

# Quarterly Bulletin

2014 Q1 | Volume 54 No. 1



BANK OF ENGLAND







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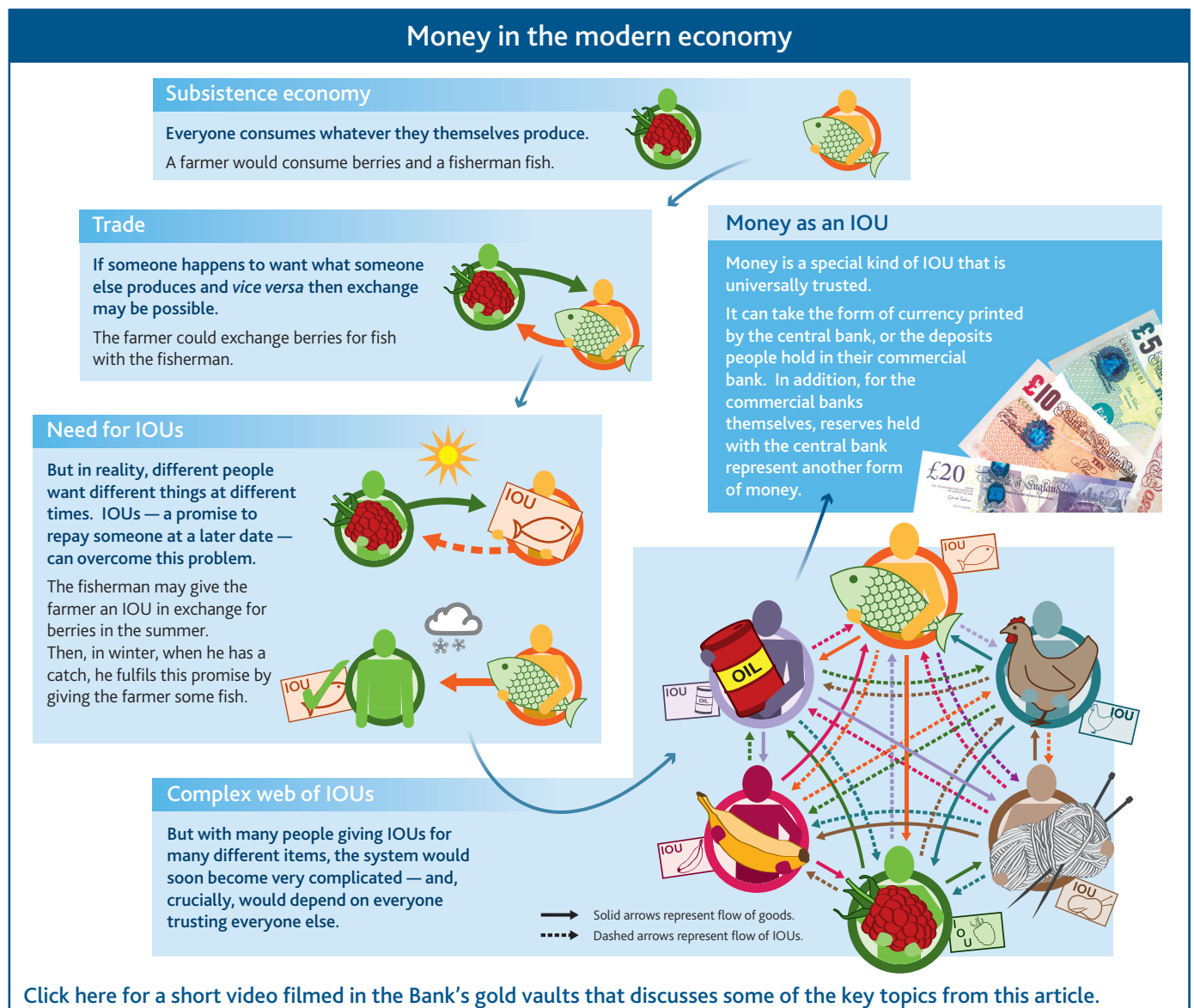
# Topical articles



# Money in the modern economy: an introduction

By Michael McLeay, Amar Radia and Ryland Thomas of the Bank's Monetary Analysis Directorate.<sup>(1)</sup>

- Money is essential to the workings of a modern economy, but its nature has varied substantially over time. This article provides an introduction to what money is today.
- Money today is a type of IOU, but one that is special because everyone in the economy trusts that it will be accepted by other people in exchange for goods and services.
- There are three main types of money: currency, bank deposits and central bank reserves. Each represents an IOU from one sector of the economy to another. Most money in the modern economy is in the form of bank deposits, which are created by commercial banks themselves.



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

Most people in the world use some form of money on a daily basis to buy or sell goods and services, to pay or get paid, or to write or settle contracts. Money is central to the workings of a modern economy. But despite its importance and widespread use, there is not universal agreement on what money actually is. That is partly because what has constituted money has varied over time and from place to place.

This article provides an introduction to the role of money in the modern economy. It does not assume any prior knowledge of economics before reading. The article begins by explaining the concept of money and what makes it special. It then sets out what counts as money in a modern economy such as the United Kingdom, where 97% of the money held by the public is in the form of deposits with banks, rather than currency.<sup>(1)</sup> It describes the different types of money, where they get their value from and how they are created. A box briefly outlines some recent developments in payment technologies. A companion piece to this *Bulletin* article, 'Money creation in the modern economy',<sup>(2)</sup> describes the process of money creation in more detail, and discusses the role of monetary policy and the central bank in that process. For expository purposes this article concentrates on the United Kingdom, but the issues discussed are equally relevant to most economies today. A short video explains some of the key topics covered in this article.<sup>(3)</sup>

## What counts as money?

Many different goods or assets have been used as money at some time or in some place. **Goods** are things that are valued because they satisfy people's needs or wants, such as food, clothes or books. An **asset**, such as machinery, is something that is valuable because it can be used to produce other goods or services. So which goods or assets should be described as money? One common way of defining money is through the functions it performs. This approach traditionally suggests that money should fulfil three important roles.

The first role of money is to be a **store of value** — something that is expected to retain its value in a reasonably predictable way over time. Gold or silver that was mined hundreds of years ago would still be valuable today. But perishable food would quickly become worthless as it goes bad. So gold or silver are good stores of value, but perishable food much less so.

Money's second role is to be a **unit of account** — the thing that goods and services are priced in terms of, for example on menus, contracts or price labels. In modern economies the unit of account is usually a currency, for example, the pound in the United Kingdom, but it could be a type of good instead. In the past, items would often be priced in terms of something

very common, such as staple foods ('bushels of wheat') or farm animals.

Third, money must be a **medium of exchange** — something that people hold because they plan to swap it for something else, rather than because they want the good itself. For example, in some prisoner of war camps during the Second World War, cigarettes became the medium of exchange in the absence of money.<sup>(4)</sup> Even non-smokers would have been willing to exchange things for cigarettes; not because they planned to smoke the cigarettes, but because they would later be able to swap them for something that they did want.

These functions are all closely linked to each other. For example, an asset is less useful as the medium of exchange if it will not be worth as much tomorrow — that is, if it is not a good store of value. Indeed, in several countries where the traditional currency has become a poor store of value due to very high rates of price inflation, or hyperinflation, foreign currencies have come to be used as an alternative medium of exchange. For example, in the five years after the end of the First World War, prices of goods in German marks doubled 38 times — meaning that something that cost one mark in 1918 would have cost over 300 billion marks in 1923.<sup>(5)</sup> As a result, some people in Germany at the time began to use other currencies to buy and sell things instead. To make sure sterling does not lose its usefulness in exchange, one of the Bank of England's objectives is to safeguard the value of the currency. Although the medium of exchange needs to be a good store of value, there are many good stores of value that are not good media of exchange.<sup>(6)</sup> Houses, for example, tend to remain valuable over quite long periods of time, but cannot be easily passed around as payment.

Similarly, it is usually efficient for the medium of exchange in the economy to also be the unit of account.<sup>(7)</sup> If UK shops priced items in US dollars, while still accepting payment only in sterling, customers would have to know the sterling-dollar exchange rate every time they wanted to buy something. This would take time and effort on the part of the customers. So in most countries today shops price in terms of whatever currency is the medium of exchange: pounds sterling in the United Kingdom.<sup>(8)</sup>

(1) As of December 2013. Throughout this article 'banks' and 'commercial banks' are used to refer to banks and building societies together.

(2) See pages 14–27 in this *Bulletin*.

(3) See [www.youtube.com/watch?v=ziTE32hiWdk](http://www.youtube.com/watch?v=ziTE32hiWdk).

(4) See Radford (1945).

(5) See Sargent (1982).

(6) See Ostroy and Starr (1990).

(7) Brunner and Meltzer (1971) give a detailed exposition of how using an asset as the unit of account can support its use as the medium of exchange.

(8) This has not always been true in many countries, and in some places today there are still separate media of exchange and units of account for some transactions. Doepke and Schneider (2013) give several examples.

Historically, the role of money as the medium of exchange has often been viewed as its most important function by economists.<sup>(1)</sup> Adam Smith, one of the founding fathers of the discipline of economics and the current portrait on the £20 note, saw money as an essential part of moving from a **subsistence economy**, or autarky, to an **exchange economy**. In a subsistence economy, everyone consumes only what they produce. For example, Robinson Crusoe, stranded alone on a desert island, has no need for money as he just eats the berries he gathers and the animals he hunts.<sup>(2)</sup> But it is more efficient for people to specialise in production, producing greater amounts of one good than they need themselves and then trading with one another. If Robinson Crusoe is a natural forager, for instance, then he could focus his effort on picking berries, while his friend Man Friday, a skilled fisherman, could devote all of his time to fishing. The two could then trade with one another and each consume more berries and fish than if each of them had split his time between picking berries and catching fish.<sup>(3)</sup>

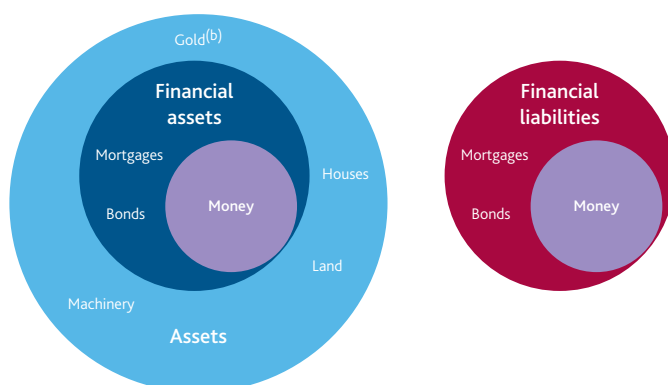
### Money is an IOU

While Robinson Crusoe and Man Friday could simply swap berries for fish — without using money — the exchanges that people in the modern economy wish to carry out are far more complicated. Large numbers of people are involved.<sup>(4)</sup> And — crucially — the timing of these exchanges is not typically coincident. Just as people do not always want to consume the same type of goods they have produced themselves, they do not always want to consume them *at the same time* that they produce them. Robinson Crusoe may gather a large amount of berries during summer, when they are in season, while Man Friday may not catch many fish until autumn. In the modern economy, young people want to borrow to buy houses; older people to save for retirement; and workers prefer to spend their monthly wage gradually over the month, rather than all on payday. These patterns of demand mean some people wish to borrow and others wish to hold claims — or IOUs — to be repaid by someone else at a later point in time. **Money in the modern economy is just a special form of IOU, or in the language of economic accounts, a financial asset.**

To understand money as a financial asset, it is helpful to first consider the wide range of different types of asset that people hold (individually or as companies). Some of these assets are shown in **Figure 1**. Non-financial assets such as capital (for example machinery), land and houses are shown in light blue. Each non-financial asset can produce goods and services for its owners. For instance, machinery and land can be used to make products or food; houses provide people with the service of shelter and comfort; and gold can be made into forms that people desire, such as jewellery.

It is possible for some of these non-financial assets (or even the goods that they produce) to serve some of the functions

**Figure 1** Money and other assets and liabilities<sup>(a)</sup>



- (a) Figure is highly stylised for ease of exposition: the quantities of each asset/liability shown do not correspond to the actual quantities in the economy.  
 (b) By statistical convention, some holdings of gold (such as by the government) are classed as a financial asset rather than a non-financial asset in economic accounts.

of money. When goods or assets that would be valuable for other purposes are used as money, they are known as **commodity money**. For instance, Adam Smith described how 'iron was the common instrument of commerce among the ancient Spartans' and 'copper among the ancient Romans'.<sup>(5)</sup> Many societies have also used gold as commodity money. The use of commodities which are valuable in their own right as money can help people to have confidence that they will be able to exchange them for other goods in future. But since these commodities have other uses — in construction, say, or as jewellery — there is a cost to using them as money.<sup>(6)</sup> So in the modern economy, money is instead a financial asset.

Financial assets are simply claims on someone else in the economy — an IOU to a person, company, bank or government. A financial asset can be created by owners of non-financial assets. For example, a landowner might decide to lease some of his or her land to a farmer in return for some of the future harvests. The landowner would have less land than before, but would instead have a financial asset — a claim on future goods (food) produced by the farmer using the asset (land). In reality, however, most financial assets are actually claims on other financial assets. Most people considering buying a bond of a company (a type of IOU from the company to the bondholder), such as a farm, would not want to be repaid with food. Instead, contracts such as bonds usually state that the bondholder is owed a certain amount of money, which the farm can get by selling its food.

(1) The historical origins of money are a matter of considerable debate. See Chapter 1 of Manning, Nier and Schanz (2009) for a discussion.

(2) Robinson Crusoe was a fictional character in an 18th century novel by Daniel Defoe, who was shipwrecked on an island.

(3) Smith (1766) described how 'in a nation of hunters, if anyone has a talent for making bows and arrows better than his neighbours he will at first make presents of them, and in return get presents of their game'.

(4) As Smith (1776) noted, 'when the division of labour first began to take place, this power of exchanging must have been very much clogged and embarrassed in its operations'.

(5) Smith (1776).

(6) The next section discusses other disadvantages of using commodities as money or linking money to commodities.



Because financial assets are claims on someone else in the economy, they are also financial liabilities — one person's financial asset is always someone else's debt. So the size of the financial liabilities in a closed economy is equal to the size of the financial assets, as depicted in Figure 1.<sup>(1)</sup> If a person takes out a mortgage, they acquire the obligation to pay their bank a sum of money over time — a liability — and the bank acquires the right to receive those payments — an asset of the same size.<sup>(2)</sup> Or if they own a company bond, they have an asset but the company has an equally sized liability. In contrast, non-financial assets are not claims on anyone else. If someone owns a house or some gold, there is no corresponding person indebted by that amount — so there are no non-financial liabilities. If everyone in the economy were to pool all of their assets and debts together as one, all of the financial assets and liabilities — including money — would cancel out, leaving only the non-financial assets.

### Why money is special

In principle, there might be no need for a special financial asset such as money to keep track of who is owed goods and services. Everyone in the economy could instead create their own financial assets and liabilities by giving out IOUs every time they wanted to purchase something, and then mark down in a ledger whether they were in debt or credit in IOUs overall. Indeed, in medieval Europe merchants would often deal with one another by issuing IOUs. And merchant houses would periodically settle their claims on one another at fairs, largely by cancelling out debts.<sup>(3)</sup> But such systems rely on everyone being confident that everyone else is completely trustworthy.<sup>(4)</sup> Otherwise, people would worry that some of the IOUs they were holding might be from people who would not pay them back when they came to redeem them. Even if they trusted everyone who they had lent to directly, they may worry that those people held IOUs from untrustworthy people, and therefore would not be able to repay their own IOUs.

Money is a *social institution* that provides a solution to the problem of a lack of trust.<sup>(5)</sup> It is useful in exchange because it is a special kind of IOU: in particular, **money in the modern economy is an IOU that everyone in the economy trusts**. Because everyone trusts in money, they are happy to accept it in exchange for goods and services — it can become universally acceptable as the medium of exchange. Only certain types of IOU can obtain that status. For example, if a type of IOU is not widely trusted to be repaid, it is less likely to be acceptable in exchange — and less like money. The next section of the article explains what types of IOU function as money in the modern economy, and how those particular IOUs became trusted enough to be universally acceptable in exchange.

## Different types of money

The previous section explained that although many goods or assets can fulfil some of the functions of money, money today is a special type of IOU. To understand that further, it is useful to consider some of the different types of money that circulate in a modern economy — each type representing IOUs between different groups of people. All of these types of money, along with various other commonly used terms related to money are set out in a glossary (Table A) at the end of the article. For this article, the economy is split into three main groups: the central bank (in the United Kingdom, the Bank of England); the commercial banks (for example, high street banks such as Barclays and Lloyds); and the remaining private sector of households and companies, hereon referred to as 'consumers'.

Economic commentators and academics often pay close attention to the amount of 'broad money' circulating in the economy. This can be thought of as the money that consumers have available for transactions, and comprises: **currency** (banknotes and coin) — an IOU from the central bank, mostly to consumers in the economy; and **bank deposits** — an IOU from commercial banks to consumers.<sup>(6)</sup> Broad money is a useful concept because it measures the amount of money held by those responsible for spending decisions in the economy — households and companies. A box in the companion article explains what information different measures of money can reveal about the economy.

A different definition of money, often called 'base money' or 'central bank money', comprises IOUs from the central bank: this includes **currency** (an IOU to consumers) but also **central bank reserves**, which are IOUs from the central bank to commercial banks. Base money is important because it is by virtue of their position as the only issuer of base money that central banks can implement monetary policy.<sup>(7)</sup> The companion article explains how the Bank of England varies the interest rate paid on reserves to affect spending and

(1) A closed economy, such as Robinson Crusoe's desert island, is an economy that does not conduct any exchanges with outside economies.

(2) Note that the sum the mortgagor has to pay back over time will typically be greater than the amount they originally borrowed. That is because borrowers will usually have to pay interest on their liabilities, to compensate the lender for the inconvenience of holding an IOU that will only be repaid at a later date.

(3) Medieval fairs and their economic significance are discussed in more detail in Braudel (1982).

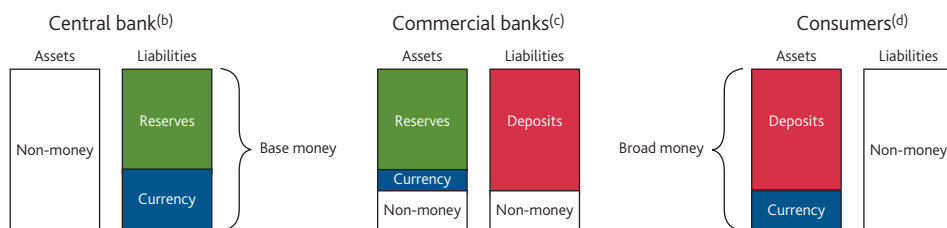
(4) The importance of a lack of trust as a necessary condition for the existence of money is emphasised in papers by Kiyotaki and Moore (2001, 2002), who famously argue that 'evil is the root of all money'. Kocherlakota (1998) points out that a lack of a record of all transactions is another necessary condition. Earlier work by Brunner and Meltzer (1971) and King and Plosser (1986) also argues that there must be some impediment to stop a credit system being used instead of money.

(5) King (2006) provides a detailed account of money as a social institution.

(6) The definition of broad money used by the Bank of England, M4<sup>ex</sup>, 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.

(7) Some Scottish and Northern Irish commercial banks are also allowed to issue their own banknotes, but to do so they must also hold an equal amount of Bank of England banknotes or reserves deposited at the Bank of England, meaning their issuance does not change the amount of base money. Notes held at the Bank may include £1 million notes (Giants) and £100 million notes (Titans).

**Figure 2** Stylised balance sheets of different types of money holders and issuers in the economy<sup>(a)</sup>



- (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 matching assets. In practice the central bank holds other non-money liabilities. Its non-money assets are mostly made up of government debt. Although that government debt is held by the Bank of England's Asset Purchase Facility, so does not appear directly on the Bank of England's consolidated balance sheet.  
 (c) Commercial banks' non-money assets would include government debt and non-money liabilities would include long-term debt and equity.  
 (d) Consumers represent the private sector of households and companies. Balance sheet only shows broad money assets and corresponding liabilities. Consumers' non-money liabilities would include secured and unsecured loans.

inflation in the economy, along with the amounts of the different types of money.

### Who owes who? Mapping out the IOUs

Drawing a **balance sheet** is a useful way to map out the IOUs of different people to each other. As discussed previously, each IOU is a **financial liability** for one person, matched by a **financial asset** for someone else. Then, for any individual, their balance sheet simply adds together, on one side, all of their assets — their IOUs *from* other people and their non-financial assets; and on the other, all of their liabilities (or debt) — their IOUs *to* other people.<sup>(1)</sup>

You can add together the individuals in each group to get a consolidated balance sheet, which shows the IOUs of that group to the other groups in the economy.<sup>(2)</sup> **Figure 2** shows a stylised balance sheet of assets and liabilities for each of the three groups in the economy. The different types of money are each shown in a different colour: currency in blue, bank deposits in red and central bank reserves in green. Broad money is therefore represented by the sum of the red and the blue assets held by consumers, whereas base money is the sum of all of the blue and the green assets. (Note that the balance sheets are not drawn to scale — in reality the amount of broad money is greater than the amount of base money.) Each type of money features on the balance sheets of at least two different groups, because each is an asset of one group and a liability of another. There are also lots of other assets and liabilities which do not fulfil the functions of money (everything except the lilac circles in **Figure 1**); some of these are shown in white in **Figure 2**. For example, consumers hold loans such as mortgages, which are liabilities of the consumer and assets of the consumer's bank.

The rest of this section discusses each of the three types of money in more detail, explaining why it is valued and briefly describing how it is created.<sup>(3)</sup> A box on page 9 briefly outlines some recent developments in payment technologies and alternative currencies that have led to the creation of different instruments that have some similarities with money.

### (i) Fiat currency — banknotes and coin

#### What is it?

**Currency** is made up mostly of **banknotes** (around 94% of the total by value as of December 2013), most of which are an IOU from the Bank of England to the rest of the economy.<sup>(4)</sup> Currency is mostly held by consumers, although commercial banks also hold small amounts in order to meet deposit withdrawals. As stated in their inscription, banknotes are a 'promise to pay' the holder of the note, on demand, a specified sum (for example £5). This makes banknotes a liability of the Bank of England and an asset of their holders, shown in blue on their balance sheets in **Figure 2**.

When the Bank of England was founded in 1694, its first banknotes were convertible into gold. The process of issuing 'notes' that were convertible into gold had started earlier than this, when goldsmith-bankers began storing gold coins for customers. The goldsmiths would give out receipts for the coins, and those receipts soon started to circulate as a kind of money. The Bank of England would exchange gold for its banknotes in a similar way — it stood ready to swap its notes back into gold on demand. Other than a few short periods, that was how currency worked for most of the next 250 years — the 'gold standard'.<sup>(5)</sup> But the Bank permanently abandoned offering gold in return for notes in 1931 so that Britain could better manage its economy during the Great Depression, as discussed below.

Since 1931, Bank of England money has been fiat money. **Fiat or 'paper' money is money that is not convertible to any other asset (such as gold or other commodities).**

- (1) As a convention total assets and liabilities must balance. If assets are greater than debt, the difference is defined as that asset holder's equity capital. For example, a consumer with no debt would have equity equal to the value of their assets. For an introduction to capital in the context of banks, see Farag, Harland and Nixon (2013).  
 (2) Debts to other individuals within the group are cancelled out, leaving only IOUs to and from other groups.  
 (3) Ryan-Collins *et al* (2011) provide a detailed introductory account of where money comes from.  
 (4) The remaining roughly 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.  
 (5) There were several periods, particularly during wars, when the Bank temporarily stopped exchanging gold for notes. HM Treasury also issued notes at the outbreak of the First World War — these 'Treasury Notes' could be converted to coins and remained in circulation until 1928.

## Recent developments in payment technologies and alternative currencies

The recent past has seen a wave of innovation in payment technologies and alternative currencies. This box briefly outlines some of these developments, focusing on how they relate to the concept of money discussed in the main article. Overall, while they perform — to a varying extent — some of the functions of money, at present they are not typically accepted as a medium of exchange to the same extent that currency, central bank reserves or bank deposits are.

One set of innovations allows households and businesses to convert bank deposits into other, purely electronic forms of money (sometimes referred to as 'e-money') that can be used to carry out transactions. These technologies aim to improve the process of making payments. Examples include PayPal and Google Wallet. Just as it may be more convenient to carry out transactions using bank deposits rather than banknotes, for some transactions it may also be more convenient to use money in an e-money account rather than banknotes or bank deposits. These forms of money have some similar features to bank deposits. For example, money in an e-money account represents a store of value so long as the companies providing it are seen as trustworthy. E-money can also be used as a medium of exchange with businesses (such as online sellers) or individuals that accept it. However, it is still not as widely accepted as other media of exchange, for instance, it is not generally accepted by high street shops. Transactions using these technologies are also typically denominated in the existing unit of account (pounds sterling in the United Kingdom).

Another set of innovations have served to introduce a new unit of account. These schemes aim to encourage economic

activity within a defined environment, and include local currencies, such as the Bristol, Brixton or Lewes Pounds in the United Kingdom.<sup>(1)</sup> Local currencies are discussed in detail in a previous *Bulletin* article (Naqvi and Southgate (2013)). These forms of money can be obtained in exchange for currency at fixed rates: for example, one pound sterling can be swapped for one Bristol Pound. Local currency can then be exchanged for goods and services that can be priced in their own unit of account — Brixton Pounds rather than pounds sterling. As a result their use as a medium of exchange is intentionally limited. For example, the Lewes Pound can only be used at participating retailers, which must be located in the Lewes area.

A further category of innovations is digital currencies, such as Bitcoin, Litecoin and Ripple. The key difference between these and local currencies is that the exchange rate between digital currencies and other currencies is not fixed. Digital currencies are not at present widely used as a medium of exchange. Instead, their popularity largely derives from their ability to serve as an asset class. As such they may have more conceptual similarities to commodities, such as gold, than money. Digital currencies also differ from the other technologies discussed so far in this box because they can be created out of nothing, albeit at pre-determined rates. In contrast, local currencies come into circulation only when exchanged for pounds sterling. While the amount of money held in e-money accounts or local currencies depends entirely on demand, the supply of digital currencies is typically limited.

(1) While local, or complementary, currencies are not a new innovation, they have only recently become adopted by a number of UK areas. See Naqvi and Southgate (2013) for more details.

Because fiat money is accepted by everyone in the economy as the medium of exchange, although the Bank of England is in debt to the holder of its money, that debt can only be repaid in more fiat money. The Bank of England promises to honour its debt by exchanging banknotes, including those no longer in use, for others of the same value forever. For example, even after its withdrawal on 30 April 2014, the £50 note featuring Sir John Houblon will still be swapped by the Bank for the newer £50 note, which features Matthew Boulton and James Watt.

