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Bank of England monetary operations with interest on reserves

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As a result of Quantitative Easing, banks have large amounts of reserve deposits at the Bank of England. The Bank pays interest on these reserves at its official Bank Rate. Given functioning interbank markets, this effectively ties overnight wholesale rates to Bank Rate.

In this paper it is argued that the Bank's objectives of (a) direct transmission of the Monetary Policy Committee's interest rate choices and (b) systemic stability would best be served if this method of operation were continued into the future, rather than reverting to the reserves-averaging system that was used during 2006-2009 or any previous system.

It is also argued that, with interest on reserves, they should be regarded as short-term government debt rather than 'money'. In this light, QE is simply a shortening of the average maturity of government debt, which could have been achieved by the Treasury's Debt Management Office as part of its normal operations.

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Introduction

In May 2006, the Bank of England (hereafter, the 'Bank') began paying interest on bank reserve deposits at its official Bank Rate. But in the 'reserves averaging' regime of that time, the quantity of each bank's reserves that attracted interest was restricted to a range around a 'target' level of reserves that the bank was obliged to pre-declare, averaged over each monthly maintenance period. This meant that the marginal opportunity cost of reserves to the banks stayed close to Bank Rate, but only if the Bank supplied the right amount of reserves to enable the banks' reserve deposits to be within this range.

In view of the Bank's desire that wholesale market rates should remain close to Bank Rate, this regime was nonetheless a welcome improvement over earlier procedures. Before 2006, reserves were unrewarded and the Bank then had to supply reserves in quantities that exactly matched demand, otherwise market rates moved towards the boundaries of the *corridor* formed by the Bank's deposit and lending facilities.

Even under the new reserves-averaging regime, however, the Bank still had to supply reserves in appropriate amounts to meet demand, albeit with some leeway. Moreover the regime was ill-fitted to cope with the expansion of reserve supply that the Bank undertook to overcome the breakdown of interbank markets in late 2007. To maintain interest rate transmission within the reserves averaging regime, the Bank greatly widened the range of reserve deposits that attracted interest from 1% to 60% around the banks' targets, then took steps to reabsorb the reserves.

When Quantitative Easing began in March 2009, this caused another, larger increase in reserve deposits. Rather than trying to offset this by selling other assets or making further adjustments to the reserves averaging scheme, this scheme was suspended in favour of paying interest unconditionally on all reserve balances.

This paper takes the position that this current regime is superior to previous regimes because it provides for the precise transmission of the Bank's interest rate policy independently from any amount of 'balance sheet activities' such as QE or extraordinary liquidity support measures.

It is recommended that the Bank continues in the future to pay interest on all reserves and arranges that banks collectively always have excess reserves. If and when QE is finally withdrawn, this will require the Bank to ensure by means of its market operations that it supplies enough reserves to leave banks with an excess.

Amongst the relevant literature, Bowman, Gagnon and Leahy (2008) and Borio and Disyatat (2010) analyse alternative central bank practices; Clews, Salmon and Weeken (2010) look specifically at the Bank of England's operations; and Keister, Martin and McAndrews (2008) concentrate on how interest on reserves separates monetary policy from central bank 'balance sheet' activities. An earlier advocate of interest on reserves was Goodfriend (2002).

The next section presents a brief description of the Bank's past and present methods of dealing with the financial markets.

Bank of England monetary operations

All financial claims denominated in pounds sterling are ultimately claims on sterling currency, which only the Bank of England can supply. Hence, in order that UK retail banks can always honour their depositors' demands to exchange them for currency, the Bank must make its currency continuously available to them. It does this by providing them with *reserves* or 'liquidity'. Reserves are the banks' deposits at the Bank, with the property that the Bank stands ready to exchange them for its currency unconditionally and without notice.

The Bank provides reserves by lending via 'repos' (repurchase agreements: effectively loans against eligible collateral). Reserves also increase if the Bank purchases assets such as treasury bills or longer-term government debt (as it did under QE). In general, the sum of banks' reserve balances adjusts to changes in any of the other entries on the Bank's balance sheet (Table 1): reserves are *determined* by the other entries.

