A Note on Monetary Policy

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In Britain and other countries with developed financial markets, central banks set the short-term nominal interest rate for the currency that they issue: the short-term interest rate is the monetary *instrument***.**

The first part of this note describes how the central bank interacts with financial markets and how its choices of interest rate are transmitted to the wider economy. The second part is about how the central bank makes its choices of interest rate.

The note also explains that central banks do not apply monetary policy by controlling the monetary base or the money supply, even though standard textbook analyses continue to describe monetary policy in this way.

1. What is monetary policy?

2. How does the central bank choose the interest rate?

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1. What is monetary policy?

1.1 The functions of banks

The main business of banks is to take deposits and to lend, and they make profits from the interest margin between the rate they charge for loans and the rate they pay to depositors. The other important function of banks is to operate the payments system. For this purpose, about half of private sector deposits in banks are *sight deposits* that may be withdrawn without notice when the account holder makes a payment (see the simplified balance sheet for UK banks, below). But loans are the largest component of banks' assets and they are *illiquid*: they represent the working capital of firms or mortgage finance to householders, for instance, and cannot easily be 'called-in' or sold if the bank needs to pay its depositors.

To cope with net withdrawals of deposits, banks therefore need *liquid assets*, the most liquid being holdings of currency and *reserves*. Reserves are the banks' own deposits at the central bank (hence they also appear as liabilities on the Bank of England's balance sheet) and they are liquid because they may be immediately withdrawn.[1]

UK banks and building societies: consolidated account. Sterling balances, £ billions					
liabilities	Sept.07	Sept.09	assets	Sept.07	Sept.09
private sector deposits	1,612.1	1,983.5	£ currency (vault cash)	9.0	6.4
public sector deposits	48.7	61.6	reserve deposits at BoE	31.9	140.1
repo loans from BoE	56.0	39.5	govt and private securities	150.4	387.9
net other	238.9	522.6	loans to UK private sector	1,904.4	2,074.3
	1,955.7	2,607.2		1,955.7	2,607.2

Bank of England (BoE), £ billions					
liabilities	Sept.07	Sept.09	assets	Sept.07	Sept.09
£ sterling currency	40.4	47.0	government securities	2.4	164.5
bank reserve deposits	31.9	140.1	net foreign assets	-1.7	-0.3
government deposits	1.0	1.4	repo lending to banks	56.0	39.5
net other		15.2	net other	16.6	
	73.3	203.7		73.3	203.7

Simplified balance sheets for UK banks and the Bank of England

Source: Monetary and Financial Statistics, Bank of England, October 2009, tables B1.1.1, B2.1, B2.2, B2.2.1

However, as currency earns no interest, the banks keep stocks of 'vault cash' or 'till money' that are only a small fraction of their deposit liabilities (see balance sheet). Up until 2006, the Bank of England paid no interest on reserves either, hence the banks held negligible amounts, preferring interest-earning securities such as bank bills, treasury bills and longer-term paper such as government bonds. These assets are liquid as they may easily be sold in the financial markets or used as collateral security for loans from other institutions.

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[1] Some central banks oblige their banks to hold *required reserves* as a minimum percentage (e.g. 2%) of their own short-term deposit liabilities. The Bank of England's 'cash ratio' deposits are effectively a reserve requirement but they are only 0.25% of banks' short-term liabilities and play no part in the operation of monetary policy.

In 2006, the Bank of England began paying interest on reserves at its chosen official rate of interest known as *bank rate* (currently 0.5%: November 2009).[2] This meant that reserves were no longer such an unattractive asset and the banks increased their holdings (see the balance sheet for September 2007; the much larger holdings shown in 2009 are a result of *quantitative easing* –see Section 2.4 below).

When a retail payment is made, for instance by a cheque drawn on the payer's bank account which the payee deposits in a different bank, this implies that the paying bank owes the amount of the cheque to the receiving bank. The wholesale debts between banks that are thus created by retail payments may be settled in a variety of ways: for example by transfers of bank reserves, by sales of assets, by loans that are secured on assets or by unsecured interbank loans. Settlement by transfers of reserves has become more common since these began to bear interest.

Note that these transactions are between the banks – one bank's loss of a deposit is another bank's gain – hence they will not cause any changes on the consolidated balance sheet of the banks presented above. The transactions that are relevant for monetary policy are those that involve the central bank.

1.2 The Bank of England's money-market operations

While the major central banks all follow similar procedures, the following is a simplified description of the operations normally carried out by of the Bank of England. The special measures that it adopted following the financial crisis and the subsequent recession are discussed in Section 1.4.

Suppose that individuals decide to hold more currency, as they regularly do during holiday seasons, and they draw on their bank deposits for this purpose. Since it is not wise for commercial banks to deplete their small stocks of banknotes ('vault cash'), they must obtain the extra currency from the Bank of England. In terms of the above balance sheets, deposits at banks fall while the currency liability of the Bank of England rises.

