the Euro Area countries) after mid-2012 contrasts with the expansion in the balance sheet of the US Federal Reserve during the same period (see Figure 2). At that point, the Euro Area economy was in an atypical situation where the central bank appeared to contribute to the general deleveraging trend. With the exception of the government sector which continued to leverage up, financial corporations, households and, especially, the non-financial corporate sector were deleveraging.[12] The leveraging-up by the government sector was not sufficient to offset the central bank's contribution. Taken as a whole, the public sector was deleveraging, contrary to the case in the US (see Figure 3).

[12] See in particular Girón and Rodríguez-Vives (2015) for a discussion on the interaction between leverage in the public sector and in the private non-financial sector.

Figure 3: Public sector size: consolidated sum of government and central bank liabilities

(cumulated growth (solid line) and contributions to growth (bars))



Source: Girón and Rodríguez-Vives (forthcoming).
Last observations: 2015 Q1.
Notes: Cumulated growth rates of the stock of liabilities of the government and central banks since end-2006 (solid line) and their respective contributions (bars). The government and central bank liabilities are consolidated (by removing government deposits at the central banks). Dotted line: share of liabilities of the total economy in % of GDP of the respective economy.

These developments raise the question whether the shrinking of the ECB's balance sheet should be interpreted as a contractionary impulse. It is shown further below why this is not necessarily the case and that taking the developments in the central bank balance sheet at face value can be misleading. Nevertheless, the period of contraction in the balance sheet was followed by a gradual decline in inflation expectations to levels perceived as posing risks to price stability. The ECB eventually took a more active stance on its balance sheet, seeking to expand its size. A balance sheet size expansion should arguably lead to an increase in inflation and inflation expectations, although such link is theoretically and empirically not certain as discussed by Friedman (2015).

The launch of targeted longer-term lending operations[13] in June 2014 (with a fixed interest rate and up to four-year maturity) represented the first step of a more active management of the ECB's balance sheet. The liquidity demand in the first of those operations was, however, relatively low and the ECB President announced in September

[13] The targeted lending operations were aimed at providing incentives for banks to use the central bank funds for lending to the real economy (with lending for house purchases excluded from the calculation of allowances).

2014 the aim of approaching again the peak size observed in mid-2012, while introducing purchases of targeted private sector assets (namely asset backed securities and covered bonds) to support the bank lending channel. The subsequent decision to launch a programme of public sector asset purchases, which confirmed a move to quantitative easing, was the most significant step in the active management of the Eurosystem's balance sheet size.

A rationale for the central bank to leverage up when the rest of the economy is under pressure to deleverage

Supporting asset prices when other sectors deleverage, thereby avoiding disorderly deleveraging in the economy, provides a rationale for the central bank to expand (or commit in a contingent manner) its balance sheet at times of crisis. The extent to which a central bank can do so is not without bounds, however: it is limited by the central bank's capacity to maintain credibility in fulfilling its mandate on a sustainable basis.[14]

The reason why a reduction in leverage exerts a downward pressure on prices is explained for instance in Cour-Thimann and Winkler (2012). To recall, the leverage L, defined as the ratio of debt to assets D/A, can be re-written as follows**:**

$$L = \frac{D}{A} = \frac{1}{\left(\frac{A-D}{D}+1\right)}$$

From this expression, it follows that leverage can be reduced in two ways. The first way is by increasing net assets (A–D), typically via higher savings,[15] but this requires that some economic agents have to 'accommodate' the increased savings, for instance the rest of the world or the government (through increased investment or other spending). However, this was difficult in the context of the global economic crisis and the subsequent sovereign debt crisis in the Euro Area. The other way to reduce leverage is to repay debt D while holding net assets constant, which, however, requires the liquidation

[14] See ECB (2013) for a discussion on the link between the central bank's creditability and its financial strength. In addition, fulfilling the mandate can only be done with an objective of sustainability, otherwise it would foster adverse side effects. For instance, too large a balance sheet expansion through central bank liquidity support to banks could foster moral hazard in the financial sector, including a renewed mispricing of risks and asset price bubbles, and prepare the ground for financial and price instability further down the road.

[15] Alternatively, net assets (A-D) can be increased by replacing debt with equity as source of financing.

of assets, A. This exerts a downward pressure on asset prices, with the possibility of a self-defeating leverage loop, a so-called ‘disorderly’ deleveraging. The central bank can counteract such adverse developments by providing liquidity to support asset prices and pre-empt fire sales at times of crisis (Bindseil and Jabłecki, 2013).

Moreover, the prevalence of lending operations among the ECB’s non-standard measures – as opposed to outright transactions – implied less relief of the pressure on banks to deleverage in the Euro Area relative to the US. The Federal Reserve’s asset purchases allowed the private sector to offload some of their assets onto the central bank’s balance sheet (Praet, 2012; Cour-Thimann and Winkler, 2012).[16] The eventual recourse by the ECB to quantitative easing in early 2015 can also be seen in this light. By providing cash in exchange for assets purchased and by sustaining at the same time the prices of other assets, quantitative easing relieved some of the deleveraging pressure on banks. The move to quantitative easing (and earlier related communication) was followed in particular by upward pressure on asset prices such as government bonds and stocks, albeit also by a weakening of the Euro exchange rate (ECB, 2015). Moreover, later in the year, as the upward pressure was not seen to spill over much to consumer prices (as measured with the HICP index) and downside risks to price stability over the medium term seemed to persist, the ECB took a more accommodative stance. On 3 September 2015, it raised the share of government bonds the ECB can buy from 25% of each specific issue to 33%, and at the press conference that day the ECB was also seen as preparing the ground for a further expansion of the asset purchase programme (which could touch on the horizon, size, or parameters of the purchases).

The leveraging-up of the Eurosystem balance sheet (through increased claims on the banking systems and other assets) also implied a transfer of risk in the economy. The risk exposure was transferred away from the private (financial) sector to the public sector, through the central bank balance sheet. Such risk transfer can be seen as having implications for taxpayers, given the Eurosystem’s increased exposure to financial assets

[16] A simplified balance sheet presentation could easily show the difference in the impact of the central bank measures on the sector of financial institutions in the Euro Area and the US.

or to relatively weak banks putting forward relatively risky assets in return for central bank liquidity. Nevertheless, central banks have mechanisms in place to mitigate the risks from their operations, such as through financial buffers and the design of their collateral frameworks (the eligible collateral assets are valued daily and haircuts are applied).

Accounting for 'contingent easing' in assessing Eurosystem balance sheet developments

A priori, a central bank balance sheet expansion would have an expansionary effect on the economy, and a balance sheet contraction a contractionary effect. In practice, this is not necessarily the case,[17] for two reasons. The first, well-known explanation, is the possible use of credit easing and relates to the change in balance sheet composition apart from its size. The second explanation relates to the possible use of contingent easing, through measures that have no direct or foreseeable implications for the central bank balance sheet, albeit potentially large effects on its future development. Those measures do not imply a direct or foreseeable leveraging-up of the central bank balance sheet, but still support asset prices and the economy via expectational effects and in particular by reducing the amount of risk in the economy, as well as reducing the pressure upon the private sector to deleverage.

Two specific non-standard measures of a contingent nature stand out in the case of the ECB:[18] the fixed-rate full allotment tender procedure in the monetary policy operations (introduced in October 2008)[19] and the Outright Monetary Transactions (OMTs, introduced in September 2012). The OMTs consist in potentially unlimited purchases in the secondary market of bonds from stressed Euro Area governments, associated with

[17] A parallel can be made with the case of the policy rates instrument, whereby a cut (hike) does not necessarily have an expansionary (contractionary) effect on the economy, depending on whether this cut (hike) takes place in a situation where the natural rate of interest increases, declines or remain stable.

[18] The US Federal Reserve's various backstop measures to the financial system and specific financial institutions undertaken in late 2008 and early 2009 also entailed some contingent elements.

[19] Furthermore, the indexation of the interest rate in longer-term refinancing operations on the future main refinancing rate over the lifetime of the operations adds to the contingent character of the fixed rate full allotment measure. The indexation feature was introduced in December 2009 and kept in most of the subsequent refinancing operations of a maturity above 3 months until its waiving in June 2014 with the introduction of the targeted longer-term refinancing operations. Indexation implies in particular that a reduction in the policy interest rate is immediately translated to reduced costs for the borrowing bank over the remainder of the outstanding operations. It thus constitutes a form of contingent easing (while operating as well in the other direction of a contingent tightening in case of an increase in the policy interest rate).

strong conditionality on the part of those governments to pursue the necessary reforms in their economies.[20] The OMT announcement had a powerful easing effect on financial conditions in the Euro Area although the measure was never activated (at least not before the ECB eventually introduced quantitative easing). This makes the OMT measure a pure example of 'contingent easing', in contrast to quantitative easing and credit easing.