Table 1	**Bank of England: relevant sterling balances**									£ billions	
	liabilities					*assets*					
February[a] month end	currency issued	bank reserves	1-week bills	govt deposits	net other	short-term repos[b]	long-term repos	other loans	govt securities[c]	total[d]
2001	27.2	0.58		0.4	2.9	15.9			15.2	31.1
2002	29.4	0.18		0.2	3.5	17.5			15.8	33.3
2003	33.9	0.23		1	2.4	21.8			15.7	37.5
2004	36.0	0.07		0.8	3.6	23.9			16.6	40.5
2005	35.4	0.03		0.9	4.1	24.5			15.9	40.4
2006	36.9	0.75		0.8	3.9	26.7			15.6	42.3
2007	38.4	18.0		0.8	9.6	30.3	15.0	5.7	15.8	66.8
2008	45.0	21.5		1.4	4.5	6.0	32.0	23.8	10.6	72.4
2009	48.6	37.7	42.2	2.1	13.9		131.5		13.0	144.5
2010	50.2	166.3		1.2	5.1		21.0		201.8	222.8
2011	52.2	151.3		1.7	14.9		13.6		206.5	220.1
2012	54.9	214.7		1.8	49.6		3.9		317.1	321.0

Source: Bank of England Annual Reports; Monetary and Financial Statistics tables B2.1.1. D2.2, D2.2.1

(a) February is the end of the Bank of England's financial year

(b) This item includes outright bill purchases up to 2004 and small amounts of access to the late lending facility up to 2006

(c) From 2010, the largest component of 'government securities' is purchases under quantitative easing.

(d) The total balance sheet is typically £20bn higher than figures reported here. The difference is mainly foreign assets and liabilities.

However, some entries on the Bank's balance sheet are not under its control, in particular the currency issue. The amount of currency in circulation is at the level that individuals and firms (including retail banks) wish to hold it. When more currency is demanded, the retail banks obtain it from the Bank of England and they pay for it as a decrease in their reserve deposits.

Up until March 2009, the Bank's practice was to use repos and other market operations to compensate for changes in the other balance sheet items and to enable banks, in aggregate, to have their 'desired' levels of reserve deposits. This meant that the Bank had to make continuous estimates of the 'autonomous factors' that cause changes in banks' reserve balances such as changes in the currency issue, changes in government deposits and maturing repo loans to the banks, in order to determine the appropriate value of the market operations. When commercial banks were short of reserves – a 'money-market shortage' – the Bank would supply reserves by repos or outright purchases of short-term bills. If, less usually, there

was a surplus, this was absorbed by reverse repos. These arrangements relied crucially on the efficient distribution of reserves amongst banks through the interbank market.

Within this general framework, there were two distinct operating arrangements before and after 2006 and details of each now follow.

Procedures before 2006

Under procedures before May 2006, each bank was required to have non-negative reserve balances[1] at the end of each day. To provide for this, the Bank undertook a series of market operations during the day, aiming by successive approximation precisely to eliminate any money-market shortage or surplus by the close of business.

At this time, reserves earned zero interest and, as banks in aggregate were always supplied with sufficient reserves, there was little reason to hold them as a precaution against shortage. The actual amounts of reserves held during this period were thus very small (Table 1). If an individual bank found itself short, it could access overnight 'late lending' at a 'penalty' rate (1% over the official rate; reduced to 0.25% from March 2005). Conversely, from June 2001, a bank with excess reserves could place these in the 'deposit facility' at the same margin below the official rate, although this facility was seldom used.

It may be emphasised that the Bank was not *choosing* the quantity of reserves to supply on any day. It was passively supplying the quantity determined by other causes such as the demand for currency. Any undersupply of reserves in the daily operations forced some banks to make use of the more costly lending facility, raising the marginal cost of reserves and causing market rates to rise towards the higher interest rate for this facility. Likewise, an oversupply of reserves caused market rates to fall below the official rate and towards the lower bound provided by the deposit facility.[2]

