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Monetary Policy Responses to the Crisis and Exit Strategies

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ABSTRACT/RÉSUMÉ

Monetary policy responses to the crisis and exit strategies

Central banks have responded with exceptional vigour to the crisis by using their traditional interest-rate tools to their limits and deploying a wide range of unconventional measures. This paper documents these responses in a systematic way, reviews the evidence about their impact, and discusses the need to exit from these measures. Unconventional monetary policy measures appear to have been broadly successful in terms of improving conditions in financial markets and stabilising the real economy. In line with the improvement in functioning of financial markets, however, these unconventional measures should be gradually removed. Given the considerable changes in the size and composition of central banks' balance sheets, the exit will likely involve the combination of various tools. More challenging questions surround the decisions of when and how fast the current exceptional amount of stimulus should be reduced and then eliminated. A particularly important goal will be to preserve the hard-won anchoring of inflation expectations and dissipate any hypothetical fears that central banks' greater risk exposure and purchases of bonds issued or backed by governments might have reduced their independence regarding monetary policy decisions.

JEL codes: E31, E42; E44; E50, E51; E52, E58.
Keywords: monetary policy; exit strategies; financial crisis; unconventional policy.

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Réponses de la politique monétaire à la crise et stratégies de sortie

Les banques centrales ont répondu avec une vigueur exceptionnelle à la crise en poussant leurs instruments traditionnels de taux d'intérêt jusqu'à leurs limites et en déployant une vaste gamme de mesures non conventionnelles. La présente étude fournit une description systématique de ces mesures, fait le bilan des éléments disponibles permettant d'apprécier leur efficacité et examine le besoin de mettre progressivement fin à ces dispositifs. Dans l'ensemble, les mesures de politique monétaire non conventionnelle semblent avoir été couronnées de succès en contribuant à l'amélioration des conditions financières et à la stabilisation de l'économie réelle. Toutefois, au fur et à mesure que les marchés financiers retrouvent un fonctionnement plus normal, ces mesures non conventionnelles devront être retirées. Étant donné l'ampleur des changements qui ont affecté la taille et la composition du bilan des banques centrales, les stratégies de sortie devront nécessairement s'appuyer sur un large éventail d'instruments. Des questions plus délicates encore se poseront lorsqu'il s'agira de décider du calendrier et du rythme selon lesquels l'exceptionnel stimulus monétaire actuel devra être réduit puis éliminé. À cet égard, il sera crucial de préserver l'ancrage, durement acquis, des anticipations d'inflation et d'éviter une situation hypothétique dans laquelle le public craindrait que la plus grande exposition au risque des banques centrales tout comme leurs acquisitions de titres de dette publique ou quasi-publique puissent avoir réduit leur indépendance dans la conduite de la politique monétaire.

Classification JEL : E31, E42; E44; E50, E51; E52, E58.
Mots-clefs: politique monétaire; stratégies de sortie; crise financière; mesures non conventionnelles.

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MONETARY POLICY RESPONSES TO THE CRISIS AND EXIT STRATEGIES

Makoto Minegishi and Boris Cournède[1,2]

Introduction and key findings

1. Central banks in OECD countries have responded vigorously to the challenges posed by the crisis. They have employed their traditional monetary policy instruments to the extent possible, taking policy rates to very low levels. Going beyond conventional instruments, they have expanded the scope of liquidity management beyond traditional counterparties, term length and sources of collateral with the aim of providing ample liquidity to the banking system. Furthermore, some central banks have engaged in open market operations covering a range of assets in order to stimulate aggregate demand and safeguard financial stability. These unconventional monetary policy measures have, together with traditional interest rate policy and government fiscal and financial market policies, contributed to containing the economic downturn and strengthening confidence in financial markets.

2. This paper documents these unconventional measures for seven central banks in the OECD area, assesses their impact and discusses possible exit strategies.[3] The key findings of the paper can be summarised as follows.

- Major monetary policy measures taken in response to the crisis can be categorised under five headings: i) lowering policy rates to very low levels, ii) increasing liquidity provision to financial institutions, iii) intervening directly in wider segments of the financial market, iv) purchasing long-term government bonds and v) supporting specific institutions. Non interest-rate measures have resulted in substantial changes in size and composition of central bank balance sheets, with varying implications for the monetary base.

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3. The central banks covered in the paper are the US Federal Reserve (Fed), the European Central Bank (ECB), the Bank of Japan (BoJ), the Bank of England (BoE), the Bank of Canada (BoC), the Sveriges Riksbank (Riksbank) and the Swiss National Bank (SNB). The cut-off date for information presented in this study is 4 February 2010.

- These unconventional monetary policy measures appear to have contributed to stabilising financial markets and reduced yields on targeted instruments and have helped set the stage for the subsequent economic recovery.

- Retaining such measures for too long can have adverse implications for the functioning of financial markets and inflation. Thus, as financial markets continue to move towards normalisation and the economic recovery takes hold, central banks must exit from many of the crisis-driven measures by reducing their intervention in financial markets.

- Charting the road towards the exit will, however, have to take into account that, alongside the still central objective of maintaining price stability, the goal of preserving financial stability (whether seen as an independent goal or a pre-condition for price stability) has become more important for central banks, as it can no longer be taken for granted in the wake of the crisis. Hence, during the exit phase, central banks need to employ a variety of tools to pursue both objectives simultaneously. In particular, interest rate decisions should be predominantly based on the macroeconomic objective of price stability and must not be unduly influenced by consideration for financial stability concerns.

- The exit from unconventional measures will differ for shorter and longer-term assets and will involve the use of liability management instruments:

  – As tensions in financial markets have subsided, the use of extraordinary shorter-term liquidity facilities has already started to diminish, mainly thanks to market incentives embodied in the measures, and such programmes are set to terminate at a fixed date in the future. Against this background, some central banks have already taken the first step of the exit by scaling down liquidity-providing programmes. For financial stability reasons and in view of possible contingencies in still unsettled conditions, it is important for banks to have potential access to ample liquidity for some time to come, and abrupt termination of shorter-term liquidity facilities should be avoided. However, with market conditions normalising, increasing the cost of borrowing via such programmes (*e.g.* by higher fees, narrowing collateral requirements or shortening the maturity) is warranted to discourage their use outside contingencies.

  – Some central banks have accumulated very large amounts of long-dated assets. An outright sale of such assets is an important exit option, particularly for private assets that involve credit risk and more distortive implications. However, selling might have destabilising impacts on the markets concerned, implying that there are also benefits to keeping such assets on the balance sheets. Retaining long-term assets to maturity would also avoid abrupt large losses that would have to be realised if such assets were sold in an environment of higher long-term rates. As large-scale losses could raise questions about the independence of monetary authorities, retention could help to preserve central bank credibility.

  – To the extent that central banks choose to hold short and long-dated assets on their balance sheets, their impact on liquidity can be offset with the use of liability management tools. In this environment, active use of the deposit rate can be a convenient tool for the exit, as it affects banks' desired holding of reserves, though it also has downsides (not least for the operation of money markets). Central banks can also make use of various tools to drain liquidity, including reverse market operations, term deposits and issuance of central bank bills, the latter two being more practical as they do not have to be tied to particular assets. Where schemes for monetary policy implementation have been traditionally restrictive, new tools may have to be introduced.

- Uncertainty concerning the underlying strength of financial markets, the existence of still large slack and a muted inflation outlook all suggest that the exit should be conducted at a slow pace. Even though monetary policy actions should not be conditioned on government actions, monetary policy exit should also bear in mind that government actions, such as the removal of emergency financial market measures and fiscal stimuli, have spill-over effects on financial markets and the overall economy. Withdrawal of monetary policy measures, in turn, can also have implications for fiscal authorities. Central banks should also bear in mind that the exit has repercussion internationally.

- Over a longer horizon, the framework for monetary policy implementation may have to be re-assessed in the light of the crisis experience. Some measures that have been implemented during the crisis have the potential of enhancing central banks' operational capacity on a permanent basis. An important question remains as to how generous central banks should be in providing liquidity under normal financial market conditions. The fact that central banks have once extended liquidity provision in times of the crisis may complicate monetary policy implementation in the post-crisis period, which calls for more stringent macro-prudential regulation.

3. The rest of the paper is structured as follows. It begins with a summary of measures taken in response to the crisis, focusing on how they have led to changes in both size and composition of the monetary base as well as assessing their impacts on financial market developments (Section 1). A discussion on potential implications for financial market functioning and inflationary concerns (Section 2) leads to a section highlighting the importance of formulating, communicating and ultimately executing appropriate exit strategies (Section 3). The paper concludes with some open questions regarding how the overall framework for monetary policy implementation may have to be re-assessed after the exit is completed (Section 4).

1. Monetary policy measures and their consequences

Monetary policy responses to the crisis

4. As the financial crisis intensified, reactions of central banks were unprecedented in both speed and scope (Table 1). In addition to exhausting the use of the traditional tool of short-term interest rates, major central banks have taken on more risk than usual and occasionally become *de facto* market makers in a number of important areas. Monetary policy measures taken in response to the crisis can be largely categorised into the following five elements:[4,5]

i) lowering policy rates to very low levels,

4 . This section draws on number of special reports and speeches that summarise the policy actions taken in response to the crisis, such as Bernanke (2009) and ECB (2009a), sometimes in a multilateral context such as Bank of Japan (2009), Sellin (2009), and Cecchetti and Disyatt (2009).

5. Many of these measures were aimed at restoring stability in the financial markets and were not necessarily directly linked to the macroeconomic goal of price stability. Indeed, one could narrowly focus on unconventional measures that solely target aggregate demand, as was done by Meier (2009). However, in the current crisis, financial stability and macroeconomic stability objectives have been intertwined: measures to restore financial stability have been taken so as to prevent a negative feedback loop whereby financial weakness induces economic sluggishness.

ii) increasing liquidity provision to financial institutions,[6]

iii) intervening directly in wider segments of the financial market, '

iv) purchasing long-term government bonds, and

v) supporting specific institutions.

Table 1. Central bank measures in response to the crisis

	Fed	ECB	BoJ	BoE	BoC	Riksbank	SNB
Lowering policy rates to very low levels	x	*De facto*	x	x	x	x	x
Increasing liquidity provision to financial institutions	x	x	x	x	x	x	x
Intervening directly in wider segments of the financial market	x	x	x	x			x
Purchasing long-term government bonds	x		x	x			
Supporting specific institutions	x		x	x		x	x

Lowering policy rates to very low levels

5. In response to the crisis, central banks aggressively cut policy target rates in most cases to levels where the zero lower bound is effectively binding (Figure 1). In the earlier stage of the crisis, policy stances were not uniform across central banks: while the Fed, the BoC and the BoE started to cut policy target rates as early as in the course of 2007, other central banks kept their policy rates on hold or even increased them owing to inflation concerns. However, as the crisis intensified after the collapse of Lehman Brothers in September 2008, all central banks surveyed here started to cut policy targets rates at a very rapid pace, as previous inflation concerns quickly gave way to concerns about the deep recession which might even lead to deflation. Most central banks have taken their main policy rates (or the rate that determines the effective market rate) to close to zero, maintaining slightly positive rates to prevent the withering of money market transactions.[7]

6. With the aim of influencing expectations so that bond yields fall beyond the shortest horizon, some central banks have explicitly indicated that exceptionally low interest rates are to be maintained for some time. The most explicit is the Riksbank, which has published a clear path of future policy rates along with – and conditional on – its economic and inflation projections. The BoC has made a conditional commitment since April 2009 to keep interest rates unchanged until the second quarter of 2010 and acknowledges that this pledge has been made in response to the fact that short-term interest rate cannot be reduced further (Bank of Canada, 2009). The Fed has relied on verbal guidance to indicate that policy

6. As by-products, liquidity-absorbing measures have also been extended.

7 The BoJ, in contrast to the previously adopted zero-interest rate policy, stopped at 10 bps in the current crisis, claiming that this is the lowest level of interest rate that covers transaction cost. The ECB appears to be particularly concerned with this risk, as it kept the main target rate relatively high at 1%. In practice, however, effective market rates have been allowed to fall significantly below this level in the euro area, to around ⅓ per cent in January 2010. Beechey and Elmér (2009) outline some non-macroeconomic issues for central banks to consider when the policy target rate reaches very low levels, such as risks of discouraging certain market activities and potential disruption of the interest rate channel. They conclude for Sweden that the policy interest rate of 25 basis points has not significantly damaged functioning of financial market.

interest rates are likely to be kept at exceptionally low levels for an extended period. The BoJ has more recently started to make it more explicit that it intends to keep the current accommodative policy stance for some time.[8]

Increasing liquidity provision to financial institutions

7. Exceptionally low policy interest rates have been expected to lead to lower funding cost for banks, which should in turn support activity through reduced lending rates. Money markets, however, became dysfunctional at the start of the crisis, which has complicated the task of central banks. As market participants faced exceptional uncertainty over their own liquidity needs while becoming extremely wary of counterparty risk, money market interest rate rose substantially relative to risk-free rates. With many banks simply hoarding liquidity, the transaction volume in the market diminished considerably. Hence, despite successive cuts in policy rates, this turmoil in the money market impaired the interest rate channel of the monetary policy transmission mechanism.[9]

8. In this environment, central banks have greatly eased the conditions under which they lend liquidity to banks, often involving modification of pre-existing facilities and introduction of new schemes. The new focus on the available amount rather than the price of liquidity has been dictated to some extent by the fact of effectively reaching the zero lower bound. But this is not necessarily the case: many central banks started to increase liquidity provision significantly while the policy target rate was still clearly in positive territory. The objective was to meet significantly increased demand for liquidity, caused by higher liquidity preference, prompted by stronger precautionary demand and lower opportunity costs of holding reserves.

9. In the area of liquidity provision, measures taken by central banks exhibit a number of common characteristics as follows:

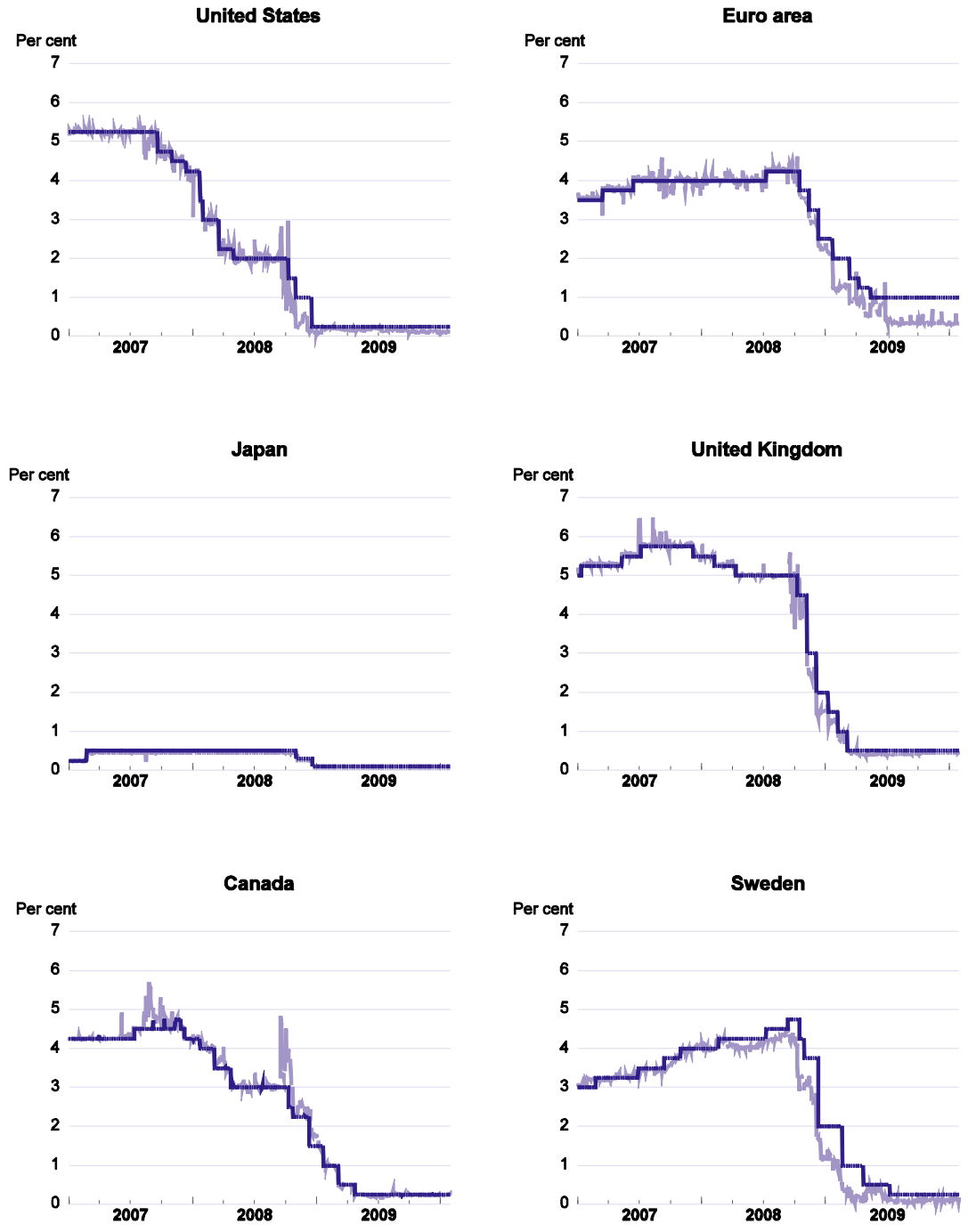
- Relaxation/elimination of caps in liquidity offers: In normal times, central banks provide only a limited amount of liquidity to the money market, just enough to align the effective market rate to the policy target. The presumption is that the overall amount of liquidity in the market corresponding to the target level of interest rate is sufficient and that any distribution of liquidity among banks can be left to the money market. As financial turmoil intensified, central banks judged that money markets were not guaranteeing a smooth distribution of liquidity within the banking system and that the overall amount of liquidity had become insufficient to meet an exceptional increase in precautionary demand for liquidity. In recognition of this situation, central banks started to relax the limit concerning the amount of liquidity available.[10] In some

8. This commitment has been made in conjunction with its decision to let expire some of the crisis-related temporary measures.