As for fixed-rate full allotment, it implies that the size of the Eurosystem balance sheet was largely endogenous to banks' demand for liquidity,[21] at least until mid-2014.[22] This is different to the case of the US Federal Reserve and other major central banks which primarily control the extent of their balance sheet expansion through asset purchase programmes.[23] Indeed, given that the bulk of the ECB's monetary policy operations until end-2014 consisted in lending to banks the full amount of liquidity they needed (against eligible collateral) for a limited period, the associated balance sheet expansion reverses automatically as the operations come to maturity. The Eurosystem balance sheet developments reflect the sum of the funds demanded by banks in new operations net of the funds reimbursed in relation to previous operations. A decline in bank demand can reflect an attenuation in funding market tensions and systemic risks (and thereby an easing in monetary and financial conditions). Thus, the contraction in the Eurosystem balance sheet observed between 2012 Q3 and 2014 Q3 after four years of expansion essentially reflected the repayment of large-scale refinancing operations (specifically, two three-year longer-term refinancing operations launched around the turn of 2012 that had an early repayment option).

---

[20] The announcement of the OMTs followed the statement of President Draghi (on 26 July 2012) that the ECB would do 'whatever it takes, within its mandate' to preserve the Euro. The OMTs were designed to address unwarranted redenomination risk premia that had appeared in bond markets.

[21] The period during which fixed-rate full allotment would apply was extended many times during the crisis: this extended the promise given to banks that they could borrow unlimited amounts of central bank liquidity, limited only by their capacity to pledge assets as collateral in exchange. Nevertheless, the endogeneity nature of the measure still has an indirect exogenous component: the central bank sets the criteria on which banks can obtain liquidity, such as the collateral eligibility, and therefore can influence the volume of liquidity demanded by banks.

[22] The ECB's targeted longer-term refinancing operations introduced in June 2014 depart from the full allotment mode but also include some endogenous elements (the provision of central bank liquidity to individual banks is made dependent on their actual amounts of lending to corporates).

[23] The amount of assets purchased is determined exogenously and assets are held for an indefinite period of time. That period is only limited by the maturity of the assets purchased, which was also dramatically lengthened compared to pre-crisis levels (e.g. to as much as 30 years for certain mortgage-backed securities). It would take a decision from the central bank to reduce its leverage in this case, contrary to the automatic reversibility attached to the lending operations in the case of the Eurosystem.

Both the fixed rate full allotment and the OMT measures consisted in providing insurance against certain adverse outcomes for the transmission of monetary policy to the Euro Area economy (respectively the risk of liquidity shortages faced by individual banks, and the risk of adverse self-fulfilling equilibria in sovereign bond markets). Through their very presence, such central bank backstops also mitigated or even eliminated the systemic risks themselves. By signalling its readiness to act with its balance sheet instrument, the central bank can immediately influence expectations and stabilize asset markets, possibly also making the actual activation of the announced contingent measures eventually unnecessary.

This shows that any analysis of the central bank balance sheet instrument and its effects on the economy needs to account for the possible presence of contingent measures. For instance, their presence may imply that the Eurosystem balance sheet contraction between 2012 Q3 and 2014 Q3, when other economic sectors were generally under pressure to deleverage and at unchanged or even reduced policy rates, was not necessarily contractionary, at least for some time. However, formalising the account of contingent easing in empirical models is inherently difficult, as is any empirical assessment of the beneficial (or adverse and moral hazard) effects from insurance. Even an enhanced balance sheet size indicator (e.g. determined in a forward-looking and probabilistic way, using the size implications of various outcomes weighted with their probabilities to occur)[24] would not be sufficient to characterise the capacity of the central bank to act as balance sheet of last resort.

The Eurosystem's spatial composition and the wide extent of the balance sheet of last resort function in a currency union

Besides size, composition matters, and not only as regards the characteristics of the various claims and liabilities on the central bank balance sheet. In the multi-country

[24] In the same way as the assessment of public finances needs to account for the government's contingent liabilities (e.g. related to social security systems or to the outcome of certain multilateral arrangements), the assessment of the central bank's balance sheet size can a priori be enhanced through taking account of the central bank's contingent liabilities.

context of the Euro Area, the role of the central bank as balance sheet of last resort – and the observed effects on the various Euro Area economies – also entails a spatial dimension.

Indeed, the Eurosystem balance sheet is the consolidated aggregate of the balance sheets of the ECB and the National Central Banks (NCBs). During the crisis, large intra-Eurosystem balance sheet positions developed on the individual NCBs' balance sheets that do not show up in the consolidated aggregate: the 'Target balances'. They are represented in Figure 4. Two groups of countries emerge from this picture: those whose NCBs have large negative Target balances, which are also the crisis countries such as Greece, Ireland, Portugal, Spain and Italy; and those whose NCBs have large positive Target balances, such as Germany and Luxembourg. The Target balances reflect large payment imbalances in the payment system TARGET2[25] of the Eurosystem, with the banking systems in the latter countries being the net recipients of the large outflows from banking systems in the crisis countries.[26] Facing payment outflows and losing access to the interbank market, the banks in crisis countries turned to their NCBs to borrow increased amounts of liquidity. The increased volumes of lending operations correspond to the increased claims that the NCBs in the crisis countries built up upon their national banking systems.

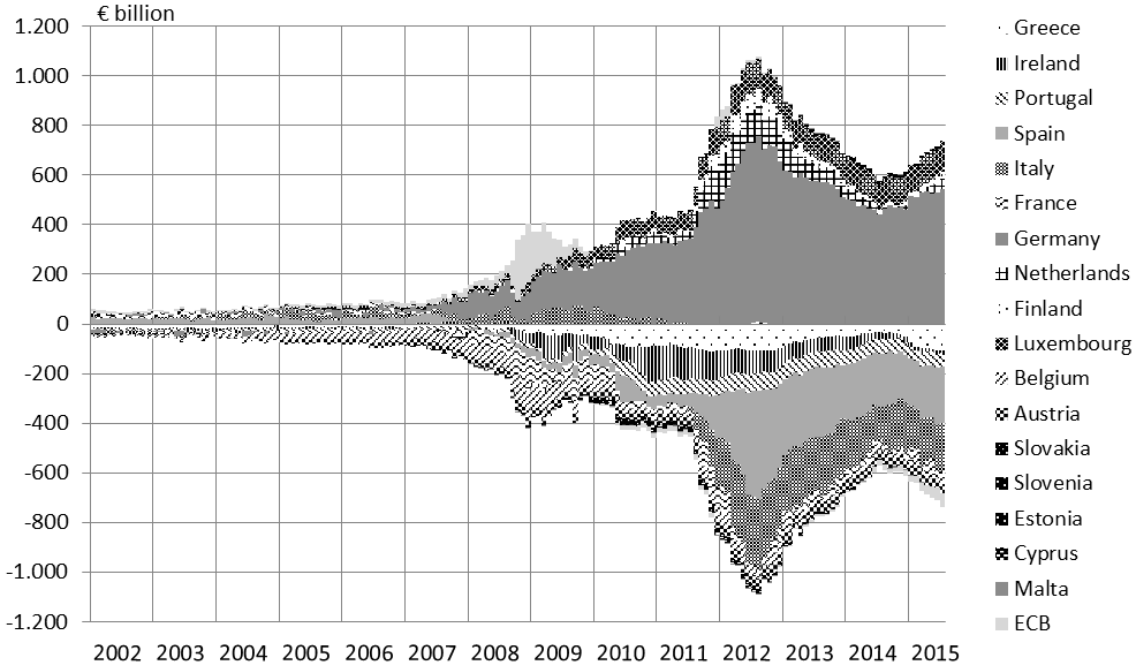
As a result, the balance sheet sizes of the NCBs expanded. The increased intra-Eurosystem positions in TARGET2 (the Target balances) were associated with increased volumes of lending operations (in the case of negative Target balances), or increased volumes of deposits (in the case of positive Target balances). The balance sheet expansion was more pronounced in the crisis countries, given the higher share of payment imbalances relative to the size of their banking systems. It is thus particularly in the crisis countries that the central banks leveraged up: central banks acted as balance

[25] TARGET2 is the payment system operated by the Eurosystem. It is an acronym for Trans-European Automated Real-time Gross settlement Express Transfer system (in its second generation).