Hence, although the reserves supplied in the routine daily operations were at the official repo rate, the marginal cost of reserves tended to fluctuate between the boundaries of the *corridor* formed by the rates for the deposit facility and the late lending facility. This was reflected in the volatility of overnight rates (SONIA) during the period (Chart 1).
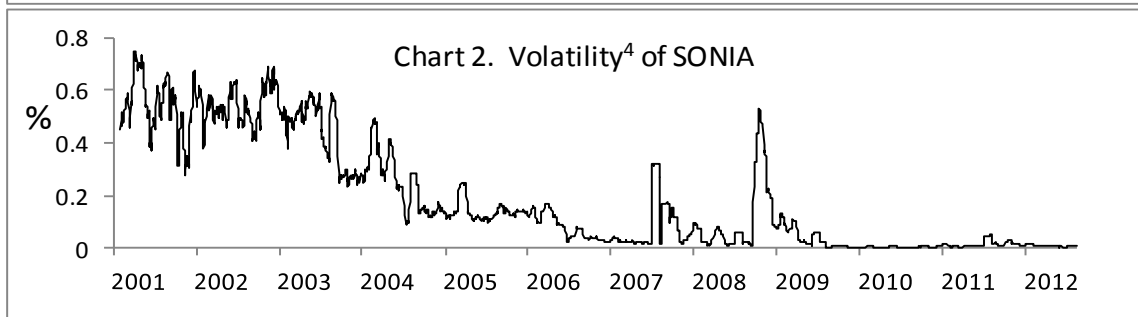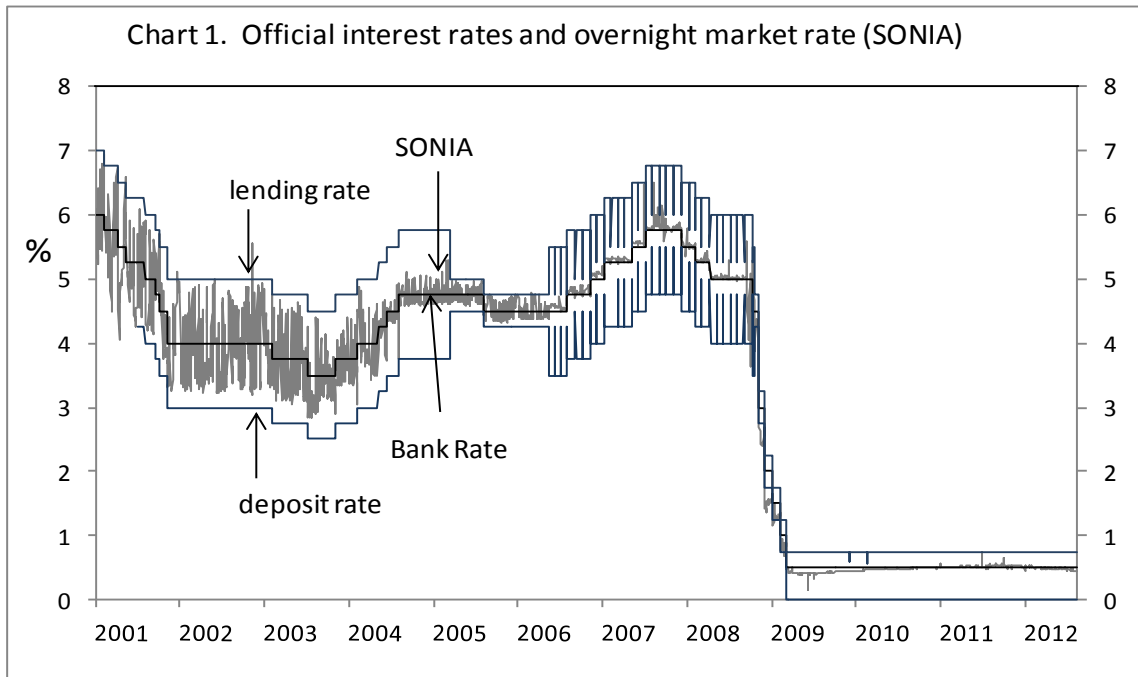
The Bank's 'reserves-averaging' system, 2006-09

In May 2006, the Bank changed to its 'reserves-averaging' regime in which interest was directly paid on reserve deposits and, rather than assessing the banks' reserve positions daily, it changed to monthly 'maintenance periods'. Prior to each period, each participating bank

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[1] UK banks are required to maintain non-interest bearing 'cash ratio deposits' of 0.15% of eligible liabilities, currently amounting to a total of around £2.5bn. Reserve balances are assessed after satisfaction of this requirement. Cash ratio deposits are similar to the reserve requirements that some other central banks impose but no attempt is made to vary the ratio as a monetary policy instrument.

[2] Central bank market operations are sometimes analysed in terms of a stylised demand function for reserves (see, for example, Bowman et al. (2010), Bank of England (2012b)), capturing the presumption that, if market rates exceed the rate in the deposit facility, banks are content to hold higher levels of reserve deposits as market rates fall. However, judging by the values of reserves actually held during this period in the UK, any such interest rate elasticity of demand is very small, allowing little latitude for error in the amount of reserves supplied. Borio and Disyatat (2010) take this elasticity to be effectively zero.

declared a target value of reserves that it intended to hold during the period. These reserves attracted interest at the Bank's official rate, now renamed 'Bank Rate', provided that, on average over the maintenance period, the bank's actual reserves were equal to its target within a range that was initially set at ± 1%.[3] As a consequence of this change, reserve deposits rose considerably from their previous low levels (Table 1) and reserve supplies were correspondingly increased, mainly by means of long-term repos.