9. The SNB engineered more accommodative monetary policy stance at the peak of financial stress thanks to its direct targeting of three-month LIBOR. See, for instance, OECD (2010).

10. To the extent that demand for liquidity arises from idiosyncratic shocks specific to each institution, banks can have recourse to the standing lending facility provided by central banks. In the United States and the United Kingdom, however, banks have proved to be reluctant to use these facilities due to the so-called "stigma" problem: banks are concerned that the use of the central bank facility, if known to other market participants, may be perceived as signalling financial weakness. Indeed, in the early stage of the crisis, the Fed relaxed the conditions to use its discount window facilities, which failed to contain pressures in the money market and the introduction of the Term Auction Facility by the Fed was an attempt to address this problem. The BoE has also taken measures so that the use of the facility will not easily be known by other market players.

Figure 1. Policy-determined and money market interest rates



Note: The solid line represents the policy rate of the central banks. United States: Federal Funds target rate; Euro area: main refinancing operations, minimum bid rate; Japan: overnight uncollateralized call rate; United Kingdom: repo rate; Canada: Bank of Canada's target for the overnight financing rate.
The grey lines show actual money market rates. Money market interest rates; United States: effective Federal Funds rate; Euro area: EONIA (Euro overnight index average); Japan: collateralised unconditional overnight call rate; United Kingdom: SONIA (Sterling Overnight Index Average rate); Canada: call loans overnight rate; Sweden: rate on 90-day Treasury bills.
Sources: Bloomberg, Bank of Japan, Datastream and ECB.

cases (for the ECB with refinancing operations and the BoJ with the newly introduced special funds-supplying operations), the limit has been eliminated entirely with the introduction of full-allotment at the pre-announced fixed rate.[11] Even where this is not the case and liquidity must be obtained through bids at auctions, offers from central banks have been significantly increased, particularly after the autumn 2008, so that in practice banks do not appear to have been constrained.[12]

- Relaxation of collateral eligibility requirements: Liquidity provision from central banks normally requires that counterparties pledge collateral of a safe credit quality and includes haircuts on the value of the securities to provide loss protection for central bank. As the crisis intensified and market participants' demand for safer assets increased, a lack of eligible collaterals became increasingly perceived as an obstacle in boosting liquidity provision, particularly where the traditional list of collaterals for monetary policy operations was limited. [13] All central banks have responded by expanding the list of eligible collateral. [14] On top of the direct impact of facilitating ample liquidity provision against larger pools of collaterals, widening the list of eligible collateral has also served to indirectly support wider credit market segments, as collateral acceptance by central banks should increase liquidity in the market segments concerned. In this regard, some central banks (BoJ, BoC and Riksbank) introduced new liquidity provision schemes that specifically use securities issued by non-financial corporations as eligible collateral so that credit flows can be indirectly supported. The inclusion of less credit-worthy instruments implies that central banks are exposed to higher credit risk, although haircuts provide central banks with loss protection.

- Expansion of the list of counterparties to central bank operations: Money market turmoil created a situation where liquidity could not be distributed smoothly among banks. In particular, the lack of mutual trust in the banking system meant that some banks which do not trade with monetary authorities could not anymore borrow money effectively from other banks. Expansion of the list of counterparties to the central bank was considered necessary to reach a greater number of banks directly. This need was particularly strong for central banks that traditionally relied on a small number of institutions for their core monetary policy operations (*e.g.* primary dealers for the Fed and the BoC). The Fed and the BoC have therefore introduced schemes to enable operations against a wider set of counterparties. Other central banks have also expanded the list of counterparties, although changes during the crisis were minimal because the list had already been wide even before the crisis.

11. In the case of the BoJ, the fixed-rate full-allotment offer is only applicable against collaterals of corporate debt. For the ECB, it is applicable for all refinancing operations.

12. For instance, the Term Auction Facility by the Fed is based on auctions where participants bid for liquidity. After October 2008, however, the amounts offered have been made large enough to meet all requests at the minimum rate.

13. Collateral eligibility used to be particularly rigorous for the Fed, the BoC and the BoE that generally accepted only government securities or the equivalent for market operations (collateral eligibility has been wider for the use of the standing facility). Other central banks (ECB, BoJ, Riksbank and SNB) traditionally accepted wider ranges of assets.

14. Some central banks have directly provided their counterparties with safe and liquid instrument other than central bank money. Fed, BoJ and BoE have introduced or expanded schemes enabling illiquid assets to be temporarily exchanged for more easily tradable government securities. In Sweden, in close consultation with the central bank, the government conducted extraordinary auctions to increase the supply of short-term government securities.

- Provision of longer-term liquidity: The money market was especially dislocated at long maturities, pushing the corresponding rates to high levels compared with expected overnight rates. Against this background, central banks significantly expanded the duration of their liquidity-providing operations, from traditional short horizons, typically overnight or one week, to about three months (Fed) and one year (ECB, BoJ, BoE, BoC, Riksbank and SNB).[15]

- Liquidity provisions in foreign currency: In response to a significant shortage of dollar liquidity outside the United States, mutual currency swap agreements have been signed across major central banks, allowing non-US central banks to provide dollar liquidity directly to banks operating domestically. The SNB also made use of swap facilities to ease the pressure on foreign Swiss franc markets.[16]

10. These measures, together with the direct market intervention schemes discussed below, have resulted in far greater liquidity provision than required to keep effective market rates in line with policy rates, generating a significant downward pressure on market rates. For instance, longer-horizon operations have helped to ease concerns about liquidity availability, but they have also resulted in massive liquidity in the overnight interbank market. This was particularly a problem when the target was still well above zero. The fact that all central banks have decided to keep positive policy targets, albeit small, implies that this has continued to be a relevant issue even after the target rates fell to very low levels.

11. Although liquidity injections were sterilised to some extent by offsetting positions on the asset side (such as sales of short-term government securities or an increase in longer-term liquidity provision matched by a reduction in short-term provision), central banks have also introduced new liability management tools so as to keep the market rate on target. For instance, short-term central bank bills have come to be widely used as a means to temporarily drain excess liquidity (introduced by the BoE and the SNB, and active use of the existing scheme by the Riksbank) but this kind of operation does not exist for the Fed. Government deposits have sometimes played a role in effectively draining liquidity from the banking system (*e.g.* the Fed). As the policy target rates reached very low levels, however, it is the use of the deposit rate – newly introduced for the Fed and the BoJ – that has become a dominant force to align effective market rates with policy targets.[17] Its actual use, however, differs across central banks. Many central banks (Fed, BoJ, BoE and BoC) now remunerate excess reserves at the policy target rates.[18] By contrast, the deposit rate in the euro area has been kept significantly below the main policy rate. In an environment of ample liquidity provision, the deposit rate has more traction, so that effective market rates have tended to fall to below the main policy rate to levels much closer to the deposit rate (Figure 1).[19] This may have complicated the implementation of monetary policy, as the main refinancing rate can no longer be considered as the main indicator of the monetary policy stance (ECB, 2010). In Sweden, the standing deposit facility (whose interest rate has now become negative at the repo rate minus 50 bps) has been

15. Both the BoJ and the BoE could rely on the existing operational scheme to provide longer-term liquidity provision up to one year.

16. In these swap agreements, central banks are not exposed to foreign exchange rate risk, as positions will be ultimately unwound at the same exchange rates used when drawing on the swap line.

17. For the BoJ, this measure was initially introduced as a temporary scheme but the Bank has recently decided to keep this scheme for the time being. Among the seven central banks considered here, the SNB is the only central bank that does not remunerate excess reserves.

18. This may have the effect of discouraging the lending activity in the interbank market, as banks are reluctant to lend to each other, relying instead on central bank facilities.

19. The effective overnight rate for euro (EONIA) was hovering around 35 bps at the end of January 2010, much closer to the rate in the deposit facility (25 bps) than to the main refinancing rate (100 bps).

seldom used in practice, because the Riksbank conducts large-scale liquidity absorbing fine-tuning operations at a significantly higher rate that is closer to the policy rate (the repo rate minus 10 bps).

Intervening directly in wider segments of the financial market

12. Apart from the money market, many segments of financial markets have been severely affected by the crisis, where both new issuance in the primary market and trading in the secondary market have suffered from lower transaction volume and hence less liquidity. Some of the previously discussed measures (such as widening collateral eligibility) have had impact on wider market segments indirectly, *via* banks. However, as some important markets remained impaired, central banks embarked on more explicit support by way of direct interventions including outright asset purchases (Table 2).

Table 2. Direct intervention and purchase of long-term government bonds by central banks

	Fed	ECB	BoJ	BoE	BoC	Riksbank	SNB
Commercial paper	x [1]		x [2]	x [5]			
Corporate debt			x [2]	x [5]			x [2]
Mortgage-backed securities	x [2]						
Agency bonds	x [2]						
Securitised products	x [3]						
Covered bonds		x [2]					
Equity			x [4]				
Foreign exchange							x [6]
Long-term government bonds	x [2]		x [7]	x [5]			

Notes:

1. Asset-Backed Commercial Paper Money Market Fund Liquidity Facility (AMLF), Commercial Paper Funding Facility (CPFF) and Money Market Investor Funding Facility (MMIFF).
2. Direct purchase programme.
3. Term Asset-Backed Securities Loan Facility (TALF).
4. Direct purchase of equity held by banks.
5. Asset Purchase Facility.
6. Unsterilised intervention in the Swiss franc-euro market.
7. Increased monthly pace of outright purchases.

13. Direct interventions by central banks were aimed at boosting market sentiment, increasing liquidity and boosting prices (or equivalently lowering yields). Reflecting differences in financial market structures across economies, central banks' interventions in this area differ more than in the case of liquidity provision. Given the importance of capital market funding to the US economy, the Fed has been the most active in this regard. Programmes initiated by the Fed have taken the form of lending to buyers of the financial instruments that are targeted (taking these securities as collateral). Even in such cases, the effects can be considered to be broadly similar to outright purchases since these schemes have been structured so that the downside risk is effectively transferred to central banks or fiscal authorities.[20] Many other central banks have also decided to purchase outright various categories of private sector assets, although their interventions have generally been far smaller compared with the that of Fed.

14. Some central banks have intervened in an even more unusual way. The BoJ has decided to resume its purchases of corporate equities with the aim of reducing banks' risk exposure to fluctuations in

20. Under the Asset-Backed Commercial Paper Money Market Fund Liquidity Facility (AMLF) and the Term Asset-Backed Securities Loan Facility (TALF), the Fed and, in the case of TALF, the Treasury have extended loans on a non-recourse basis so that the downside risk has been transferred to the Fed or the Treasury. In the Commercial Paper Funding Facility (CPFF), the Fed has extended loans to a special purpose vehicle whose assets solely consist of commercial paper holdings.

share prices.[21] For the SNB, the most significant measure has been its decision to conduct unsterilised interventions in the foreign exchange market to prevent further appreciation of the franc against the euro.

Purchasing long-term government bonds

15. Three central banks have increased or introduced outright purchase of long-term government bonds (Table 2). The BoJ, with a view to facilitating liquidity provision over longer-term horizons, has increased the monthly pace of purchase from the pre-crisis level of ¥ 1.2 trillion (equivalent to 0.23% of 2007 GDP) eventually to ¥ 1.8 trillion (0.35%). The Fed purchased $300 billion (equivalent to 2.1% of 2007 GDP) of long-term Treasury securities in order to lower the risk-free rate over medium to long-term horizons, thereby easing credit conditions across a wide spectrum. The quantitative easing policy by the BoE that aims at expanding the base money as rapidly as possible is conducted through the Asset Purchase Facility whose asset size was extended from the initial £75 billion (5.4% of 2007 GDP) to £200 billion (14.3%), largely comprised of holdings of gilts. The three central banks have refrained from purchasing government bonds in the primary market, to avoid fuelling fears that they might monetise fiscal deficits.

Supporting specific institutions

16. Some central banks (Fed, BoE, Riksbank and SNB) have engaged in emergency liquidity provisions to individual financial institutions.[22] Although these measures may be considered to be a part of the traditional lender-of-last-resort function of central banks, the counterparty sometimes included institutions that have been normally considered to be beyond the scope of the lender-of-last-resort function. Central banks also appear to have gone beyond the application of usual criteria regarding the quality of the collateral they have accepted in some of these operations.

Similarities and differences across central banks

17. While actions have been similar in some aspects (*e.g.* ample liquidity provision), they nonetheless differ considerably across central banks in both scope and magnitude. Discrepancies are particularly large as regards the extent to which central banks have intervened in wider market segments and taken on long-dated assets. These differences are highlighted by a significant divergence in the stated focus: each central bank has communicated a set of policy actions using its own terminology, such as "credit easing" for the Fed, "enhanced credit support" for the ECB and "quantitative easing" for the BoE.[23] The difference appears to reflect dissimilarities in central banks' pre-existing operational and institutional setups, in the structures of their economies as well as in the judgements made about the functioning of monetary transmission. All of these differences are, in turn, reflected in the size and composition of the monetary base, which is discussed below.

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21. As a legacy of traditional cross-holding of stocks, the equity holdings of Japanese banks have still been important.

22. The supported institutions were Bear Sterns and American International Group in the United States, Kaupthing Bank and Carnegie Investment Bank in Sweden, and UBS in Switzerland. In the United Kingdom, in addition to the previously announced support for Northern Rock, it has recently been revealed that massive liquidity support was extended at the height of the crisis to Royal Bank of Scotland and HBOS. In addition, the BoJ decided to provide subordinated loans to banks, although the actual provision of the loan has been extremely limited.

23. The paper does not use these terms so as to avoid confusion. The wording of "quantitative easing" appears particularly problematic, as it is also used in a broader sense to imply any policy that involves an active use of the balance sheet of central banks. Borio and Disyatat (2009) argue that the discussion of unconventional measures has been complicated by the use of different definitions and propose a systematic framework to categorise them, focusing on the differing use of balance sheets.

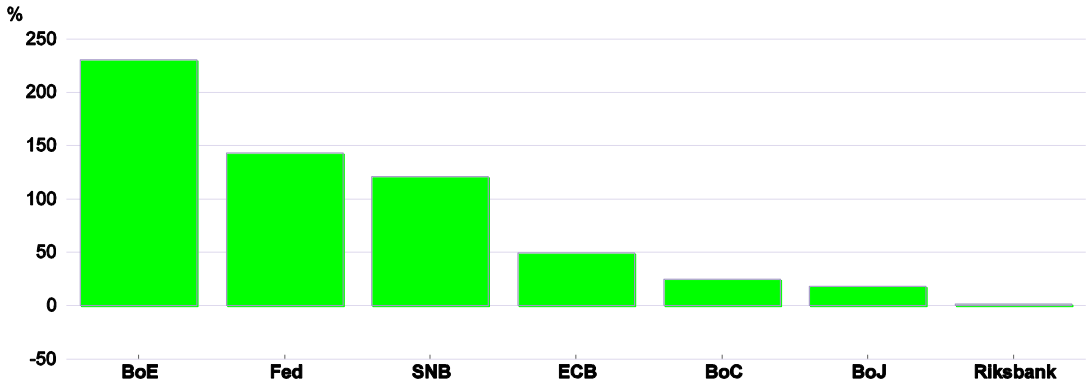
Changes in the monetary base: a summary indicator of unconventional measurse

18. The overall stance resulting from the various initiatives taken by central banks cannot be easily summarised in a single number.[24] All measures have, however, resulted in significant changes on both sides of central banks' balance sheets and their size and composition provide an indication of the policy stance. Hence, since changes on either side of the balance sheets are ultimately reflected in the monetary base, it may serve as a rough proxy of unconventional monetary policy actions. The monetary base is more informative as an indicator when considering not only the size of of its changes but also the composition of the counterparty transactions.

