Lessons from Quantitative Easing: Much ado about so little?
Daniel Gros, Cinzia Alcidi and Willem Pieter De Groen
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Abstract

It remains difficult to measure the impact of the different episodes of quantitative easing (QE) undertaken since 2008 in the major advanced economies (the US, the UK and Japan). One can clearly discern QE in the expansion of the balance sheets of the central banks concerned, but the impact on (long-term) interest rates is difficult to isolate, given the global trend towards lower rates and the high degree of co-movement across major currency areas. For example, in the US, QE is credited with a strong fall in interest rates, but rates have also fallen as much in the euro area without the stimulus of QE until now. This simple finding implies that the studies that neglect the global trend might mistakenly credit QE with a fall in interest rates which was global and would have occurred anyway. This argument is compatible with the evidence of a strong impact of QE on the exchange rate is also spotty. Moreover, the available academic studies find substantial impact when financial markets were in turmoil in 2008-09, but much smaller effects from the later QE operations. The medium-term impact of QE on growth and inflation seems to have been modest.

It is too early to estimate the cost of exiting or reversing QE. The logic of the arguments for QE implies that the cost should be equal to the benefits of undertaking QE in the first place.
Lessons from Quantitative Easing: Much ado about so little?
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Executive Summary

- Several years after major advanced countries launched large-scale asset purchase programmes (LSAP programmes as they are officially called in the US), it remains difficult to measure their overall impact. Each of the different episodes of quantitative easing (QE) undertaken since 2008 in the major advanced economies (the US, the UK and Japan) constitutes a special case. Economic and financial conditions were very different in 2008-09 when the first LSAPs started (in the UK and the US) from the conditions in Japan in 2001 or in 2012-13, or in the euro area today.

- QE was undertaken only after all other ‘conventional’ monetary policy instruments (e.g. bringing policy rates close to zero) had failed to stimulate the economy.

- A first clear finding is that one can clearly discern QE in the expansion of the balance sheets of the central banks. Central banks are thus able to increase the base money by whatever amount they wish. As widely anticipated, however, this increase in base money visibly translated into more money in circulation and more credit being granted.

- The increase in the balance-sheet size was substantial (more than 20% of GDP) in all the three comparator cases (the US, the UK and Japan).

- The impact of QE on (long-term market) interest rates is more uniform. A number of studies find a substantial impact of the first US and UK asset purchases on interest rates (a drop of more than 100 basis points, mostly during the announcement period). But in some cases, long-term rates rose during implementation (as experienced in the US for QE2 and Japan).

- However, (long-term) interest rates in the euro area remained highly correlated with US interest rates even during QE episodes. This suggests that QE might in reality have had little impact on rates. The decline in rates preceding QE episodes might just have been a market reaction to weakness in the economy (and the announcement of QE was also a reaction to that weakness).

- Adopting a comparative, global point of view thus gives a very different picture from the one suggested by most studies, which focus exclusively on the country where QE takes place. Moreover, the view that QE had little independent impact can explain why, contrary to a widespread view, the impact of QE on the exchange rate is by far not uniform: the effective rate moved little in the case of the US, depreciated for Japan, but appreciated for the UK. The view that QE had little independent impact on the economy is also compatible with the observation that inflation rates have not increased in a sustained manner after the major QE operations considered here.

- The initial market reaction to the QE initiated by the European Central Bank (ECB) is unique: a combination of a strong depreciation with a substantial fall in interest rates (from an already-low level), which for once is not just part of a global trend. This could be due to the fact that deposit rates at the ECB are negative (which was, and still is not the case in the comparator countries).

- From an economic point of view, any purchase of government debt by a central bank shortens the average effective maturity of government debt. De facto, the programme of the ECB constitutes (to about 80%) a series of parallel national quasi-fiscal operations executed by national central banks, which could shorten the effective maturity of public debt by up to one and a half years. This effect could be offset, however, by national debt management offices if they issue more long-term debt. In other words, national debt offices can affect the effectiveness of QE on the real economy.
1. Introduction

Given that the recovery from the crisis of 2008 has been sluggish in advanced economies, central banks in these countries have embarked on ever-more expansionary monetary policies. After lowering interest rates to historically low levels and in some cases literally to zero, the US Federal Reserve Bank (Fed), the Bank of England (BoE) and, more recently, the Bank of Japan (BoJ) resorted to large-scale asset purchase programmes (called quantitative easing or QE) in order to drive down long-term interest rates and thus stimulate their economies further.

The purpose of this study is to ascertain what lessons these action hold for the large programme of purchasing public-sector securities that the European Central Bank (ECB) will implement over the next two years.

According to Bernanke and Reinhart (2004), even if the policy rate is pinned at the lower bound, central banks can expand the amount of reserves beyond the level required to hold the policy rate at zero. Such expansion of the balance sheet through asset purchases financed with central bank money is supposed to affect nominal spending and thereby generate domestic inflation. In theory, this is expected to happen by affecting asset prices (including government securities), money, borrowing rates, inflation expectations, confidence and exchange rates. These variables, in turn, affect GDP and inflation, which are the ultimate objectives of the policy.

Asset purchases by the central bank were thus known as a policy tool. But until 2008, precedents were limited; and there was, and still is, only imperfect understanding of the channels through which QE operates and even less its broader macroeconomic effects.

The Bank of Japan is credited with being the first central bank to resort to quantitative easing. In March 2001, it undertook to purchase large amounts of government bonds, more than necessary to set the interest rate policy at zero, to fight against deflation. Fixed initially at around ¥5 trillion, (about 1% of GDP), the target was raised several times, reaching ¥30 trillion in May 2003. The programme was also subsequently extended to asset-backed securities (ABS), equities and commercial papers and lasted until 2006. This first episode of is now widely regarded as a failure because of its small size, but this failure is difficult to document because its effects were never accurately assessed. The Bank of Japan itself has claimed that the policy was never truly effective.

The Fed introduced the first round of QE (QE1) in 2008. The purchases included debt of government-sponsored enterprises (GSEs), mortgage-backed securities (MBS) and long-term Treasuries for a total of $1.75 trillion. The second round (QE2) was announced in October 2010 and finished in June 2011, it entailed the purchase of $600 billion of Treasuries. A maturity extension programme, the ‘Operation Twist’ (OT), launched a few months later targeted Treasuries for $400 billion. The third round of QE (QE3) started in September 2012. It targeted a monthly purchase of $85 billion through the purchase of mortgage-backed securities ($40 billion) and longer-term Treasury securities ($45 billion). Overall, the Fed balance sheet increased by about $3.5 trillion (roughly 20% of GDP).

Soon after the Fed’s action, the BoE also embarked on large purchases of assets in March 2009. It started with a purchase of up to £50 billion and then incrementally raised the ceiling of its programme to £375 billion (also roughly 20% of GDP), most of which was used to purchase Government securities.

After rejecting the policy for almost a decade as unsuccessful, Japan returned to quantitative easing in 2008, when the Bank of Japan started a sequence of interventions in the market which led to massive outright purchases of (different classes of) assets. The cumulative increases in the monetary base amounted to as much as ¥101 trillion (roughly 20% of GDP) by the end of 2012. More recently, in 2013, after Shinzo Abe took office, the BoJ launched perhaps the boldest monetary easing in modern history with the intention of doubling the monetary base in two years by aggressively...
purchasing government bonds, exchange-traded funds, as well as real estate investment trusts. This programme is still ongoing.

In March 2015, the ECB became the last of the central banks to launch an explicit QE in the form of its Public Sector Purchase Programme (PSPP). Before this, the ECB had undertaken a series of longer-term refinancing operations for banks, two rounds of covered bond purchase programmes in 2009 and 2011 and a securities markets programme in 2010. It also designed an open-ended outright monetary transactions (OMT) programme in 2012, but it was never used. The novelty of the programme started by the ECB in 2015 is thus mainly the size, rather than the instrument itself.