### Why do people use it?

Fiat money offers advantages over linking money to gold when it comes to managing the economy. With fiat money, changes in the demand for money by the public can be matched by changes in the amount of money available to them. When the amount of money is linked to a commodity, such as gold, this

places a limit on how much money there can be, since there is a limit to how much gold can be mined. And that limit is often not appropriate for the smooth functioning of the economy.<sup>(1)</sup> For example, abandoning the gold standard in 1931 allowed Britain to regain more control of the amount of money in the economy. The United Kingdom was able to reduce the value of its currency relative to other countries still linking their currency to gold (and this was accompanied by an increased amount of money in circulation), which some economic historians argue helped Britain avoid facing as deep a recession as many other countries around the world in the 1930s.<sup>(2)</sup>

(1) There could also be too much creation of money in periods where the amount of that commodity grows quickly. In the 16th century, Spain experienced a prolonged period of higher inflation after it imported large amounts of gold and silver from the Americas.

(2) Temin (1989) and Eichengreen (1992) conduct detailed analysis of countries' economic performance under the gold standard and during the Great Depression.

Although there are advantages to using fiat money for the *economy as a whole*, these may not be realised unless *individuals* decide they want to use it in exchange. And, if banknotes are not directly convertible into a real good of some kind, what makes them universally acceptable in exchange? One answer is that the trusted medium of exchange just emerges over time as a result of a social or historical convention. There are many such conventions that emerge in society. For example, motorists in the United Kingdom drive on the left-hand side of the road, and this convention began when enough drivers became confident that most others would do the same.<sup>(1)</sup> But equally the convention could have become driving on the right, as it did in many other countries.

In the case of money, however, the state has generally played a role in its evolution.<sup>(2)</sup> To be comfortable holding currency, people need to know that at some point someone would be prepared to exchange those notes for a real good or service, which the state can help guarantee. One way it can do this is to make sure that there will always be demand for the currency by accepting it as tax payments. The government can also influence that demand somewhat by deeming that currency represents 'legal tender'.<sup>(3)</sup>

Even if the state does underpin the use of currency in this way, that by itself does not ensure that people will (or are legally bound to) use it. They need to trust that their banknotes are valuable, which means that it is important that banknotes are difficult to counterfeit.<sup>(4)</sup> They also need to have faith that the value of their banknotes will remain broadly stable over time if they are to hold them as a store of value and be able to use them as a medium of exchange. This generally means the state must ensure a low and stable rate of inflation.

Since abandoning the gold standard in 1931, various other ways of keeping the value of money stable have been tried, with differing degrees of success. For example, in the 1980s, policy aimed to keep the rate at which the amount of broad money in the economy was growing stable over time.<sup>(5)</sup> Since 1992, the Bank has had an inflation target for consumer prices. The inflation target means that the Bank is committed to aiming to keep the value of money relatively stable in terms of the number of goods and services it can buy. So instead of being confident that their banknotes will be worth a certain amount of gold, people can expect that they will be worth a stable amount of real products from one year to the next.

### How is it created?

The Bank of England makes sure it creates enough banknotes to meet the public's demand for them. The Bank first arranges the printing of new banknotes by a commercial printer. It then swaps them with commercial banks for old banknotes — those

which are no longer fit to be used or are part of a series that has been withdrawn. These old notes are then destroyed by the Bank.

The demand for banknotes has also generally increased over time. To meet this extra demand, the Bank also issues banknotes over and above those needed to replace old banknotes.<sup>(6)</sup> The extra newly issued notes are bought by the commercial banks from the Bank of England. The commercial banks pay for the new currency, a paper IOU of the Bank of England, by swapping it for some of their other, electronic IOUs of the Bank — central bank reserves. The size of their balance sheets in **Figure 2** would be unchanged, but the split between the green and blue components would be altered.<sup>(7)</sup>

## (ii) Bank deposits

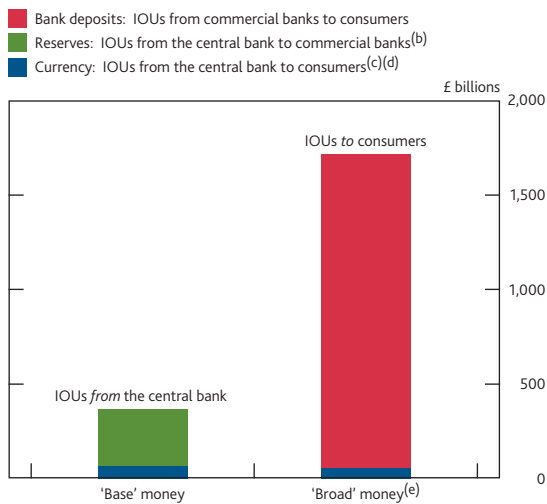
### What are they?

**Currency only accounts for a very small amount of the money held by people and firms in the economy. The rest consists of deposits with banks**, as shown in **Chart 1**. For security reasons, consumers generally do not want to store all of their assets as physical banknotes. Moreover, currency does not pay interest, making it less attractive to hold than other assets, such as bank deposits, that do. For these reasons, consumers prefer to mostly hold an alternative medium of exchange — **bank deposits**, shown in red in **Figure 2**. Bank deposits can come in many different forms, for example current accounts or savings accounts held by consumers or some types of bank bonds purchased by investors. In the modern economy these tend to be recorded electronically. For simplicity, this article focuses on households' and firms' deposits with banks, as these most clearly function as money.

### Why do people use them?

When a consumer makes a deposit of his or her banknotes with a bank, they are simply swapping a Bank of England IOU for a commercial bank IOU. The commercial bank gets

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- (1) Young (1998) explains that these conventions were largely formed in Europe when people still drove horse-drawn carriages, rather than cars. They were then later enshrined in law, guaranteeing that people would follow the convention.
  - (2) Goodhart (1998) argues that historical evidence suggests the state was crucial in the development of money as a medium of exchange. He contrasts that view with the position of Menger (1892), who proposes a more natural evolution.
  - (3) For example, Bank of England banknotes are the only notes that are legal tender in England and Wales. But that legal tender status only has a narrow meaning relating to the repayment of debts. In ordinary transactions it has little practical application, since whether a currency is used as the medium of exchange depends only on whether there is agreement between the two parties carrying out the exchange.
  - (4) For information on current security features and education materials, see [www.bankofengland.co.uk/banknotes/Pages/educational.aspx](http://www.bankofengland.co.uk/banknotes/Pages/educational.aspx).
  - (5) See Cairncross (1995) or Wood (2005) for detailed histories of monetary policy regimes in the United Kingdom.
  - (6) See Allen and Dent (2010) for a full description of the Note Circulation Scheme.
  - (7) As shown in **Figure 2**, Bank of England currency is matched on the other side of the central bank's balance sheet by non-money assets, which in normal times were typically sterling money market instruments or government bonds. These assets pay interest, while currency does not. The income from those assets (after deducting the Bank's costs of issuing notes) is paid to HM Treasury, and is known as 'seigniorage'.

**Chart 1** Amounts of money in circulation<sup>(a)</sup>

- (a) All data are for December 2013.  
 (b) Reserves balances at the Bank of England held by banks and building societies, non seasonally adjusted. Data are measured as the monthly average of weekly data.  
 (c) Currency in base money includes notes and coin in circulation outside the Bank of England, including those in banks' and building societies' tills. Data are measured as the monthly average of weekly data.  
 (d) Currency in broad money includes only those notes and coins held by the non-bank private sector, measured as the month-end position.  
 (e) M4 excluding intermediate other financial corporations.

extra banknotes but in return it credits the consumer's account by the amount deposited. Consumers only swap their currency for bank deposits because they are confident that they could always be repaid. Banks therefore need to ensure that they can always obtain sufficient amounts of currency to meet the expected demand from depositors for repayment of their IOUs. For most household depositors, these deposits are guaranteed up to a certain value, to ensure that customers remain confident in them.<sup>(1)</sup> This ensures that bank deposits are trusted to be easily convertible into currency and can act as a medium of exchange in its place.

In the modern economy, bank deposits are often the default type of money. Most people now receive payment of their salary in bank deposits rather than currency. And rather than swapping those deposits back into currency, many consumers use them as a store of value and, increasingly, as the medium of exchange. For example, when a consumer pays a shop by debit card, the banking sector reduces the amount it owes to that consumer — the consumer's deposits are reduced — while increasing the amount it owes to the shop — the shop's deposits are increased. The consumer has used the deposits directly as the medium of exchange without having to convert them into currency.

### How are they created?

Unlike currency, which is created by the Bank of England, **bank deposits are mostly created by commercial banks themselves.** Although the stock of bank deposits increases whenever someone pays banknotes into their account, the amount of bank deposits is also reduced any time anyone makes a withdrawal. Moreover, as **Chart 1** shows, the

amount of currency is very small compared to the amount of bank deposits. Far more important for the creation of bank deposits is the act of making new loans by banks. When a bank makes a loan to one of its customers it simply credits the customer's account with a higher deposit balance. At that instant, new money is created.

Banks can create new money because bank deposits are just IOUs of the bank; banks' ability to create IOUs is no different to anyone else in the economy. When the bank makes a loan, the borrower has also created an IOU of their own to the bank. The only difference is that for the reasons discussed earlier, the bank's IOU (the deposit) is widely accepted as a medium of exchange — it is money. Commercial banks' ability to create money is not without limit, though. The amount of money they can create is influenced by a range of factors, not least the monetary, financial stability and regulatory policies of the Bank of England. These limits, and the money creation process more generally, are discussed in detail in the companion piece to this article.

### (iii) Central bank reserves

Commercial banks need to hold some currency to meet frequent deposit withdrawals and other outflows. But to use physical banknotes to carry out the large volume of transactions they do with each other would be extremely cumbersome. So banks are allowed to hold a different type of IOU from the Bank of England, known as **central bank reserves** and shown in green in **Figure 2**. Bank of England reserves are just an electronic record of the amount owed by the central bank to each individual bank.

Reserves are a useful medium of exchange for banks, just as deposits are for households and companies. Indeed, reserves accounts at the central bank can be thought of as playing a similar role for commercial banks as current accounts serve for households or firms. If one bank wants to make a payment to another — as they do every day, on a large scale, when customers make transactions — they will tell the Bank of England who will then adjust their reserves balances accordingly. The Bank of England also guarantees that any amount of reserves can be swapped for currency should the commercial banks need it. For example, if lots of households wanted to convert their deposits into banknotes, commercial banks could swap their reserves for currency to repay those households. As discussed earlier, as the issuer of currency, the Bank of England can make sure there is always enough of it to meet such demand.

<sup>(1)</sup> The Financial Services Compensation Scheme offers protection for retail deposits up to £85,000 per depositor per Prudential Regulation Authority authorised institution. For more information see [www.fscs.org.uk](http://www.fscs.org.uk).

## Conclusion

This article has introduced what money means and the different types of money that exist in a modern economy. Money today is a form of debt, but a special kind of debt that is accepted as the medium of exchange in the economy. And

most of that money takes the form of bank deposits, which are created by commercial banks themselves. A companion piece to this article, 'Money creation in the modern economy', describes the process of money creation by commercial banks in more detail.

**Table A** Glossary of different types of money and different names for money<sup>(a)</sup>

Name	Description	Also known as
Bank deposits	Type of IOU from a commercial bank to a person or company.	Inside money (if not matched by outside money on bank balance sheets).
Base money	<b>Central bank reserves + currency.</b>	Monetary base. Central bank money. Outside money (in the United Kingdom). High-powered money. M0.
Broad money	<b>Currency</b> held by the private sector (other than banks) + <b>bank deposits</b> (and other similar short-term liabilities of commercial banks to the rest of the private sector).	M4 <sup>ex</sup> (headline measure of broad money used by the Bank of England — excludes the deposits of certain financial institutions, known as intermediate other financial corporations (IOFCs), in order to provide a measure of money more relevant for spending in the economy). M4 (includes the deposits of IOFCs). M3 (older definition that did not include building society deposits).
Central bank reserves	Type of IOU from the central bank to a commercial bank.	
Commodity money	A commodity with intrinsic value of its own that is used as money because it fulfils the main functions — such as gold coins.	
Currency	Type of IOU (in paper banknote or coin form), largely from the central bank to the holder of the note.	Notes and coin.
Fiat money	Money that is irredeemable — it is only a claim on further fiat money.	

(a) A box in 'Money creation in the modern economy' explains how different measures of money are useful in understanding the economy.

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# Money creation in the modern economy

By Michael McLeay, Amar Radia and Ryland Thomas of the Bank's Monetary Analysis Directorate.<sup>(1)</sup>

- 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.<sup>(1)</sup> 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.<sup>(2)</sup>

## 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.<sup>(3)</sup>

**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.<sup>(4)(5)</sup> Of the two types of broad money, bank deposits make up the vast majority — 97% of the amount currently in circulation.<sup>(6)</sup> **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](http://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.<sup>(1)</sup>

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.

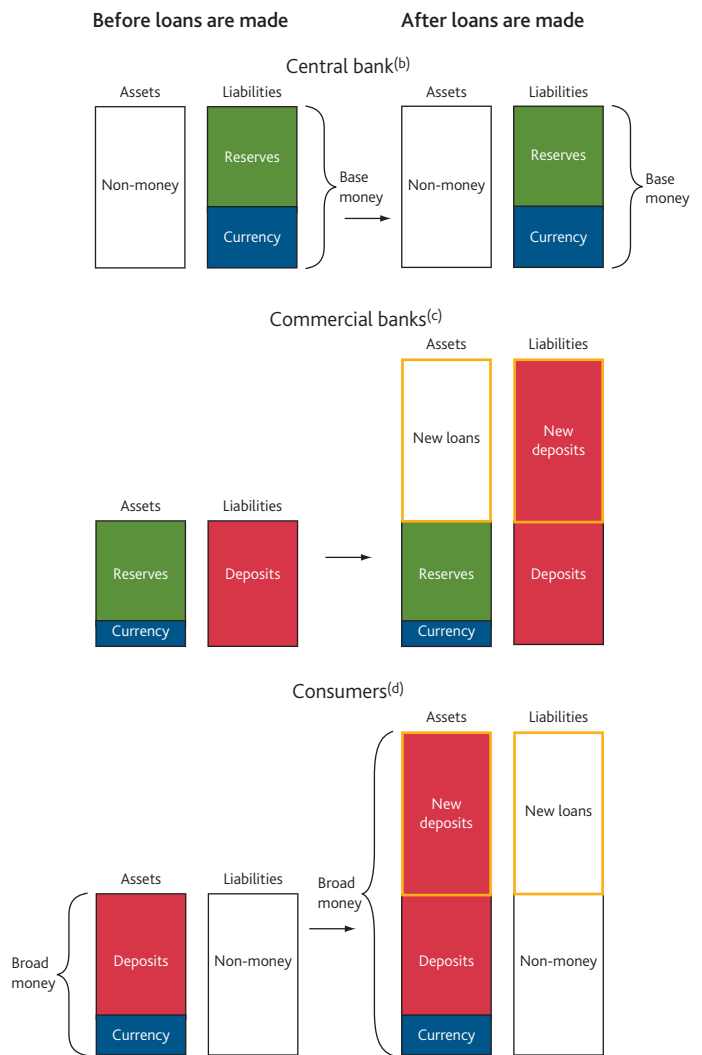
While new broad money has been created on the consumer’s balance sheet, the first row of **Figure 1** shows that this is without — in the first instance, at least — any change in the amount of central bank money or ‘base money’. As discussed earlier, the higher stock of deposits may mean that banks want, 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.<sup>(2)</sup>

### Other ways of creating and destroying deposits

Just as taking out a new loan creates money, the repayment of bank loans destroys money.<sup>(3)</sup> 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<sup>(a)</sup>



- (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.<sup>(1)</sup> When banks purchase government bonds from the non-bank private sector they credit the sellers with bank deposits.<sup>(2)</sup> 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.<sup>(3)</sup>

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.<sup>(4)</sup> 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.<sup>(1)</sup> 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*

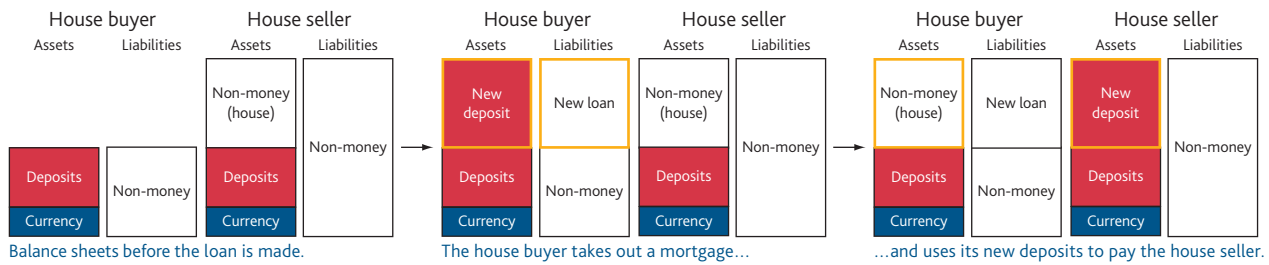
Banks also need to manage the risks associated with making new loans. One way in which they do this is by making sure that they attract relatively *stable* deposits to match their new loans, that is, deposits that are unlikely or unable to be withdrawn in large amounts. This can act as an additional 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.<sup>(2)</sup> 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.

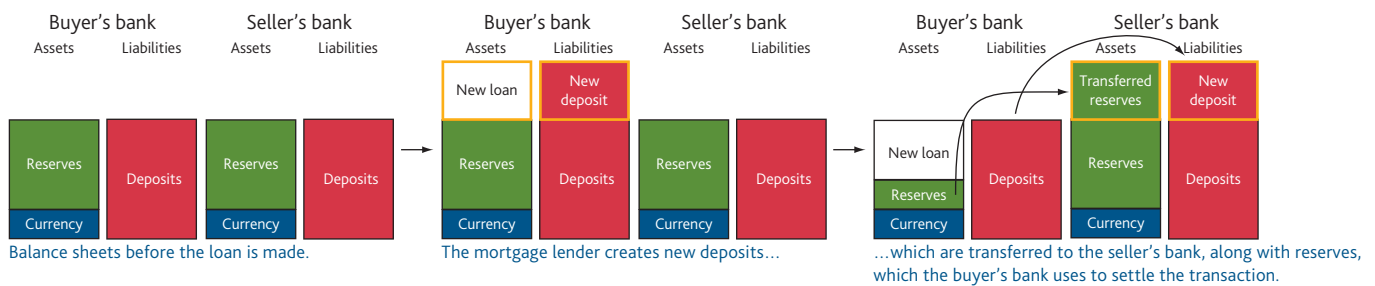
(2) Banks also guard against liquidity risk by holding liquid assets (including reserves and currency), which either can be used directly to cover outflows, or if not can quickly and cheaply be converted into assets that can. Although if banks purchase liquid assets such as government bonds from non-banks,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

**Figure 2** Money creation for an individual bank making an additional loan<sup>(a)</sup>

**Changes to the balance sheets of the house buyer and seller**

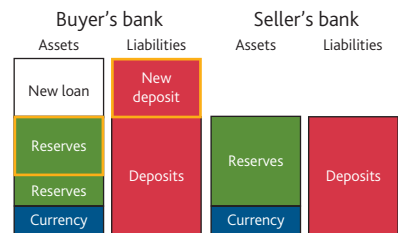


**Changes to the balance sheets of the house buyer and seller's banks**



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.<sup>(1)</sup> But if that perception of a less risky environment were unwarranted, the result could be a more fragile financial system.<sup>(2)</sup> 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.<sup>(3)</sup>

### (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'.<sup>(4)</sup> 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.<sup>(5)</sup> 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.<sup>(6)</sup> 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).<sup>(1)</sup> 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.<sup>(2)</sup> 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.<sup>(3)</sup> 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.**<sup>(4)</sup> **Rather, they focus on prices — setting interest rates.**<sup>(5)</sup> 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.<sup>(6)</sup> 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.<sup>(7)</sup>

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.<sup>(8)</sup> 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.<sup>(9)</sup> 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](http://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.<sup>(1)</sup> 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'.<sup>(2)</sup>

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.<sup>(3)</sup> 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.<sup>(4)</sup>

A number of econometric studies have suggested that sectoral movements in broad money may also provide valuable incremental information about spending in the economy.<sup>(5)</sup> 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.<sup>(6)</sup> 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.<sup>(7)</sup> 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.<sup>(8)</sup> For this reason, the Bank's headline measure of broad money is M4<sup>ex</sup>, which excludes IOFC deposits.

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- (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](http://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](http://www.bankofengland.co.uk/statistics/Pages/iadb/notesiadb/m4adjusted.aspx) for more detail.

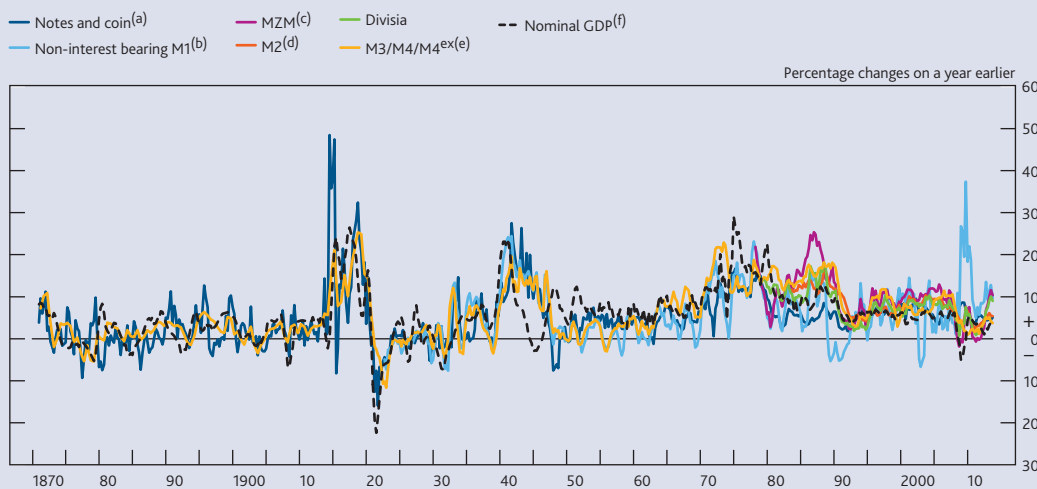


**Table 1** Popular monetary aggregates that can be constructed from available UK data<sup>(a)</sup>

Name	Definition	Description <sup>(b)</sup>	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 <sup>(c)</sup>
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.<sup>(d)</sup></i>	1870–present <sup>(c)</sup>
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 <sup>(c)</sup>
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 <sup>(c)</sup>
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 <sup>ex</sup>	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. <sup>(e)</sup>	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](http://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](http://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](http://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.

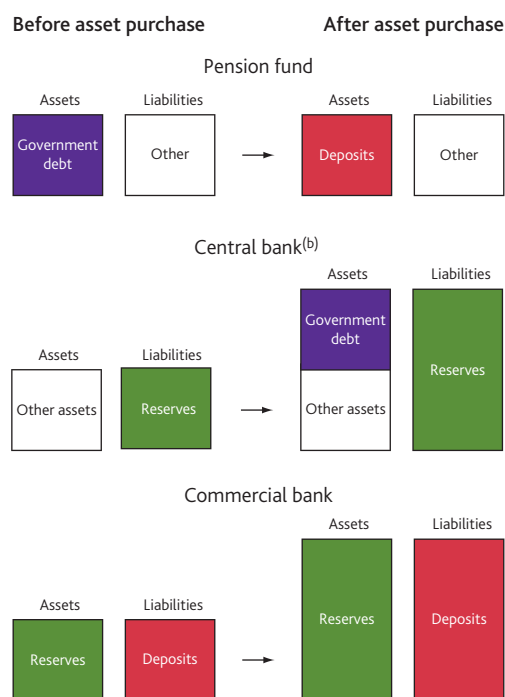
QE involves a shift in the focus of monetary policy to the quantity of money: the central bank purchases a quantity of assets, financed by the creation of broad money and a corresponding increase in the amount of central bank reserves. The sellers of the assets will be left holding the newly created 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.<sup>(1)</sup> 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<sup>(a)</sup>



(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.<sup>(1)</sup> 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.<sup>(2)</sup>

## 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.

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(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).

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# The Court of the Bank of England

By Sir David Lees and John Footman.<sup>(1)</sup>

- The Court is the Bank's Board of Directors. Its role has changed over the years as the Bank has evolved from a privately owned bank into a public institution, and especially over the past 20 years.
- In statute, Court's task is to 'manage the affairs of the Bank'. It sets the Bank's strategy and budget and risk standards, and oversees internal controls through its Audit and Risk Committee.
- Court also monitors the processes and performance of the Bank's key policy Committees — the Monetary Policy Committee, the Financial Policy Committee and the Board of the Prudential Regulation Authority. This role is performed by the nine non-executives, who sit on an Oversight Committee created by the 2012 Financial Services Act.

The Court is the Bank's Board of Directors. There is no particular mystery in the term: 'Court' is (among other things) a word used to describe a formal assembly, and the few public companies formed at the time of the Bank's foundation, in 1694, tended to be governed by Courts of Directors. When the Bank had private shareholders — as it did until 1946 — they would meet as the 'Court of Proprietors'.<sup>(2)</sup>

While keeping its name, the Court has evolved over time and particularly over the past 20 years. As a company, the Bank was created by a Royal Charter — 'to promote the publick Good and Benefit of our People'<sup>(3)</sup> — rather than under the Companies Act, but its governance arrangements have been reformed by successive Acts of Parliament and by conscious application of corporate best practice. The present Court has most of the characteristics of a company Board, though with the obvious qualification that its success is not measured by profits, dividends or balance sheet size, but by the delivery of the Bank's policy objectives.

## Early history

The Court in 1694 consisted of 24 Directors, a Governor and a Deputy Governor: the diarist John Evelyn asserted that the new corporation had been put 'under the Government of the most able and wealthy citizens of London'.<sup>(4)</sup> As is clear from the Court records of the period,<sup>(5)</sup> the Bank's earliest years were an active and to a degree perilous period of the Bank's existence. To keep its Charter and privileges, and its role as the Government's banker and debt manager, the Bank had to meet the Government's extensive credit needs while at the same time establishing and maintaining the highest credit rating for itself.<sup>(6)</sup> The Directors took a close interest in the quality of

advances. For many years afterwards — in fact up until 1914 — a Court 'Committee of Daily Waiting' scrutinised the Bank's day-to-day business and took the key decisions about advances and discounts. Monitoring the risk in the Bank's balance sheet — which has increased to around £400 billion since the recent financial crisis — remains a key function of the modern Court's Audit and Risk Committee.

