



Pentti Pikkarainen

Central bank liquidity operations during the financial market and economic crisis: observations, thoughts and questions



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The views expressed in this paper are those of the author and do not necessarily reflect the views of the Bank of Finland or the Ministry of Finance.

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Abstract

The paper concentrates on illustrating and assessing central banks' liquidity operations during the crisis that started in August 2007. In addition to the ECB, the central banks of Sweden, Switzerland, the United Kingdom, Australia, Japan, Canada and the United States are analyzed. During the crisis the liquidity operations of central banks have converged. In many cases, central bank balance sheets have undergone extremely strong growth. The actions by central banks raise a number of questions concerning exit from the measures taken, the impact of the measures, central banks' risks and their governance structure.

Keywords: central banks, liquidity operations, balance sheets

JEL classification numbers: E52, E58, E32, G01

Keskuspankkien likviditeettioperaatiot rahoitusmarkkina- ja talouskriisin aikana: havaintoja, pohdintoja ja kysymyksiä

Suomen Pankin keskustelualoitteita 20/2010

Pentti Pikkarainen
Rahapolitiikka- ja tutkimusosasto

Tiivistelmä

Tässä keskustelualoitteessa kuvataan ja arvioidaan keskuspankkien likviditeettioperaatioita elokuussa 2007 alkaneen kriisin aikana. Euroopan keskuspankin lisäksi kuvauksen ja arvioinnin kohteena ovat Australian, Ison-Britannian, Japanin, Kanadan, Ruotsin, Sveitsin ja Yhdysvaltojen keskuspankit. Keskuspankkien toimissa kriisin aikana ei ole korostunut niinkään erilaisuus tai heterogeenisuus, vaan pikemminkin keskuspankkien likviditeettioperaatiot ovat samankaltaistuneet. Keskuspankkien taseet ovat kasvaneet monessa tapauksessa erittäin voimakkaasti.

Avainsanat: keskuspankit, likviditeettioperaatiot, tase

JEL-luokittelu: E52, E58, E32, G01

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1 Introduction

During the ongoing financial and economic crisis that began in August 2007, a number of strong, and in many cases unprecedented, non-standard measures have been taken in the various segments of economic policy. With regard to monetary policy, central banks have sharply cut their policy rates, and interest rates are currently at a record low level. As well as interest rate policy, central banks have also implemented a range of measures to provide additional liquidity both in their domestic markets (economic areas) and with respect to other economic areas.

The macroeconomic situation is forecast to improve gradually, at least when viewed in terms of the pace of output growth. In many countries, however, unemployment is very high. Financial markets remain vulnerable, particularly due to concerns over the funding and sustainability of public finances. Even so, governments and central banks in many countries are phasing out the policies pursued during the crisis. The central banks that have been the first to do so have already increased their policy rates or otherwise tightened their monetary policy stance. A stepwise unwinding of non-standard measures in liquidity management is under way. On the other hand, some central banks have actually continued to expand certain non-standard measures.

The present paper concentrates on illustrating and assessing central banks' liquidity operations during the crisis. In addition to the European Central Bank (ECB) / Eurosystem, also presented and analysed are the central banks of Australia, the United Kingdom, Japan, Canada, Sweden, Switzerland and the United States. As the crisis starts to bottom out little by little, it will be possible to gradually proceed to describe and evaluate the measures taken. At the present juncture, however, the analysis is inevitably of a highly tentative nature. Thorough research on the actions of central banks and other policymakers and their implications during the crisis is sparse. The time for such research will come later.

This paper is structured as follows: Chapter 2 recaps the fundamentals of monetary policy, especially from the perspective of liquidity management. Chapter 3 looks into central bank measures in the area of liquidity management in the eight countries mentioned above. In addition to the liquidity operations, the development of central bank balance sheets is also reviewed. Chapter 4 singles out questions raised by the measures taken and the consequently strongly expanded balance sheets. At this stage, only indicative answers or tentative reflections can be offered for many of these questions. Chapter 5 briefly summarises the key findings.

2 Central bank liquidity management: a recap of fundamentals

Through their activities, central banks seek to influence one or other macroeconomic variable, generally either inflation or output (economic growth) or a combination of the two. In striving towards this final target, the central bank will normally seek to influence a short-term money market interest rate so that it is configured in a way consistent with the desired development of the final target.¹ In many cases, the overnight rate is the money market rate that central banks are most keen to steer. This interest rate is described as the *operational target* of monetary policy. Of the central banks reviewed in this paper, the overnight rate is the operational target of all apart from the ECB and the Swiss National Bank. The ECB has not given a clear definition of its operational target, although in some of its statements it has implied that it is the overnight rate. The Swiss National Bank's operational target is the three-month unsecured money market rate.

Central banks seek to influence their operational targets via either *open market operations* or *standing facilities* or a combination of the two. In conducting open market operations, they actively regulate the amount of central bank liquidity in the banking system so that the operational target is as close as possible to the target adopted.² The key policy rate of open market operations is generally close to the level of the operational target.

In the daily recourse to standing facilities, the initiative lies with the banks, not with the central bank, as in the case of open market operations. Standing facilities may include two elements: the marginal lending facility and the deposit facility. The interest rate on the marginal lending facility is higher than the key policy rate, and therefore central bank funding provided through this channel is somewhat more expensive for banks than funding obtained via the main open market operation. The interest rate on the deposit facility, in turn, is lower than that on the main open market operation, and banks are therefore not encouraged to use the deposit facility, but to invest their excess reserves in the market.

Many central banks have a *minimum reserve system* in place. Of the central banks covered by this study, Australia, Canada and Sweden do not operate a minimum reserve system. Previously, such a system was seen as an instrument for influencing the supply of bank credit. This is not the case at present. This is primarily due to the fact that reserve holdings are remunerated at a rate of interest

¹ Bindseil (2004) provides a thorough presentation of the operational implementation of monetary policy. It also provides an accurate analysis of various monetary policy instruments. Mitlid and Vesterlund (2001) give a good brief account of the operational framework for monetary policy.

² At the time when open market operations were introduced, they were as a rule conducted as outright asset purchases and sales, but currently they normally take the form of either repos (repurchase agreements on securities) or collateralised credit (Bindseil 2004).

equal to the market interest rate or the central bank policy rate. Minimum reserve systems normally include averaging provisions. This means that banks may fulfil their reserve requirements flexibly within the maintenance period. Banks can thus make use of this flexibility according to their liquidity situation. Consequently, a minimum reserve system with an averaging provision operates as a buffer for liquidity shocks, smoothing fluctuations in the overnight rate.

Whenever banks receive central bank credit via open market operations, standing facilities or in the form of emergency funding, the central bank requires them to provide *collateral* in security for the credit extended. Likewise, collateral is required for intraday credit granted within the payment system. Some central banks require the same collateral for open market operations, standing facilities and intraday credit. This is the approach adopted by the Eurosystem. But this is not always the case. The US central bank, the Federal Reserve (Fed), for example, accepts a more limited range of collateral for its open market operations than for its standing facilities.

The central bank must define those financial institutions that are its 'customers': in other words, those financial institutions that have direct access to central bank financing. The *range of counterparties* of some central banks may vary according to the type of operation. The range of counterparties in the Fed's open market operations, for example, is very limited (about 20 banks), but its standing facilities are accessible to a broad set of banks. The Eurosystem has a very broad range of counterparties, and in the pre-crisis period it only restricted banks' access to fine-tuning operations.

The discussion above has provided an overview of the standard central bank model for liquidity steering that is currently applied in a variety of forms.³ During the crisis that began in August 2007, however, central banks have applied and remoulded this model in a variety of ways. The standard model allows reshaping in respect of many of its features: in respect of open market operations, standing facilities, the minimum reserve system, the range of counterparties and collateral policy.

During the crisis, it has been necessary for central banks to consider new means of influencing the state of the financial markets in an environment in which the policy rate is zero or close to it. Many central banks have, in fact, in one way or another abandoned the standard model described above, which seeks to use liquidity operations to influence the operational target, and thereby the final target. In addition to the traditional operational target, many central banks have also begun to strive for other objectives: they have sought to influence much longer-term interest rates than the overnight rate, thereby influencing the yield curve; they have sought to influence various risk premia in the financial markets;

³ The standard model is often referred to as a corridor model. This is because the interest rates on the marginal lending and deposit facilities provide a corridor, ie a ceiling and a floor, for short-term (normally overnight) interest rates.

they have sought to influence not only prices (interest rates), but also access to finance; they have sought to influence the functioning of the financial markets (improve market liquidity, reduce market uncertainty).

The pursuit of these objectives has necessitated the introduction of new instruments and procedures, with central banks implementing non-standard operations during the crisis, referred to officially as *non-standard monetary policy operations* or *unconventional monetary policy operations*. No unambiguous definitions exist for these concepts, and some may use them to mean the same thing. The measures can possibly be classified into two categories: some can be interpreted as variations of the previously applied operational framework, while others are clearly exceptional compared with the normal operational framework.

Outright asset purchases in the financial markets, with the aim of influencing other than the operational target of monetary policy, are currently considered as being non-standard operations.⁴ In conducting these purchases, central banks acquire securities for their portfolios directly from the financial markets. The assets may be debt securities issued by either the public or the private sector. In buying public sector debt securities in the markets, the central bank seeks to influence the yield curve. In buying private sector debt securities, the central bank seeks to influence interest rate spreads (risk premia). Both measures also impact on the availability of financing.

Outright asset purchases usually cause the balance sheets of central banks to grow. Accordingly, the volume of central bank liquidity in the economy tends to expand. The composition of central bank balance sheets also changes as a consequence of these operations.

As Borio and Disyatat (2009) point out, operations that influence the size and composition of central bank balance sheets are not new or exceptional in the sense that they have not been conducted before; they have, and in large amounts. Central bank interventions in foreign exchange markets, for example, belong to this category. In performing foreign exchange interventions, central banks seek to influence the exchange rate (ie the price of the currency), and the operations have an impact on the size and composition of central bank balance sheets. What is new or exceptional in the balance sheet operations presently being conducted is that they have been carried out in market segments in which central banks do not normally operate and with motives that deviate from normal.

⁴ These operations have also been conducted before: see eg Bindseil (2004) and Kuttner (2006). Kuttner also endeavours to assess the impact of outright asset purchases on the yield curve.