Interest rates and exchange rates are the two key financial-market prices that transmit monetary policy to the real economy. With QE being used only when short-term (policy) rates are already at zero, the key indicator of success of QE would be lower longer-term interest rates. However, long-term rates (or their inverse, the price of long-term bonds) constitute asset prices that are often more affected by expectations about future market conditions than the current economic circumstances. Announcement effects can thus be more important than the implementation itself.

The impact of asset purchases on the exchange rate is even more difficult to gauge since the exchange rate is also an asset price, which is influenced by many economic variables and expectations about the future. Moreover, it is clear that when several of the major advanced economies engage in QE simultaneously, not everyone can have a weaker exchange rate at the same time.

The longer-term impact of QE on interest rates and exchange rates is also difficult to measure, because one has to make many assumptions about how asset prices, like the exchange rate and the interest rate would have evolved in the absence of QE. For example, in the case of Japan, (long-term) interest rates had been very low for a long period and seemed little affected by the increasingly aggressive asset purchases of the Bank of Japan starting in 2012. But the exchange rate of the yen started to depreciate strongly after the asset purchase programme was greatly increased in size and scope.

In the US, by contrast, the exchange rate moved little around the announcement and implementation of the different asset purchase programmes operated over the last seven years by the Federal Reserve. In the case of the UK, one actually observes a trend-wise appreciation of the pound over the period during which the Bank of England bought large amounts of gilts, and there was apparently some impact, albeit only temporary, on long-term interest rates.

For these reasons, it is difficult to estimate the impact of the actual asset purchases undertaken on the real economy in terms of growth or inflation (or rather deflation avoided).

However, the real difficulties go even deeper. The available studies just look at developments within the country undertaking QE and neglect the global environment. Global financial markets are highly integrated and (long-term) rates have been highly correlated across advanced economies, or only along a downwards trend, but also during cyclical ups and downs. Over most periods rates have declined as much, sometimes more, in areas where QE was not undertaken. The ECB in particular has been criticised for not having undertaken asset purchases earlier and it was even argued that one reason the absence of a common fiscal agent for the eurozone is so important is that it has much delayed the decision of the ECB to undertake large purchases of public sector bonds. However, there is no sign that the fact that the ECB did not undertake bond purchases when they were undertaken by the US and the UK led in any way to higher interest rates in the euro area.

The global, comparative evidence is thus compatible with the view that QE did not move interest rates, but appeared to be important because major central banks undertook asset purchases when they realised that the recession caused by the Great Financial Crisis would be longer than anticipated. Markets had been quicker to revise expectations; rates had thus come down before
central banks started to buy assets. The prolonged weakness affected most of the developed world. Interest rates thus fell, trend-wise, in most advanced economies. But only some central banks then reacted with asset purchases (the Fed and BoE), giving the impression that the anticipation of QE had had a strong impact on rates in their areas although these central banks were only reacting to the same driving force as markets, namely slow growth. In the end, rates fell as much in the euro area, where QE was not undertaken (until recently).

The fact that US QE had little impact on interest-rate differentials (USD versus euro) also explains why these asset purchases had little impact on exchange rates. The absence of a clear impact of the QE episodes in the US and the UK on the exchange rate should a priori have been puzzling: if QE had had such a strong impact on interest rates as often asserted (i.e. in the order of 100 basis points), one should have expected a strong impact on the exchange rate.

The rest of this paper compares the experience of the different countries and tries to identify common features as well as differences, concentrating on the aspects that seem relevant from the point of view of the ECB. It then offers an overview of the empirical literature, which estimates the impact of QE on the economy. This is followed by a brief consideration of the interaction between debt management policies and central bank purchases. The concluding remarks provide some lessons for the euro area.

2. **QE in action: Central banks’ balance sheets**

Table 1 below summarised schematically the main operating features of the central banks of the comparator countries considered here (the UK, the US and Japan) and the euro area.

<table>
<thead>
<tr>
<th>Area</th>
<th>European Central Bank</th>
<th>Bank of England</th>
<th>Federal Reserve</th>
<th>Bank of Japan</th>
</tr>
</thead>
<tbody>
<tr>
<td>Programme</td>
<td>Public sector purchase programme (PSPP)</td>
<td>Asset purchase facility (APF)</td>
<td>Large-scale asset purchases (LSAPs)</td>
<td>Quantitative and qualitative monetary easing (QQE)</td>
</tr>
<tr>
<td>Main objective</td>
<td>Price stability (2% inflation)</td>
<td>Price stability (2% inflation)</td>
<td>Support economic recovery</td>
<td>Price stability (2% inflation)</td>
</tr>
<tr>
<td>Foreseen transmission channels</td>
<td>Portfolio rebalancing, asset prices and exchange rate</td>
<td>Portfolio rebalancing, asset prices and exchange rate</td>
<td>Flattening yield curve</td>
<td>Flattening yield curve, exchange rate</td>
</tr>
<tr>
<td>Types of assets</td>
<td>Euro-area public and private debt securities</td>
<td>UK government bonds, (secured) commercial paper, corporate bonds and credit guarantee scheme</td>
<td>US government and securities issued or guaranteed by GSEs</td>
<td>Japanese government bonds, exchange-traded funds, real estate investment trusts</td>
</tr>
<tr>
<td>Size</td>
<td>EUR 1.14 tr. 11.5% of GDP</td>
<td>GBP 375 bn. 22% of GDP</td>
<td>USD 3.7 tr. 22.5% of GDP</td>
<td>JPY 130 tr. (up to Feb 2015), 27% of GDP</td>
</tr>
<tr>
<td>Main policy rates at start</td>
<td>Main refinancing operations 0.05%</td>
<td>Official bank rate 0.50%</td>
<td>Federal funds rate 1.00%</td>
<td>Uncollateralised overnight call rate 0.10%</td>
</tr>
<tr>
<td>Deposit rate (March, 2015)</td>
<td>-0.20%</td>
<td>0.00%</td>
<td>0.25%</td>
<td>0.10%</td>
</tr>
</tbody>
</table>

*Note: This table compares only the recent quantitative-easing programmes in the aftermath of the 2007-09 global financial crisis. The Bank of Japan also conducted a quantitative-easing programme in the early 2000s that has been omitted from this analysis.*

*Sources: AMECO, European Central Bank, Bank of England, Bank of Japan, Federal Reserve and IMF.*
The table highlights several interesting features of the programmes. The first one is the size. Relative to GDP, the programmes of the BoE and the Fed are of similar magnitude. Japan’s programme is already the largest and the only one that is open-ended. The euro-area programme is the smallest. Another feature of the euro area is the negative interest rate on excess reserves (see last row). This implies that banks, whether they sell government bonds directly to the ECB or act as intermediaries, will end up with additional reserves, which will cost them 20 basis points. Thus, for banks to accept to sell bonds, yields will have to reflect to the cost of holding reserves.

It is interesting to recall that the main rationale for a negative rate was to reduce excess reserves at the ECB, hence indirectly to reduce the size of the balance sheet. This conflicts with current QE policy, which by definition entails an expansion of the balance sheet.

2.1 The effects of QE on balance sheets: The US, the UK and Japan

Figures 1 to 3 show the evolution of the balance sheets in the three comparator countries over time. The balance sheet of the Federal Reserve has now reached over $4 trillion, or close to 25% of GDP. Two assets clearly dominate on the asset side: Treasury securities and federal agency securities. The latter are all guaranteed by the federal government. This implies that the Federal Reserve had de facto bought only government paper. It is thus formally true that the Federal Reserve has intervened in the market for securitised mortgages, but it has bought only securities guaranteed by the government. In terms of the evolution over time, one sees clearly the three steps of QE 1, 2 and 3.

