

Money creation in the modern economy

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- This article explains how the majority of money in the modern economy is created by commercial banks making loans.
- Money creation in practice differs from some popular misconceptions — banks do not act simply as intermediaries, lending out deposits that savers place with them, and nor do they 'multiply up' central bank money to create new loans and deposits.
- The amount of money created in the economy ultimately depends on the monetary policy of the central bank. In normal times, this is carried out by setting interest rates. The central bank can also affect the amount of money directly through purchasing assets or 'quantitative easing'.

Overview

In the modern economy, most money takes the form of bank deposits. But how those bank deposits are created is often misunderstood: the principal way is through commercial banks making loans. **Whenever a bank makes a loan, it simultaneously creates a matching deposit in the borrower's bank account, thereby creating new money.**

The reality of how money is created today differs from the description found in some economics textbooks:

- Rather than banks receiving deposits when households save and then lending them out, bank lending creates deposits.
- In normal times, the central bank does not fix the amount of money in circulation, nor is central bank money 'multiplied up' into more loans and deposits.

Although commercial banks create money through lending, they cannot do so freely without limit. Banks are limited in how much they can lend if they are to remain profitable in a competitive banking system. Prudential regulation also acts as a constraint on banks' activities in order to maintain the resilience of the financial system. And the households and companies who receive the money created by new lending may take actions that affect the stock of money — they could quickly 'destroy' money by using it to repay their existing debt, for instance.

Monetary policy acts as the ultimate limit on money creation. The Bank of England aims to make sure the amount of money creation in the economy is consistent with

low and stable inflation. In normal times, the Bank of England implements monetary policy by setting the interest rate on central bank reserves. This then influences a range of interest rates in the economy, including those on bank loans.

In exceptional circumstances, when interest rates are at their effective lower bound, money creation and spending in the economy may still be too low to be consistent with the central bank's monetary policy objectives. One possible response is to undertake a series of asset purchases, or 'quantitative easing' (QE). QE is intended to boost the amount of money in the economy directly by purchasing assets, mainly from non-bank financial companies.

QE initially increases the amount of bank deposits those companies hold (in place of the assets they sell). Those companies will then wish to rebalance their portfolios of assets by buying higher-yielding assets, raising the price of those assets and stimulating spending in the economy.

As a by-product of QE, new central bank reserves are created. But these are not an important part of the transmission mechanism. This article explains how, just as in normal times, these reserves cannot be multiplied into more loans and deposits and how these reserves do not represent 'free money' for banks.

[Click here for a short video filmed in the Bank's gold vaults that discusses some of the key topics from this article.](#)

(1) The authors would like to thank Lewis Kirkham for his help in producing this article.

Introduction

'Money in the modern economy: an introduction', a companion piece to this article, provides an overview of what is meant by money and the different types of money that exist in a modern economy, briefly touching upon how each type of money is created. This article explores money creation in the modern economy in more detail.

The article begins by outlining two common misconceptions about money creation, and explaining how, in the modern economy, money is largely created by commercial banks making loans.⁽¹⁾ The article then discusses the limits to the banking system's ability to create money and the important role for central bank policies in ensuring that credit and money growth are consistent with monetary and financial stability in the economy. The final section discusses the role of money in the monetary transmission mechanism during periods of quantitative easing (QE), and dispels some myths surrounding money creation and QE. A short video explains some of the key topics covered in this article.⁽²⁾

Two misconceptions about money creation

The vast majority of money held by the public takes the form of bank deposits. But where the stock of bank deposits comes from is often misunderstood. **One common misconception is that banks act simply as intermediaries, lending out the deposits that savers place with them.** In this view deposits are typically 'created' by the saving decisions of households, and banks then 'lend out' those existing deposits to borrowers, for example to companies looking to finance investment or individuals wanting to purchase houses.

In fact, when households choose to save more money in bank accounts, those deposits come simply at the expense of deposits that would have otherwise gone to companies in payment for goods and services. Saving does not by itself increase the deposits or 'funds available' for banks to lend. Indeed, viewing banks simply as intermediaries ignores the fact that, in reality in the modern economy, commercial banks are the creators of deposit money. This article explains how, rather than banks lending out deposits that are placed with them, the act of lending creates deposits — the reverse of the sequence typically described in textbooks.⁽³⁾

Another common misconception is that the central bank determines the quantity of loans and deposits in the economy by controlling the quantity of central bank money — the so-called 'money multiplier' approach. In that view, central banks implement monetary policy by choosing a quantity of reserves. And, because there is assumed to be a constant ratio of broad money to base money, these reserves are then 'multiplied up' to a much greater change in bank

loans and deposits. For the theory to hold, the amount of reserves must be a binding constraint on lending, and the central bank must directly determine the amount of reserves. While the money multiplier theory can be a useful way of introducing money and banking in economic textbooks, it is not an accurate description of how money is created in reality. Rather than controlling the quantity of reserves, central banks today typically implement monetary policy by setting the price of reserves — that is, interest rates.

In reality, neither are reserves a binding constraint on lending, nor does the central bank fix the amount of reserves that are available. As with the relationship between deposits and loans, the relationship between reserves and loans typically operates in the reverse way to that described in some economics textbooks. Banks first decide how much to lend depending on the profitable lending opportunities available to them — which will, crucially, depend on the interest rate set by the Bank of England. It is these lending decisions that determine how many bank deposits are created by the banking system. The amount of bank deposits in turn influences how much central bank money banks want to hold in reserve (to meet withdrawals by the public, make payments to other banks, or meet regulatory liquidity requirements), which is then, in normal times, supplied on demand by the Bank of England. The rest of this article discusses these practices in more detail.

Money creation in reality

Lending creates deposits — broad money determination at the aggregate level

As explained in 'Money in the modern economy: an introduction', broad money is a measure of the total amount of money held by households and companies in the economy. Broad money is made up of bank deposits — which are essentially IOUs from commercial banks to households and companies — and currency — mostly IOUs from the central bank.⁽⁴⁾⁽⁵⁾ Of the two types of broad money, bank deposits make up the vast majority — 97% of the amount currently in circulation.⁽⁶⁾ **And in the modern economy, those bank deposits are mostly created by commercial banks themselves.**

(1) Throughout this article, 'banks' and 'commercial banks' are used to refer to banks and building societies together.

(2) See www.youtube.com/watch?v=CvRAqR2pAgw.

(3) There is a long literature that does recognise the 'endogenous' nature of money creation in practice. See, for example, Moore (1988), Howells (1995) and Palley (1996).

(4) The definition of broad money used by the Bank of England, $M4^{EX}$, also includes a wider range of bank liabilities than regular deposits; see Burgess and Janssen (2007) for more details. For simplicity, this article describes all of these liabilities as deposits. A box later in this article provides details about a range of popular monetary aggregates in the United Kingdom.

(5) Around 6% of the currency in circulation is made up of coins, which are produced by The Royal Mint. Of the banknotes that circulate in the UK economy, some are issued by some Scottish and Northern Irish commercial banks, although these are fully matched by Bank of England money held at the Bank.

(6) As of December 2013.

Commercial banks create money, in the form of bank deposits, by making new loans. When a bank makes a loan, for example to someone taking out a mortgage to buy a house, it does not typically do so by giving them thousands of pounds worth of banknotes. Instead, it credits their bank account with a bank deposit of the size of the mortgage. **At that moment, new money is created.** For this reason, some economists have referred to bank deposits as ‘fountain pen money’, created at the stroke of bankers’ pens when they approve loans.⁽¹⁾

This process is illustrated in **Figure 1**, which shows how new lending affects the balance sheets of different sectors of the economy (similar balance sheet diagrams are introduced in ‘Money in the modern economy: an introduction’). As shown in the third row of **Figure 1**, the new deposits increase the assets of the consumer (here taken to represent households and companies) — the extra red bars — and the new loan increases their liabilities — the extra white bars. New broad money has been created. Similarly, both sides of the commercial banking sector’s balance sheet increase as new money and loans are created. It is important to note that although the simplified diagram of **Figure 1** shows the amount of new money created as being identical to the amount of new lending, in practice there will be several factors that may subsequently cause the amount of deposits to be different from the amount of lending. These are discussed in detail in the next section.