3 Liquidity measures implemented by central banks during the crisis

This section reviews the actions during the crisis of the central banks of the eight countries (economic areas) mentioned above. Previous comparative studies have mainly been conducted by the Bank for International Settlements (BIS), the International Monetary Fund (IMF) and the ECB.

3.1 Comments on the literature

The Committee on the Global Financial System (CGFS), acting in connection with the BIS, published a report on the subject as early as August 2008. This deals with the actions of seven central banks (excluding Sweden) during the crisis. However, a lot has happened since publication of the report, which only covers the early stages of the crisis. The CGFS' work has been carried on within the BIS by Borio and Nelson (2008) and Borio and Disyatat (2009), who have focused on analysing non-standard operations.

The IMF has published three reports on the theme: Chailloux et al (2008), Stella (2009) and Klyuev et al (2009). The analysis by Chailloux et al (2008) roughly includes the same range of central banks as the BIS reports. Klyuev et al (2009) study the unconventional measures taken by the central banks of seven countries (excluding Sweden) and their implications. The analysis by Stella (2009) concentrates on Fed balance sheets issued since 1951.

Papadia and Välimäki (2010) provide an extremely thorough analysis of Eurosystem activities since 1999. Furthermore, they examine the actions of the central banks of the United States, Japan and the United Kingdom, including balance sheet developments. Cheun et al (2009) analyse the collateral frameworks of the Eurosystem, the Fed and the Bank of England. The ECB's Monthly Bulletin (ECB, 2009) largely includes material similar to that in the analysis by Papadia and Välimäki (2010) on central bank balance sheets.

A new feature in this crisis has been the establishment of swap lines between central banks, particularly to provide US dollar liquidity to banks operating outside the United States. Goldberg et al (2010) present an analysis of dollar-related swap arrangements and their impacts. Moessner and Allen (2010) provide a highly comprehensive review of swap agreements between central banks during the crisis.

3.2 Observations on liquidity operations carried out by central banks

Central bank interest rate policies (Figure 1) and liquidity policies during the crisis have been affected by several factors: the scale of change in the economic situation (the scale of the macroeconomic and financial shock), central bank mandates (differences in final targets, differences in the opportunities to use various monetary policy instruments), financial market structure (bank dominance vs financial intermediation via securities markets) and the status quo ante (the type of instruments and procedures in place prior to the crisis). Consequently, the situation of the countries dealt with here and their central banks is highly heterogeneous in respect of these features.⁵ Nevertheless, the actions of the central banks during the crisis have not highlighted differences or heterogeneity; instead, the liquidity operations of the central banks have become similar. Although central bank actions have displayed some significant differences, they still bear witness to some sort of convergence rather than divergence.

Observations related to open market operations:

- The central banks of all countries have extended the maturity of their open market operations, some up to 12 months (Australia, the euro area, Canada, Sweden and Switzerland). Before the crisis, the Eurosystem covered about a third of the liquidity provision in open market operations by operations executed monthly with a maturity of three months. During the crisis, the Eurosystem introduced one-month (covering a maintenance period), six-month and even 12-month open market operations. The Eurosystem has been a pioneer in this area.
- All central banks have used fine-tuning operations more actively than before. These are normally aimed at reducing fluctuations in overnight rates.
- Some central banks (Eurosystem and Fed) have altered their tender procedures, migrating from variable-rate tenders to fixed-rate tenders (with full allotment). In the case of fixed-rate tenders with full allotment the counterparties determine the allotment amounts, with collateral serving as the only constraint. Liquidity is thus determined by demand – not by supply.
- Some central banks (Eurosystem and Swiss National Bank) have frontloaded the liquidity provision within the maintenance period.

⁵ For the pre-crisis operational frameworks of the central banks dealt with here, see eg Borio and Nelson (2008) and Chailloux et al (2008).

Changes to *standing facilities* and *minimum reserve systems* have been relatively small. The central banks of the euro area, the United Kingdom, Switzerland and the United States have narrowed the width of the corridor formed by the interest rates on the standing facilities. The Reserve Bank of Australia introduced a new window facility for longer-term deposits. The Bank of Japan launched a deposit facility. The Fed extended the maturity of discount credit. The Bank of England discontinued the publication of the names of counterparties to its standing facilities and gave banks more leeway for the fulfilment of minimum reserve requirements.

All the central banks have expanded the lists of assets accepted as *collateral*; collateral policy has thus been eased. The Eurosystem has also moved in the opposite direction and tightened the use as collateral of certain types of asset-backed securities (ABSs). This was done in response to the losses suffered by the Eurosystem in connection with the bankruptcies of Lehman Brothers and the Icelandic banks.

All the central banks, excluding the Reserve Bank of Australia, have broadened the *range of counterparties* or admitted existing counterparties broader access to various forms of central bank credit. Given that the Eurosystem has had a very broad range of counterparties from the beginning, there has been no significant pressure on the Eurosystem in this respect. However, the Eurosystem has enlarged the range of counterparties to its fine-tuning operations and assigned eligible counterparty status to the European Investment Bank (EIB).

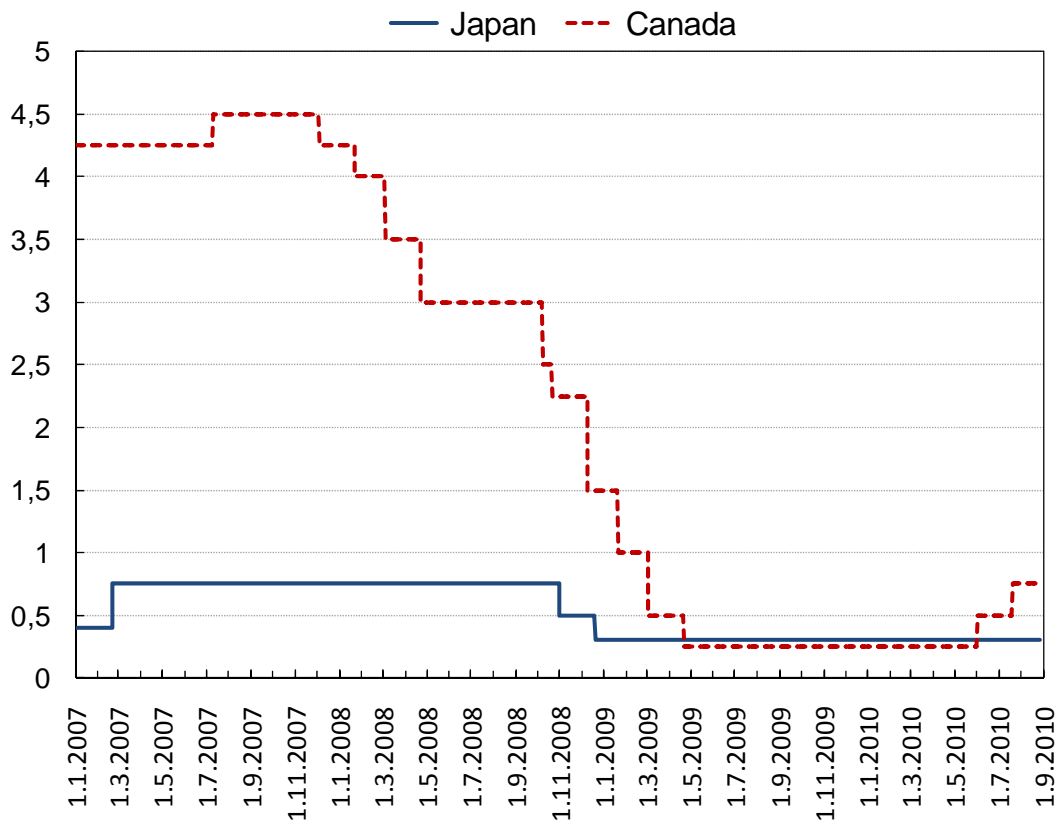
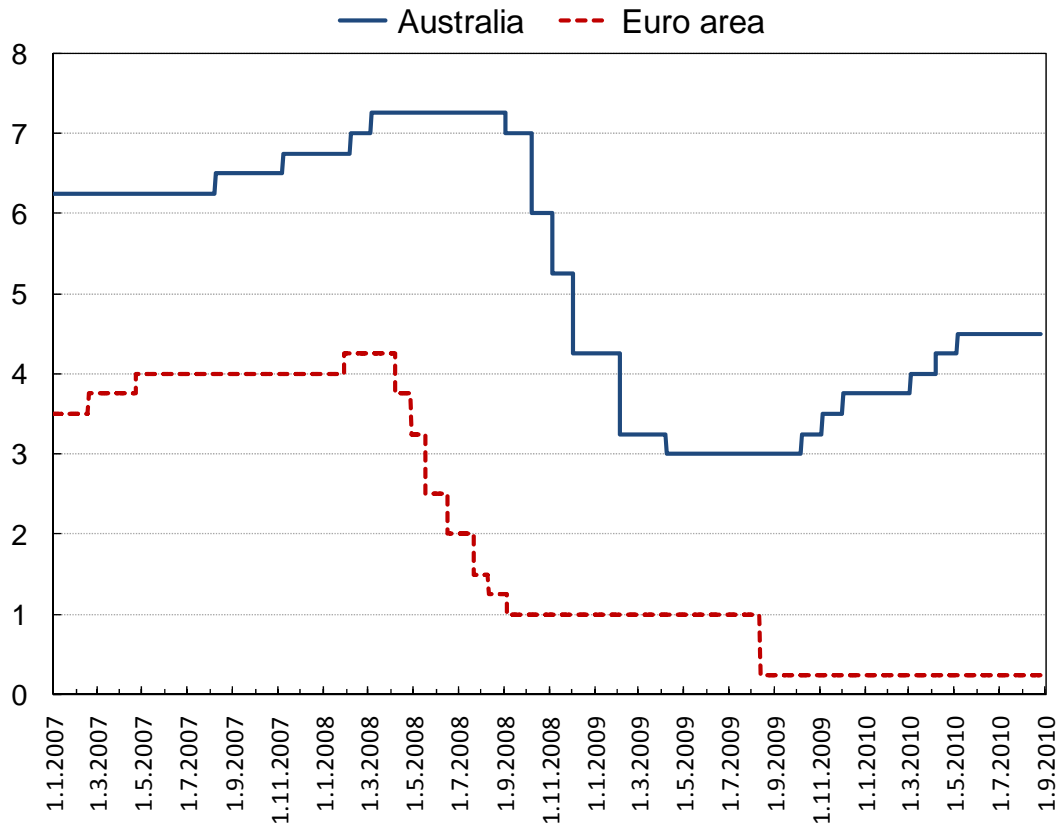
All the central banks other than those of Canada and Sweden have started *purchasing securities outright* in the financial markets for their balance sheets. The most active player has been the Fed, with purchases of very different types of securities (debt issued by the federal government, debt securities issued by GSE institutions, MBSs). The Bank of England has bought both sovereign debt and private sector debt securities. In July 2009, the Eurosystem launched a programme, implemented via the ECB and the national central banks, targeting purchase of covered bank bonds for a total of around EUR 60 billion. In May 2010, the ECB announced its intention to start buying public debt securities.