How will the commercial banks pay the Bank of England for the extra currency it has issued to them? They pay by drawing on their reserve deposits and the relevant bookkeeping entry will be a reduction in bank reserves equal to the amount of the extra currency.

Changes in banks' reserves at the Bank of England are the balancing entry whenever any of the central banks' other liabilities or assets change. As another example, suppose that the government draws on its accounts at the central bank in order to make a payment to a creditor in the private sector. When this payment is deposited into a bank, this gives rise to a debt of the central bank to the commercial bank which again is settled by a change in bank reserves, in this case an increase.

Finally, the Bank of England periodically provides funds to banks by granting them 'repos' (shorthand for 'sale and repurchase agreements') which are, in effect, secured short-term loans[3]. It

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[2] Full details of the new operating arrangements introduced by the Bank of England in May 2006 are described in "Implementing monetary policy: reforms to the Bank of England's operations in the money market." Bank of England Quarterly Bulletin, 45.2, (summer 2005), p.221-220. The Bank's 'manual' on its operations is the Red Book, available at http://www.bankofengland.co.uk/markets/money/publications/redbookjan08.pdf

[3] Under a repo or 'sale and repurchase agreement', the bank sells the central bank a security (usually a government bond or 'gilt') with an agreement to repurchase it later (usually 2 weeks later; recently it has also been making repo loans for longer periods of up to a year). A repo amounts to a loan to the bank backed by the collateral of the bond (and it is therefore shown on the above balance sheet as a bank liability: 'repo loans from BoE'). Interest is effected as the difference between the sale and repurchase price of the bond.

does this deliberately to influence the banks' reserve positions, often to offset other causes of changes to the reserves.[4] If it expects an increase in currency demand, for example, it may grant repo lending in order to provide the banks with the necessary reserves. The interest rate charged for short term repo lending is close to the *bank rate* which it pays on reserve deposits.

The important point is that, by its own dealing in the money-market, the Bank of England supplies funds (provides *liquidity*) to the banks *on demand*. It cannot do otherwise. This is fundamentally because the Bank of England is, by law, the only issuer of £-sterling banknotes – this the defining difference between a central bank and other financial institutions – and all financial liabilities denominated in sterling are ultimately claims on currency, the most obvious example being 'sight' deposits in commercial banks which the depositor can withdraw as currency on demand.

To enable the banks at all times to satisfy their depositors' demands for currency, the Bank of England must stand ready at all times to lend its currency to the banks. If it failed to do so, or even if there was suspicion that some bank would be unable to honour demands for currency withdrawal, the likely consequence would be a bank run as happened, remarkably, with Northern Rock in 2007.

Since the Bank of England cannot choose the amount of such lending, it has to choose the interest rate at which it lends. This *bank rate* is the marginal cost of funds to the banks, measured either as the cost of short term repo loans or equivalently as the rate paid on reserve deposits. This rate is transmitted to the wider economy as the short-term rate for lending £-sterling funds, as is explained in the following section.

In the appendix, I address the question of whether the central bank could operate by setting the quantity of the monetary base instead of lending to banks as required at a chosen interest rate.

1.3 Interest rates in the money-market and banks' retail rates

With the central bank lending to banks as required at its chosen bank rate, short-term lending between banks will also normally take place at rates that are close to bank rate. Provided that lending banks are confident about the solvency of borrowing banks or the quality of collateral security being offered, no bank would be able to obtain a rate higher than bank rate for a loan to another bank when that bank can borrow from the central bank at bank rate; similarly, the lending bank will not lend at less than bank rate when it can obtain bank rate on its reserve deposits. It does not matter that the values of the central bank's transactions are tiny compared to the overall values of interbank deals. The routine practice of the central bank, of lending to banks on demand, means that the wholesale rates for interbank lending in the money-market remain close to bank rate.[5]

Hence, if banks have enough liquid assets (bills and bonds) which they can sell or use as collateral security, they can effectively borrow unlimited amounts of funds in the money-market at around bank rate.[6] What interest rate will they offer for deposits? Deposits and interbank borrowing are

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[4] The Bank of England sometimes also undertakes 'open market operations' which are outright purchases or sales of government securities from/to the financial markets. Confusingly, the Bank includes repo lending in the category of what it calls 'open market' operations'.

[5] Interbank rates became detached from bank rate during the financial crisis, reflecting lack of trust between the banks. For instance, the one month sterling interbank rate (Libor) reached as far as 1½% above bank rate in late 2008 but this margin has now narrowed to around 3 basis points.

[6] This raises the question of what happens when banks run low on liquid assets. Obviously, a bank attempts to maintain its portfolio of liquid assets but it may have difficulty if it suffers from a large number of non-performing loans. In this case, the central bank may find itself being asked to lend against illiquid assets. This amounts to solvency support; see section 1.4.

alternative sources of funds so, as competitive profit maximisers, they set the rate offered on deposits at some margin below bank rate to cover administration and transactions costs.