19. The increase in the monetary base during the crisis differs markedly across key monetary authorities (Figure 2, Panel A).[25] Particularly large changes have been observed for BoE, the Fed and the SNB, with the monetary base increasing by 100% or more. At the other side of the spectrum are the BoJ, the BoC, with an increase of only about 20% and the Riksbank, with hardly any increase.

Figure 2a. Increases in the monetary base over the pre-crisis norms

(Percentage change to end December 2009 vis-à-vis the January-July 2007 average)



Notes: For details on all countries, please see footnotes at the end of Figure 2b.
Sources: For sources see Figure 2b.

24. This is in contrast to the case for the BoJ under its 2001-06 quantitative easing policy where the outstanding amount of reserve balances was given a clear role to indicate the stance of monetary policy.

25. Data on the monetary base have been calculated from balance sheet information using the narrow definition of currency in circulation plus reserves to ensure comparability across central banks to the extent possible. The standing deposit facility has been included in the monetary base, because such deposits are very liquid and their economic effect is likely to be the same as excess reserves. Monetary base developments thus computed are largely consistent with the official data, with the exception of Sweden, where the national definition of the monetary base now includes central bank bills. For the purpose of the present analysis, issuance of central bank bills is instead regarded as one way of reducing the monetary base without having to shrink the balance sheet of monetary authorities. The size and composition of the monetary base at each point in time have been compared with the pre-crisis levels, for which the January-July 2007 averages have been used as the base. Where international comparison is made, the size of monetary base is normalised using the 2007 GDP.

Figure 2b. Increases in the monetary base over the pre-crisis norms

(Percentage change vis-à-vis the January-July 2007 average)

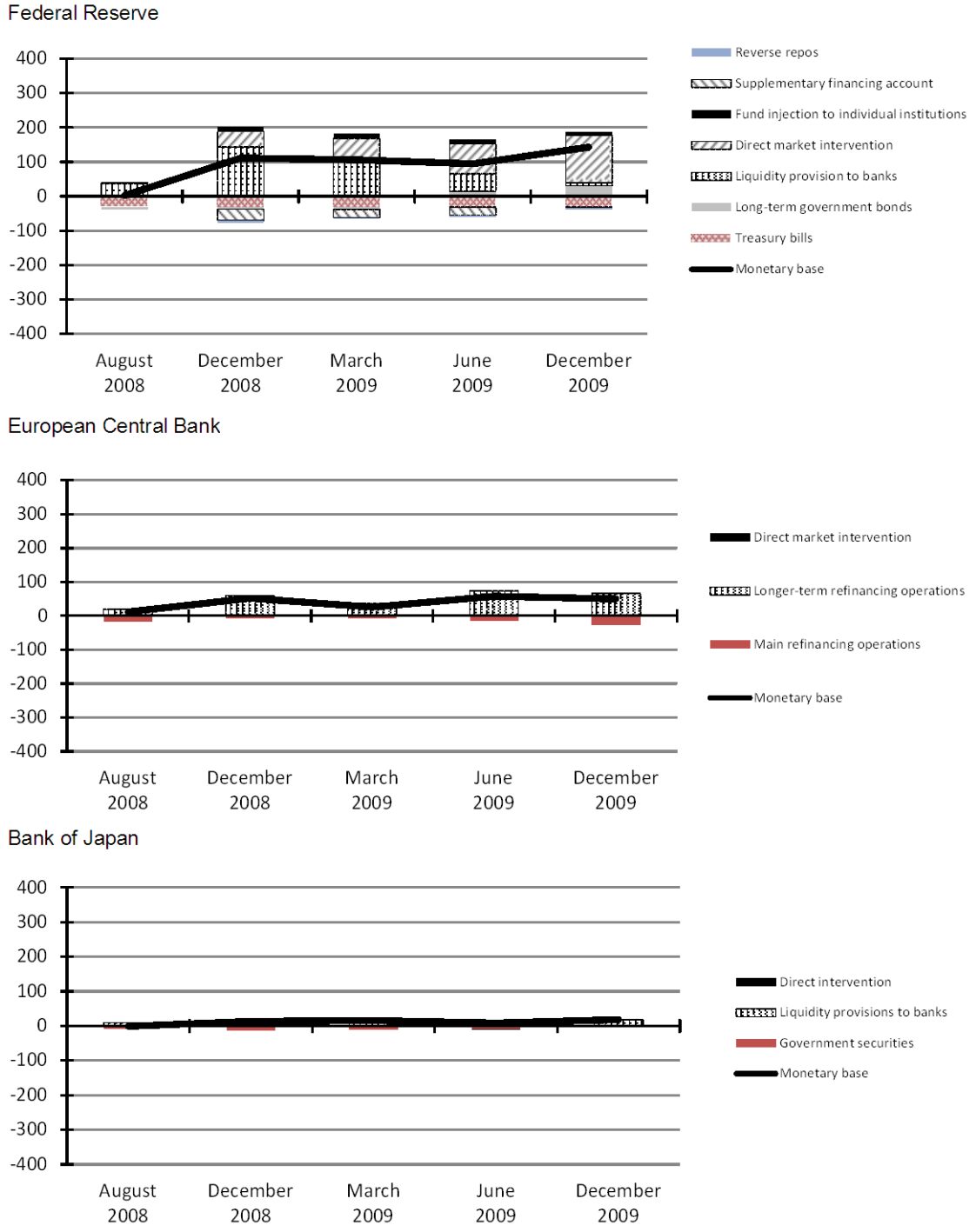
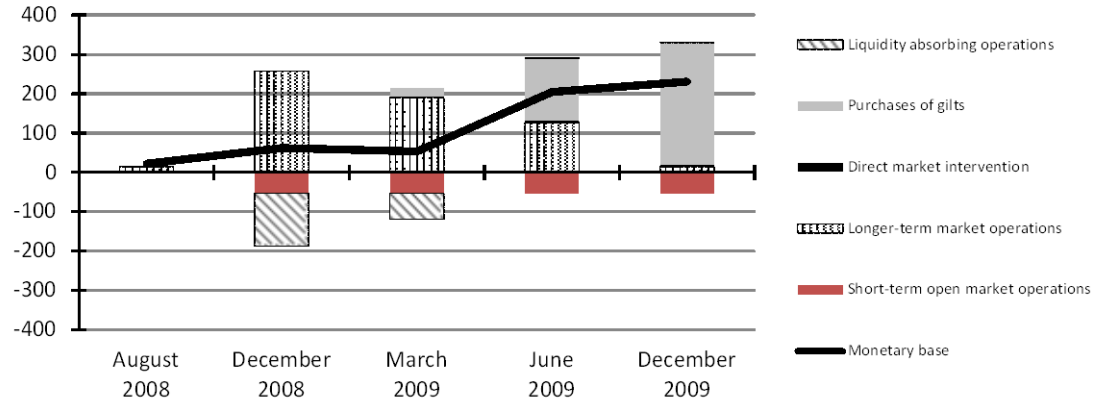


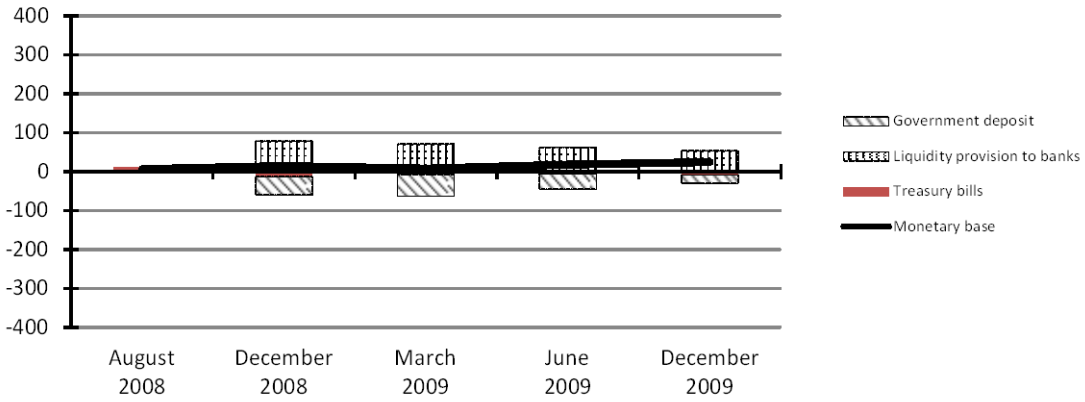
Figure 2b. Increases in the monetary base over the pre-crisis norms *(cont.)*

(Percentage change vis-à-vis the January-July 2007 average)

Bank of England



Bank of Canada



Sveriges Riksbank

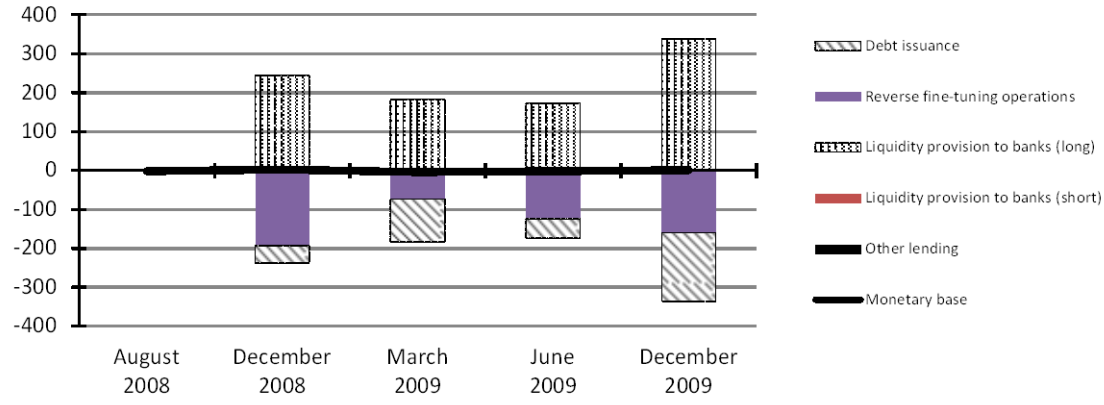
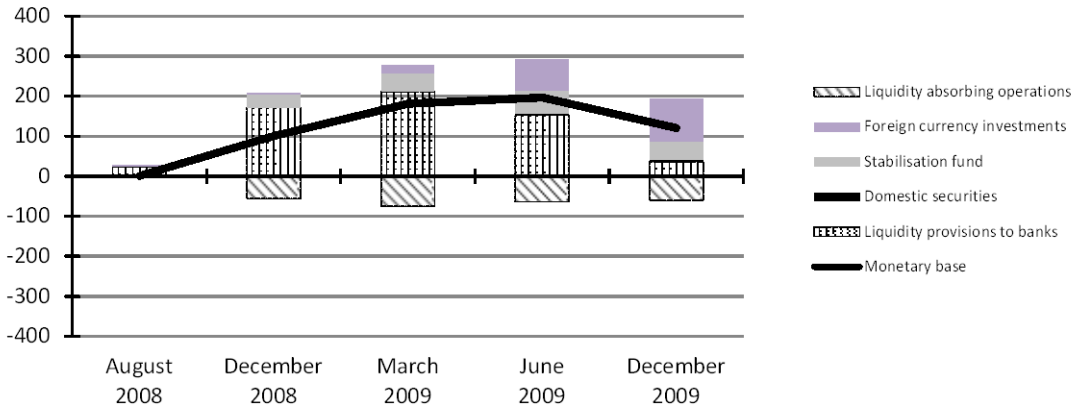


Figure 2b. Increases in the monetary base over the pre-crisis norms *(cont.)*

(Percentage change vis-à-vis the January-July 2007 average)

Swiss National Bank



Notes:
1. The data for the Fed are based on Federal Reserve Statistical Release H.4.1 "Factors Affecting Reserve Balances". (http://www.federalreserve.gov/releases/h41/).
Monetary base = Currency in circulation + Reserve balances + Service-related deposits
Liquidity provision to banks = Repurchase agreements+ Term auction credit + Primary credit + Secondary credit + Seasonal credit + Primary dealer and other broker-dealer credit + Central bank liquidity swaps
Direct market intervention = Federal agency debt securities + Mortgage-backed securities + Term Asset-Backed Securities Loan Facility + Asset-Backed Commercial Paper Money Market Mutual Fund Liquidity Facility + Net portfolio holdings of Commercial Paper Funding Facility LLC + Net portfolio holdings of LLCs funded through the Money Market Investor Funding Facility
Fund injected to individual institutions = Credit extended to American International Group, Inc., net + Net portfolio holdings of Maiden Lane LLC + Net portfolio holdings of Maiden Lane II LLC + Net portfolio holdings of Maiden Lane III LLC

2. The data for the ECB are taken from "Weekly Financial Statement" (http://www.ecb.int/press/pr/wfs/2010/html/index.en.html).
Monetary base = Banknotes in circulation + Current accounts (covering the minimum reserve system) + Deposit facility
Direct market intervention = Securities held for monetary policy purposes (i.e. covered bonds)

3. The data for the BoJ are based on "Monetary Base and the Bank of Japan's Transactions" (http://www.boj.or.jp/en/theme/research/stat/boj/mbt/index.htm).
Monetary base = Banknotes and coins in circulation + Current account balances
Liquidity provision to banks = Purchases of JGSs under repurchase agreements + Funds-supplying operations against pooled collateral + Purchases of CP under repurchase agreements + Special funds-supplying operations to facilitate corporate financing + Loans pursuant to Article 33 of the Bank of Japan Law
Direct market intervention = Outright purchases of CP + Outright purchases of Corporate Bonds + Stocks Held as Trust Property

4. The data for the BoE are taken from "the Bank returns" supplemented by detailed information about the Asset Purchase Facility (http://www.bankofengland.co.uk/publications/bankreturn/index.htm).
Monetary base = Notes in circulation + Reserve balances + Cash ratio deposits
Direct market intervention = Commercial paper and corporate debts held by the Asset Purchase Facility.
Purchase of gilts = Gilts held by the Asset Purchase Facility.

5. The data for the BoC are taken from "Weekly Financial Statistics, Table B2 Bank of Canada: Assert and liabilities" (http://www.bankofcanada.ca/en/wfsgen.html).
Monetary base = Notes in circulation + Canadian dollar deposits of chartered banks, other and other members of the Canadian Payments Association (for the calculation of the pre-crisis averages) + Canadian dollar deposits, members of the Canadian Payments Association .
Liquidity provision to banks = Securities purchased under resale agreements + Advances (including the Term Loan Facility) and All other assets (that included securities purchased under resale agreements prior to 3 October, 2007).

6. The data for Sveriges Riksbank are taken from "'The Riksbank's assets and liabilities, the Weekly Report " (http://www.riksbank.com/templates/YearList.aspx?id=11996).
Monetary base = Banknotes and coins in circulation + Deposit facility
Liquidity provision to banks (short) = Main refinancing operations + Fine-tuning operations + Marginal lending facility
Liquidity provision to banks (long) = Structural operations

7. The data for SNB are taken from "Monthly Statistical Bulletin, Table A1 Balance sheet items of the SNB" (http://www.snb.ch/en/iabout/stat/statpub/statmon/stats/statmon).
Monetary base = Banknotes in circulation + Sight deposits of domestic banks + Sight deposits of foreign banks and institutions + Other sight liabilities
Liquidity provisions to banks = Claims from CHF repo transactions + Balances from swap transactions against CHF
Liquidity absorbing operations = Liabilities from CHF repo transactions + SNB debt certificates

20. These differences in changes in the size and composition of the monetary base reflect the different policy measures implemented during the crisis. For all major central banks, the increases in the monetary base were initially driven by liquidity support to the banking sector (Figure 2, Panel B). This component has in most cases tended to shrink over time as financial market conditions improved. For the Fed and the BoE, subsequent large increases in the monetary base were largely due to the substantial asset-purchase programmes. For the other central banks, the increases in the monetary base remained much smaller and were driven mainly by liquidity support to the banking sector. Major characteristics of the evolution of the monetary base for each central bank, including the main counterparts of the monetary base increase in their balance sheets, are summarised in Box 1, with some reference to actual policy measures taken by each central bank.

Box 1. Developments of the monetary base in key central banks

This box lists major characteristics of changes in monetary bases of central banks vis-à-vis the pre-crisis averages (Figure 2b).