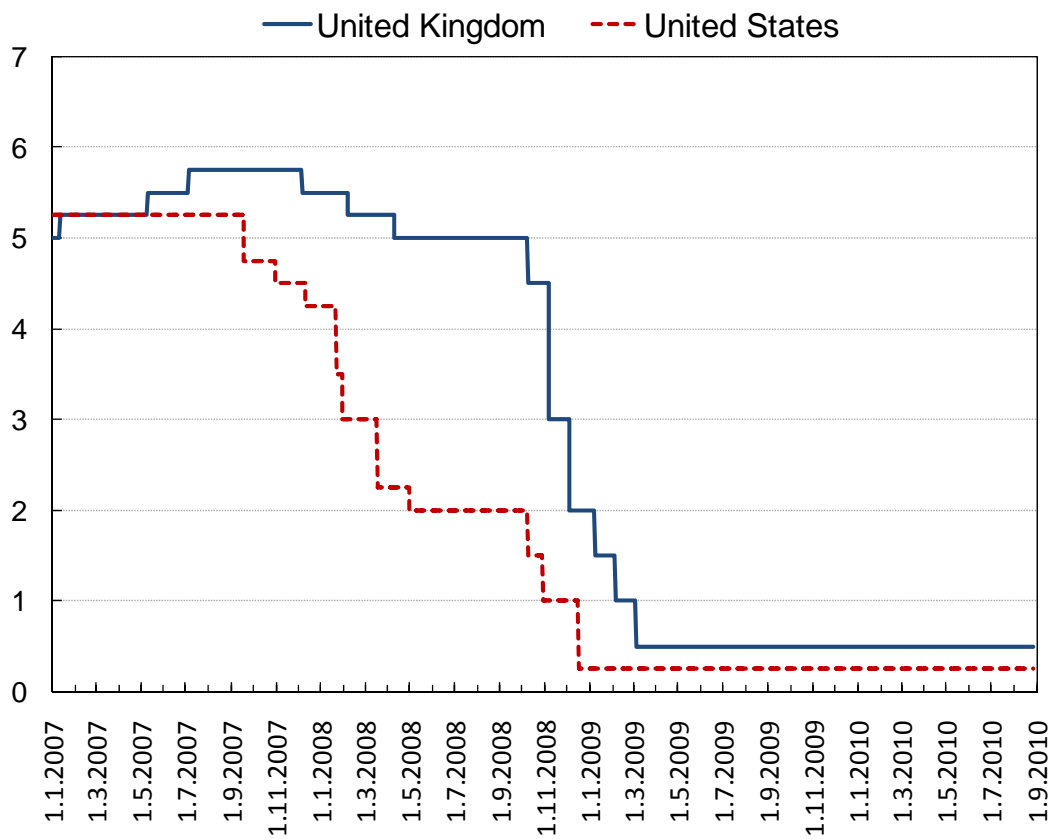
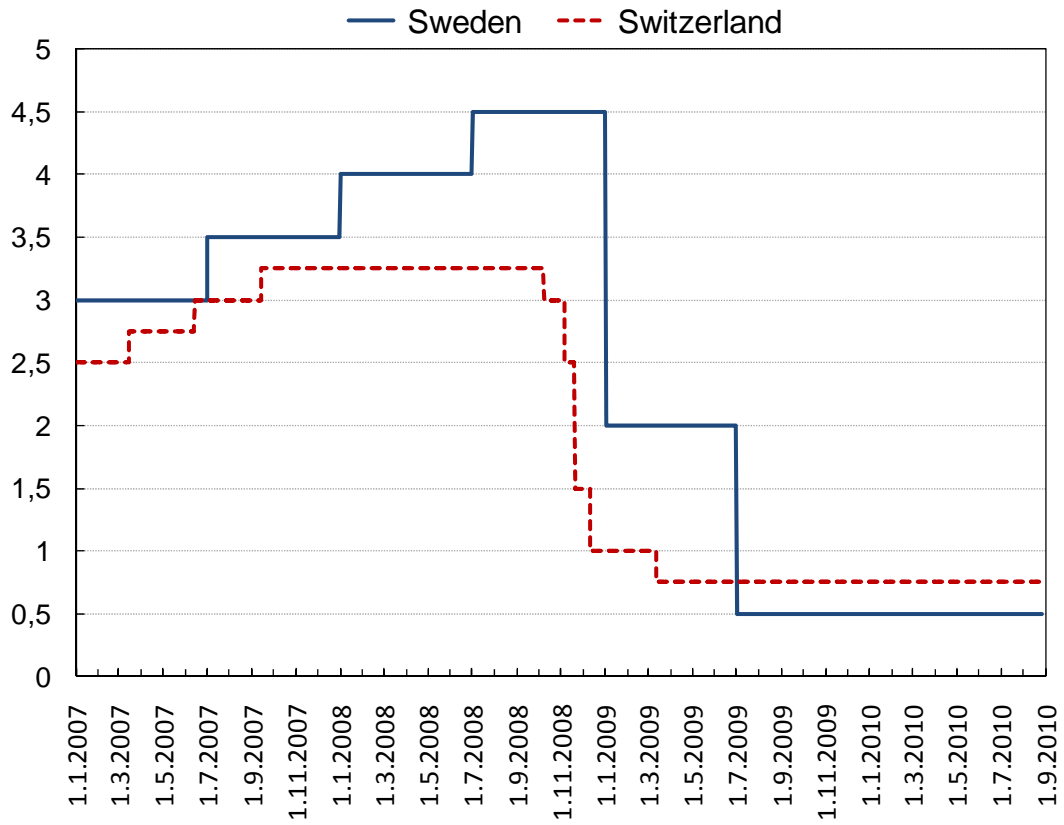
The central banks of the euro area, the United Kingdom, Japan, Canada and the United States have introduced or expanded their *securities lending programmes*. These programmes do not affect the amount of central bank liquidity in the economy, but improve the liquidity and functioning of the markets concerned.

Central banks have opened *swap lines*, by means of which US dollar liquidity, in particular, has been provided outside the dollar region. The Fed has established such swap arrangements with 14 central banks, including the seven other central banks mentioned here and the central banks of Denmark and Norway. The ECB, the Swiss National Bank and Sveriges Riksbank have also been active in this area.

Figure 1.

Central bank policy rates, 2007–2010, %





In addition to these measures, the Bank of Japan has purchased shares to support the stock market, the Swiss National Bank has bought foreign currencies in order to prevent excessive appreciation of the Swiss franc and issued central bank certificates of deposit with the aim of absorbing money market liquidity, the Eurosystem has absorbed liquidity by collecting deposits via tenders and the Fed has made direct loans to some institutions.

3.3 Central bank balance sheets

As a consequence of the operations carried out, central bank balance sheets have grown very strongly in all the countries other than Japan. (Figure 2 shows each country's balance sheet in terms of its own currency; Figure 3 plots the balance sheets relative to nominal GDP.) The balance sheet of the Reserve Bank of Australia, too, does not suggest any trend growth, even though it expanded vigorously at the end of 2008 following the panic caused by the collapse of Lehman Brothers. The strongest balance sheet growth was witnessed in Sweden, at about 250%. The United Kingdom, Switzerland and the United States experienced balance sheet growth of some 150%. The balance sheet of the Eurosystem roughly doubled. The balance sheet of the Bank of Canada grew by around 30–40%.

The evolution of the balance sheets and their size relative to nominal GDP are also interesting. Before the crisis, the size of the balance sheet relative to nominal GDP was the smallest in Canada (at around 3.5%). In the United Kingdom, Sweden and the United States, the balance sheet equalled around 6–7% of GDP. Japan (around 25%) and Switzerland (around 20%) had much larger balance sheets. The Eurosystem (around 15%) was somewhere in the middle.

