

# Unconventional Monetary Policies: Evolving Practices, Their Effects and Potential Costs

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- Central banks have introduced several types of unconventional monetary policy measures, ranging from liquidity and credit facilities to asset purchases and forward guidance.
- To date, these measures appear to have been successful. They helped to restore market functioning, facilitated the transmission of monetary policy and supported economic activity.
- Such policies, however, have potential costs, including challenges related to the greatly expanded balance sheets of central banks and the eventual exit from these measures, as well as the vulnerabilities that can arise from prolonged monetary accommodation.

The Great Recession that followed the financial and economic crisis of 2007–09 provoked an unprecedented policy response from central banks, including lowering policy rates to close to zero and employing unconventional monetary policy measures.<sup>1</sup> Given the weak recovery in the major advanced economies, some central banks have continued to apply these measures.

Most observers agree that unconventional measures have been successful. Liquidity and credit facilities have helped to restore market functioning, repair dysfunctional credit markets and facilitate the transmission of monetary policy. Meanwhile, asset purchases—such as large-scale asset purchases (LSAPs) or quantitative easing (QE)—and forward guidance have supported economic activity and helped central banks to achieve their price-stability objectives. There is, however, a growing awareness of the potential costs and risks associated with (i) the greatly expanded balance sheets of central banks; (ii) the eventual, but unprecedented, exit from unconventional policy measures; and (iii) the vulnerabilities that can arise from an environment of very low policy rates in the major advanced economies for a prolonged period (referred to as “low for long”). Moreover, there is the risk that monetary policy may be trying to address issues that

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<sup>1</sup> These measures, in particular the provision of liquidity, straddle the line between financial stability policies and monetary policies, facilitating the transmission of monetary policy. We refer to them here as unconventional monetary policy.

are better tackled by fiscal or structural reforms. Nevertheless, to date, the benefits of unconventional measures appear to outweigh their potential costs (Bernanke 2012).

This article first summarizes the various types of unconventional monetary policy measures, the channels through which they work and the consequences of such policies for central bank balance sheets. This is followed by a discussion of the effectiveness and potential costs of these measures.

## Unconventional Monetary Policies: Evolving Practices

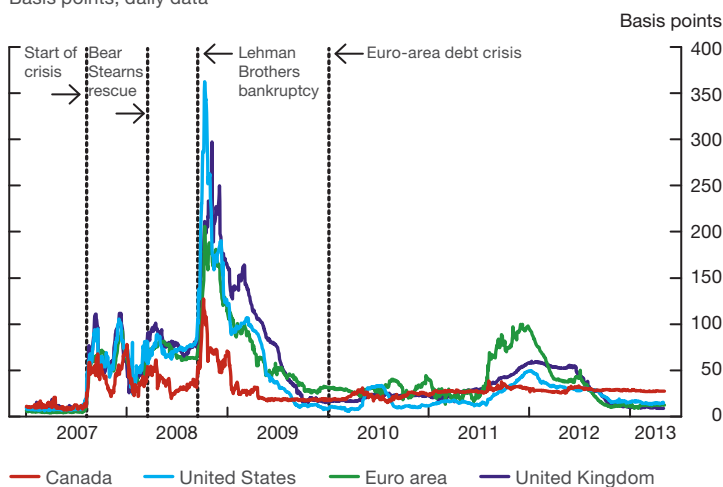
The types of unconventional monetary policy measures implemented by central banks have evolved since the onset of the crisis. In this article, we distinguish between liquidity facilities, credit facilities, asset purchases and forward guidance (see the Appendix on page 15 for a list of selected measures).<sup>2</sup>

The financial crisis that started in 2007 intensified in September 2008, as liquidity dried up and maturities shortened, leading to an unprecedented increase in spreads (Chart 1). To alleviate financial market disruptions, central banks quickly provided liquidity to short-term funding markets through a number of emergency facilities and currency swap agreements. They also introduced new or expanded credit facilities, designed to restore the provision of credit in specific markets.

In late 2008, as the impact of the financial crisis spread to the real economy, major central banks lowered policy rates to close to zero. To ease monetary conditions further, many turned to LSAPs. To counter weak aggregate demand, the U.S. Federal Reserve and the Bank of England purchased government debt to put downward pressure on long-term yields.<sup>3</sup> The Bank of Japan introduced a more modest purchase program to fight persistent

**Chart 1: Three-month LIBOR-OIS spread**

Basis points, daily data



Note: The LIBOR-OIS spread is the difference between the London Interbank Offered Rate (or equivalent) and the Overnight Index Swap. It is a measure of stress in the money markets.

Sources: Bloomberg and Bank of Canada calculations

Last observation: 6 May 2013

<sup>2</sup> *Liquidity facilities* involve the provision of liquidity by central banks to address elevated pressures in term funding markets. *Credit facilities* are measures aimed at restoring the functioning of a particular credit market and promoting bank lending. *LSAPs* are sizable medium- to long-term asset purchases (mostly of government debt) by the central bank. *Forward guidance* is central bank communication regarding the future path of the policy rate.

<sup>3</sup> The Federal Reserve also purchased mortgage-backed securities and agency debt, as well as long-term securities in exchange for short-term securities (through its Maturity Extension Program).

deflation. Against the backdrop of a euro-area debt crisis, the European Central Bank (ECB) introduced the Securities Markets Programme (SMP), which focused on stabilizing government securities markets to promote the transmission of monetary stimulus.