Chart 1. Official interest rates and overnight market rate (SONIA)

Chart 2. Volatility[4] of SONIA

As before, excesses could be placed in the deposit facility and deficiencies could be made up by borrowing at the 'penalty' lending rate. And, as before, the Bank still had to estimate the changes in other entries on its balance sheet in order to gauge the amount of reserves it needed to supply for the banks to meet their target balances. However, there was no longer a need for daily adjustments to reserve supply, since banks reserve balances were only assessed over monthly maintenance periods; consequently, market operations to supply the 'right' amount of reserves were conducted weekly during the maintenance periods instead of daily. On the last day of each period, a further operation was conducted in the attempt to 'fine tune' the reserve supply precisely.

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[3] The UK banks' target levels of reserves under this 'reserves-averaging' arrangement played the same role as required reserves in similar arrangements run by other central banks.

Not surprisingly, the averaging feature of this new scheme removed much of the volatility in overnight market rates during maintenance periods (Chart 1; Chart2 [4]), until this was disturbed by the banking crisis in late 2007. As an additional precaution to prevent spikes in market rates on the last day of each period, the Bank narrowed the corridor formed by the lending and deposit facilities on the last day of each maintenance period from ± 1% to ± 0.25% around Bank Rate.

The most important measure for suppressing volatility was, however, paying interest on reserve deposits at Bank Rate over a range of levels of deposit around the banks' targets. Although this range was initially restricted to only ±1% around the target, this allowed some latitude for error in the Bank's estimation of the 'autonomous factors' affecting the banks' reserve balances and, hence, in the magnitude of its market operations needed to supply the 'right' amount of reserves. Provided that the banks' reserve deposits were within this range, the marginal (opportunity) cost of reserves was Bank Rate. As a result, there was less use of the standing facilities than in the previous regime and market rates remained generally close to Bank Rate.

Crisis measures

Beginning in late 2007, the interbank market ceased to function efficiently as fears of default risk amongst banks led some to hoard reserves whilst others were short. To ease this problem, the Bank adopted a number of measures including a large expansion in its provision of reserves, both in its weekly operations and later via long-term repos against a wider range of collateral. This enabled the Bank to play a larger part as intermediary, helping to overcome the reluctance of the banks to deal amongst themselves.

However, this expansion of reserves would have caused some banks' holdings to exceed the levels that attracted interest, under the reserves-averaging regime of this period, given the prevailing narrow width (±1%) of the reserves-target range. To overcome this problem, the range was widened to ±60% around target in September 2007. Later, between October 2008 and June 2009, the Bank acted directly to absorb some of the excess reserves that it had previously supplied under long-term repo contracts, by issuing 1-week sterling bills (the outstanding value of these bills at end February 2009 was £42.2bn: Table 1). Meanwhile, the width of the reserves-target range was progressively reduced to ±10% before this scheme was suspended altogether in March 2009.

Arrangements since March 2009

In March 2009, the Bank began its first QE programme, purchasing a total of £200bn of assets which were nearly all government debt. In exchange, banks acquired large amounts of reserves (Table 1) and the Bank suspended its reserves targeting scheme in favour of the current system of paying interest at Bank Rate unconditionally on all reserve deposits. It also suspended its short-term repos as there was no longer any purpose in making short-term adjustments to its liquidity provision when the banks had an oversupply of reserves. It has, however, continued to supply some reserves by means of long-term (3 and 6-month) repos.

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[4] The volatility of SONIA is plotted as a 22-working-day moving standard deviation, SD, of the difference, r, between daily SONIA and Bank Rate: $SD_t = (\sum_{i=t}^{t-22}(r_i - \sum_{j=t}^{t-22} r_j/22)^2 /21)^{1/2}$.

With subsequent extensions to QE, the Bank has now purchased a total of around £340bn of government debt.

One of the main objectives of the Bank's operating system is that market rates should stay close to the policy rate chosen by the Bank's MPC. The new operating system since March 2009 has served this objective well in respect of short-term market rates. Over the past year, overnight secured wholesale rates (SONIA) have seldom deviated from Bank Rate by more than a few basis points (Chart 2). Secured overnight rates (RONIA) are currently slightly below Bank Rate. However, the transmission of these interbank rates to banks' retail deposit and lending rates remains impaired, as will now be discussed.

Monetary policy transmission

The Bank of England's current operating system has been described as a *floor system*.[5] Given functioning interbank markets, interbank rates will not fall below the floor (Bank Rate) while the banks can earn the floor rate. But the floor is also the *ceiling*: rates will not rise above Bank Rate while banks have large amounts of reserve deposits.[6]

A similar close relationship between Bank Rate and market rates would obtain if the Bank supplied fewer reserves than required, then allowed the banks unlimited access to borrowing at Bank Rate. In this case, provided that there were no shortage of eligible collateral for the Bank's repo lending, Bank Rate would be the *ceiling* because no bank would pay a higher rate for interbank funds than it pays at the Bank. It would also be the *floor* because the overall shortage of reserves supplied would cause some banks to be borrowing from the Bank at all times.