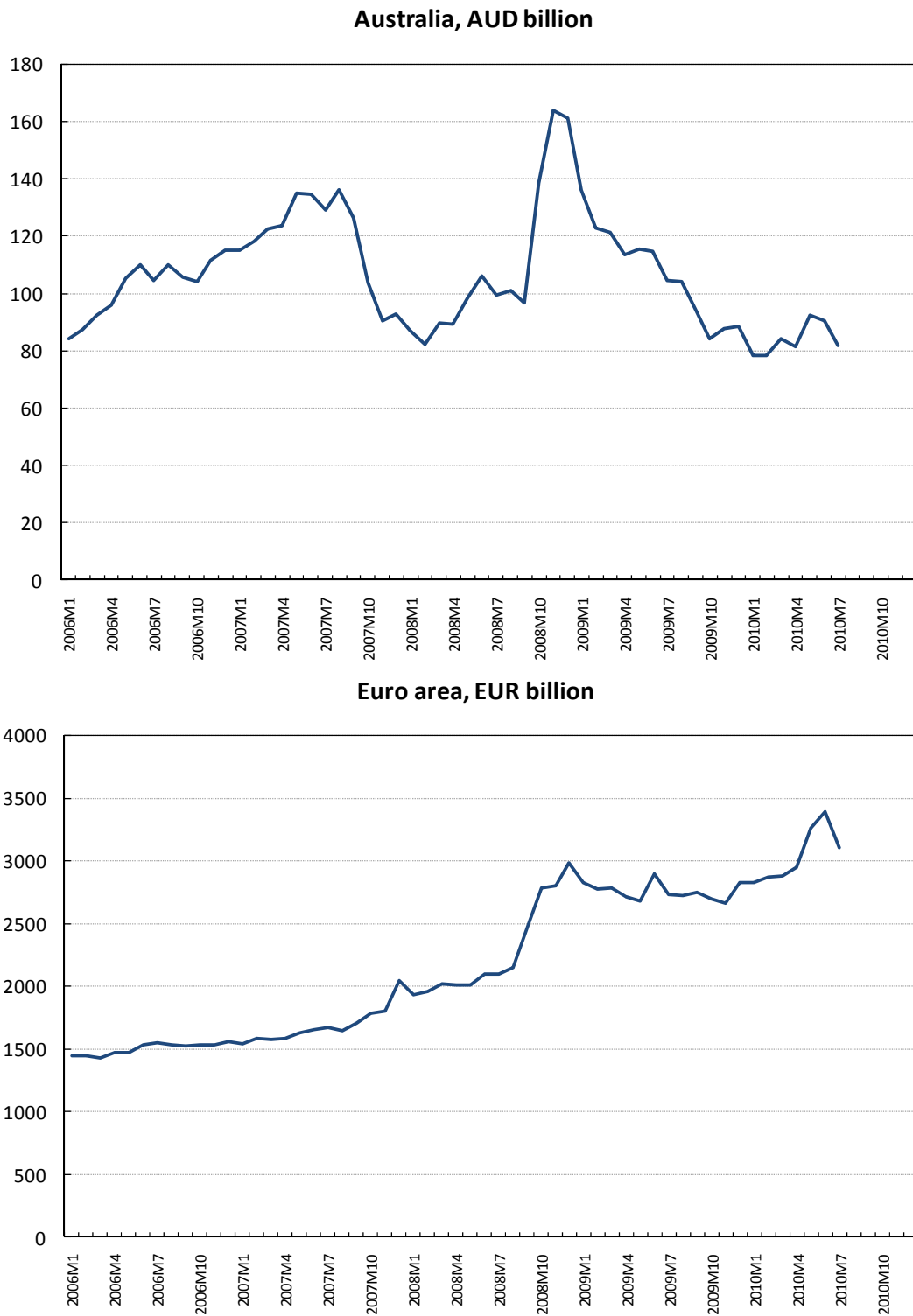
Following the crisis, balance sheet size relative to GDP grew very strongly in Switzerland (to about 40%) and the euro area (to about 30%), reaching the Japanese level. The balance sheet of Sveriges Riksbank also expanded to the same level. The United Kingdom and the United States saw the ratio rise to some 15%.

The central bank balance sheets have been boosted by both outright asset purchases (especially in the United States and the United Kingdom) and fixed-rate full allotment tender procedures in open market operations (notably within the Eurosystem). Foreign currency operations conducted by central banks have been particularly large in Sweden and Switzerland. Sveriges Riksbank has provided US dollar liquidity to its counterparties and established swap lines with Iceland, Lithuania and Estonia. The Swiss National Bank has bought foreign exchange in the markets and provided foreign currency liquidity to its counterparties.

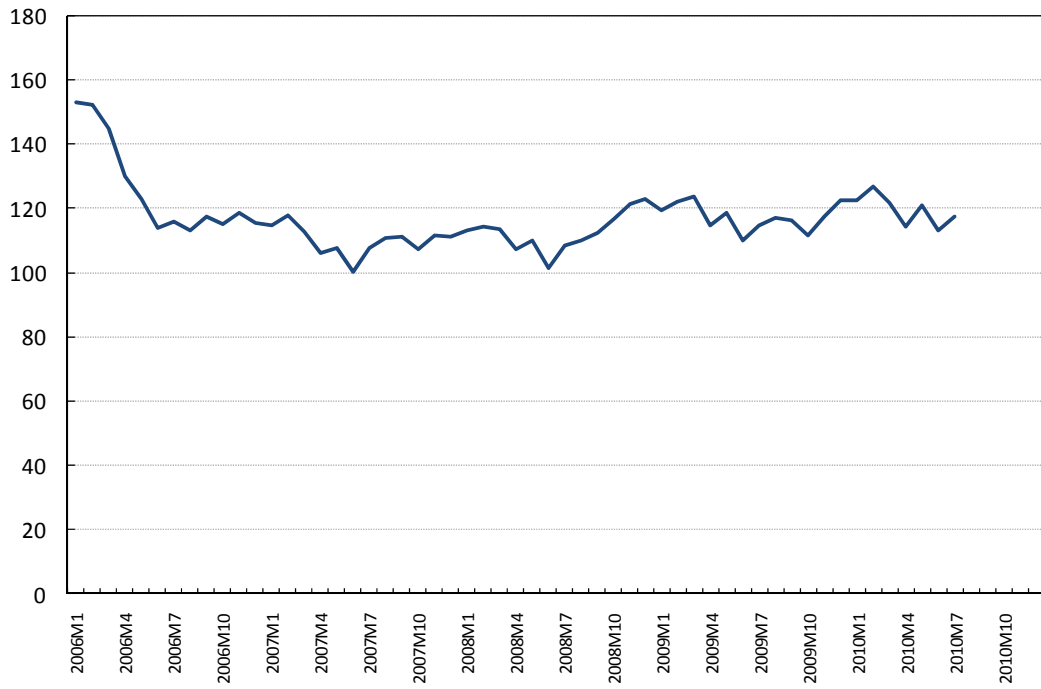
On the liabilities side of the balance sheet, banknote issuing has developed very steadily. The expansion of the balance sheets has meant strong growth in the monetary base.

Figure 2.

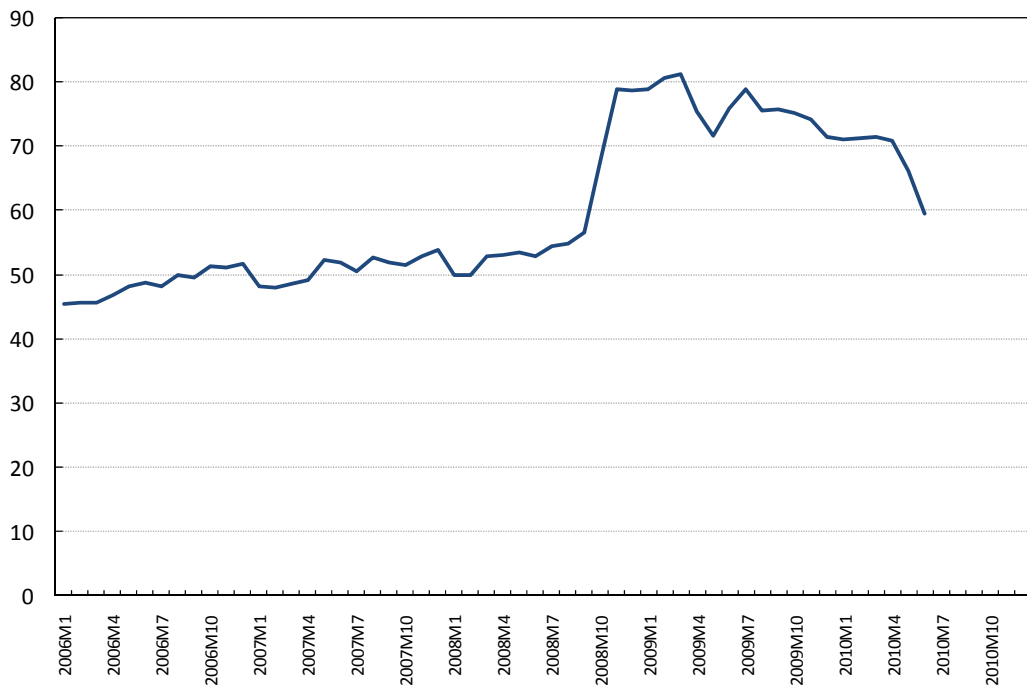
Central bank balance sheets in national currencies 2006–2010