The balance sheet of the Bank of England shows a similar evolution and composition: the total size is now also close to, but somewhat below, 25% of GDP and the overwhelming proportion of assets is constituted by UK government paper. In the UK, one also clearly sees the two episodes of QE undertaken by the Bank of England.

The balance sheet of the Bank of Japan showed a more continuous increase already before the onset of ‘Abenomics’ in 2012-13, which changed the speed of increase, but did not constitute a novelty per se. Government paper dominates again today to a large extent on the asset side, but the Bank of Japan is apparently keeping a large part of the loans and discount that it bought during the 2006-08 period of private-sector asset purchases.

*Figure 1. Federal Reserve - Balance sheet ($ mil)*

*Note: Percentage refers to 2014 GDP. Source: Federal Reserve.*
Figure 2. Bank of England - Balance sheet (£ mil)

Note: Percentage refers to 2014 GDP.
Source: Bank of England

Figure 3. Bank of Japan - Balance sheet (¥ 100 mil)

Note: Percentage refers to 2014 GDP.
Source: Bank of Japan.
2.2 The effects of QE on the banking system

QE affects the balance sheet of the central bank but also, directly or indirectly, the balance sheet of banks and money in circulation. In this section we concentrate on the direct impact of QE on the balance sheet of banks and the money supply.

The impact on bank lending is only indirect and largely speculative. Quantitative easing might affect lending because the interest rates on government bonds are in some cases a benchmark for interest rates on loans.

There is a widespread view that banks will be the largest (potential) sellers of government securities to the ECB. But this remains to be seen. At any rate, banks did not hold large amounts of government bonds in the US and, to a lesser extent in the UK. In these two countries, the central banks thus bought the bonds from non-bank institutions, with banks being only intermediaries.

However, as illustrated in Figure 4, no matter who ultimately sells the asset to the central bank, the end result will always be an increase in the deposits of the banking system at the central bank and thus an increase in base money.

For ease of exposition, the figure is highly stylised. The final effect will depend on the structure of the financial system. For instance, in the case of the UK, the BoE intentionally encouraged non-banks, mostly pension funds, to sell their gilt holdings in order to have an impact on their asset allocation.

The first step in any QE is the transaction between commercial banks and the central banks by which new deposit of the commercial banks at the central bank replace the previous assets, i.e. the government bonds. This is depicted in the left hand panel of Figure 4 below.

**Figure 4. Impact of QE on balance sheets**

![Diagram showing the impact of QE on balance sheets](image)

Source: Authors’ own elaboration.

The right-hand panel shows the account flows when the commercial bank is an intermediate for some non-bank seller (central banks transact only with commercial banks). The impact of the QE operation on the balance sheet of the central bank remains the same, but the balance sheet of the commercial bank increases because it will credit the seller (e.g. a pension fund) with the proceeds of the sale. The effect will thus be an increase in commercial-bank deposits, or the money supply.

From the point of view of the central bank, the effect of QE is certain: an expansion of its balance sheet; the increase in assets (the government bonds bought under QE) is mirrored on the liabilities side by the increase of bank reserves.

For commercial banks, the impact of QE on their balance sheets has one certain consequence: the increase in deposits at the central bank.
If the bank sold its own holdings of government bonds to the central bank, the liability side of the banking system will not be affected. Banks will then have simply exchanged two assets: government bonds against deposits at the central bank. Banks might be unwilling to make this asset switch even if the price of government bonds is very high (the return very low), because in most jurisdictions they have to hold large amounts of government bonds for regulatory reasons. For example, banks have to hold highly liquid assets equivalent to a certain percentage of their total assets. Government bonds are in practice the securities most readily accepted by supervisors and regulators for this purpose.

The QE operations in the UK and the US did not lead to large sales of banks. In the US that would have been impossible anyway as banks did not hold large amounts of government bonds. In the UK most sales came from pension funds and other non-bank financial intermediaries. This might have been the result of a combination of moral suasion by the Bank of England on pension funds to sell at least part of their large holdings and the regulatory reasons for commercial banks to keep their holdings of government debt.

If (commercial) banks do not sell their holdings of government debt, the money supply will increase upon impact by the amount of the securities bought under the QE programme. Of course, the initial transaction (e.g., a pension fund exchanges a government bond for a bank deposit) represents only the very first step in a potentially long series of other transactions, which are indirectly a consequence of QE, as interest rates, and expectations of future interest rates and other economic variables, are also affected.

Other metrics of the size of QE could thus be the value of bonds bought in relation to the size of the balance sheet of the banking system or that of the central bank itself. Table 2 shows that under different metrics the size of the different QE programmes appears starkly different.

<table>
<thead>
<tr>
<th></th>
<th>European Central Bank</th>
<th>Bank of England</th>
<th>Federal Reserve</th>
<th>Bank of Japan</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>March 2015 – September 2016</strong></td>
<td>3.8</td>
<td>3.7</td>
<td>28.8</td>
<td>14.4</td>
</tr>
<tr>
<td><strong>March 2009 – October 2012</strong></td>
<td></td>
<td>212</td>
<td>196</td>
<td>79</td>
</tr>
</tbody>
</table>

**Note:** Various definitions have been used depending on the availability of data. For the euro area, data for credit institutions have been used; for the United Kingdom, data on monetary financial institutions were used, excluding the central bank; for the US, data are from commercial banks; and for Japan, from domestically licensed banks.

**Sources:** Authors’ calculations based on AMECO, European Central Bank, Bank of England, Bank of Japan and Federal Reserve.

Measured as the percentage increase in the size of the balance sheet of the central bank, the QE of the ECB appears smallest, mainly because its balance sheet is already rather large. In terms of the size of the total banking system, the programme of the ECB seems to be similar to that of the Bank
of England, mainly because both the UK and the euro area have very large banking systems (at least compared to the US). In terms of the size of the money supply, the differences appear less stark (but M3 is the measure used by the ECB, as opposed to M2 in the US).

**Box 1. TLTROs (euro area) and the FLS (UK): Are they similar?**

When the ECB launched the targeted longer-term refinancing operations (TLTROs), the general impression was that the ECB was almost replicating the Bank of England’s funding for lending scheme (FLS). The latter is an unconventional monetary policy to provide cheap money to the banking sector, and thereby encourages lending to households and companies. However, a closer look at the two instruments reveals that they are not necessarily the same.

On 13 July 2012, the Bank of England and HM Treasury launched the FLS, offering funds to banks (and building societies) for an extended period at below market rates. The BoE offered an initial entitlement of discounted funding available to all banks, including those deleveraging, up to the 5% of their stock of existing loans (as of June 2012) to the real economy. The banks are then eligible to borrow additional funding equal to any positive net lending – new lending minus repayments – that they extend during the reference period. Accordingly, both the price and quantity of funding provided to banks are linked to their performance in lending to the UK real economy.

So far, there are several similarities with the programme launched by the ECB. On 5 June 2014, the ECB announced the TLTRO. Under this scheme, banks were initially entitled (in the first TLTROs of September and December 2014) to borrow up to 7% of the total amount of their loans to the euro area, non-financial private sector in the euro area, excluding loans to households for house purchases, outstanding on 30 April 2014. Later, during the period from March 2015 to June 2016, all counterparties will be able to borrow additional amounts in a series of TLTROs conducted quarterly up to three times each bank’s net lending to the euro area, non-financial private sector provided between 30 April 2014 and the respective allotment reference date in excess of a specified benchmark.

Despite these similarities, the operational functioning of the two programmes is different. The TLTROs are conducted as a standard monetary operation in which the central bank provides cash to banks, in exchange for eligible collateral. The same Eurosystem collateral rules apply in relation to eligibility criteria, valuation and haircuts on the use of eligible assets as in other Eurosystem liquid operations.