- The Fed started to increase liquidity provision to financial institutions (notably through its newly created Term Auction Facility) in the early stage of the crisis, although it initially sterilised the effect of these operations on the monetary base by selling Treasury bills. It was only after the intensification of the crisis in September 2008 that the monetary base expanded noticeably. Although the total size of the monetary base remained broadly stable at high levels from the end of 2008 to the end of June 2009, Fed policies nonetheless evolved over time, as can be seen from changes in the contributions from various programmes. The impact of liquidity provisions to banks has gradually become smaller over time as the use of these facilities has dwindled while the Fed stepped up its direct market intervention: most notably outright purchases of mortgage-backed securities and, to a lesser extent, agency bonds (with the impact of the TALF programme remaining negligible so far) and, more recently, outright purchases of long-term government bonds. This trend continued until end-December 2009 and led to a further increase in the monetary base. Lending to individual institutions has made a minor contribution. On the liquidity-absorbing side, the Fed exhausted, at a relatively early stage, the conventional option of selling Treasury bills, which was replaced by the use of the "Supplementary Financing Account", whereby the Treasury sells bills and deposits proceeds at the Fed (so that liquidity is effectively drained from the banking system). The use of this account, however, started to shrink from its peak in early November 2009, adding further upward pressure on the size of the monetary base.

- For the ECB, the important measures have always been mediated by banks, reflecting the predominant importance of bank-based financing in the euro area. Since the start of the crisis, longer-term refinancing operations (originally up to three months and later extended to one year) have to a large extent replaced the conventional main refinancing operations (usually of one-week maturity). The introduction of the full-allotment scheme led to a significant increase in the monetary base in the autumn of 2008. Although the volume was allowed to come down in early 2009, it increased again from mid-2009 onward, reflecting three large one-year operations. Meanwhile, outright purchases of covered bonds, which can still be considered as an extension of bank-mediated support measures because they are primarily issued by banks, remains a minor factor in expanding the monetary base.

- Regarding the BoJ, as in the case of the ECB, bank-based measures have been the main drivers of changes in the monetary base, in particular through the re-financing scheme to facilitate corporate financing that was established in December 2008. On the other hand, BoJ holdings of government securities have come down, as the impact of redemption has outweighed an increase in the monthly pace of purchases. Meanwhile, direct intervention measures, such as outright purchases of commercial paper and corporate bonds as well as the resumption of purchases of equities held by banks, have only had a negligible influence. The decision taken in early December to provide ample liquidity through the New Funds-Supplying Operation resulted in some increase in the monetary base at the end of December 2009.

- The BoE stepped up its special monetary measures in the autumn of 2008, when the Bank started to use its existing operational framework to supply massive liquidity over a longer horizon (up to one year). However, a significant portion was offset for some time by a contraction in short-term operations and an active

Box 1. Developments of the monetary base in key central banks (continued)

issuance of newly introduced central bank bills. There was a major shift in the policy stance in March 2009 with the introduction of a "quantitative easing" scheme with a huge increase in the purchases of gilts. Although this policy also involves buying commercial paper and corporate bonds, the impact of these two categories of purchases remains very small. Indeed, the buying of gilts has been the predominant driver of the expansion of the monetary base, almost entirely replacing the role of traditional liquidity-providing operations. The BoE has stopped issuing bills.

- At the BoC, the overall size of the monetary base has increased only marginally. Although the facility of term purchases and resale agreements has been used actively, resulting in greater provision of liquidity to banks, the effect on the monetary base has been largely offset by an increase in government deposits and, to a lesser extent, sales of Treasury bills by the Bank for sterilisation purposes.

- The Riksbank has not expanded the monetary base (as defined for the purpose of this paper) on a net basis, as ample provision of liquidity has always been matched by significant expansion of liquidity-absorbing operations.[0] Liquidity provisions to banks have relied entirely on longer-term operations (whose maturity has been extended to one year). The Riksbank, however, absorbed liquidity at the same time through fine-tuning operations initially and bill issuance more recently.

- At the SNB, liquidity provision to banks through domestic repo transaction (extended to one year) has been an important factor in large increases in base money, as has Swiss franc liquidity provision using swap agreements.[2] The liquidity injection into UBS (Stabilisation Fund) has also made some contribution. More recently, however, an increase in the SNB's foreign-currency-denominated assets has been particularly noticeable, following the policy of unsterilised intervention in the foreign exchange market to deter the further appreciation of the Swiss franc against the euro. Meanwhile, the decision to purchase domestic private securities has had negligible impact on the monetary base. A certain portion of these liquidity injections has been absorbed by issuing central bank bills.

1. The official monetary base data, however, show a noticeable increase because they include central bank bills (usually of one-week maturity).

2. As the SNB directly targets the LIBOR, upward pressure exerted on the LIBOR rate as oversees investors started to unwind previously accumulated Swiss franc positions have a direct consequence for monetary policy, to which the SNB reacted through swap agreements with the ECB, Hungarian and Polish central banks.

The impact on market developments

21. Assessing the isolated impact of liquidity and credit intervention measures initiated by central banks is difficult, not least because they have also been accompanied by forceful government emergency financial policy measures.[26] Although the impact of each policy measure cannot be assessed in isolation, as a whole, the responses from central banks and governments appear to have contributed to improvements in market functioning, as the stress in financial markets now appears to have largely receded. It is perhaps premature to arrive at a decisive conclusion about the exact contribution of unconventional monetary policies at this stage, but empirical studies have found some positive effects of these measures on market developments. For instance, Aït-Sahalia *et al.* (2009) find that macroeconomic and financial sector policy announcements have had positive impacts on interbank credit and liquidity risk premia in the

26. In a number of countries, government have recapitalised banks. A series of temporary guarantee schemes at various levels have also been implemented. Since October 2008, temporary schemes have been introduced in some countries where governments guarantee newly-issued bank debt or money market transactions. At the retail level, deposit insurance has been extended, and a temporary blanket deposit guarantee has also been granted in a few countries.

United States, the euro area, Japan and the United Kingdom. More narrowly focusing on the liquidity facilities, Christensen *et al*. (2009) also conclude that they helped to lower liquidity premiums embedded in money market rates in the United States, and Meier (2009) tentatively finds positive effects for the United Kingdom. Special liquidity measures may have had wider positive effects: for instance, Yehoue (2009) has found some positive effects in emerging market countries. Corroborating the evidence on financial market effects, the experience with unconventional monetary policy measure in Japan prior to the current crisis is summarised in Box 2.

Box 2. The Japanese experience with quantitative easing from 2001 to 2006

From March 2001 to March 2006, the Bank of Japan adopted a quantitative easing (QE) policy which essentially comprised the following three elements:

- The outstanding amount of reserves became a policy target, which was increased significantly beyond required reserves.
- The significant expansion of reserve balances led the overnight interbank interest rate to fall to zero.
- The BoJ made an explicit commitment to keep this policy until year-on-year changes in CPI would become positive.

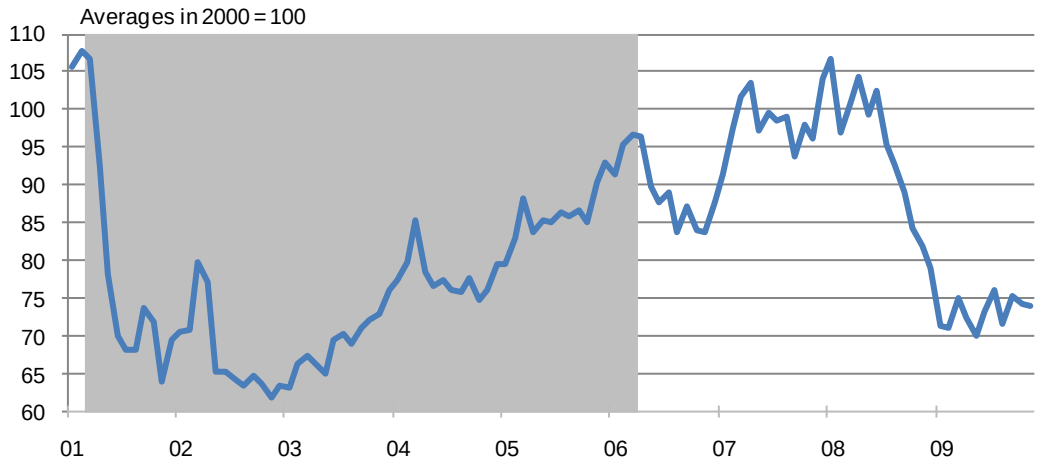
The Japanese policy during this period may be viewed as somewhat different from the various measures taken during the current crisis. For instance, the Japanese QE policy appears to have predominantly focused on the liability side of the balance sheet, while the currently adopted measures by some central banks put more emphasis on changes on the asset side (*e.g.* Bernanke, 2009). Still, there is some similarity between the Japanese QE policy and the current unconventional measures (Shirakawa, 2009), as the Japanese QE policy also involved changes on the asset side. In order to boost liquidity provision so as to generate the desired strong increase in reserve balances, the maturity of fund-supplying operations was extended and the monthly pace of outright purchases of long-term government bonds was increased. The Bank also relaxed collateral eligibility rules and purchased asset-backed commercial paper and asset-backed securities[1]. The overall financial and macroeconomic environments are also similar, as the policy was implemented amid severe stress in the financial system.

These measures, in conjunction with government initiatives including capital injections and a blanket deposit guarantee, significantly contributed to stabilising the financial sector as a whole. The Japanese experience was more mixed with respect to the impact on economic activity, however. Existing empirical studies indicate that the commitment to keep zero interest rate had the effect of lowering the yield curve, especially at the short-to-medium horizon (Ugai, 2007; Oda and Ueda, 2005). In addition, one by-product may have been effects through the exchange rate. The perception of a continued low interest rate environment may have contributed to depreciation of the yen, notably through the so-called carry-trade, with the real effective exchange rate depreciating about 17% during the period when the QE was in place. However, evidence on the impact of increased reserves *per se* cannot be confirmed (Shirakawa, 2009). In fact, despite the massive increase in the monetary base, the aggregate money stock failed to show any noticeable increase and CPI inflation remained extremely muted. This was against the backdrop of the non-performing loan problems in the banking system combined with weak loan demand having virtually closed the capacity of monetary policy to stimulate lending (OECD, 2005).

Side-effects of the QE policy were also apparent in the money market, as market participants became extremely reluctant to trade with each other. During the QE period, the transaction volume was reduced by 50% in comparison with the average level during the 1990s, although it slowly recovered starting in the middle of 2003. The large market contraction led financial institutions to downsize their operational capacities (*e.g.* the credit line network used for the mutual supply of interbank credit and personnel and computer systems in the front and back offices in connection with financial transactions), eroding the fundamental market infrastructure (Bank of Japan, 2006). Although the exit from the QE policy was decided because the pre-committed inflation condition of its removal was judged to have been met, concerns for market functioning appear to have also played a role. The Bank moved quickly to mop up excess liquidity, principally by not rolling over short-term transactions as they matured and the reserve balances fell more than 50% within three months after the exit. The recovery in the money market activity, however, took a little longer, with the transaction volume in the market getting back close to pre-QE levels only a year after the exit (see Figure).

Box 2. The Japanese experience with quantitative easing from 2001 to 2006 (continued)

Box Figure 1. Amount outstanding in the overall call market at the end of the month



Note: Shaded areas indicate periods when the BoJ implemented the QE policy.

1. The Bank also purchased stocks held by banks with the view to reducing the market risk associated with banks' equity holding.

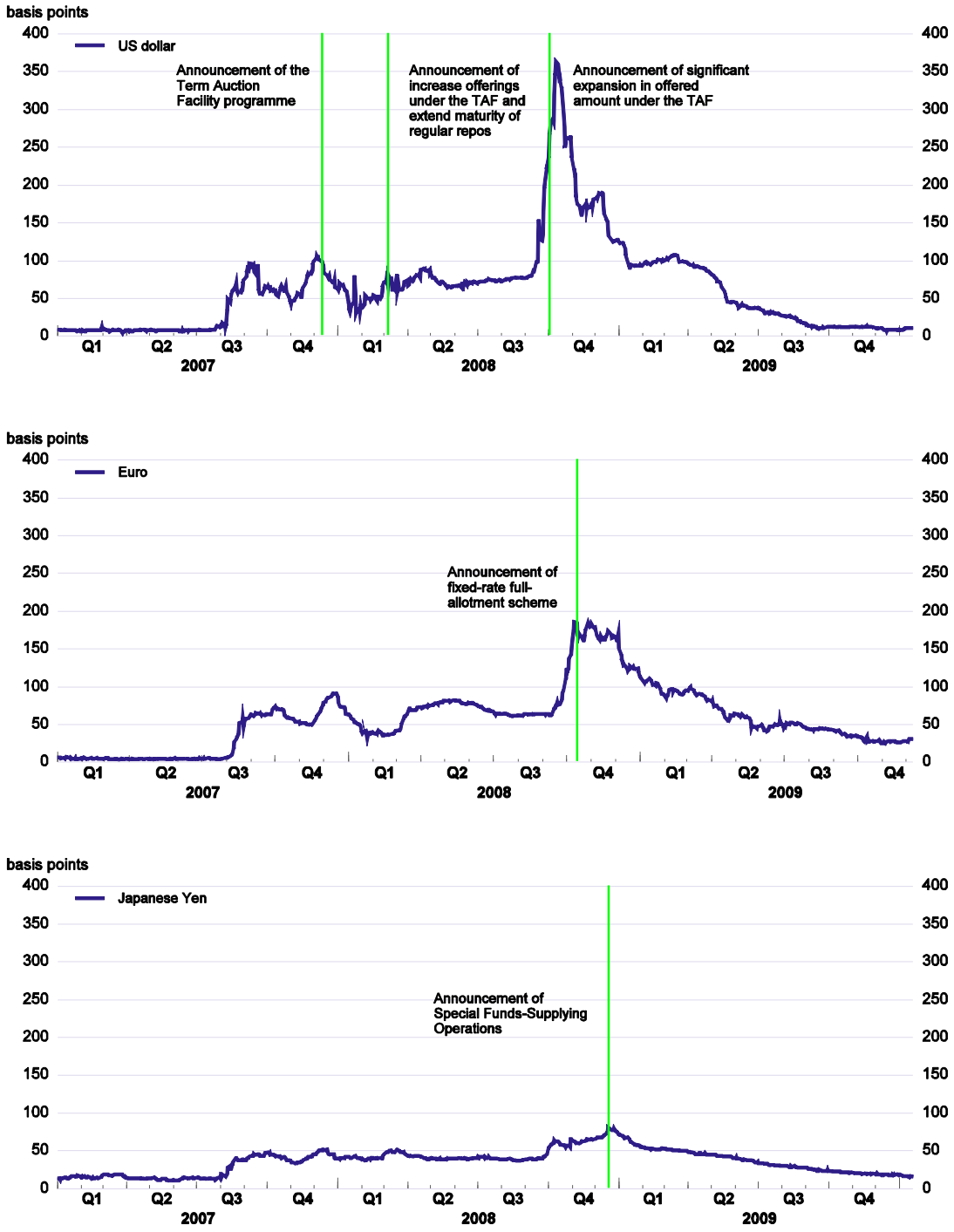
22. Turning to specific market developments, the normal functioning of the money market has now been largely restored, as the stress in the market has largely receded (Figure 3). Spreads between unsecured three-month interbank rates and average expected overnight rates have fallen to levels that are now closer to their pre-August 2007 averages, with announcements of major unconventional initiatives appearing to have had strong market impacts. Significant improvement in the functioning of money markets allows earlier aggressive policy rate cuts to be transmitted more fully to the economy, as it enables banks to access short-term funds at a very low price (Figure 4).

23. Outstanding bank loan volumes keep contracting on a year-on-year basis under the lagged impact of the past slump in activity and tighter credit standards. However, as the conditions of banks stabilise, the net percentage of banks tightening credit conditions has generally been falling across OECD areas.