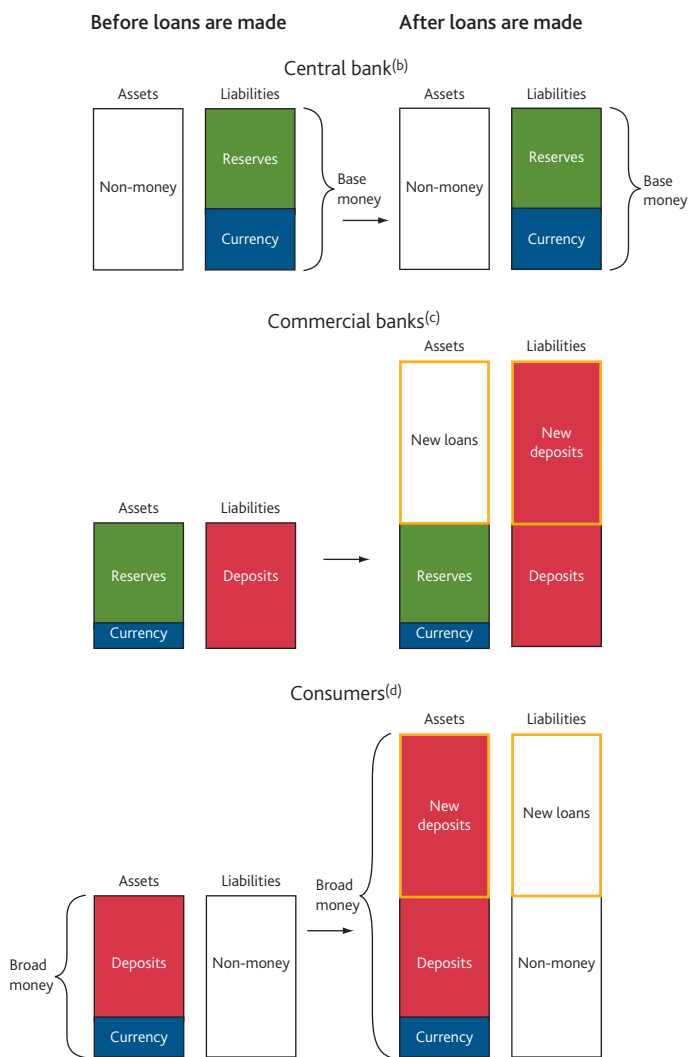
While new broad money has been created on the consumer’s balance sheet, the first row of **Figure 1** shows that this is without — in the first instance, at least — any change in the amount of central bank money or ‘base money’. As discussed earlier, the higher stock of deposits may mean that banks want, or are required, to hold more central bank money in order to meet withdrawals by the public or make payments to other banks. And reserves are, in normal times, supplied ‘on demand’ by the Bank of England to commercial banks in exchange for other assets on their balance sheets. In no way does the aggregate *quantity* of reserves directly constrain the amount of bank lending or deposit creation.

This description of money creation contrasts with the notion that banks can only lend out pre-existing money, outlined in the previous section. Bank deposits are simply a record of how much the bank itself owes its customers. So they are a *liability* of the bank, not an *asset* that could be lent out. A related misconception is that banks can lend out their reserves. Reserves can only be lent *between banks*, since consumers do not have access to reserves accounts at the Bank of England.⁽²⁾

Other ways of creating and destroying deposits

Just as taking out a new loan creates money, the repayment of bank loans destroys money.⁽³⁾ For example, suppose a consumer has spent money in the supermarket throughout the month by using a credit card. Each purchase made using the

Figure 1 Money creation by the aggregate banking sector making additional loans^(a)



- (a) Balance sheets are highly stylised for ease of exposition: the quantities of each type of money shown do not correspond to the quantities actually held on each sector’s balance sheet.
- (b) Central bank balance sheet only shows base money liabilities and the corresponding assets. In practice the central bank holds other non-money liabilities. Its non-monetary assets are mostly made up of government debt. Although that government debt is actually held by the Bank of England Asset Purchase Facility, so does not appear directly on the balance sheet.
- (c) Commercial banks’ balance sheets only show money assets and liabilities before any loans are made.
- (d) Consumers represent the private sector of households and companies. Balance sheet only shows broad money assets and corresponding liabilities — real assets such as the house being transacted are not shown. Consumers’ non-money liabilities include existing secured and unsecured loans.

credit card will have increased the outstanding loans on the consumer’s balance sheet and the deposits on the supermarket’s balance sheet (in a similar way to that shown in **Figure 1**). If the consumer were then to pay their credit card

- (1) Fountain pen money is discussed in Tobin (1963), who mentions it in the context of making an argument that banks cannot create unlimited amounts of money in practice.
- (2) Part of the confusion may stem from some economists’ use of the term ‘reserves’ when referring to ‘excess reserves’ — balances held above those required by regulatory reserve requirements. In this context, ‘lending out reserves’ could be a shorthand way of describing the process of increasing lending and deposits until the bank reaches its maximum ratio. As there are no reserve requirements in the United Kingdom the process is less relevant for UK banks.
- (3) The fall in bank lending in the United Kingdom since 2008 is an important reason why the growth of money in the economy has been so much lower than in the years leading up to the crisis, as discussed in Bridges, Rossiter and Thomas (2011) and Butt *et al* (2012).

bill in full at the end of the month, its bank would reduce the amount of deposits in the consumer's account by the value of the credit card bill, thus destroying all of the newly created money.

Banks making loans and consumers repaying them are the most significant ways in which bank deposits are created and destroyed in the modern economy. But they are far from the only ways. Deposit creation or destruction will also occur any time the banking sector (including the central bank) buys or sells existing assets from or to consumers, or, more often, from companies or the government.

Banks buying and selling government bonds is one particularly important way in which the purchase or sale of existing assets by banks creates and destroys money. Banks often buy and hold government bonds as part of their portfolio of liquid assets that can be sold on quickly for central bank money if, for example, depositors want to withdraw currency in large amounts.⁽¹⁾ When banks purchase government bonds from the non-bank private sector they credit the sellers with bank deposits.⁽²⁾ And, as discussed later in this article, central bank asset purchases, known as quantitative easing (QE), have similar implications for money creation.

Money can also be destroyed through the issuance of long-term debt and equity instruments by banks. In addition to deposits, banks hold other liabilities on their balance sheets. Banks manage their liabilities to ensure that they have at least some capital and longer-term debt liabilities to mitigate certain risks and meet regulatory requirements. Because these 'non-deposit' liabilities represent longer-term investments in the banking system by households and companies, they cannot be exchanged for currency as easily as bank deposits, and therefore increase the resilience of the bank. When banks issue these longer-term debt and equity instruments to non-bank financial companies, those companies pay for them with bank deposits. That reduces the amount of deposit, or money, liabilities on the banking sector's balance sheet and increases their non-deposit liabilities.⁽³⁾

Buying and selling of existing assets and issuing longer-term liabilities may lead to a gap between lending and deposits in a closed economy. Additionally, in an open economy such as the United Kingdom, deposits can pass from domestic residents to overseas residents, or sterling deposits could be converted into foreign currency deposits. These transactions do not destroy money *per se*, but overseas residents' deposits and foreign currency deposits are not always counted as part of a country's money supply.

Limits to broad money creation

Although commercial banks create money through their lending behaviour, they cannot in practice do so without limit. In particular, the price of loans — that is, the interest rate (plus

any fees) charged by banks — determines the amount that households and companies will want to borrow. A number of factors influence the price of new lending, not least the monetary policy of the Bank of England, which affects the level of various interest rates in the economy.