[26] For the link between Target balances and the crisis in the Euro Area, see for instance Cour-Thimann (2013).

sheets of last resort for the crisis economies in an even more pronounced way than that pictured at the aggregate Eurosystem level (see Figure 2).[27]

Figure 4: A quasi-spatial dimension: Target balances in the Euro area central bank balance sheets



Notes: Last observations: end-July 2015. A positive (negative) sign reflects a net claim (liability) of the NCB vis-à-vis the ECB in the TARGET2 payment system. The Target balances are vis-à-vis the ECB and add up to zero.
Source: Updated from Cour-Thimann (2014), based on ECB, NCBs and IMF data.

The balance sheets of the individual NCBs across the Euro Area countries reflect a spatial dimension in terms of how the Eurosystem balance sheet is composed, even if this spatial dimension is quite imperfect in a financially integrated area.[28] The analysis of the spatial composition underlying the Eurosystem balance sheet reveals the full extent to which an individual central bank is able to leverage up. This potential is a priori larger for a central bank within a currency union. This is because of the necessary absence, in a currency

[27] This point could be illustrated using a reproduction of Figure 2 at the national level for the individual Euro Area countries, or for the groups of countries with a positive Target balance and those with a negative Target balance on their respective central bank balance sheets.

[28] The delimitation of national banking systems and the relevance of national borders for assessing cross-border payments is blurred in a financially integrated area: banks participating in monetary policy operations (and in TARGET2) at different Euro Area NCBs may be part of the same banking group. In addition, the cross-border flows may not reflect the geographical location of the activities underlying the transactions.

union, of mechanisms that would limit cross-border payment flows or the relative amounts of liquidity that the individual central banks can provide to their respective banking systems.[29] Thus, within a currency union like the Euro Area, the central bank's role as balance sheet of last resort can take wider proportions than in the case of a single country. Given the transfer of risk involved when central banks leverage up (see above) and the prevalence of risk-sharing in a currency union, the extent of the insurance mechanism embedded in the currency union also takes wide proportions – and so do potentially the associated issues of moral hazard.[30]

3 The transmission of balance sheet measures: a sectoral perspective

The analysis of the transmission mechanism of monetary policy in the mainstream New-Keynesian literature and in central bank practice typically focuses on the transmission of the policy interest rates, or expectations thereof.[31] Such analysis thus considers only the policy rates and communication instruments, leaving aside the transmission via balance sheets (and associated communication). Given its quantity nature (as opposed to the price nature of the policy rate instrument), the transmission via the balance sheet instrument should be properly assessed in a monetary or flow-of-funds framework (see also Cobham and Kang, 2012, and Christensen and Krogstrup, 2014).

This section turns to the concrete composition aspect in the use of the balance sheet instrument and its transmission to the economy, using information on money and credit flows and the sectoral accounts. It addresses the second question raised in this paper: to what extent did the central bank support the flows of funds to the various economic sectors, and in particular to the corporate sector?

---

[29] Indeed, in the case of a central bank having its own currency, a massive injection of liquidity in a situation of large payment outflows would lead to a depreciation of the currency. This would in turn trigger a rebound in competitiveness and thus reduce the outflows and the very need for central bank liquidity, thereby limiting the extent of the leveraging up.

[30] One could be tempted to infer that the larger leveraging-up of NCBs in crisis countries would imply a transfer of risks across borders, at the expense of the countries whose NCBs leveraged less. This is not an appropriate reading, as one also needs to consider the origin of the risks that were transferred to the central banks' balance sheets (see Cour-Thimann, 2013 for an explanation).

[31] See, for instance, the presentation of the transmission mechanism of monetary policy on the official websites of the ECB and the US Federal Reserve.

Typology of the balance sheet measures

This section proposes a typology of balance sheet measures in order to characterise their impact on the various sectors in the economy. Figure 5 draws the matrix of possible central bank balance sheet measures according to the nature of the monetary policy operations (lending operations versus outright purchases), the anticipated associated risk for the central bank balance sheet, and the economic sector affected. The non-standard measures employed by the ECB are indicated in this matrix by their established acronyms. A few additional instruments are also included, such as commercial paper and corporate bonds (which were employed by the Fed, the Bank of Japan and the Bank of England during the crisis) as well as trade credit-based instruments (which were part of the traditional toolkit of central banks). Such a matrix offers a classification of the way the central bank takes financial risk onto its balance sheet according to three fundamental characteristics:[32]

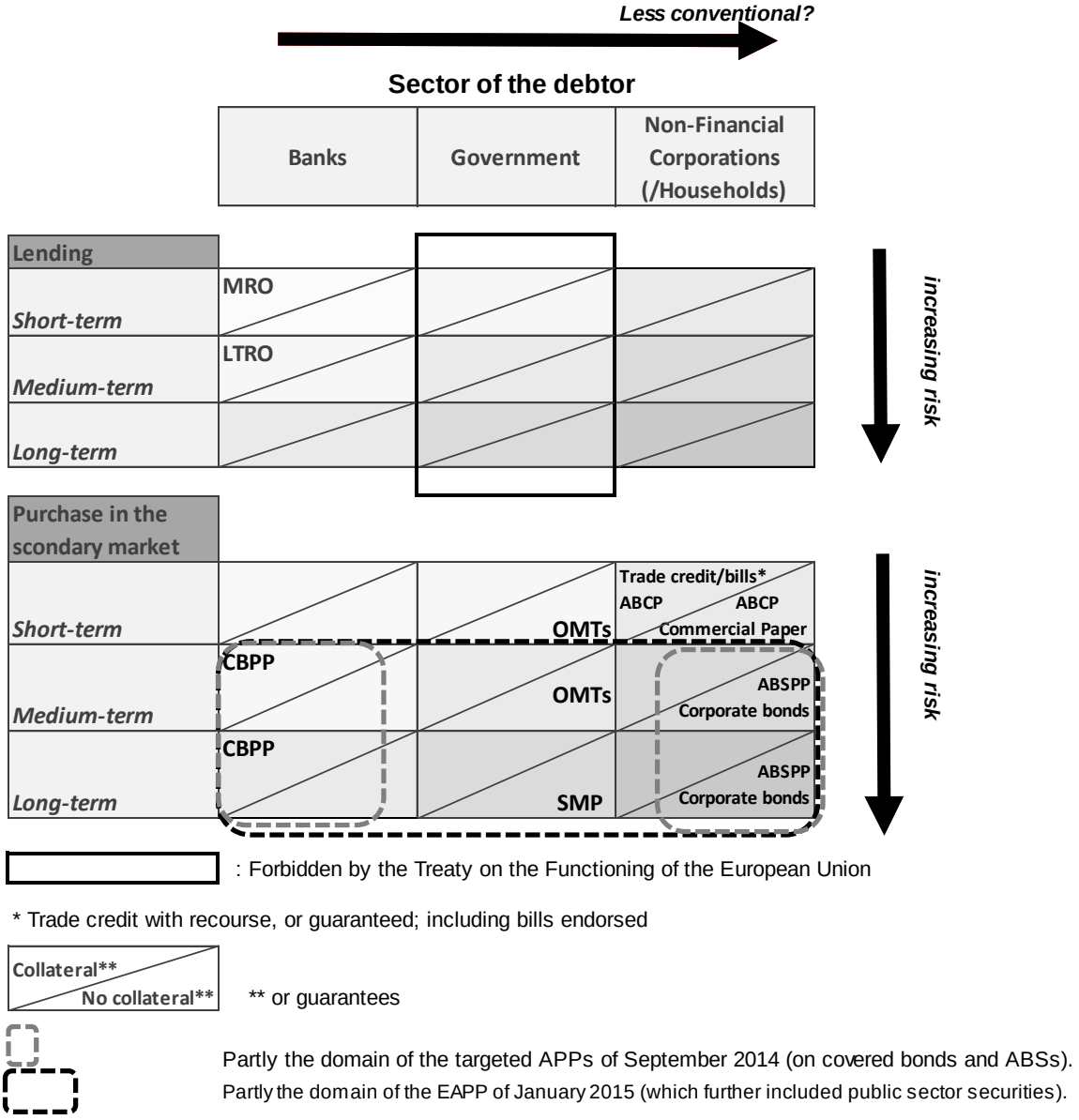
(1) the recourse to collateralised lending versus asset purchases;
(2) the issuer sector of the debt acquired: banks, government or non-financial corporations (NFCs);
(3) the maturity/duration of the instrument.