Similarly, the rate charged by banks for their lending to individual and corporate borrowers will exceed bank rate by a margin to cover transactions costs and also default risk. In other words, the banks set their retail lending and deposit rates at appropriate margins above and below the official bank rate of the central bank. When bank rate changes, the banks' retail rates are observed to change approximately in parallel with bank rate.

The other consequence of the central bank's provision of liquidity is that the commercial banks' retail lending decisions are not dependent on their having sufficient deposits. Hence, when a bank has an opportunity to lend, its decisions over whether to lend, what amount to lend and at what interest margin, may be taken mainly on the basis of the perceived risk. Commercial banks do not wait for deposits before lending, as would be implied by the textbook 'money multiplier' theory (see appendix). Because central banks routinely provide liquidity to their commercial banks, the banks know they can always fund their lending by borrowing in the money-market at rates close to the central bank's lending rate.

1.4 The effects of the financial crisis and the recession

In 2007, it became clear that some banks had been lending too freely and too cheaply, particularly for home loans. In both the United States and Britain, mortgage loans were being granted in amounts that were six times the borrower's annual income and up to 125% of the value of the secured property, and the risks had become seriously underpriced. When significant numbers of loans began to default (notably in the 'subprime' market in the US) there was a widespread fall in confidence in the banks and several had to be bailed out by governments.

One of the factors which drove this expansion in lending and also played a major part in the banking collapse was *securitisation*, in which a bank pools together several hundred loans to create an *asset backed security*. This is then divided into *tranches* with a prescribed order of payout when some of the underlying loans default on payments. In a typical structure containing a *senior*, a *mezzanine* and a *junior* tranche, the first losses are borne by the junior tranche, and the mezzanine tranche only becomes impaired when the losses exceed the entire amount of the junior tranche. Similarly, the senior tranche only suffers if losses exceed the amounts of the mezzanine and the junior tranches, making it much more secure than the original pool.

The senior tranche is thus *credit enhanced*, invariably gaining the highest rating from one of the credit rating agencies, and it becomes an attractive investment to other institutions. The process enables banks to turn risky loans into assets that can be sold in the financial markets, freeing up cash for further lending. Under existing bank regulations, it also enables institutions that own senior tranches to hold smaller amounts of regulatory capital than if they held the original assets, thereby increasing leverage.

In the years prior to 2007, the issue of asset backed securities grew at an increasing rate, reaching a global value of around $10 trillion in mid-2007[7], with banks in most developed countries becoming involved as originators of these securities, or buyers, or both. And as the market expanded, more complex financial instruments were introduced such as *collateralized debt obligations* which are, for instance, securitised assets created by combining several mezzanine tranches of previous securitisations. These developments had the effect of concealing risk and the new assets were

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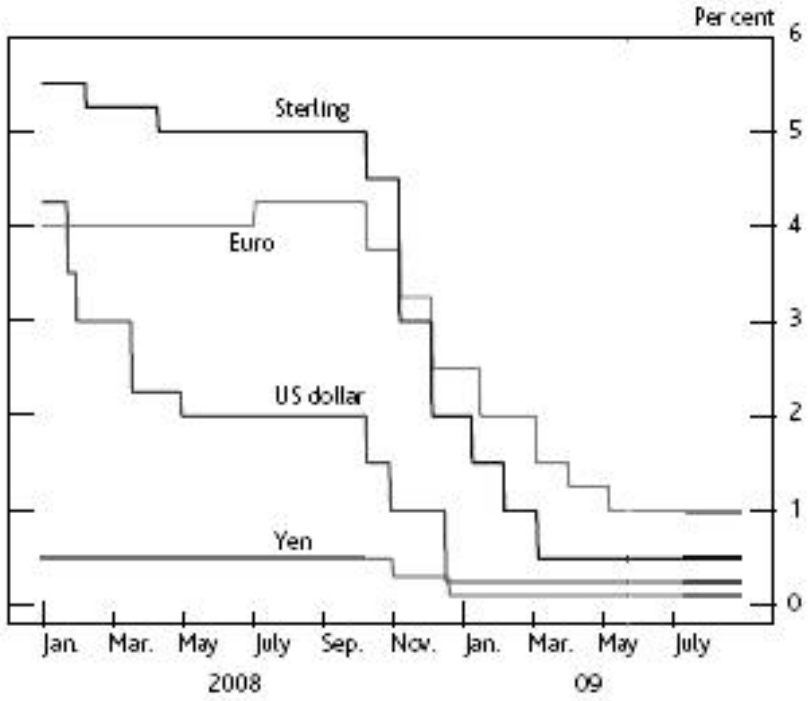
[7] Estimate from Bank of England Stability Report, October 2007.

increasingly hard to value. When the market finally collapsed, many of them were written down to a fraction of their face values, earning the label 'toxic assets'.