The limits to money creation by the banking system were discussed in a paper by Nobel Prize winning economist James Tobin and this topic has recently been the subject of debate among a number of economic commentators and bloggers.⁽⁴⁾ In the modern economy there are three main sets of constraints that restrict the amount of money that banks can create.

(i) **Banks themselves face limits on how much they can lend.** In particular:

- Market forces constrain lending because individual banks have to be able to lend profitably in a competitive market.
- Lending is also constrained because banks have to take steps to mitigate the risks associated with making additional loans.
- Regulatory policy acts as a constraint on banks' activities in order to mitigate a build-up of risks that could pose a threat to the stability of the financial system.

(ii) **Money creation is also constrained by the behaviour of the money holders — households and businesses.** Households and companies who receive the newly created money might respond by undertaking transactions that immediately destroy it, for example by repaying outstanding loans.

(iii) **The ultimate constraint on money creation is monetary policy.** By influencing the level of interest rates in the economy, the Bank of England's monetary policy affects how much households and companies want to borrow. This occurs both directly, through influencing the loan rates charged by banks, but also indirectly through the overall effect of monetary policy on economic activity in

(1) It is for this reason that holdings of some government bonds are counted towards meeting prudential liquidity requirements, as described in more detail by Farag, Harland and Nixon (2013).

(2) In a balance sheet diagram such as Figure 1, a purchase of government bonds from consumers by banks would be represented by a change in the composition of consumers' assets from government bonds to deposits and an increase in both deposits and government bonds on the commercial banks' balance sheet.

(3) Commercial banks' purchases of government bonds and their issuance of long-term debt and equity have both been important influences on broad money growth during the financial crisis as discussed in Bridges, Rossiter and Thomas (2011) and Butt *et al* (2012).

(4) Tobin (1963) argued that banks do not possess a 'widow's cruse', referring to a biblical story (earlier referenced in economics by John Maynard Keynes) in which a widow is able to miraculously refill a cruse (a pot or jar) of oil during a famine. Tobin was arguing that there were limits to how many loans could be automatically matched by deposits.

the economy. As a result, the Bank of England is able to ensure that money growth is consistent with its objective of low and stable inflation.

The remainder of this section explains how each of these mechanisms work in practice.

(i) Limits on how much banks can lend

Market forces facing individual banks

Figure 1 showed how, for the *aggregate* banking sector, loans are initially created with matching deposits. But that does not mean that any given *individual* bank can freely lend and create money without limit. That is because banks have to be able to lend profitably in a competitive market, and ensure that they adequately manage the risks associated with making loans.

Banks receive interest payments on their assets, such as loans, but they also generally have to pay interest on their liabilities, such as savings accounts. A bank's business model relies on receiving a higher interest rate on the loans (or other assets) than the rate it pays out on its deposits (or other liabilities). Interest rates on both banks' assets and liabilities depend on the policy rate set by the Bank of England, which acts as the ultimate constraint on money creation. The commercial bank uses the difference, or spread, between the expected return on their assets and liabilities to cover its operating costs and to make profits.⁽¹⁾ In order to make extra loans, an individual bank will typically have to lower its loan rates relative to its competitors to induce households and companies to borrow more. And once it has made the loan it may well 'lose' the deposits it has created to those competing banks. Both of these factors affect the profitability of making a loan for an individual bank and influence how much borrowing takes place.

For example, suppose an individual bank lowers the rate it charges on its loans, and that attracts a household to take out a mortgage to buy a house. The moment the mortgage loan is made, the household's account is credited with new deposits. And once they purchase the house, they pass their new deposits on to the house seller. This situation is shown in the first row of Figure 2. The buyer is left with a new asset in the form of a house and a new liability in the form of a new loan. The seller is left with money in the form of bank deposits instead of a house. It is more likely than not that the seller's account will be with a different bank to the buyer's. So when the transaction takes place, the new deposits will be transferred to the seller's bank, as shown in the second row of Figure 2. The buyer's bank would then have fewer deposits than assets. In the first instance, the buyer's bank settles with the seller's bank by transferring reserves. But that would leave the buyer's bank with fewer reserves and more loans relative to its deposits than before. This is likely to be problematic for the bank since it would increase the risk that it would not be able to meet all of its likely outflows. And, in practice, banks

make many such loans every day. So if a given bank financed all of its new loans in this way, it would soon run out of reserves.

Banks therefore try to attract or retain additional liabilities to accompany their new loans. In practice other banks would also be making new loans and creating new deposits, so one way they can do this is to try and attract some of those newly created deposits. In a competitive banking sector, that may involve increasing the rate they offer to households on their savings accounts. By attracting new deposits, the bank can increase its lending without running down its reserves, as shown in the third row of Figure 2. Alternatively, a bank can borrow from other banks or attract other forms of liabilities, at least temporarily. But whether through deposits or other liabilities, **the bank would need to make sure it was attracting and retaining some kind of funds in order to keep expanding lending.** And the cost of that needs to be measured against the interest the bank expects to earn on the loans it is making, which in turn depends on the level of Bank Rate set by the Bank of England. For example, if a bank continued to attract new borrowers and increase lending by reducing mortgage rates, and sought to attract new deposits by increasing the rates it was paying on its customers' deposits, it might soon find it unprofitable to keep expanding its lending. Competition for loans and deposits, and the desire to make a profit, therefore limit money creation by banks.

Managing the risks associated with making loans

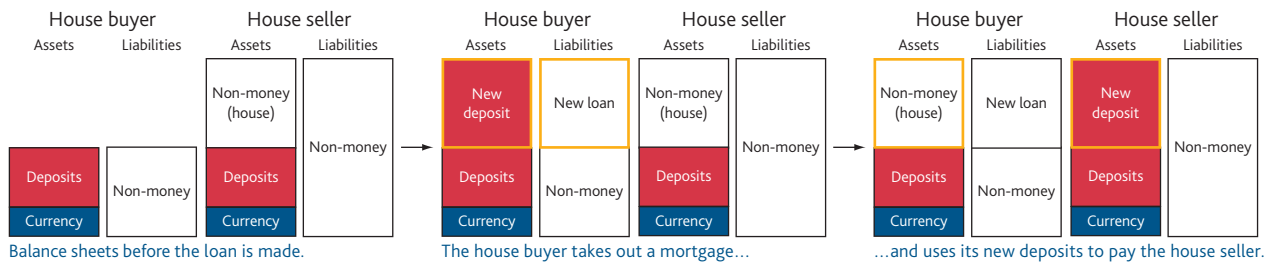
Banks also need to manage the risks associated with making new loans. One way in which they do this is by making sure that they attract relatively *stable* deposits to match their new loans, that is, deposits that are unlikely or unable to be withdrawn in large amounts. This can act as an additional limit to how much banks can lend. For example, if all of the deposits that a bank held were in the form of instant access accounts, such as current accounts, then the bank might run the risk of lots of these deposits being withdrawn in a short period of time. Because banks tend to lend for periods of many months or years, the bank may not be able to repay all of those deposits — it would face a great deal of **liquidity risk**. In order to reduce liquidity risk, banks try to make sure that some of their deposits are fixed for a certain period of time, or term.⁽²⁾ Consumers are likely to require compensation for the inconvenience of holding longer-term deposits, however, so these are likely to be more costly for banks, limiting the amount of lending banks wish to do. And as discussed earlier, if banks guard against liquidity risk by issuing long-term liabilities, this may destroy money directly when companies pay for them using deposits.

(1) See Button, Pezzini and Rossiter (2010) for an explanation of how banks price new loans.