When global economic growth weakened again in late 2011 through 2013, monetary policy-makers in some advanced economies reintroduced LSAPs, such as the Federal Reserve's open-ended purchases of Treasuries and mortgage-backed securities. Likewise, in order to achieve its newly stated inflation target of 2 per cent within two years, the Bank of Japan announced in April that it will double its holdings of Japanese government bonds over the next two years.

To reduce long-term interest rates further, some central banks enhanced their guidance on the future path of the policy rate. For example, in April 2009, the Bank of Canada stated, "Conditional on the outlook for inflation, the target overnight rate can be expected to remain at its current level until the end of the second quarter of 2010 in order to achieve the inflation target."<sup>4</sup> The Federal Reserve first introduced date-based guidance in 2011 and then outcome-based guidance in 2012, in which the future path of the federal funds rate was tied to explicit outcomes in the unemployment rate and inflation.

In addition, as the flow of credit through the banking system remained impaired, both the Bank of England and the Bank of Japan introduced financing schemes to promote lending by banks to households and businesses, while the ECB extended the maturity and quantity of lending to banks in the euro area through its long-term refinancing operations (LTROs).<sup>5</sup>

To sum up, central banks reacted in a timely and aggressive manner to the financial and economic crisis, implementing a variety of unconventional measures, and tailoring the type and magnitude of the measures to domestic market conditions. As conditions evolved, so did the approaches taken by central banks; they extended existing policies and introduced new ones in order to achieve their objectives for monetary policy and financial stability.

◀ *Central banks tailored the type and magnitude of unconventional measures to domestic market conditions*

## Channels of Unconventional Monetary Policy

Unconventional monetary policy affects financial markets and the economy more broadly through several channels. Liquidity facilities work directly on the targeted markets, but also have wider effects, such as enhancing the viability of banks by preventing a liquidity crisis from becoming a solvency crisis and improving the transmission of monetary policy. Likewise, credit facilities, such as the ECB's LTROs, increase the ability of banks to provide credit to the real economy and support the sovereign debt market, while other credit facilities, such as the Federal Reserve's Commercial Paper Funding Facility, revive specific credit markets through the purchase of assets. LSAPs work through multiple channels, both directly and indirectly, by:

- (i) increasing the prices of the purchased assets, thereby lowering their yield, and creating wealth effects that in turn support consumption;
- (ii) motivating investors to rebalance their portfolios toward higher-return, riskier assets;

<sup>4</sup> The Bank of Canada was less aggressive than most of its advanced-economy counterparts in its use of unconventional policies, reflecting the resilience of the Canadian financial system and its strong underlying macroeconomic policy framework.

<sup>5</sup> The LTROs also helped support the sovereign debt market, as banks used borrowed liquidity to buy government bonds, especially in the euro-area periphery.

- (iii) providing a signal about the future path of the policy rate;
- (iv) putting downward pressure on the exchange rate;
- (v) better anchoring inflation expectations, leading to lower real interest rates; and
- (vi) demonstrating that the central bank is willing to do whatever it takes to meet its objectives, thus supporting confidence.

Forward guidance works by influencing market participants' expectations of the future path of the policy rate and the term structure of interest rates. Specifically, if the central bank credibly communicates that the policy rate will likely remain lower for a longer period than previously indicated, this will serve to lower long-term interest rates as well, which will affect the economy in ways similar to those described for LSAPs.

## Central Bank Balance Sheets

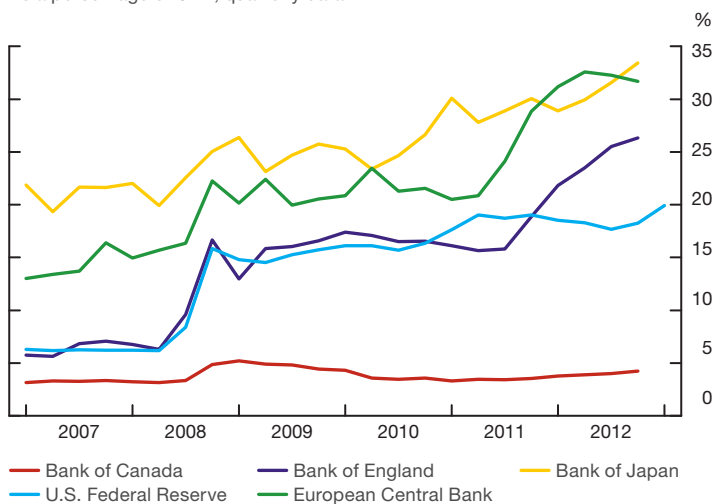
The measures taken by many central banks have had significant implications for the size and composition of their balance sheets. Stated as a percentage of gross domestic product (GDP), the balance sheets of the Federal Reserve and the ECB have more than doubled since 2007, and the Bank of England's has quadrupled (Chart 2).<sup>6</sup> The Bank of Japan's balance sheet has increased by only 50 per cent so far, but, under its recently announced policy, it is expected to increase to approximately 60 per cent of GDP by the end of 2014. While purchases of government debt (and mortgage securities) account for the bulk of this expansion for most countries, LTROs represented most of the increase in the ECB's balance sheet.