This rapid deterioration in the value of bank's assets quickly led to justifiable suspicions about the solvency of many banks including several of the world's largest. As a result, banks became reluctant to lend both to their retail customers and to other banks. The money markets seized up. Faced with a potential collapse of payments systems, governments and central banks had no alternative but to support vulnerable banks, by providing liquidity for longer periods and against lower quality assets, by guaranteeing banks' assets, and by injecting capital at taxpayers' expense, in some cases amounting to partial or complete nationalisation.

The sudden reduction in the availability of credit, accompanied in Britain and the US by sharp falls in property prices, led to recession[8] in all major economies. Governments generally responded with stimulatory (Keynesian) fiscal policy, but the scope for extra spending or for tax reduction was limited because government budgets everywhere were severely stretched. Budget deficits had already risen markedly because of the recession-induced reduction in tax revenue and increased welfare spending (the 'automatic stabilisers') and because of the support given to the banks. The high levels of government debt that have now arisen in many countries are a serious threat to economic recovery.



Central bank rates 2008-09

The other arm of economic policy, monetary policy, was also used aggressively in attempt to mitigate the recession and central banks rapidly reduced their interest rates close to zero (see figure). As nominal interest rates cannot fall below zero, other measures were then introduced such as the Bank of England's *quantitative easing*.

Quantitative easing will be described later in section 2.4. I first return to the determination of interest rates in more 'normal' times.

[8] A recession is defined as four successive quarters of negative real economic growth.

2. How does the central bank *choose* the interest rate?

2.1 The effects of changes in interest rate

Having established that the monetary control instrument is the short term interest rate (bank rate), the next task is to consider how the central bank should choose its value. For this purpose, the objective of monetary policy needs to be defined and these days it is invariably a target for inflation. The target may be explicit, like the UK's inflation target of 2% (consumer price index)) with a margin of error of ± 1 %, or it may be stated more loosely, like the instruction to the European Central Bank to aim for "low and steady inflation" which it interprets as below but close to 2%. Sometimes the central bank is also instructed to pay attention to high economic growth, as in the US, but it must be borne in mind that a single *instrument* (the interest rate) cannot be used to target more than one *objective* at the same time. Raising growth would imply lower interest rates, while reducing inflation would imply higher interest rates. However, even though central banks are always more or less conscious of the effects of their interest rate choices on economic growth, the main focus is on inflation.

The central bank therefore needs to know how inflation is affected by its interest rate choices. The main impact of interest rate changes is on aggregate demand with a reduction in interest rate tending to raise demand, and vice versa. Depending on supply capacity, higher demand leads to higher real output and higher inflation or both, where the change in output is usually thought to be temporary according to Phillips Curve theory. Unfortunately, there are also other influences on demand which are not easily measurable or predictable like 'confidence' and 'habits'. This leads to considerable uncertainty in the magnitude of the responses to interest rate changes and the responses are also delayed: the peak of the response of inflation to a change in short-term interest rate is lagged by 18 months or more. It is nonetheless important to study the channels by which interest rates are believed to influence demand and inflation, and I give a brief overview.[9]

Consider the consequences of a *reduction* in the Bank of England's official bank rate. Most bank loans in the UK are at a variable interest rate, such as variable-rate mortgage loans for house purchases and overdraft loans which are the predominant form of finance for smaller firms. When bank rate falls, the cost of this finance falls, and this tends to cause an increase in borrowing, both for consumption and investment. The reduction in interest rates also reduces the reward to saving, which also encourages spending.[10]

Another important influence on demand works through *asset* prices. When interest rates fall, the prices of both physical and financial assets rise. Financial assets such as bills and bonds are claims to specified future nominal amounts of cash; hence their nominal values rise to bring the return on these assets in line with the lower rate of interest. For physical assets such as property, the raised demand due to the lower cost of borrowing tends to raise prices. The higher values of these and other assets makes individuals and firms more confident about spending and also provides increased collateral security for increasing their borrowing.

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[9] A more complete description of the effects of interest rates is in "The Transmission Mechanism of Monetary Policy", Bank of England Quarterly Bulletin, 39.2, (May 1999), p.161-70.

[10] Although a reduction in interest rates tends to increase borrowing and reduce saving, the effect on savers could be the opposite. Savers who want to maintain a given income stream from their interest payments would need to save more rather than less. The outcome depends on the relative magnitudes of the 'income and substitution' effects in standard microeconomic theory of intertemporal choice.

An episode that illustrates these effects and has parallels with current circumstances was the British experience of 1985-95. In the late 1980s, the prices of assets, particularly houses, rose rapidly as a result of low interest rates and aggressive marketing of loans by banks which had recently enjoyed some deregulation. The consequence was high demand and output growth followed by rising inflation (the 'Lawson boom'). The government responded by raising interest rates sharply (at the time, interest rates were chosen by the finance minister rather than the central bank), and the higher rates were forcibly continued when the decision was made in 1990 to join the Exchange Rate Mechanism (ERM) of the European Union. This policy eventually succeeded in overcoming inflation but it also caused a serious slump, with the usual features of falling demand and output and widespread bankruptcies. It was also notably characterised by falling property prices and 'debt deflation' as many property owners were unable to maintain interest payments on their loans. Interest rates were markedly reduced when Britain left the ERM in 1992, and average real growth then gradually returned to its 'normal' level of around 2.5%.