Also under the FLS, the BoE England requires eligible collateral from banks following the same rules and haircuts followed in the existing structure of the Sterling Monetary Framework to protect the central bank’s balance sheet against losses. In the case of FLS, however, UK banks use this collateral in exchange for UK Treasury bills. Technically, FLS transactions are structured as collateralised stock lending transactions (Joyce et al., 2011a).
As the figure above shows, the UK Debt Management Office (DMO) issues (and holds) bills specifically for the FLS, and thus they count as liabilities of the National Loan Fund, the statutory body of the UK Government that provides loans to public bodies, managed as part of the UK DMO, which is one of HM Treasury’s executive agencies. Under the FLS, the bank borrows the Treasury bills from the DMO under an uncollateralised stock lending agreement and pays the DMO a fee to cover administrative costs.

The banks can then use these Treasury bills as collateral to borrow cash on a secured basis in the market or in the BoE’s open-market operations, or to retain them and use them as substitute for reserves in their liquid-asset buffer. Since the Treasury bills have a maturity of nine months, they need to be ‘rolled over’ during the life of an FLS transaction, whereby the participant returns the maturing Treasury bills to the Bank in a window between 10 and 20 days prior to maturity. The Bank returns these Treasury bills to the DMO in exchange for new Treasury bills, which the Bank in turn gives to the participant on the same day (Joyce et al., 2011a).

Under the FLS, it emerges that the role of the BoE is merely to intermediate the liquidity between the government and the financial sector, which in turn should transfer this liquidity to the real sector. As the FLS transactions are merely stock lending operations, they do not appear directly on the BoE’s balance sheet, although the quarterly bulletin takes note of the quantity of Treasury bills borrowed under the FLS.

This description shows how the two operations are different in nature in that the final counterpart of the banks under the FLS is the Treasury, not the central bank. Moreover, described by the Governor of the Bank of England during the launch of this programme, the FLS is a “joint action by the Bank and the Treasury”. Such a situation is clearly not replicable in the euro area, where a single Treasury does not exist.

2.3 Balance sheets and money supply

Under a standard monetary policy operations, any increase in the monetary base is usually followed, sooner or later, by an increase in the money (and credit) supply. However, since 2008 the link between the monetary base and the money supply (however defined, M1, M2 or M3) has been completely broken.

As shown in Figures 5, 6 and 7, the monetary base of the major central banks has increased strongly, sometimes by multiples, but the money supply has barely budged.
As illustrated in McLeay (2014) one explanation for this relates to the existence of reserves that banks hold at the central bank. Banks cannot directly lend out of reserves. So QE automatically creates a monetary base but not necessarily money. Of course it can create the incentives for a bank, e.g. by lowering the cost of funding, to create new broad money, but in the end this decision remains with banks.

It is interesting to note, as can be inferred from Figure 8 that in the case of the ECB the money multiplier (i.e. the ratio between the money supply and the monetary base) has been extremely
variable since 2007-08, but the relationship between money and nominal GDP has been rather constant. It is also worth noting that the ratio of money-to-GDP had been increasing during the credit boom until 2008, a period during which the actual growth of M3 exceeded the target of the ECB (of 4.5% per annum) almost every year without any inflationary pressures developing.

Figure 8. Euro Area: ECB balance sheet, money supply and GDP, 1999=100

Sources: European Central Bank and Eurostat.

2.4 The effects of QE on financial markets: Interest and exchange rates

The declared purpose of large asset purchases is to lower (long-term) interest rates (given that short-term rates are already at zero, this amounts to a flattening of the yield curve) and to affect inflation expectations.

In the case of Japan and the euro area today it is expected that the exchange rate will depreciate, although this is not an explicit policy goal.

This section documents the short- and more medium-term evolution of interest, exchange and inflation rates around major QE operations, which can be seen in the expansion of the balance sheets. We first adopt a more descriptive, medium-term perspective to check whether large-scale asset purchases did have a discernible impact on key variables, such as inflation and the exchange rate. We then proceed to summarise the findings of the academic literature, which usually adopts a shorter-term view and state-of-the-art econometric methods.

The four figures (9-12) below, each with two panels, show the evolution of the central bank balance sheets (blue line) and the evolution of the nominal effective exchange rate (NEER in the left-hand panels) and that of inflation (orange line in the right-hand panels). Shaded areas indicate the QE episodes considered here. In addition, two tables shows the short-term impact of the announcement as well as the start of the quantitative easing programmes on respectively the long-term interest rates as well as the nominal and inflation-adjusted real exchange rates.
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Figure 9. Japan: Central bank balance sheet, exchange rate and inflation

Source: Bank of Japan.

Figure 10. US: Central bank balance sheet, exchange rate and inflation

Source: Federal Reserve.

Figure 11. UK: Central bank balance sheet, exchange rate and inflation

Source: Joyce et al. (2011a).
The figures suggest that the impact of quantitative easing on inflation and exchange rates is mixed. For Japan, one has to take into account that the ‘Abenomics QE’ represents a quickening of asset purchases, rather than a radically new monetary policy instrument. This is apparent, as already mentioned above, by the fact that the blue line depicting the size of the central bank balance sheet slopes upwards already before 2012. This is important since the left-hand panel of Figure 10 shows that during the pre-Abenomics period of ‘moderate QE’ the exchange rate had appreciated and then depreciated sharply when the pace of asset purchases quickened (and became open-ended) in 2012. The figure also shows that the yen is still stronger than it was a few years ago (in 2006-07), but the impression has been created that a determined QE of a large size has a strong impact on the exchange rate.

The inflation rate (measured by the core HICP) shown on the right-hand side of Figure 10 shows a similar evolution: deflation under ‘moderate QE’ and a sudden acceleration under Abenomics. Part of this was due to the pass-through of the exchange-rate depreciation. But another part was due to the increase in the VAT tax rate. The latest available data for core inflation, stripping out taxes, show a sudden drop, but not yet a return of outright inflation. For the time being, the impression persists that Abenomics has ended deflation.

For the US, it is much more difficult to detect any impact of QE (or rather its three different incarnations) on either the exchange rate or inflation. The two panels of Figure 11 show that both the exchange rate and inflation underwent large swings, which are seemingly unrelated to the various rounds of asset purchases by the Federal Reserve. The dollar had been depreciating sharply before the onset of QE1 and then suddenly appreciated when it was implemented. The peak was reached in 2008 (after a rough doubling of the monetary base under QE1). A phase of dollar weakness followed, which only partially coincided with QE2 until 2011. Since then the dollar has appreciated trend-wise despite further increases in the balance sheet of the Federal Reserve under QE3. It is also difficult to find a clear impact of QE on inflation, which continued to fall for about two years after the start of QE1, then reversed course roughly in coincidence with QE2, but then trended downwards despite QE3 being implemented. These broad developments should be kept in mind when judging the academic studies surveyed in section 3, most of which find at least some positive impact of (the various rounds of) QE on inflation. Clearly, these studies did not relate QE to actual inflation, but to an assumed baseline of what would have happened without QE.

**Sources:** European Central Bank and Eurostat.
The case of the UK also does not show a clear link between the central bank balance sheet and either inflation or the exchange rate. The left-hand panel of Figure 12 shows that the exchange rate of the pound depreciated sharply (on an effective basis, not just against the euro) just before the onset of the first round of QE in the UK. This could in principle have been due to the effect of the announcement (although the depreciations started long before the Bank of England even discussed internally a large asset purchase programme). However, the second round of asset purchases of the Bank of England was not related to any exchange rate depreciation. On the contrary, the exchange rate appreciated before and during the implementation of a policy that led to a rough doubling of the balance sheet of the Bank of England. The inflation rate depicted in the right-hand panel of Figure 12 shows a similar pattern: an increase in inflation following the first round of QE in the UK, but a fall after the second round.