By the 19th century, the Bank and its Court had established a more settled pattern. The Bank's continuance was assured by Peel's 1844 Act, and the same Act embedded the gold standard as the monetary system in operation in the United Kingdom. The Bank finally gained a monopoly of note issue,<sup>(7)</sup> but the profit was to be accounted for separately from the rest of the Bank and paid to the Treasury. Over time, the private proprietors became less significant — and by the turn of the century the Bank was conducting itself in most respects as a public policy institution. At the same time, the role of the Governor became more significant. A Bank memorandum of 1894 described the Governor as 'supreme over every department and over the whole machinery by which the business of the Bank was carried on'. He would however be expected to consult the Committee of Treasury — a

(1) Sir David Lees has been Chairman of Court since 2009. John Footman is the Secretary of the Bank. The authors would like to thank Sharon Hughes, Hannah Reynolds and Laurence Smith for their help in producing this article.

(2) Since 1946 the Proprietor has been the Treasury Solicitor.

(3) Preamble to 1694 Charter, see [www.bankofengland.co.uk/about/documents/legislation/1694charter.pdf](http://www.bankofengland.co.uk/about/documents/legislation/1694charter.pdf).

(4) See Roberts and Kynaston (1995). The list of initial subscribers to Bank stock was a roll-call of the City's most influential citizens.

(5) The Minutes of Court from 1694–1912 are published by the Bank at [www.bankofengland.co.uk/archive/Pages/digitalcontent/archivedocs/courtminutes.aspx](http://www.bankofengland.co.uk/archive/Pages/digitalcontent/archivedocs/courtminutes.aspx).

(6) Charters were granted for relatively short periods, and renewal depended on the Bank's willingness to extend or arrange further credit to the Government. See Broz and Grossman (2004).

(7) Though only in England and Wales.

Committee of the Court's senior members — where time allowed; and to 'bring before the Court all such matters as, in his view, they should be acquainted with'.<sup>(1)</sup>

The Directors may have been non-executive but the modern *Corporate Governance Code*<sup>(2)</sup> would certainly not see them as independent. As Walter Bagehot described in *Lombard Street* (see the box on page 30), the Court provided a talent pool for future Governors and an experience pool of previous incumbents. Directors, after a suitable apprenticeship, served two-year terms as Deputy Governor and then Governor, and subsequently remained on Court, which thus became a repository of immense though perhaps narrow experience. Thomson Hankey, a Governor in 1852–53, was still a Director 40 years later.<sup>(3)</sup>

### Reforms after Cunliffe and under Norman

The pattern described by Bagehot was broken in the early 20th century, when Lord Cunliffe served for seven years followed shortly afterwards by Lord Norman, who served in the end for 24 years, from 1920 until 1944. Cunliffe is remembered now mainly for his high-handed approach to the Treasury,<sup>(4)</sup> but he plainly upset the Court as well, and a Committee chaired by Lord Revelstoke<sup>(5)</sup> proposed a number of reforms, which were implemented after Cunliffe's departure. The changes included appointment of a 'Comptroller' — what we might now call a Chief Operating Officer — and, in relation to Court, a retirement age and a requirement on the Governor to consult the Committee of Treasury on all matters of importance.

Under Norman there were further changes. Norman had always been convinced of the need for a group of full-time professionals on the Court, and Deputy Governors appointed from 1929 onwards were full-time and, in the sense that they served in that role for more than the conventional two-year term, permanent. With this practice embedded, the role of the 'Comptroller' ceased.<sup>(6)</sup> More radically, following the Peacock Report of 1932,<sup>(7)</sup> the Court introduced Executive Directors — full-time paid directors — of whom seven were appointed between 1932 and 1938.<sup>(8)</sup> Among the non-executive directors, Norman introduced more industrialists to balance the City merchants; and on the staff, a number of professional advisers.

### Nationalisation

Institutionally, Norman's long Governorship was a constructive period for the Bank. But it also sowed the seeds for nationalisation. The gold standard, reintroduced in 1925, was abandoned in 1931, and the Treasury took the gold and foreign exchange reserves into its own Exchange Equalisation Account, for which the Bank was Agent. During this period it became increasingly the convention to seek the Chancellor's acquiescence in a Bank Rate change. The Governor retained great influence, in the City and internationally, but the levers

of monetary policy were now held elsewhere. And active use of monetary policy became rare — Bank Rate, with one short break in August 1939, stood at 2% from 1932–51. 'I am an Instrument of the Treasury' remarked Norman, late in his Governorship.<sup>(9)</sup>

So when the Bank was nationalised in 1946, the Government found it sufficient to acquire the privately held stock, to take a statutory power to appoint the Court of the Bank — including Governors — and, for good measure, to take a power to direct the Bank. There was no attempt to define the Bank's objectives or functions, as had been common in other countries' central bank statutes.<sup>(10)</sup> Whatever the Bank might be, it was enough at the time for the Government to have control of its policy. Nationalisation caused almost no disturbance in the Bank's management and organisation.<sup>(11)</sup>

### The post-1946 Court

In the 1946 Act and Charter Amendment, the Court was reduced from 26 to 18 members: a Governor, a Deputy Governor, and 16 Directors, up to four of whom could be executive. Initially the pattern of appointments remained much as in Norman's time: merchant bankers, industrialists and (usually) a trade unionist. Increasingly, however, the Executive Directors were appointed from the Bank's staff rather than from outside. Directors were appointed for four-year terms, and the Governors for five. Directors served normally two terms — though typically there were one or two who served longer, and these continued to populate the Committee of Treasury.<sup>(12)</sup> Court at this time met weekly, normally on a Thursday.<sup>(13)</sup>

The 1946 Act and all subsequent legislation described Court as managing 'the affairs of the Bank'. This could have meant many things. The short explanation was that the Governor was responsible for policy and Court was responsible, at the highest level, for ensuring that the Bank was well run. Court was not involved in individual policy decisions, nor in the advice tendered to the Chancellor, and following the Bank rate tribunal in 1958 the Directors were given no advance notice of policy changes.<sup>(14)</sup> From the 1990s onwards, following evolving best practice, Court set out in a formal document the

(1) See Sayers (1976), page 7.

(2) See Financial Reporting Council (2012).

(3) See Sayers (1976), page 6.

(4) After countermanding the Treasury's instructions on the disposition of the wartime gold reserve, 'The Governor, summoned again to No. 11, was required to write out his resignation, which Bonar Law held for future use' (Adams (1999)).

(5) See Revelstoke (1917).

(6) But only for the time being. A Chief Operating Officer was again appointed in 2013.

(7) See Peacock (1932).

(8) See Roberts and Kynaston (1995).

(9) See Fforde (1992), page 15.

(10) See Fforde (1992), page 13.

(11) See Hennessy, in Roberts and Kynaston (1995), page 198.

(12) This continued until 1998.

(13) The meetings eventually became monthly, although until the 1998 Act was passed the statutory requirement for a weekly meeting remained. It was met by calling the meeting but advising the non-executives that there would be no lunch afterwards. In consequence each weekly meeting was usually inquorate and did no business.

(14) See Fforde (1992), page 703.

## Walter Bagehot, writing in *Lombard Street* (1873), describes mid-19th century Court

The Bank of England is governed by a board of directors, a Governor, and a Deputy-Governor; and the mode in which these are chosen, and the time for which they hold office, affect the whole of its business. The board of directors is in fact self-electing. In theory a certain portion go out annually, remain out for a year, and are subject to re-election by the proprietors. But in fact they are nearly always, and always if the other directors wish it, re-elected after a year. Such has been the unbroken practice of many years, and it would be hardly possible now to break it. When a vacancy occurs by death or resignation, the whole board chooses the new member, and they do it, as I am told, with great care. For a peculiar reason, it is important that the directors should be young when they begin; and accordingly the board run over the names of the most attentive and promising young men in the old-established firms of London, and select the one who, they think, will be most suitable for a Bank director. There is a considerable ambition to fill the office. The status which is given by it, both to the individual who fills it and to the firm of merchants to which he belongs, is considerable. There is surprisingly little favour shown in the selection; there is a great wish on the part of the Bank directors for the time being to provide, to the best of their ability, for the future good

government of the Bank. Very few selections in the world are made with nearly equal purity. There is a sincere desire to do the best for the Bank, and to appoint a well-conducted young man who has begun to attend to business, and who seems likely to be fairly sensible and fairly efficient twenty years later.

The age is a primary matter. The offices of Governor and Deputy-Governor are given in rotation. The Deputy-Governor always succeeds the Governor, and usually the oldest director who has not been in office becomes Deputy-Governor. Sometimes, from personal reasons, such as ill-health or special temporary occupation, the time at which a director becomes Deputy-Governor may be a little deferred, and, in some few cases, merchants in the greatest business have been permitted to decline entirely. But for all general purposes, the rule may be taken as absolute. Save in rare cases, a director must serve his time as Governor and Deputy-Governor nearly when his turn comes, and he will not be asked to serve much before his turn. It is usually about twenty years from the time of a man's first election that he arrives, as it is called, at the chair. And as the offices of Governor and Deputy-Governor are very important, a man who fills them should be still in the vigour of life. Accordingly, Bank directors, when first chosen by the board, are always young men.<sup>(1)</sup>

(1) Women were not admitted to the staff of the Bank until 1894; the first woman Director was Frances Heaton, appointed in 1993.

extent to which it delegated authority to the Executive and those powers which it retained to itself. The latter included strategy, budgets, remuneration policies and the pay of the most senior members of the Bank, approval of the Accounts and the formation and terms of reference of Committees. This statement of 'Matters Reserved to Court' is continually reviewed and updated and the latest version is now published.<sup>(1)</sup>

As the Bank evolved in the post-nationalisation period, it acquired new statutory powers for the supervision of banks — under the Banking Acts of 1979 and 1987 — and of wholesale intermediaries in a carve-out from the Financial Services Act of 1986. Court was not a natural body to exercise such powers — not least because a number of the non-executive members came from regulated firms — and they were delegated to a series of committees under the Governor. From 1987 there was a separate statutory board — the Board of Banking Supervision — which oversaw the exercise of the Banking Act powers (but did not take supervisory decisions itself). The Court Directors were nevertheless acutely conscious that the formal responsibility was theirs as Directors of the Bank, and developed a practice of holding joint discussions with the Board of Banking Supervision.

## Changes in the Bank 1994–2014

The past 20 years have seen great changes in the Bank. The long public debate about central bank independence concluded with the announcement, in May 1997, that the Bank would have operational responsibility for setting monetary policy, within a target set by government. At the same time, the Bank's supervisory responsibilities passed to a new regulator, the Financial Services Authority (FSA). These changes were given effect by the 1998 Bank of England Act. The Bank also ceased to be the Government's debt manager.

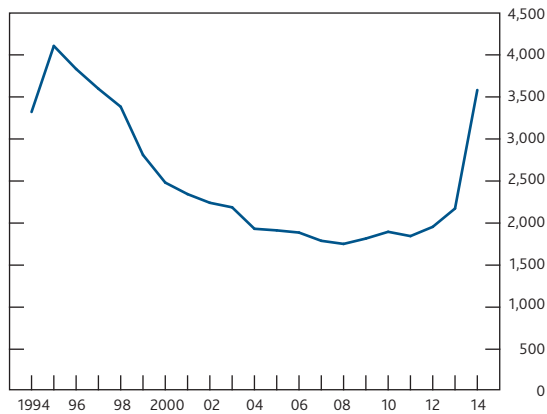
From 2007 onwards, however, the Bank became increasingly involved in dealing with the consequences of the financial crisis, through emergency assistance, the introduction of new liquidity facilities and bank resolution. In 2009, statutory provision was made for resolution, to be managed by the Bank. In 2010, the incoming government announced that the Bank was to have new macroprudential powers to direct regulators, and would itself take over the prudential regulation of banks, other deposit-takers, major investment firms and insurers. These changes came into force in April 2013.

(1) See Bank of England (2013).

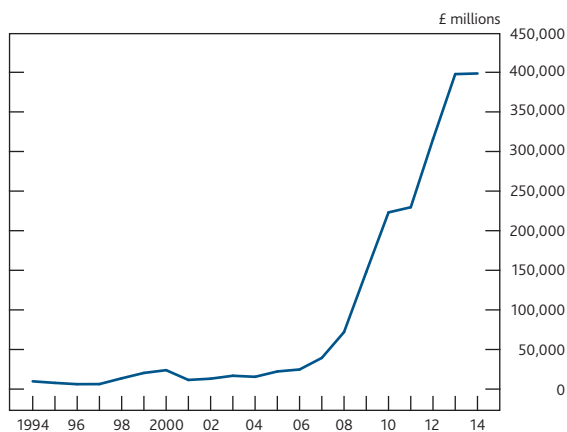


Some indication of the impact of these changes on the management of the Bank is given by **Charts 1 and 2**, which show the number of Bank employees and the size of the Bank's balance sheet over the period.

**Chart 1** Number of Bank of England employees



**Chart 2** Total assets of the Bank of England



### The 1998 Act

The public debate on the possibility of transferring responsibility for monetary policy decisions back to the Bank occupied much of the 1990s. The implications for governance were explored by the 1993 Treasury Select Committee (TSC) Report on the Bank, which suggested that while the power to set interest rates could not be left entirely with the Governor, nor could it be left to the Court in its existing form. The TSC recommended a Monetary Policy Committee consisting of the Governor, the Deputy Governor and the relevant Executive Directors — the key characteristic of all being that they (a) had relevant expertise and (b) held no employment or office outside the Bank.<sup>(1)</sup>

The 1998 Act resolved the issue by establishing a Monetary Policy Committee (MPC) consisting of the executive members of Court (the Governor and — from this point — two

Deputy Governors), the Executive Directors for monetary analysis and market operations, and also members from outside the Bank, appointed for terms of three years on the basis of their knowledge and experience.

The Court was reformed too. Other than the Governors, all 16 Directors reverted to the historic pattern of being non-executive. Appointments were for terms of only three years, and five for the Governors. The Bank's Executive Directors became members of the staff. The Court's role was specified as being to manage the Bank's affairs, 'other than the formulation of monetary policy'. Its functions were to include determining the Bank's objectives and strategy, ensuring the effective discharge of the Bank's functions, and ensuring the most efficient use of the Bank's resources. The Non-executive Directors were formed into a 'Committee of Directors' (immediately christened 'NedCo') with a chair nominated by the Chancellor.

The role of NedCo was to review the Bank's performance and financial management, and it was required to make an annual report. NedCo was also required to keep under review the processes adopted by the MPC and in particular to ensure that it took proper account of regional, sectoral and other information.

Although bank supervision had been transferred to the FSA, the 1998 Act gave the Bank a second Deputy Governor, for Financial Stability. It gave the Bank no statutory powers in the area, but a separate Memorandum of Understanding (MoU) between the Treasury, the FSA and the Bank declared that whereas the FSA had responsibility for regulating individual financial institutions, the Bank had responsibility for the 'stability of the financial system as a whole'.

How to interpret and act on this responsibility provided a perennial puzzle for the Court, which again found itself in the position of having a responsibility without any independent means of carrying it out — not, at least, without appearing to trespass on the responsibilities of the other two parties to the MoU.

During the financial crisis, however, the Bank was immediately drawn into the support of individual institutions and, with the Treasury, into the resolution of institutions that failed. One of the matters reserved to Court is the approval of transactions 'outside the ordinary course of business'. A number of such transactions required the approval of Court and a 'Transactions Committee' was established to enable urgent cases to be agreed swiftly. That Committee met (either in person or by teleconference) on eleven separate occasions between 2007 and 2009.

(1) See Treasury and Civil Service Committee (1993).

## The 2009 Act

In the wake of the financial crisis, the 2009 Banking Act gave the Bank three new statutory functions and a further change in its governance arrangements. The new functions were for the orderly resolution of failing deposit-takers, the oversight of interbank payment systems and the regulation of the banks that are permitted to issue banknotes in Scotland and Northern Ireland. The new governance arrangements were intended to clarify the Bank's responsibility for financial stability and to place ownership of it with Court. The Bank was given a statutory financial stability objective — 'to contribute<sup>(1)</sup> to protecting and enhancing the stability of the financial systems of the United Kingdom' — and a Financial Stability Committee of Court was established by statute to advise the Court on a financial stability strategy, and to monitor the Bank's use of its new powers under the Act.

Court itself was greatly reduced in size — from 16 to nine Non-executive Directors — and one of the non-executives was to be appointed by the Chancellor to chair Court, rather than the Governor. This gave statutory blessing to an informal practice, adopted in 2003, of asking the senior Non-executive Director to chair Court meetings.<sup>(2)</sup> Both the statute and the previous informal arrangement reflected what was becoming the near universal practice in the private sector of separating the roles of Chairman and Chief Executive Officer (CEO).

## The 2012 Act and the Oversight Committee

In June 2010 the Government announced that the Bank would be given macroprudential powers of recommendation and direction, to be exercised by a Financial Policy Committee (FPC), formed, like the MPC, of Bank executives and external experts, and chaired by the Governor.<sup>(3)</sup> It was also announced that the Bank would again take responsibility for banking regulation — together with the regulation of other deposit-takers, major investment firms and insurers. This function would be managed in a separate subsidiary of the Bank, the Prudential Regulation Authority (PRA), with its own Board.<sup>(4)</sup> The cumulative enlargement of the Bank's overall responsibilities and powers prompted questions about how, as an institution, the Bank was to be held accountable.

In a report in November 2011, the TSC recommended that Court be replaced by a new 'Supervisory Board'.<sup>(5)</sup> This would have responsibility for the budget and allocation of resources between the Bank's functions; its members would be fewer and be 'eminent and professionally experienced individuals' with specific skills in finance and prudential policy; they would see all MPC and FPC papers and observe their meetings; minutes of their meetings would be published; and it would have dedicated staff support. It would conduct *ex-post* reviews of the Bank's performance in the prudential and monetary policy fields, which would be published.

In response the Court accepted that the Bank's new responsibilities would need to be accompanied by new accountability mechanisms, and proposed to establish an Oversight Committee, composed of the Non-executive Directors and with direct access to the policymaking processes and papers of the Bank, the ability to attend policy meetings, and the power to commission *ex-post* reviews from external policy experts. The executive members of Court would attend when invited, but could not themselves be members of the Oversight Committee if that Committee was to be properly independent.

These arrangements were incorporated into the 2012 Act,<sup>(6)</sup> which came into force on 1 April 2013. At the same time, the 2009 provision establishing the Financial Stability Committee of Court was repealed; and it was provided that Court would consult the FPC about its financial stability strategy. The FPC, unlike the MPC, was created as a Committee of Court. Other provisions of the 2012 Act included limiting Governors of the Bank to a single non-renewable term of eight years;<sup>(7)</sup> and creation of a third Deputy Governor, for Prudential Supervision, who would act as Chief Executive of the PRA.

## The Court today

It is worth taking stock of what this long period of evolution has produced.

Court is a conventional unitary board and, with the exception of monetary policy formulation, it manages the affairs of the Bank. As with any company, the members are appointed by the shareholder (in this case the Crown): the process follows the normal codes and practices for public appointments.<sup>(8)</sup>

Court is just one of the key policy Committees of the Bank — the others, all chaired by the Governor, and all with independent external members, are the MPC, the FPC and the PRA Board. The box on page 33 summarises the composition and appointment process for each of these Committees; for an overview of their respective roles and responsibilities, see Murphy and Senior (2013).

The Bank has two principal statutory objectives — for monetary policy ('to maintain price stability') and for financial

(1) 'Contribute' was undefined; but was anyway dropped when the Bank was given macroprudential and microprudential powers in 2012.

(2) In practice the business of Court was discussed in NedCo, with the Governors present by invitation, and any decisions were then ratified in a short Court meeting afterwards, chaired by the Governor.

(3) For more details on the role and powers of the FPC, see Tucker, Hall and Pattani (2013).

(4) For more details on the PRA, see Bailey, Breeden and Stevens (2012).

(5) See Treasury Committee (2011).

(6) See Part 1 of the Financial Services Act 2012 at [www.legislation.gov.uk/ukpga/2012/21/contents/enacted](http://www.legislation.gov.uk/ukpga/2012/21/contents/enacted).

(7) Mark Carney, who became Governor on 1 July 2013, has indicated that he would serve a single term of five years.

(8) See the code of practice for ministerial appointments to public bodies at <http://publicappointmentscommissioner.independent.gov.uk/wp-content/uploads/2012/02/Code-of-Practice-20121.pdf>.

## The Bank's major Committees

The Bank has four principal Committees, each containing a mix of full and part-time members. These are:

The **Court**, which is the Bank's Board of Directors, consisting of four executive members (the Governor and three Deputy Governors, collectively 'the Governors') and nine non-executive members. The non-executive members form the Bank's Oversight Committee, which has statutory reviewing functions, recently extended by the 2012 Financial Services Act. All appointments to the Court are made by the Crown.

The **Monetary Policy Committee**, consisting of five executive members and four part-time external members. Three of the executive members are Governors and hold their position *ex officio*, and two are full-time Bank employees appointed by the Governor with the Chancellor's agreement. The part-time external members are appointed by the Chancellor.

The **Financial Policy Committee**, consisting of five executive members, the Chief Executive of the Financial Conduct Authority, four part-time external members and a non-voting representative of the Treasury. The executive members are the four Governors *ex officio* and one full-time employee appointed by the Governor with the Chancellor's agreement. The part-time external members are appointed by the Chancellor.

The **Prudential Regulation Authority Board**, consisting of three executive members, the Chief Executive of the Financial Conduct Authority (FCA) and four independent members. The three executive members are Governors (including the CEO of the PRA). The independent members are appointed by the Court of the Bank with the Chancellor's approval. The Court could appoint further executive members but must always ensure that the independent members (including the FCA's CEO) are in a majority.

policy ('to protect and enhance the stability of the financial system of the United Kingdom'). An annual remit from the Treasury defines what price stability is to be 'taken to consist of': but it is left to Court to define financial stability and to set a strategy, taking advice from the FPC and consulting the Chancellor.<sup>(1)</sup> In addition to their respective primary objectives, both the MPC and FPC have a subordinate secondary objective to support the economic policy of the Government, including its objectives for growth and employment. The PRA has its own statutory objectives, for ensuring the safety and soundness of regulated firms and the protection of insurance policyholders, and following the 2013 Financial Services Reform Act, has a secondary objective of facilitating competition. The PRA Board sets the regulatory strategy, consulting Court.

Court sets other objectives as part of its management of the affairs of the Bank, including financial objectives, and agrees with the Governors a delivery strategy which the Oversight Committee monitors. The annual objectives and strategy are published in the Bank's *Annual Report*.<sup>(2)</sup>

Court has made and published (for the first time in 2013) a statement of the 'reserved matters' that it expects to determine itself (see below). Other matters are delegated to the Governor. The MPC, the FPC and the PRA Board are each responsible for meeting their statutory objectives. Court's responsibility is to ensure that they are adequately (but efficiently) resourced to deliver those objectives.

Court approves the Bank's budget and allocation of resources. It also approves the PRA's budget. Court approves any recommendation to the Treasury concerning cash ratio

deposits (which banks are required to maintain to fund the Bank's policy functions).<sup>(3)</sup> Court approves the appointment of auditors, the adoption of accounting principles, and the annual accounts. Court (or where appropriate the Oversight Committee) approves remuneration of the most senior staff and pay policies throughout the Bank (including the PRA). All senior appointments are made subject to Court's approval.

Transactions outside the normal course of business require the approval of Court, or of its Transactions Committee.

Court has appointed committees to support its functions: an Audit and Risk Committee; a Remuneration Committee and a Nominations Committee. Other committees may be formed from time to time for specific pieces of business (for example those relating to buildings or banknote contracts).

The new Oversight Committee, like NedCo before it, keeps under review the Bank's performance in relation to its objectives and its financial management. However the scope of this review is now much broader than before, and includes the performance (not just the processes) of the FPC and the MPC. In a sharp reversal of the convention adopted in 1958, non-executive members have since 2013 been fully briefed on the issues before the policy committees and may attend their meetings. And reviews may be commissioned into policy outcomes. Anticipating this, Court in 2012 commissioned

(1) See Bank of England Act 1998 as amended. The Treasury also makes recommendations direct to the FPC, on a comply or explain basis.

(2) See the Bank of England *Annual Report* at [www.bankofengland.co.uk/publications/Pages/default.aspx](http://www.bankofengland.co.uk/publications/Pages/default.aspx).

(3) The PRA is financed by a separate levy on regulated institutions.

external reviews of the Bank's arrangements for extending emergency liquidity support to banks, into the Bank's forecasting capabilities, and into the effectiveness of the Sterling Monetary Framework.<sup>(1)</sup> Each of these reviews made recommendations and the Oversight Committee is keeping their delivery under review.

The Oversight Committee does not under the Act have any responsibility for overseeing the PRA. However the Court, as shareholder of the PRA has (in approving the PRA's articles of association) reserved to itself the function of keeping the PRA's performance under review, and has agreed with the PRA Board a basis for doing so.<sup>(2)</sup>

The distinction between the Executive and the Oversight Committee is an important one: but Court remains a unitary board of executives and non-executives and to some extent the responsibilities overlap — for example, in relation to the management of the Bank's financial affairs. In those cases the Court and the Oversight Committee discharge their responsibilities concurrently.

### Conflicts of interest

Each of the Bank's Committees — including Court — has, either in statute or in its procedures (or both), provisions for managing conflicts of interest — that is, situations in which a member has a personal interest in a matter being discussed or decided in a meeting, or an opportunity to profit from information provided to the Committee. Such interests may be financial (for example a shareholding in a company being discussed, or a long or short position in a particular market) or arise from another directorship or employment.

The procedures now include, for Court and all the Bank's Committees, a ban on acquiring securities issued by regulated firms and requirements to disclose all financial holdings of any kind to the Bank and to obtain the Bank's approval before undertaking any transaction in securities, derivatives or (above a certain threshold) foreign exchange. These rules on financial transactions are identical to those applying to Bank staff. Additionally, on appointment, a member must disclose any directorships or employment relationships: the Bank maintains registers of interests, and where any matter relevant

to such an interest is discussed, the member is required to withdraw from the meeting.

The latter type of conflict is likely to arise mainly with the part-time, independent members: Governors are required to give exclusive services to the Bank,<sup>(3)</sup> and Bank staff may not without the Bank's consent hold any outside directorship or trusteeship. By contrast, the independent members of Committees and Court non-executives give only a proportion of their time to the Bank.