A further influence on demand works through the foreign exchange rate. However, this link in the transmission mechanism is particularly unreliable because (with no restrictions on capital flows) foreign exchange rates are much more strongly influenced by changes in perceptions of returns on capital for reasons other than changes in interest rate. To the extent that interest rates have an influence, a lower interest rate is usually associated with a lower foreign exchange value of the currency. A weaker currency then stimulates aggregate demand because it raises exports.

These are the main channels whereby interest rates are generally understood to influence aggregate demand. The direction of the overall effect is not in dispute: there is agreement that lower interest rates stimulate demand and vice versa, as would be predicted by any model of the 'IS' curve. However, as already mentioned, the responses to interest rate changes are not accurately predictable. One reason is that the response varies with the business cycle. In recessions, lower rates may have little effect on spending because individuals are naturally reluctant to incur further debt, as is currently the case in Britain. This 'liquidity trap' has been afflicting Japan for a number of years during which interest rates have hardly risen above zero. Another reason is that there are many other influences on demand, one of which is longer-term rates on interest. Bank rate is a short-term rate, and much expenditure, particularly for investment, requires borrowing for longer periods. We must consider how the *yield curve* (the relationship between interest rates of different maturities) is influenced by *expectations* of future short-term rates.

2.2 The role of expectations

The expectations hypothesis of the term structure of interest rates states, loosely, that the interest rate for a loan of maturity T years is an average of current and expected future short-term rates over the following T years. Hence the movement of the yield curve in response to a change in bank rate depends on how the change in bank rate *causes expectations of future bank rates to be revised.* Often, changes in bank rates have been fully anticipated. In this case, there is no change in expectations at the moment of the bank rate change, and longer-term rates will be unaffected. But if the bank rate change is a surprise, or smaller or larger than expected, this represents new information and longer rates will generally change too.

Consider how an unexpected *fall* in bank rate will affect expectations of future bank rates. The observed pattern of bank rate changes reveals serial correlation: a fall is more likely to be followed by a further fall in the following months than a rise. In any event, one may presume that the fall is not expected to be reversed immediately. As a result, the unexpected fall in bank rate should lead to

downward revision in the expectations of future bank rates out to, say, 2 years, which implies that longer rates with maturities up to 2 years should also fall.

Beyond that maturity, the result is less predictable and it depends more on *expected inflation*. Bank rate is the central bank's instrument for controlling inflation, so if future inflation is expected to be high, the central bank will need to set high bank rates. When the current bank rate falls unexpectedly, inflation expectations may be revised in either direction. The fall in bank rate may signal that the central bank sees no threat of future inflation, so that inflation expectations are revised downwards and long rates also fall, because lower future inflation will allow the central bank to set lower bank rates in the future. Alternatively, the fall in the bank rate may be interpreted as a deliberate attempt at short-term demand stimulation without sufficient regard for the potential inflationary consequences. In this case inflation expectations will rise and long rates will also rise.

Clearly, any information which causes changes in expectations of the future path of the bank rate is highly important and information *other than* current changes in the rate may be more relevant. If the governor of the central bank makes a statement implying that bank rates will be lower in the future and this statement is believed, then this will tend to stimulate demand. Moreover, anyone who can correctly predict a change in rates stands to make profits by appropriate dealing in financial assets.

For these reasons, great weight is attached to the statements of central bank governors. Every word from Jean-Claude Trichet at the European Central Bank is scrutinised by analysts searching for clues about future interest rate intentions. And in the US, Alan Greenspan (the former governor of the Federal Reserve: the US central bank) became famous for his 'constructive ambiguity': making statements that influence expectations in desired directions without limiting the scope for future changes in rates. In practice, there are many signals that influence expectations of interest rates such as the timing of interest rate changes and the accompanying announcements, and the monthly releases of inflation rate statistics since it is known that these data have a bearing on the central bank's interest rate setting decisions.

To summarise, reducing the interest rate tends to stimulate demand and it may eventually lead to higher inflation. Conversely, raising interest rates tends to reduce demand and inflation. But there are many other influences on demand and inflation, which makes the magnitude and delay in the response of inflation to a change in interest rates hard to predict. It is against this background that the central bank must choose the bank rate that is most appropriate for achieving its inflation objective.

2.3 Central bank independence

The prevalent arrangement nowadays is that central banks are *independent* (the Bank of England has been independent since 1997). This means that the government chooses the *objective*, usually specified as an inflation target as described above, while the job of the central bank is to choose a time path for the interest rate that is most likely to achieve that objective.