It is actually the euro area where one finds the strongest persistent link between the size of the central bank’s balance sheet and both the exchange rate and inflation (see the two panels of Figure 12). This is surprising since there has been no QE in the euro area (until now), and the ECB could influence the size of its balance sheet only indirectly via its offers of long-term lending to banks at favourable rates (see the box on why this was not the case in the UK, which had a widely discussed ‘funding for lending’ scheme).

We also provide a tabular overview of the impact of quantitative easing on long-term interest rates in Table 3 below. The column entitled ‘change’ shows the difference between the long-term interest rate one quarter before the start of the actual asset purchases and the rate one quarter after the start of the asset purchases. This variable should thus capture both the announcement effect and the impact of the initial implementation (we assume that the market had learned enough about the actual impact of the asset purchases after one quarter to anticipate correctly the rest). As five of the seven entries in this column are negative, one can conclude that in most cases QE did have the intended impact. The two exceptions are where the long-term rates rose or remained rather unchanged around the start (as experienced in the US for QE2 and QE3 as well as Japan).

Table 3 also provides in the last column the evolution of the interest rate differential, i.e. the difference between US (or UK) and core euro-area interest rates. This column shows entries that are mostly close to zero. We will come back to the crucial importance of this observation below.

Table 3. Impact of quantitative easing programmes on interest rates

<table>
<thead>
<tr>
<th></th>
<th>Long-term interest rate (%)</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Before</td>
</tr>
<tr>
<td>Euro area</td>
<td></td>
</tr>
<tr>
<td>PSPP (Mar 2015)</td>
<td>1.6</td>
</tr>
<tr>
<td>United Kingdom</td>
<td></td>
</tr>
<tr>
<td>QE1 (Mar 2009)</td>
<td>4.2</td>
</tr>
<tr>
<td>QE2 (Oct 2011)</td>
<td>2.9</td>
</tr>
<tr>
<td>United States</td>
<td></td>
</tr>
<tr>
<td>QE1 (Nov 2008)</td>
<td>3.9</td>
</tr>
<tr>
<td>QE2 (Nov 2010)</td>
<td>2.8</td>
</tr>
<tr>
<td>Twist (Sept 2011)</td>
<td>3.2</td>
</tr>
<tr>
<td>QE3 (Sept 2012)</td>
<td>1.8</td>
</tr>
<tr>
<td>Japan</td>
<td></td>
</tr>
<tr>
<td>QQE (Apr 2013)</td>
<td>0.6</td>
</tr>
</tbody>
</table>
Note: The data before, at and after the start of the quantitative easing programmes refer, respectively, to the quarterly averages for the quarter before the start of the programme, the quarter in which the programme started and the quarter after the start of the programme. Note that long-term interest rates refer to average government bonds maturing in about ten years published by the OECD. The euro-area core is proxied by the long-term interest rates for Germany.
Source: OECD.

Table 4 provides similar information on the reaction of the (effective nominal) exchange rate around major QE episodes. The column change again shows the (percentage) difference between the nominal effective exchange rate one quarter before and one quarter after the start of the asset purchases to illustrate the combined announcement and implementation effect. In this column there are three entries with the wrong sign (QE UK, QE1 US and Operation Twist) in the sense that the exchange rate appreciated (although one would expect QE to result in a depreciation). Moreover, those entries with the wrong (positive) sign are larger than those with the expected negative sign.

Table 4. Impact of quantitative easing programmes on exchange rates

<table>
<thead>
<tr>
<th>Nominal effective exchange rate (index 2010=100)</th>
<th>Before</th>
<th>At start</th>
<th>After</th>
<th>Change</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Euro area</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>PSPP (Mar 2015)</td>
<td>100.3</td>
<td>..</td>
<td>..</td>
<td>..</td>
</tr>
<tr>
<td><strong>United Kingdom</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>QE1 (Mar 2009)</td>
<td>104.5</td>
<td>97.2</td>
<td>101.4</td>
<td>-3.1</td>
</tr>
<tr>
<td>QE2 (Oct 2011)</td>
<td>98.4</td>
<td>100.0</td>
<td>101.0</td>
<td>2.6</td>
</tr>
<tr>
<td><strong>United States</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>QE1 (Nov 2008)</td>
<td>95.8</td>
<td>106.0</td>
<td>108.8</td>
<td>13.0</td>
</tr>
<tr>
<td>QE2 (Nov 2010)</td>
<td>100.7</td>
<td>97.4</td>
<td>96.1</td>
<td>-4.6</td>
</tr>
<tr>
<td>Twist (Sept 2011)</td>
<td>93.6</td>
<td>94.2</td>
<td>97.8</td>
<td>4.3</td>
</tr>
<tr>
<td>QE3 (Sept 2012)</td>
<td>99.0</td>
<td>98.9</td>
<td>97.5</td>
<td>-1.5</td>
</tr>
<tr>
<td><strong>Japan</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>QQE (Apr 2013)</td>
<td>91.7</td>
<td>86.1</td>
<td>86.5</td>
<td>-5.1</td>
</tr>
</tbody>
</table>

Note: The data before, at and after the start of the quantitative easing programmes refer, respectively, to the quarterly averages for the quarter before the start of the programme, the quarter in which the programme started and the quarter after the start of the programme. The nominal effective exchange rates (NEER) are the three-month averages of the BIS effective exchange rate indices. An increase in the NEER means that the currency has appreciated in nominal terms.
Source: Authors’ calculations based on BIS.

2.5 Global financial markets and national QE

So far our analysis has followed the usual approach of looking for a link between asset purchases and financial market variables at the national level. In reality, however, financial markets in advanced countries are very open and highly integrated. This implies that one should not just look at US financial variables when trying to measure the impact of QE. But finding the impact of QE in globally integrated financial markets is much more difficult, as one needs to adopt a comparative approach.
A first key observation is that in reality (long-term) interest rates have followed a common long-term trend across major currency areas. Global financial markets are highly integrated and (long-term) rates have been highly correlated across advanced economies, not only along a downwards trend, but also during cyclical ups and downs, as illustrated in Figure 13 below. The correlation is too tight and has lasted too long to be just a result of chance or some quirk in the data. The most natural interpretation is that there exists a global capital market which is integrated across currency boundaries. Short-term interest rates are determined by central banks directly and can thus deviate strongly whenever the policy stance is different. Since 2009 short-term interest rates have basically been equal to zero in both the US and the euro area, but long-term (here 10-year) rates have fluctuated, albeit around a clear common downwards trend.

*Figure 13. Long-term interest rates in the major currency areas from 1990*

Source: OECD.

The effectiveness of large asset purchases by the Federal Reserve should thus not be measured simply by the associated fall in US interest rates, but a fall in the interest rate differential between the US and euro area (or other major markets).

However, if one uses this metric, one must conclude that large asset purchases by the Fed have failed to have a differential impact on the US. Table 5 below shows that over most QE periods rates have declined as much, and sometimes more, as they have in areas where QE was not undertaken. The small size of the changes in the interest-rate differentials is striking. For the US, no QE episode is associated with a change in the interest rate differential of more than 0.1%.