If interbank markets function efficiently, in both of these cases – oversupplying reserves then paying interest unconditionally on reserve deposits at the official rate (Bank Rate), or undersupplying reserves then allowing unrestricted borrowing at the official rate – the marginal (opportunity) cost of reserves stays fixed to the official rate.

This was not true under the framework used by the Bank of England before May 2006, in which the Bank aimed to avoid either a money market shortage or a surplus by supplying precisely the required amount of reserves, without giving the banks any leeway to deposit any excess or borrow any shortfall at the official rate. As discussed, under this arrangement, any oversupply or undersupply sent the marginal cost of reserves towards the boundaries of the corridor formed by the deposit and lending facilities.

While the reserves-averaging regime partially removed this shortcoming by paying interest at Bank Rate over a range of reserve deposits, the current *floor* regime with oversupplied reserves and unrestricted interest on reserves removes it completely, holding overnight unsecured market rates tightly to Bank Rate. The current regime thus fulfils the objective of precise transmission of the Bank's choice of official rate. It also has the added advantage that

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[5] See, for example, Keister et al. (2008); Bank of England (2012b).

[6] Sterling interbank market rates were actually a few basis points *below* the Bank Rate floor for much of 2009-10. The explanation given by Bowman et al. (2010) is that some banks whose money-market transactions are included in SONIA do not have deposit accounts at the Bank of England. This is also the case in the US where the Fed funds rate stays a few basis points below the Fed's interest rate on reserves (see Bech and Klee, 2011). Other central banks that have recently begun to pay interest on excess reserves unconditionally are the Bank of Japan and the Bank of Canada.

the Bank is relieved of its work in estimating the amount of reserves it needs to supply or to use short-term market operations for this purpose.

It may be argued, however, that fluctuations in very short-term rates are not necessarily very important for the *effect* of interest rate policy. Even in the pre-2006 regime, when overnight (SONIA) rates could vary by up to100 basis points from one day to the next, this volatility tended not to spread far along the yield curve. Variations in 1-month Libor, for instance, have been much smaller than in SONIA (Chart 3), except during the banking troubles of September 2007 to December 2008 when the wide and variable margin between Libor and Bank Rate reflected the breakdown of the market for unsecured interbank lending.

Chart 3. Bank Rate and 1-month Libor
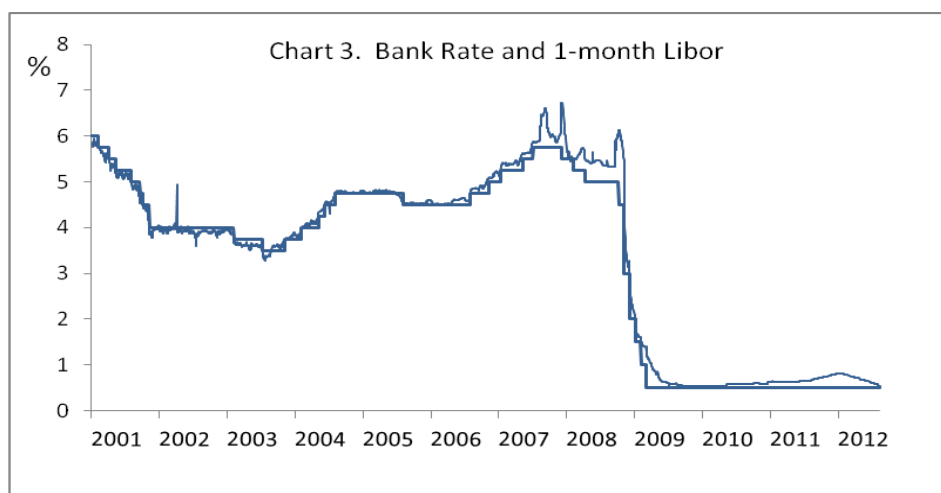
Most interbank transactions are now secured and, to the extent that unsecured interbank loans are taking place, these are mainly short-term (Bank of England, 2012a). One must therefore question the usefulness of Libor as an indicator of the cost of wholesale bank funding. Irrespective of Libor rates, the fact remains that, with some £340bn of reserves currently in the banking system, the opportunity cost of short term funds to the banks is the rate at which these reserves are rewarded, *i.e.* Bank Rate at 0.5%.