It is obviously desirable to bring people with relevant and current experience — in finance, business, markets, academia — into the Bank's decision-making. But equally obviously, it makes a Committee less effective if one or more of its members has to continually withdraw from discussions on account of conflict. A conflict that was sufficiently direct or serious to make that likely could also pose a reputational risk to the Bank. So in determining a policy for the PRA Board, and itself, Court has also determined that in addition to the prohibition on financial dealings, no non-executive member should normally be involved in the management or direction of any PRA-regulated institution.

### Conclusion

The changes in the Court over the past 20 years have been as dramatic as those in the Bank more generally. The Court of 1994 — a year when the Bank was in any case looking back, over its first 300 years — might have felt at home in the same room 50 years earlier. The present Court would not. Much reduced in size, with a non-executive chair, a Senior Independent Director and effective Audit and Remuneration Committees, Court is very far removed from its predecessors in terms of efficiency and professionalism. Its task is immeasurably greater, too, reflecting the range of the Bank's statutory functions and the complex relationships of the individual policy committees. The challenge for the Bank's Executive is to unify these functions and committees and deliver coherent policies in support of monetary and financial stability. And for the Court, and particularly the new Oversight Committee, the challenge is to ensure that the Bank is properly accountable for the responsibilities that it has been given and the resources that it now deploys.

(1) See [www.bankofengland.co.uk/about/Pages/courtreviews/default.aspx](http://www.bankofengland.co.uk/about/Pages/courtreviews/default.aspx).

(2) See 'Matters reserved to Court', November 2013, page 21. This function was delegated to the Oversight Committee.

(3) See Schedule 1 of the 1998 Bank of England Act.

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# Dealing with a banking crisis: what lessons can be learned from Japan's experience?

By Benjamin Nelson of the Bank's Monetary Assessment and Strategy Division and Misa Tanaka of the Bank's Prudential Policy Division.<sup>(1)</sup>

- This article examines Japan's policies in dealing with its banking crisis during the 1991–2004 period, in order to draw lessons for policymakers today.
- Japan's policy choices reflected a difficult trade-off between the need to contain moral hazard on the one hand, and the need to limit systemic risk on the other. The resolution of the crisis ultimately required recapitalising banks and resolving uncertainty over banks' asset valuations.

## Overview

Japan's equity and property market booms ended in 1990–91 after monetary policy was tightened following a period of low interest rates, and the banking regulator introduced a new policy to curb real estate lending. This was followed by a 'lost decade', characterised by slow economic growth and financial instability.

The banking regulator initially responded with a policy of regulatory forbearance — that is, refraining from forcing banks to recognise their losses promptly. But after the crisis turned systemic in 1997, the authorities undertook public capital injections and set transparent regulatory standards to improve disclosure and provisioning of non-performing loans. Drawing extensively on the statements, memoirs and interviews of the Japanese policymakers of the time, this article examines Japan's policies in dealing with its banking crisis during the 1991–2004 period and draws the following lessons:

- Japan's experience with policies to curb real estate lending at the peak of the property boom contains some lessons for modern macroprudential policy — even though the Japanese regulatory authority did not have an explicit macroprudential policy mandate. In particular, Japan's experience highlights the need for a macroprudential policy authority to choose the timing and the form of intervention appropriately by taking into account the impact of monetary policy and the behaviour of institutions that are not covered by its policy tools.

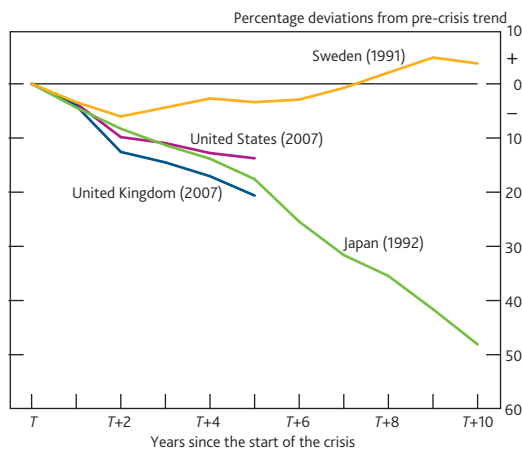
- Japan's policy experience in the first half of the 1990s highlights risks associated with forbearance — both by banks and the regulators. Evidence suggests that forbearance may have increased eventual losses at banks. The underestimation of the extent of the problem, the expectation of an economic recovery, and the absence of a comprehensive legal framework to facilitate prompt recapitalisation and orderly resolution of failing banks were factors behind regulatory forbearance. This underscores the need to ensure that banks are adequately capitalised to withstand plausible stress scenarios.
- Resolving uncertainty over banks' asset valuations and recapitalisation were crucial for restoring market confidence. In Japan, this required detailed and repeated supervisory inspections based on transparent loan classification and provisioning standards.
- Credit support measures might smooth adjustment in the short run, but risk exacerbating imbalances and make its withdrawal politically difficult if extended over long periods. Such measures therefore need to be designed to maintain the right incentives and supported by strong underwriting standards.

[Click here for a short video that discusses some of the key topics from this article.](#)

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

Following a collapse in equity and property prices in the early 1990s, Japan underwent a period of financial sector distress culminating in a full-blown systemic banking crisis in 1997. The long period of economic stagnation accompanying the period of financial sector distress is frequently referred to as Japan's 'lost decade'. The size of the decline in output during the first few years of the 'lost decade' relative to the path implied by the pre-crisis trend growth rate was similar to that of the United Kingdom after the recent financial crisis (Chart 1).

**Chart 1** Post-crisis output losses relative to pre-crisis trend<sup>(a)</sup>



Sources: IMF *World Economic Outlook* (October 2013) and Bank calculations. Crisis dates are from Reinhart and Rogoff (2009).

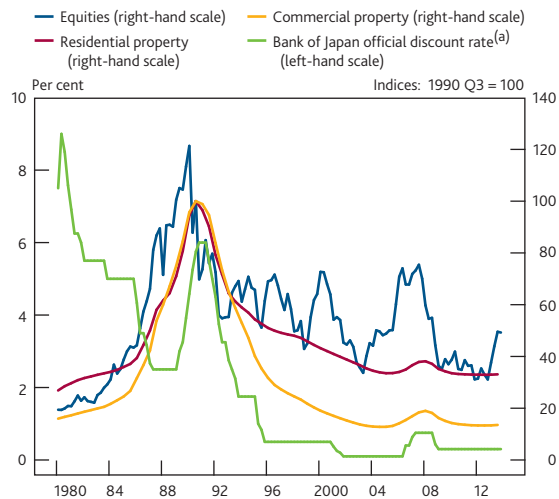
(a) T = year when the crisis started. Pre-crisis trend growth was calculated using the average annual growth rate ten years prior to the crisis.

This article reviews Japan's policies towards its banking sector since the early 1990s, and considers what lessons can be drawn from its experience for macroprudential policy, the resolution of failed banks, and policies aimed at supporting credit. Specifically, it examines the factors that contributed to the delay of loss recognition and recapitalisation of the banking system in the first half of the 1990s, and what steps were taken from the late 1990s onwards in order to set the banking system on a recovery path. **In order to shed light on the constraints and thinking behind particular policy choices, this article draws extensively on statements, interviews and memoirs of the Japanese policymakers of the time, most of which are available only in Japanese.** A short video explains some of the key topics covered in this article.<sup>(1)</sup>

It is worth noting at the outset that the crisis dynamics in Japan differed from those that played out in the United Kingdom in the aftermath of the recent global financial crisis. The crisis in the United Kingdom turned rapidly systemic during 2007–08, whereas the Japanese banking crisis was more 'slow burning', unfolding over several years. Policy responses — including the recapitalisation of banks and monetary stimulus — were also undertaken more rapidly in the United Kingdom compared with Japan. Perhaps partly as a result, the United Kingdom has managed to avoid the deep

asset price deflation which exacerbated losses at Japanese banks over time (Chart 2). Nevertheless, there are some perennial issues and trade-offs facing policymakers dealing with the aftermath of a financial crisis. Japan's experience contains a wealth of policy lessons which remain pertinent to today's policymakers, not least because of the number of approaches tried in dealing with failing banks during the 'lost decade'.

**Chart 2** Japan's asset prices and monetary policy



Sources: Thomson Reuters Datastream and Bank calculations.

(a) Bank of Japan official discount rate currently refers to the Basic Discount Rate and Basic Loan Rate.

This article is organised as follows. The first section briefly describes the origins of the Japanese banking crisis. The article then examines the Japanese authorities' approach to dealing with the banking sector during 1991–96, and considers how policies changed after the crisis became systemic in 1997. It then evaluates policies to support credit after the crisis turned systemic. The final section draws lessons from the Japanese experience. Although this article focuses on policies towards banks, it should be noted at the outset that Japan's prolonged downturn reflected a complex interplay of monetary, fiscal and banking sector policies, as well as external factors, such as the Asian crisis during 1997–98.

### Origins of the Japanese banking crisis

During the second half of the 1980s, Japan experienced a macroeconomic boom accompanied by sharp increases in real estate and equity prices (Chart 2). The build-up of macroeconomic and asset price booms was associated with the easing of monetary policy. Following the 1985 Plaza Accord, in which the G5 countries agreed to let the Japanese yen appreciate against the US dollar, the Bank of Japan (BoJ) lowered the official discount rate five times, by a total of 2.5 percentage points, between

(1) See [www.youtube.com/watch?v=-9R7LVq3DU0](http://www.youtube.com/watch?v=-9R7LVq3DU0).

January 1986 and 1987. This was intended to counter the contractionary impact of the stronger yen on net exports but also as part of efforts at international policy co-ordination that called for countries with current account surpluses — such as Japan and Germany — to stimulate their domestic demand. The BoJ took the first step towards changing its monetary easing stance at the end of August 1987 by starting to guide market interest rates to a higher level. But this policy was soon suspended with the onset of the global stock market crash in October 1987 ('Black Monday') and the consequent international pressure for policy co-ordination in order to prevent excessive weakness of the US dollar.<sup>(1)</sup> This gave rise to the expectation that the BoJ would not raise rates for a prolonged period.

At the same time, the gradual liberalisation of capital markets in the 1980s served to increase competition in the corporate loan market as large corporates increased their bond issuance and reduced their reliance on bank borrowing. This induced banks to seek alternative investment opportunities and to increase their exposures to the real estate market. There is also evidence that banks expanded small business and foreign lending during this period as they lost their traditional large corporate customers.<sup>(2)</sup>

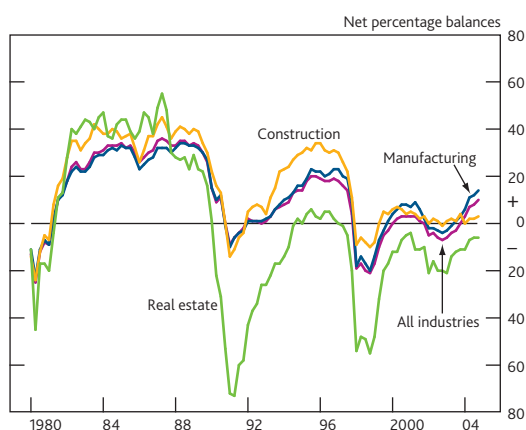
The greater competition from banks in mortgage lending during the 1980s in turn drove the *jusen* — the private non-bank financial firms dedicated to mortgage and real estate lending — to seek alternative, riskier investment opportunities in order to maintain their profitability. The *jusen* companies had been created by banks in the 1970s to meet the public's demand for homeownership. In the 1980s, however, the *jusen* started increasing their exposure to real estate companies and property developers as they started facing stiff competition from banks in the home mortgage market. This meant that banks themselves became indirectly exposed to risky real estate companies, as the banks were providers of equity and credit to the *jusen*.<sup>(3)</sup>

The rapid increase in property prices was politically unpopular, as it was seen to be profiting speculators and property developers at the expense of ordinary people seeking homeownership. On the back of this, the Banking Bureau of the Ministry of Finance (MoF), which was in charge of bank supervision and regulation until 1998, began issuing administrative guidance to depository financial institutions to restrain lending to the property sector in as early as 1985 Q3. But, collectively, the administrative guidance issued in the late 1980s was generally considered to have been ineffective in curbing the asset price boom.<sup>(4)</sup> The BoJ had also started urging commercial banks to maintain a 'prudent lending attitude' from 1987 Q2 but, with the official discount rate held at a low level, this did not prove effective in curbing lending growth.<sup>(5)</sup>

The asset price boom ultimately ended in 1990, and it did so abruptly. Having peaked in December 1989, equity prices fell by nearly 40% in the following twelve months, and property prices started falling sharply a year later. It is thought that two policy actions contributed to the end of Japan's 'bubble era'. First, the BoJ began tightening monetary policy by raising the official discount rate for the first time in almost nine years, from 2.5% to 3.25% in May 1989. This was followed by further rapid increases to 6% by August 1990.

Second, in March 1990 — just at a time when monetary policy tightening was beginning to curb lending growth across sectors — the MoF's Banking Bureau issued an administrative guidance, referred to as credit 'quantity restrictions' (*souryou kisei*), requesting depository institutions under its supervisory power (i) to keep the growth rate of lending to the real estate sector below that of total lending, and (ii) to report lending to the real estate, construction and related non-banking sectors, including to the *jusen*. In contrast to the MoF's earlier measures, the 'quantity restrictions' set a concrete quantitative benchmark for credit growth to the real estate sector. This policy — which was kept in place until December 1991 — appears to have had a strong catalytic effect in tightening bank lending to the real estate sector: as **Chart 3** shows, real estate firms had reported a particularly abrupt and sharp tightening of bank lending attitudes from 1990 Q2. At the same time, agricultural co-operative financial institutions, which were not fully under the MoF's supervision and hence were not covered by the quantity restrictions, continued to increase their exposures to the *jusen*.<sup>(6)</sup>

**Chart 3** Tankan survey of enterprises: lending attitudes of financial institutions by sector



Notes: Net percentage balance of 'Accommodative' minus 'Severe', percentage points. In the Tankan, there is a discontinuity between the time-series data up to the December 2003 survey and those in and after the March 2004 survey.

Source: Bank of Japan Tankan short-term economic survey of all enterprises in Japan.

(1) See Okina, Shirakawa and Shiratsuka (2001).

(2) See Hoshi and Kashyap (2000).

(3) See Hoshi and Patrick (2000), pages 12–13.

(4) See Komine (2011), pages 380–81 and the statement of Yoshimasa Nishimura, the Head of the MoF's Banking Bureau during 1994–96, in Matsushima and Takenaka (2011), page 309. The administrative guidance was not legally binding.

(5) See Okina, Shirakawa and Shiratsuka (2001).

(6) See Hoshi and Patrick (2000), pages 12–13.



## Policies towards failing financial institutions: Phase I (1991–96)

This section examines how policymakers responded to the deepening financial sector problems in the first few years after the collapse of the asset price bubble. As discussed below, 'regulatory forbearance' and the protection of creditors of failed institutions were the main initial policy responses. Although these policies prevented individual bank failures from triggering a systemic crisis, they gave rise to creditor moral hazard and ultimately undermined investor confidence in the asset quality of the banking system.

### The *jusen* problem: the overture

The collapse in property prices plunged the *jusen* into severe financial difficulty, as their borrowers started defaulting on their payments. The *jusen* problem had two important implications for the banking sector. First, exposures to the losses at the *jusen* weakened banks' balance sheets. As at March 1991, the MoF's Banking Bureau had estimated that 37% of the *jusen*'s outstanding loans were non-performing.<sup>(1)</sup> In 1993, the MoF orchestrated the restructuring of loans to the *jusen* by its main creditors, based on the assumption that property prices would increase by 25% in the following ten years. By 1995, however, around 75% of the *jusen*'s loans were estimated to have become non-performing, as property prices continued to slide further. All the *jusen* were eventually declared insolvent and were liquidated in 1995, with banks shouldering most of the resulting losses.

Second, the use of fiscal funds for the resolution of the *jusen* — which was mainly aimed at limiting the losses imposed on agricultural co-operative financial institutions — critically undermined public support for the use of fiscal funds in subsequent bank failures. Although only a small amount of public funds (¥680 billion, equivalent to 0.1% of GDP) was used for the resolution of the *jusen*, the resulting public outcry made the authorities reluctant to use public funds for bank recapitalisation in subsequent years.<sup>(2)</sup>

### The policy of 'regulatory forbearance'

The collapse of property prices hit banks' balance sheets both through their direct lending to related sectors as well as through their indirect exposures via the *jusen*. The MoF first disclosed its estimate of non-performing loans (NPLs) at major banks to be ¥7 trillion–¥8 trillion (equivalent to 1.4%–1.6% of nominal GDP) in April 1992, but soon revised it up to ¥12 trillion (2.5% of GDP) in October 1992.<sup>(3)</sup>

The MoF's initial response was characterised by 'regulatory forbearance' — that is, refraining from forcing banks to recognise their losses promptly. In fact, the Head of the MoF's Banking Bureau during 1992–94 stated that its early attempts to privately persuade banks to write down bad loans and stop

paying dividends were rejected by bankers who feared shareholder criticism; and that he did not consider a more forcible intervention in individual banks' dividend policy to be appropriate at a time of financial liberalisation.<sup>(4)</sup> Another senior official who was at the MoF's Banking Bureau around this time also stated that major banks were discouraged from issuing new equity in the domestic market as this could have further exacerbated falls in equity prices.<sup>(5)</sup> Thus, banks were not forced to deal with their NPLs or to raise new capital in the first half of the 1990s.

In the early 1990s, the Japanese authorities dealt with the sporadic failures of relatively small banks and credit co-operatives by encouraging healthier institutions to absorb them. The institution taking over the failing bank was offered financial assistance from the Deposit Insurance Corporation (DIC), which was designed to limit depositors' losses in the event of a failure of a depository institution. Before 1996, however, the DIC's financial assistance could not legally exceed the cost of paying off the insured depositors. Hence, in some cases, where the amount of funds required exceeded the legal limit allowed under the Deposit Insurance Law at that time, the BoJ provided risk capital.<sup>(6)</sup> These methods ensured that even uninsured creditors and depositors of failed institutions avoided suffering losses.<sup>(7)</sup>

There were a number of reasons why the policy of regulatory forbearance was adopted during the first half of the 1990s. These included:

- **Underestimation of the scale of the problem.** There was uncertainty over the exact size of the NPLs across the system because the data were patchy. The MoF's Banking Bureau at that time relied on banks' self-reported NPL data, but banks themselves were initially not fully aware of the extent of the problems with some of their borrowers.<sup>(8)</sup> Moreover, these self-reported figures for NPLs were based on a narrow definition and did not include loans under forbearance (such as those with renegotiated or rescheduled interest payments). A former senior official at the MoF's

(1) See Nishino (2003), page 23.

(2) See Nakaso (2001). The main criticism was that the politically influential agricultural co-operatives refused to shoulder losses that were proportionate to their credit exposures in the resolution of the *jusen*. Although the founder banks of the *jusen* also ended up shouldering disproportionately large losses, the avoidance of proportionate losses by the agricultural co-operatives meant that the remaining losses were imposed on taxpayers.

(3) These figures covered NPLs at major banks only and included loans which were either in default or were more than six months in arrears. This definition of NPLs was narrower than the one used by the US banking supervisors at that time.

(4) See the statement of Nobuyuki Teramura, the Head of the MoF's Banking Bureau during 1992–94, in Matsushima and Takenaka (2011), pages 226–27.

(5) See the statement of Toshiyuki Tsukasaki, a head of division at the MoF's Banking Bureau during 1993–95, in Matsushima and Takenaka (2011), pages 371–72.

(6) For example, in 1995 the BoJ provided capital to establish Tokyo Kyodou Bank that assumed the assets of failed credit co-operatives in Tokyo. The limit on the financial assistance offered by the DIC was lifted in 1996 with the amendment of the Deposit Insurance Law. See Nakaso (2001) for further details.

(7) Before the temporary blanket guarantee on deposits was officially announced in 1996, the deposit principal was guaranteed up to a value of ¥10 million.

(8) See the statement of Teramura in Matsushima and Takenaka (2011), page 220.

Banking Bureau identified the shortage of bank inspectors and their limited power to conduct intrusive inspections as key factors for its failure to uncover the extent of problem lending.<sup>(1)</sup> Nevertheless, the authorities are likely to have been aware that the NPL problem was substantially larger than the published figures. The key reason for forbearance appears to have been the judgement by the MoF's Banking Bureau that major banks had the capacity to deal with the NPL problem over time in light of its projection for banks' operating profits and the substantial unrealised capital gains on their share holdings.<sup>(2)</sup>

- **Expectation of an economic recovery.** Underlying this judgement was the expectation of senior officials at the MoF's Banking Bureau that the NPL problem could be brought under control once the economy recovered and asset prices stabilised — even though the BoJ had privately recommended a speedy resolution of NPL problems to the MoF in as early as 1992.<sup>(3)</sup> Few expected in the early 1990s that Japan was in for a 'lost decade' characterised by economic stagnation and falling asset prices, and hence there was little awareness at that time that the failure to deal with the NPL problem and to recapitalise banks early could increase the risk of a more systemic banking crisis a few years down the line. Even in 1996, the policymakers' focus was on credit co-operatives, which were thought to be the most damaged part of the financial system, while failures of major banks were unforeseen.<sup>(4)</sup>
- **Absence of a comprehensive legal mechanism for prompt recapitalisation and orderly resolution of failing banks.** Before 1998, the MoF's Banking Bureau did not have the remit to force banks to ensure that they had adequate funds to take account of the expected losses on NPLs (so-called 'loan loss provisioning').<sup>(5)</sup> It also did not have the remit to order undercapitalised banks to take prompt corrective actions to raise capital — for example through new equity issuance or dividend restrictions.<sup>(6)</sup> Moreover, forcing loss recognition could potentially have destabilised the system at this time: there was a genuine concern that imposing losses on creditors could have triggered a system-wide run, and there was no legal mechanism to inject fiscal funds into weak banks that could not raise new capital on their own.<sup>(7)</sup>

Although policymakers did not push banks to deal with their NPL problems in the early part of the decade, from 1996 onwards a number of reforms were made to strengthen the legal mechanisms to resolve insolvent institutions in an orderly manner so as to minimise their systemic impact. In 1996, the government announced a full guarantee on all deposits until March 2001, which was subsequently extended to March 2002.<sup>(8)</sup> In practice, not only deposits but all forms of uninsured debt such as debentures (medium to long-term debt instruments), interbank lending and derivatives trading were fully guaranteed in all bank failures after 1996.<sup>(9)</sup> In addition,

the jurisdiction and resources of the DIC were expanded through various legal reforms between 1996 and 1998. In 1996, the Housing Loan Administration Corporation and the Resolution and Collection Bank were established to hold assets and collect claims of failed *jusen*, and banks and credit co-operatives, respectively.<sup>(10)</sup>

### Consequences of regulatory forbearance

The MoF's policies were, in some respects, successful in dealing with the failures of individual institutions without triggering a system-wide crisis or a credit crunch up until 1996. However, they gave rise to two unintended consequences: moral hazard, both on the part of banks' creditors and managers (acting in the interest of shareholders); and a loss of investor confidence.

#### Moral hazard

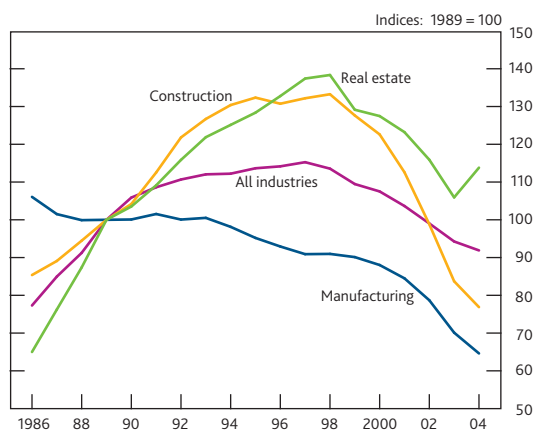
Moral hazard is a situation where a party has a tendency to take excessive risks as he or she does not have to bear the full cost of that risk. During the initial phase of the banking crisis, two types of moral hazard were observed:

- **Creditor moral hazard:** depositors and creditors were willing to lend money to nearly insolvent depository institutions offering above-market interest rates, due to the policy to avoid imposing losses on uninsured depositors and creditors. This resulted in higher losses for the deposit insurance fund when these institutions ultimately failed.
- **Bank management/shareholder moral hazard:** managers of a weakly capitalised bank with insured deposits, acting in the interests of its shareholders, may have the incentive to 'gamble for resurrection' by investing in risky assets: if the gamble is successful, shareholders gain, whereas if it fails, shareholders will at the most lose all their investments and the remaining losses will be borne by the deposit insurance fund.

(1) See the statement of Tsukasaki in Matsushima and Takenaka (2011), pages 355–59.  
(2) The statement of Teramura confirms that the BoJ had privately shared with the MoF its own top-down estimate of NPLs to be more than ¥40 trillion (8.2% of GDP) in 1992: see Matsushima and Takenaka (2011), page 220. Nishino (2003) also reports that a confidential MoF paper estimated the system-wide NPLs to be ¥50 trillion (10.2% of GDP) by late 1992 — four times the published figure — but that paper concluded that major banks could deal with these NPLs over time. The statement of Tsukasaki confirms this: see Matsushima and Takenaka (2011), page 354.  
(3) See Nishino (2003), pages 18–19.  
(4) See Nakaso (2001).  
(5) In general terms, capital is available for absorbing unexpected losses, whereas accounting provisions, together with related regulatory deductions, take account of expected losses.  
(6) See Gomi (2012), page 34.  
(7) Indeed, Prime Minister Kiichi Miyazawa floated the idea of the possible need to use public funds in order to stabilise the financial system in as early as 1992. Teramura states that he did not consider it to be politically feasible or necessary to establish a legal framework to inject public funds into financial institutions at a time when the crisis had not yet turned systemic. See Matsushima and Takenaka (2011), page 256.  
(8) The blanket deposit guarantee was removed in a phased manner between April 2002 and March 2005.  
(9) Creditors of Sanyo Securities, a security house which failed in 1997, did not receive a guarantee, and this triggered a systemic crisis (discussed in the following section).  
(10) The two institutions were merged into the Resolution and Collection Corporation in 1999.

Japanese banks 'gambled' mainly by rolling over loans to weak firms with a high risk of insolvency in order to avoid realising losses — a practice known as 'evergreening'. In fact, the outstanding stock of loans to the troubled construction and real estate sectors continued to increase substantially until 1998 (Chart 4).<sup>(1)</sup> The failure to deal with problem loans in the early phases of the crisis eventually led to larger losses for banks and taxpayers as property prices failed to recover and bad debts continued to increase. Existing research also suggests that 'evergreening' contributed to a growing problem of credit misallocation, which could have had the effect of delaying Japan's economic recovery.<sup>(2)</sup>

Chart 4 Japanese banks' loans outstanding by sector<sup>(a)</sup>



Sources: Bank of Japan and Bank calculations.