Only for the UK does one find one episode with a change in the differential of a significant size (0.4%). But given that the pound has tended to follow the US dollar, it is doubtful whether one should look at the differential with the euro area or rather with the US.
Table 5. Counterfactual impact of quantitative easing programmes on long-term interest rates

<table>
<thead>
<tr>
<th>Long-term interest rate (%)</th>
<th>Change (T+1q-T-1q)</th>
<th>Compared to euro area (core)</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>United Kingdom</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>QE1 (Mar 2009)</td>
<td>-0.57</td>
<td>-0.40</td>
</tr>
<tr>
<td>QE2 (Oct 2011)</td>
<td>-0.65</td>
<td>-0.22</td>
</tr>
<tr>
<td><strong>United States</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>QE1 (Nov 2008)</td>
<td>-1.13</td>
<td>0.06</td>
</tr>
<tr>
<td>QE2 (Nov 2010)</td>
<td>0.67</td>
<td>-0.05</td>
</tr>
<tr>
<td>Twist (Sept 2011)</td>
<td>-1.16</td>
<td>0.00</td>
</tr>
<tr>
<td>QE3 (Sept 2012)</td>
<td>-0.12</td>
<td>-0.07</td>
</tr>
<tr>
<td><strong>Japan</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>QQE (Apr 2013)</td>
<td>0.08</td>
<td>-0.18</td>
</tr>
</tbody>
</table>

Note: The figures represent the decline/increase in the long-term interest rates in the period around the start of the quantitative easing programmes. The changes are calibrated deducting the average interest rate in the quarter after the start minus the average of the quarter before the start. Long-term interest rates refer to average government bonds maturing in about 10 years published by the OECD. The euro-area core is proxied by the long-term interest rates for Germany.

Source: Own elaboration based on data from OECD.

The table above shows the movement of the transatlantic interest differential just around major large-scale asset purchases in the US. Figure 14 below shows the evolution of the long-term (10-year) interest-rate differential between the US and the euro area (proxied by the main riskless rate, i.e. the German rate). Since the ECB did not undertake QE until only at the very end of this period, one would expect that the repeated round of large-asset purchases by the Federal Reserve should have resulted in a lowering of long-term US rates relative to euro-area rates (i.e. the line should have gone up). However, the opposite has been the case: US rates increased relative to euro-area rates if one compares the period just before QE1 (say May 2008) to January 2014 (i.e. long before it could be anticipated that the ECB would also eventually engage in large-scale purchases of government bonds). Over this period the Federal Reserve bought bonds worth in total over 20% of US GDP, but US interest rates actually increased (slightly) relative to euro-area rates.
This finding has important policy implications. The ECB in particular has been criticised for not having undertaken asset purchases earlier, and it was even argued that one reason the absence of a common fiscal agent for the eurozone is so important is that it has much delayed the decision of the ECB to undertake large purchases of public sector bonds. However, there is no sign that the fact that the ECB did not undertake bond purchases when they were undertaken by the US and the UK did in any way lead to higher interest rates in the euro area. The ECB did of course undertake other ‘unconventional’ monetary policy operations, but these were confined to providing more liquidity to the banking system with the longest maturity being (until recently) 3-year operations. It is thus difficult to explain the co-movement of US and euro-area rates with similar monetary policy operations.

The fact that US QE had little impact on interest rate differentials (USD versus euro) also explains why these asset purchases had little impact on exchange rates. The absence of a clear impact of the QE episodes in the US and the UK on the exchange rate should a priori have been puzzling: if QE had had such a strong impact on interest rates as often asserted (i.e. in the order of 100 basis points), one should have expected a strong impact on the exchange rate.

But how can one explain the fact that interest rates seem to have fallen before QE was undertaken? One simple explanation is that major central banks undertook asset purchases when they realised that the recession caused by the Great Financial Crisis would be longer than anticipated. Markets were quicker to revise expectations, which explains why market rates (long-term rates are set in the market, not by central banks) had fallen before central banks started to buy assets. The prolonged weakness affected most of the developed world. Interest rates thus fell, trend-wise, in most advanced economies. But only some central banks then reacted with asset purchases (US, UK), giving the impression that the anticipation of QE had had a strong impact on rates in their areas.
although these central banks were only reacting to the same driving force as markets, namely slow growth. In the end, rates fell as much in the euro area, where QE was not undertaken (until recently). The global comparative evidence thus suggests that QE was largely ineffective.

3. Has QE affected the real economy? A survey of the academic literature

In section we provide a summary of the literature that has tried to measure the impact of QE on wider macroeconomic variables. This literature starts by necessity from the national point of view and then to ignore the connections across global financial markets discussed above.

As illustrated by the overview of the literature presented below, the impact of QE on the real economy varies significantly across countries or regions, depending on the time of its implementation, and its magnitude is highly uncertain. There are two main sources of uncertainty when trying to estimate the effects of QE on the economy. First and foremost, a host of factors will have been affecting the economy during the crisis period, when most QE programmes are launched, and it is extremely difficult to disentangle them and isolate the effects of unconventional monetary policy from financial markets' and macroeconomic conditions. Second, most estimation methods require ‘heavy’ assumptions (e.g. about transmission mechanisms at work) that can dramatically affect the results.

In a nutshell, in the case of Japan it emerges that the first QE was ineffective vis-à-vis the real economy, and the second QE had just a very small effect on demand and none on inflation or the exchange rate. In the case of the US, it looks like QE1 was the most effective in terms of unemployment and inflation, while QE2 was far less effective. In the case of the UK, most studies seem to suggest that the effects were economically significant both on GDP, but the uncertainty around the magnitude of the impact is considerably high.

Before looking into specific findings, it is worth noting that a lot of emphasis in the QE literature is on long-term rates. Besides the fact that reducing long-term interest rates is an explicit objective of certain central banks’ QE policy (e.g. that of the BoJ and the Fed), such rates are key transmission channels between the policy and the real economy. In relation to this point, Rudebusch et al. (2007) show that although there is no structural relationship between the term premium and GDP, a reduced-form empirical analysis supports the existence of an inverse relationship between the term premium and real economic activity.

The main findings of the literature are summarised below by looking at the experience of individual countries.

The impact of QE in Japan

Japan was the first to introduce a QE programme in 2001 and it has had a long experience with quantitative easing. During the period 1999-2001, before the first QE, the BoJ had followed zero interest-rate policy (ZIRP) but when the dotcom bubble burst, the Japanese economy was hit by another negative shock and the risk of deflation emerged again. At that moment it seemed necessary to respond to it with some policy innovation. The BoJ embarked on the purchase of Japanese Government Bonds (JGBs) as the main instrument for increasing reserves of financial institutions. The BoJ exited quantitative easing in March 2006, amid signs that deflation risks were fading. It is interesting to note that during that period the central bank purchased directly only a limited amount of government securities. The largest amount was bought by the postal offices, which at that time were owned by the government.

As a response to the global financial crisis, in 2008 the BoJ re-launched the JGB purchases and adopted a number of unconventional measures to promote financial stability. In October 2010, the
BoJ introduced its Comprehensive Monetary Easing (CME) policy, which differs from typical quantitative easing in other central banks by including purchases of risky assets in an effort to reduce term and risk premia and to respond to the re-emergence of deflation and a slowing recovery. As mentioned in the introduction, another explicit round of QE was started in 2013, as the second arrow of ‘Abenomics’.

Despite such a long reliance on this policy tool, the jury is still out on QE. Research on the effectiveness of quantitative experiences has yielded mixed results and most of them point to limited effects on economic activity.

Ugai (2007) offers a survey of the empirical studies looking into the first QE experiences. His work suggests that evidence exists that quantitative easing helped reduce yields but its effect on economic activity and inflation was found to be small. The survey confirms that the BoJ’s commitment to maintain the QE shaped expectations towards a lasting zero interest rate, thereby lowering the yield curve. By contrast, the results are mixed as to whether an expansion of the monetary base and altering the composition of the BOJ’s balance sheet led to portfolio rebalancing. In general, this effect, if any, was smaller than that stemming from the commitment.

Studies focusing on QE’s impact on Japan’s economy through various transmission channels find that the QE created an accommodative environment in terms of corporate financing, in particular by containing financial institutions’ funding costs and staving off funding uncertainties. However, the QE effect on demand and inflation is often found to be limited. The most-cited explanations for this effect are the dysfunctional banking sector, which impairs the functioning of the credit channel, and banks’ deleveraging.