However, Bank Rate does not measure the banks' current cost of retail lending, which has been elevated by more onerous capital requirements, and securitisation is no longer in widespread use. Furthermore, the cost of statutory capital is elevated by perceived higher bank risk, partly a result of the banks' holdings of eurozone assets. As a result, the transmission mechanism of monetary policy is still impaired: the current low Bank Rate is not being fully reflected in retail interest rates. The margin of UK commercial bank lending rates above Bank Rate remains much higher than before the crisis and short-term deposit rates remain above Bank Rate as the banks strive to reduce their reliance on wholesale funding and improve capital ratios.

The Bank, backed by the government, is now trying to encourage the commercial banks to lend more with its 'funding for lending' scheme. Essentially, this makes collateralised loans to banks for up to 4 years at Bank Rate plus 0.25%, on condition that the banks use this funding for retail lending. This scheme will reduce the banks' cost of medium-term funding, which may lead to both a reduction in banks' lending rates and an increase in the volume of lending. It cannot address the other causes of low bank lending: increased risk aversion, tighter regulation and reduced demand to borrow, given the current state of the economy.

Operations of the European Central Bank

While the Bank of England changed to its *floor* system in 2009 by paying interest on all reserves at Bank Rate, the ECB has retained its *corridor* system. It is useful, briefly, to look at the consequences given that, as in the UK, eurozone banks in aggregate currently have large excess reserve balances.

As with the Bank of England, the ECB sets three interest rates. Its central 'main refinancing' rate, currently 0.75%, corresponds to the UK Bank Rate and is applied in its routine main operations (MROs) and long-term operations (LTROs) for supplying reserves. There is also a 'deposit facility' and a 'marginal lending facility' for which rates are currently 0% and 1.5% respectively. Until late 2008, the ECB sought to provide just sufficient reserves through its MROs to hold market rates close to the central rate, in a manner similar to the Bank of England at that time (Chart 4).

Chart 4. Official euro interest rates and overnight market rate (EONIA).
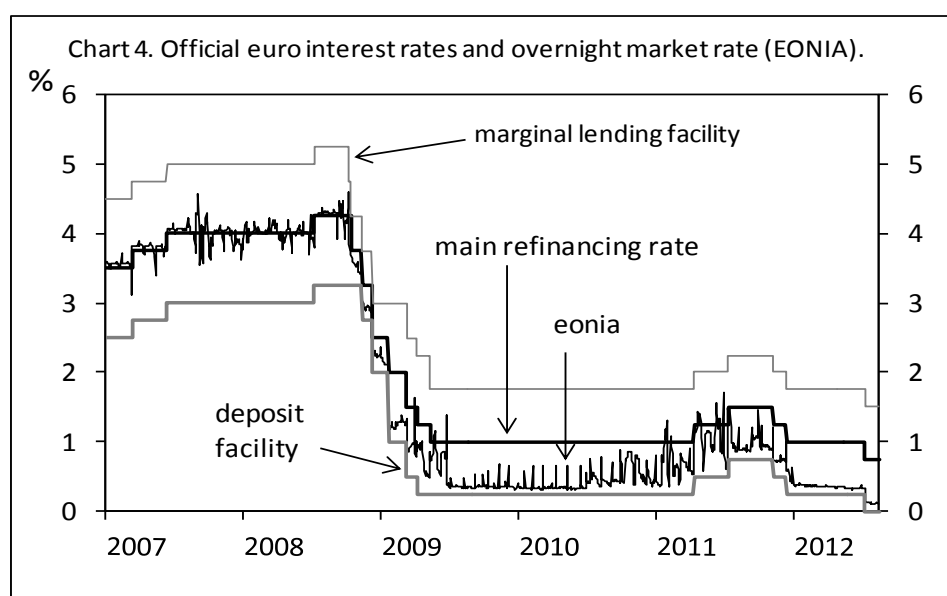
In October 2008, in response to poorly functioning interbank markets, the ECB changed to 'full allotment' in its weekly MROs, allowing its banking counterparties to choose the amount that they borrow at the main refinancing rate. It also supplied an excess of reserves via LTROs. But unlike the Bank of England, the ECB did not change its rules to reward these reserves at its central rate; excess reserves (those in excess of the ECB's reserve requirement) have continued to earn interest at the lower rate on the deposit facility.

The result was that, in 2009, overnight euro market rates (EONIA) moved closer to the rate at the deposit facility than the main refinancing rate, a condition that has generally persisted since then. As a consequence of the recent 3-year LTROs of December 2011 and February 2012, eurozone banks now have a total of around €800bn in excess reserves. Since the rate on the deposit facility was reduced to zero in July 2012, these reserves no longer earn interest.