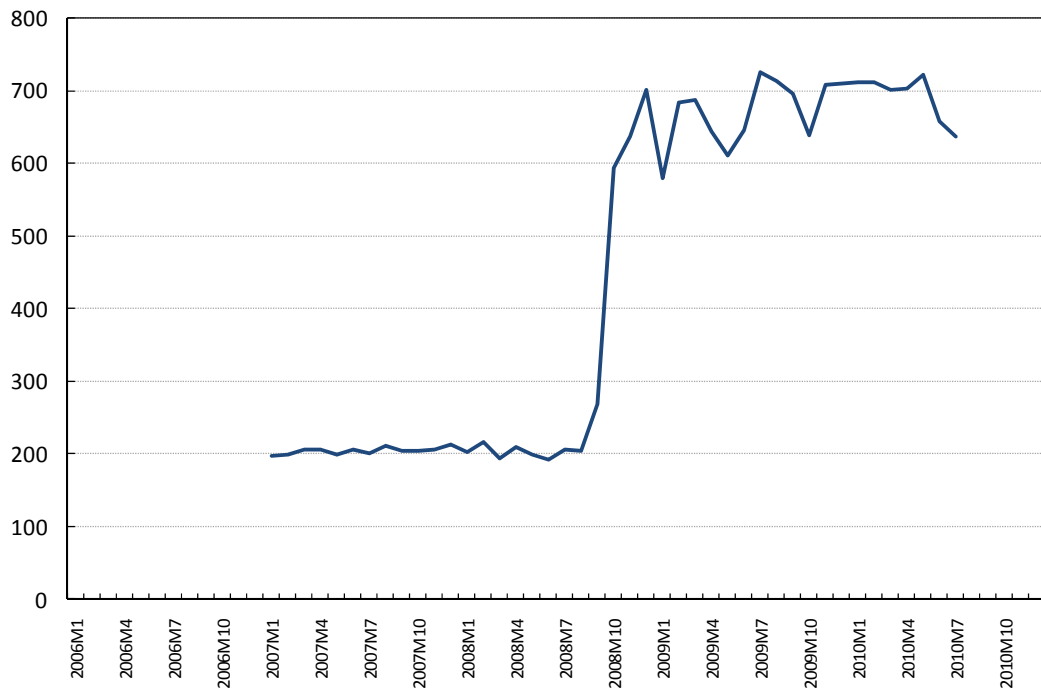
Japan, JPY trillion



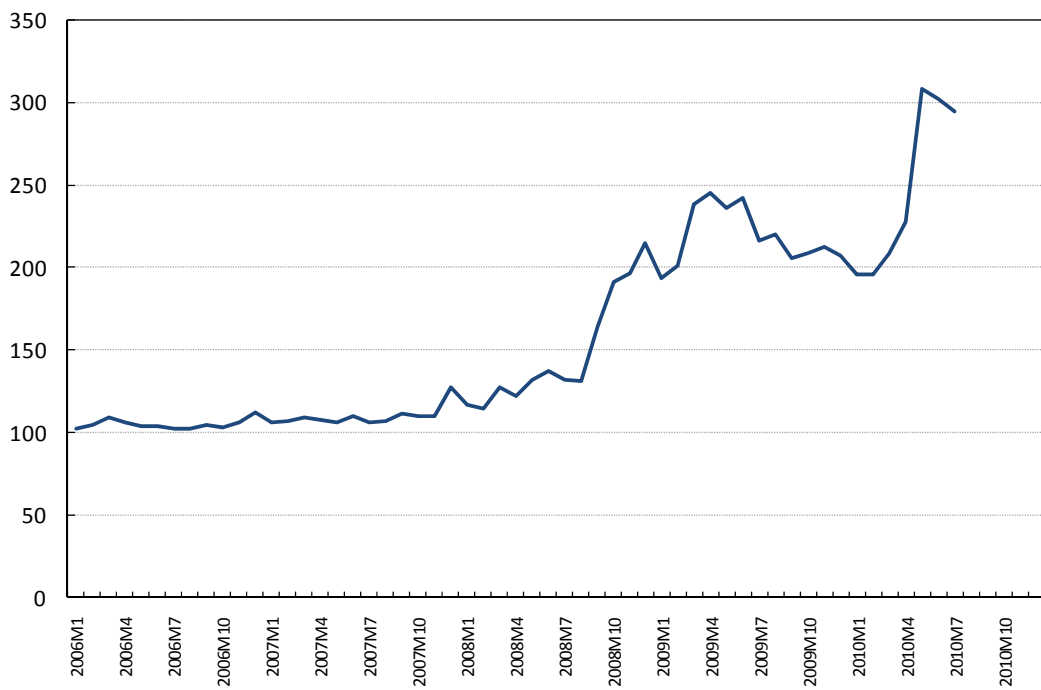
Canada, CAD billion



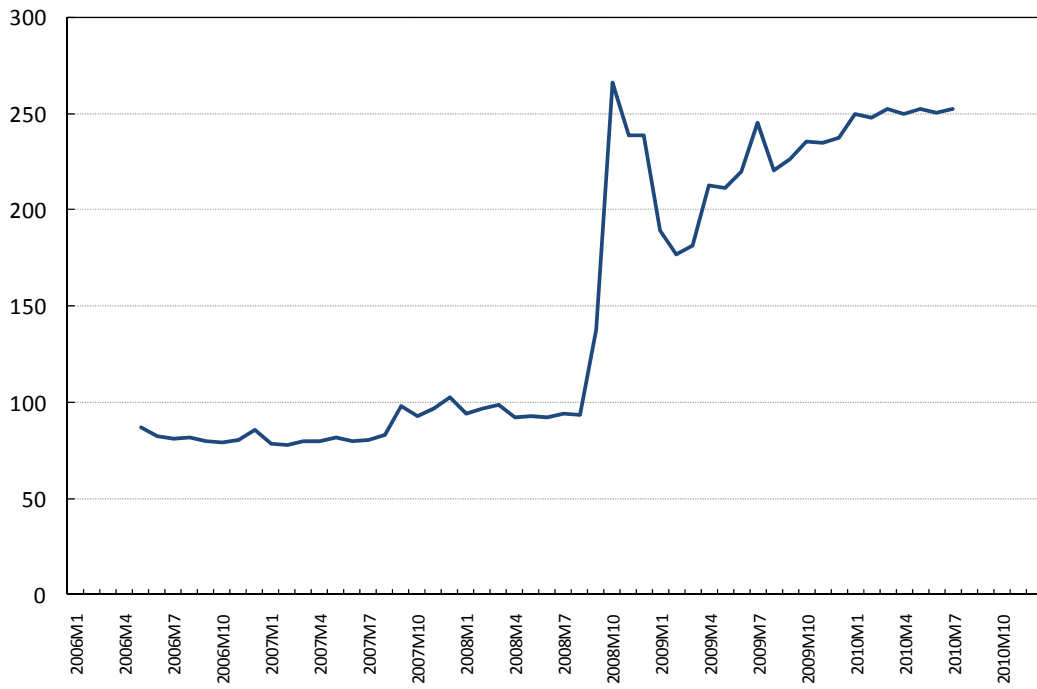
Sweden, SEK billion



Switzerland, CHF billion



United Kingdom, GBP billion



United States, USD billion

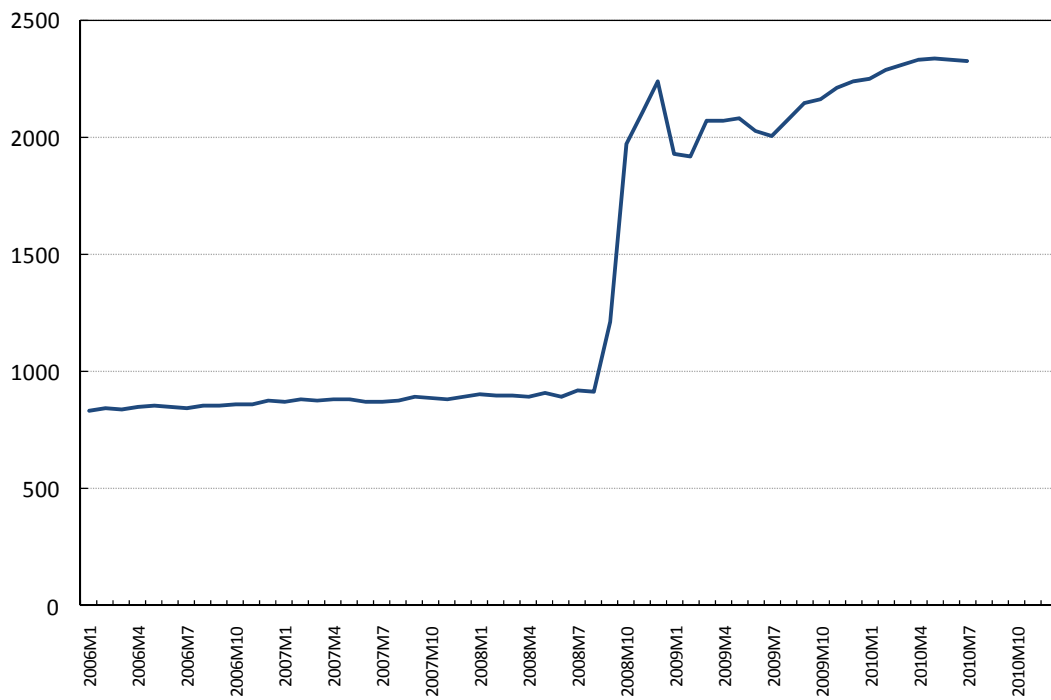
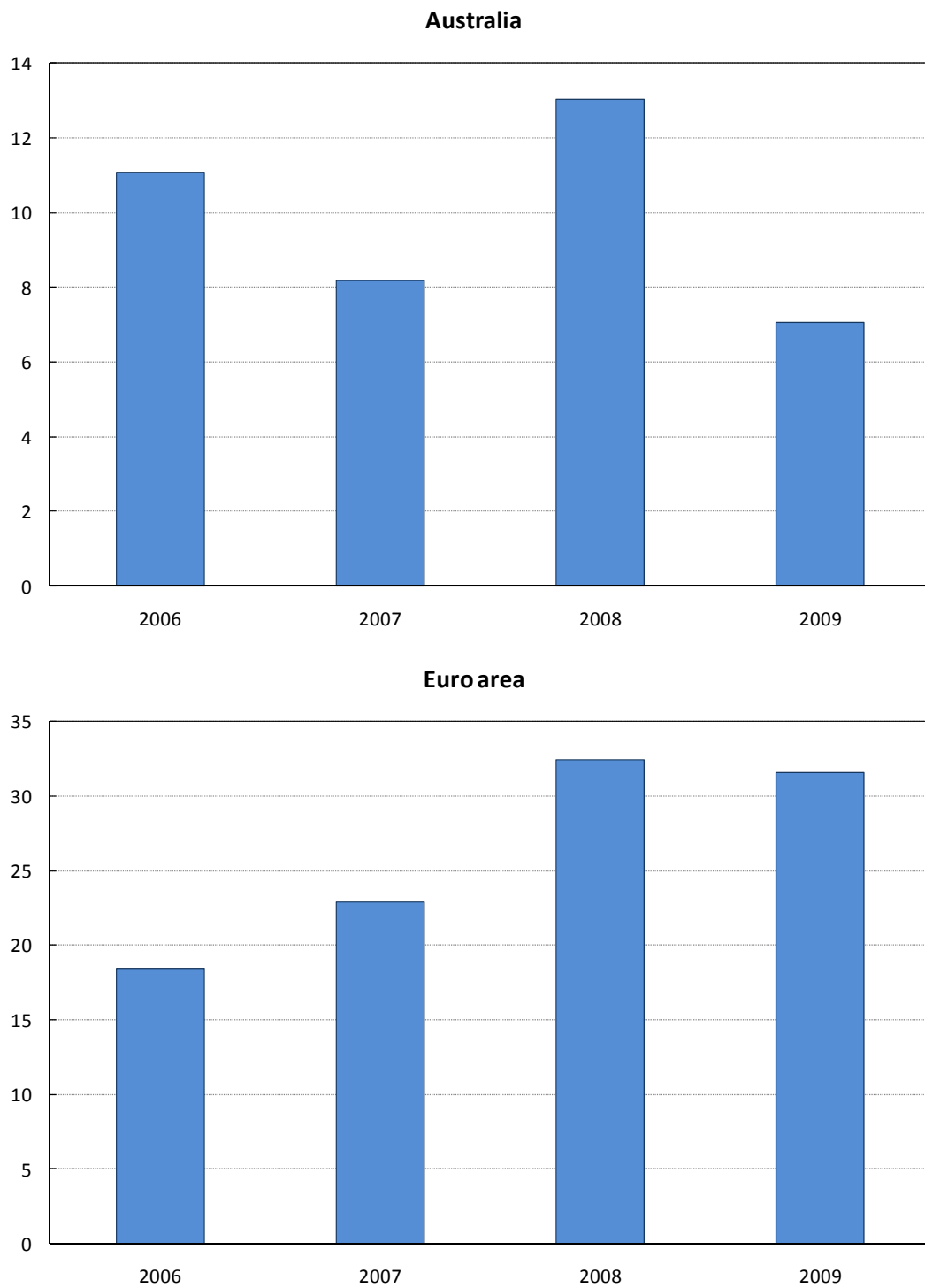
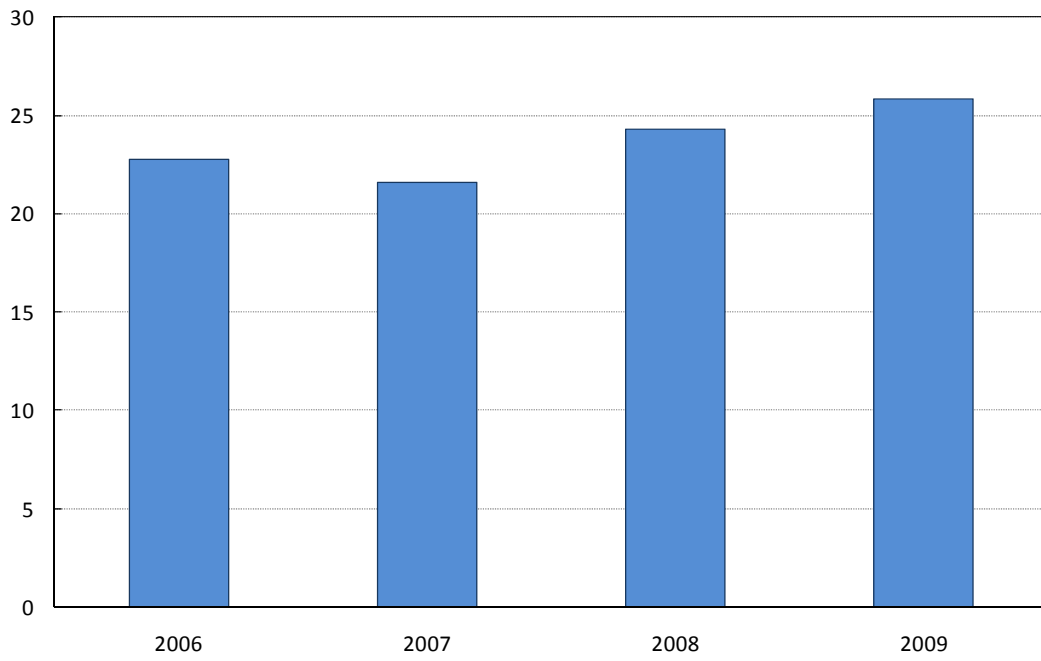