24. Other segments of the market have also shown marked improvements, particularly where central bank interventions have been important (Figure 5). In the United States, due in part to Fed purchases of mortgage-backed securities, the spread of conventional mortgage rates over government bond yields has come down from the peak of around 250 basis points in December 2008 to about 50 basis points in December 2009, which has contributed to the stabilisation of the housing market. Although quantifying the effects of asset purchases by central banks remains challenging, the New York Fed has estimated that large-scale asset purchase programmes conducted by the Fed taken together (totalling $1.8 trillion) have reduced the 10-year government bond yield as much as 50 basis points (Sack, 2009). Based on the fall in yields immediately after purchases, Gagnon (2009) concludes that the impact is larger: each $1 trillion purchase of longer-term assets would lower the 10-year government bond yield by 54 basis points. In the euro area, although the magnitude of the central bank intervention has been much smaller relative to the

Figure 3. Money market conditions

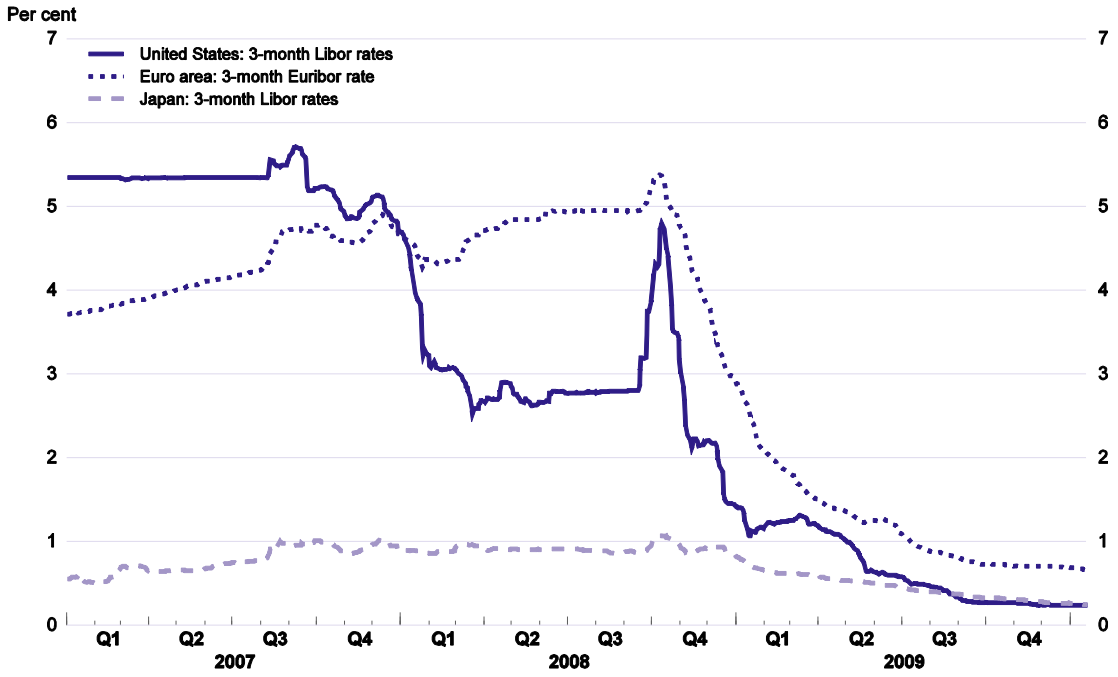
Three-month spreads, last observation: 18 January 2010



Note: Spread between three-month EURIBOR and EONIA swap index for euro area; spread between three-month LIBOR and overnight indexed swap for the United States and Japan.
Sources: Datastream and Bloomberg.

Figure 4. Interbank lending rates

Last observation: 18 January 2010



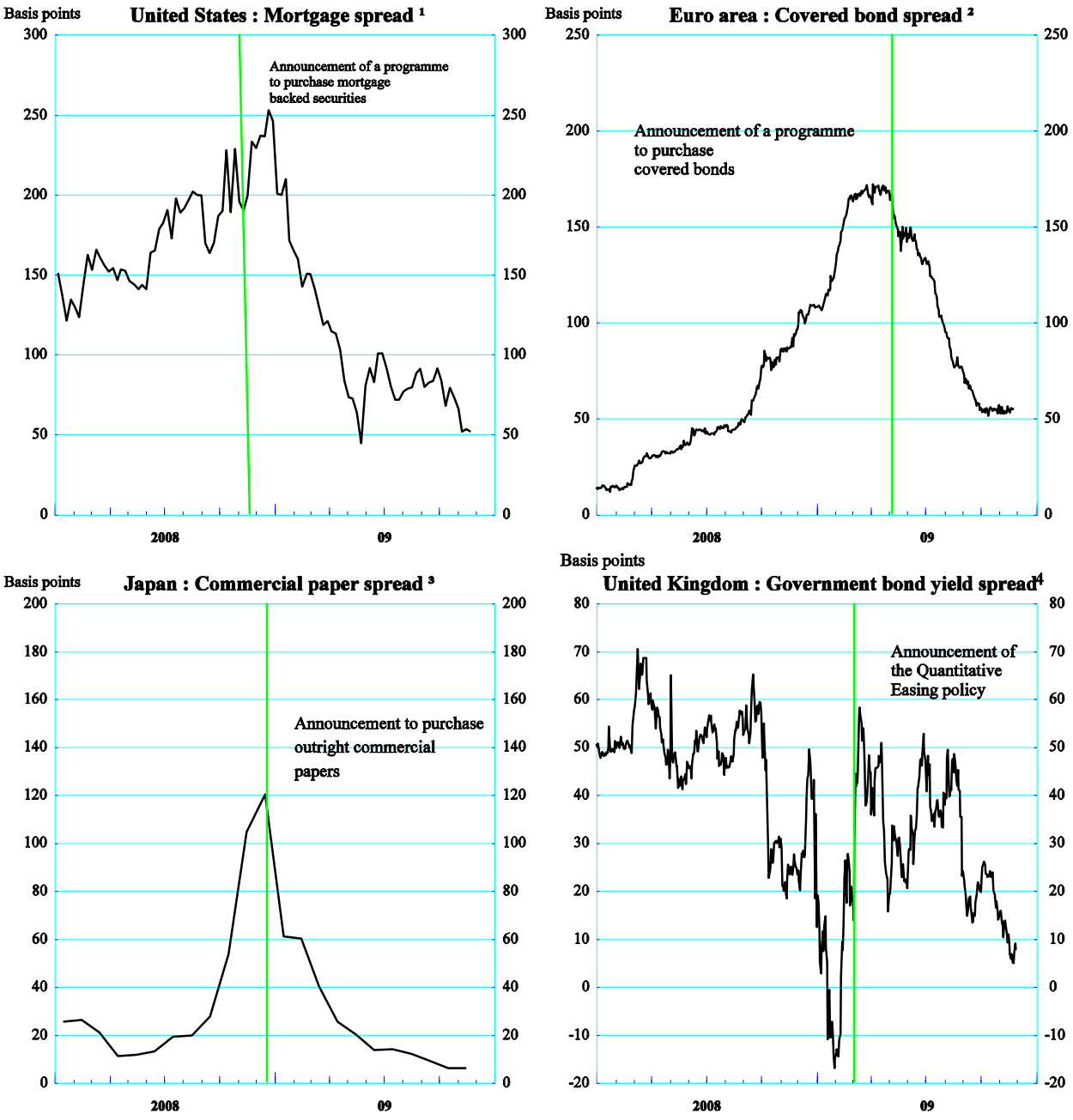
Source: Datastream.

size of the market, the ECB's decision to purchase covered bond appears to have had a very strong confidence effect: spreads have significantly narrowed, and new issuance and trading in the secondary market have been revitalised (ECB, 2009b). In Japan, the decision by the BoJ to purchase commercial paper outright led to an immediate reduction in the spread. In the United Kingdom, the widening of the spread of swap rates over government bond yields has been taken as an indication that BoE purchases of gilts have reduced yields (Bean, 2009).[27] All in all, these measures have contributed to alleviating stress in financial markets and to restoring appetite for risks, as observed by reduced corporate bond spread bonds and CDS rates for banks, and more generally, an increase in equity prices

25. These improvements should, however, be seen in the perspective of the massive central bank and government interventions. Indeed, central banks have become dominant market players in important areas. In the mortgage-backed security market in the United States, for instance, the Fed has been the predominant buyer since the introduction of the direct purchase scheme with its acquisition to date exceeding 50% of the total volume of new issuance in 2009. In the United Kingdom, the net increase in gilts holdings by the BoE has exceeded new issuance of public debt by a large margin, and, at the end of September, nearly 20% of gross debt of the general government was held by the central bank.

27. By November 2009, however, the swap spread had returned to its pre-purchase level, where it stayed until the time of writing in early February 2010.

Figure 5. Selected market developments where central bank interventions have been important



1. Conventional mortgage rate (30 years) - Treasury benchmark bond yield (30 years).
2. IBOXX Euro covered bond yields - swap rates.
3. Average issuance rate of CP (rated a-1 or higher) - short-term government security yield (3 months).
4. 10 year swap rate - 10 year government bond yield.
Sources: Central bank data, Datastream.

2. What are the potential risks?

The implications for asset prices and the functioning of financial markets

26. As long as the market malfunctions which warranted their introduction are still present, the benefit of having unconventional monetary policy measures in place should outweigh potential risk of significantly distorting market signals.[28] However, these measures could have undesirable consequences if they were maintained for too long as market conditions further improve.

27. If exceptional monetary policy measures are kept in place beyond the period when their targeted markets are dysfunctional, their distortionary effects on asset prices may weaken economic performance. For example, large interventions to purchase securities backed by lending to specific sectors, such as housing, can result in artificially low costs of mortgage borrowing, possibly in turn contributing unduly to house price appreciation and attracting excessive investment in residential construction.[29] Previous OECD work has identified that conventional monetary easing, when it is well below "Taylor rates" and is maintained for an extended period of time, is frequently followed by the build-up of financial imbalances in housing markets (Ahrend *et al.*, 2008). If such effects can arise even while monetary easing is not specifically targeted toward housing, they can be expected to be more likely to occur when ultra-low rates are coupled with very large purchases of assets backed by mortgages.

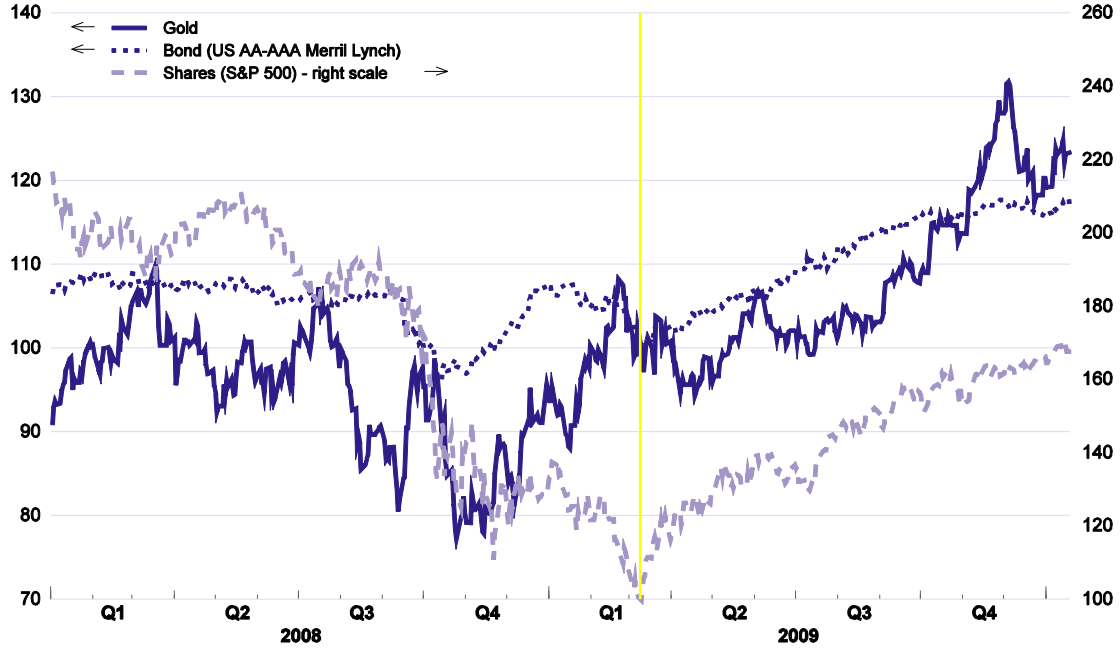
28. As segmentation across markets recedes, however, sector-specific effects should become less acute as the effect from exceptional monetary operations spills over to classes of assets that are close substitutes to the targeted categories. Following on the same example as above, the effect of large purchases of agency mortgage-backed securities can spread to government bonds, artificially compressing their yield. Hence, cross-sectoral distortion may diminish but concerns about economy-wide effects may increase. In this regard, a sign of excess liquidity inflating asset prices would be if asset classes which in normal times show no or negative correlations started to appreciate jointly. For instance, there may be a case for watching whether the positive correlations observed since March 2009 between shares and bonds, and between gold and bonds, persist (Figure 6).

29. Another possible risk associated with the continuation over the medium term of special liquidity programmes is that they can result in an inefficient allocation of money across the financial sector. A decentralised money market offers the benefit that participants monitor each other and incorporate their assessment of the credit risk of recipients in the price of interbank loans. As such, a decentralised money market incorporates a built-in feedback mechanism that should put a price on counterparty risk. These functions are lost in a regime of full allotment where all participants can borrow unlimited liquidity from the central bank at a fixed rate. These considerations would call for restoring normal liquidity operations as soon as the money market can function on its own. Even so, at least part of the market discipline may be lost permanently because most participants will draw the lesson from this and previous crises that the monetary authorities will intervene if turmoil were to occur again in money markets in the future (Rochet and Tirole, 1996; Rochet, 2009).

28. There may be sporadic incidents where central bank intervention has shown some signs of negative influence. For instance, in Japan, firms have occasionally issued commercial paper at lower yields than government bills of the same maturity.

29. Even where intervention is judged to be necessary to attain a public policy objectives (*e.g.* to encourage home ownership in the United States), this role should normally be reserved for fiscal authorities (Goodfriend, 2009).

Figure 6. Developments in share, bond and gold prices
(9 March, 2009 = 100)



Source: Datastream.

The implications for inflation expectations

30. From the viewpoint of macroeconomic stability, unconventional measures, if maintained for too long, could destabilise inflation expectations and induce inflationary pressures. In a more normal environment where financial intermediation is functioning smoothly and the precautionary demand for liquidity is reduced, the huge accumulation of reserve balances could result in a rapid increase in the aggregate money stock, which in turn could eventually boost aggregate demand and inflationary pressures if there is no spare capacity. The risk of such inflationary pressures in the future can be incorporated in inflationary expectations at present, thereby prompting changes in prices and wages that raise inflation in the near term. In general, while some increases in inflation expectations are not problematic in a situation where actual inflation is low and deflation risk is not fully eliminated, increases beyond central banks' implicit and explicit targets would be destabilising.

31. Amid weak developments in bank lending, increases in monetary aggregate such as M1 and M2 so far appear to reflect liquidity preference on the part of the household and corporate sectors (Figure 7).[30] With uncertainty still prevailing in the economy and the stress in the banking sector still elevated, most of the extra liquidity obtained from central banks has been simply hoarded, as can be seen in a plunge in money multipliers across countries in line with the expansion in monetary base (Figure 8). As long as this remains the case, massive injection *per se* is unlikely to lead to inflationary pressures (Keister and

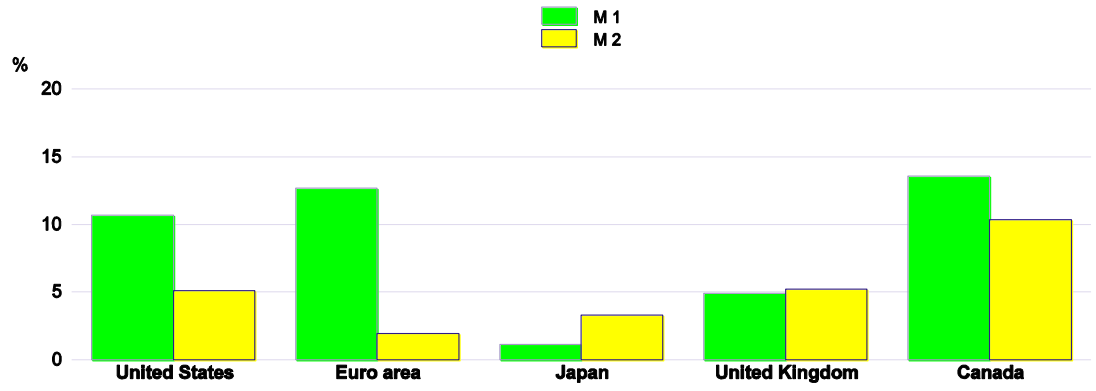
30. In Switzerland, a high pace of aggregate money growth has also partly reflected the fact that bank lending continues to grow, as the domestic banking sector has remained relatively immune from the effects of the crisis. The SNB has already stated its intention to keep a close watch on movements in the monetary aggregates.

McAndrews, 2009). The previous Japanese experience suggests that, as long as weakness in the banking sector persists and the credit channel remains impaired, a massive increase in the monetary base *per se* is unlikely to lead to inflation. Besides, a significant expansion in the monetary base in itself may not be a good leading indicator for inflation, particularly where major changes to monetary policy implementation (*e.g.* the remuneration of excess reserves) have most likely altered the relationship between base and broad money. However, as market stress continues to subside, banks may start to rely on the abundance of liquidity as a basis for stronger credit and monetary expansion. While such a development should be welcome to a certain extent, its potential implication for inflationary pressure cannot be ignored.