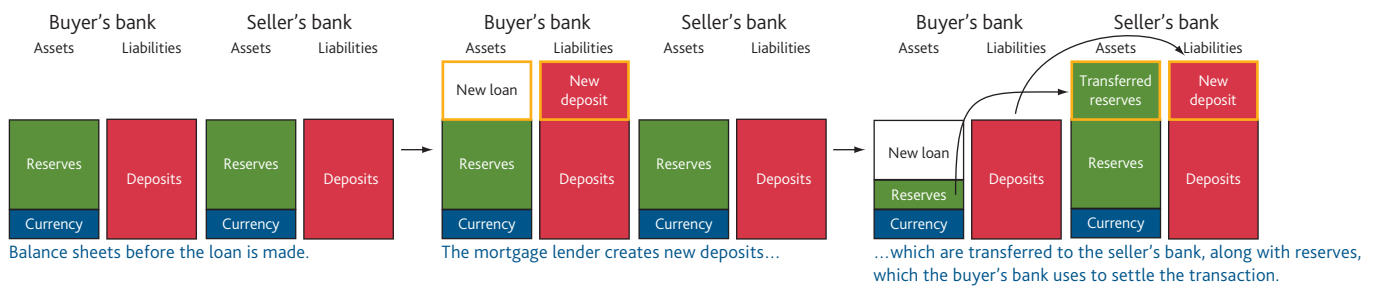
(2) Banks also guard against liquidity risk by holding liquid assets (including reserves and currency), which either can be used directly to cover outflows, or if not can quickly and cheaply be converted into assets that can. Although if banks purchase liquid assets such as government bonds from non-banks, this could create further deposits.

Figure 2 Money creation for an individual bank making an additional loan^(a)

Changes to the balance sheets of the house buyer and seller

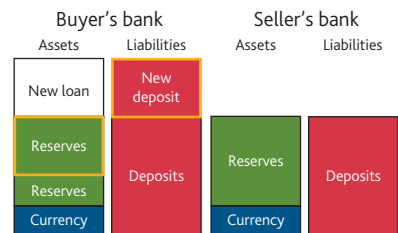


Changes to the balance sheets of the house buyer and seller's banks



But settling all transactions in this way would be unsustainable:

- The buyer's bank would have fewer reserves to meet its possible outflows, for example from deposit withdrawals.
- And if it made many new loans it would eventually run out of reserves.



So the buyer's bank will in practice seek to attract or retain new deposits (and reserves) — in the example shown here, from the seller's bank — to accompany their new loans.

(a) Balance sheets are highly stylised for ease of exposition: the quantities of each type of money shown do not correspond to the quantities actually held on each sector's balance sheet.

Individual banks' lending is also limited by considerations of **credit risk**. This is the risk to the bank of lending to borrowers who turn out to be unable to repay their loans. In part, banks can guard against credit risk by having sufficient capital to absorb any unexpected losses on their loans. But since loans will always involve some risk to banks of incurring losses, the cost of these losses will be taken into account when pricing loans. When a bank makes a loan, the interest rate it charges will typically include compensation for the average level of credit losses the bank expects to suffer. The size of this component of the interest rate will be larger when banks estimate that they will suffer higher losses, for example when lending to mortgagors with a high loan to value ratio. As banks expand lending, their average expected loss per loan is likely to increase, making those loans less profitable. This further limits the amount of lending banks can profitably do, and the money they can therefore create.

Market forces do not always lead individual banks to sufficiently protect themselves against liquidity and credit risks. Because of this, prudential regulation aims to ensure that banks do not take excessive risks when making new loans, including via requirements for banks' capital and liquidity positions. These requirements can therefore act as an additional brake on how much money commercial banks create by lending. The prudential regulatory framework, along with more detail on capital and liquidity, is described in Farag, Harland and Nixon (2013).

So far this section has considered the case of an individual bank making additional loans by offering competitive interest rates — both on its loans and deposits. But if *all* banks simultaneously decide to try to do more lending, money growth may not be limited in quite the same way. Although an individual bank may lose deposits to other banks, it would itself be likely to gain some deposits as a result of the other banks making loans.

There are a number of reasons why many banks may choose to increase their lending markedly at the same time. For example, the profitability of lending at given interest rates could increase because of a general improvement in economic conditions. Alternatively, banks may decide to lend more if they perceive the risks associated with making loans to households and companies to have fallen. This sort of development is sometimes argued to be one of the reasons why bank lending expanded so much in the lead up to the financial crisis.⁽¹⁾ But if that perception of a less risky environment were unwarranted, the result could be a more fragile financial system.⁽²⁾ One of the responses to the crisis in the United Kingdom has been the creation of a macroprudential authority, the Financial Policy Committee, to identify, monitor and take action to reduce or remove risks which threaten the resilience of the financial system as a whole.⁽³⁾

(ii) Constraints arising from the response of households and companies

In addition to the range of constraints facing banks that act to limit money creation, the behaviour of households and companies *in response* to money creation by the banking sector can also be important, as argued by Tobin. The behaviour of the non-bank private sector influences the ultimate impact that credit creation by the banking sector has on the stock of money because more (or less) money may be created than they wish to hold relative to other assets (such as property or shares). As the households and companies who take out loans do so because they want to spend more, they will quickly pass that money on to others as they do so. How *those* households and companies then respond will determine the stock of money in the economy, and potentially have implications for spending and inflation.

There are two main possibilities for what could happen to newly created deposits. First, as suggested by Tobin, the money may quickly be destroyed if the households or companies receiving the money after the loan is spent wish to use it to repay their own outstanding bank loans. This is sometimes referred to as the 'reflex theory'.⁽⁴⁾ For example, a first-time house buyer may take out a mortgage to purchase a house from an elderly person who, in turn, repays their existing mortgage and moves in with their family. As discussed earlier, repaying bank loans destroys money just as making loans creates it. So, in this case, the balance sheet of consumers in the economy would be returned to the position it was in before the loan was made.

The second possible outcome is that the extra money creation by banks can lead to more spending in the economy. For newly created money to be destroyed, it needs to pass to households and companies with existing loans who want to repay them. But this will not always be the case, since asset and debt holdings tend to vary considerably across individuals

in the economy.⁽⁵⁾ Instead, the money may initially pass to households or companies with positive holdings of financial assets: the elderly person may have already paid off their mortgage, or a company receiving money as a payment may already have sufficient liquid assets to cover possible outgoings. They may then be left holding more money than they desire, and attempt to reduce their 'excess' money holdings by increasing their spending on goods and services. (In the case of a company it may instead buy other, higher-yielding, assets.)

These two scenarios for what happens to newly created money — being quickly destroyed or being passed on via spending — have very different implications for economic activity. In the latter, the money may continue to be passed between different households and companies each of whom may, in turn, increase their spending. This process — sometimes referred to as the 'hot potato' effect — can lead, other things equal, to increased inflationary pressure on the economy.⁽⁶⁾ In contrast, if the money is quickly destroyed as in the former scenario, there need be no further effects on the economy.

This section has so far discussed how the actions of banks, households and companies can affect the amount of money in the economy, and therefore inflationary pressure. But the ultimate determinant of monetary conditions in the economy is the monetary policy of the central bank.

(iii) Monetary policy — the ultimate constraint on money creation

One of the Bank of England's primary objectives is to ensure monetary stability by keeping consumer price inflation on track to meet the 2% target set by the Government. And, as discussed in the box on pages 22–23, over some periods of time, various measures of money have grown at a similar rate to nominal spending, which determines inflationary pressure in the economy in the medium term. So setting monetary policy appropriately to meet the inflation target should ultimately ensure a stable rate of credit and money creation consistent with meeting that target. This section explains the relationship between monetary policy and different types of money.

In normal times, the Monetary Policy Committee (MPC), like most of its equivalents in other countries, implements monetary policy by setting short-term interest rates, specifically by setting the interest rate paid on central bank reserves held by commercial banks. It is able to do so because

(1) See, for example, Haldane (2009).

(2) Tucker (2009) discusses the possibility of such 'risk illusion' in the financial system.