The first characteristic is shown in the upper and lower blocks in Figure 5: the mobilization of instruments by central banks can then take place either via acceptance of collateral for lending (i.e. liquefying illiquid or less liquid instruments) or via outright purchases. In both cases, this inevitably and endogenously affects the liquidity and risk properties of such claims in the eyes of investors and hence the financing conditions of the respective debtors (Allen, 2014). The distinction between collateralized and outright transactions is also relevant for the risk assumed on the central bank's balance sheet – in its various forms of counterparty, market, and liquidity risks. For instance, the central

[32] The financial risk attached to the monetary policy operations includes a credit risk (as in the case of lending operations), a market risk (as in the case of assets purchased or underlying collateralised operations, the value of the assets evolving with the market), and a liquidity risk (as in the case where the central bank would liquidate assets). The liquidity risk depends on whether the asset acquired is tradable/marketable or is an illiquid claim (such as in the case of the assets being individual bank loans).

bank bears a counterparty risk in its lending operations (the risk that the borrowing bank cannot reimburse the central bank).

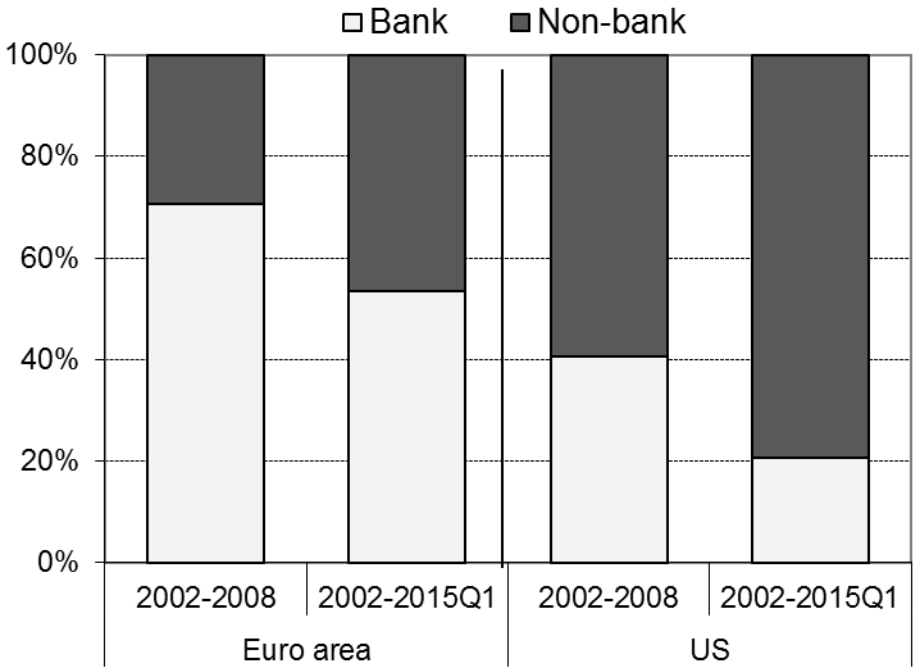
Figure 5: A sectoral classification of the central banks' balance sheet measures



Notes: MRO: Main Refinancing Operations; LTRO: Longer-Term Refinancing Operations; CBPP: Covered Bond Purchase Programme; OMTs: Outright Monetary Transactions; SMP: Securities Markets Programme; ABSPP: Asset Backed Securities Purchase Programme; ABCP: Asset Backed Commercial Paper; APP: Asset Purchase Programmes. EAPP: Expanded Asset Purchase Programme. Together with CBPP3 and the ABSPP, the Public Sector Purchase Programme (PSPP) constitutes the Expanded Asset Purchase Programme.

As explained for instance in Cour-Thimann and Winkler (2012), the choice made by the central bank to have recourse to collateralised lending rather than asset purchases depends on the financial structure of its economy. In the more bank-based Euro Area economy, the ECB privileged collateralised lending to banks; in the market-based US economy, the Federal Reserve privileged outright asset purchases of debt issued by the non-bank sectors (subject to government guarantees in various forms).[33] Figure 6 shows the relative shares of bank and non-bank financing for the non-financial corporate sector in the Euro Area and the US. Over the period during the financial crisis, the relative reliance on bank-financing declined markedly in both regions, which is not surprising given the concentration of funding difficulties in the banking sector in the aftermath of the financial crisis and the regulatory pressure on banks to deleverage. [34]

Figure 6: Funding of the non-financial corporate sector in the Euro Area and the US (shares in cumulated debt transactions)



Source: Eurostat, ECB, US Federal Reserve.

[33] The assets included mainly government bonds, government-guaranteed mortgaged backed securities, commercial paper, and securitised loans.

[34] For an analysis of the link between bank leverage and the credit cycle in the Euro Area, see for instance Girón and Mongelluzzo (2013).

The second characteristic is shown by the columns in Figure 5, which distinguish the sectors that are the issuers of the underlying claims targeted by monetary policy operations – this matters for the financial risk taken by the central bank as well as for monetary policy transmission.[35] The horizontal arrow on top of the figure further characterises a move from banks to the government and to non-financial corporations or households as increasingly 'less conventional', but adds a question mark. What is considered more unconventional today – using instruments issued by the private non-financial sector – was once considered standard and safe, and preceded the use of government debt instruments.

The maturity of instruments and operations, shown by the rows in the two blocks of Figure 5, is the third characteristic of relevance for the risk assumed on the central bank's balance sheet and for the transmission channel. The choice of maturity for central bank interventions was traditionally limited to the very short end of the spectrum, considered to involve a lower risk for the central bank and to introduce lower market distortions.[36]

The ECB's monetary policy in normal times corresponds to the top left corner of the matrix in Figure 5. It relies on lending funds to banks against collateral and over short maturities (in Main Refinancing Operations, MROs), both features contributing to minimize the risk taken up on the central bank balance sheet. The ECB's non-standard measures during the crisis involved moving within the matrix, but until 2014 it continued to rely essentially on intermediated financing via the banking sector.

A first step in the non-standard domain was to take on more risk vis-à-vis the same counterpart sector (banks). The ECB did so by providing liquidity support to banks in

---

[35] From a flow-of-funds perspective, in the Tobin-Brainard portfolio balance tradition, the demand-supply balance for different assets matters for monetary policy transmission. With an application to the Euro Area sectoral data, Jaccard (2013) shows, in a dynamic stochastic general equilibrium model, that the economic crisis in the aftermath of the financial crisis was primarily caused by liquidity factors, with strong nonlinear effects on the corporate sector.

[36] Operating in the short-term domain puts the focus on liquidity provision and liquefying less liquid claims in exchange for, and as a close substitute for, money (in a quantity perspective). The exchange of money (reserves) for longer-dated paper is typically assessed with reference to the so-called 'term premium' (in a price perspective). Such exchanges would imply intervening in the longer-term allocation of savings and capital and thereby introduce market distortions. (For instance, distortions are seen to be larger in the case of longer-dated corporate bonds than in the case of short-dated claims, such as commercial paper).

incrementally generous terms. It supplied the liquidity demand of banks in full provided they had adequate collateral, extended the range of eligible collateral, lent at longer maturities, and purchased assets issued by banks for which the risk was contained. Thus, the maturity of the longer-term lending operations (LTROs) was gradually extended from 3 months to 1 year, then to 3 years and even up to 4 years with the targeted long-term refinancing operations (TLTROs) decided in June 2014. The purchase of assets issued by banks was aimed at providing further liquidity support, through the different vintages of the Covered Bonds Purchase Programmes (CBPP1-3, launched in 2009, 2011 and 2014) and the purchases of asset backed securities (ABSs) initiated in September 2014. Covered bonds are seen as low-risk assets: they benefit from a double-recourse protection in that they constitute a claim on both the issuer and the collateral.[37] ABSs are often issued by banks and the possibility of selecting their risk profile (e.g. by purchasing only the upper and safer tranches) constitutes an additional safeguard for the central bank.[38]

A second step in the non-standard domain involved moving away from the focus on banks towards purchasing liabilities from non-bank issuers, in the first place government debt, on secondary markets. (Direct lending to the public sector or primary market purchases of its debt is itself ruled out by the prohibition of monetary financing in the Treaty on the Functioning of the European Union). The Securities Markets Programme (SMP), the OMTs[39] and the large-scale purchases of public sector securities as part of the 'Expanded Asset Purchase Programme' launched in January 2015, come in this category.