Figure 3.

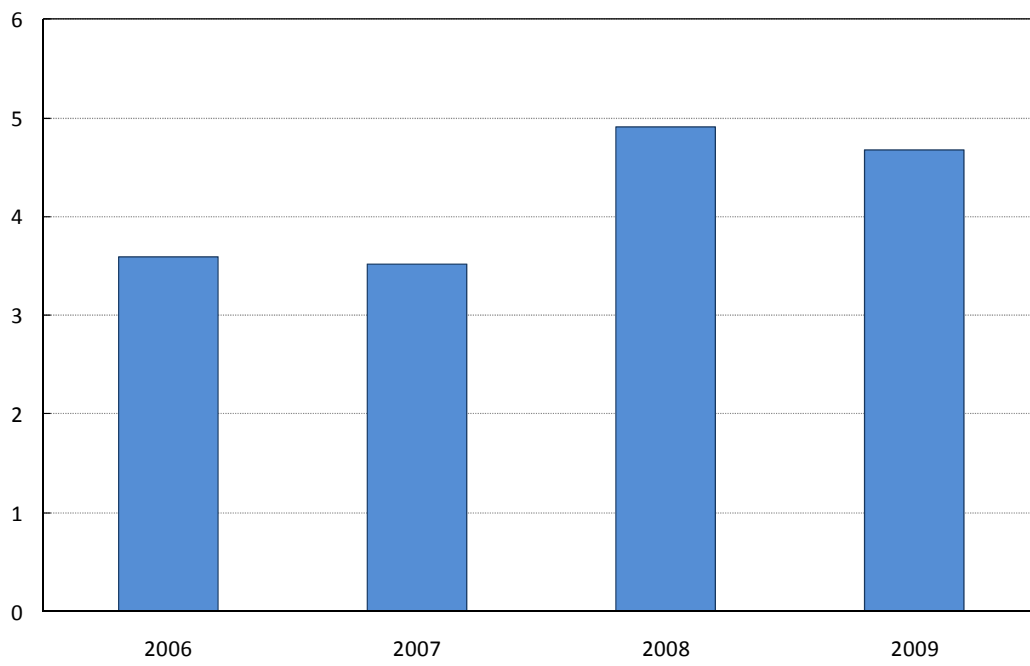
Central bank balance sheets (December) relative to nominal GDP, 2006–2009, %