(3) Tucker, Hall and Pattani (2013) describe the new powers for macroprudential policymaking in the United Kingdom in the wake of the recent financial crisis.

(4) See Kaldor and Trevithick (1981).

(5) See Kamath *et al* (2011).

(6) This mechanism is explained in more detail in papers including Laidler (1984), Congdon (1992, 2005), Howells (1995), Laidler and Robson (1995), Bridges, Rossiter and Thomas (2011) and Bridges and Thomas (2012).

of the Bank's position as the monopoly provider of central bank money in the United Kingdom. And it is because there is demand for central bank money — the ultimate means of settlement for banks, the creators of broad money — that the price of reserves has a meaningful impact on other interest rates in the economy.

The interest rate that commercial banks can obtain on money placed at the central bank influences the rate at which they are willing to lend on similar terms in sterling money markets — the markets in which the Bank and commercial banks lend to each other and other financial institutions. The exact details of how the Bank uses its money market operations to implement monetary policy has varied over time, and central bank operating procedures today differ somewhat from country to country, as discussed in Clews, Salmon and Weeken (2010).⁽¹⁾ Changes in interbank interest rates then feed through to a wider range of interest rates in different markets and at different maturities, including the interest rates that banks charge borrowers for loans and offer savers for deposits.⁽²⁾ By influencing the price of credit in this way, monetary policy affects the creation of broad money.

This description of the relationship between monetary policy and money differs from the description in many introductory textbooks, where central banks determine the quantity of broad money via a 'money multiplier' by actively varying the quantity of reserves.⁽³⁾ In that view, central banks implement monetary policy by choosing the quantity of reserves. And, because there is assumed to be a stable ratio of broad money to base money, these reserves are then 'multiplied up' to a much greater change in bank deposits as banks increase lending and deposits.

Neither step in that story represents an accurate description of the relationship between money and monetary policy in the modern economy. **Central banks do not typically choose a quantity of reserves to bring about the desired short-term interest rate.**⁽⁴⁾ **Rather, they focus on prices — setting interest rates.**⁽⁵⁾ The Bank of England controls interest rates by supplying and remunerating reserves at its chosen policy rate. The supply of both reserves and currency (which together make up base money) is determined by banks' demand for reserves both for the settlement of payments and to meet demand for currency from their customers — demand that the central bank typically accommodates.

This demand for base money is therefore more likely to be a consequence rather than a cause of banks making loans and creating broad money. This is because banks' decisions to extend credit are based on the availability of profitable lending opportunities at any given point in time. The profitability of making a loan will depend on a number of factors, as discussed earlier. One of these is the cost of funds that banks face, which is closely related to the interest rate paid on reserves, the policy rate.

In contrast, the quantity of reserves already in the system does not constrain the creation of broad money through the act of lending.⁽⁶⁾ This leg of the money multiplier is sometimes motivated by appealing to central bank reserve requirements, whereby banks are obliged to hold a minimum amount of reserves equal to a fixed proportion of their holdings of deposits. But reserve requirements are not an important aspect of monetary policy frameworks in most advanced economies today.⁽⁷⁾

A looser stance of monetary policy is likely to increase the stock of broad money by reducing loan rates and increasing the volume of loans. And a larger stock of broad money, accompanied by an increased level of spending in the economy, may cause banks and customers to demand more reserves and currency.⁽⁸⁾ So, in reality, the theory of the money multiplier operates in the reverse way to that normally described.

QE — creating broad money directly with monetary policy

The previous section discussed how monetary policy can be seen as the ultimate *limit* to money creation by commercial banks. But commercial banks could alternatively create too little money to be consistent with the economy meeting the inflation target. In normal times, the MPC can respond by lowering the policy rate to encourage more lending and hence more money creation. But, in response to the financial crisis, the MPC cut Bank Rate to 0.5% — the so-called effective lower bound.

Once short-term interest rates reach the effective lower bound, it is not possible for the central bank to provide further stimulus to the economy by lowering the rate at which reserves are remunerated.⁽⁹⁾ One possible way of providing further monetary stimulus to the economy is through a programme of asset purchases (QE). Like reductions in Bank

(1) The framework for the Bank's operations in the sterling money markets is set out in the Bank's 'Red Book', available at www.bankofengland.co.uk/markets/Documents/money/publications/redbook.pdf. Recent developments in sterling money markets are discussed by Jackson and Sim (2013).

(2) Bank of England (1999) discusses the transmission mechanism of monetary policy in more detail.

(3) Benes and Kumhof (2012) discuss the money multiplier myth in more detail.

(4) As discussed by Disyatat (2008).

(5) Bindseil (2004) provides a detailed account of how monetary policy implementation works through short-term interest rates.

(6) Carpenter and Demiralp (2012) show that changes in quantities of reserves are unrelated to changes in quantities of loans in the United States.

(7) The Bank of England currently has no formal reserve requirements, for example. (It does require banks to hold a proportion of non-interest bearing 'cash ratio deposits' with the Bank for a subset of their liabilities. But the function of these cash ratio deposits is non-operational. Their sole purpose is to provide income for the Bank.) Bernanke (2007) discusses how reserve requirements now present less of a constraint than in the past in the United States.

(8) Kydland and Prescott (1990) found that broad money aggregates led the cycle, while base money aggregates tended to lag the cycle slightly.

(9) If the central bank were to lower interest rates significantly below zero, banks could swap their bank reserves into currency, which would pay a higher interest rate (of zero, or slightly less after taking into account the costs of storing currency). Or put another way, the demand for central bank reserves would disappear, so the central bank could no longer influence the economy by changing the price of those reserves.

The information content of different types of money and monetary aggregates

One of the Bank of England's primary objectives is to ensure monetary stability by keeping inflation on track to meet the Government's 2% target. Milton Friedman (1963) famously argued that 'inflation is always and everywhere a monetary phenomenon'. So changes in the money supply may contain valuable information about spending and inflationary pressure in the economy. Since money is essential for buying goods and services, it is likely to contain **corroborative information** about the *current* level of nominal spending in the economy. It may also provide **incremental information** about *future* movements in nominal spending, and so can be a useful indicator of future inflationary pressure. Finally, the behaviour of money may help to reveal the **nature of the monetary transmission mechanism**, especially when monetary policy is operated through 'quantitative easing' (QE).

In practice, a key difficulty is assessing which measures of money are the appropriate ones to look at for each of the different purposes. The Bank currently constructs a number of monetary aggregates and publishes a range of data that allow to be created, summarised in **Table 1**. **Chart A** shows some long-run historical time series of the growth of monetary aggregates compared with that of nominal spending in the economy.⁽¹⁾ Given the various changes in the UK monetary regime over the past 150 years, it is unlikely that a single monetary indicator perfectly captures both the corroborative and incremental information in money. The UK financial sector has also undergone various structural changes that need to be taken into account when considering the underlying link between money and spending. For example, during periods when the financial sector has grown relative to the rest of the economy (such as in the early 1980s and the 2000s), broad money has tended to grow persistently faster than nominal spending.

Narrower measures of money, such as notes and coin and sight deposits (accounts that can be withdrawn immediately without penalty) are, in principle, better corroborative indicators of spending, as these are likely to be the types of money used to carry out the majority of transactions in goods and services in the economy. The sum of notes and coin and sight deposits held by the non-bank private sector is sometimes known as zero maturity money or 'MZM'.⁽²⁾

Broader measures of money might be more appropriate as incremental indicators of future spending and more revealing about the nature of the transmission mechanism. M2, for example, additionally includes household time deposits such as savings accounts.⁽³⁾ And M4 is an even broader measure, including all sight and time deposits held by non-financial companies and non-bank financial companies. The main article describes how QE works by first increasing the deposits of financial companies. As these companies rebalance their

portfolios, asset prices are likely to increase and, with a lag, lead to an increase in households' and companies' spending. So monitoring broad money has been an important part of assessing the effectiveness of QE.⁽⁴⁾

A number of econometric studies have suggested that sectoral movements in broad money may also provide valuable incremental information about spending in the economy.⁽⁵⁾ For example, non-financial companies' deposits appear to be a leading indicator of business investment in the economy. One can also try and weight different types of narrow and broad money together using some metric of how much each type of money is used in transactions — known as a Divisia index.⁽⁶⁾ In practice, the interest paid on a given type of money is typically used as a weighting metric. That is because individuals and companies are only likely to hold money which earns a low interest rate relative to other financial instruments if it compensates them by providing greater transactions services.