32. Another important channel by which unconventional monetary policy actions could influence inflations expectations is through credibility and perceived independence of the central bank. Inflation expectations may drift upwards if economic agents perceive a greater risk that central bank actions are constrained by their expanded balance sheets, such that, for instance, the existence of large excess reserves or the continued need to support the financial sector would prevent them from adjusting interest rates in a timely manner.

33. Moreover, central banks' balance sheets have become exposed to much larger risk than would normally be the case. Taking riskier assets as collateral, intervening directly in credit market and injecting funds to individual institutions all imply credit risk. The risk is likely to be manageable in the case of extending normal liquidity provision to banks against collaterals, because credit is extended only for a short period of time and losses are incurred only when the collateral market collapses and banks pledging that collaterals fail simultaneously. However, the risk may be more pronounced for measures involving outright purchases of private-sector instruments. This is particularly the case for lending against or purchasing assets whose value is hard to determine and may have been distorted significantly by the central bank intervention, notably fund injection to individual institutions or, in the case of the United States, securitised products bought under the TALF programme. Additionally, funds injected into individual institutions are also risky, if this turns out to be *de facto* solvency rather than liquidity support.[31]

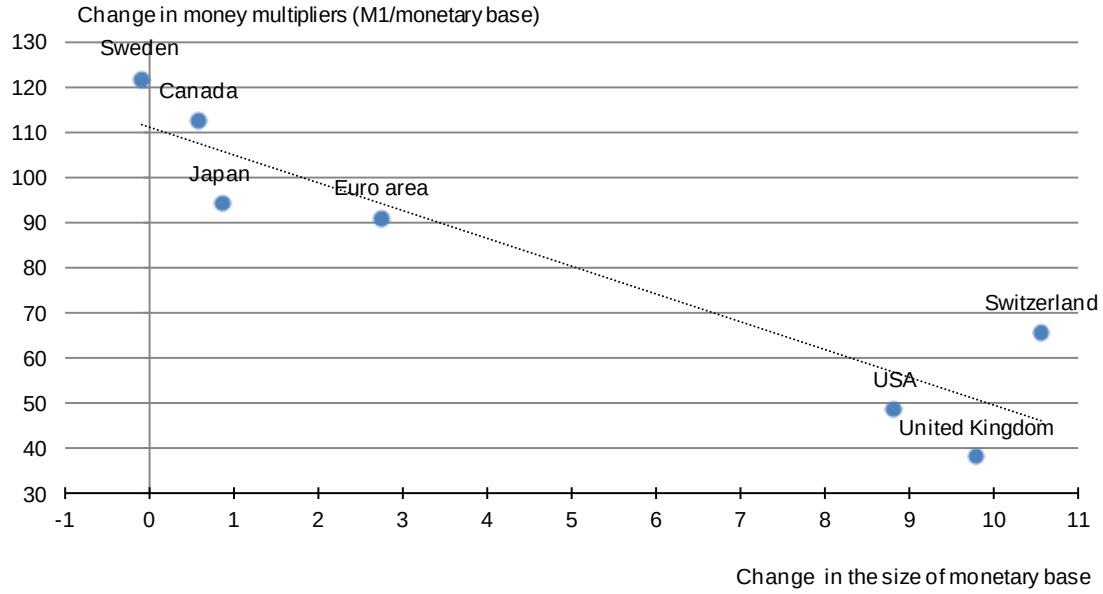
Figure 7. Recent changes in aggregate money stock
(Year-on-year percentage changes, November 2009)



Note: All data are for November, except for M2+ in Canada (October data).
Source: OECD Main Economic Indicators.

31. This suggests that central banks' exposures should promptly be transferred to the government, Funds injected to individual institutions by the BoE and the Riksbank have already been transferred to the government.

Figure 8. Changes in money multipliers and the monetary base



Notes: All data are for November. The vertical axis measures the size of money multipliers (M1/monetary base) with pre-crisis averages (January – July 2007) set to 100. The horizontal axis refers to changes in the size of monetary based measured as per cent of 2007 GDP.

Sources: OECD Main Economic Indicators; individual central banks.

34. At the same time, holding longer-term assets imply that central banks are being exposed to interest rate risk, as central banks have bought these assets at relatively high prices in an environment of low interest rates.[32] The degree of interest rate risk incurred by central banks will have important implications for the exit which are discussed below. If losses occur, or the public perceive that such can be the case, the associated burden for tax payers may raise the issue of credibility. If losses have to be compensated *ex post* by the government, the reliance on finance ministries may undermine the perception of independence. While central bank independence has proved to be effective to deliver low and stable inflation, preserving the perception of central bank independence could be more challenging in an environment where central banks have taken measures to affect directly long-term government bond yields in times of ballooning budget deficits. Weakened credibility and perceived threat to central bank independence could compromise hard-earned confidence in the ability and determination of central banks to keep inflation in check and risk destabilising inflation expectations. In this respect, it is comforting that inflation expectations, as can be seen from survey data, show no major sign of drifting up so far, suggesting that economic agents largely expect that the exit from various unconventional measures will be achieved in a smooth fashion.

3. How should central banks exit?

35. Central banks need exit strategies from current settings of both unconventional and conventional policy instruments which involve two inter-related but conceptually different goals. On the one hand, central banks will need to scale back their intervention in financial markets and reduce excess liquidity. On the other hand, central banks must start adjusting interest rates in view of their macroeconomic objective of price stability. The large scale of the needed liquidity withdrawal and the uncertainty concerning the

32 . In the case of the Bank of England, any losses arising out of or in connection with its quantitative easing policy would be indemnified by the Treasury.

effectiveness of each tool (to be discussed later) taken separately call for central banks to rely on a combination of different tools to achieve the exit.

36. Ideally, the exit strategy should ensure that these two goals can be pursued separately, as the optimal timing and sequence of achieving them are likely to be different. An appropriate exit strategy would ideally "decouple" changes in balance sheets, either in terms of their size or composition from the level of interest rate (Borio and Disyatat, 2009). Central banks are already well positioned to achieve this. The fact that a number of unconventional measures, such as the Term Auction Facility in the United States, were initiated well before the room for conventional interest rate cut was exhausted attests to decoupling in the early stage of the crisis.

Tools for the exit

37. In discussing the exit, it is useful to rely on a stylised diagram following Keister *et al.* (2008), Ennis and Keister (2008) and Goodfriend (2002), depicting how the overnight money market interest rate is determined (Figure 9). The interest rate on reserves (*i.e.* the overnight money market rate) is determined by the interaction of demand and supply. As central banks can always choose the volume of supply by way of market operations, the supply curve is vertical at any level desired by the monetary authorities.[33] The demand curve is downward sloping, with the rates on standing facilities providing the cap and the floor. Banks generally should have no incentive to pay an interest rate in the money market which is higher than the rate on standing loan facility available from the central bank.[34] Likewise, no bank would lend at a rate lower than the deposit rate, which provides a risk-free alternative.

38. The movement in the vertical direction (*i.e.* the level of interest rates) corresponds to the central bank's concern for the macroeconomic objective of price stability. Under normal circumstances, this is the predominant concern for monetary authorities that set the supply of reserves to attain the desired level of the interest rate. The movement of the supply curve in the horizontal direction in the region where the lower bound of interest rate has already been reached can be considered as quantifying concern for financial market issues: central banks supply reserves in excess of what would be required to keep the interest rate at the desired level because they want to support financial stability.[35] An outward shift of the demand curve reflects an increase in liquidity preference on the part of market participants, as was seen during the crisis. At the current conjuncture, most central banks are likely to be operating in the region of Point A, where abundant liquidity is provided and where the lower bound of the interest rate is effectively binding[36].

Automatic reduction relying on market mechanisms has already been initiated

39. Central banks may take the first step toward the exit by reducing the flows created by the unconventional measures. In many cases, these flow reductions can rely on endogenous market mechanisms. Many central bank programmes embody incentives whereby an improvement in market

33. In the case of full allotment, the central bank loses the ability to position the supply curve. However, the crisis measure of full-allotment can be interpreted as having the same effect as shifting the supply curve to the far right of the diagram.

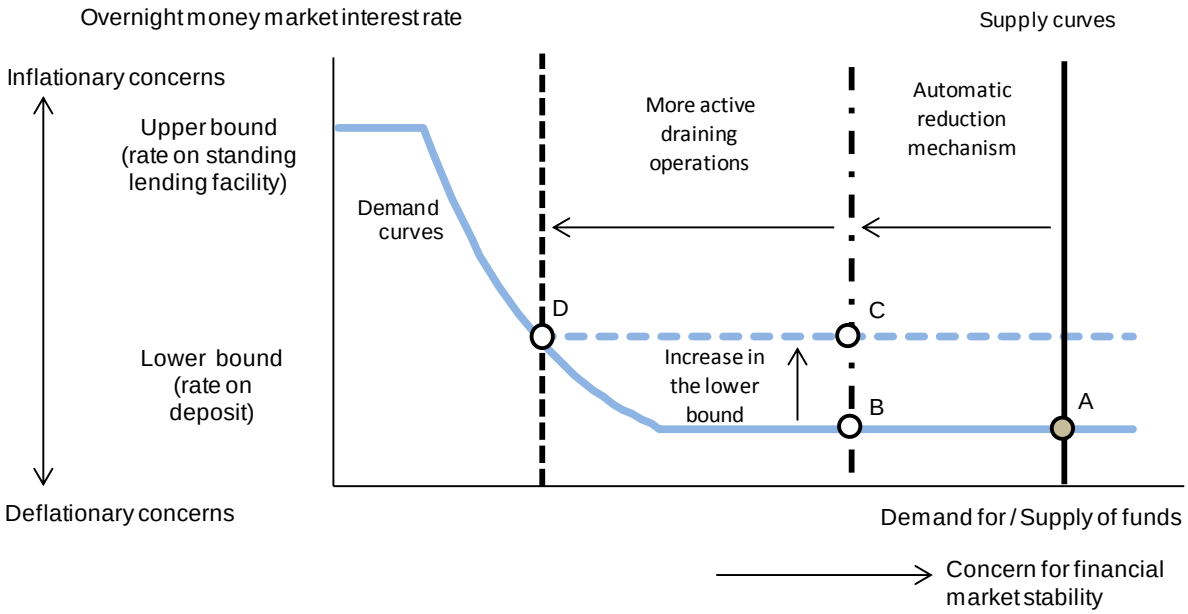
34. The "cap" may be less binding if there is stigma associated with borrowing from the standing loan facilities.

35. The current unconventional measures are the most conspicuous example, but central banks have temporarily increased liquidity provision to ensure market stability in the past, such as after the 9/11 attack.

36 . As discussed earlier, overnight rates in the euro area have been well below the main refinancing rate set by the ECB but still somewhat above the deposit rate

functioning more or less automatically discourages financial market participants from using these facilities. The clearest example is where the facility involves upfront fees (*e.g.* the Commercial Paper Funding Facility operated by the Fed). To a lesser extent, this is also generally true when the required collateral is

Figure 9. Determination of money market interest rate: a stylised illustration



subject to stringent haircuts. If pledging collateral is costly, banks should find it cheaper to borrow on an unsecured basis from the money market once it has recovered sufficiently. The fact that central banks have significantly expanded the list of securities eligible as collateral may make this effect less compelling. To the extent that extended liquidity support is aimed at meeting a rise in precautionary demand for liquidity, a stabilisation in the markets will either reduce this demand or trigger increases in money growth.

40. In practice, and in line with the improvement in financial markets, the demand for some central bank facilities has already been on a downward trend (see previous Figure 2b). As regards the Fed, the amount outstanding in its Commercial Paper Funding Facility has come down by about 95% from its peak. As for the ECB's one-year refinancing operations based on full-allotment procedure, demand for the second operation in September and the last operation in December 2009 turned out to be significantly lower than that for the first operation in June. More generally, for many central banks, some of the programmes have become heavily undersubscribed. In light of these developments, exit steps have already been taken as outlined in Box 3.

Box 3. First steps towards the exit

The exit from a series of unconventional measures has already been gradually proceeding in line with significant improvement in the functioning of markets.

First, some temporary liquidity measures adopted at the height of the crisis have become less used, as better market conditions have greatly reduced the need for market participants to rely on central bank facilities. To the extent that this is the case, central banks have decided to let crisis measures expire at the pre-announced date:

- The Fed let its special facilities (including as the Asset-Backed Commercial Paper Money Market Mutual Fund Liquidity Facility and the Commercial Paper Funding Facility) expire at the pre-announced date of 1 February, 2010. All dollar-liquidity swap positions were also closed at the same date.

Box 3. First steps towards the exit (continued)

- For the BoJ, the programmes to purchase commercial paper and corporate bonds (remaining maturity up to one year only) expired in December, 2009.
- The BoC has terminated two of its three emergency measures (the private-sector term purchase and resale agreement programme, and the term loan facility).
- The SNB and the ECB wound up their the Swiss franc swap arrangements at the end of January.

Second, even for liquidity measures that have continued to be used by market participants, some central banks have judged that market improvements have made the case for the special facilities less compelling, and decided that they should be discontinued. In order to avoid abrupt withdrawal of liquidity, however, central banks pre-announced such termination decisions well in advance of the expiry date while often stressing their intention to provide sufficient liquidity.

- The volume of funding provided by the Fed under its Term Auction Facility has already fallen well below its peak. The Fed has announced that the last auction will take place in March, 2010.
- The ECB conducted its last one-year refinancing operation in December 2009: although the full-allotment procedure remained in place, the rate payable was made variable at the average minimum bid rate of the main refinancing operations over its life. The ECB has also announced that the March operation will mark the end of its six-month refinancing operations. Furthermore, it has announced that the main refinancing operations will be carried out as fixed rate tender procedures with full allotment as long as needed and at least until mid-April, which holds open the possibility that the traditional tendering procedure may be restored after that date.
- The BoJ has also decided to discontinue the special funds-supplying operations to facilitate corporate financing at the end of March 2010. The Bank has also indicated, however, its intention to continue providing ample liquidity from April 2010 onward, relying on the traditional scheme.
- The Riksbank has decided to terminate its 12-month liquidity-providing operation. It has also announced that liquidity would be continued to be provided over 3 and 6 month horizons but it would require slightly higher interest rates.

Even in the cases where the purchase of longer-dated assets is involved, the move towards exit is gradually taking place.

- The Fed completed its purchases of Treasury securities at the end of October 2009. It has also indicated that the pace of purchases of mortgage-backed securities and agency bonds will gradually slow and the programme is expected to be completed by the end of the first quarter of 2010.
- The SNB has decided to discontinue the programme to purchase corporate bonds. It has also hinted to measure the pace of intervention going forward, as the Bank is to prevent any “excessive” appreciation of the currency (as opposed to simply any appreciation).

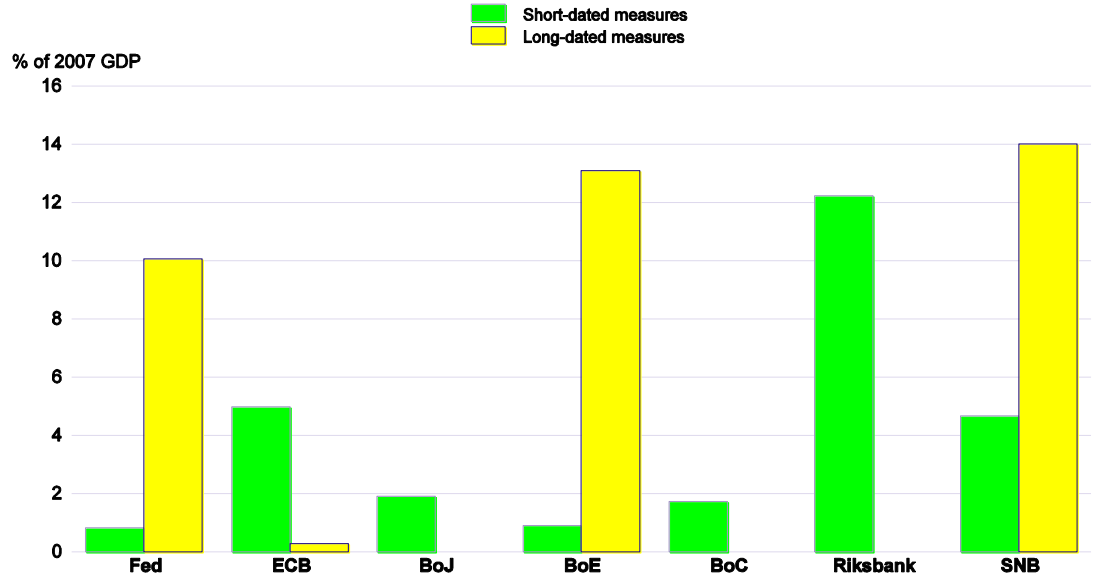
Although these measures are likely to prevent further expansion of central bank balance sheets, some central banks will continue to hold large stocks of long-dated assets on their balance sheets and the exit from the corresponding liquidity impact has not started. Partly reflecting a relatively restrictive pre-crisis implementation scheme for monetary policy, the Fed, however, has recently started to prepare technical steps required for the exit, while emphasising that it does not imply any imminent initiation of the exit in this regard. For instance, the Fed has been experimenting with reverse repurchasing operations with primary dealers to identify necessary technical specificities. It has also made public a proposal to establish a term-deposit facility, again as a means to drain reserves.