---

[37] Covered bonds and collateralized lending are both *de facto* collateralized instruments, with *a priori* two differences: (1) in the regular lending operations the collateral is generally liquid, while the covered bonds, which are themselves liquid, contain illiquid pledges (also originated by the borrower); and (2) the maturity is *a priori* longer in the case of assets purchased outright than in lending operations. However, those differences were attenuated by the extension of the range of eligible collateral in the lending operations to less liquid assets and of their maturity.

[38] Unlike covered bonds, ABSs do not remain on the banks' balance sheets and thus they do not benefit from double recourse protection whereby the claim would be both on the issuer and on the collateral.

[39] The motivation behind the SMP, which was active during 2010-2011, differed from that of quantitative easing such as in the case of the US Federal Reserve's Large Scale Asset Purchases (LSAP). The Federal Reserve purchased federal bonds with the intention of lowering term premia and long-term yields, hence providing additional monetary accommodation. By contrast, the ECB aimed at countering dysfunctional markets and intervened in selected government bond markets at the national (sub-federal) level that were regarded as important elements in monetary policy transmission. This motivation was also paramount for the OMTs launched in the summer of 2012 (see above). Unlike the SMP, potential purchases under the OMTs were ex ante unlimited, in a maturity bracket limited to up to 3 years, and made conditional on countries entering an adjustment programme in order to ensure solvency.

As illustrated in the matrix in Figure 5, a third potential step in the non-standard domain is a move towards purchases of the liabilities of the non-financial private sector directly, bypassing the banking sector's balance sheet constraints. This could involve, for instance, purchasing (non-financial) corporates' liabilities, such as commercial paper or corporate bonds. The Federal Reserve and the Bank of England purchased such assets in the early phase of the financial crisis. The central bank risk is reduced if those assets benefit from guarantees or at least if they are of short maturity and are traded in liquid secondary markets as in the case of commercial paper, a traded short-term debt instrument issued by very large companies usually benefiting from well-established external ratings. In fact, the ECB added state-backed company bonds to the list of assets eligible for purchase under its EAPP in July 2015. To some extent, the purchase of ABSs discussed above already involved moving to the non-financial sector.[40]

Another way of moving the focus of central bank action to the non-financial sector while keeping the balance sheet risk limited would be purchasing or refinancing commercial bills (including traditional trade bills or bills of exchange). The rediscounting of trade bills was the most traditional instrument for liquidity provision by central banks over the centuries (before the onset of repo securities operations in Europe and before the practice of using Treasuries for open market operations in the US). With the advent of the Euro, the Bundesbank, the Banque de France and other central banks in the Euro area discontinued the instrument in 1998. At the Bank of England, commercial bills ceased to be eligible for rediscount in 2005, but the experience of the early 1980s when the central bank purchased massive amounts of commercial bills and encouraged their rediscounting shows that a central bank can successfully revive the market for trade bills and its use in monetary policy. The collateral underlying trade bills, trade credit,[41] thus features in Figure 5, as a short-term liability of non-financial corporations. In a way, trade credit is 'securitised' in the form of a trade bill. The advantage relative to an ABS is that the trade bill is a short-term, self-liquidating instrument, whose financial risk is further limited in

[40] Even if the ABSs are often issued by banks or associated special purpose vehicles, they package loans or other claims (credit cards, leasing, and possibly trade receivables) that are vis-à-vis non-financial private agents. ABSs are thus an intermediate case in the matrix.

[41] A trade receivable or payable (i.e. trade credit) is a bookkeeping entry for an intercompany sale not yet paid. A trade bill is the corresponding paper, which can be used as a payment instrument vis-à-vis a third party.

that it is guaranteed by multiple signatures. The trade bill is indeed typically endorsed by both the seller and the buyer, and discounted and underwritten by a bank.

Transmission channels

A flow-of-funds framework based on the sectoral accounts facilitates the analysis of the quantity flows in an economy,[42] and therefore of how changes in the size as well as in the composition of the central bank balance sheet are transmitted to financial instruments held and issued by other sectors in the economy. This section provides some examples of the main financing channels, while a deeper analysis could include the effects on both the liability side and the asset side of the balance sheets of the various economic sectors.

From a monetarist perspective, balance sheet measures operate by affecting broad monetary aggregates. The simple textbook 'money-multiplier' characterization of central bank balance sheet actions captures the extent to which central bank (outside) money translates into broad (inside) money, that is, the quantity of money in the money-holding sector (which includes households, non-financial corporations and – in part – the government, as well as non-bank financial intermediaries). However, the creation of inside money is not a stable function of central bank money but rather depends both on the banks' capacity to supply credit and on the demand for loans by the private sector (which in turn creates deposits). Hence, central bank support to the broad monetary aggregates can operate via lending liquidity to banks, thus relying on the bank-lending channel for the transmission to the wider economy, or alternatively by purchasing assets from non-banks, thus placing money directly in the hands of the asset holders. In the case of asset purchases, the holding sector (not the issuing sector) of the assets matters in the first place for the impact on broad money aggregates (Christensen and Krogstrup, 2014). If the assets are purchased from the non-bank sectors, broad money increases by the amount of the purchases. Broad money can further increase indirectly depending on the

[42] See for instance Winkler and de Rougemont (2013) for an exposition of the use of sectoral accounts in the Euro Area.

portfolio-rebalancing channel (that is, the way in which the holding sector would rebalance its portfolio with the cash received in exchange for the assets purchased).[43]

In the case of liquidity provision to the banks, however, the impact on broad money is less straightforward as it depends on the functioning of the bank-lending channel. Indeed, broad money, the quantity of money in the money-holding sector, itself depends on money creation in the banking system. Here, stock-flow relationships matter in various places as the balance sheet situation of financial and non-financial sectors influences the capacity of the bank-lending channel to operate. The latter may be impaired in the presence of deleveraging pressures, debt overhang and capital constraints. From a flow-of-funds perspective, again the issuing sector matters for the transmission of central banks' interventions in assets markets and for the portfolio rebalancing between money, bonds and other assets, in addition to the holding sectors (as in Tobin, 1969).

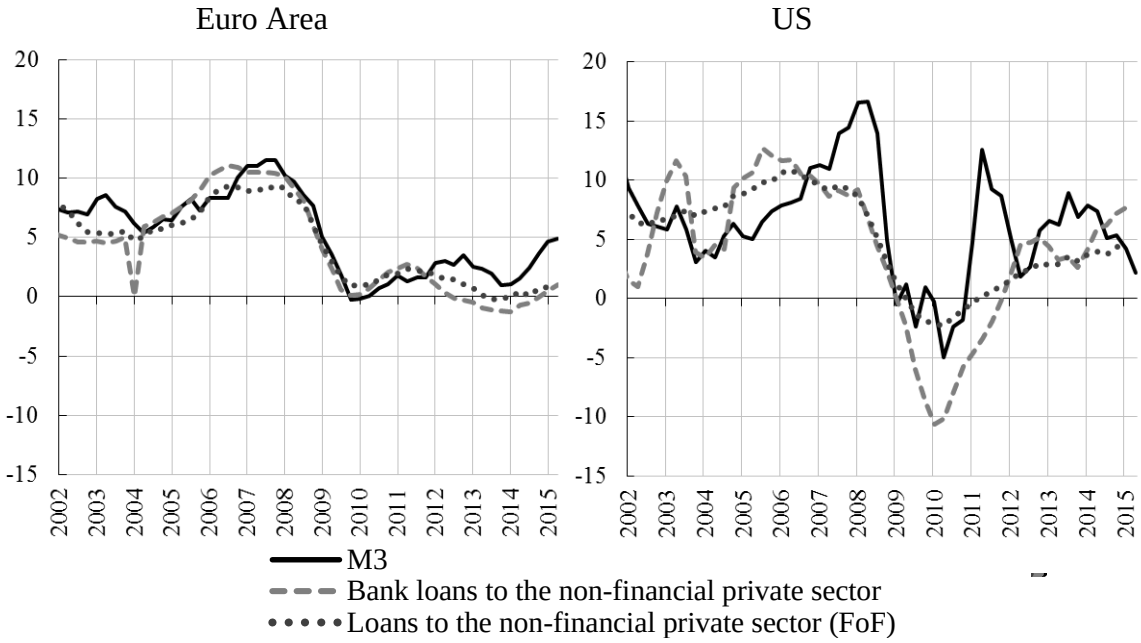
Figure 7 shows the development of broad money and loans (bank loans and broader flow-of-funds aggregates) for the Euro Area and the US. In the first phase of the financial crisis bank lending appeared to contract much more sharply in the US with much more rapid deleveraging (especially that related to mortgage defaults and repossessions) in the household and banking sectors, followed by a gradual recovery in money and lending growth. In the Euro Area, a double-dip profile can be observed, with a renewed decline in money and lending after the intensification of the sovereign debt crisis in 2011. This suggests that the ECB's liquidity support via the LTROs (then of nearly EUR 1 trn) – and the SMP, CBPPs and OMTs – did not translate into a durable recovery in bank lending at the time.[44] This does not mean that such measures were not decisive in stabilizing the banking system and addressing tail risks in impaired bank and government funding markets. The measures were seen to prevent disorderly bank deleveraging and much more adverse counterfactual scenarios. The lack of a durable recovery in bank lending in

[43] See Carpenter et al. (2013) for a flow-of-funds based assessment of the asset purchases of the US Federal Reserve, as well as Thornton (2012) for a sceptical view on the portfolio balance channel in the case of government bonds. Bertaut et al. (2011) estimate asset demand equations for bank deposits, treasury securities and corporate debt in a portfolio balance model.