(a) Data from 1993 are for domestically licensed banks and overdrafts are included. Data before 1993 are estimates based on lending growth of the discontinued series for domestically licensed banks (excluding trust subsidiaries and foreign trust banks).

### Loss of investor confidence

Investor confidence in the Japanese financial system and its regulators was eroded through a series of events during the 1994–95 period. The credibility of the published NPL figures was undermined when Hyogo Bank, which failed in August 1995, revealed its NPLs to be 25 times the amount that was published in its account as at March 1995.<sup>(3)</sup> The MoF's credibility abroad was then undermined further by the discovery of large trading losses at the New York branch of Daiwa Bank in September 1995, amid reports that the MoF had failed to alert the US authorities even though Daiwa had informally let the Head of the Banking Bureau know about the losses by August of that year. This series of events led to increased funding costs for Japanese banks in international markets.

## Dealing with a systemic banking crisis: Phase II (1997–2004)

This section examines how the crisis turned systemic in 1997, and discusses the set of policies that were subsequently adopted in order to set the banking system on a path for recovery. The policy package included the following elements:

- **Bank recapitalisation using public funds**, aimed at restoring confidence in the banking system and its ability to continue providing credit to the real economy.
- **Tightening of disclosure and provisioning standards for NPLs** in order to incentivise banks to clean up their balance sheets and to ensure that they had adequate funds to cover potential losses arising from NPLs (so-called 'loan loss provisioning'). These regulatory standards were enforced through intensified supervisory inspections.

### What triggered the systemic banking crisis?

Japan's banking sector was unprepared for a further macroeconomic downturn in 1997, when the fragile recovery was choked by fiscal tightening and the onset of the Asian financial crisis.<sup>(4)</sup> In November 1997, the banking crisis became systemic with the bankruptcy of Sanyo Securities. The Japanese authorities had judged that the failure of this medium-sized securities house would have limited systemic implications.<sup>(5)</sup> Thus, contrary to the approach taken with bank failures up to this point, Sanyo was resolved under insolvency law, imposing losses on its shareholders and creditors.<sup>(6)</sup> The authorities' intention was to minimise the creditor moral hazard discussed in the previous section and to improve market discipline.

Against their expectations, however, the bankruptcy of Sanyo triggered a chain of events which plunged the fragile banking system into a systemic crisis. Sanyo's bankruptcy, which constituted the first post-war default in the Japanese interbank market, caused an immediate freeze of interbank lending. As interbank rates shot up, several banks faced funding difficulties, thus propagating the crisis across the system. Within the same month, Hokkaido Takushoku Bank, one of the eleven large 'city banks',<sup>(7)</sup> Yamaichi Securities, the fourth largest securities firm, and Tokuyo City Bank, a regional bank, collapsed. The interbank market was salvaged only through a massive liquidity injection by the BoJ, and a blanket guarantee on all creditors of these failed institutions.

This was a turning point in the history of Japan's banking crisis. In the following years, the Japanese authorities initiated a set of policies to recapitalise banks, to improve NPL disclosure and to force banks to improve provisioning against NPLs.

- (1) Peek and Rosengren (2005) find evidence that firms were more likely to receive additional bank credit if they were in poor financial condition, and that this 'evergreening' behaviour was more prevalent among banks with low capital ratios.
- (2) Caballero, Hoshi and Kashyap (2008) find evidence that the continued operation of weak firms due to banks' 'evergreening' had a negative effect on healthy firms, reducing their profit, likelihood of entry into markets and levels of investment.
- (3) See Nihon Keizai Shinbun Sha (1997), pages 148–51.
- (4) Specifically, the consumption tax was raised from 3% to 5%, the temporary income tax cuts were cancelled and the social security insurance premium was raised in 1997.
- (5) A security house specialises in trading stocks and bonds for itself and on behalf of its clients.
- (6) See Nakaso (2001).
- (7) City banks are typically large in size with headquarters and branches in major cities, and are involved in the financing of large corporates.

## Two rounds of public capital injections during 1998–99

Faced with a systemic banking crisis, the government decided that a public capital injection would be necessary to restore investor confidence in the system and to preserve the system's capacity to continue lending to the real economy. The Japanese government undertook two rounds of public capital injection into major banks in the late 1990s.

The first round of public recapitalisations was conducted in March 1998, when 23 banks applied for capital injections totalling ¥1.8 trillion (0.4% of GDP).<sup>(1)</sup> In order to remove the stigma associated with receiving public capital, even strong banks were encouraged to apply, and, in the end, each of the major banks applied for an almost identical amount of funds.

The first round of capital injections soon proved to be insufficient to stabilise the system, however. The problem with this round of recapitalisations was that all applications were approved without thorough supervisory scrutiny of these banks' balance sheets, with the committee tasked to evaluate banks' applications for public funds not having direct access to detailed supervisory information related to individual banks. In fact, some members of that committee questioned the solvency of Nippon Credit Bank, which failed later in the same year. But both the BoJ and the MoF confirmed the bank to be solvent at that point, although the BoJ did raise concerns over the Long-Term Credit Bank, which also failed subsequently.<sup>(2)</sup> In June 1998, supervisory responsibility was transferred from the MoF to the newly created Financial Supervisory Agency (JFSA).<sup>(3)</sup> The Japanese authorities commenced the first large-scale, system-wide inspection of major banks, and by 1998 Q4, the JFSA had identified two major banks (Long-Term Credit Bank and Nippon Credit Bank) that had received public capital injections earlier that year to be insolvent. These two banks were temporarily nationalised, with the government taking full ownership.

In March 1999, the government undertook a second round of recapitalisations, with fifteen major banks receiving a total of ¥7.5 trillion (1.5% of GDP): one major bank, Bank of Tokyo Mitsubishi, decided not to apply for public funds this time around.<sup>(4)</sup> Crucially, unlike the first round of recapitalisations, this second round of recapitalisation was authorised by the newly established Financial Reconstruction Commission, an independent administrative commission attached to the Prime Minister's Office with the authority to inspect and supervise financial institutions as the parent organisation of the JFSA.<sup>(5)</sup> Accordingly, this round of capital injections was based on the JFSA's bank-by-bank estimate of underprovisioning — that is, the shortfall of funds relative to expected losses on NPLs — that it identified through a thorough system-wide inspection.

## Tightening standards for NPL disclosure and provisioning

By early 1998, the MoF's internal estimates put NPLs in the banking system at ¥76 trillion (14.8% of GDP in 1998) once loans under forbearance were included. This was more than triple the MoF's published estimate of ¥21.7 trillion (4.1% of GDP) as at September 1997, which was based on a narrower definition of NPLs.<sup>(6)</sup>

By this time, there was a recognition that the disposal of NPLs needed to be accelerated in order to rebuild market confidence and mitigate systemic instability. The newly established JFSA tried to achieve this by strengthening the regulatory standards for assessing banks' asset quality, improving disclosure of NPLs, and tightening provisioning standards against NPLs. These stricter regulatory standards were enforced through intensive supervisory inspections by the JFSA. These reforms, which were aimed at strengthening banks' incentives to clean up their balance sheets, turned out to be crucial in putting the Japanese banking system on a sustainable path for recovery.

In 1998, the regulatory definition of NPLs was broadened,<sup>(7)</sup> and banks were mandated to disclose their NPLs based on this new standardised definition from March 1999. In addition, the JFSA introduced a standardised inspection scheme in order to estimate the scale of system-wide underprovisioning by scrutinising banks' own self-assessments of loan quality.<sup>(8)</sup> It also set out explicit guidelines for provisioning — that is, how much funds banks needed to set aside to take account of potential losses on NPLs — in its inspection manual in 1999. Finally, the JFSA revised guidelines for external auditors in order to ensure that the supervisor's inspection results were properly reflected in banks' financial statements.<sup>(9)</sup> In addition to its regular inspections, the JFSA carried out four 'special inspections' between October 2001 and November 2004 in order to scrutinise the large, troubled exposures of major banks and to identify underprovisioning.<sup>(10)</sup>

It took several years and repeated inspections based on the inspection manual for the JFSA to force banks to recognise their underprovisioning. These efforts required substantial human resources, requiring almost a tripling of bank examiners at the JFSA between 1998 and 2004.<sup>(11)</sup> After peaking in

(1) Out of this ¥1.8 trillion, only 18% took the form of convertible preferred shares, while the remaining 82% took the form of subordinated debt and loans, which were classified as Tier 2 capital. New issuance of subordinated debt and loans does not lead to a dilution of equity holders' claims, and hence was preferred by banks over new equity issuance. See Deposit Insurance Corporation of Japan (2012).

(2) See Nishino (2001), pages 118–23.

(3) It was subsequently reorganised and renamed as Financial Services Agency (JFSA).

(4) See Hoshi and Kashyap (2010).

(5) See Nakaso (2001).

(6) See Nishino (2001), page 91.

(7) The new definition identified NPLs as loans to failed borrowers, loans with overdue interest payment over three months or more, and all restructured loans.

(8) See JFSA (1999).

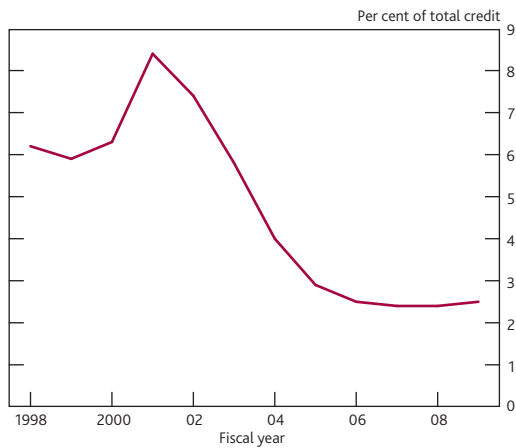
(9) See Nakaso (2001).

(10) See [www.fsa.go.jp/news/newse/e20040916-1.html](http://www.fsa.go.jp/news/newse/e20040916-1.html) for information on these four rounds of inspections.

(11) See JFSA (2005).

March 2002, Japanese banks' NPL ratio gradually declined (Chart 5), while the share of NPLs that banks had covered through collateral and provisioning rose from 76% in March 2002 to 80% in March 2005.

Chart 5 Non-performing loans of Japanese banks<sup>(a)</sup>



Sources: JFSA and Bank calculations.

(a) Fiscal year starts in April and ends in March (so the figure for 1998 refers to April 1998 to March 1999). Data are for all banks.

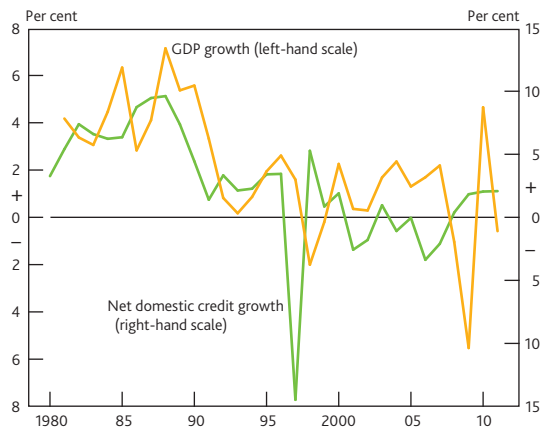
Meanwhile, as the degree of underprovisioning in the system was gradually revealed after the late 1990s, banks' loss-absorbing capacity came under scrutiny. As equity prices had fallen by over 40% by end-1999 from their peak at end-1989, unrealised gains on stockholdings were exhausted. Thus, several major banks relied heavily on opaque deferred tax assets (DTAs) and 'double gearing' — the cross-holding of equity capital between banks and life insurance companies — in order to maintain their regulatory capital ratios.<sup>(1)</sup> DTAs are the net present value of a future tax shelter due to accumulated loan losses in the past, and hence have real value only when a bank can generate taxable income in the near future. As DTAs have no value at liquidation, their value as 'capital' becomes questionable if a bank is continuously making losses.<sup>(2)</sup> The JFSA tightened rules regarding the use of DTAs in calculating Tier 1 capital only gradually during the 2006–08 period. This policy of 'phasing' aimed to gradually enhance the resilience of the financial system amid concerns that an immediate tightening of capital rules could cause a second credit crunch and undermine the official sector's efforts to dispel deflationary pressure.

### Policies to support credit (1997–)

This section reviews Japan's policy response to the credit crunch which emerged during the later stages of its banking crisis. Although bank lending growth slowed since the onset of the crisis, firms continued to report easy access to bank credit during the 1993–97 period. This was, in part, a reflection of forbearance on lending. A system-wide credit crunch emerged only after the crisis became systemic in 1997 and the

regulatory standards for NPL provisioning were subsequently tightened (Chart 6). The box on pages 44–45 presents evidence that the weak credit growth was mainly driven by those banks that entered the crisis with the weakest capital positions, or incurred the heaviest losses following the crisis.

Chart 6 Japanese GDP and credit growth<sup>(a)</sup>



Sources: IMF *World Economic Outlook* (2003), World Bank and Bank calculations.

(a) Year-on-year growth rates. Both series are real. Net domestic credit is deflated by the consumer price index.

When the credit crunch emerged, there was little room for 'conventional' monetary policy easing, as the policy rate had already reached 0.5% by September 1995. Although the BoJ cut the policy rate to 0.25% in September 1998 and again to 0.15% in February 1999, the onset of deflation meant that real interest rates started drifting up in the late 1990s.<sup>(3)</sup> In April 1999, the BoJ initiated 'unconventional' policy by announcing the 'zero interest rate policy' (ZIRP). Although the BoJ ended the ZIRP in August 2000 when it raised the policy rate to 0.25%, it again cut the rate to 0.15% in February 2001 following the burst of the dotcom bubble in the United States, and announced its 'quantitative easing policy' in March 2001.

The credit crunch after 1997 hit small and medium-sized enterprises (SMEs) — which depended on bank loans to finance their operations — most severely. To increase credit availability, the government launched a number of policy measures. First, it set SME lending targets for each bank that received a public capital injection in March 1999. Second, the government introduced the Special Credit Guarantee

(1) See Fukao (2003, 2007). 'Double-gearing' refers to a practice via which weak banks asked insurance companies to provide equity capital (Tier 1 capital) and subordinated debt (Tier 2 capital), with insurance companies asking banks in turn to hold their surplus notes (similar to non-voting redeemable preferred shares) and subordinated debt. This practice enabled both parties to flatter their regulatory capital ratios, but at the cost of increasing the likelihood of spillovers as insolvency of one party would give rise to direct losses for the other.

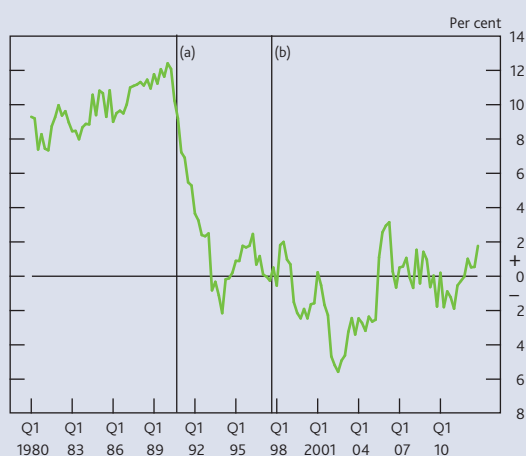
(2) In 2003, before the JFSA started tightening rules regarding the use of DTAs in calculating Tier 1 capital, the accountants refused to certify accounts of Resona Holdings, which had been relying excessively on DTAs in maintaining adequate capital ratios. This event, which led to a public capital injection into Resona, was unexpected by the JFSA which was notified late in the day. See Gomi (2012), pages 102–03.

(3) See Ueda (2012).

## What types of banks drove the decline in credit in Japan?

Credit growth started slowing in 1990 following the collapse of asset prices, and ground to a halt in 1997 around the time when, as discussed in the main text of the article, the Japanese banking crisis became systemic (Chart A). Following that, credit growth turned negative for several years and the economy entered a period during which the ratio of credit to GDP declined substantially. By 2007, the credit to GDP ratio had returned to levels that had last been seen two decades earlier (Chart B).

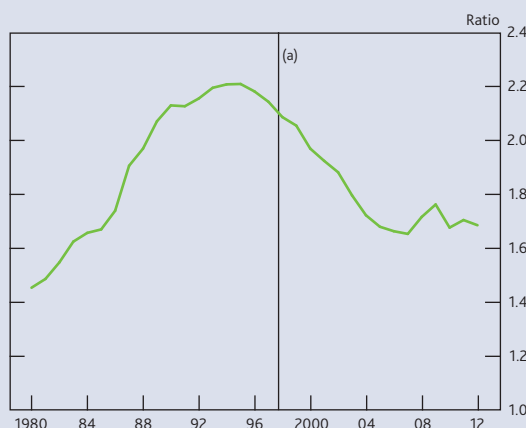
**Chart A** Annual nominal bank credit growth



Sources: Bank for International Settlements (BIS) and Bank calculations.

- (a) Vertical line denotes 1990 Q3 when asset prices peaked.  
 (b) Vertical line denotes 1997 Q4 when the crisis became systemic (see main text).

**Chart B** Credit to GDP ratio



Sources: BIS, IMF *World Economic Outlook* (October 2013) and Bank calculations.

- (a) The vertical line denotes 1997 Q4 when the crisis became systemic (see main text).

Bank credit accounted for around half of the total stock of credit provided to the private sector at the onset of the crisis. What explains the decline in credit provision by those banks whose lending contracted most acutely during the crisis period? And what were the balance sheet characteristics of the banks that expanded most rapidly?

## Evidence from a panel of Japanese banks

We use a panel data set containing annual observations of a sample of around 100 Japanese banks over the period 1999 to 2012.<sup>(1)</sup> Table 1 contains some summary statistics. Mean growth in net loans (that is, the change in the stock of loans, adjusted for loan losses) was just short of 1% per year in this sample over the period, although there was considerable variation across banks and time (Chart C). The average ratio of Tier 1 capital to total assets — a measure of the loss-absorbing capacity of a bank — was around 4.6%. On average, there was deleveraging between 1999 and 2012, as indicated by the growth in the Tier 1 ratio, which was around 0.1 percentage points per year.

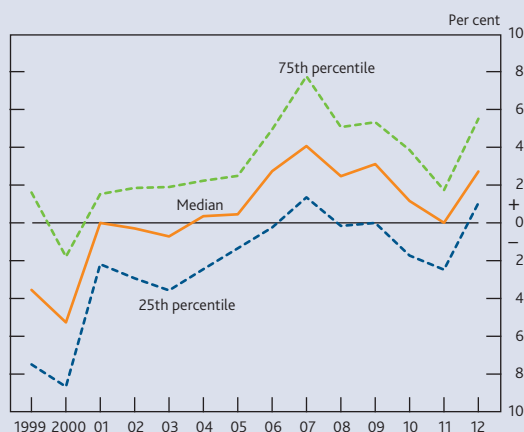
**Table 1** Summary statistics for Japanese banks for 1999–2012 (annual data)

Statistics (per cent unless noted otherwise)	Growth rate of net loans	Growth rate of common equity	Tier 1 ratio <sup>(a)</sup>	Change in Tier 1 ratio (percentage points)	Liquid asset ratio <sup>(b)</sup>	Change in liquid asset ratio (percentage points)
Mean	0.97	5.28	4.60	0.10	4.96	-0.19
Median	0.89	3.81	4.24	0.03	3.74	-0.07
75th percentile	3.58	10.94	5.03	0.24	6.07	0.88
25th percentile	-1.89	-4.13	3.47	-0.13	2.24	-1.27
Standard deviation	5.94	21.19	3.37	0.63	6.54	2.18

Sources: Capital IQ and Bank calculations.

- (a) Defined as the ratio of Tier 1 capital to total assets.  
 (b) Defined as the ratios of cash and cash equivalents to total assets.

**Chart C** Distribution of growth in net loans



Sources: Capital IQ and Bank calculations.

We investigate the statistical strength of the relationship between the various balance sheet and profitability characteristics of the banks in the sample and each institution's net loan growth. To do this, we run some simple regressions of the form:

$$\text{Loan growth}_{i,t} = \alpha_i + \alpha_t + \beta X_{i,t} + e_{i,t} \quad (1)$$

where  $i$  indexes institutions and  $t$  indexes time. The parameters  $\alpha_i$  and  $\alpha_t$  control for bank and time-specific effects,

such as bank-specific business models and time-specific macroeconomic conditions, and the vector  $X_{i,t}$  contains a set of bank characteristics, such as the capital ratios and measures of profitability summarised in Table 1. The term  $e_{i,t}$  is a normally distributed error. The vector  $\beta$  summarises the statistical strength of the relationship between the characteristics in  $X_{i,t}$  and net loan growth, the variable we are most interested in for this exercise. The regression estimates of the  $\beta$  coefficients are reported in Table 2.

**Table 2** Regression estimates for the relationship between loan growth and other bank balance sheet variables<sup>(a)</sup>

Dependent variable:		
Net loan growth	Regression (1)	Regression (2)
Tier 1 ratio (-1)	1.74*** (3.23)	2.67*** (3.73)
D Tier 1 ratio (-1)		-2.30*** (-3.60)
Liquid asset ratio (-1)	0.65**	0.85**
D liquid asset ratio (-1)		0.40 (1.39)
Growth common equity (-1)		0.05* (1.96)
Observations	421	238
Number of banks	116	53
Average number of observations per bank	3.63	4.49
Year fixed effects	Yes	Yes
Bank fixed effects	Yes	Yes

(a) Regressions include a constant, year and bank fixed effects (not reported). 'D' denotes first difference. '-1' denotes a one-year lag. \*\*\*, \*\* and \* denote significance at 1%, 5% and 10% levels, respectively. Robust standard errors clustered by bank are reported in parentheses.

The estimates should be treated as purely *descriptive* as it is hard to make concrete statements about causality in this exercise.<sup>(2)</sup> The simplest model, reported in column (1), suggests that banks with stronger capital and liquidity positions in the previous year tended also to have higher growth in net loans in the current year. Moving from column (1) to column (2) investigates how this picture changes as extra explanatory variables are added, although this comes at the cost of a reduced sample size.

In particular, column (2) shows the results of including *changes* in capital and liquidity positions in the regression. The results in this column suggest that banks with stronger capital or liquidity positions in the previous year continued to exhibit higher loan growth in the current year, *all else equal*. For example, the results in columns (1) and (2) imply that a bank starting with a capital ratio 1 percentage point higher in the previous year tended also to grow its net loans by between 1.7 and 2.7 percentage points more quickly in the current year. But column (2) shows that banks that had strengthened their solvency positions in the previous year (that is, banks for which the capital ratio increased) tended to exhibit slower net loan growth in the current year, *all else equal*. By the nature of the

exercise, we do not attach a causal interpretation to these comovements. But they suggest that weak lending growth and undercapitalisation went hand in hand. Overall, the results are indicative of considerable richness in the dynamics of balance sheet adjustment over the period.<sup>(3)</sup>

Growth in common equity in the previous year, which captures past profitability, also tended to be positively correlated with loan growth in the current year, though the economic significance of the relationship was weak. And there is some evidence that banks with a higher liquid asset ratio in the previous year, which captures the proportion of a bank's balance sheet comprised of highly liquid assets (here taken to be cash), were better able to support lending growth in the current period.<sup>(4)</sup>

## Conclusions

There are various economic interpretations of the correlations uncovered by these simple regressions. One is that weak lending growth in the aftermath of the systemic phase of the Japanese banking crisis was driven by those banks that entered the crisis with the weakest capital positions, or incurred the heaviest losses following the crisis. These banks might have sought to restore these positions in the years after the crisis through deleveraging. Equally, banks with stronger liquidity positions may have been better able to access funding in the wake of the crisis as their balance sheets were to a greater degree shielded from the fall in collateral values that ensued throughout the period.

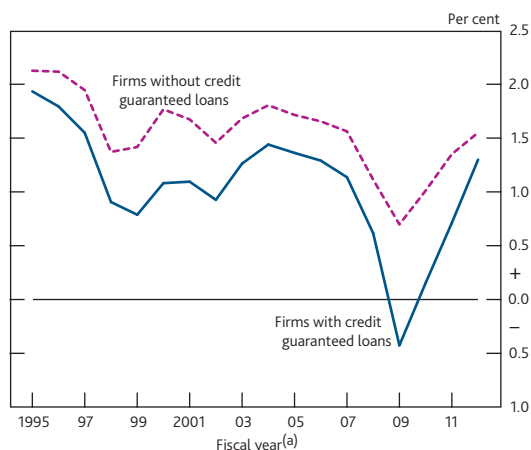
If these interpretations are correct, they suggest that, among other things, measures taken by the prudential authorities in the future which have the effect of boosting the solvency positions of banks could help smooth the provision of credit when shocks to the economy eventually materialise.

- (1) The data were collected from Capital IQ. Disclaimer: This may contain information obtained from third parties, including ratings from credit ratings agencies such as Standard & Poor's. Reproduction and distribution of third party content in any form is prohibited except with the prior written permission of the related third party. Third party content providers do not guarantee the accuracy, completeness, timeliness or availability of any information, including ratings, and are not responsible for any errors or omissions (negligent or otherwise), regardless of the cause, or for the results obtained from the use of such content. Third party content providers give no express or implied warranties, including, but not limited to, any warranties of merchantability or fitness for a particular purpose or use. Third party content providers shall not be liable for any direct, indirect, incidental, exemplary, compensatory, punitive, special or consequential damages, costs, expenses, legal fees, or losses (including lost income or profits and opportunity costs or losses caused by negligence) in connection with any use of their content, including ratings. Credit ratings are statements of opinions and are not statements of fact or recommendations to purchase, hold or sell securities. They do not address the suitability of securities or the suitability of securities for investment purposes, and should not be relied on as investment advice.
- (2) A causal interpretation would require us, for example, to instrument the explanatory variables in the regression with other observables that affect loan growth only through their effect on the explanatory variables and which do not affect loan growth directly.
- (3) The liquid asset ratio used here is a simple ratio of cash and cash equivalents to total assets. It is therefore distinct from the Basel III Liquidity Coverage Ratio measure of liquidity risk.
- (4) These conclusions are consistent with findings of Kapan and Minoiu (2013), who study the effects of bank balance sheet strength on deleveraging during the recent crisis.

Programme, under which the government-backed Credit Guarantee System (CGS) guaranteed 100% of bank loans to SMEs. The approval standards for these guarantees were very generous: SMEs' applications for loan guarantees were approved unless they had significant negative net worth, tax delinquency, were already in default or were 'window dressing' to flatter their balance sheets.<sup>(1)</sup> As a result, 43.5% of SMEs were using the CGS guarantee as of 2001, with 11.7% of outstanding SME loans being guaranteed. Third, the JFSA clarified loan classification standards for SME loans in 2002 in order to prevent a further tightening of credit conditions.