Exit will also require discretionary actions

41. However, the automatic reduction in the supply of reserves that can be achieved through self-unwinding features is unlikely to be large enough to enable central banks to regain the ability to adjust interest rates. In the context of the previously discussed Figure 9, it will merely shift the point from A to B, where the deposit rate is most likely to remain binding. This is because, first of all, some central banks

have been engaged in measures with long-lasting consequences (Figure 10). This is particular the case for the Fed and the BoE, both of which have accumulated massive long-term assets on their balance sheets. The extent to which these central banks can rely on the repayment of securities at short maturities as well as the above-mentioned automatic mechanisms appears to be very limited in practice. For instance, as of

Figure 10. Short-dated versus long-dated (or date-undetermined) measures
(Differences from the January-July 2007 average to end-2009s, per cent of 2007 GDP)



Note: The classification is based on data used for Figure 2.b. Items showing negative deviation from the pre-crisis averages have been excluded in calculation.
Fed Short-dated measures = Liquidity provision to banks. Long-dated measures = Direct market intervention + Long-term government bonds + Fund injection to individual institutions.
ECB Short-dated measures = Refinancing operations (except for main refinancing operations). Long-dated measures = Direct market intervention.
BoJ Short-dated measures = Liquidity provisions to banks.
BoE Short-dated measures = Market operations. Long-dated measures = Direct market intervention + Purchase of gilts.
BoC Short-dated measures = Liquidity provision to banks; Riksbank Short-dated measures = Liquidity provision to banks (long).
SNB Short-dated measures = Liquidity provisions to banks. Long-dated measures = Domestic securities + Stabilisation fund + Foreign currency investments.
Sources: For sources see Figure 2b.

mid-January 2010, none of the mortgage-backed securities held by the Fed will mature within a year and only one-tenth of its holdings of US Treasury securities will do so (Table 3).[37] Consequently, for these central banks, the overall size of the monetary base has remained quite elevated, even though their provision of shorter-term liquidity has come down significantly from its peak.

37. The problem is less acute in the BoJ programme to purchase corporate bonds as the Bank has purchased a limited amount of issues which mature in less than a year. In the case of SNB, no maturity information is available. However, divesting the position may not be easy, given that the unwinding could have adverse repercussion for the exchange rate.

Table 3. Assets held by the Fed: positions maturing within one year

	Total	Maturing within one year	
	Amounts in billion (US$)		Per cent of the total
Term auction credit	76	76	100%
U.S. Treasury securities	777	91	12%
Federal agency debt securities	161	26	16%
Mortgage-backed securities	969	0	0%
Commercial paper	9	9	100%

Note : The data are as of 13 January, 2010,

Source : Federal Reserve

42. Even central banks that have not purchased large amounts of long-dated securities must pay attention to the risk that a simple termination of temporary programmes might result in liquidity supply being cut off too abruptly, which may have adverse consequences for financial stability. Thus, the termination of the programmes may have to be smoothed, so that, for example, a certain portion of maturing positions will be rolled over under more stringent conditions: fewer amounts, higher rates and shorter maturities. For instance, the previously mentioned BoJ decision to terminate some of the temporary programmes came with a continued commitment to provide ample liquidity to the market using the existing operations. This need for intermediate steps is particularly clear where a 'hump' exists in the pattern of liquidity provisions. For instance, the first one-year long-term refinancing operation by the ECB resulted in a massive liquidity provision equal to about 40% of the monetary base, which will be taken out of the system on 1 July 2010, unless the ECB takes complementary measures. [38]

Exit tools involving more active actions on the part of central banks

43. For the reasons discussed above, the exit will not be purely automatic: even if some facilities unwind on their own, central banks will have to take specific actions in addition. In the terminology of Figure 9, central banks can take two approaches, shifting either the demand or the supply curves. Although these two approaches are often interlinked, each will be discussed separately below, as they each possess distinctive characteristics.

Measures to increase demand for reserves

44. The first option is to shift the bottom part of the demand curve upward, so that the existing supply of reserves will be consistent with a higher level of interest rates, and the market equilibrium will shift from Point B to Point C. This is possible to the extent that central banks can raise the interest rate payable on excess reserves.

45. One of the benefits of relying on the deposit rate is that it enables central banks to start adjusting interest rates, regardless of the level of excess liquidity remaining in the banking system. Thus, this is an attractive option for central banks that have engaged in long-dated measures, as it minimises the risk of delayed interest rate hikes due to excess liquidity. Other central banks can use this option to maintain their liquidity support measures for longer. Another important merit of this option is its relative simplicity at the operational level, as the application and the enforcement of the decision can be simply left to the market

38 . If the liquidity provision made under the original one-year operation is to be replaced by regular main refinancing operations (1 week maturity) or longer-term refinancing operations (three month maturity), it will lead to a substantial shortening of the maturity.

though arbitrage mechanism, rather than having to rely on an array of separate liquidity-absorbing operations (to be discussed below).

46. There are a number of caveats to this approach, however:

- First, obviously, central banks must be able to remunerate excess reserves so that the deposit interest rate can be controlled. Most central banks can now do so on a permanent basis, the SNB being the only central bank in the sample that does not remunerate excess reserves.[39] While it does not target the overnight interest rate, the fact that it has experienced a large expansion of the monetary base putting downward pressure on interest rates may imply that, in addition to draining liquidity, reserve remuneration can be a potentially useful tool.

- Second, the mechanism will be more effective if excess reserves are remunerated in similar conditions for all the major participants in the market for central bank money. If some big players are left outside the remuneration scheme, such as the GSEs currently in the United States, they may continue to have an incentive to lend below the rate on the deposit facility, which complicates the process and makes the lower bound less binding.[40]

- Third, the relative pace of increase in the deposit rate *vis-à-vis* the pace of increase in the main target rate has implication for the functioning of financial markets. Central banks usually operate with a corridor between the main target rate and the deposit rate so that banks have an incentive to lend money out in the market rather than simply depositing money at the central bank facility. In the current environment where the main target rate has come down to very low levels, however, the corridor has often either completely disappeared or narrowed to a very small margin. To the extent that this is the case, the increase in the deposit rate would have to come with a nearly equal increase in the main target rate or the deposit rate would have to increase less than the main target rate. As long as there is excess liquidity in the system, however, the deposit rate will determine the effective money market rate, which will continue to discourage activities in the money market, particularly when the opportunity cost of holding reserves remains close to zero.

- Fourth, since the deposit rate has never been given a prominent role to indicate policy stance in the recent past, its new role as the main signalling device of the policy stance should be clearly communicated to the market. This would be particularly important for central banks that have maintained a relatively wide corridor, as in the euro area, where, in an environment of unlimited liquidity provision, the deposit rate has gained traction in determining the level of interest rate prevailing in the money market, so that an increase in the deposit rate would imply a tightening of monetary policy.

- Lastly, even though the remuneration of reserves makes it possible to raise interest rates, the large amount of reserves in the banking system would increase the risk of monetary expansion with consequent inflationary pressure.

39. The BoJ initially introduced this measure as a temporary facility, which it later decided to maintain for the time being.

40. Currently in the United States, the effective federal funds rates are lower than the deposit rate. The exemption of the GSEs from the remuneration scheme appears to be one reason for this, another reason being general reluctance on the part of banks to arbitrage this situation (Kohn, 2009).

All in all, even though many theoretical arguments can be advanced in favour of using the deposit rate, a monetary policy framework that heavily depends upon the deposit rate has never been implemented in practice. These caveats highlight the need to take measures to withdraw liquidity at the same time, as discussed below[41].

Measures to reduce supply of reserves

47. The second option for central banks is to reduce the supply of reserves so that the supply curve shifts inward to the left. In the context of Figure 9, this corresponds to a move from Point B to Point D. In this regard, central banks can use a number of tools.

48. Central banks holding large amounts of long-dated assets always have an option to engage in outright sales. Measures of this nature reduce liquidity with a one-for-one reduction on the asset side of their balance sheet. Asset sales also have the benefits of removing credit risk from their balance sheets. Moreover, unwinding central bank positions would help to reduce potential distortions across market segments. This is particularly important if market developments, such as increases in transactions and opportunities for arbitrage, are judged to be insufficient to correct distortion in a spontaneous way. In view of these considerations, outright sales are more compelling for private securities, which expose central banks to higher credit risk and whose distortive impacts on markets are likely to be greater than in the case of government bond holdings. However, central banks may have little scope to sell assets in the immediate future unless the economic recovery and the underlying normalisation of financial markets turn out to be proceeding at a much faster pace than expected. In a weaker environment, large-scale sales could be de-stabilising for financial markets and long-term rates, possibly jeopardising the economic recovery.

49. In normal times, decisions to divest long-dated assets should be motivated solely by monetary policy considerations, with any profits and losses resulting from interest rate movements simply incidental to the decision. In a similar vein, where assets are purchased specifically for monetary policy purposes, changes in their valuation should not have policy implications as they neither add to nor withdraw liquidity. In current circumstances, however, the strategy concerning asset sales may also be coloured by the potentially large losses from interest rate movements for the central banks that have actively acquired long-term assets. For instance, the average remaining maturity of long-dated assets held by the Fed (Treasury securities, agency bonds and mortgage-backed securities) appears to be on the whole in the vicinity of ten years. If the market interest rate moves up from the current level of 3.5% to 5.2%, a level more or less in line with the long-term equilibrium as assumed in OECD (2009), the loss could exceed by a wide margin the normal level of annual profits of the Fed or its capital buffer. For the BoE, whose gilts holdings have, on average, a remaining maturity of nearly 14 years, an increase in the interest rate from the current level to the long-run neutral rate assumed in OECD (2009) could also result in a massive loss.[42] Reflecting the special nature of monetary policy, long-term assets held by central banks are not necessarily subject to mark-to-market valuation: for instance the Fed keeps them at historical value (Board of Governors, 2008). This would imply that losses would have to be recognised only when the assets are sold in an environment where interest rates have risen, while, if kept to maturity, losses can be smoothed over the remaining life of the security, as the premium paid over par values can be amortised.

41 . The potential case for central banks to continue supplying ample liquidity and operate conventional monetary policy solely with the deposit rate is discussed at the final section of the paper.

42. On the other hand, for the ECB, the potential interest rate risk is likely to be smaller, both because the purchased amount remains smaller and typical maturity of covered bonds is shorter than mortgage-backed securities or gilts.

50. The concern would be that substantial losses could affect central bank credibility:

- in the event of large sales and realised losses, the central bank may be indemnified by the government or receive a capital injection from the fiscal authorities, threatening actual or perceived independence;
- if assets are kept to maturity, the losses will be spread over time, reducing transfers from the central bank to the fiscal authorities over an extended period. This could also possibly compromise independence, although the smoother profile of the impact may reduce the risk.

Recognising this concern the BoE, before engaging in massive purchases of long-term assets, obtained an agreement with the government that any losses arising out of or in connection with its quantitative easing policy would be indemnified by the Treasury.

51. If central banks chose to keep the assets on their balance sheets until maturity, they can offset their impact on liquidity *via* other operations. This effectively amounts to absorbing liquidity from reserve positions while maintaining the size of the balance sheet by way of *liability management*. Unlike outright sales of long-dated assets, money is not entirely drained from the banking system but less is made available for the interbank market, which helps central banks to start raising interest rates.[43]

52. For example, provided that macro-prudential considerations also justify this, central banks can introduce or increase the reserve requirement that would shift some portion of the "excess" reserves into "required" reserves. Although the level of the monetary base is unaffected by this measure, there will be less loanable funds in the overnight money market, thus effectively reducing supply and leading to upward pressure on interest rates in the market. In normal times, the required reserve ratio has ceased to be used as a monetary policy instrument, since developments in interbank markets have made open market operations much more efficient and effective tools. In the current circumstances, however, the exceptionally high level of reserves may warrant measures directly targeted at reducing excess reserves, at least temporarily during the exit phase. The measure could be particularly effective, if a faster-than-expected pace of credit increases were to generate inflationary concerns. The required part of reserves can be remunerated at the prevailing market rate, so as to avoid the problems associated with imposing an implicit tax on reserve holdings[44]. Nonetheless, the high levels of excess reserves imply that, for this measure to have a major impact, the increase in the required reserve ratio has to be very large from relatively low levels now normally applied.[45]

53. Central banks can also resort to more explicit liquidity-absorbing operations, all with the similar effect of reducing the level of monetary base matched by an equal increase in other less liquid liability items. First, central banks can conduct reverse repurchasing operations, in which long-dated assets acquired by central banks are sold with a promise to buy them back at a pre-specified date in the future. Second, central banks can offer longer-term deposits, in addition to the use of the standing overnight deposit facility. Third, central banks can issue their own bills. Among these, the latter two may be more practical, as they do not have to be matched by any particular assets. The benefit of relying on these operations is flexibility. Unlike the outright sales of assets, which is costly to reverse, the effect of liquidity

43. As previously discussed, some central banks, notably the Fed, appear to have already exhausted the options of selling short-term government securities, because of their massive sales at the early stage of the crisis.

44. As banks are "forced" to set aside a certain portion of money as required reserves, they are deprived of an opportunity to lend this amount out in the money market. Thus, the associated opportunity cost, which is the prevailing money market rate, can be considered as implicit tax on reserve holding.

45. A universally applicable large increase in the reserve ratio may lead to a distributional problem, given the difficulty of correctly forecasting precautionary demand for reserves that varies from one bank to another and over time.

absorption can be reset and adjusted according to market developments upon maturity.[46] And unlike increases in reserve requirement, which are universally applicable, financial market participants retain an option not to participate in such operations, so that they can continue to hold liquidity if judged necessary. Another advantage is that central banks do not incur interest-rate-related losses in such operations.

54. For these measures to be effectively conducted, a number of points need to be carefully considered.

- First, just as substantial increases in liquidity provision have been made possible by enlarging the pool of eligible counterparties, these liquidity-absorbing operations may have to be carried out against a large number of financial market participants. Where the traditional list of counterparties for open market operations is short (such as the Fed with primary dealers), it may have to be broadened so that relatively large-scale operations can be conducted without the risk of under-subscription to offers from central banks[47]. Issuance of bills can be potentially the more convenient tools, as it enables central banks to go easily beyond the traditional list of counterparties. This issue, however, may be less of a problem in a situation where market functions have completely normalised so that the distribution of liquidity among financial market participants can be left to the market and the arbitrage mechanisms are working efficiently.

- Second, in a similar vein to the discussion on the use of the deposit rate, the interest rate at which liquidity is absorbed should be carefully considered. In order for financial market participants to have a clear incentive to participate in these operations, the interest rate should be reasonably higher than those on the standing deposit rate. When the interest rate is endogenously determined, such as in the case of bill issuance, this is likely to be a less important issues.

- Third, the maturity of these operations also matters. Short maturity, such as one week, may be impractical, as it implies that positions have to be rolled over repeatedly. Thus, longer-term liquidity absorption measures may be desirable. However, from the viewpoint of financial market participants, this can directly compete with other sources of risk-free money, such as Treasury bills, thereby exerting upward pressures on the interest rates in the corresponding maturity segment.

55. In some cases, particularly where central banks do not have the legal authority to issue their own bills (*e.g.* the Fed), they can co-operate with the government to set up a scheme where the government issues short-term securities to the market and deposits the proceeds with the central bank, as the Fed and the US Treasury have already done. It may not be appropriate, however, to rely on this measure in the process of the exit, as it implies that central banks do not have control over the timing and the pace of the exit, which may compromise the perception of independence. Indeed, the use of the Fed's Supplementary Financing Account had already diminished considerably at the end of January 2010, which caused an additional pressure on its balance sheet.

Actual challenges and tools vary across central banks

56. Reflecting the difference in measures taken as well as in operational settings, central banks face different challenges and the actual tools of the exit are specific to each central bank. The exit appears to be

46. Should markets destabilise, central banks can always "undo" the impact of asset sales by engaging in liquidity-providing operation or buying long-dates assets again. However, it could have a negative impact on the confidence and credibility.