In terms of composition, the average maturity of central banks' portfolios has often lengthened and their risk profile has increased, owing to new practices such as purchasing riskier assets and relaxing collateral

◀ *The measures taken by many central banks have had significant implications for the size and composition of their balance sheets*

**Chart 2: Total assets on central bank balance sheets**

As a percentage of GDP, quarterly data



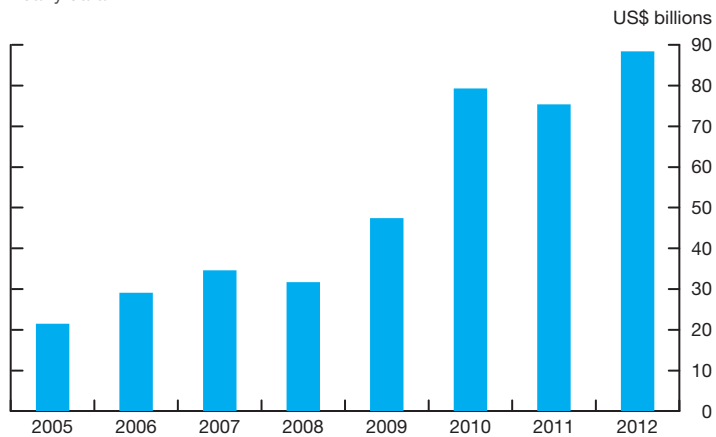
Sources: U.S. Federal Reserve, U.S. Bureau of Economic Analysis; Bank of England, U.K. Office for National Statistics; European Central Bank, Eurostat; Bank of Japan, Cabinet Office of Japan; and Bank of Canada calculations

Last observations: United States, 2013Q1; all others, 2012Q4

<sup>6</sup> In contrast, the Bank of Canada's balance sheet increased by only about 50 per cent from 2007 to 2009, before falling back to close to its previous level as a share of GDP.

**Chart 3: Profits of the U.S. Federal Reserve**

Yearly data



Source: U.S. Federal Reserve

Last observation: 2012

requirements. These changes have so far proven profitable for central banks, such as the Federal Reserve (Chart 3). Over time, however, central banks may experience losses as interest rates normalize. The implications of this potential development continue to generate much debate and are discussed in more detail below.

## Effects of Unconventional Monetary Policies

A large body of evidence shows that most unconventional monetary policy measures have been successful to date. It is important to note that identifying and evaluating the effects of such policies is nevertheless challenging; thus, the conclusions should be viewed with appropriate caution.<sup>7</sup>

### Liquidity and credit facilities

Liquidity facilities appear to have significantly reduced yields and revived activity in the targeted funding markets. These initiatives had the most impact when their access costs<sup>8</sup> were low and collateral requirements were flexible. For example, the Federal Reserve's Term Auction Facility triggered a fall in interbank market spreads, thereby mitigating difficulties in funding markets. As well, central bank dollar swaps alleviated dollar-funding stresses and effectively minimized systemic liquidity disruptions (Goldberg, Kennedy and Miu 2011).

Credit facilities appear to have also made a positive contribution to the functioning of the targeted markets and have had important confidence effects in signalling the central bank's willingness to intervene whenever necessary. In particular, measures targeting the commercial paper market in the United States, the United Kingdom and Japan have effectively lowered spreads and increased issuance.

Preliminary evidence suggests that recently introduced credit facilities have had a measurable impact on financial markets and lending. Market funding costs for U.K. banks have fallen sharply, and credit conditions have eased (Churm et al. 2012). Likewise, the ECB's LTROs were heavily used by banks

◀ *Recently introduced credit facilities have had a measurable impact on financial markets and lending*

<sup>7</sup> For a detailed discussion, see Kozicki, Santor and Suchanek (2011).

<sup>8</sup> Access costs include direct costs such as fees, and indirect costs such as the stigma attached to using a facility.

and triggered an important decline in interest rate premiums, reduced systemic risk, led to lower yield spreads for peripheral sovereigns and likely mitigated a credit crunch in the euro area. Moreover, market sentiment improved and previously closed bank funding markets gradually reopened (ECB 2012a).