While all these measures helped to support credit to SMEs, the dependence of SMEs on public loans rose sharply after 1998 and continued for a prolonged period thereafter: together with publicly guaranteed loans, lending by public financial institutions still constituted 26% of total loans to SMEs as of 2011.<sup>(2)</sup> Available evidence also suggests that the credit guarantees may, in some cases, have sustained bank lending to relatively weak firms in troubled industries. For example, Bank of Japan (2009) presents evidence that the ratio of outstanding guarantees from CGS to total loans for small firms tended to be higher in sectors with longer years of debt redemption or higher default rates. Bank of Japan (2013) also shows evidence that those firms that received guaranteed loans tended to have a lower return on assets relative to firms without guaranteed loans (Chart 7), and that a significant proportion of firms receiving credit guaranteed loans were operating with a negative return on assets (Chart 8).

**Chart 7** Return on assets of firms with and without credit guaranteed loans



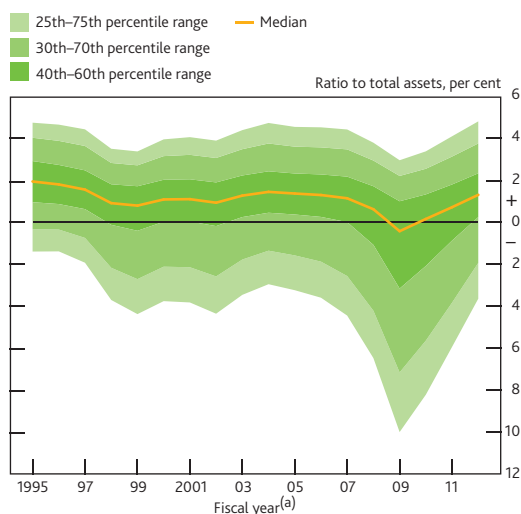
Source: Bank of Japan (2013), page 41.

(a) Fiscal year starts in April and ends in March (so the 1995 figure refers to April 1995 to March 1996).

## Lessons from the Japanese experience

Japan's experience in dealing with its banking crisis clearly illustrates the difficult trade-off between the need to contain moral hazard and fiscal costs on the one hand, and the need to contain systemic risk on the other. The Japanese authorities

**Chart 8** Distribution of return on assets of firms with credit guaranteed loans



Source: Bank of Japan (2013), page 41.

(a) Fiscal year starts in April and ends in March (so the 1995 figure refers to April 1995 to March 1996).

successfully prevented a collapse of its domestic financial system and avoided large-scale international spillovers from their national crisis, despite the involvement of several internationally active banks. This is unlikely to have been possible without guaranteeing the non-equity liabilities of failed financial institutions — particularly during 1997–98 when the rest of Asia was in financial turmoil.<sup>(3)</sup> This policy, however, came at a cost of encouraging creditor moral hazard.

It should be recognised that the Japanese authorities' policy choices reflected this difficult trade-off in an environment of heightened uncertainty, and at a time when the legal frameworks for prompt recapitalisation and orderly resolution of failing financial institutions were initially missing. But with the benefit of hindsight, a number of lessons can be drawn from Japan's experience for macroprudential policy, the resolution of failing banks, and credit policy.

**First, the MoF's experience in using credit 'quantity restrictions' to curb real estate lending contain some lessons for modern macroprudential policy.** Its experience highlights the need for macroprudential policy authorities to choose the timing and form of intervention judiciously by taking into account the system-wide impact of rapid credit expansions.<sup>(4)</sup> It underscores the need for macroprudential

(1) The limit on the total size of the guarantee programme was ¥20 trillion, which was increased to ¥30 trillion in 1999 — equivalent to 6% of GDP at the time. This scheme closed for new applications in 2001 but Japan reintroduced another credit guarantee scheme in October 2008 (which was due to expire in March 2010 but was replaced by a similar successor scheme a year later). Based on lessons from the past experience, approval standards were tightened under the new scheme. See Uchida (2010).

(2) See Bank of Japan (2012).

(3) For example, Nakaso (2001) notes that preventing international spillovers was a key consideration in guaranteeing all the liabilities of Yamaichi Securities, which failed in November 1997.

(4) More international experiences with sectoral capital requirements also highlight the importance of timing and calibration in achieving the desired outcome. See Bank of England (2014), Box 1.



authorities to consider the interaction of their policies with monetary policy, and communicate effectively in order to smooth the market reaction.<sup>(1)</sup> And it points to difficulties associated with controlling risk exposures of those financial institutions that are not covered by the macroprudential policy tools. This highlights the importance of a regular review of the appropriateness of the regulatory perimeter.<sup>(2)</sup>

**Second, Japan's experience in the first half of the 1990s highlights risks associated with forbearance, both by banks and by regulators.** To some extent, the combination of policies used in the first half of the 1990s was successful in avoiding an excessive tightening of credit conditions and the costly liquidation of a number of financial institutions during that period. But to the extent that forbearance allows weak banks and firms to survive, it can potentially worsen credit misallocation problems and increase eventual losses at banks.<sup>(3)</sup> The underestimation of the extent of the problem, the expectation of an economic recovery, and the absence of a comprehensive legal framework to facilitate prompt recapitalisation and orderly resolution of failing banks were factors behind regulatory forbearance. Japan's experience thus highlights the need for ensuring that banks are adequately capitalised to withstand plausible stress scenarios.

**Third, resolving uncertainty over banks' asset valuations and recapitalisation were crucial for restoring market confidence.** This underscores the need for a regulatory mechanism to ensure that weakly capitalised banks are

promptly identified and forced to raise capital. In Japan, this required detailed and repeated inspections by bank supervisors based on transparent regulatory standards for loan classification and provisioning. This needed significant supervisory resources and took a long time.

**Fourth, credit support measures extending over long periods risk exacerbating imbalances.** Such measures might smooth adjustment in the short run by maintaining the flow of credit, but might not provide long-term solutions to the problem of rebalancing. Moreover, the emergence of sectors and firms dependent on continued policy support could make it politically difficult to withdraw such measures. To avoid these problems, such policy measures need to be designed carefully to maintain the right incentives for lenders and borrowers, and supported by strong underwriting standards.

Although this paper focused on Japan's policies towards its banking sector during its 'lost decade', these were not the only causes for the deep and prolonged banking crisis. In particular, the increase in bad assets throughout the 1990s was, to some extent, also due to the continued decline in asset prices, which had become overly inflated during the 1980s. There was also a complex interplay of fiscal, monetary and banking sector policies behind Japan's long stagnation, as well as external shocks, most notably the Asian crisis in 1997–98, which financial sector policy alone would have struggled to manage.

(1) For more information on the signalling channel of macroprudential policy see Giese *et al* (2013).

(2) See Bank of England (2012), Box 4 for a discussion of this issue.

(3) In the case of the United Kingdom, Arrowsmith *et al* (2013) concluded that bank forbearance to SMEs appeared to account for only a small proportion of the weakness in aggregate productivity and that it was unlikely to threaten financial system stability.

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# The role of business model analysis in the supervision of insurers

By John Breckenridge of the Prudential Regulation Authority's Insurance Directorate and James Farquharson and Ruth Hendon of the Prudential Regulation Authority's Policy Division.<sup>(1)</sup>

- The Prudential Regulation Authority (PRA) supervises insurance companies since, in the absence of regulation, there could be adverse effects for policyholders and financial stability.
- Like all firms, insurers' business models — the ways they make profit — and the risks they face evolve over time. The PRA uses business model analysis (BMA) as part of its forward-looking supervisory approach, to help to ensure that these evolving risks are recognised.
- This article explains the use of BMA, using as case studies the rise of price comparison websites in the motor insurance market, and the growth of non-standard annuity products for life insurers.

## Overview

Insurance plays an important role in the UK economy. It supports economic activity by helping businesses and households to manage the risks that they face — risks which in many cases would be severe if they were to fall on an individual person or business. It is important that insurers are prudentially sound so that threats to financial stability are minimised and so that policyholders can expect claims will be met as they fall due with a high degree of confidence. The Prudential Regulation Authority (PRA), which assumed responsibility for the prudential regulation of insurers in April 2013, needs to make judgements to ensure its resources are focused on the greatest risks. And it takes a forward-looking approach — so supervisors must ask the right questions about what could go wrong in future.

Business model analysis (BMA) helps the PRA to make forward-looking judgements by exploring how a firm plans to make money, and what risks it takes in so doing. After setting out the role of insurance in the economy and the insurer's business model, this article explains the potential use of BMA in the supervisory process by considering two case studies:

(i) **The rise of price comparison websites, or 'aggregators', in the motor insurance market.** Aggregators accounted for around 33% of all motor insurance sales in 2012, having only first appeared around a decade earlier. Consumers using aggregators are very price-sensitive, with only 7% choosing an insurance policy outside of the top five cheapest quotes. Such dramatic changes have improved competition and helped keep costs down for

customers. But they have also introduced risks that the PRA must consider as part of its supervision.

(ii) **The growing market for 'non-standard' annuities that can offer improved retirement incomes for those in poor health.** These products accounted for around 30% of total annuity sales in 2012, compared to 12% in 2008. However, they present a number of risks for insurance companies. For instance, those selling non-standard annuities are particularly exposed to improvements in the lifespans of those in less than average health, meaning that insurers could incur large losses if they underestimate future medical advances, say, or the number of smokers who later go on to quit. Moreover, by drawing some of those in poorer health away from standard annuities, they have also changed the risks faced by insurers that do *not* offer non-standard annuities.

These market developments, then, introduce new sources of vulnerability that the PRA must assess. Where motor insurers sell through price comparison websites, for instance, the PRA can scrutinise the assumptions made about future policy renewals and the controls around the complex pricing algorithms that are used. Similarly, the amount and quality of the data that insurers use to price annuities can be examined, particularly for those that apply to specific health conditions. This type of BMA helps the PRA to consider whether a firm's profits are in line with the risks it is taking and, where necessary, to respond pre-emptively on the basis of what could go wrong in the future.

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

Insurance companies allow businesses and individuals to transfer risk, by exchanging a future unknown outcome for a known premium upfront. In a world that is inherently uncertain, insurers play a key role in the economy by allowing households to smooth consumption and by boosting firms' confidence to spend and invest.

Life insurers offer protection from uncertainty over the timing of death. General insurers protect, among other things, against natural disaster, fire, theft and accidental damage, as well as against legal liability. Insurers take on a diverse range of risks and the effect on policyholders and on financial stability were an insurer to fail could be severe.

In April 2013, the Prudential Regulation Authority (PRA), a subsidiary of the Bank of England, assumed responsibility for the prudential regulation and supervision of insurers.<sup>(1)</sup> Conduct supervision of insurers — which focuses on the way customers are treated — passed to the newly created Financial Conduct Authority (FCA). This is in contrast to the previous system of financial regulation, where both prudential and conduct supervision were undertaken by the Financial Services Authority (FSA).

This article discusses some of the ways in which changes to an insurer's business model feed in to the PRA's approach to prudential supervision of insurers. It starts with an overview of the insurance industry, assuming no prior knowledge. The article then explains in more depth how the PRA uses business model analysis (BMA) as part of its supervisory approach. Two case studies are used to illustrate the application of BMA, focusing on (i) the impact of price comparison websites for the motor insurance industry, and (ii) the growth of the non-standard 'enhanced' annuity market.

## What is insurance and what role does it play?

Insurance allows people to exchange the risk of a very uncertain (and possibly very bad) financial outcome for a predictable, known cost or premium. Demand for insurance arises because consumers would prefer to pay a small fee up front rather than take the risk of having to pay a large amount later if the insured event occurs. Most consumers prefer to do this even if the fee or 'premium' they pay amounts to more than the average or expected cost of the insured event. They are risk-averse, and so prepared to pay an extra margin for the certainty that insurance offers. For example, a homeowner with a house worth £100,000 with a one in a thousand annual probability of it burning down will typically be prepared to pay more than the expected loss (£100) to avoid the risk of a larger financial loss.

Insurance supports economic activity via a number of channels. The ability to smooth out what could otherwise be a very volatile pattern of costs gives consumers confidence to

make large purchases such as houses, cars and holidays. Insurance helps businesses to expand and invest by protecting their premises, stock and employees. It allows innovation, by protecting claimants when liability results from new products or medicines. Professional indemnity cover allows doctors, solicitors and accountants to practice. And insurance markets such as Lloyd's of London allow insurers to come together to share larger risks such as those associated with large public infrastructure projects.

In protecting people and businesses from losses related to unpredictable events, insurance serves a social purpose by reducing reliance on the state. Pooling risks between large numbers of people, and protecting individuals from catastrophic outcomes that would otherwise leave them bankrupt, reduces the need for a government safety net. Pension savings vehicles and annuity products provided by insurers also provide a private supplement to the state pension.

Insurers are willing and able to supply insurance because, by taking on a large number of similar risks, they can reduce the uncertainty over the combined cost of the insured events; the risks are pooled. For example, while it is very hard to know if any one individual will crash their car in a given year, an insurer can assess with much greater confidence how many car drivers out of 100,000 will have an accident and what the total costs of this are likely to be.

### Types of insurance product

While the concepts of transferring and pooling risk are central to all types of insurance, there is a wide variety of product types.<sup>(2)</sup> Typically these fit into three categories:

- (i) **Life insurance**, which covers risks arising from uncertainty about the lifespan of an individual. It includes:
  - annuities, which provide guaranteed income until death, and so protect an individual from the financial cost of living longer than expected;
  - conventional life assurance, which pays out a lump sum to beneficiaries on the death of the policyholder; and
  - savings products, which, for tax and legal reasons, have historically offered a limited death benefit alongside investment return.

(1) See Bailey, Breen and Stephens (2012) for a description of the PRA's role and its approach to supervision. See also Debbage and Dickinson (2013) for the rationale for prudential regulation and supervision of insurers.

(2) Furthermore, some risks that can be transferred using insurance-like arrangements are not technically classified as insurance. For example, credit default swaps (CDS) are derivative contracts which essentially insure against the risk that a company or government will be unable to pay its debts. Because there is no requirement for the contract buyer to have an insurable interest in the insured event, CDS do not constitute insurance contracts in legal terms.

**(ii) Non-life or general insurance**, which includes:

- property cover, protecting physical property such as buildings, cars, ships or aeroplanes from losses which may arise from events such as natural disasters, thefts, fires or accidental damage;
- various liability policies, which protect individuals and companies against the costs arising from legal liability (for example negligence) claims against them; and
- miscellaneous financial loss cover, including business interruption policies that protect against loss of business as a result of events such as severe weather.

**(iii) Reinsurance**, which is a further layer of insurance taken out by insurance companies to transfer some of the risks they have taken on. Reinsurance is typically provided by specialist reinsurers.

Not all risks can be transferred using insurance. Although there are various possible definitions, a risk is generally considered to be insurable if: it is unpredictable and reasonably unlikely to occur; the policyholder has a genuine financial interest, usually called an insurable interest, in the risk (for example it is not possible to take out a life assurance policy on a stranger's life); the loss that might arise from the risk can be expressed in monetary terms, and is neither trivial for the policyholder nor catastrophically large for the insurer; and it will be definite whether or not a loss has occurred, and what is the monetary size of the loss.<sup>(1)</sup>

**Why insurance differs from other business models**

Insurance companies have a very different business model from most other types of company. This is discussed in more detail in the box on pages 52–53. One key aspect of insurers' business models is the inverted production cycle: insurers receive premiums up front and deliver a service later. This has two main implications:

- insurers can earn an investment return over the period between premiums being paid in and claims being paid out; and
- while most retailers can set prices based on a known cost of production, the price charged for insurance is set based on estimates of the future level of claims and expenses.

Insurers seek to make profits primarily through good underwriting (carefully selecting and pricing the risks they take on) and investment income (investing premium income and making a return in excess of that needed to pay policyholder claims). Expense management and robust claims handling will also help to control costs. If premiums and investment income exceed the cost of claims and expenses, the remainder can be retained as profit or used to pay dividends to shareholders.

In seeking profits, however, insurers must take certain risks. Poor underwriting can lead to losses if the estimates of future claims and expenses that were used to price a policy turn out to be too optimistic. Meanwhile, if investments fall in value, or are difficult to turn into cash when needed, money might not be available to pay claims falling due.

**How does the PRA use business model analysis to supervise insurers?**

The failure of an insurance company is likely to have negative consequences for policyholders. For example, a policyholder with a flooded or burnt down home, or an annuitant relying on the regular monthly income from their policy, would clearly suffer if payments due to them are not made as expected. Given the important role that they play in the economy, insurers can also give rise to risks to the stability of the financial system. Moreover, a number of market failures are present in insurance markets. The prudential supervision of insurers can help to counteract these market failures, leading to a more stable financial system and ensuring that there is a reasonably high probability that insurers are able to meet obligations to policyholders as they fall due. Debbage and Dickinson (2013) explore these issues in more detail and set out the rationale for the prudential regulation and supervision of insurers.

The PRA's approach to supervision has been set out in a number of publications and speeches.<sup>(2)</sup> Importantly, the PRA has adopted a judgement-based, focused and forward-looking approach. This approach is intended to avoid a tick-box mentality among supervisors, to ensure resources are focused on the greatest risks, and to make sure the right questions are asked about what could go wrong in the future.

An important part of forward-looking supervision is an understanding of future as well as current risks that may threaten the ongoing viability of an insurer's operations. The PRA's capital requirements help to make insurers resilient against short-term shocks. But to be confident that insurers will remain viable over the longer term, the PRA needs to know whether an insurer's profits are sustainable. In other words, the PRA will need to analyse the risks of an insurer's particular business model.

BMA is now a central part of the PRA's supervisory approach, and receives more prominence than was the case under the FSA. This is partly in recognition that before the financial crisis, supervision did not focus sufficiently on some of the key questions regarding a firm's business model, such as how the

(1) Nevertheless, there are often disagreements between policyholders and insurers over the size of losses. For some types of claim, for instance liability claims, it may take many years for the full extent of an insured loss to be known.

(2) See Bailey, Breeden and Stevens (2012) for a summary.

## The insurance company business model and balance sheet

Insurance companies have very different business models to most other types of company. This means insurers and their customers face a unique set of risks.

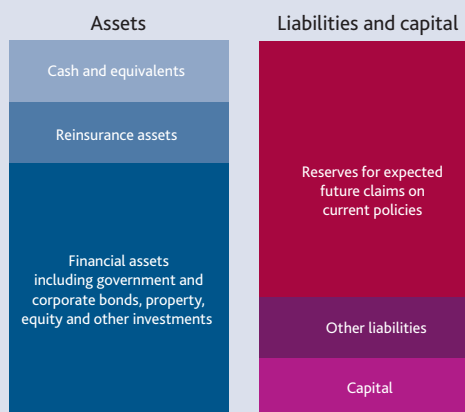
The key difference in an insurance company business model is the order of the production cycle; that is, the order in which the product is made, a customer pays for it, and the product is delivered by the company. In general, a company would have to invest time and money to build up the stock of a product before customers pay money to the company and then receive their goods. For an insurance company it is the other way round. The customer pays the premium for their policy up front, but only receives any benefit from the insurer later.<sup>(1)</sup> This is known as an inverted production cycle.

For example, in the case of an annuity, the policyholder will pay a lump sum to the insurer in return for the promise of a future stream of income payments. The annuity will only be of financial benefit to the policyholder once the income payments have exceeded those which could have been drawn down from the initial lump sum — and this may not happen until a number of years (or decades) after the product is bought. For general insurance contracts, the policyholder will only receive a payment at some point in the future if an insured event — such as a house fire or a car accident — occurs.

The inverted production cycle has the potential to affect an insurer's incentives. Most businesses will only be paid when their customers have received a satisfactory product, creating an incentive to offer a high-quality product and good customer service. But an insurer receives payment in advance. This, combined with the relatively low barriers to entry to the insurance market, has led in the past to cases of fraudulent activity. There have also been cases of overoptimistic insurers distributing too much to their shareholders or members and not holding enough back to cover potential future claims. The vast majority of insurers will want to manage themselves safely and carefully for reputational reasons, and to attract new policyholders. But for the few exceptions, the inverted production cycle strengthens the case for having independent bodies to regulate insurers in terms of both their financial resources and the way they do business.<sup>(2)</sup>

To help understand how insurance companies work it is helpful to consider a stylised model of an insurer's balance sheet (**Figure A**). The balance sheet shows an insurer's assets and liabilities at a single point in time. Capital is the balancing item, and equates to the assets in excess of the liabilities.

**Figure A** Stylised insurance company balance sheet



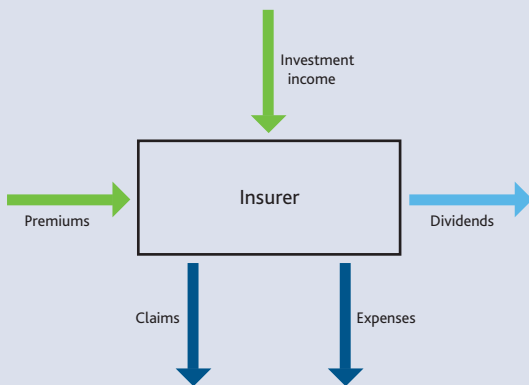
The majority of an insurer's assets are financial investments, typically government bonds, corporate bonds, listed shares and commercial property. The assets generate investment income and are chosen carefully to reflect the nature and timing of the insurance liabilities that may need to be paid.

As discussed in the main body of the article, some insurers use reinsurance to share some of the risk they have taken on. In exchange for a premium, the reinsurer will promise to pay a certain portion of the insurer's future claims. The expected future payments from the reinsurer constitute a reinsurance asset to the original insurer.

Insurers must estimate how many policyholders will claim on their policies and how expensive these claims will be, holding the aggregate expected cost of future claims in the form of reserves. Typically, these reserves represent the majority of an insurance company's liabilities — its obligations to others. As time passes and more information becomes available, these estimates will be revised. If claims are higher than previously estimated, an insurer may have to increase its reserves, leading to a loss. If there are fewer claims than expected, part of the reserves can be released as profit.

The highly simplified cash-flow diagram in **Figure B** helps to demonstrate how such profits may arise: if premiums and investment income exceed claims and expenses, the resulting profit can be kept by the insurer as retained earnings on its balance sheet,<sup>(3)</sup> or distributed back to capital providers, for example as dividends.

The profitability of an insurance contract will not be known at the outset, as it will depend on future events. To have a good chance of selling profitable policies, an insurer must carefully choose which risks it takes on and how to price these risks. This process is known as underwriting. Underwriting income will be generated where claims are less than premiums. To

**Figure B** Simplified cash-flow diagram<sup>(a)</sup>

(a) At the end of each accounting period, 'retained earnings' are equal to the remainder of cash inflows (premiums plus investment income) net of outflows (claims and expenses; and dividends). Retained earnings feed back into the stock of capital — so in Figure A, would be represented by an increase in the size of the balance sheet that reflects higher cash on the asset side and higher capital on the liabilities side.

achieve this, the insurer must ask prospective policyholders for information which will help it to understand the risk and determine a suitable price. For instance, before offering life insurance cover, an insurer may want to know a policyholder's age, medical history, whether they smoke, their occupation, their postcode, and so on.

The inverted production cycle gives rise to another key source of profit for an insurance company — investment income. Because the insurer receives premiums up front, it can invest these in financial markets until claims or benefits are due to be paid. Any investment income in excess of that needed to pay policyholders and cover expenses can be retained by the insurer as profit.<sup>(4)</sup>

The costs involved in attracting new policyholders, administering policies and paying out claims are significant for an insurer. Expense management is important because the inverted production cycle means that the final cost of the policy is not known when the price is set. If expenses turn out to be higher than expected, the amount that was included in the price to cover expenses may prove to be inadequate.

### Key risks to the insurance balance sheet

Over time the values of both assets and liabilities can change. On the asset side, the value of financial investments can rise and fall — and this volatility can be higher if an insurer tries to boost its investment income by investing in riskier assets. Reinsurer failure also represents a risk to the insurer, as it may prevent the recovery of reinsurance assets.

On the liability side, there is always some uncertainty about how many people will actually need to make a claim, and what those claims will cost. The severe UK floods in 2007 and more

recently are examples of unexpected events that have led to an unusually high number and cost of household insurance claims. This will have resulted in many insurers having to increase their reserves. This can also occur simply due to poor underwriting: if an insurer fails to understand the risk of flooding in an area, it may charge policyholders in that area an inadequate premium to cover the likely cost of their future home and contents insurance claims.

To be confident of remaining solvent despite uncertainty over both its asset and liability values, an insurer will need an extra buffer of assets above those covering expected payments to policyholders. The assets in excess of liabilities represent the capital of a firm. Because it can absorb losses, an insurer's capital buffer can reduce the risk of an insurer failing and so protects both policyholders and broader society from the costs of insurer insolvency.

- (1) Some savings types of life insurance products do not exactly conform to this model.
- (2) The conduct regulator, the Financial Conduct Authority, helps to ensure that consumers are treated fairly in their interactions with an insurer.
- (3) Retained earnings form part of the capital base of the insurer and so are included under capital in Figure A.
- (4) Note that for some types of contract with a profit participation element, for instance 'with-profits' contracts, some or all of the investment return will be credited to policyholders.

organisation makes money, and whether it can go on doing so for the foreseeable future.<sup>(1)</sup>

BMA helps the PRA to understand the sources of a firm's profits, and what might happen in the future to threaten these profits. To identify risks to a firm's profitability, the PRA needs to have an understanding of the company's overall strategy. This may be, for example, to increase volumes or to sell higher-margin products. Risks can also arise from competitors, so there is a need to be aware of prevailing conditions in the markets where a firm operates — including any barriers to entry to insurance markets. As risks can also emerge from changes to the social and broader macroeconomic environment, BMA helps to assess the impact of potential changes to consumer preferences or demand for certain products. Similarly BMA can be used to identify any legislative or regulatory changes that may impact an insurer's business.

To conduct BMA, the first requirement is an understanding of the fundamentals of the insurance business model. The box on pages 52–53 outlines how underwriting, investing, claims handling and expense management can be sources of profit.

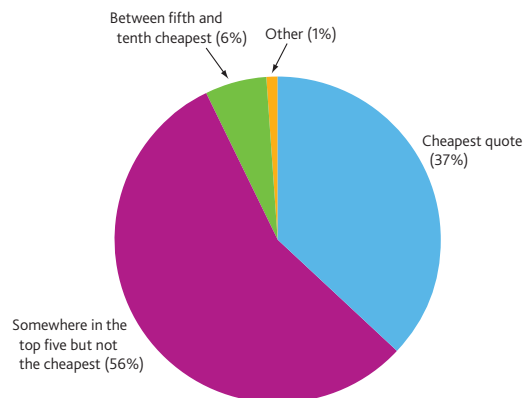
As with all industries, however, the business models of insurers are not static, and will respond to technological, social, cultural and regulatory changes. For general insurers, new technologies have fundamentally altered the distribution and marketing of retail products. Increasingly people are going online to buy motor, home and other everyday types of insurance. For life insurers consumer demand has changed not only the distribution of products but also the products themselves, for instance where products have become more tailored to individual circumstances.