47 . For instance, the proposal by the Fed to establish term-deposit facility is aimed at depository institutions, rather than a narrow list of primary dealers.

more complicated for central banks that have acquired large amounts of long-dated assets (such as the Fed and the BoE). Available instruments differ somewhat across central banks, which may affect choices for some central banks (e.g. the Fed, with its lack of authority to issue its own bills, and the SNB, which does not remunerate excess reserves).

- For the Fed, extensive holdings of long-dated assets imply that the size of the balance sheet is most likely to remain elevated for some time. The deposit rate, therefore, is an important tool as it can be used to steer market rates regardless of the size of the balance sheet. For this measure to be effective, however, all major market participants, including the GSEs, should be subject to the same remuneration scheme. Also, given that the current deposit rate is equal to the main policy rate, the Fed Funds rate will have to increase, as the deposit rate is increased. The Fed will also likely have to make use of liquidity-draining measures such as reverse repurchasing operation and term deposits. An authorisation for the Fed to issue its own bills would provide additional flexibility for liquidity management. These operations may have to be carried out against a large number of counterparties, if the traditional list of primary dealers turns out to be insufficient for large-scale absorption. Disposal of long-dated assets may commence once the market is judged to be working normally, but the pace will have to be restrained, given its potential impact on the market. Asset sales may also be complicated by the potentially large losses that would have to be recognised if they were to occur after an upward shift in interest rates. A large exposure to interest rate risk suggests holding-to-maturity as an option, as it prevents sudden realisation of losses from affecting credibility and inflation expectations but at the same time such a policy would perpetuate a distorting interference in housing and other markets. Funds injected into individual institutions can be more quickly divested through a transfer to the government.

- For the ECB, the overwhelming reliance on bank-based liquidity measures implies that the exit process is likely to be less complicated than in the case of central banks that have taken on large amounts of long-dated assets.[48] While the decision that has already been made to phase out some measures will likely lead to a reduction of the pace of liquidity provision into the market, a certain portion of maturing positions may be rolled over to avoid a large amount of liquidity being abruptly taken out of the market. This can be done through the normal operational framework of one-week main refinancing operations as well as three-month longer-term refinancing operations. While divestment of covered bonds should face no major difficulty given the relatively small size of the purchase, potentially destabilising market impacts suggest that it may be desirable to hold them on the balance sheet for a while and absorb any excess liquidity by making use of the existing tools of term deposits and central bank bills, if necessary. More generally, however, the liquidity reduction has to be conducted step-by-step so as not to destabilise the economy. Because effective market rates have fallen well below the main policy target rate, unlike in other money markets, reductions in liquidity supply will likely generate increases in effective market rate. Should it be judged necessary to continue providing ample liquidity while the Bank seeks to increase interest rates, the actual money market interest rate is likely to remain attached to the deposit rate, rather than the main refinancing rate. In such a case, more explicit communication is perhaps desirable as regards the role of the deposit rate in monetary policy implementation.

- For the BoJ, given large uncertainty and prospects of continued deflation, the Bank should withdraw extraordinary support only gradually. The commitment to continue providing ample liquidity relying on the flexibility of the existing scheme and the decision to introduce another

48 . The ECB has emphasised that the Bank has implemented its conventional measures with the exit strategy in mind (Trichet, 2009). Thus, potential problems associated with large-scale asset purchase programmes do not apply to the ECB.

new liquidity provision scheme in early December go in this direction. Should the economy recover at a faster pace than anticipated, any resulting impact on excess reserves can be easily sterilised by using existing liability management measures, such as issuance of bills, or by transforming the temporary status of the measure to remunerate excess reserves to a permanent one. Extraordinary bank-support measures, such as purchases of equity or subordinated loans and other programmes, which have a semi-fiscal flavour and have remained heavily undersubscribed, are clear candidates for prompt termination, as already scheduled.

- For the BoE, the massive purchase of gilts cannot be divested easily, as doing so could have major impacts on long-term interest rates against the backdrop of a weak fiscal position. High interest rate exposures suggests holding-to-maturity as a better option, even though the Bank will be indemnified by the Government for incurred losses. A large stock of gilts will enable the Bank to conduct large-scale reverse repurchasing operations, which can be supplemented by the resumption of its bill issuance. Reserve remuneration can also be an important tool.

- The exit for the BoC and the Riksbank appears to be relatively straightforward, as they can mostly rely on automatic reduction of balance sheets by letting previously accumulated positions mature. Liquidity absorbing fine-tuning operations or, in the case of Riksbank, issuance of bills can play a supplementary role. The introduction of reserve requirements may also help the exit process.

- For the SNB, the key issue appears to be offsetting the impact of increases in liquidity generated by unsterilised foreign exchange intervention (because of the predominant impact of this scheme on reserves), should a faster-than-anticipated pace of economic recovery warrant reducing monetary stimuli.[49] An active use of central bank bills could be supplemented, if necessary, by introducing a possibility to pay interest on reserves. The removal of corporate bonds from the balance sheet must be conducted cautiously, because, given the small size of the domestic market, even small-scale sales from the central bank may be destabilising. Although the exit by way of these tools may affect the exchange rate, its impact is likely to be smaller in comparison with the case of outright divestment of foreign currency assets.

The timing and the sequence of the exit

57. The timing and pace of withdrawal of non-interest rate measures should be primarily determined by the progress in financial market normalisation. As financial markets have not been fully repaired, there is a case for central banks to maintain their exceptional presence in financial markets for some time - or at least for them to be cautious about the pace of withdrawal for several reasons.

- First, to the extent that improvements in the functioning of the financial system depend on the presence of exceptional measures, premature withdrawal could destabilise the markets again.

- Second, premature exit could necessitate the re-introduction of once-terminated measures in case of renewed turbulence, which could weaken market confidence and threaten the credibility of central banks.

49 . Although a significant part of the Swiss franc liquidity generated by the foreign exchange intervention may be held by non-residents, the highly internationalised nature of its banking system implies that excess reserves held by foreign banks have affected the policy target rate of LIBOR, suggesting that liquidity absorption may be no less urgent.

- Third, improvement in overall financial conditions may be masking significant difference in the health of individual banks. In itself, concern for weak banks should not be a reason to hold back on measures to normalise liquidity – such concerns should be addressed by micro-prudential policy. This is because of the risk that, if expectations emerge that abundant liquidity will continue to be available (and at very low interest rates), necessary adjustment in the banking sector is delayed as economically unviable banks remain in business. Still, to the extent that heterogeneity among banks is judged to be important for the functioning of the market as a whole because of the remaining fragility in the financial system, it would be warranted to keep system-wide emergency measures in place as a safety back-up line, especially where the stigma problem tends to make the reliance on the standing lending facility less effective.

58. The most likely first step for central banks in withdrawing non-interest measures is to start scaling back exceptional liquidity support to the economy. In fact, this has already commenced, supported by endogenous market-based incentives (see Box 3 above). It can be accelerated by increasing the cost of central bank provision of liquidity by *e.g.* increasing fees and "haircuts" on eligible collateral. The phasing out of special liquidity schemes is arguably preferable to abrupt termination of facilities, especially if the phasing-out is in response to market-type mechanisms. Some of the liquidity-management measures taken during the crisis, such as the extension of counterparties and the introduction of new liability management tools, should probably be made permanent.

59. Given their potentially adverse effects on asset prices and inflation expectations, it would be desirable, in principle, to withdraw direct market interventions, purchases of long-term government bonds and support for specific institutions as soon as financial markets return to normal. However, selling such assets can be very disruptive and, as discussed above, an alternative may be to keep such assets to maturity on central bank balance sheets, with their impact on liquidity offset by other means. This is particularly the case for holding of government bonds, which pose less credit risk and have less distortive impacts on resource allocation than is the case with holding private securities. Where the purchase of longer-term securities is primarily aimed at providing stimulus to the economy, the timing of the withdrawal (or neutralisation) of such measures should depend on the same factors which determine the pace of interest rate increases.

60. In addition to financial stability issues, the exit from unconventional measures should also take into consideration the fact that policy challenge for monetary authorities is greater when deflationary risk materialises than in the case of quicker and stronger recovery threatening inflation. If unfavourable deflationary shocks occur in an environment where the option of using conventional interest rates has been exhausted, central banks may need to retain the option of extending unconventional measures more explicitly for macroeconomic purposes (Box 4).

Box 4.The exit strategy under deflationary pressure

Should deflationary risk materialise, the case for the exit is generally much less compelling, because inflationary concerns that could potentially arise from a series of unconventional measures are no longer relevant. It is particularly problematic if exit from unconventional measures destabilises market confidence, which in turn may risk leading to a downward spiral of inflation expectations. In fact, the question then is not simply suspending the exit, but deciding what central banks can do more to lift the economy out of deflation. Given that, for most central banks, policy target interest rates cannot be lowered further, additional monetary stimuli would have to come in the form of "unconventional" measures, possibly extending measures that have taken in response to the crisis. However, the focus of the measures would have to be more explicitly on reducing interest rates over the medium-to-longer term horizon, in lieu of the financial market stability objective as has often been stressed during the crisis. For instance, central banks could extend liquidity provision over a longer horizon, so that money market interest rates would fall beyond the shortest horizon. Large-scale purchases of long-dated assets, either public or private, would also be an option. Additionally, central banks could be more explicit about keeping exceptionally low interest rates longer.

Box 4.The exit strategy under deflationary pressure (continued)

Even in such an eventuality, however, there may still be room for measures that presuppose dysfunctional markets to be scaled back or even withdrawn, especially to the extent that market-based incentive mechanism embodied in the measures leads to automatic reduction. For instance, the amount of liquidity may be endogenously reduced, as financial market participants demand less liquidity arising from precautionary demand.

The BoJ provides a noteworthy example in this regard. The Bank introduced a new liquidity-provision scheme one month after it announced the decision, based on the assessment of improved market conditions, to let some emergency measures expire by a specific date. The new scheme, however, has been specifically presented as a macroeconomic stability measures in response to deepening deflation, while the expiring measures were more focussed on financial stability objectives.

61. The articulation between the two components of the exit is relatively straightforward if improving financial conditions generate inflationary concerns, as a withdrawal of the volume of liquidity can come hand in hand with increases in its price. Although it would be more complicated if upside risk to price stability emerges while financial markets have not yet fully recovered, the use of various previously-discussed tools should help to address such an eventuality. Particular complications may arise should asset prices start to move up significantly when financial institutions have yet to regain health and economic recovery remains muted. If, in response, central banks would lean against the wind by raising interest rates, this could destabilise the market and slow the healing of the financial system, and might call for slowing the exit of unconventional measures.

Unconventional monetary policy exit and spillovers

62. The exit strategy for unconventional monetary policy must be gauged in a wider environment where most other crisis-driven measures taken by governments will also need to be reversed or removed at some point. Central bank independence implies that central bank actions should not be conditioned on the pace of withdrawal of government measures, but government actions nonetheless have spill-over effects on financial markets and the overall economy, which, in turn, can have important implications for monetary policy decisions. At the same time, the withdrawal of crisis-driven monetary policy measures can also have repercussion beyond money markets, both domestically and internationally. Thus, the timing and the pace of the exit must carefully take these issues into consideration:

- First, the withdrawal of government emergency financial policy measures, especially liability guarantees can expose remaining vulnerabilities in the financial system. As a precaution, it might be safer to keep exceptional liquidity programmes in place until after the financial system has proved resilient to the withdrawal of such emergency financial policy measures.

- Second, although many unconventional monetary policy measures have been introduced with the primary aim of securing the provision of ample liquidity through the financial system, the fact that these measures have been conducted in an environment of extremely low interest rates has had the side-effect of generating large margins for many banks and other intermediaries. As such, they might have helped banks and other intermediaries in their efforts to rebuild their capital bases. To the extent that these margins are dependent on special liquidity measures, the exit from unconventional measures could affect the process of balance sheet adjustments of banks, with implications for the wider economy going forward.

- Third, on the other hand, there may be cases where the new regulatory environment actually facilitates the exit process of monetary policy measures. For instance, new regulations requiring financial institutions to hold more liquid assets can make it easier for central banks to sell bonds issued or backed by governments.

- Fourth, even when the short-term policy rate remains unchanged, the exit from unconventional measures, such as termination of longer-term liquidity provision and asset purchase programmes will likely exert upward pressure on medium to longer-term segments of the yield curve, effectively leading to tighter monetary conditions. This would also have implications for fiscal authorities, as the cost of servicing government debt would likely increase. Besides, if a situation arises where some public sector instruments accepted as collateral under a loosened eligibility criteria can no longer be accepted as such, it could further increase the financial cost for the issuer. While these factors should not delay the exit, it may be useful to communicate these risks to the fiscal authorities.

- While the timing of the exit must be ultimately determined by national economic and financial conditions, the exit process will likely have spill-over effects internationally. For instance, earlier or faster pace of exit in one country could lead to currency appreciation, which would further add to the tightening of monetary conditions. Reduction in liquidity supply of major currencies (*e.g.* the US dollar) may have important implications internationally, as was the case in the run-up to the crisis (McGuire *et al*, 2009). The case for formally coordinating monetary policy actions is less compelling than for emergency financial policy measures, especially government guarantees that directly involve competition issues. In particular, the differences in cyclical positions and financial fragilities across countries will necessarily call for different exit pathways (OECD, 2009). Nevertheless, the risk of unwarranted exchange rate movement might be reduced by well co-ordinated communication.

63. Given the unprecedented nature of the exit, both in its scope and its scale, a clear communication strategy is essential. Indeed, communication could be quite challenging for central banks especially at the start of the exit process. Even a small technical change in monetary policy implementation can easily be taken by market participants as an indication that central banks are tightening policy. Thus, even in cases where the previously-adopted measures are allowed to run off, simply because the expiry date has arrived, central banks may wish to state well in advance that they do not intend to extend the measures. Announcement of changes of a technical nature, such as fewer liquidity offers made from central banks or changes in collateral eligibility, should be accompanied by clear explanation in order to clarify the intention of the monetary authorities, so that markets do not misinterpret the nature and scope of the technical steps that will be taken in the process of normalising monetary policy. The importance of this challenge is illustrated by the strong attention that markets paid to technical reverse repo transactions by the Fed in late 2009 and changes in collateral rules by the ECB.

4. Beyond the exit

64. Over a longer horizon, the framework for monetary policy implementation may have to be re-assessed against lessons to be learned from the crisis experience. Some of the measures introduced on an emergency basis may be made permanent, as they enhance central banks' operational capacity in normal times[50]. These measures potentially include extension of counterparties, where the traditional counterparties to monetary policy operations were quite limited, and interest payment on reserves. This also holds for other liability management tools such as the ability to issue central bank bills.

65. Whether other measures - such as relaxation of standards for eligible collateral and extended maturity of liquidity operations - should be maintained largely depends on how generous central banks should be in providing liquidity to the banking sector in normal times. Restricting the provision of central

50. For instance, Cheun *et al.* (2009) compares a relatively flexible collateral framework in the euro area with more restricted schemes in the United States and in the United Kingdom and concluded that the inherent flexibility in the euro area system has served it well during the crisis.

bank liquidity may help to restore some market discipline in this regard, but the fact that central banks have once significantly extended liquidity provision in response to the crisis may have added an element of moral hazard, as market participants now have reasons to expect them to offer more liquidity at low cost when liquidity dries up in the market. Dealing with this concern calls for a more stringent regulatory framework in this regard.

66. Finally, the question arises whether the amount of liquidity provision in itself may in the future become a regular instrument of monetary policy implementation even in normal times. This could be the case to the extent greater weight is put on the objective of financial market stability in addition to the traditional objective of price stability. In the pre-crisis norm of monetary policy implementation, the price and quantity of liquidity were clearly linked, as the deposit rates that formed the lower bound of the money market interest rate were much lower than the main rate, even zero for some central banks. Central banks, however, cannot be expected to achieve these two different objectives simultaneously at all times if only the interest rate instrument is available. Separating the price of liquidity from its quantity might in principle facilitate the pursuit of price stability simultaneously with a goal of financial stability: central banks could assign the traditional interest rate tool, which determines the price of liquidity, exclusively to the macroeconomic objective of price stability, while the financial stability objective would be met by adjusting the quantity of liquidity available in the market and other stability-oriented tools. For example, this would be possible, if, in the previously discussed Figure 9, the supply curve will always interact with the demand curve at a point where the latter is horizontal at the deposit rate. Then, by always setting the interest rate on the standing deposit facility equal to the prevailing market interest rate, central banks would be able to determine the quantity of reserves independently of the price stability consideration (Keister *et al*, 2009; Goodfriend, 2009; and Woodford, 2001). However, this approach suffers from the important drawback that it would most likely suppress the money market permanently because it would drive the opportunity cost of holding reserves to zero or very close. In addition, whether the existence of ever-ample liquidity in the banking system can truly be consistent with the price stability objective has never been tested in practice.

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