[44] This is also documented by the econometric literature. For instance, exploiting data on transactions among banks and between banks and the Eurosystem, Giannone et al. (2012) find a small but significant effect of the ECB's increased role as a financial intermediary on bank lending.

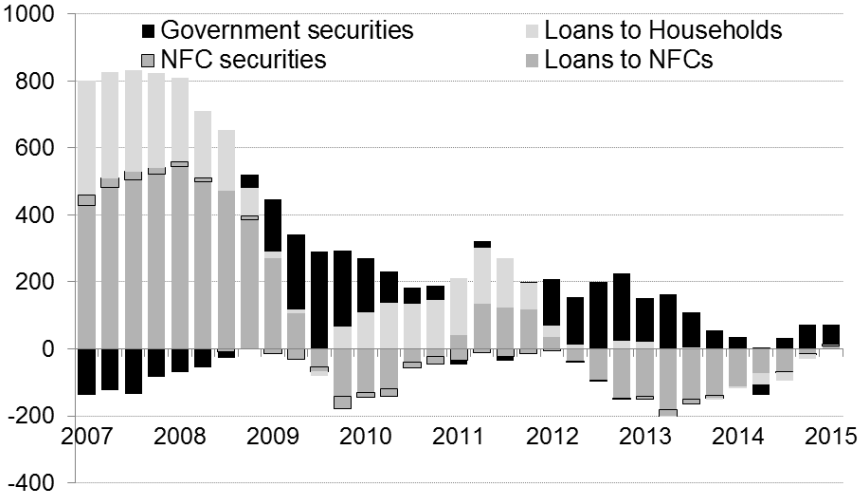
the Euro Area despite the ECB's measures raises the question of what use banks made of the massive liquidity injection, in particular through the LTROs.

Figure 7: Money and credit growth



Last observations: 2015 Q1.
Notes: Annual percentage changes. "Loans to the non-financial private sector", based on flow-of-funds (FoF) data, include both bank and non-bank loans. "Bank loans" are by Monetary Financial Institutions.
Source: ECB, Federal Reserve, Euro Area and US financial accounts.

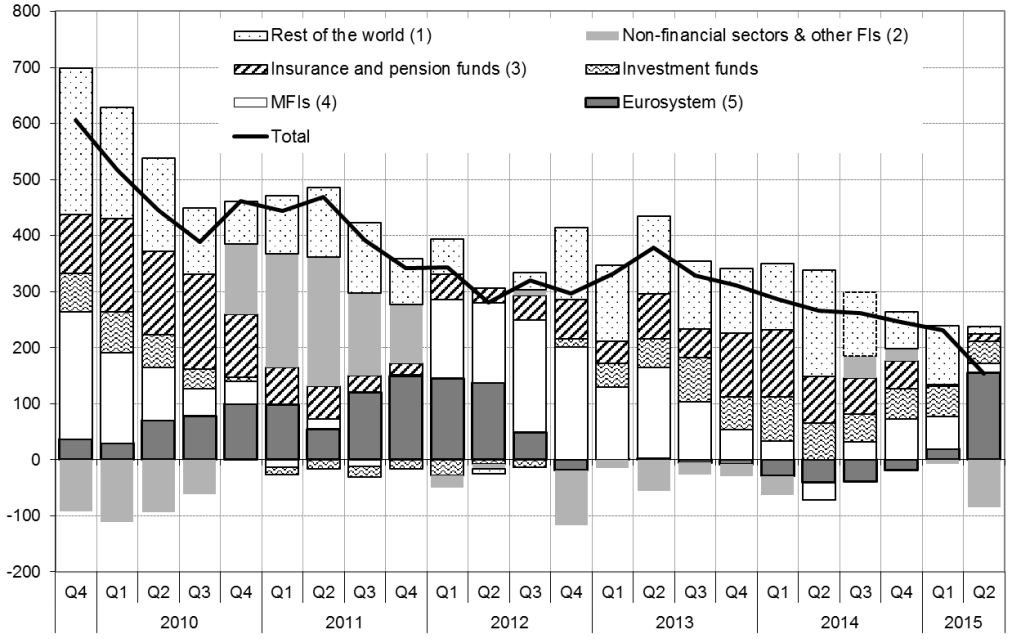
Figure 8: Net acquisitions of loans and debt securities of the non-financial sector by Monetary Financial Institutions (4-quarter sums, bn euro)



Last observations: 2015 Q1.
Source: ECB.

Figure 8 shows that banks invested heavily in government securities during the period of one-year LTROs in 2009-10 and again at the time of the two three-year LTROs in December 2011 and February 2012, coinciding with weak or negative loan flows to households and non-financial corporations. Hence, from a flow-of-funds perspective it can be argued that the two longer-term lending operations appeared more effective in supporting government bond markets than in supporting bank lending.

Figure 9: Net acquisitions of Euro Area government debt securities by sector (4-quarter sums, bn euro)



Source: ECB.
Last observations: 2015 Q2.
Notes: 1) For the observation of 2015 Q2, acquisitions of non-Monetary Financial Institutions debt securities by non-residents, (2) Households, non-financial corporations, government and other financial institutions (OFIs) other than investment funds. For 2015 Q2, it also includes insurance corporations and pension funds (ICPFs) and investment funds. Given its residual nature, it also covers valuation differences, estimation errors and statistical discrepancies, (3) For 2015 Q2, included together with the non-financial sectors residually, (4) Monetary Financial Institutions (including Money Market Funds) other than Eurosystem, 5) 2012 Q4 data include government bonds received by the Irish central bank as a result of the liquidation of Irish Resolution Corporation.

Figure 9 depicts the net purchases of Euro area government bonds across sectors. Through the 'active' SMP period between 2010 Q3 and 2012 Q3, the Eurosystem appeared to compensate for part of the reduced net purchases (or net selling) of government bonds by banks for most of the period. For countries under stress, clearly the

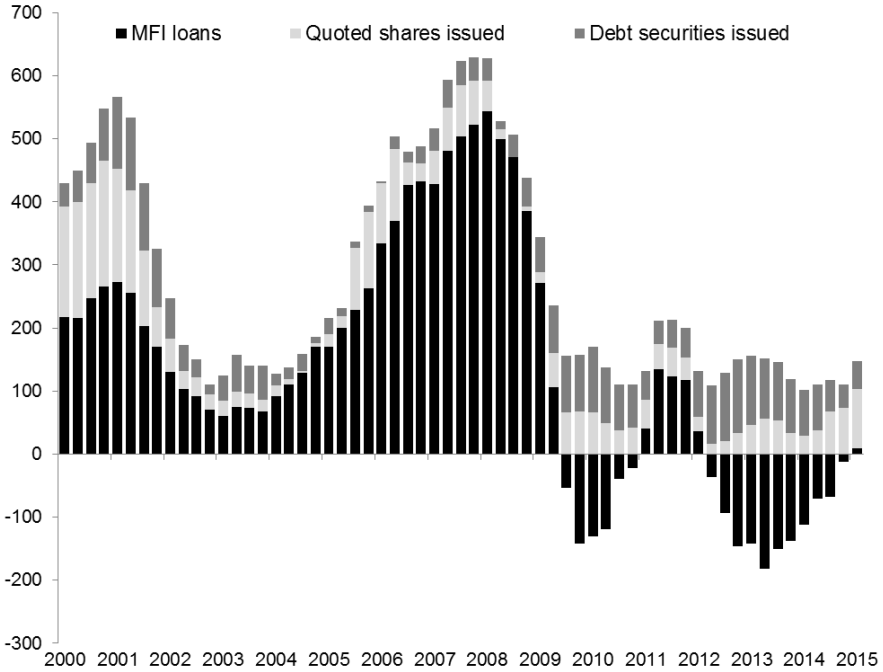
substitution effects between central bank purchases and bank purchases were even more pronounced. Some other investors also reduced purchases or turned into net sellers as well (notably foreign investors, investment funds and insurance/pension funds). Banks then stopped being net sellers and acquired government bonds again massively in 2012, with the liquidity provided by the ECB through its LTROs in late 2011 and early 2012. Other sectors followed. It is noteworthy that the reduction in government bond purchases over 2010-2011 coincided with a moderate recovery in bank lending (as seen in Figures 7 and 8), prior to the renewed deterioration in the wake of a worsening of the sovereign debt crisis during 2011-2012.