Identifying the appropriate measurement of money has been complicated by the continued development of the financial sector. This has both expanded the range of instruments that might serve as money and the range of financial institutions that borrow from and deposit with the traditional banking system. For example, sale and repurchase agreements (known as repos) — where a company agrees to buy a security from a bank with agreement to sell it back later — are currently included in M4 since the claim held on the bank can be thought of as a secured deposit.

In addition, some economists have argued that a range of instruments that provide collateral for various types of borrowing and lending could also be included in a broader measure of money.⁽⁷⁾ Moreover, many of the non-bank institutions that hold deposits mainly intermediate between banks themselves. The deposits of these institutions, known as 'intermediate other financial corporations' (IOFCs), are likely to reflect activities within the banking system that are not directly related to spending in the economy.⁽⁸⁾ For this reason, the Bank's headline measure of broad money is M4^{ex}, which excludes IOFC deposits.

(1) These series involve splicing together current Bank of England data with historic data on monetary aggregates. A spreadsheet of the data is available at www.bankofengland.co.uk/publications/Documents/quarterlybulletin/2014/longrunmoneydata.xls.

(2) A narrower measure known as non-interest bearing M1 can also be constructed. This measure has become a less useful aggregate as most sight deposits now pay some form of interest. For example, during the financial crisis when interest rates fell close to zero, the growth of non-interest bearing M1 picked up markedly as the relative cost of holding a non-interest bearing deposit fell sharply compared to an interest-bearing one. Focusing on M1 would have given a misleading signal about the growth of nominal spending in the economy.

(3) M2 contains the non-bank private sector's holdings of notes and coin plus 'retail' deposits which are deposits that pay an advertised interest rate. Those will largely be deposits held by households but will also apply to some corporate deposits.

(4) See Bridges, Rossiter and Thomas (2011) and Butt *et al* (2012).

(5) See, for example, Astley and Haldane (1995), Thomas (1997a, b) and Brigden and Mizen (2004).

(6) See Hancock (2005), for example.

(7) See, for example, Singh (2013).

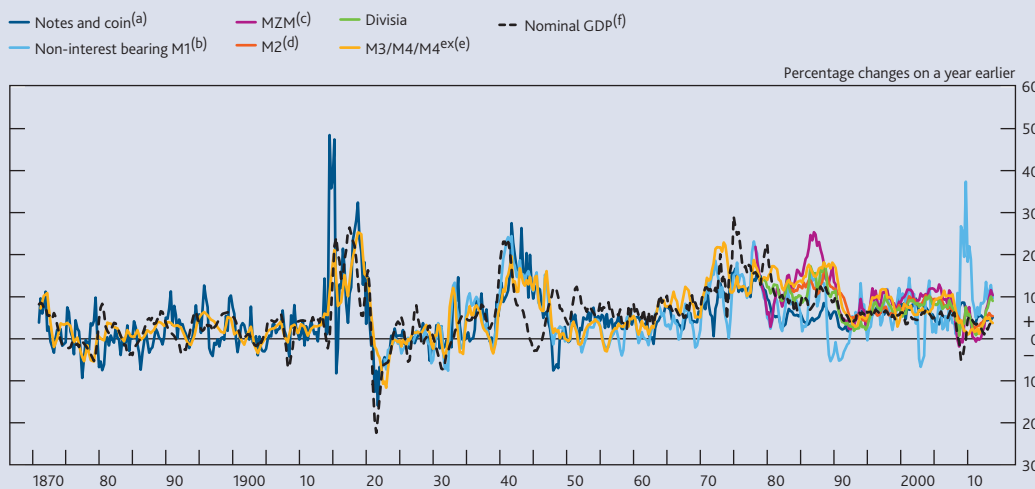
(8) See Burgess and Janssen (2007) and www.bankofengland.co.uk/statistics/Pages/iadb/notesiadb/m4adjusted.aspx for more detail.

Table 1 Popular monetary aggregates that can be constructed from available UK data^(a)

Name	Definition	Description ^(b)	Availability
Notes and coin	Notes and coin in circulation outside the Bank of England.	The narrowest measure of money and used as an indicator of cash-based transactions.	1870–present ^(c)
M0	Notes and coin plus central bank reserves.	Historically the base measure of money used in money multiplier calculations. Often used as an approximate measure of the size of the Bank of England’s balance sheet. <i>No longer published by the Bank of England but can be reconstructed.^(d)</i>	1870–present ^(c)
Non-interest bearing M1	Notes and coin plus non-interest bearing sight deposits held by the non-bank private sector.	An indicator of transactions in goods and services in the economy, less useful now since most sight deposits pay some form of interest. <i>Not published by the Bank of England but can be constructed from published components.</i>	1921–present ^(c)
MZM	Notes and coin plus all sight deposits held by the non-bank private sector.	An indicator of transactions in goods and services in the economy. <i>Not published by the Bank of England but can be constructed from published components. The Bank also produces a measure based on an ECB definition of M1.</i>	1977–present
M2 or retail M4	Notes and coin plus all retail deposits (including retail time deposits) held by the non-bank private sector.	A broader measure of money than MZM encompassing all retail deposits. The key additions are household time deposits and some corporate retail time deposits. <i>Published by the Bank of England. The Bank also produces a measure based on an ECB definition of M2.</i>	1982–present
M3	Notes and coin plus all sight and time deposits held with banks (excluding building societies) by the non-bank private sector.	Up until 1987 the headline broad monetary aggregate constructed by the Bank of England. <i>The Bank also produces a measure based on an ECB definition of M3.</i>	1870–1990 ^(c)
M4	Notes and coin, deposits, certificates of deposit, repos and securities with a maturity of less than five years held by the non-bank private sector.	Up until 2007 the headline broad monetary aggregate constructed by the Bank of England.	1963–present
M4 ^{ex}	M4 excluding the deposits of IOFCs.	Since 2007 the headline broad monetary aggregate constructed by the Bank of England.	1997–present
Divisia	A weighted sum of different types of money.	Aims to weight the component assets of broad money according to the transactions services they provide. ^(e)	1977–present

(a) All definitions refer to sterling instruments only. Some of the definitions in this table were changed at various points in time. For example the original M3 aggregate included public sector deposits and the non-bank private sector’s holdings of deposits in foreign currency. A more comprehensive history of the development of UK monetary aggregates can be found at www.bankofengland.co.uk/statistics/Documents/ms/articles/art2jul03.pdf.
 (b) Published by the Bank of England unless otherwise stated.
 (c) This series uses the data constructed by Capie and Webber (1985).
 (d) Data on M0 were discontinued following reforms to the Bank of England’s money market operations in 2006. See www.bankofengland.co.uk/statistics/Documents/ms/articles/artjun06.pdf for more details.
 (e) The Divisia indices for other financial corporations and for the non-bank private sector were discontinued in 2013. See www.bankofengland.co.uk/statistics/Documents/ms/articles/art1aug13.pdf for more details.

Chart A Different monetary aggregates and nominal spending



Sources: Bank of England, Capie and Webber (1985), Mitchell (1988), ONS, Sefton and Weale (1995), Solomou and Weale (1991) and Bank calculations. All series seasonally adjusted and break-adjusted where possible. Historical data seasonally adjusted using X12.