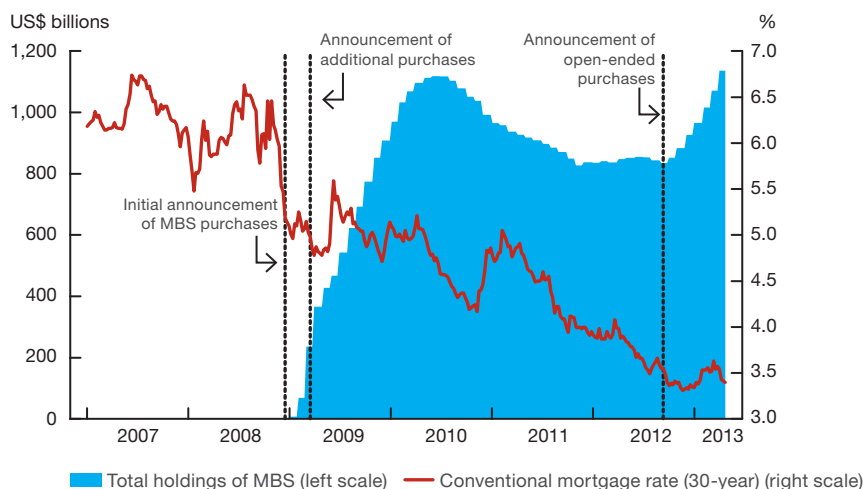
## Large-scale asset purchases

The effectiveness of LSAPs has been extensively addressed in the literature. The consensus is that LSAPs positively affected financial markets and provided stimulus to the overall economy. Yields on mortgage bonds in the United States have fallen in response to mortgage-backed asset purchases and are now at record-low levels (Chart 4). Similarly, estimates of the cumulative effect of the first three programs in the United States on the yields of 10-year bonds range from 65 to 120 basis points (Table 1). The Bank of England's gilt purchases are estimated to have lowered yields by 50 to 100 basis points (Breedon, Chadha and Waters 2012; Joyce et al. 2011), while the Bank of Japan's QE program had a smaller impact (a 13- to 24-basis-point drop in yields) (Lam 2011; Ueda 2012). The ECB's SMP in 2010, although much smaller, effectively reduced debt spreads of peripheral European governments (Chart 5), but the impact was relatively short lived, since financial market stress quickly re-emerged. Following the ECB's announcement of its Outright Monetary Transactions (OMTs) in 2012 and the statement that the ECB is "ready to do whatever it takes to preserve the euro" (Draghi 2012), debt spreads narrowed again and investor confidence rebounded (ECB 2012b).<sup>9</sup> Overall, the effectiveness of LSAPs appears to depend crucially on underlying financial and economic conditions; thus, the impact of the initial purchases may have been more significant than that of additional purchases.

◀ *Large-scale asset purchases positively affected financial markets and provided stimulus to the overall economy*

**Chart 4: Federal Reserve holdings of mortgage-backed securities (MBS) and the mortgage rate**

Weekly data



Sources: Federal Home Loan Mortgage Corporation and U.S. Federal Reserve

Last observation: Week ending on 25 April 2013

<sup>9</sup> The relative success of the announcement of OMTs (compared with the SMP) is likely related to the fact that purchases are in principle unlimited, subject to conditionality on compliance with a macro-economic adjustment program, and have greater transparency.

**Table 1: Impact of large-scale asset purchases in the United States**

	Total size (US\$ billions)	Impact on			
		Treasury yields		Level of GDP	
		basis points	basis points per US\$100 billion	%	% per US\$100 billion
<b>LSAP1</b>					
Range of estimates	1,750	38 to 107 <sup>a</sup>	2.2 to 6.1 <sup>a</sup>	0.7 to 3 <sup>b</sup>	0.04 to 0.17 <sup>b</sup>
Bernanke (2012)	1,750	40 to 110	2.3 to 6.3		
<b>LSAP2</b>					
Range of estimates	600	13 to 45 <sup>c</sup>	2.2 to 7.5 <sup>c</sup>	0.4 to 1 <sup>d</sup>	0.07 to 0.17 <sup>d</sup>
Bernanke (2012)	600	15 to 45	2.5 to 7.5		
<b>LSAP1 + LSAP2</b>					
Bernanke (2012)	2,350			3	0.13
<b>LSAP1 + LSAP2 + Maturity Extension Program</b>					
Range of estimates	2,750	65 to 100 <sup>e</sup>	2.4 to 3.6 <sup>e</sup>		
Bernanke (2012)	2,750	80 to 120	2.9 to 4.4		

a. Ihrig et al. 2012; Doh 2010; Meyer and Bomfim 2010; Gagnon et al. 2011; Neely 2012

b. Chung et al. 2012; Deutsche Bank 2010; Baumeister and Benati 2010

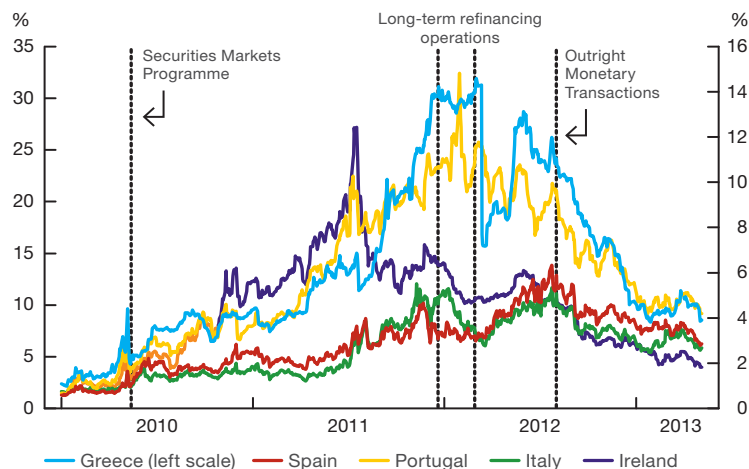
c. Ihrig et al. 2012; Krishnamurthy and Vissing-Jorgensen 2011; D'Amico et al. 2012

d. Chen, Cúrdia and Ferrero 2012; Chung et al. 2012; Meyer and Bomfim 2011

e. Ihrig et al. 2012; Li and Wei 2012; Meyer and Bomfim 2012

**Chart 5: Euro-area periphery 10-year generic bond spreads**

Percentage-point difference in yields of generic German bonds, daily data



Note: Owing to data limitations, an 8-year generic bond is used for Ireland. A generic x-year bond is the bond that has the closest maturity to x at any given point in time.