To some extent, the longer-term refinancing operations could be seen as an indirect channelling of funds in support of bond markets under stress, working to compress government bond yields while also supporting private bond markets as a side effect. However, only the more direct, even if conditional, commitment underlying the OMTs in the summer of 2012 brought about a lasting reduction in risk premia and a return of domestic and foreign long-term investors into government bonds of stressed Euro Area countries. After a temporary reversal in those trends, the introduction of quantitative easing in early 2015 had similar effects.

The transmission to non-financial corporations

Even though most of the ECB's non-standard measures were motivated by supporting the monetary transmission mechanism and ultimately credit to the real economy, bank lending to the private sector and non-financial corporations, in particular, continued to contract over recent years, against the background of low demand as well as continued deleveraging needs and increased regulatory demands on banks. The fact that the ECB liquidity provision to banks mostly 'spilled over' into the bond markets (rather than being used for bank lending), together with the need for bank balance sheet repair and regulatory pressure, implied a disintermediation in the financing of the Euro Area economy, that is, a shift away from bank-based financing towards more market-based financing. Figure 10 reflects this shift from the perspective of the non-financial corporate sector.

Figure 10: External financing of the corporate sector (4-quarter flows in bn Euro)



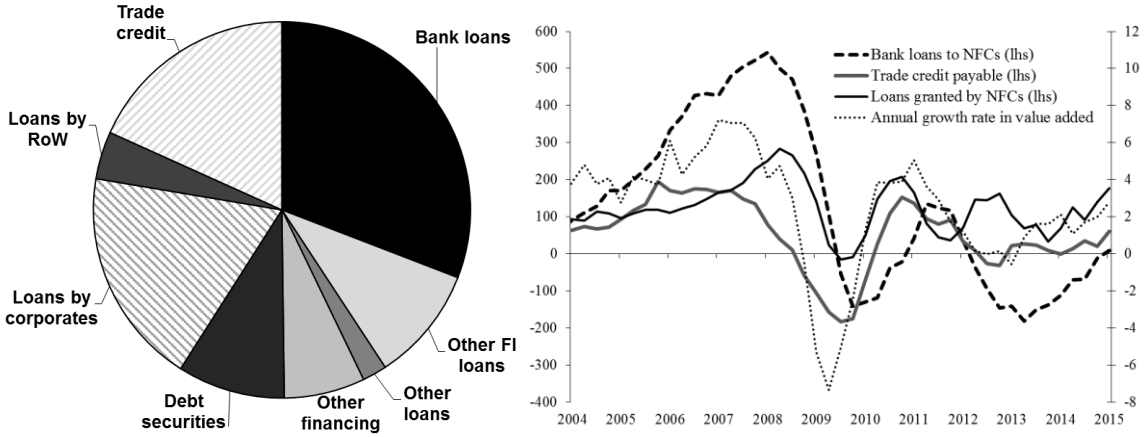
Last observations: 2015 Q1.
Note: The sources of external financing encompass borrowing from Monetary Financial Institutions (MFIs) and net issuance of debt securities and quoted shares.
Source: ECB.

Market-based funding (in stock markets and via corporate bond issuance) substituted to a significant extent for the shrinking of bank loans both in the wake of the Lehman Brothers shock in 2009-2010 and, after a short period of normalization, again after 2011-12. However, it needs to be recognized that most SMEs do not have access to bond or equity markets and remain largely bank-dependent for their financing. Thus, the ECB decided to make liquidity provision to banks conditional on lending to the non-financial private sector in the so-called targeted longer-term refinancing operations launched in 2014.[45] At the same time, attempts were made to foster the unlocking of alternative sources of funding, such as by reviving the securitization markets, which had traditionally been of limited relevance for SMEs. Instead, apart from borrowing from banks, SMEs rely to a large extent on funds lent by other firms for their external financing. This does not show up in consolidated data as in Figure 10. Figure 11 uses instead non-consolidated data for the corporate sector, that is, it distinguishes intra-sector funding.

[45] Such operations have some similarity with the Bank of England's 'funding for lending' scheme. The first targeted operation on 18 September 2014 faced a relatively low demand of 82.6 bn Euro, despite its unprecedented long maturity of four-year.

Figure 11: Corporate debt finance (including inter-company claims)

Stock of Corporate non-consolidated debt Trade credit, loans from NFCs and banks



Sources: Eurostat, ECB (internal estimates for trade credit).
Last observations: 2015 Q1. Notes: The corporate non-consolidated debt amounted in total to EUR 14.0 trillion in 2015 Q1. Corporates are non-financial corporations (NFCs). Bank loans are loans from Monetary Financial Institutions. FI: Financial Institutions.

Figure 11 (left-hand side) only considers debt instruments (i.e. abstracting from quoted shares and unquoted equity) in a non-consolidated breakdown. It appears that bank loans only make up for 1/3 of external debt financing (outstanding amounts), but this is significantly more than debt securities. At the same time, inter-corporate claims constitute altogether a larger source of funding for corporates. Such claims include trade credit and inter-company loans, both important elements in the financial supply chains and inter-linkages in the corporate world.

Figure 11 (right-hand side) shows that NFC loans to other NFCs and trade credit fulfilled a stabilising role in the financial crisis: they contracted much less than bank lending and less than activity. Carbó-Valverde et al. (2014) show on the basis of firm-level Spanish data that credit-constrained SMEs depend on trade credit, but not bank loans, and that the intensity of this dependence increased during the financial crisis. Unconstrained firms, in contrast, rely more on bank loans and less on trade credit.

This underlines the critical role of trade credit (between corporates) offering relationship-based financial buffers at times when the bank lending channel is impaired and SMEs can rely less on relationship lending from banks. There is a widespread perception that SMEs

in many countries remain liquidity- and credit-constrained, with limited cash flows and banks cutting lending and credit lines. At the same time, ample provision of central bank liquidity seems to have filtered through to SMEs to only a small extent. In addition, the at times buoyant stock markets are important for large enterprises, not SMEs. By contrast, large corporates continue to hoard cash. Among the portfolio of non-standard measures implemented or considered by central banks around the globe, it remains somewhat of a puzzle that no attention has been paid to rediscovering or re-engineering an instrument like the commercial bill (backed by trade credit). Discounting commercial bills was the most standard and traditional means of refinancing the real economy in Europe as recently as 1999, until the onset of monetary union. It was used in particular in Germany, France and Austria and dismantled for purposes of harmonisation in monetary policy operations across the Euro Area.

4 Conclusion

This paper has motivated and analysed the role of 'balance sheet of last resort' taken by a central bank in crisis times, as well as the associated notion of 'contingent easing'. It has reviewed the concept of balance sheet instrument, analysed its use by the ECB during the financial crisis in comparison with the US Federal Reserve, and used flow-of-fund frameworks (the sectoral Euro Area accounts and the accounts of the TARGET2 payment system).

At times when the financing of the economy is impaired and other economic sectors are deleveraging, there is a rationale for the central bank to act as balance sheet of last resort by leveraging up and by taking risk onto its own balance sheet to re-establish stability. In a currency union such as the Euro Area, such leveraging up and transfer of risk can take wide proportions at the national level. The actual developments in the size and composition of the balance sheet are actually insufficient to assess the central bank's role as balance sheet of last resort. The balance sheet instrument also operates through measures of a contingent nature that have no direct and foreseeable reflection in the balance sheet but have the potential to change the perception of risk and reduce systemic

risks in the economy. To capture this, the standard concepts of ‘quantitative and ‘credit easing’ need to be complemented by the concept of ‘contingent easing’.