(a) 1969 Q2 to 2013 Q4 — notes and coin in circulation. 1870 Q1 to 1969 Q2 — M0 from Capie and Webber (1985).
 (b) 1977 Q1 to 2013 Q4 — notes and coin held by the non-bank and building society private sector plus non-interest bearing deposits. Prior to 2008 Q1, excludes deposits with building societies. 1963 Q1 to 1977 Q1 — historical M1 data from *Bank of England Quarterly Bulletins*. 1921 Q4 to 1963 Q1 — Capie and Webber (1985).
 (c) Notes and coin held by the non-bank and building society private sector plus total sight deposits. Prior to 1998 Q4 excludes deposits with building societies.
 (d) Notes and coin and retail deposits held by the non-bank and building society private sector.
 (e) 1997 Q4 to 2013 Q4 — M4 excluding intermediate OFCs. 1963 Q1 to 1997 Q4 — M4. 1870 Q2 to 1963 Q1 — M3 from Capie and Webber (1985).
 (f) Composite estimate of nominal GDP at market prices. See appendix of Hills, Thomas and Dimsdale (2010) for details.

Rate, asset purchases are a way in which the MPC can loosen the stance of monetary policy in order to stimulate economic activity and meet its inflation target. But the role of money in the two policies is not the same.

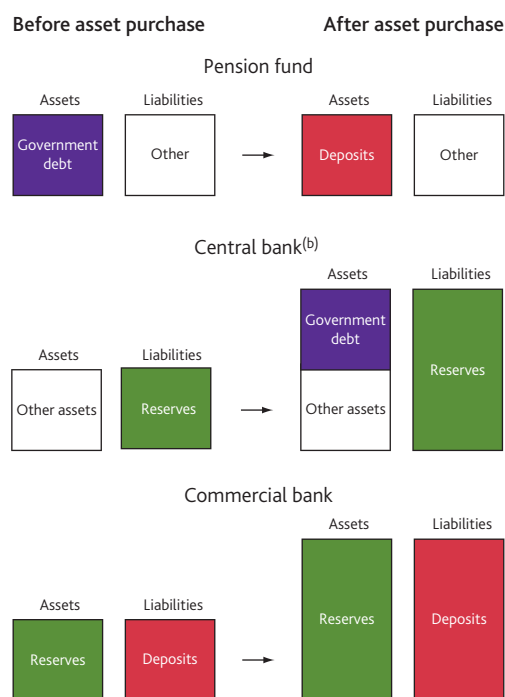
QE involves a shift in the focus of monetary policy to the quantity of money: the central bank purchases a quantity of assets, financed by the creation of broad money and a corresponding increase in the amount of central bank reserves. The sellers of the assets will be left holding the newly created deposits in place of government bonds. They will be likely to be holding more money than they would like, relative to other assets that they wish to hold. They will therefore want to rebalance their portfolios, for example by using the new deposits to buy higher-yielding assets such as bonds and shares issued by companies — leading to the ‘hot potato’ effect discussed earlier. This will raise the value of those assets and lower the cost to companies of raising funds in these markets. That, in turn, should lead to higher spending in the economy.⁽¹⁾ The way in which QE works therefore differs from two common misconceptions about central bank asset purchases: that QE involves giving banks ‘free money’; and that the key aim of QE is to increase bank lending by providing more reserves to the banking system, as might be described by the money multiplier theory. This section explains the relationship between money and QE and dispels these misconceptions.

The link between QE and quantities of money

QE has a direct effect on the quantities of both base and broad money because of the way in which the Bank carries out its asset purchases. The policy aims to buy assets, government bonds, mainly from non-bank financial companies, such as pension funds or insurance companies. Consider, for example, the purchase of £1 billion of government bonds from a pension fund. One way in which the Bank could carry out the purchase would be to print £1 billion of banknotes and swap these directly with the pension fund. But transacting in such large quantities of banknotes is impractical. These sorts of transactions are therefore carried out using electronic forms of money.

As the pension fund does not hold a reserves account with the Bank of England, the commercial bank with whom they hold a bank account is used as an intermediary. The pension fund’s bank credits the pension fund’s account with £1 billion of deposits in exchange for the government bonds. This is shown in the first panel of **Figure 3**. The Bank of England finances its purchase by crediting reserves to the pension fund’s bank — it gives the commercial bank an IOU (second row). The commercial bank’s balance sheet expands: new deposit liabilities are matched with an asset in the form of new reserves (third row).

Figure 3 Impact of QE on balance sheets^(a)



(a) Balance sheets are highly stylised for ease of exposition: quantities of assets and liabilities shown do not correspond to the quantities actually held by those sectors. The figure only shows assets and liabilities relevant to the transaction.

(b) Government debt is actually purchased by the Bank of England’s Asset Purchase Facility using a loan from the Bank of England, so does not actually appear directly on the Bank’s official consolidated balance sheet.

Two misconceptions about how QE works

Why the extra reserves are not ‘free money’ for banks

While the central bank’s asset purchases involve — and affect — commercial banks’ balance sheets, the primary role of those banks is as an *intermediary* to facilitate the transaction between the central bank and the pension fund. The additional reserves shown in **Figure 3** are simply a by-product of this transaction. It is sometimes argued that, because they are assets held by commercial banks that earn interest, these reserves represent ‘free money’ for banks. While banks do earn interest on the newly created reserves, QE also creates an accompanying liability for the bank in the form of the pension fund’s deposit, which the bank will itself typically have to pay interest on. In other words, QE leaves banks with both a new IOU *from* the central bank but also a new, equally sized IOU *to* consumers (in this case, the pension fund), and the interest rates on both of these depend on Bank Rate.

Why the extra reserves are not multiplied up into new loans and broad money

As discussed earlier, the transmission mechanism of QE relies on the effects of the newly created broad — rather than base — money. The start of that transmission is the creation of

(1) The ways in which QE affects the economy are covered in more detail in Benford *et al* (2009), Joyce, Tong and Woods (2011) and Bowdler and Radia (2012). The role of money more specifically is described in Bridges, Rossiter and Thomas (2011), Bridges and Thomas (2012) and Butt *et al* (2012).

bank deposits on the asset holder's balance sheet in the place of government debt (Figure 3, first row). Importantly, the reserves created in the banking sector (Figure 3, third row) do not play a central role. This is because, as explained earlier, banks cannot directly lend out reserves. Reserves are an IOU from the central bank to commercial banks. Those banks can use them to make payments to each other, but they cannot 'lend' them on to consumers in the economy, who do not hold reserves accounts. When banks make additional loans they are matched by extra deposits — the amount of reserves does not change.

Moreover, the new reserves are not mechanically multiplied up into new loans and new deposits as predicted by the money multiplier theory. QE boosts broad money without directly leading to, or requiring, an increase in lending. While the first leg of the money multiplier theory does hold during QE — the monetary stance mechanically determines the quantity of reserves — the newly created reserves do not, by themselves, meaningfully change the incentives for the banks to create new broad money by lending. It is possible that QE might indirectly affect the incentives facing banks to make new loans, for example by reducing their funding costs, or by increasing the quantity of credit by boosting activity.⁽¹⁾ But equally, QE could lead to companies repaying bank credit, if they were to issue more bonds or equity and use those funds

to repay bank loans. On balance, it is therefore possible for QE to increase or to reduce the amount of bank lending in the economy. However these channels were not expected to be key parts of its transmission: instead, QE works by circumventing the banking sector, aiming to increase private sector spending directly.⁽²⁾

Conclusion

This article has discussed how money is created in the modern economy. Most of the money in circulation is created, not by the printing presses of the Bank of England, but by the commercial banks themselves: banks create money whenever they lend to someone in the economy or buy an asset from consumers. And in contrast to descriptions found in some textbooks, the Bank of England does not directly control the quantity of either base or broad money. The Bank of England is nevertheless still able to influence the amount of money in the economy. It does so in normal times by setting monetary policy — through the interest rate that it pays on reserves held by commercial banks with the Bank of England. More recently, though, with Bank Rate constrained by the effective lower bound, the Bank of England's asset purchase programme has sought to raise the quantity of broad money in circulation. This in turn affects the prices and quantities of a range of assets in the economy, including money.