Sources: Bloomberg and Bank of Canada calculations

Last observation: 6 May 2013

Research suggests that, in addition to their impact on financial markets, the LSAPs in the United States have provided meaningful support to the economic recovery and have contributed to the achievement of price stability (in part by helping to prevent disinflation or even deflation) (Table 1). The evidence for the Bank of England's QE program is similar, suggesting a peak effect of 1 1/2 to 2 per cent for real output and between 3/4 and 1 1/2 per cent for inflation (Joyce, Tong and Woods 2011). Overall, LSAPs appear to have been effective when the total stock purchased relative to the size of the target market was large, and when their terms and objectives were transparently and clearly communicated.

## Forward guidance

The Federal Reserve's experience with forward guidance appears to have been successful. Since the Federal Reserve's extension of its commitment regarding the federal funds rate, market participants have pushed back the date at which they expect the rate to begin to rise. This response is evident in the reaction of financial market prices and in survey data (Bernanke 2012). The Bank of Canada's conditional commitment also succeeded in changing market expectations. Yield-curve expectations declined after the Bank's announcement, strengthening the rebound in growth and inflation in Canada (Carney 2012).<sup>10</sup>

While unconventional policies appear to have achieved their objectives to date, it is too early to judge the overall success of such practices, since it remains unclear how well central banks will exit from these policies.

## Policy Issues and Potential Costs

To date, there is little hard analysis of the potential costs of unconventional monetary policies. Nevertheless, central banks need to consider a number of issues when pursuing such policies.

### Exit and balance-sheet management

A vibrant debate is emerging on the issue of the exit from unconventional monetary policies. Exiting too soon could undermine the recovery, while too slow an exit could lead to excess liquidity and contribute to inflationary pressures. Clear communication and guidance will be crucial for a successful exit.

Despite the expansion in the monetary base relative to the economy (Chart 6), to date, inflation has largely been in line with the price-stability objectives of major central banks (Chart 7), and inflation expectations remain generally well anchored.<sup>11</sup> Nevertheless, the increased liquidity in the financial system needs to be managed appropriately to avoid future inflationary pressures.

The degree of monetary policy accommodation can be reduced by raising the target for the overnight rate and the interest paid on reserves,<sup>12</sup> by implementing reverse repos and by reducing asset holdings on the central bank's balance sheet (either through asset sales or simply by not rolling over the assets and allowing them to mature). Concurrently raising policy rates and draining reserves may, however, alter the usual transmission mechanism, and so the central bank will need to monitor the process closely (Kozicki, Santor and Suchanek 2011).

Expanded balance sheets expose central banks to potential losses. Recent analysis shows, for example, that the Federal Reserve could experience losses under certain scenarios for asset sales and market interest rates (Carpenter et al. 2013). Moreover, capital losses could result from acquiring riskier assets and relaxing collateral requirements for central bank loans.<sup>13</sup>

◀ *Exiting from unconventional monetary policies too soon could undermine the recovery, while too slow an exit could lead to excess liquidity and contribute to inflationary pressures*

<sup>10</sup> For an empirical analysis of the effectiveness of Canada's conditional commitment policy, see He (2010).

<sup>11</sup> Indeed, the expansionary monetary policy stance has not been inflationary because it has compensated for a contraction in private credit and private sector deleveraging that would otherwise be deflationary.

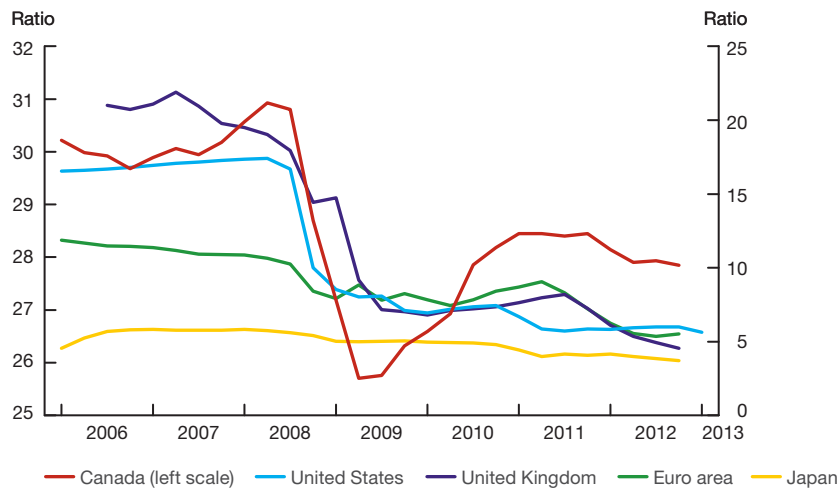
<sup>12</sup> The higher the interest rate paid on reserves, the lower the incentive for the bank to lend its funds to other banks or to the real economy.

<sup>13</sup> The ECB set aside more than half of its interest income for risk provisions in 2012 to account for potential losses on its holdings of government bonds under the SMP.