As a result of the lags in the response to interest rate changes, the practice of the central bank is sometimes called *inflation forecast targeting*. The Bank of England, for instance, uses its macroeconomic model to forecast inflation up to 2 years in the future and, if the mean 2-year forecast differs from the target, the recipe is to adjust the bank rate accordingly. But although a great deal of research has been directed towards devising 'monetary policy rules' (such as the Taylor rule) that are supposed to help central banks in their choices of optimal interest rates to reach a given target, the predictions of any model involve great uncertainty. In practice, while inflation forecasts and 'monetary policy rules' can be used as a guide, interest rate choices have to rely on judgement.

In the UK this judgement is the work of the members of the Bank of England's monetary policy committee.

The purpose of central bank independence is ostensibly to insulate interest rate choices from interference from the government in the belief that, due to imperfections in the electoral process, governments face incentives to choose interest rates that are lower than would be consistent with the inflation target. Governments are interested in being popular and low rates are always more popular then high rates. And it is often assumed that governments have a shorter time horizon than the society they serve; therefore, they might be tempted to hold down interest rates to stimulate spending ahead of an election, disregarding the longer-term potential consequence of inflation.

Another incentive for governments to go 'soft' on inflation is that inflation helps the government's budget. When price levels rise, the demand to hold currency also rises, so inflation provides governments with extra *seigniorage* (the income from issuing currency). Inflation also reduces the real value of (home-currency, non-indexed) government debts. But for this to be of benefit, inflation expectations must be low when the government borrows by selling its fixed-interest long-term bonds; if high inflation was expected, long-term rates would also be higher to reflect this. Thus the ideal short-term behaviour for a government that wishes to finance its debts most cheaply is to induce the belief that there will be low inflation so that it can borrow cheaply, then to cheat by allowing some inflation to write down the real value of its debts. This incentive is strong for those governments with large (home-currency) national debts.

A further justification for central bank independence is that it is supposed to give *credibility* to monetary policy. People know about the incentives that the government faces, so if the government is responsible for day-to-day interest rate decisions, there is the suspicion that it will be tempted to set them too low. If there is high inflation, people will expect high inflation to continue and they will doubt any promises by the government that it will strive for low inflation. However, if there is an independent central bank that is immune to the incentives that tempt the government, people may believe that it will genuinely try to meet its inflation target.

This is important because the expectation of inflation is an important determinant of actual inflation, as recognised in Phillips Curve theory. Inflation is the rate of increase of the prices of goods. In the attempt to find clearing prices, sellers of goods build the expected rate of inflation into their price increases, and inflation expectations are built into wage agreements. This leads to *persistence* in the observed time path of inflation and is another reason why governments are always keen to convince us that future inflation will be low. If expected inflation is low, this leads to cheaper debt finance as discussed above, and also to low actual inflation.

One policy that influences inflation expectations is the exchange rate regime, and this was a motive for Britain joining the European Exchange rate mechanism on 1990. Under a fixed exchange rate against some other currency, provided there are no restrictions on international capital flows, interest rates are constrained by the (uncovered) interest parity relationship to be close to those of the other currency. There is no scope for demand management by means of monetary policy and, over the longer-term, inflation cannot deviate too far from that of the other currency because of purchasing power parity. Hence, as long as the exchange rate fix is *credible*, it will succeed in holding down inflation expectations. However, the record is not good. All fixed exchange rates seem to break down in the end (except in some cases in which small countries have tied their currencies to a larger neighbour). They end with devaluations, often brought about by unsustainable capital outflows or excess demand caused by expansionary fiscal policy, as painfully demonstrated by Argentina in 2000. It remains to be seen whether the European single currency (the ultimate

"irrevocable" fixed exchange rate regime between the 16 countries of the eurozone) will have a long life.

Is full independence for the central bank actually possible? It was the government that granted independence so the government can take it away again although this would entail loss of face. Moreover, while the individuals that make up the committee that chooses interest rates may not directly be government appointees, it is hard to ensure that they are wholly insulated from political influence. This is especially relevant to the European Central Bank, whose monetary policy board contains representatives from the national central banks of the eurozone. Although the Maastricht Treaty specifically states that board members must act in the interests of the eurozone as a whole rather than their national governments, the political dimension is always present. For some time there have been severe tensions as the euro interest rate that has been chosen to suit Germany has not been appropriate for the Southern eurozone countries (Italy, Spain, Greece, Portugal), leading them first into inflation and then slump.

There is also the argument that central bank independence has the disadvantage of severing co-ordination between monetary and fiscal policy. The government can engage in expansionary fiscal policy without regard for the inflationary consequences because the central bank is responsible for inflation control and can take the blame. In the eurozone, the Stability Pact limit on government budget deficits ($\leq$ 3% of GDP) was supposed to address this but this limit has been breached in so many countries and so frequently as to render it meaningless.