(1) A similar mechanism whereby QE could increase bank lending by enabling banks to attract more stable funding is discussed in Miles (2012).

(2) These channels, along with the effect of QE on bank lending more broadly, are discussed in detail in a box in Butt *et al* (2012).

References

- Astley, M and Haldane, A (1995)**, 'Money as an indicator', *Bank of England Working Paper No. 35*.
- Bank of England (1999)**, 'The transmission mechanism of monetary policy', available at www.bankofengland.co.uk/publications/Documents/other/monetary/montrans.pdf.
- Benes, J and Kumhof, M (2012)**, 'The Chicago Plan revisited', *IMF Working Paper No. 12/202*.
- Benford, J, Berry, S, Nikolov, K, Robson, M and Young, C (2009)**, 'Quantitative easing', *Bank of England Quarterly Bulletin*, Vol. 49, No. 2, pages 90–100.
- Bernanke, B (2007)**, 'The financial accelerator and the credit channel', speech at a conference on The Credit Channel of Monetary Policy in the Twenty-first Century, Federal Reserve Bank of Atlanta.
- Bindseil, U (2004)**, 'The operational target of monetary policy and the rise and fall of the reserve position doctrine', *ECB Working Paper No. 372*.
- Bowdler, C and Radia, A (2012)**, 'Unconventional monetary policy: the assessment', *Oxford Review of Economic Policy*, Vol. 28, No. 4, pages 603–21.
- Bridges, J, Rossiter, N and Thomas, R (2011)**, 'Understanding the recent weakness in broad money growth', *Bank of England Quarterly Bulletin*, Vol. 51, No. 1, pages 22–35.
- Bridges, J and Thomas, R (2012)**, 'The impact of QE on the UK economy — some supportive monetarist arithmetic', *Bank of England Working Paper No. 442*.
- Brigden, A and Mizen, P (2004)**, 'Money, credit and investment in the UK industrial and commercial companies sector', *The Manchester School*, Vol. 72, No. 1, pages 72–79.
- Burgess, S and Janssen, N (2007)**, 'Proposals to modify the measurement of broad money in the United Kingdom: a user consultation', *Bank of England Quarterly Bulletin*, Vol. 47, No. 3, pages 402–14.
- Butt, N, Domit, S, Kirkham, L, McLeay, M and Thomas, R (2012)**, 'What can the money data tell us about the impact of QE?', *Bank of England Quarterly Bulletin*, Vol. 52, No. 4, pages 321–31.
- Button, R, Pezzini, S and Rossiter, N (2010)**, 'Understanding the price of new lending to households', *Bank of England Quarterly Bulletin*, Vol. 50, No. 3, pages 172–82.
- Capie, F and Webber, A (1985)**, *A monetary history of the United Kingdom, 1870–1982*, Vol. 1, Routledge.
- Carpenter, S and Demiralp, S (2012)**, 'Money, reserves, and the transmission of monetary policy: does the money multiplier exist?', *Journal of Macroeconomics*, Vol. 34, No. 1, pages 59–75.
- Clews, R, Salmon, C and Weeken, O (2010)**, 'The Bank's money market framework', *Bank of England Quarterly Bulletin*, Vol. 50, No. 4, pages 292–301.
- Congdon, T (1992)**, *Reflections on monetarism*, Clarendon Press.
- Congdon, T (2005)**, 'Money and asset prices in boom and bust', Institute of Economic Affairs, *Hobart Paper No. 152*.
- Disyatat, P (2008)**, 'Monetary policy implementation: misconceptions and their consequences', *BIS Working Paper No. 269*.
- Farag, M, Harland, D and Nixon, D (2013)**, 'Bank capital and liquidity', *Bank of England Quarterly Bulletin*, Vol. 53, No. 3, pages 201–15.
- Friedman, M (1963)**, *Inflation: causes and consequences*, Asia Publishing House.
- Haldane, A (2009)**, 'Why banks failed the stress test', available at www.bankofengland.co.uk/archive/documents/historicpubs/speeches/2009/speech374.pdf.
- Hancock, M (2005)**, 'Divisia money', *Bank of England Quarterly Bulletin*, Spring, pages 39–46.
- Hills, S, Thomas, R and Dimsdale, N (2010)**, 'The UK recession in context — what do three centuries of data tell us?', *Bank of England Quarterly Bulletin*, Vol. 50, No. 4, pages 277–91.
- Howells, P (1995)**, 'The demand for endogenous money', *Journal of Post Keynesian Economics*, Vol. 18, No. 1, pages 89–106.
- Jackson, C and Sim, M (2013)**, 'Recent developments in the sterling overnight money market', *Bank of England Quarterly Bulletin*, Vol. 53, No. 3, pages 223–32.
- Joyce, M, Tong, M and Woods, R (2011)**, 'The United Kingdom's quantitative easing policy: design, operation and impact', *Bank of England Quarterly Bulletin*, Vol. 51, No. 3, pages 200–12.
- Kaldor, N and Trevithick, J (1981)**, 'A Keynesian perspective on money', *Lloyds Bank Review*, January, pages 1–19.
- Kamath, K, Reinold, K, Nielsen, M and Radia, A (2011)**, 'The financial position of British households: evidence from the 2011 NMG Consulting survey', *Bank of England Quarterly Bulletin*, Vol. 51, No. 4, pages 305–18.
- Kydland, F and Prescott, E (1990)**, 'Business cycles: real facts and a monetary myth', *Federal Reserve Bank of Minneapolis Quarterly Review*, Vol. 14, No. 2, pages 3–18.
- Laidler, D (1984)**, 'The buffer stock notion in monetary economics', *The Economic Journal*, Vol. 94, Supplement: Conference Papers, pages 17–34.

Laidler, D and Robson, W (1995), 'Endogenous buffer-stock money', Credit, interest rate spreads and the monetary policy transmission mechanism, Session 3, conference on The Transmission of Monetary Policy held at the Bank of Canada in November 1994.

Miles, D (2012), 'Asset prices, saving and the wider effects of monetary policy', available at www.bankofengland.co.uk/publications/Documents/speeches/2012/speech549.pdf.

Mitchell, B R (1988), *British historical statistics*, Cambridge University Press.

Moore, B (1988), *Horizontalists and verticalists: the macroeconomics of credit money*, Cambridge University Press.

Palley, T (1996), *Post Keynesian economics: debt, distribution and the macro economy*, Macmillan.

Sefton, J and Weale, M (1995), *Reconciliation of National Income and Expenditure: balanced estimates of national income for the United Kingdom, 1920–1990*, Cambridge University Press.

Singh, M (2013), 'Collateral and monetary policy', *IMF Working Paper No. 13/186*.

Solomou, S N and Weale, M (1991), 'Balanced estimates of UK GDP 1870–1913', *Explorations in Economic History*, Vol. 28, No. 1, pages 54–63.

Thomas, R (1997a), 'The demand for M4: a sectoral analysis, Part 1 — the personal sector', *Bank of England Working Paper No. 61*.

Thomas, R (1997b), 'The demand for M4: a sectoral analysis, Part 2 — the corporate sector', *Bank of England Working Paper No. 62*.

Tobin, J (1963), 'Commercial banks as creators of 'money'', *Cowles Foundation Discussion Papers No. 159*.

Tucker, P (2009), 'The debate on financial system resilience: macroprudential instruments', available at www.bankofengland.co.uk/archive/Documents/historicpubs/speeches/2009/speech407.pdf.

Tucker, P, Hall, S and Pattani, A (2013), 'Macroprudential policy at the Bank of England', *Bank of England Quarterly Bulletin*, Vol. 53, No. 3, pages 192–200.