The ECB’s fixed-rate full allotment mode in the refinancing operations and its Outright Monetary Transactions can be characterised as ‘contingent easing’ measures, both implying that a contraction in the Eurosystem balance sheet at times when other sectors are deleveraging is not necessarily contractionary for the economy. However, the analysis of the interaction between the balance sheets of the Eurosystem and of other economic sectors over time has shown that towards the year 2014 the ECB’s credit easing and ‘contingent easing’ measures proved insufficient to halt the deleveraging in the Euro Area economy and the associated downward risks to price stability over the medium term. Such analysis could motivate a move to quantitative easing – a step that the ECB eventually took at the turn of 2015 – but it could also suggest that the central bank could explore other measures, such as measures that more directly channel the central bank funds to the real economy rather than to banks and the financial markets.

In this respect, the sectors that are the issuers of the underlying claims targeted in the monetary policy operations matter for their economic impact. A typology of the balance sheet measures is drawn that shows how the ECB’s measures were focused primarily on banks and then also on the government sector, and to a more limited extent on the non-financial private sector. A flow-of-funds framework further reveals the channels of transmission of the measures. It suggests that banks invested central bank money largely in sovereign bonds, while disengaging from corporate lending. This calls for a review of the way the central bank distributes liquidity to the economy, when the redistribution via banks is impaired and may not reach the real economy. In particular, instruments closer to the funding needs of the corporate sector such as the discounting of commercial bills used by European central banks prior to the introduction of the Euro may be worth re-visiting in this light. Arguably, such instruments also provide lower risks on the central bank balance sheet and better properties in terms of macro-prudential concerns, compared to some of the non-standard measures that central banks adopted in the wake of the crisis.

References

Aglietta, M. (2014), 'L'aggiornamento des politiques monétaires', in 'Les banques centrales : crises et défis', *Revue d'Economie Financière* 113, Association d'Economie Financière.

Allen, W. (2014), 'Eligibility, bank liquidity, bank credit and macro-prudential policy', presented at the ECB on 7 July 2014, mimeo.

Bertaut, C., DeMarco, L. P., Kamin, S. and R. Tryon (2011), 'ABS Inflows to the United States and the Global Financial Crisis', *International Finance Discussion Papers* No. 1028, Board of Governors of the Federal Reserve System, Washington.

Bindseil, U. and Jabłecki, J. (2013), 'Central bank liquidity provision, risk-taking and economic efficiency', *ECB Working Paper* 1542.

Bridges, J., Cloyne, J., Tuckett, A. and Thomas, R. (2016), 'The analysis of money and credit during the financial crisis – the approach at the Bank of England', in D. Cobham (Ed.), *Monetary Analysis at Central Banks*, Palgrave Macmillan.

Brunnermeier, M. and Y. Sannikov (2012), 'Redistributive Monetary Policy', Jackson Hole Symposium, 1 September.

Bordes, C. and R. Raymond (2014), 'Les banques centrales : crises et défis', *Revue d'Economie Financière* 113, Association d'Economie Financière, 302 pages.

Carbó-Valverde, S., Rodríguez-Fernández, F., and Udell, G. (2015), 'Trade credit, the Financial Crisis and Firms Access to Finance', *Journal of Money, Credit and Banking*, vol. 47.

Carpenter, S., Demiralp, S., Ihrig, J and E. Klee (2013), 'Analyzing Federal Reserve Asset Purchases: From whom does the Fed buy?', *Finance and Economics Discussion Series* 2013-32, Federal Reserve Board, Washington.

Christensen, J. and S. Krogstrup (2014), 'Swiss unconventional monetary policy: lessons for the transmission of quantitative easing', *Working Paper Series* 2014-18, Federal Reserve Bank of San Francisco.

Cobham, D., and Kang, Y. (2012), 'Financial Crisis and Quantitative Easing: Can Broad Money Tell Us Anything?', *The Manchester School*, Supplement 2012, 54–76.

Cobham, D. (2015), 'Multiple Objectives in Monetary Policy: A de facto Analysis for 'Advanced' Countries', *The Manchester School*, Supplement 2015, 83–106.

Cour-Thimann, P. (2013), 'Target Balances and the Crisis in the Euro Area', *CESifo Forum* 14, Special issue, April.

Cour-Thimann, P. (2014), 'Monetary Policy and Redistribution: Information from Central Bank Balance Sheets in the Euro Area and the US', *Review of Economics*, Vol.64 (3), 293-324.

Cour-Thimann, P. and Winkler, B. (2012), 'The ECB's non-standard monetary policy measures: the role of institutional factors and financial structure', *Oxford Review of Economic Policy*, Vol. 28, No. 4, 765-803.

Durré, A. and H. Pill (2012), 'Central bank balance sheets as policy tools', in 'Are central bank balance sheets in Asia too large?', *BIS Papers* No 66, October.

European Central Bank (2013), 'Central bank balance sheet expansion and financial strength in crisis times: the case of the Euroystem', box in the *Monthly Bulletin*, September.

European Central Bank (2015), 'The role of the central bank balance sheet in monetary policy', *Economic Bulletin*, Issue 4, 17 pages.

Engen, E., Laubach T. and D. Reifschneider (2015), 'The Macroeconomic Effects of the Federal Reserve's Unconventional Monetary Policies', *Finance and Economics Discussion Series* 2015-005. Board of Governors of the Federal Reserve System, (U.S.). http://dx.doi.org/10.17016/FEDS.2015.005

Friedman, B. (2015), 'Has the Financial Crisis Permanently Changed the Practice of Monetary Policy?, Has It Changed the Theory of Monetary Policy?', *The Manchester School*, Supplement 2015, 5–19.

Giannone, D., Lenza, M., Pill, H. and Reichlin, L. (2012), 'The ECB and the interbank market', *Economic Policy*, Vol. 122, 467-486.

Girón, C., and Mongelluzzo, S. (2013), 'Bank Leverage and the Credit Cycle in the Euro Area: A Bayesian Semi-parametric Approach', in Winkler, B., van Riet, A. and P. Bull (eds), *A Flow-of-funds Perspective on the Financial Crisis, Vol. I*, Money, Credit and Sectoral Balance Sheets, Palgrave Macmillan, Basingstoke, New York, 203-235.

Girón, C. and Rodríguez-Vives, M., 'The provision of leverage by Central Bank: A balance sheet perspective', forthcoming in *ECB Statistical Working Paper Series*.

Girón, C. and Rodríguez-Vives, M. (2015), 'Leverage interactions: a national accounts approach', *ECB Statistical Working Paper Series*.Jaccard, I. (2013), 'Liquidity constraints, risk premia, and the macroeconomic effects of liquidity shocks', *ECB Working Paper Series* No. 1525.

Lenza, M., Pill, H., and Reichlin, L. (2010), 'Monetary Policy in Exceptional Times', *Economic Policy*, 62, 295–339.

Papademos, L. and Stark, J. (2010), "Enhancing monetary analysis", European Central Bank, 478 pages.

Praet, P. (2012), 'Deleveraging and monetary policy', speech at the Hyman P. Minsky Conference on Debt, deficits and unstable markets, Berlin, 26 November.

Praet, P. Cour-Thimann, P. and Heider, F. (2014) 'Ensuring the transmission of the policy signal: a review of the ECB's monetary policy from 2007 to 2013', *Spanish Economic and Financial Outlook*.

Thornton, D. (2012), 'Evidence on the Portfolio Balance Channel of Quantitative Easing', Working Paper Series 2012-015A, Federal Reserve Bank of St. Louis.

Tobin, J. (1969), 'A General Equilibrium Approach to Monetary Theory', *Journal of Money, Credit and Banking*, vol. 1, issue 1, 15–29.

Trichet, J. C. (2010), 'State of the Union: The Financial Crisis and the ECB's Response between 2007 and 2009', *Journal of Common Market Studies*, 48, Annual Review, 7–19.

Winkler, B. (2010) 'Cross-checking and the Flow of Funds', in L. Papademos and J. Stark (eds), Enhancing Monetary Analysis, Frankfurt am Main, European Central Bank, 355–80.

Winkler, B. and de Rougemont, P. (2013) 'The Financial Crisis in the Light of the Euro Area Accounts', in B. Winkler, van Riet, A. and P. Bull (eds), *A Flow-of-Funds Perspective on the Financial Crisis*, Vol. II: Macroeconomic Imbalances and Risks to Financial Stability, Palgrave Macmillan, Basingstoke, New York, 155-198.