Whether or not central banks can be or should be wholly independent, this arrangement does seem to have worked in achieving and maintaining low inflation in developed Western economies. Germany and Switzerland are believed to have had the most independent central banks since the last war and also the best records of inflation control. Although there are disputes about how independence is measured, the evidence that inflation is negatively correlated with independence is mostly accepted. It is by no means clear, however, that central bank independence is the only reason why inflation might appear to have been conquered. Other contributing factors may be the generally higher levels of growth (until recently), the accompanying reductions in budget pressures, and greater popular acceptance that inflation is a problem that should be avoided.

2.4 Quantitative easing: can we expect inflation?

With interest rates now effectively at zero in developed countries, there is concern that this stimulus will cause a return of inflation. This concern is further fuelled by the *quantitative easing* of the Bank of England, with equivalent policies being pursued by the European and American central banks.

Quantitative easing is the name given by the Bank of England to its extraordinary programme of purchasing £200 bn of medium-dated government securities (see the Bank's September 2009 balance sheet, page 2: about £150 bn had been purchased at that date). It was hoped that the cash which the banks received as a consequence of these open-market purchases would induce them to return to higher levels of lending, given that interest rates are effectively at zero and there is no scope for reducing them further.

However, quantitative easing has not so far been a great success because bank lending remains constrained both by supply and demand. Having recently burnt their fingers, banks are looking much more carefully at risk, and individuals and firms are trying to save rather than taking on more debt, given anxiety about future income and cash flow. Instead of increasing their lending, the banks have largely sent the extra cash back to the Bank of England as reserves (see balance sheet).

The inflation worry thus rests on two observations. First, quantitative easing constitutes 'monetisation' of government debt – the Bank of England is paying for government spending with new 'money' – and there are many cases in which this has been associated with inflation. Second, the increase in bank reserves means an increase in the *monetary base*, M0 (defined as banknotes and coin plus bank reserves) and the quantity theory of money says that the price level rises roughly in proportion to the money supply, measured as M0 or some broader measure such as M4 which includes deposits in banks.

The problem with this reasoning is that it ignores the mechanism by which inflation is caused. Inflation is rising prices of goods, and it is caused by excess demand for goods, something that is notably absent at present. If and when demand returns, the Bank says it will be withdrawing quantitative easing. Even without a withdrawal of quantitative easing, there is nothing to prevent the Bank achieving higher interest rates by raising its bank rate on bank reserves and its repo loans.

Having said that, inflation is the one sure way in which the government could write off large amounts of its debts, as described above in Section 2.3. When the economy does eventually begin to recover, the temptation for the government to lean on the Bank of England to continue its 'soft' monetary policy will be very large.

Appendix: monetary base control

The usual textbook treatment of monetary policy claims that the central bank chooses the value of the monetary base (alias 'reserve base' or 'high powered money'; defined as currency issued by the central bank, plus reserves). The monetary base is the central bank's *instrument* rather than the interest rate, and this enables control of the *money supply* (defined as currency plus deposits in banks[11]). The money supply is assumed to be *caused* by the monetary base via a predictable 'money multiplier' relationship.

The point of this appendix is to show that this is a poor description of actual practice. Further, it would not be *possible* for the central bank to operate by setting the monetary base. Essentially, this is because bank deposits are claims to currency which only the central bank can supply. Hence, in order to ensure that banks can honour their obligations to convert deposits into currency, the central bank *must* stand ready to issue whatever quantity of currency is demanded; it cannot choose the quantity of currency it issues and must therefore set the cost of its lending, i.e. the interest rate.

In more detail, the money multiplier theory is as follows. With the central bank setting the value of the monetary base, it is obviously no longer lending (providing liquidity) to banks on demand, and banks are therefore presumed to keep enough excess reserves to satisfy deposit withdrawals. The amount of this desired fractional reserve would be based on the observed statistics of deposit withdrawals, balanced against the loss of income from foregone lending In this scenario, the wholesale (interbank) interest rate becomes market-determined at a value that equates the given stock of reserves with banks' demands for it.

Suppose, for instance, that for every £100 of their money, individuals choose to hold £5 as currency. Of the remaining £95 of deposits, suppose banks' required reserves and desired excess reserves together come to £5. With these numbers, £10 of monetary base *causes* £100 of money: the 'money-multiplier' is 10. When the central bank wants to raise the money supply, it raises the monetary base by 'injecting cash' into the money-market, and it does this by buying government bonds from the private sector (an 'open market purchase'). [12] The money supply is then supposed to rise through the 'deposit expansion' process, as follows.