To illustrate how BMA can be applied to specific subsectors of the insurance market, the remainder of this section considers two case studies. These help to show how the questions that BMA tries to answer can inform supervision.

### General insurance case study: price comparison websites and the UK motor insurance market

The emergence of price comparison or 'aggregator' websites has fundamentally changed how motor insurance policies are sold. These websites allow customers to enter their details into a single online form and quickly receive a range of quotes from a large number of insurance companies. These quotes can then be sorted and filtered based on price or other features such as policy excess. Increased comparability of pricing has increased the importance of price as a factor when people purchase car insurance via aggregators; market data suggest that, when using price comparison sites, very few people opt for a policy that is outside of the cheapest five quotes (Chart 1).

Chart 1 Choice of quote by consumers using price comparison websites



Source: Datamonitor Financial (2012).

Before price comparison websites became the dominant distribution channel, motor insurance policies were primarily sold through insurance brokers, or directly over the phone or internet. This had allowed insurers to compete both through branding and through developing broker relationships, the latter acting as a barrier to new entrants. But today, the increased consumer focus on price and the high number of insurers competing for market share have squeezed profit margins, encouraging insurers to try to offer the most competitive quote to each customer and to seek alternative sources of profit.

One way that insurers can offer cheaper quotes is by assessing each customer's risks — underwriting — at a more individualised level. A quotation will typically be based on factors such as the policyholder's age, the car make and model, past claims history, postcode, and a range of other socioeconomic factors.<sup>(2)</sup> To try to stay ahead of their rivals and price more accurately, firms have developed highly sophisticated pricing models, which use complex algorithms to offer instant quotes based on a wide range of risk factors. To successfully implement these more complex pricing models, insurers need sufficient market scale and robust IT systems.

Another way for insurers to offer more competitive quotes is to offer the main insurance product at a price that is lower than its true value, in the expectation of being able to make up the difference by cross-selling and up-selling more profitable related products. Indeed, there is some evidence that consumers tend to be less price conscious when making discretionary 'add-on' purchases compared to compulsory purchases.<sup>(3)</sup> Behavioural biases can also mean that add-ons appear relatively cheap when compared with the cost of a single large item, even if the customer would not regard them

(1) See HM Treasury (2011).

(2) Note that since the EU Gender Directive (December 2012) it has been illegal for insurers to charge a differentiated premium based on gender.

(3) Ahmetoglu *et al* (2010).



as cheap if they were considered in isolation.<sup>(1)</sup> Legal expense cover, personal accident cover and breakdown support can therefore be sold alongside the compulsory element of motor insurance, at high margins. For example, a recent market study found that for every pound of premium received for add-on personal accident insurance, insurers paid out only nine pence in claims.<sup>(2)</sup>

Expected sales of these profitable ‘ancillary’ products can lead insurers to sell the core product of motor insurance at a loss. When setting prices, the insurer will consider the lifetime profit they expect to arise from the initial sale of a policy to a new customer. This would include the expected profit on ancillary products as well as the profit on future renewals of the policy. Future renewals can be more profitable for the insurer than the original policy, because the fee originally paid to the aggregator website (typically £40–£50) would not be incurred again at renewal.

### Risk implications for motor insurers

Price comparison websites help to drive down costs for consumers. But for motor insurers selling products this way, the combination of complex technology, rapidly evolving competitive market dynamics and highly aggressive pricing strategies has created a number of risks, some of which are outlined below.

First, the complex automated pricing models that are central to this business model are a point of vulnerability for the insurer as they increase the threat of mispricing. Since the cheapest quotes appear at the top of a price comparison website, they are both prominent and highly likely to be accepted. Mispriced quotes from a pricing algorithm, that accidentally undercharge for the real level of risk, can thus quickly translate into large potential losses for the insurer. To avoid selling a large number of policies at inappropriately low prices, an insurer will need to have systems and controls in place to quickly identify and address cases where the pricing algorithm is underpricing risks. Pricing and risk selection, and the controls around these, are thus likely to be an area of supervisory focus for such firms.

A second risk is that any strategy that offsets expected losses on the core insurance product with expected profits on ancillary products is highly vulnerable to market changes. To the extent that profits from ancillary products have already been accounted for in the pricing of the core motor insurance policy, the insurer could suffer future losses if profit streams from ancillary products do not emerge as expected. This could happen because of increased competition. For example, the high profit margins on add-on products such as legal expense cover have begun to attract competition from the aggregator websites themselves, who are keen to capture some of this value. Additionally, a hardening of consumer attitudes could reduce the capacity of insurers to sell ancillary products; for

example, if high margin add-on products attract attention in the media, from the conduct regulator (the FCA) or from consumer groups. Recently the FCA released its market study of general insurance add-ons. It found significant failings in this market, resulting in poor consumer outcomes, and proposed a number of interventions to strengthen competition.<sup>(3)</sup> Changes in the external environment could therefore make these cross-subsidies unsustainable over the medium term and threaten the viability of the business model.

Finally, there is the risk that insurers taking into account the lifetime profit on a policy when setting the initial price may incorrectly predict the true future rate of policy renewals. Aggregator websites are incentivised to encourage customers to shop around rather than to renew with the same provider (as they earn a fee from each sale via their website), and are starting to actively target customers whose policies are due for renewal.

### Life insurance case study: non-standard annuities

A traditional annuity pays a guaranteed income until death, in exchange for a single initial premium. In recent years, annuity providers have begun to offer non-standard annuities, which can benefit those who are in poorer than average health by offering them a higher income. The non-standard annuity market can be subdivided into three categories: lifestyle annuities, which are underwritten based on factors such as Body Mass Index, cholesterol level or smoker status; enhanced annuities, which are targeted at those with medical conditions that may reduce life expectancy; and impaired annuities for those with very serious or life-threatening medical conditions.

Non-standard annuities are a growing proportion of the annuity market, making up around 30% of total annuity sales in 2012 compared to 12% in 2008 (**Chart 2**). This growth has been driven by several factors, including:

- Increased consumer awareness of the ‘open market option’, whereby customers can shop around for an annuity rather than stay with the provider of their pension savings vehicle. This has heightened the visibility of enhanced annuities.
- The current low interest rate environment and the expectation that rates may remain low for some time. This will have pushed annuity rates down, meaning prospective customers are more likely to seek out ways of boosting their income.
- Technological innovations, which have enabled better collection and storage of policyholder medical data, making

(1) An analogy would be ‘extended warranty’ insurance products, which typically have very high margins and are often sold alongside high-value one-off purchases such as white goods or mobile phones.

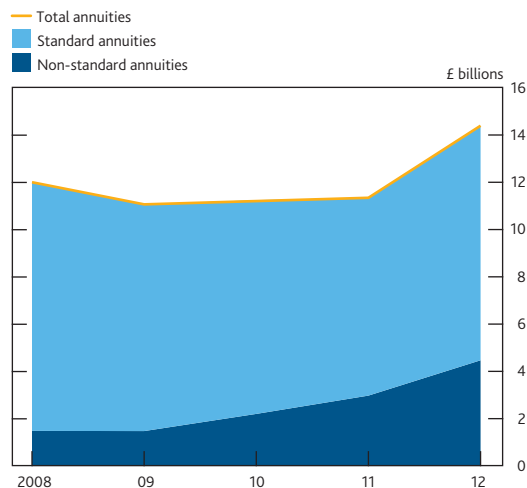
(2) Financial Conduct Authority (2014).

(3) *Ibid.*

the underwriting process smoother and allowing policyholders to submit their own medical information online.<sup>(1)</sup>

- The FSA's Retail Distribution Review, which has made the fees charged by independent financial advisers more transparent, increasing the incentives for advisers to demonstrate the value that they add by seeking out the best possible rates for their clients.<sup>(2)</sup>

**Chart 2** Annuity market sales



Sources: Association of British Insurers and Bank calculations.

### Risk implications for annuity writers

Enhanced annuities help to broaden the range of product choices offered at retirement, but they require careful management by insurers. All annuity providers are exposed to the risk that life expectancy improves faster than had been anticipated. But those selling enhanced annuities are particularly exposed to improvements in the lifespans of those in less than average health. If future medical developments happen at a faster pace than was expected when the product was priced, insurers could be left with significant losses. This could affect a large number of insurers simultaneously. To manage this risk, insurers need data that will help them to predict the life expectancy of the various subsets of policyholders with particular health conditions. The relative lack of good data also makes accurate prediction of longevity much more difficult. Moreover, this scarcity of data has created a competitive pricing advantage for those insurers that have been offering non-standard annuities (and collecting data) for longer time periods, and may have acted as a barrier to new entrants.

It may also be the case that policyholders have an incentive to overstate the extent of lifestyle factors such as smoking habits in order to benefit from a higher annuity rate. Furthermore, evidence suggests that those who stop smoking, even late in life, can benefit from increased life expectancy — and once an annuity is sold, the insurer cannot control the policyholder's subsequent behaviour. Mis-estimating the number of smokers

who will go on to quit or who have exaggerated their consumption could also lead to future losses.

Insurers that have not entered the non-standard annuity market are still very much affected by it. This is because of a process known as anti-selection. If policyholders in poor health increasingly choose to purchase non-standard rather than traditional annuities, the average health of the remaining pool of lives will improve. If traditional annuity providers do not reflect this improved level of health by increasing their pricing, they will undercharge for the true future lifespan of the lives they insure. An insurer that is 'late' to update its rates and so offers higher rates than its peers could attract large volumes of new business, making the problem worse. So all annuity providers, whether offering non-standard annuities or not, need to carefully monitor developments in the market and make sure their underwriting and pricing are as reflective as possible of the pool of risks they are taking on.

To help them to do this, insurers may continue to seek out more individualised information about their policyholders, accelerating the trend towards individually underwritten annuities and causing the market for 'at retirement' products to further evolve.

### What does the PRA do with the results of business model analysis?

A crucial question to ask when looking at the results of a BMA exercise is whether the firm's profits are in line with the risks it is taking. Innovation and business model change is generally good for competition (and hence for consumers). It is not the PRA's responsibility to manage a firm, nor to determine or approve its business model. However, it is a lesson from previous company failures that an inadequate risk-return trade-off is a leading indicator of vulnerability.<sup>(3)</sup> This can inform the PRA's activities in a number of ways.

First, it helps the PRA to carry out more focused reviews. Understanding a business model's risks helps the PRA to use its limited amount of resource more efficiently, ensuring that the areas which have the most potential to threaten the PRA's objectives are given priority.

Second, BMA allows the PRA to be forward looking and to respond pre-emptively on the basis of what could go wrong in future. Businesses which are viable and profitable today may not remain viable over the longer term if, for example, the social or economic environment changes. A deep understanding of the business model allows the PRA to identify how sensitive a firm's profits are to these sorts of changes.

(1) Comparison websites have also raised customer awareness of enhanced annuities.

(2) For more information, see [www.fsa.gov.uk/rdr](http://www.fsa.gov.uk/rdr).

(3) See, for example, Financial Services Authority (2008).

Third, the results of a BMA exercise help to inform the PRA's expectations of a firm's financial and non-financial resources. For example, the PRA might raise capital requirements, or require a firm to improve its governance process, to address weaknesses identified by BMA.

The case studies in this article also show some of the specific vulnerabilities that have been created by changes in an insurer's operating environment. To address these vulnerabilities, the supervision of firms can be tailored accordingly. For example, where motor insurers sell through price comparison websites, the PRA can scrutinise the assumptions made about future policy renewals and about the external operating environment. The complex pricing and risk selection models can be studied, along with the controls in place around these. There are a large number of firms in the UK motor insurance market, many with very similar business models, so the vulnerabilities mentioned here are common to several firms.

Similarly the PRA can examine the amount and quality of the data that insurers are using to price annuities, particularly for those that apply to specific health conditions. Firms can be asked to justify the allowances they have made for anti-selection and the increased health of those buying traditional annuities. The amount of capital that is held as a buffer against unexpected improvements in longevity can be reviewed given the changes to the structure of the market. Using BMA in this way highlights the PRA's commitment to being forward looking: identifying potential problems before

they materialise, and where necessary taking pre-emptive action.

## Conclusion

Insurance plays an important role in the UK economy, supporting economic activity by helping businesses and households to manage the risks that they face. Given the importance of this role, insurers have the potential to affect UK financial stability, both through the way they carry out their business, and in the event that they fail.

Carrying out BMA is only one part of the PRA's approach to supervision, but it has several uses. Understanding the sustainability and specific vulnerabilities of insurers' business models allows the PRA to focus its supervisory activity, making the most effective use of its resources. It allows supervisors to have a forward-looking view of the threats to firms and to take pre-emptive action. It can also feed into the Financial Policy Committee's surveillance of risks to the financial system as a whole.

Meanwhile, technology, longevity, the financial markets and other aspects of the external environment will continue to evolve. In response, insurers will continue to develop and revise their business models, bringing both beneficial innovation and a new set of emerging insurance risks. BMA helps the prudential supervision of insurers to keep pace with these external developments.

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# Nowcasting UK GDP growth

By Venetia Bell, Lai Wah Co, Sophie Stone and Gavin Wallis of the Bank's Conjunctural Assessment and Projections Division.

- Official estimates of UK GDP growth are published with a lag, but other data and statistical models provide an early indication of GDP growth.
- This article describes the approaches taken by Bank staff to produce early estimates ('nowcasts') of GDP growth, ahead of the publication of official estimates.
- Although the confidence bands around the Bank staff's nowcasts can be large, these estimates have tended to be more accurate than those from a simple statistical model.

## Overview

An assessment of the current cyclical position of the UK economy is a key input into the Monetary Policy Committee's (MPC's) monthly policy decisions and its *Inflation Report* projections. Official GDP data are published with a lag, however, so 'nowcasts' — estimates of growth in the current quarter, or the most recent quarter for which no official estimate is available — help policymakers to form a view on the prevailing state of the economy. Bank staff use a variety of models and indicators to provide nowcasts for the MPC which, since May 2013, have been reported in the quarterly *Inflation Report* and in the MPC minutes (see [summary chart](#)).

There are many different approaches to nowcasting, and a large body of literature on this topic. These differences stem from the range of data available that is considered useful, and the different ways of modelling the relationship between these data and GDP.

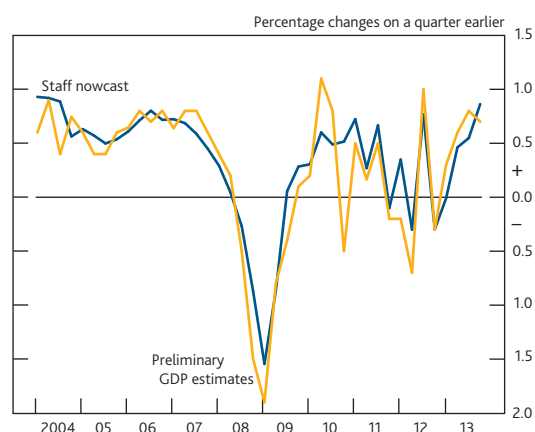
When growth is relatively stable, it is difficult to improve upon simple statistical models in which GDP growth depends linearly on its previous values. But the performance of such models is often poor during more volatile periods.

As this article discusses, Bank staff use two main models to nowcast GDP. One is based on modelling growth in different industries, while the other is based on mapping from survey indicators to GDP at an aggregate level.

A key aspect to nowcasting is also assessing when purely estimation-based nowcast models are likely to give a poor signal of GDP growth. The nowcasts produced by Bank staff

take this into account, and so do not purely reflect the mechanical outputs of the models outlined in this article. In recent years, there have been a number of events that have led Bank staff to place less weight on the mechanical nowcasts implied by estimation-based models. For example, the financial crisis increased output volatility substantially, and special events — such as the Diamond Jubilee and London Olympics — had temporary effects on output that also increased quarterly volatility. This is likely to have been a key reason why the root mean squared error of the staff nowcast (0.3 percentage points) has been lower than that of a simple autoregressive model (0.6 percentage points) over the period 2004–13.

**Summary chart** Staff nowcast versus ONS preliminary estimate of GDP<sup>(a)</sup>



(a) The chart shows, for each quarter at the time of the *Inflation Report*, the staff nowcast alongside the preliminary estimate of GDP growth, which is published around 10–11 weeks after the *Inflation Report*. For example, the final observation is for 2013 Q4 — the nowcast was published in the November 2013 *Inflation Report* and the preliminary estimate was published in January 2014. Chained-volume measures. GDP is at market prices.

UK GDP nowcasts — estimates of growth in the current quarter, or the most recent quarter for which no official estimates are available — form part of a range of information on current economic conditions used by the Monetary Policy Committee (MPC) to inform policy.<sup>(1)</sup> Nowcasting is important because official data are published with a lag, and so the nowcast produced by Bank staff informs the starting point of the MPC’s projections for GDP growth. This nowcast exploits information that is available earlier and at higher frequencies than official published figures for quarterly GDP growth. Since May 2013, staff nowcasts have been reported in the *Inflation Report* and in the MPC minutes.

After their initial publication, UK GDP data are often revised, reflecting the incorporation of new data sources, and, over time, any methodological changes. So in nowcasting UK GDP, it is important to decide whether to nowcast the first official estimate of GDP (called the ‘preliminary’ estimate), or what the official data will eventually show. Ultimately, it is the latter that is most important for policymakers. But, in practice, it is helpful to make an assessment of what the first official estimate is likely to be, and this is the focus of this article. One can subsequently model how that first estimate may be revised over time. Previous Bank work has assessed the relationship between early official estimates and mature estimates, and that approach is used to map from the nowcasts set out in this article to estimates of what the Office for National Statistics (ONS) will eventually publish.<sup>(2)</sup>

This article outlines the main approaches currently used by Bank staff to nowcast UK GDP and examines the performance of these approaches. But there are many different methods of nowcasting, so a broader overview of those adopted in the literature, and by other economic forecasters, is contained in the box on page 61.

## Industry model

One approach to nowcasting GDP is to model the economy split into different industries. This approach makes use of official industry-level data and a range of indicators to build up an aggregate GDP nowcast. A key advantage of this approach is that monthly output measures and indicators of UK GDP, which are typically at an industry level, are generally more timely than expenditure and income measures.<sup>(3)</sup> Nowcasting using the expenditure measure of GDP is discussed in the box on page 64.

Monthly official UK output data are useful for nowcasting at an industry level. While monthly data are often more volatile than quarterly data, the monthly profile often has a sizable impact on the quarterly growth rate.<sup>(4)</sup> So nowcast models that use monthly data to estimate quarterly growth rates often outperform models that only use quarterly data.

In addition to official data, survey indicators have typically improved industry nowcasts for the United Kingdom. As a result, the coverage of a particular survey is a key factor in determining the optimal industry groups for nowcasting.

Taking into account the industry groups in both the official and survey data, there are some natural groupings for nowcasting output in the UK economy (Table A). For example, private non-distribution services (PNDS), currently the largest industry group used by staff to produce nowcasts, aligns well with the coverage of the Markit/CIPS UK services PMI survey.<sup>(5)</sup> Other surveys of the services industry are useful for nowcasting services output. But, historically, models that use data from the Markit/CIPS services PMI survey have, on average, slightly outperformed those that use other surveys. The output data and indicators currently used for the industry model are set out in the appendix.

**Table A** Industry groups for the UK economy

Share of UK gross value added, per cent <sup>(a)</sup>	
Private non-distribution services: private business and consumer services, excluding distribution	48
Government services: health, education and defence	19
Distribution services: retail, wholesale and motor trades	11
Manufacturing	10
Construction	6
Utilities: electricity, gas, steam, air, water supply and sewerage	3
Extraction: mining and quarrying, including oil and gas	2
Agriculture	1

(a) These shares are calculated using the 2010 weights currently used by the ONS to estimate the chained-volume measure of aggregate GDP. Consequently, these weights can be used to aggregate the nowcasts for the different industries. These weights change annually with the publication of the *Blue Book*.

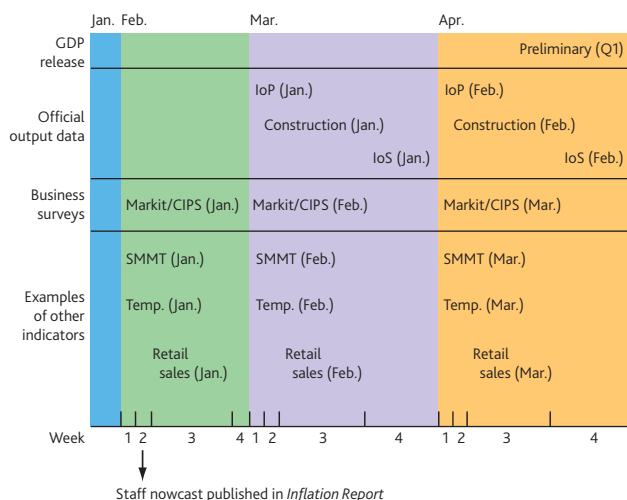
The contribution of monthly official data in nowcasting models relative to other data varies throughout the quarter, as more official data become available. The basic modelling relationship that Bank staff typically use in the industry model approach is, for a given month  $t$ :

$$Output_t = \alpha + \beta_1 output_{t-1} + \beta_2 indicator_t + error_t \tag{1}$$

The inputs to this type of model change as new data are released. This is illustrated in Figure 1, using Q1 as an example. Q1 preliminary GDP data are released towards the end of April, so the figure shows indicators that are released up to that

(1) For a discussion of world GDP and trade nowcasts see Stratford (2013).  
 (2) For further details of the Bank’s methods for dealing with data uncertainty since 2007, see Cunningham and Jeffery (2007). For details of the Bank’s methods prior to this, see Ashley *et al* (2005).  
 (3) Indeed, preliminary GDP estimates constructed by the ONS rely most heavily on the output data, and data on expenditure and incomes in the UK economy tend to be incorporated into official data with a longer lag. For more details, see Lee (2013).  
 (4) One simple way to think about the importance of monthly dynamics within a quarter is to consider an example when the level of output increases only in the last month of the previous quarter. If output then remains flat in the nowcast quarter, quarter-on-quarter output growth would still be positive.  
 (5) CIPS stands for Chartered Institute of Purchasing and Supply, and PMI stands for Purchasing Managers’ Index.

**Figure 1** Illustrative release dates for a selection of indicators used for nowcasting Q1<sup>(a)</sup>



(a) Markit/CIPS refers to the PMI surveys, 'Temp' refers to UK mean temperature anomalies data published by the Met Office, 'SMMT' refers to Society of Motor Manufacturers and Traders car registrations, 'loP' refers to the Index of Production release, 'loS' refers to the Index of Services release, and 'Construction' refers to the Output in the Construction Industry release. Months in parentheses show the latest month covered in the release published at that time.

point. In the first month of the nowcast quarter, January in this case, nowcasts are generated for each month in the quarter by estimating equations that use the previous outturn(s) of the nowcast variable — autoregressive term(s) — and selected indicators.

At the time that Bank staff normally produce the nowcast for the *Inflation Report*, for example, no official data for industry output are available for the nowcast quarter. PNDS is the largest industry group used by staff to produce the nowcast, as discussed above. At the time of the February 2014 *Inflation Report*, PNDS output for January was estimated using ONS data for December and the Markit/CIPS services PMI survey indicator for January.<sup>(1)</sup> The forecast for PNDS output in February was generated using the industry model estimate for PNDS output in January, and a forecast for the Markit/CIPS services PMI survey indicator in February, and a forecast was generated similarly for PNDS output in March (the details are provided in the appendix).

## Weighted survey model

An alternative approach to nowcasting GDP at an industry level is to focus on the relationships between survey indicators and GDP at an aggregate level. A disadvantage of this approach is that it excludes monthly official data. But the main advantage is that, for nowcasting early on in the data cycle, it does not require forecasts of monthly official data — it places full weight on the available survey data, which is more timely than the official data. And surveys of business expectations tend to be good indicators of output one quarter ahead, so in addition to a nowcast, this approach can be applied to produce a one quarter ahead forecast.

The weighted survey approach proceeds in three stages. First, the data from individual business surveys are aggregated to be as representative as possible of the whole UK economy. The surveys and data series that Bank staff currently use in this approach are outlined in **Table B**. Each survey yields an 'output' measure of recent activity, and an 'expectations' indicator of near-term growth. These output and expectations data from each business survey are then mapped to GDP growth. That involves transforming each series such that it has the same average and variance as GDP growth.<sup>(2)</sup> Each of the surveys may be used as an individual indicator of GDP growth, but, in the weighted survey model approach, the survey series are weighted together based on past performance, to produce a single nowcast. At the time of the *Inflation Report*, the weighted survey model uses a subset of the survey information to produce a nowcast because not all of the 'output' measures of activity for the nowcast quarter are available at this time (**Chart 1**).

**Table B** Business surveys used in the weighted survey model<sup>(a)</sup>

Survey: specific indicator	Industries included
BCC: domestic and export sales, past three months	Manufacturing, <sup>(b)</sup> services
BCC: confidence about future turnover	Manufacturing, <sup>(b)</sup> services
CBI: volume of output, past three months; volume of business, past three months; volume of sales this month compared with a year earlier <sup>(d)</sup>	Manufacturing, <sup>(c)</sup> business and professional services, consumer services, distributive trades <sup>(e)</sup>
CBI: volume of output, next three months; volume of business, next three months; volume of sales next month compared with a year earlier <sup>(d)</sup>	Manufacturing, <sup>(c)</sup> business and professional services, consumer services, distributive trades <sup>(e)</sup>
Markit/CIPS: <sup>(e)</sup> Output Index; <sup>(f)</sup> Business Activity Index; <sup>(f)</sup> Total Industry Activity Index <sup>(f)</sup>	Manufacturing, services, construction
Markit/CIPS: <sup>(e)</sup> New Orders Index; <sup>(f)</sup> Business Expectations Index; Future Business Activity Index	Manufacturing, services, construction

- (a) BCC stands for British Chambers of Commerce and CBI stands for Confederation of British Industry.  
 (b) Construction firms are included in the manufacturing total.  
 (c) In the months in which the *CBI Industrial Trends Survey* is not released, updated indicators are obtained from the *CBI Monthly Trends Enquiry*.  
 (d) An indicator for the volume of sales compared with the previous quarter is only available from 2003 onwards.  
 (e) These monthly indicators are mapped into a quarterly growth rate before they are used in the model.  
 (f) Seasonally adjusted measure.