**Chart 6: Ratio of nominal GDP to the monetary base**

Seasonally adjusted quarterly data

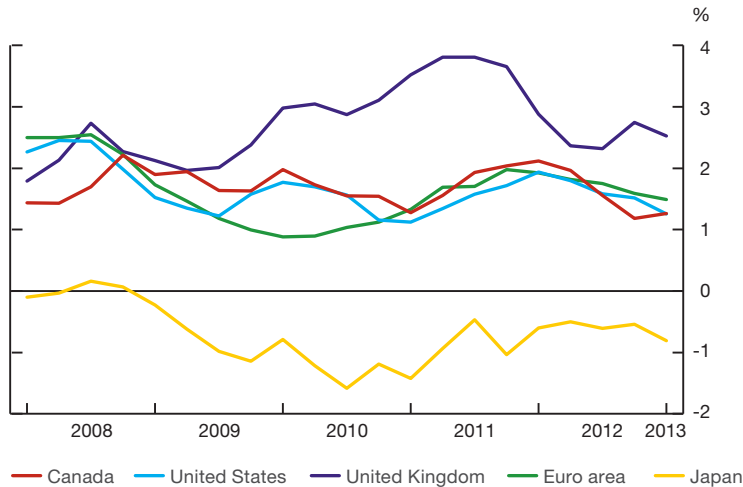


Sources: Bank of Canada, Statistics Canada; Haver Analytics for data from the U.S. Federal Reserve, U.S. Bureau of Economic Analysis, Bank of England, U.K. Office for National Statistics, European Central Bank, Eurostat, Bank of Japan and Cabinet Office of Japan; and Bank of Canada calculations

Last observations:  
United States, 2013Q1;  
all others, 2012Q4

**Chart 7: Core CPI in major advanced economies**

Year-over-year change, percentage points, seasonally adjusted quarterly data



Note: The core PCE index is used for U.S. data.

Sources: Statistics Canada; and Haver Analytics for data from the U.S. Bureau of Economic Analysis, U.K. Office for National Statistics, Eurostat, and the Ministry of Internal Affairs and Communications of Japan

Last observation: 2013Q1

Central banks can, in principle, bear the risks of losses on their balance sheets without impairing their ability to conduct monetary policy.<sup>14</sup> In this context, losses would not prevent the central bank from tightening as the real economy begins to improve, since they are a minor cost compared with the larger benefit of better economic growth.

<sup>14</sup> In the United States, cumulative earnings over the entire period of unconventional monetary policy actions are estimated to be positive and even higher than they would have been without the LSAPs (Carpenter et al. 2013).

## Central bank independence and credibility

Asset purchases of government debt could undermine the credibility of the central bank if such purchases are seen to be facilitating large fiscal deficits. This could lead to a loss of perceived independence and thus an unanchoring of inflation expectations. As well, the central bank's reputation could be damaged should it incur losses on its portfolio. Central banks must therefore ensure that any unconventional policy measures they implement are clearly communicated and aimed squarely at achieving their mandated objectives, and nothing more.

◀ *Central banks must ensure that any unconventional policy measures they implement are clearly communicated and aimed squarely at achieving their mandated objectives*

## Low for long and financial stability

In many countries, the implementation of balance-sheet policies has led to an extended period of very low interest rates across the entire term structure, causing concerns about “low for long” (Carney 2010). For example, institutions, such as insurance companies and pension funds, are required—or prefer—to hold long-term assets as part of their portfolios. Given their need to match the returns from such assets with their long-term liabilities, these institutions may feel compelled to invest in riskier assets or implement new business strategies where the risks are not understood as well. More broadly, while portfolio rebalancing is a key channel through which LSAPs work, it could lead to excessive risk taking and increase vulnerabilities in the financial system, requiring heightened diligence on the part of financial supervisors. Finally, “low for long” may lead to forbearance, as loans are extended at low rates that allow otherwise non-viable firms and/or banks to continue operating. These “zombie” firms/banks would impede the needed restructuring of the economy.

## Distributional effects

Related to “low for long” is the concern that asset purchases might have distributional effects; that is, they would benefit one group at the expense of another.<sup>15</sup> While lower long-term yields favour borrowers over savers, some observers have argued that the wealth effects associated with portfolio rebalancing would benefit holders of equities over bondholders. Recent analysis suggests that this concern may be overstated, since lower yields are mostly offset by higher asset prices (Bank of England 2012). Nevertheless, central banks should be mindful of distributional effects.

## Spillovers

Much like conventional monetary policy, unconventional policies can affect other asset-market prices. Neely (2012) finds that LSAP announcements substantially reduced not only yields on foreign long-term bonds but also the spot value of the U.S. dollar (Chart 8).

◀ *Much like conventional monetary policy, unconventional policies can affect other asset-market prices*

Many emerging-market economies (EMEs), and some advanced economies, have criticized the Federal Reserve's LSAPs as targeting currency depreciation, thereby fuelling capital flows to EMEs. Current research, however, does not support this assertion.<sup>16</sup> Moreover, in an environment of deficient demand, LSAPs have proven to be necessary to enable the Federal Reserve to achieve its price-stability objectives. Currency depreciation is part of monetary policy transmission and, in fact, assists in the adjustment process between surplus countries (which would otherwise experience inflation) and

<sup>15</sup> While all monetary policy actions are taken for the benefit of the entire economy, such actions will nevertheless have unavoidable distributional effects.

<sup>16</sup> See, for example, Ghosh et al. (2012), IMF (2011), and Forbes and Warnock (2012).