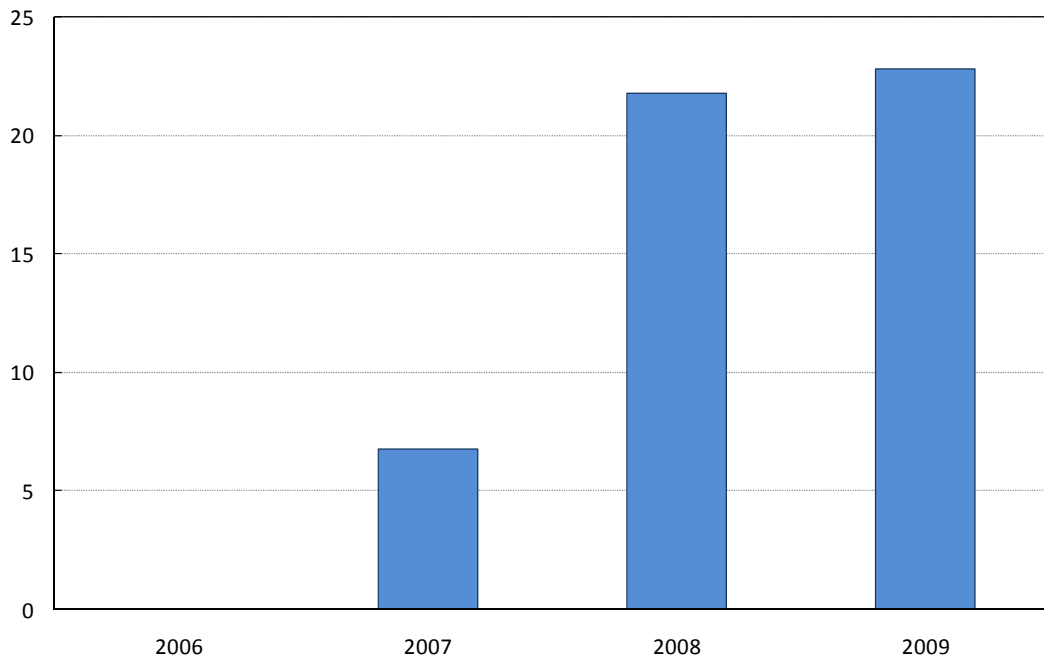
Japan



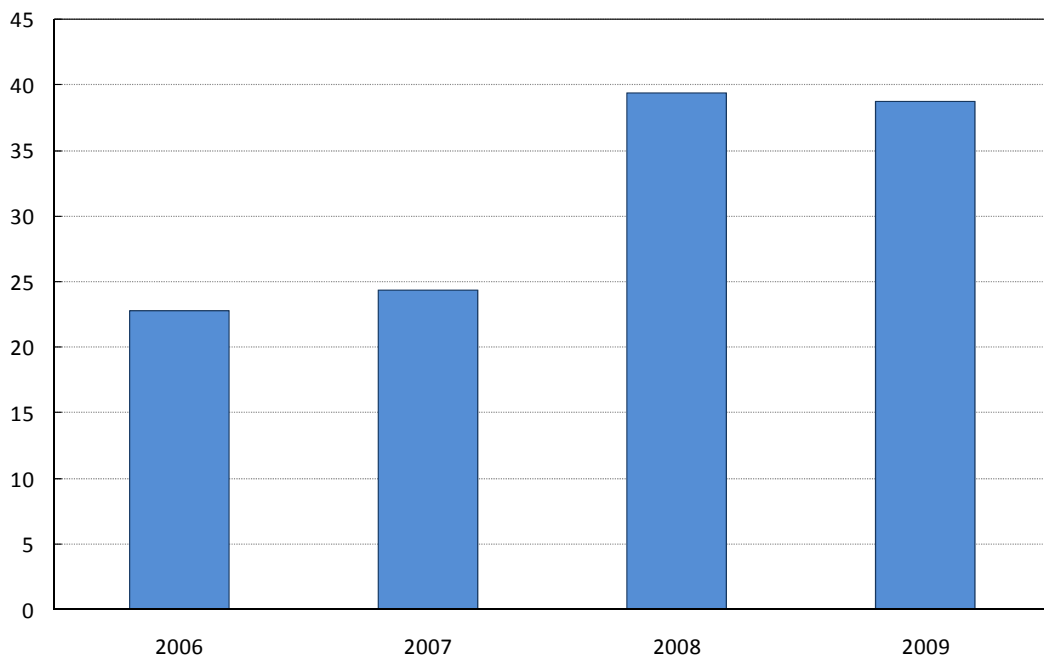
Canada



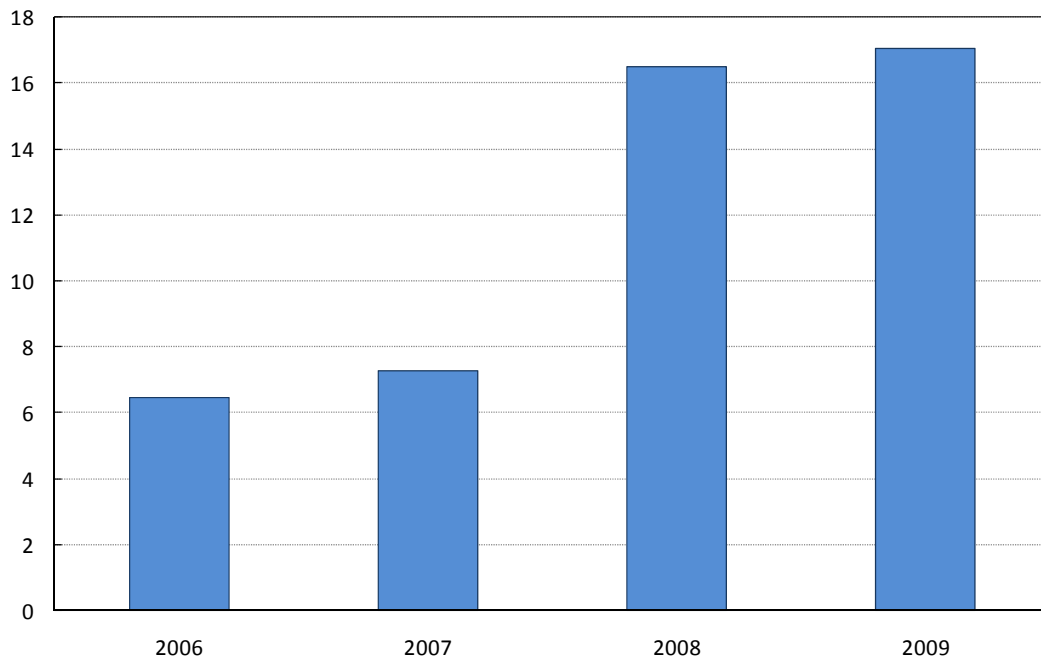
Sweden



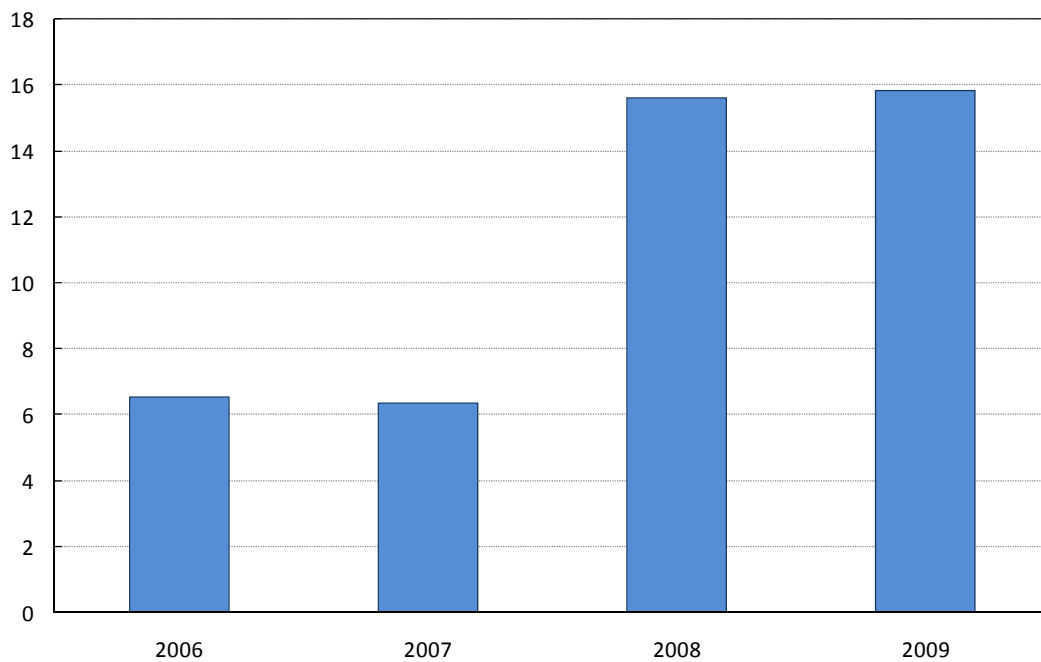
Switzerland



United Kingdom



United States



The balance sheet developments reflect the scale of shocks hitting the economies and the role of the financial markets in various countries. The raw material producers Australia and Canada have coped with the crisis fairly well. The Canadian banking and financial sector managed to avoid financial market problems considerably better than its southern neighbour. Canadian, Australian and Japanese financial institutions were less exposed to complex structured

financial instruments than their US and European counterparts. The evolution of the balance sheet of Sveriges Riksbank has been affected by concerns and doubts over Swedish banks' risks in the Baltic States. The United Kingdom, Swiss and US financial systems have been under particularly severe pressure. Japan's pre-crisis leeway was already very limited.

4 Thoughts on the experiences gained; open questions

As the economic crisis has not yet come to an end and economies are only now at the recovery phase, with many central banks still at least partly in crisis mode, it is too early to draw strong conclusions from central banks' interest rate policies and liquidity operations during the crisis. The same naturally applies to other segments of economic policy. Even so, it is useful for both monetary policymakers and researchers to start considering the lessons and conclusions to be drawn from the experiences gained. This section raises some themes that particularly concern central bank liquidity operations. At this stage, there are probably more open questions than informative answers.

4.1 Exit from measures

With the economic situation improving and the financial markets returning to normal, central banks need to consider how they will exit from their relaxed interest rate policies, non-standard measures in liquidity operations and various other actions to stimulate the financial markets. Some central banks have already raised their policy rates and partly phased out their liquidity operations introduced during the crisis. Meanwhile, others have chosen to introduce new operations and approaches or, for example, continue outright asset purchases.

Clearly, there is no straightforward answer or recommendation on how to exit. An optimal exit will depend on many factors, such as the macroeconomic situation, economic policy measures other than monetary policy actions and the state of the financial markets. Some of the measures and procedures introduced in the area of liquidity management can be such that they need to be used over a longer period of time and perhaps even on a permanent basis (Section 4.4). Exiting from securities portfolios accumulated during the crisis will last many years in some cases.

4.2 Assessing the success of measures taken

The success of measures taken in monetary policy and other economic policies ought to be assessed. This is no easy task. In the first place, it is both difficult and, actually, impossible to identify the significance of various measures. What has been the role of interest rate policy? What has been the impact of liquidity operations? What has been the impact of financial market stimulus measures launched by central banks and other policymakers? What has been the role of other economic policies (such as fiscal policy)? Measures already begin to influence economic behaviour as soon as some information on them becomes available.

Secondly, it is not very easy to determine where the actual focus should be when we want to assess the effectiveness of central bank measures. The ultimate aim of the measures is to support economic recovery, and their impact on, for example, economic activity (growth, labour or the housing market) should be evaluated in that light. Liquidity operations are carried out with a view to influencing, in the first place, the state and functioning of the financial markets, and particularly the money markets. Then, indicators such as the evolution of the operational target and its deviation from the policy rate, the trend in periodic interest rates, the yield curve, various risk premia (spreads) could serve as yardsticks. Interposing between these two groups of variables is the measurement of the general sentiment and state of the financial markets, for example, by means of a monetary index (a combination of market interest rates and foreign exchange rates), a financial market index (a combination of various market interest rates, foreign exchange rates and stock prices) or credit developments.

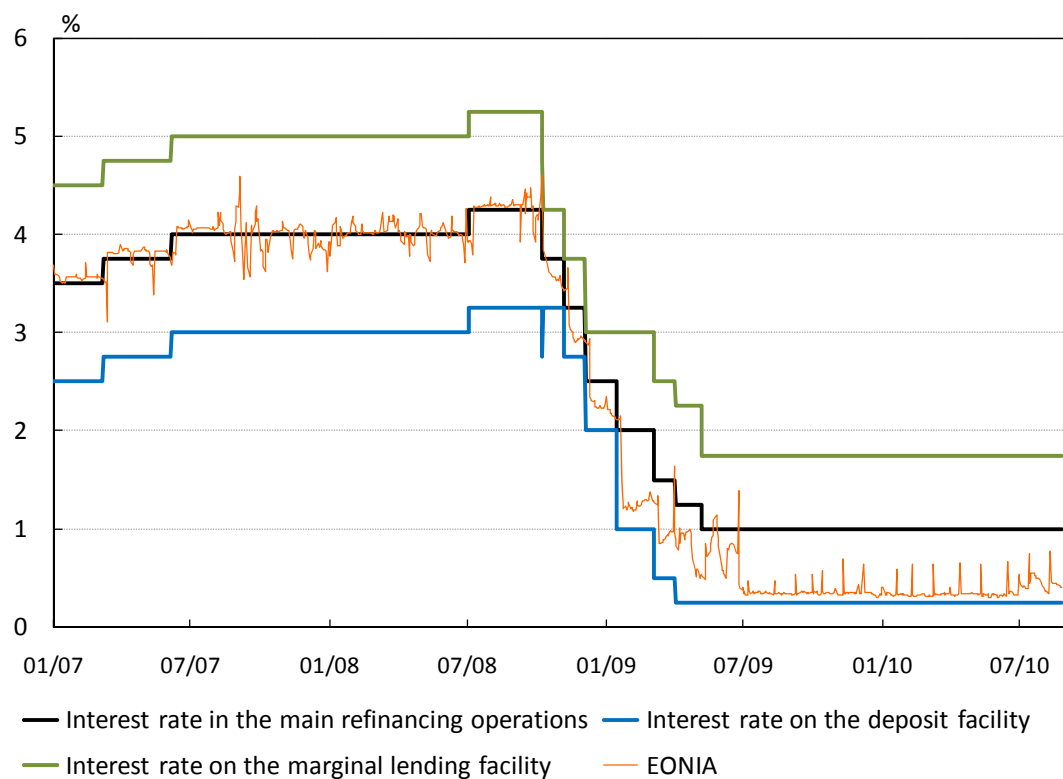
In all the countries examined here, money market interest rates have closely followed the path of the central bank's policy rate. The link is usually closer, the shorter the maturity under review. Long-term interest rates (such as 5-year or 10-year government bond yields) have also fallen, but less than money market rates. Yield curves have steepened considerably. Japan, where the pre-crisis leeway for interest rate policy was already very limited, emerges as an exception.

4.3 Operational target of monetary policy and assessment of the policy stance

As noted in Section 2, the most common operational target of monetary policy among the countries under review is the overnight interest rate. Exceptions are the Swiss National Bank, whose operational target is the three-month unsecured market interest rate, and the ECB, whose operational target is unclear.

Prior to the crisis, and for a while during it, the euro area overnight interest rate, the EONIA, was on average at the same level as the ECB's key policy rate (the minimum bid rate in the main refinancing operation, MRO) (Figure 4). Since the Eurosystem's introduction of fixed-rate full allotment tender procedures, the EONIA has been clearly below the key policy rate. The same is true for other short-term money market rates. The EONIA has actually been constrained by the Eurosystem rate on the deposit facility, and against this background the rate on the deposit facility has in practice become a key, or at least a very important, policy rate.