Berkmen (2012) revisits the question of whether quantitative easing and other unconventional monetary easing measures have been effective. His empirical analysis shows some evidence that between 2008 and 2010 monetary easing has supported economic activity but only feeble and to an even lesser extent inflation. Similarly to Lam (2011) Berkem (2012) finds that QE had no statistically significant impact on inflation expectations. While the impact on demand is weak, it appears that this QE episode was more effective than the previous experience, possibly due to improvements in the banking and corporate sectors. This finding together with the results from Baumeister and Benati (2013) suggest that the monetary policy transmission mechanism may have been strengthened, but Japan’s stable inflation expectations and relatively flat Phillips curve keep the effect of monetary measures small on the real economy.

Berkem (2012) did not find evidence that the 2008-10 QE had an effect on the exchange rate. This implies that any impact on economic activity is likely to work through other channels of transmission than the exchange rate.

**The impact of QE on the US economy**

Between December 2008 and March 2010, the Fed purchased more than $1.7 trillion in assets in the so-called ‘QE1’. This represented 22% of the $7.7 trillion stock of longer-term agency debt, fixed-rate agency MBS and Treasury securities outstanding at the beginning of the LSAP. In November 2010, the Fed announced a programme to purchase $600 billion of long-term Treasury securities. The programme’s goal was to boost economic growth and put inflation at levels more consistent with the Fed’s maximum employment and price stability mandate.

In order to assess the impact of the QE on the real economy, one can look at how the policy has affected long-term yields. For this purpose, Gagnon et al. (2010) re-scale the Fed purchases to measure the amount of duration the Fed removed from the market using the concept of ‘10-year equivalents’, or the amount of 10-year par Treasury securities that would have the same duration as the portfolio of assets purchased. Between December 2008 and March 2010, the Federal Reserve will
have purchased more than 20% of the total outstanding stock of 10-year equivalents across these three asset classes at the beginning of the programmes.

Following this approach, Gagnon et al. (2010) find that LSAPs reduced the supply to the private sector of assets with long duration and increase the supply of assets (bank reserves) with zero duration (and convexity). This affects the risk premium on the assets being purchased and triggers the portfolio re-balancing effect.

The purchases of MBS posed the greatest operational challenge to the Fed, owing to their more complex nature and their heterogeneity compared to Treasuries, but most likely also produced the most important results. The purchases of MBS and agency debt began at a time when liquidity in these markets was poor and spreads to Treasury yields were unusually wide and they helped to improve market liquidity by providing a large buyer for these securities on a consistent basis. As result, yields narrowed relative to Treasury yields.

Gagnon et al. (2010) conclude that by reducing the net supply of assets with long duration, the programmes appear to have been successful in reducing the term premium. The overall size of the reduction in the 10-year term premium appears to be somewhere between 30 and 100 basis points. While the effects appear to be widespread (from Treasury securities, to corporate bonds and interest-rate swaps) the most noticeable impact was in the mortgage market. And the effect was even more powerful on longer-term interest rates on agency debt and agency MBS by improving market liquidity and by removing assets with high prepayment risk from private portfolios.

Baumeister and Benati (2013) assess the effect of a compression in the long-term yield spread on both output growth and inflation, induced by central banks’ asset purchases within an environment in which the policy rate is constrained at the zero lower bound. In the case of the US, the model simulations, based on a counterfactual analysis, suggest that in the absence of policy interventions, the US economy would have been in deflation until 2009:Q3 with annualised inflation rates as low as -1%. Real GDP would have been 0.9% lower, and unemployment would have been 0.75 percentage points higher, reaching a level of about 10.6% in 2009:Q4.

Chung et al. (2011) find effects which are not negligible. Based on counterfactual model simulations, they find that the past and projected expansion of the Federal Reserve’s securities holdings since late 2008 are roughly equivalent to a 300 basis-point reduction in policy interest rates (since 2009 through 2012). Model simulations suggest that the additional stimulus provided by the purchases has kept the unemployment rate at a lower level than what it would have been in the absence of the purchases, by 1½ percentage points by 2012. They also argued that the asset purchases have probably prevented the US economy from falling into deflation.

Liu and Mumtaz (2011) find a smaller effect. By using a change-point VAR model, they estimated that the Fed’s asset purchase programme reduced 10-year spreads by an average of 90 basis points over the crisis period. Without the asset purchase programme, the unemployment rate was estimated to have been 0.7 percentage points higher and inflation, on average, 1 percentage point lower in 2010.

Chen et al. (2012) focused only on the second LSAP programme (QE2) and, based on simulation of the LSAP II in an estimated medium-scale DSGE model, conclude that the effects of the asset purchase programme on GDP growth and inflation were moderate but with a lasting impact on the level of GDP. They argue that the reason why asset purchase programmes are in principle effective at stimulating the economy is the existence of limits to arbitrage and market segmentation between short-term and long-term government bonds. Indeed the QE2 period excludes high financial turbulence that could encourage stronger financial segmentation, and data provide little support that these frictions are pervasive. For this reason, the overall effects on GDP growth is estimated not to exceed half a percentage point and the inflationary consequences of asset purchase programmes
are even smaller. In the exercise they also assess the effect of higher financial fragmentation and this results in a larger impact on real GDP, but this is much smaller than the results found by Baumeister and Benati (2013) and Chung et al. (2011), which use different methods and assumptions regarding the risk premium. In Chen et al. (2012), the effect of QE on GDP growth and inflation increases significantly when it is combined with a commitment to keep interest rates low for some period of time. This implies that the magnitude of LSAP effects depends greatly on expectations vis-à-vis interest-rate policy, but those effects are weaker and more uncertain than conventional interest-rate policy. This suggests that communication about the beginning of federal funds rate increases will have stronger effects than guidance about the end of asset purchases.

The impact of QE in the UK

When looking at the experience of the UK, most of the existing studies have tried to estimate the impact of QE following model-based approaches. They quantify the impact on GDP and on inflation simulating the effect of a fall in the longer-term maturity government bond yields or in the money supply. The Bank of England (Joyce et al., 2011b) provides an overview of the studies on the subject matter and adds some new results.

In the UK the peak impact of QE on 10-year gilt yields is estimated at 100 basis points; in econometric models (both SVAR and times series approach) this translates into an increase in the GDP of about 1.5 percentage point and around 1 percentage point in inflation. Using a monetary approach leads to higher estimates for GDP, about a 2% impact, and 1% on inflation. Lastly when trying to account for a portfolio rebalancing effect induced by the monetary easing, the effect on asset prices and then demand translate into a peak impact GDP increase of 1.5-2.5%. As clearly acknowledged by Joyce et al. (2011b), while all estimates are significant, they are also highly uncertain as none of the methods is able to capture in a proper fashion the transmission channels at work.

Baumeister and Benati (2013) proposed counterfactual estimates and find that without quantitative easing, annualised inflation in the UK would have fallen to -4% and output growth would have reached a trough of -12% at an annual rate in the first quarter of 2009.

It is interesting to note that the literature surveyed above focuses only on the first period of QE. The UK did not have clearly distinguished rounds of QE like the US, but in October 2011 the programme was expanded after about a year of maintenance. If the findings for the US were applicable also to the UK, one may find a smaller effect of QE after 2011.

4. The fiscal aspects of QE

In a country with its own currency, the central bank and the Treasury can be consolidated for fiscal purposes, at least in the long run. Any gains or losses that the central bank makes are usually transferred to the (national) Treasury. This is one of the reasons why the fact that monetary and fiscal policy cannot be kept completely separate under extreme circumstances matters less in a national context when the country has its own currency. Within the euro area, one could consolidate the sum of all national Treasuries with the accounts of the ECB, as the Eurosystem, sooner or later, transmits most of its profits to national Treasuries, according to the capital key, which determines the shares of each country in the ECB.