When the central bank buys government bonds, deposits in banks rise and this is reflected as an increase in excess reserves. Banks now have more reserves than they want, so they find willing borrowers and they lend. But people borrow for the purpose of paying for goods and services, which means that the borrowed funds are paid into some other individual's or firm's bank deposit, or they may be used to repay a loan.[13] Either way, banks will again find they have more reserves than they want which then causes more lending. Each time the same initial reserves are lent and re-deposited, a proportion is kept as currency (5%, using the above numbers), and a further proportion (another 5%) is absorbed as required reserves and desired excess reserves, and it is therefore unavailable for lending. In this way, deposits and the money stock continue to increase by decreasing amounts, as is laboriously described in most textbooks. The expansion process terminates when the money stock has risen by the 'multiplier' (10 in the above example) multiplied by the injection of new reserves.

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[11] There are several definitions of 'money': M1 is currency held by the public + short-term deposits, M2 is M1 + medium term deposits etc. The commonly reported measure in the UK is M4 which also includes long-term deposits in banks and building societies. For this discussion we can think of money as being M1.

[12] The tools of monetary management are supposed to be open market operations by which the central bank changes the monetary base, the required reserve ratio which affects the value of the multiplier, and the central bank's 'discount' rate for 'last resort lending' which affects the multiplier by influencing the excess reserves that banks choose to hold.

[13] Some writings attach great significance to the fact that banks 'create money'. Money (defined as currency plus deposits) is indeed created whenever a loan is made but there is nothing sinister in this. One reason for this fixation with money creation is probably a confusion of money with wealth and the implied misconception that banks can create wealth out of nothing. In fact, banks are just intermediaries and their profits are the reward for taking risks. Wealth is created when the funds that they lend are invested by borrowers to create real assets.

One obvious problem with this process is that banks do not have a pool of approved borrowers queuing up for loans and waiting until the banks have funds to lend. As mentioned above, banks offer credit when a potentially profitable lending opportunity arises, then find the funds in the money-market. The effect of the current British policy of *quantitative easing* (large scale open-market purchases) has been to cause increase in reserves with no noticeable increase in bank lending.

A more obvious problem would arise in the opposite case when there is a *shortage* of reserves, which might be caused by a rise in currency demand, or a deliberate reduction in monetary base by means of an open-market sale. In the absence of automatic access to more monetary base, this causes banks' excess reserves and vault currency stocks to fall.

If an individual bank found its reserves falling below its desired level, its reaction would be to sell liquid assets in the money-market. If banks collectively suffered a reduction in their reserves, competition to raise funds by selling money-market paper would cause a rise in wholesale interest rates. With an acute shortage of reserves, it might be argued that wholesale interest rates would rise sufficiently to persuade some individuals to deposit their currency holdings, thus relieving the shortage.[14] A more plausible outcome is that the sharp rise in interest rates would lead individuals to doubt the banks' ability to pay, inducing them to *withdraw* more currency rather than depositing.

Even if banks generally were holding large stocks of voluntary excess reserves, and even if the central bank never attempts to *reduce* the monetary base, there will always be a non-zero probability that net currency withdrawals will exceed the banks' aggregate excess reserves and vault currency. If this happened, banks would no longer be able to pay out their customers' deposits as currency, immediately causing a loss of confidence in the banks and breakdown of the payments system. In the absence of access to central bank lending, the only way for banks to be wholly confident of meeting all possible withdrawals of currency would be for them to hold reserves at least equal to their short-term liabilities. This arrangement, known as narrow banking or 100% reserve banking, would be a radical departure from current practice.

It might then be argued that the central bank could fix the monetary base but undertake to lend extra reserves only in an emergency or truly 'last resort' situation. But the only consistent criterion for identifying such an emergency would be *if there is a shortage of reserves*. As soon as banks became confident of such support, at whatever interest rate the central bank may choose, excess reserve holdings could be reduced back to zero, and we revert to the present system in which the interest rate for central bank lending is the monetary control instrument.

The upshot is that the central bank *cannot* set the amount of currency it issues (or the monetary base). The central bank *must* provide liquidity on demand: it must finance money-market shortages *exactly and in full*, as is observed to be the case. In doing so, it cannot avoid setting its interest rate for this finance, i.e. the bank rate.

Of course, this does not prevent the central bank from *targeting* the monetary base. The central bank may target any variable, meaning that it chooses the path of its interest rate instrument over time in attempt to achieve some desired value of range of values of the target variable. Monetary base targeting (and money supply targeting) has indeed been practiced from time to time by various central banks in the belief that this was a good method of achieving some desired inflation rate. The prevalent current practice is rather to target the inflation rate itself.

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[14] If one follows the textbook story literally, a shortage of reserves would put the deposit expansion process into reverse: banks would attempt to regenerate their reserves by *calling in* loans which would reduce deposits causing a further reduction in loans etc. But it would be out of the question for banks to call in loans unless this is for non-performance. As stressed above, bank loans are *illiquid* because they have been used to purchase firms' capital stock and individuals' properties. When a bank liquidates a non-performing loan, it usually recovers considerably less than the book value of the loan, the process takes time, and it tends to push the borrower into bankruptcy if the borrower is not already bankrupt.