If interbank markets in the eurozone were fully functional, including cross-border interbank markets, this would imply that the ECB's *effective* policy rate is the 0% deposit facility rate, not the 0.75% main refinancing rate. This would appear to be confirmed by EONIA, the euro interbank rate for unsecured overnight loans which is currently about 0.1%.

However, EONIA is calculated as an average of the rates as reported by 44 large banks and, since the eurozone has some 6000 banks, it may not be a reliable measure over the whole eurozone. Moreover, the distribution of euro excess reserves is far from uniform; they are nearly all in the deposit facilities of central banks of the northern eurozone countries such as Germany and the Netherlands whereas the large borrowers of LTRO funds were the Southern 'peripheral' countries, particularly Italy and Spain. This suggests that, while the cost of interbank funds for northern banks is close to the 0% rate on the deposit facility, some banks in the periphery face a higher cost of funds or may not be able to access interbank lending at all.

The transmission of policy rates in the eurozone is arguably in a far worse state than in the UK as a result of the fragmentation of eurozone financial markets and the difficulties faced by some banks in the peripheral countries.

Future monetary operations

This purpose of this paper is to consider which system for monetary policy operations might be appropriate in more 'normal' times, meaning, in particular, that interbank markets are fully functional and Quantitative Easing is no longer in common use, although it may be some years before these conditions return.

The Bank has expressed its intention to return to the reserves-averaging scheme (Clews et al., 2010), one argument being that it is important to keep interbank markets active since observation of transactions provides useful information about bank conditions. The Bank also prefers that wholesale debts between banks are settled amongst the banks themselves rather than through their reserve accounts.

This paper nonetheless recommends the continuation of the current floor regime with oversupplied reserves and interest paid at the official Bank Rate on all reserves. The two reasons motivating this recommendation are (a) given functional interbank markets, it facilitates the transmission of Bank Rate to wholesale rates, and (b) it enables the Bank to conduct 'balance sheet' activities such as QE without disturbing this transmission, as is discussed below. When the asset purchases under QE are eventually reversed, this will require that banks are still left with sufficient excess reserves to hold overnight rates to the Bank Rate floor.

The standing facilities and 'liquidity insurance'

If there is a permanent oversupply of reserve and excesses are absorbed at Bank Rate, this calls into question the value of having a corridor formed by the deposit and lending facilities at lower and higher rates respectively. Given a functioning interbank market to distribute the reserves amongst the banks, no use will be made of the facilities and the rates for these facilities become irrelevant.

There remains, however, a case for 'liquidity insurance' to support individual institutions as necessary. For this purpose, the Bank has retained the lending facility along with its Discount Window Facility that lends gilts in exchange for less liquid assets, with appropriate attention to asset quality and potential moral hazard. It has also recently introduced its Extended Collateral Term Repo facility which lends for longer periods. In the context of this paper, the

important point is that, under the floor system, these facilities have no relevance to the transmission of Bank Rate.

Monetary policy and Quantitative Easing

An important advantage of the current regime is that it separates the transmission of the Bank's interest rate policy from QE and other 'balance sheet' activities. Indeed, the point of moving to the current regime with interest on all reserve deposits was to avoid having to 'sterilise' the large increase in reserves caused by QE, to prevent it from interfering with interbank market rates.

The motivation for QE is to stimulate demand, given that Bank Rate is close to its lower limit of zero. To the extent that it has succeeded, its main channel of transmission is thought to be by reducing longer-term interest rates[7]: QE raised the demand for government bonds and, by portfolio substitution, other financial assets also, causing a general fall in longer-term rates.

QE nonetheless continues to be presented as 'boosting the money supply' (Bank of England, 2012b), with the implication that the large increase in the monetary base (defined as currency plus reserves) caused by QE is an additional stimulatory force. This has led some to argue that this 'monetisation' of the national debt will prove to be inflationary. This argument is based on the quantity theory, that the quantity of money (or the monetary base) remains roughly proportional to nominal income. More reserves induce more bank lending via the 'money-multiplier', which in turn raises expenditure and prices until that proportionality is restored.

However, an essential element of this argument is that reserves earn no interest, so that banks with excessive levels of reserves are induced to seek any profitable lending opportunities. With interest now paid on reserves at Bank Rate, the canonical distinction between 'money' and 'bonds' becomes blurred and this incentive to lend falls away. An institution with deposits at the Bank will be content to lend them out only if the risk-adjusted return from lending exceeds the deposit rate.

A related argument is that, even with reserves earning interest at market rates, a large increase in the supply of reserves leaves the banks with more liquid assets than they desire. While they might reinstate the desired portfolio balance by disposing of substitute liquid assets such as treasury bills, Clews et al. (2010) suggest that they might also be inclined to increase lending[8]. In a similar vein, Ennis and Wolman (2010) suggest that a bank with large amounts of reserves on its balance sheet might be more inclined to increase its lending as it has no need to seek funding by selling other assets or borrowing in the money markets.