**Chart 8: U.S. real effective exchange rate**

Source: Bank for International Settlements

Last observation: March 2013

deficit countries. Critics of the Federal Reserve's LSAPs should recognize that without LSAPs, higher U.S. interest rates would have resulted in even greater deflationary pressures and weaker growth.

Finally, some observers have argued that LSAPs have contributed to a rise in commodity prices; however, there is little evidence that the rise in commodity prices through 2009 and 2010 was related to LSAPs (Glick and Leduc 2012). Instead, other factors, such as supply constraints and robust EME demand, were likely more important drivers behind the higher prices.

## Conclusion

The Great Recession that followed the 2007–09 financial crisis prompted central banks to implement a series of unprecedented policy interventions. On balance, research to date suggests that these measures were—and remain—effective, helping to mitigate the worst aspects of the crisis and sustain the recovery. Without them, economic outcomes would have been much worse. Unconventional monetary policies have thus become part of the toolkit of central banks, permitting them to provide considerable policy stimulus should circumstances require more action.

Nevertheless, to fully assess their effectiveness, it is necessary to see how well central banks manage the exit from these policies. Moreover, unconventional policies have potential costs. Extended balance sheets imply greater risks for central banks, while highly accommodative monetary policy for an extended period could have adverse consequences for financial stability, as well as for central bank credibility and independence. While central banks must be mindful of the potential costs and risks of their actions, currently these issues do not appear to present sufficient cause to restrict the use of these measures.

## Literature Cited

- Bank of England. 2012. "The Distributional Effects of Asset Purchases." Bank of England *Quarterly Bulletin* (Q3): 254–66.
- Baumeister, C. and L. Benati. 2010. "Unconventional Monetary Policy and the Great Recession: Estimating the Impact of a Compression in the Yield Spread at the Zero Lower Bound." European Central Bank Working Paper No. 1258.
- Bernanke, B. S. 2012. "Monetary Policy Since the Onset of the Crisis." Speech at the Federal Reserve Bank of Kansas City Economic Symposium, Jackson Hole, Wyoming, 31 August.
- Breedon, F., J. S. Chadha and A. Waters. 2012. "The Financial Market Impact of U.K. Quantitative Easing." *Oxford Review of Economic Policy* 28 (4): 702–28.
- Carney, M. 2010. "Living with Low for Long." Speech to the Economic Club of Canada, Toronto, Ontario, 13 December.
- . 2012. "Guidance." Speech to the CFA Society Toronto, Toronto, Ontario, 11 December.
- Carpenter, S. B., J. E. Ihrig, E. C. Klee, D. W. Quinn and A. H. Boote. 2013. "The Federal Reserve's Balance Sheet and Earnings: A Primer and Projections." Federal Reserve Board Finance and Economics Discussion Series No. 2013-01.
- Chen, H., V. Cúrdia and A. Ferrero. 2012. "The Macroeconomic Effects of Large-Scale Asset Purchase Programmes." *The Economic Journal* 122 (564): F289–F315.
- Chung, H., J.-P. Laforte, D. Reifschneider and J. C. Williams. 2012. "Have We Underestimated the Likelihood and Severity of Zero Lower Bound Events?" *Journal of Money, Credit and Banking* 44 (s1): 47–82.
- Churm, R., A. Radia, J. Leake, S. Srinivasan and R. Whisker. 2012. "The Funding for Lending Scheme." Bank of England *Quarterly Bulletin* (Q4): 306–20.
- D'Amico, S., W. English, D. López-Salido and E. Nelson. 2012. "The Federal Reserve's Large-Scale Asset Purchase Programmes: Rationale and Effects." *The Economic Journal* 122 (564): F415–46.
- Deutsche Bank. 2010. "Benefits and Costs of QE2." *Global Economic Perspectives*, 29 September.
- Doh, T. 2010. "The Efficacy of Large-Scale Asset Purchases at the Zero Lower Bound." Federal Reserve Board of Kansas City *Economic Review* (Second Quarter): 5–34.
- Draghi, M. 2012. "Verbatim of the Remarks Made by Mario Draghi." Speech at the Global Investment Conference, London, 26 July.