Figure 4. **ECB interest rates and EONIA**



The Eurosystem's practice is somewhat puzzling. If the stance of monetary policy is assessed on the basis of the MRO rate, a picture other than that painted by the EONIA and short-term money market interest rates emerges.⁶ At the same time, it

⁶ Bindseil (2004, 1) notes immediately at the beginning of his book that monetary policy implementation means the selection of an operational target and how the central bank seeks to achieve the operational target using various monetary policy instruments. This is the driving idea of the book. The publications by the BIS (2008) and Borio and Nelson (2008) also underline that the operational target should be close to the key policy rate and that the success of monetary policy implementation should even be assessed on this basis.

may be perfectly possible and even useful for a central bank to adopt different approaches during normal times and under strained market conditions.

There is no unequivocal definition of an operational target. As a rule, central banks choose the overnight rate as the operational target because it is easiest for them to influence the shortest possible interest rates. The central bank usually has the best grip on precisely the overnight rate. The overnight rate is also important for the functioning of wholesale market funding. But, from the perspective of monetary policy formulation for macroeconomic purposes, there would be a case for choosing a longer money market interest rate than the overnight rate, such as one-month or three-month rates, as an operational target, like currently in Switzerland, or in Finland in the 1990s.⁷

Assessment of the monetary policy stance becomes difficult if the central bank starts to make outright purchases and influence the yield curve (long-term interest rates) and various risk premia.⁸ Then, the stance of monetary policy is not only represented by, for example, the overnight rate or the key policy rate, but also by long-term interest rates. How can the stance of monetary policy be assessed in such a situation?

4.4 Which procedures are permanent? What should be changed?

It is possible that some of the procedures and instruments adopted by central banks during the crisis will be perceived as useful in the future, too. Some may be useful upon return to normal; others may be found useful in forthcoming crises and shocks.

There is a common understanding that *open market operations with long maturities* have made highly useful contributions during the crisis. This view is supported by their strong popularity in Eurosystem operations, in particular. Longer-term operations will probably be of great use in future crises, too. Meanwhile, upon return to normal, the role of longer-term operations is likely to become closer to what it was prior to the crisis. It may well be that there is no exact return to the precise status quo prior to the crisis.⁹ From the historical point of view, it is interesting that Eurosystem longer-term operations were included in the Eurosystem toolbox largely by accident, as a result of a compromise, and

⁷ Bindseil (2004, Chapter 3.1) argues that, for the formation of interest rate expectations, the overnight interest rate is a more logical operational target than any periodic rate.

⁸ Borio and Disyatat (2009) raise this question.

⁹ The need for longer-term operations also essentially depends on the size of the liquidity deficit. If it is small, there is less need for various types of open market operations. The size of the liquidity deficit naturally has a crucial impact on the amount of collateral required, too, and possibly on the type of collateral. The smaller the liquidity deficit, the lower the amount of collateral required.

many have regarded them as completely futile. Opinions have surely changed in this respect.

Fixed-rate tenders have also functioned well during the crisis, at least as regards banks' access to liquidity. Counterparties have known exactly the price at which they have been able to cover their needs for central bank liquidity. The full allotment tender procedure is, however, challenging for the central bank's balance sheet management, as under this procedure the balance sheet (its size and composition) starts to be determined by the actions of banks, and the central bank's own grip on its balance sheet loosens. The same applies to determination of the overnight interest rate.

Central banks' *collateral policies* have converged during the crisis. It remains to be seen to what extent the changes will be permanent and to what extent we will see a return to the pre-crisis situation. Since the failures of Lehman Brothers and the Icelandic banks, the Eurosystem has paid attention to the use of ABS-type collateral assets whose collateral values collapse in the case of a counterparty encountering difficulties. Efforts have been made to root out practices of this kind. Bank certificates of deposit include similar features.

Some central banks' collateral requirements vary depending on the operations involved: central banks may require different collateral for open market operations (with differences occurring according to the type of the operation), marginal lending facilities and intraday credit. There is a justification for permitting different solutions. The differentiation of collateral assets by instrument requires an appropriate collateral framework. In the much-used pooling system, for example, differentiation is difficult, if not actually impossible.

During the crisis, central banks have slightly expanded the *range of their counterparties*. Particularly under difficult economic conditions, direct access to central bank financing and instruments has been deemed important. A highly liberal counterparty policy may thus be warranted in times of crisis (Madigan, 2010). But the reverse of this is that such a policy in some degree erodes market activity, as financial intermediation shifts away from the markets and onto central bank balance sheets. Of course, there may be a justification for allowing different counterparties to participate in different liquidity operations.

One question worth posing is whether a central bank should accept at all as eligible counterparties financial institutions whose operations and supervision mainly take place outside their own country or economic area. Lehman Brothers and the Icelandic banks were such counterparties. From the point of view of the central bank's own risk management, a successful collateral policy undoubtedly provides final security and is perhaps more important than the counterparty issue.

Another perspective from which the counterparty issue could be viewed is to consider which financial institutions are important for monetary policy transmission and which are important for financial market stability or overall activity. The Eurosystem counterparty policy, for example, is based on institutions

that are key to monetary policy transmission: credit institutions. Counterparties important for financial market stability or overall activity could also include other non-bank financial firms, depending on the structure of the financial markets (Kohn, 2010).

Outright asset purchases in the financial markets as a monetary policy instrument clearly belong to non-standard measures, not to normal activity. Central banks' own-currency-denominated investment portfolios represent a grey area. Central banks do not usually report on qualitative changes that have occurred inside these portfolios. Such measures may nevertheless have an impact on the condition and functioning of the financial markets.

Central banks' *securities lending programmes* underpin the functioning of the financial markets, especially market liquidity. Central banks engage in this type of activity during normal times by making use of their investment portfolios. When, in extraordinary circumstances, they acquire portfolios for monetary policy purposes, securities in such portfolios can also be lent out.

Swap lines established between central banks have served to meet foreign currency needs and thereby reduce ensuing problems and tensions. One alternative to accommodating banks' foreign currency liquidity needs might have been the sale of central bank holdings of securities denominated in foreign currency. This could have been difficult in a sensitive market situation, possibly resulting in further disruptions to securities markets. Consequently, swap lines can be seen as a kind of substitute for the use of foreign reserve assets. If swap lines were to remain permanent or central banks could rely on them being opened in similar future situations, they would reduce the need to hold foreign reserves. Aizenman et al (2010) and Obstfeld et al (2009) argue that foreign reserves and swap lines can also be complementary: swap lines are opened only with those central banks that hold sufficient foreign reserves. This acts as an incentive to accumulate large foreign reserves.

4.5 Central bank risks

As a consequence of the liquidity operations, central banks' risks have increased quite significantly in many cases. This follows both from growth in the size of central bank balance sheets and from changes in the composition of the asset side of the balance sheet, longer maturities in open market operations, more relaxed collateral policies and a wider range of counterparties. Credit extended via open market operations and standing facilities, and emergency liquidity assistance (ELA), if any, are associated with a risk related to the counterparty and a risk related to collateral. Outright asset purchases include both market risk and credit risk. If a central bank has bought foreign currency during the crisis and increased

its foreign reserve base (as the Swiss National Bank has), the foreign exchange risk of the central bank has grown.

4.6 Central banks' role, independence and governance structures

Taylor (2009) presents a highly critical assessment of the Fed's actions during the crisis. His critique focuses particularly on the very strong expansion of the Fed's balance sheet, the underlying 'money printing', outright purchases of assets that are kept on the Fed's balance sheet and direct lending to certain economic sectors and institutions (AIG, Bear Stearns). Taylor finds the Fed's actions highly questionable and considers it necessary for the Fed to return to the pre-crisis situation as soon as possible. In his view, the Fed has strongly deviated from normal monetary policy procedures under which the central bank steers the overnight rate via its liquidity operations while not otherwise interfering much in the functioning of the financial markets. Taylor considers the Fed's actions as being a combination of traditional monetary policy and industrial policy. In fact, he refers to the Fed's activities as 'mondustral policy' (industrial policy using monetary policy tools).

In Taylor's opinion, the Fed's actions pose numerous problems. In the first place, the amount of central bank money (monetary base) in the economy has grown vigorously, a fact that must always be taken into account. Secondly, the central bank's risks have hugely increased and may pose a threat to its financial position, independence and room for manoeuvre in monetary policy going forward. Thirdly, industrial policy in the United States and generally in other countries as well belongs to institutions other than the central bank. Currently, the Fed takes both monetary policy and industrial policy decisions. This is a highly peculiar constellation and cannot be regarded as sustainable. Industrial policy decisions should be taken elsewhere than the Fed, mainly in the US Congress.

The points put forward by Taylor are also relevant for all other central banks with strongly swollen balance sheets and significantly increased risks. On the other hand, central banks in some countries may act as government agents, as the governments do not necessarily have other channels to promptly address the condition of the financial markets. This may be interpreted as meaning that in such a case the government (implicitly) safeguards the central bank's capital position and operational capacity.

5 Conclusion

This paper has reviewed the liquidity operations conducted by the central banks of eight countries during the financial market and economic crisis that began in August 2007. Despite different starting positions and economic developments, the central banks' actions during the crisis have not been marked by divergence or heterogeneity: on the contrary, their liquidity operations have converged. Close cooperation and smooth exchange of information and experience between the central banks are one factor behind these developments. In the context of open market operations, central banks have used more fine-tuning operations, lengthened the maturities of operations and experimented with fixed-rate full allotment tender procedures. They have narrowed the width of the corridor formed by the interest rates on the standing facilities. Collateral policy has been eased, and counterparty policy has become more liberal. Central banks have bought securities for outright holding on their balance sheets. They have introduced new securities lending programmes and provided liquidity across borders.

In many cases, central bank balance sheets have undergone extremely strong growth. Of the central banks reviewed here, this is particularly true for the central banks of the euro area, the United Kingdom, Sweden, Switzerland and the United States. Moreover, there has been a considerable change in the composition of balance sheets. These five central banks in particular have seen their risks increase sharply. With balance sheets ballooning, the monetary base has experienced strong growth.

The actions by central banks during the crisis raise a number of questions concerning exit from the measures taken, the impact of the measures, central banks' risks and independence and their governance structures. In the worst case, the strongly increased risks of central banks may act as a constraint on the room for manoeuvre in future monetary policy.

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