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[7] It is not the object of this paper to assess the effects of QE. However, Joyce et al. (2011) report that the UK's £200bn of QE between March 2009 and March 2010 is estimated to have reduced gilt yields by 1% with larger reductions in corporate bond yields. Meaning and Zhu (2011) estimate a lower average fall in gilt yields of 0.27%. Another channel for QE, consistent with the observation that the falls in long rates tended to coincide with the *announcements* of QE both in the UK and the US, may be a signalling effect: QE reinforces expectations of low future official rates. There is no consensus about the likely effects of the Bank's more recent and ongoing programme of QE.

[8] The Bank of England (2012b, §29) goes further, suggesting that if access to liquidity is too easy, this may encourage banks to take on riskier activities.

However, as argued by Borio and Disyatat (2010), since the return to holding the reserves is similar to the return on other short-term liquid assets and to the cost of money-market borrowing, this quantitative effect of reserves on lending is weak if it exists at all. Even if large amounts of (interest-bearing) reserves did cause some rise in banks' inclination to lend, this effect could presumably be easily countered by raising Bank Rate slightly more than would be necessary in the absence of the excess reserves.

QE as a reduction in government debt maturity

When reserves earn interest at market rates, they become close substitutes for treasury bills. They are equally risk free and it is not relevant that reserves are a claim on the Bank, rather than the Treasury. Hence, treating the Bank and the Treasury as a unit called 'the state', and grouping banks with other firms and individuals as 'the private sector', the only material difference between reserves and other state debt is their short maturity.

It is not relevant that reserves are assets of banks that cannot be owned by non-banks. Suppose bonds bought by the Bank under a QE programme were sold by a pension fund. In exchange, the pension fund receives an increased deposit in its retail bank and that bank receives a claim on the Bank (of England) in the form of increased reserves. The bank is thus just an intermediary and it is as if the pension fund held the reserves.

In this light, instead of 'monetising' government debt, QE has simply replaced gilts of maturities of 3 years or more with other 'gilts' of maturity one day. It has reduced the average maturity of state liabilities held by the private sector, causing the adjustment of relative yields on other assets until financial institutions are content with the composition of their portfolios. Much the same result as QE could have been achieved by the Treasury's Debt Management Office in its normal operations if it had issued only short dated debt instead of a range of maturities.

UK government debt has an average maturity of 14.8 years (June 2012, including treasury bills and index-linked debt). The Bank of England now owns about 27% of the total issue, with a maturity distribution similar to the debt as issued by the DMO. This implies that, after QE, the average maturity of state debt, including the debt that is now in the form of Bank of England reserves, has an average maturity of about 11 years. This is still considerably higher than the average maturity of national debts of other countries. For instance, the average maturity of United States government debt is around 5 years, Canada 6, Australia 5 and Germany 6 years.

There is clearly scope for further shortening of maturities, if it is thought that this would have a worthwhile beneficial effect. But then this imperative should perhaps be built into the mandate of the DMO rather than having the Bank undertake more QE.

Conclusion

The Bank of England is 'minded', in due course, to reinstate the main elements of its 'reserve averaging' procedures prior to March 2009 (Clews et al. 2010). This paper has argued that, on the contrary, the Bank should rather stay with its current *floor* system, using its market operations to ensure that banks collectively have ample reserve deposits and paying interest at its official Bank Rate on all reserves.

Two objectives would be served by this. First, the system provides for direct and accurate transmission of the Bank's interest rate policy. Secondly, it insulates this monetary function from any balance sheet activity that the Bank may wish to undertake such as QE, or extraordinary support for particular institutions or markets under its stability remit.

Whatever the Bank's ultimate choice of operating framework, no purpose would be served by changing from the current floor system until the assets bought by the Bank under the QE programmes have been re-sold to the market. Moreover, the Bank may choose to begin raising Bank Rate *before* such sales have begun, let alone ended.[9] The Bank will then have the opportunity to confirm that the floor system remains an effective means of applying monetary policy during a rising interest rate environment.

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[9] In the US, a number of authors such as Bech and Klee (2011) argue that the floor system will remain as a viable method for the US Fed to raise the Fed funds rate whilst it still holds substantial QE assets. Carlstrom and Fuerst (2010) noted that, in April 2010, the Fed envisaged that the time for unwinding its first QE programme would be around 5 years, a timescale that has presumably been extended since the Fed has embarked on further QE and 'operation twist'.

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