- European Central Bank (ECB). 2012a. "Impact of the Two Three-Year Longer-Term Refinancing Operations." European Central Bank *Monthly Bulletin* (March): 37–39.
- . 2012b. *Financial Stability Review* (December).
- Forbes, K. J. and F. E. Warnock. 2012. "Capital Flow Waves: Surges, Stops, Flight and Retrenchment." *Journal of International Economics* 88 (2): 235–51.
- Gagnon, J., M. Raskin, J. Remache and B. Sack. 2011. "The Financial Market Effects of the Federal Reserve's Large-Scale Asset Purchases." *International Journal of Central Banking* 7 (1): 3–43.
- Ghosh, A. R., J. Kim, M. S. Qureshi and J. Zalduendo. 2012. "Surges." International Monetary Fund Working Paper No. WP/12/22.
- Glick, R. and S. Leduc. 2012. "Central Bank Announcements of Asset Purchases and the Impact on Global Financial and Commodity Markets." *Journal of International Money and Finance* 31 (8): 2078–101.
- Goldberg, L. S., C. Kennedy and J. Miu. 2011. "Central Bank Dollar Swap Lines and Overseas Dollar Funding Costs." Federal Reserve Bank of New York *Economic Policy Review* (May): 3–20.
- He, Z. 2010. "Evaluating the Effect of the Bank of Canada's Conditional Commitment Policy." Bank of Canada Discussion Paper No. 2010-11.
- Ihrig, J., E. Klee, C. Li, B. Schulte and M. Wei. 2012. "Expectations About the Federal Reserve's Balance Sheet and the Term Structure of Interest Rates." Federal Reserve Board Finance and Economics Discussion Series No. 2012-57.
- International Monetary Fund (IMF). 2011. "Recent Experiences in Managing Capital Inflows—Cross-Cutting Themes and Possible Policy Framework." Strategy, Policy and Review Department (14 February).
- Joyce, M., A. Lasasosa, I. Stevens and M. Tong. 2011. "The Financial Market Impact of Quantitative Easing in the United Kingdom." *International Journal of Central Banking* 7 (3): 113–61.
- Joyce, M., M. Tong and R. Woods. 2011. "The United Kingdom's Quantitative Easing Policy: Design, Operation and Impact." Bank of England *Quarterly Bulletin* (Q3): 200–12.
- Kozicki, S., E. Santor and L. Suchanek. 2011. "Unconventional Monetary Policy: The International Experience with Central Bank Asset Purchases." *Bank of Canada Review* (Spring): 13–25.
- Krishnamurthy, A. and A. Vissing-Jorgensen. 2011. "The Effects of Quantitative Easing on Interest Rates: Channels and Implications for Policy." *Brookings Papers on Economic Activity* (Fall): 215–87.
- Lam, W. R. 2011. "Bank of Japan's Monetary Easing Measures: Are They Powerful and Comprehensive?" International Monetary Fund Working Paper No. WP/11/264.

- Li, C. and M. Wei. 2012. "Term Structure Modelling with Supply Factors and the Federal Reserve's Large Scale Asset Purchase Programs." Federal Reserve Board Finance and Economics Discussion Series No. 2012-37.
- Meyer, L. H. and A. N. Bomfim. 2010. "Quantifying the Effects of Fed Asset Purchases on Treasury Yields." Macroeconomic Advisers, *Monetary Policy Insights: Fixed Income Focus*, 17 June.
- . 2011. "The Macro Effects of LSAPs II: A Comparison of Three Studies." Macroeconomic Advisers, *Monetary Policy Insights, Policy Focus*, 7 February.
- . 2012. "Not Your Father's Yield Curve: Modeling the Impact of QE on Treasury Yields." Macroeconomic Advisers, *Monetary Policy Insights: Fixed Income Focus*, 7 May.
- Neely, C. J. 2012. "The Large-Scale Asset Purchases Had Large International Effects." Federal Reserve Bank of St. Louis Working Paper No. 2010-018D.
- Ueda, K. 2012. "The Effectiveness of Non-Traditional Monetary Policy Measures: The Case of the Bank of Japan." *Japanese Economic Review* 63 (1): 1–22.

Appendix

## Selected Unconventional Monetary Policies of Major Advanced Economies

Facility	Program	Year	Summary
<b>Liquidity facilities</b>			
Federal Reserve	Term Auction Facility	2007	Term funding for depository institutions
	Primary Dealer Credit Facility	2008	Discount window facility for primary dealers
	Term Securities Lending Facility	2008	Auctions for Treasury bills in exchange for illiquid securities
European Central Bank	Expansion of Refinancing Operations	2008	Increased funding through fixed-rate full-allotment operations
Bank of England	Special Liquidity Scheme	2008	Swapped Treasury bills for illiquid assets
Bank of Canada	Term Purchase and Resale Agreement	2008	Term funding for primary dealers against collateral
Major central banks	U.S.-Dollar Swap Facilities	2008	U.S.-dollar/euro/other currency swaps between major economies
<b>Credit facilities</b>			
Federal Reserve	Commercial Paper Funding Facility	2008	Purchased 90-day commercial paper
	Money Market Investor Funding Facility	2008	Term funding to increase liquidity for MMFs
	Term Asset-Backed Securities Loan Facility	2008	Supported issuance of asset-backed securities
European Central Bank	3-year LTROs	2011	€1.1 trillion in term lending to banks
Bank of England	Funding for Lending Scheme	2012	Subsidizing funding to banks that increase lending
Bank of Japan	Stimulating Bank Lending Facility	2012	Providing 1- to 3-year low-interest loans to boost credit provision
<b>Asset purchases</b>			
Federal Reserve	Large-Scale Asset Purchase (1)	2008	Purchased \$300 billion USTs, \$1,450 billion MBS and agency debt
	Large-Scale Asset Purchase (2)	2010	Purchased \$600 billion USTs
	Large-Scale Asset Purchase (3)	2012	Purchasing \$85 billion (USTs and MBS) per month
	Maturity Extension Program (1 and 2)	2010	Purchased longer-term USTs in exchange for short-term USTs
European Central Bank	Securities Markets Programme	2010	Purchased €200 billion in periphery sovereign debt
	Outright Monetary Transactions	2012	Unlimited purchase of short-term sovereign debt with conditionality
Bank of England	Asset Purchase Facility	2009	Purchased £375 billion in assets (mainly gilts)
Bank of Japan	Asset Purchase Program	2013	Doubling size of the balance sheet to ¥270 trillion

MMF = money market fund  
 LTRO = long-term refinancing operation  
 UST = U.S. Treasury  
 MBS = mortgage-backed security