However, this applies only to ordinary monetary policy operations. For example, emergency liquidity assistance (ELA) is granted by national central banks (NCBs) and all the losses or gains from ELA operations remain with the national central bank that granted it. Apparently the PSPP was not regarded as a ‘normal’ monetary policy operation since it was decided that 80% of the asset purchases would be undertaken by the NCBs under their own responsibility. The reason for this was obviously that the NCBs from creditor countries, such as Germany or the Netherlands, were
worried that they might have to share in the losses if there was a default on the bonds bought under this programme. Moreover, these purchases, which remain only on the books of the individual NCBs, will have to be exclusively for national bonds.

The fact that 80% of the purchases under the PSPP will be undertaken by NCBs means that the PSPP will have mainly the effect to shorten the duration of the existing national public debt. The deposits of banks with the NCB represent effectively public debt with a zero duration (these deposits can be withdrawn daily). When the Bundesbank buys a German government bond with a residual maturity of 10 years, it reduces the maturity of that part of the German public debt from 10 years to zero (one day, to be precise). If short-term interest rates increase, the Bundesbank would make losses on its investment, but these losses should be offset against the gains that the German Finance Ministry made by selling the bond.

This shortening of the effective duration of government debt could be substantial given that the Bundesbank is likely to buy about one-quarter to one-fifth of all the (publicly traded) German government (federal) debt over the lifetime of the PSPP. If the average maturity of the purchases of the Bundesbank is about six years, the effective duration of German government debt (at least that which is in a publicly tradable form) would be reduced by 1.2 to 1.5 years.

The analysis of Greenwood et al. (2014) can thus also be applied in the context of the euro area. The authors argue that monetary and fiscal policies in the US have been pushing in opposite directions, with debt management policies partially offsetting the impact of monetary policy. They start with the observation that asset purchases of the central bank are supposed to lower (long-term) interest rates by reducing the supply of longer-dated government bonds to the public. They then show that the large US federal deficits had led to a very large increase in the supply of longer-dated federal debt securities (bonds), given that a large proportion of any debt issuance of the US Treasury is always in longer-term paper. However, explicit decisions by the US debt management office to lengthen the average maturities of the new securities it was offering to the public had reinforced substantially the outstanding amount of longer-term US federal debt securities.

About one-half of this increase in longer-dated US federal securities has been undone by the various rounds of asset purchases of the Federal Reserve, which was needed to lower (long-term) interest rates.

The net result of these two opposing policies has thus been still a substantial increase in the longer-term securities held by the public: the fiscal deficits combined with the lengthening of maturity by the debt management office would have increased the supply (measured in the equivalent of 10-year bonds) by close to 30% of GDP. But the various rounds of asset purchases by the Federal Reserve took about 15% of GDP from the market.

They also document that the weighted-average duration of federal debt securities issued by the Treasury has increased from about 4 years in 2008 to 4.6 years in late 2014. However, if one aggregates the Treasury and the Federal Reserve, the (weighted-average) duration has actually fallen to 2.9 years (Greenwood et al., 2014, p. 11) – a reduction of 1.7 years, which is not far from the hypothetical value for the euro area mentioned above. This lower effective average maturity of the US public (federal) debt might now become relevant as the Federal Reserve is about to start increasing rates. The increase in rates will lead to a higher cost of debt service more quickly than if the duration of the public debt had been at the 4.6 years, which apparently was the target of the Treasury since 2008.

This analysis could be applied to the euro area as well, and it implies that national debt-management offices could easily offset the purchases of their NCBs by issuing more long-term debt. The temptation to do so will be strong with longer-term rates (say 10-years and longer) close to the zero lower bound. Given that the Bundesbank is likely to buy about as much as the new bond issues
planned of the Federal government over the next two years, the Bundesbank could offset the impact of the PSPP for the market for Bunds by issuing only debt with 12-year maturity to keep the average maturity of the German debt at six years.

Many commentators have focused on the size of the purchases (€60 billion monthly) relative to the flow supplies of government debt, arguing that the purchases by the ECB might be larger than the available new supply of debt resulting from current fiscal deficits. This point of view might be appropriate for a short-term trader, but not from a macroeconomic point of view. If the flows of supply determined the interest rate on public debt, interest rates would have been sky high a few years back when public-sector deficits were much higher than today.¹

5. Concluding remarks: Any lessons for the ECB?

The ECB has now embarked on QE ‘euro-style’ with its Public Sector Purchase Programme. The ECB has taken pains to underline that it is formally just extending an existing asset purchase programme to government bonds. And President Draghi has emphasised that “asset purchases are unconventional, but not unorthodox” (Draghi, 2015).

However, the PSPP is more than just an extension of an existing programme to buy assets on the secondary market. The PSPP does represent an important departure from previous practice, not so much because the ECB will now be buying government bonds, but because of the scale of the programme (over €1 trillion) and the avowed intention to continue until inflationary expectations move into more comfortable territory.

It is ironic that part of the reason why the ECB felt compelled to start QE was that it had previously introduced another innovation (at least among central banks of the major advanced countries), namely negative deposit rates. The purpose of forcing banks to pay a fee of 0.2% for parking their funds at the ECB was to induce them to withdraw these deposits and make lending more attractive. Negative deposit rates achieved the first objective. The deposits of commercial banks at the ECB fell by hundreds of billions of euro after the deposit rate first became negative. But later it was felt that this reduction in the size of the balance sheet of the ECB somehow indicated that monetary policy had become less accommodative. This reduction in the balance was one of the key arguments in support of QE because only an asset-purchase programme would enable the ECB to deliver an increase in its balance sheet.

The experience of other advanced countries also provides little guidance for the much-discussed argument that the lower interest rates achieved through QE will provide a disincentive for structural reforms. In Japan, QE was (re-)launched explicitly as part of the ‘three arrows’ of the Abenomics, with the third arrow being structural reforms. The first two arrows to increase demand have been released, but so far there has been little progress on structural reforms.

The period since the beginning of the global financial crisis in 2008 has been an extraordinary one for central banks around the world. In advanced countries, central banks have reached deeper and deeper into their box of unconventional policy tools. Central banks have bought several trillions of euros in government and other bonds. But there is little evidence that this has had a durable impact on the economy. The current recovery seems to represent a cyclical upswing rather than the result of this unprecedented policy effort.

The ECB has claimed that the fall (long-term) in interest rates and risk spreads during the few months prior to the QE announcement in late January points to a strong anticipation effect. Moreover the euro area is benefitting from a much weaker exchange rate (in Japan only the exchange

rate moved). This might be partially due to the fact that QE is combined in the euro area with negative deposit rates (of 0.2%) at the ECB, which adds downward pressure on interest rates and upward pressure on securities prices. This might increase the impact of asset purchases by the ECB, compared to the US where deposits at the Federal Reserve are still remunerated at 0.25%.

All in all, it appears that QE in the euro area is very important for financial markets, but the impact on the real economy remains to be seen and will be difficult to disentangle from other effects, such as the lower oil price.

As far as inflation is concerned, an increase, even if modest, seems to appear in market-based inflationary expectations (e.g. swap rates) by contrast inflationary expectations (like consensus) had been falling in January, signalling no unambiguous effect.

The proposition that a reduction in the availability of long-term dated government debt for the private sector provides evidence that QE is working would imply that a large fiscal deficit financed by the issuance of debt will also have a strong impact on longer-term interest rates (and the exchange rate). From a fiscal point of view, the PSPP of the ECB is (to about 80%) equivalent to a set of active debt-management policies pursued in parallel at the national level by the participating NCBs, which are effectively reducing the maturity of the existing national debt. As a consequence, national debt offices can then affect the effectiveness of QE on the real economy.
References


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