A further quantitative source of information on developments in output are the scores put together by the Bank's Agency network.<sup>(3)</sup> Each month, the Agents form an assessment of how manufacturing output levels and business and consumer services turnover compare in the most recent three months with that of the same period a year earlier. The resulting quantitative Agents' scores are therefore helpful in assessing

- (1) Index of Services data for December 2013 were not yet published at the time, so the monthly growth rate was calculated using the monthly growth rates for October and November 2013 and the quarterly growth rate for 2013 Q4 from the preliminary GDP release.  
 (2) This is done by normalising each individual observation of the survey series (subtracting the mean of the survey series and then dividing by the standard deviation of the survey series), then multiplying it by the standard deviation of GDP growth and adding the mean of GDP growth. Following this adjustment, the new survey series have the same mean and variance as the GDP growth series.  
 (3) The Bank has twelve regional Agencies based around the United Kingdom. Each Agency provides a monthly assessment of economic conditions for its region, following discussions with individual businesses, organisations and groups. For more details, see [www.bankofengland.co.uk/publications/Pages/agentssummary/default.aspx](http://www.bankofengland.co.uk/publications/Pages/agentssummary/default.aspx).

## Different approaches to nowcasting

There is a wealth of literature on GDP nowcasting that covers a number of different approaches. The suitability of each approach depends on the information set available and the timeliness of official data and other indicators, which can differ significantly across countries. This box outlines a few of the main approaches, but more comprehensive reviews are available in recent literature, such as Bańbura *et al* (2013).

One approach to nowcasting is to use a basic statistical model, in which GDP growth depends linearly on its previous values. In periods of stable growth, it is difficult to improve upon this type of model, as discussed in Mitchell (2009). But during periods of more volatile growth, the performance of basic statistical models for nowcasting is often poor, as discussed in the final section of this article.

One common approach to nowcasting is to use 'bridge equations', which are regressions of quarterly GDP growth on selected monthly indicators. That is done in two steps. First, monthly indicators are forecast over the remainder of the nowcast quarter to obtain a quarterly nowcast for that indicator. Second, the resulting nowcasts are used as regressors in the 'bridge equation' to obtain the GDP nowcast. The industry model discussed in the first section of this article uses the first step of this approach (monthly series are forecast to obtain quarterly indicators), but because forecasts are obtained for each industry, the GDP nowcast is simply calculated using each industry's weight in GDP. The 'bridge equation' approach addresses one of the challenges of nowcasting: indicators are available for different frequencies (daily, weekly, monthly and quarterly), and are released at different times.<sup>(1)</sup> But using bridge equations limits the number of indicators, potentially discarding useful information, and also requires forecasts of some indicators, which could increase nowcast errors.

More recently, mixed-data sampling (MIDAS) has become a popular approach to nowcasting. The MIDAS approach is a simple way of handling data sampled at different frequencies that does not require indicators of a higher frequency, normally monthly, to be forecast over the quarter.<sup>(2)</sup> Instead, MIDAS equations directly relate quarterly GDP to the more frequent indicator and its lags. As discussed in Kuzin, Marcellino and Schumacher (2011), an alternative solution to this issue is a mixed-frequency vector autoregression (VAR), which can be put in a form that allows for missing values for data not yet available.

Another popular approach to nowcasting is to use factor models. In this approach, common statistical trends (referred to as 'factors'), which may reflect common economic

influences, are estimated from a large set of data. This addresses the problem with some other approaches that potentially useful information is discarded. If there is a high degree of comovement among the series, then most of the movement in the series of interest can be captured by a few factors. Different types of factor methods are discussed in Eklund and Kapetanios (2008). The MPC's forecasting platform contains a range of different statistical models that can be used to nowcast GDP, including factor and VAR models.<sup>(3)</sup>

Several economic forecasters employ dynamic factor models, including the European Central Bank.<sup>(4)</sup> The performance of dynamic factor models varies from economy to economy. Barhoumi *et al* (2008), for example, evaluate the performance of a particular dynamic factor model for nowcasting GDP growth in selected European economies. Internal Bank of England analysis suggests that the performance of certain dynamic factor models for predicting UK GDP growth was poor during and following the recession, but Bank staff have not used this type of model systematically.

An area of development in the nowcasting literature has been estimating densities, rather than only producing a central estimate for GDP growth. A density nowcast provides the likelihoods that a model would attach to the different outcomes of GDP growth occurring. This approach is a way of formalising the uncertainty around the outlook for the economy, and is used by the Norges Bank, for example.<sup>(5)</sup>

(1) This is sometimes called the 'jagged edge' problem — where some indicators have missing data points because they are less timely than other indicators.

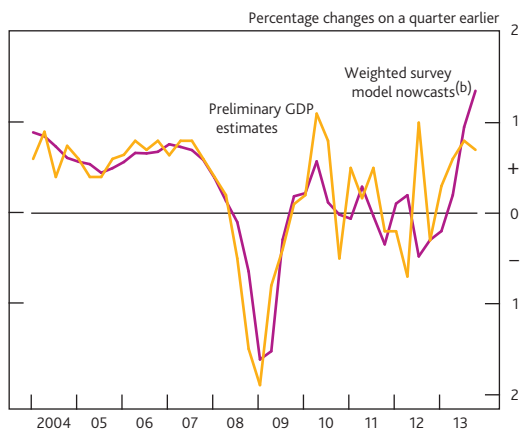
(2) For further information, see Ghysels, Sinko and Valkanov (2007).

(3) For more details of the individual models, see Kapetanios, Labhard and Price (2007).

(4) For a summary of different types of dynamic factor models, see Stock and Watson (2011).

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

**Chart 1** Weighted survey model nowcasts at the time of the *Inflation Report*<sup>(a)</sup>



- (a) The chart shows, for each quarter at the time of the *Inflation Report*, the nowcast from the weighted survey model alongside the preliminary estimate of GDP growth, which is published around 10–11 weeks after the *Inflation Report*. Chained-volume measures. GDP is at market prices.
- (b) The weighted survey model is explained in the text of this section, and estimated using equation (2). The nowcasts shown in the chart are produced using the survey indicators available at the time of each *Inflation Report* — that is, the weighted survey model uses a subset of the survey information because not all of the 'output' measures of activity for the nowcast quarter are available at this time.

how output growth has evolved over the course of a year. But it is difficult to infer anything about the pattern of growth compared with the previous quarter from these data, and so they are not used in the weighted survey nowcast model. Instead, the information provided by the Agents is used to help interpret the results of the models.

A challenge with the weighted survey model is that the availability and performance of different surveys varies at the different stages of nowcasting and forecasting one quarter ahead. As a result, the weighted survey model is estimated at six different times in the data cycle, which correspond to when new survey observations become available. To illustrate this, **Figure 2** shows the stages for forecasting, and then nowcasting, Q1. On each occasion, the weight on each survey indicator is allowed to vary, according to its most recent performance.<sup>(1)</sup> In other words, the following equation is re-estimated each month, and the coefficients for each of the indicators change each month:

$$\begin{aligned} \text{Preliminary } GDP_t = & \alpha + \beta_1 BCC_t^o + \beta_2 BCC_{t-1}^e + \\ & \beta_3 CBI_t^o + \beta_4 CBI_{t-1}^e + \beta_5 CIPS_t^o + \beta_6 CIPS_{t-1}^e + \text{error}_t \end{aligned} \quad (2)$$

Survey indicators of businesses' expectations tend to receive more weight early on in the data cycle, when no information is available on actual output. Survey measures of businesses' output generally receive more weight once businesses start reporting their actual output for the nowcast quarter.

## Considerations in using estimation-based nowcasts

Purely estimation-based nowcast models have limitations, and Bank staff take these into account when producing their

**Figure 2** Illustrative data cycle for forecasting and nowcasting Q1 using the weighted survey model<sup>(a)</sup>

	Oct.	Nov.	Dec.	Jan.	Feb.	Mar.
Surveys relating to Q1	Markit/CIPS expectations	Markit/CIPS expectations	Markit/CIPS expectations	Markit/CIPS output	Markit/CIPS output	Markit/CIPS output
	CBI expectations	CBI expectations	CBI expectations	CBI output	CBI output	CBI output
			BCC expectations			BCC output
Estimate for Q1	First	Second	Third	Fourth	Fifth	Sixth
	One quarter ahead forecast			Nowcast		

Staff nowcast published in *Inflation Report*

- (a) A forecast for Q1 is first generated when the Markit/CIPS survey expectations indicators, in October, are published. At this time, the other survey indicators are assumed to be the same as in the previous period.

nowcasts. In particular, issues may arise that affect the accuracy of the mechanical estimates from the nowcast models. There is also a more general consideration associated with using estimation-based nowcasts from statistical models: it is difficult to identify underlying economic reasons for changes in the estimates from such models.

### Issues affecting model accuracy

Estimation-based nowcast models are normally estimated using a long history of data, and so do not always respond quickly to new information or take into account special events. This can affect their accuracy in particular quarters. Consequently, there are occasions when nowcast models do not adequately capture developments, and on such occasions Bank staff place less weight on these models to nowcast GDP.

### Indicators sometimes diverge from data outturns

If an indicator starts to diverge noticeably from data outturns, then there may be a case to aim off a model that places a lot of weight on that particular indicator. Each of the industry nowcast models is re-estimated annually, and the weighted survey model is re-estimated throughout the data cycle, but on some occasions a change in the performance of indicators is noticeable over a relatively short period of time.

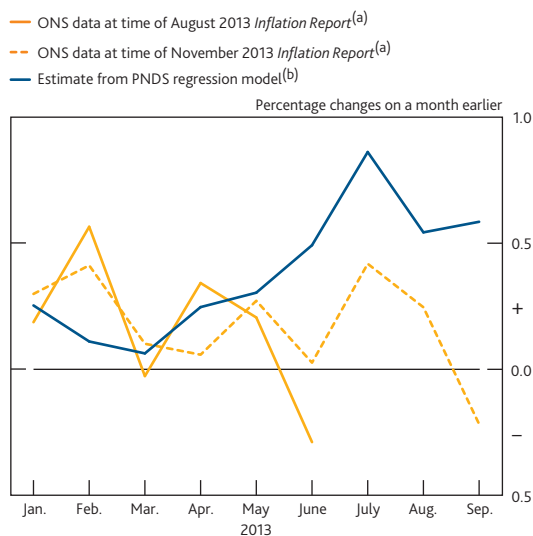
There was a noticeable divergence between data from the surveys and official data outturns in 2013. At the time of the August 2013 *Inflation Report*, for example, there had been a rise in the Markit/CIPS services PMI survey indicator in June 2013, but this had not been matched in the official ONS data available at the time (the solid orange line in **Chart 2**). Consequently, the regression model for PNDS output (see appendix) had overpredicted growth in Q2 (the blue line was well above the solid orange line). Moreover, the Markit/CIPS services PMI survey indicator had risen again in

(1) The performance is currently evaluated using a four-year rolling window. The weights on each indicator are constrained to be positive, but this constraint has little impact on the nowcast from the weighted survey model.



July 2013 and was suggesting that PNDG growth would be 1.3% in Q3 (and monthly growth would average 0.7%). That would have been a very large increase by historical standards, and it was not corroborated in other data. So in this particular example, Bank staff chose not to use the growth rate implied by the PNDG regression model. Instead, a gap was maintained between the model prediction and the nowcast for PNDG growth in Q3 that was of a similar magnitude to the difference between the model prediction and the ONS estimate for Q2. ONS estimates available at the time of the following *Inflation Report* showed that the official data for Q3 were indeed below the level suggested by the model (the dashed orange line was lower than the blue line in **Chart 2**), although it may be the case that the official data are eventually revised higher.

**Chart 2** Model-implied nowcast versus first official estimate of PNDG growth in 2013



(a) Includes Bank calculations for the last month of the previous quarter, because the Index of Services data are not available for this month at the time of the *Inflation Report*. The monthly growth rate is calculated using the most recent Index of Services release and the quarterly growth rate from the preliminary GDP release.

(b) In-sample prediction up to, and including, 2013 Q1. Uses data available at the time of the August 2013 *Inflation Report*.

### Using qualitative indicators for quantitative estimates

A difficulty faced in using business surveys in particular is that they are normally a qualitative measure of a variable. In other words, surveys ask businesses whether their output has increased, decreased or remained the same, but not by how much it has changed. This means, for example, that if all survey respondents suddenly change their response from 'no change' to an increase in output, but the volume of their output has only increased a little, then the pickup recorded by the survey measure will overstate the magnitude of the increase in growth.

### Temporary and special events

Sometimes other sources of information may suggest that the models or survey data do not capture recent events. The Bank's Agents sometimes receive information about

temporary events affecting output in a particular industry. For example, the Agents passed on information about maintenance that affected oil and gas production in the North Sea in 2012. Other events may affect output across a number of industries, such as the Diamond Jubilee and London Olympics in 2012. Typically, the impact of these sorts of events may be estimated using specific sources of information, for instance Olympic ticket sales, or by extracting information from the monthly profile of growth in the industries most likely to be affected by the special event.<sup>(1)</sup>

### Unstable coefficients

Changes in output dynamics over time mean that the coefficients in nowcast models can, within a very short period of time, fail to capture the magnitude of movements in output. The sharp contraction in output in 2008–09 is a good example. Most of the monthly nowcast models are estimated using data that are available from the 1990s onwards. The contraction in output in 2008–09 was unprecedented over the model estimation period, and the coefficients in the models generally failed to capture the depth of the contraction in output.

### Understanding the reasons for changes in nowcasts

In general, statistical models rarely provide an underlying economic reason for why they produce the estimates that they do, even though they often help to reduce nowcast and forecast errors. This is one reason why structural models are important: they provide a framework for understanding the workings of an economy.<sup>(2)</sup> For this reason, the MPC use both structural and statistical models to produce their forecasts.

Statistical models are likely to have an advantage over structural models for nowcasting, however, by directly incorporating more timely sources of information about the evolution of the economy, such as data from business surveys. During the recent financial crisis, for example, very few structural models forecasted the sharp contraction in output.<sup>(3)</sup> By contrast, statistical models that incorporated information from business surveys were generally better at forecasting the downturn, although they still made large errors.

### The staff nowcast and its performance

Bank staff use a variety of models and indicators to provide a nowcast for the MPC. This nowcast is produced using estimation-based models, including the industry model and the weighted survey model. It also incorporates other sources

(1) Details of Bank staff estimates for the contributions of the Diamond Jubilee and the London Olympics to quarterly growth in manufacturing and services output are provided in the November 2012 and February 2013 editions of the *Inflation Report*.

(2) A structural model is essentially a system of behavioural equations that derive from decisions made by optimising economic agents, such as households and firms.

(3) See Hendry and Mizon (2012).

## Nowcasting different measures of GDP

This article focuses on statistical models that are designed to nowcast the output measure of UK GDP, but both nowcasts and official estimates of GDP can also be estimated using expenditure and income data. This box explains why those alternative approaches are informative, and summarises some of the methods used by Bank staff to nowcast using these measures.

A key reason for nowcasting using the expenditure data is that structural models, such as the central organising model in the MPC's forecasting platform (COMPASS), are consistent with that framework.<sup>(1)</sup> Structural models are based on the behaviour of optimising economic agents, such as households' consumption and businesses' investment decisions. So it is not sufficiently informative to have a GDP nowcast based solely on output data: its breakdown across the expenditure components of demand is also important.<sup>(2)</sup>

Based on the information used in the Bank's structural models, therefore, Bank staff nowcast the main expenditure components: consumption, investment, government spending, exports, imports and stockbuilding. A simple regression approach, similar to the industry model on the output side, is used to nowcast each of these components. These expenditure-component nowcasts complement the estimates based on the expenditure models within the suite of models in the Bank's forecasting platform. As described in Burgess *et al* (2013), there are a range of expenditure models in the suite. For example, the suite contains several 'Keynesian' consumption functions, which model household spending as a function of current labour income.

The performance of the expenditure models tends to be worse, however, than the output-based nowcasting models. Unlike

the output data, there is relatively limited monthly official data available on the expenditure side. Nor are most alternative indicators of expenditure components as comprehensive or timely as the information available for the output of the economy. So the expenditure models tend to rely more heavily on past data, and the performance of the models is typically worse than for the equivalent output models. In part reflecting that data availability, however, some expenditure models tend to perform better than others. For example, the performance of consumption models tends to be better than those for investment, stockbuilding, exports and imports.

There is normally a difference between the staff nowcast based on output measures of GDP and the sum of the individual expenditure nowcasts. That is not surprising: early official estimates of the output and expenditure measures of GDP are rarely equal for the most recent years of data. An alignment adjustment is added to the expenditure measure of quarterly GDP to make it equal to GDP implied by the headline GDP measure.<sup>(3)</sup> So, in a similar way, any discrepancies between the output-based GDP nowcast and an expenditure-based GDP nowcast may be allocated to an alignment adjustment. But, as with the ONS data, a large difference between these two measures might be informative. For example, it might suggest heightened uncertainty around the estimates.

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- (1) The platform is described in detail in Burgess *et al* (2013). The central organising model is a New Keynesian general equilibrium model similar to those used at other central banks and policy institutions. This model has been in use since the end of 2011.
  - (2) In principle, income data may also be used to nowcast GDP, but in practice these data have not tended to be used for nowcasting. But income measures remain important for structural models, see Burgess *et al* (2013).
  - (3) The alignment adjustment contributes to quarterly GDP growth, but the level of the alignment adjustment sums to zero over each calendar year. For more details, see Williams (2009).

of information to allow for limitations associated with estimation-based models, as discussed above.

Since May 2013, the staff nowcast has been reported in the *Inflation Report*. At this point in the data cycle, no official data for the nowcast quarter are available. The official preliminary estimate for GDP growth is published around 10–11 weeks after the publication of the *Inflation Report*. The staff nowcast has captured the broad movements in the official preliminary estimates for quarterly GDP growth (Chart 3). Nonetheless, for particular quarters, the nowcast has sometimes been very different from the preliminary estimate of GDP growth.

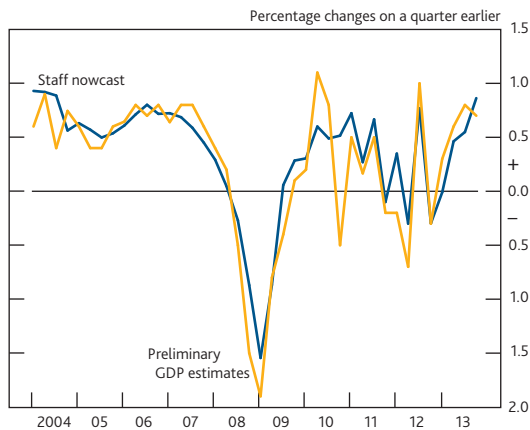
The remainder of this section provides an overview of the performance of the staff nowcast relative to the nowcasts from the weighted survey model and a common benchmark model.<sup>(1)</sup> One of the most common summary statistics for

evaluating forecast performance is the root mean squared error (RMSE). In this article we evaluate the performance of the nowcasts using the information set available at the point in time that the nowcast would have been estimated, sometimes described as 'real time' evaluation.

The RMSE can be thought of as the historical error band around the nowcast, and this is quoted in the *Inflation Report* alongside the staff nowcast. Since 2004, the RMSE for the staff nowcast has been around 0.3 percentage points. The RMSE for the weighted survey model nowcast has been higher, at around 0.4 percentage points (Table C).<sup>(2)</sup>

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- (1) For a recent assessment of the MPC's forecasting performance, see Hackworth, Radia and Roberts (2013).
  - (2) It is not possible to calculate a RMSE associated with the industry model over the past, because the models and indicators used to produce the nowcast from the industry model have changed over time, as staff review these regularly.

**Chart 3** Staff nowcast versus ONS preliminary estimate of GDP<sup>(a)</sup>



(a) The chart shows, for each quarter at the time of the *Inflation Report*, the staff nowcast alongside the preliminary estimate of GDP growth, which is published around 10–11 weeks after the *Inflation Report*. For example, the final observation is for 2013 Q4—the nowcast was published in the November 2013 *Inflation Report* and the preliminary estimate was published in January 2014. Chained-volume measures. GDP is at market prices.

**Table C** Nowcast errors relative to official UK GDP estimates since 2004<sup>(a)</sup>

Model	Root mean squared error, percentage points
Staff nowcast	0.30
Weighted survey model nowcast	0.43
Benchmark model nowcast <sup>(b)</sup>	0.57

(a) Errors are relative to the preliminary estimate of quarterly GDP growth. Chained-volume measures. GDP is at market prices.

(b) The benchmark model is an autoregressive model with two lags, often called an AR(2), where GDP growth depends linearly on its two previous values. To be consistent with the staff nowcast and weighted survey model, the benchmark model has been estimated in 'real time', such that it is re-estimated every quarter, after a new preliminary GDP estimate has been published.

A useful way to examine nowcast performance is to compare the results with those of a benchmark model. A common benchmark model is a simple autoregressive model for GDP growth, in which GDP growth depends linearly on its previous value(s). Such models tend to produce quite accurate nowcasts and forecasts during periods—such as 1993–2007—when growth is relatively stable. But benchmark models can usually be improved upon when growth is more volatile.<sup>(1)</sup> Both the staff nowcast and the weighted survey model nowcast outperform the benchmark (Table C). Although the nowcast outperforms other models, a difference in quarterly GDP growth of 0.3 percentage points could nonetheless result in a materially different outlook for GDP growth, suggesting that there is considerable uncertainty surrounding the outlook even after taking a large amount of information into account.

Given the staff nowcast incorporates a large information set—including information relating to some of the limitations of a purely regression-based model—it is perhaps not surprising that it has a lower RMSE than the mechanical nowcasts produced by the weighted survey model and the benchmark.

For particular periods of time, it is possible to isolate reasons why the staff nowcast is likely to have performed better than the mechanical nowcasts provided by the models:

- First, the recession increased output volatility substantially. The largest error from the benchmark model occurred in 2008 Q4, when output contracted sharply (Chart 4). Both the weighted survey model and the staff nowcast performed better, because they both incorporated data from the business surveys. Moreover, the Bank's Agents were quick to pick up the marked change in business sentiment and sharp fall in orders in Autumn 2008 as the economy weakened, which was reflected in the staff nowcast.
- Second, there have been a number of temporary or special events that have affected output. In 2012 Q2 and Q3, the quarters in which the Diamond Jubilee and London Olympics occurred, the staff nowcast error was substantially lower than those from the benchmark and weighted survey models. Nonetheless, there were times when the staff nowcast did not adequately capture temporary events that affected output—its largest error occurred when there was heavy snowfall that disrupted output unexpectedly in 2010 Q4.
- Finally, there has been a period when data from the surveys and the official data outturns have diverged. In 2013, the staff nowcast outperformed the weighted survey model because data from the business surveys appeared to overstate GDP growth. As discussed earlier in the context of the PNDS model, staff chose to reduce the weight placed on the nowcasts implied by the surveys because the movements were large relative to historical standards, and not corroborated in other data. So far, that judgement appears to have reduced nowcast errors relative to the ONS preliminary GDP estimate.

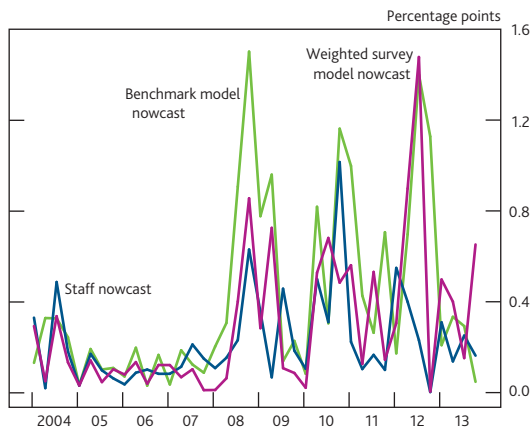
## Conclusion

GDP growth is a key statistic in describing the state of the economy. It is therefore important that growth prospects are assessed frequently and rigorously in order to assist policymakers.

Bank staff use two main models and a range of other information to produce their nowcasts. The main advantage of the industry model for nowcasting is that it incorporates monthly official data as it becomes available and exploits the time-series properties of GDP growth. The industry level of granularity is also an efficient way to incorporate additional, and timely, sources of information on temporary and special events that may affect output in particular industries. Meanwhile, the advantage of the weighted survey model is

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

**Chart 4** Absolute nowcast errors at the time of the *Inflation Report*<sup>(a)</sup>



(a) The chart shows the absolute difference between the nowcast at the time of the *Inflation Report* and the preliminary estimate of quarterly GDP growth, which is published around 10–11 weeks after the *Inflation Report*. Chained-volume measures. GDP is at market prices.

that it places full weight on the more timely sources of information available for UK output — business surveys — so it is particularly useful for nowcasting early in the data cycle.

There may be occasions when purely estimation-based nowcast models do not perform well, so a key aspect to nowcasting is assessing when models are likely to give a poor signal of GDP growth. In recent years, there have been a number of events that have led Bank staff to place less weight on the mechanical nowcasts from estimation-based models. This is likely to have been a key reason why the nowcasts produced by Bank staff have, on average, outperformed those from the weighted survey model and a simple autoregressive model over the period 2004–13.

## Appendix Description of output data and indicators currently used in the industry model approach

Industry	Frequency	Start year <sup>(a)</sup>	Estimated equation <sup>(b)</sup>	Indicator	Additional information
Private non-distribution services (PNDS)	Monthly	1997	(1) $PNDS_t = \alpha + \beta_1 PNDS_{t-1} + \beta_2 CIPSo_t + \epsilon_t$ (2) $CIPSo_t = \alpha + \beta_1 CIPSo_{t-1} + \epsilon_t$	CIPSo: Markit/CIPS Services PMI, Business Activity Index.	A forecast for the Markit/CIPS data is used for those months for which data are not yet available. Equation (1) contains dummy variables for the Golden and Diamond Jubilees. (c)
Government services (GOVT)	Quarterly	1997	(1) $GOVT_t = \alpha + \beta_1 GOVT_{t-1} + \beta_2 EMPF_t + \epsilon_t$ (2) $GOVT_t = \alpha + \beta_1 GOVT_{t-1} + \beta_2 EMPF_t + \epsilon_t$	EMPF: Bank staff's quarterly government employment growth forecast. GOVTM1: the first month of government services data for the quarter, published in the ONS Index of Services release. (d)	Equation (1) is used until the first month of government services data are published (monthly data are published with a two-month lag), after which equation (2) is used.
Retail (RO)	Monthly	1996	$RO_t = \alpha + \beta_1 RS_t + \epsilon_t$ $RS_t = \alpha + \beta_1 RS_{t-1} + \beta_2 RS_{t-2} + \beta_3 BRC_t + \epsilon_t$	RS: monthly growth in retail sales volumes including fuel, published in the ONS Retail Sales release. BRC: British Retail Consortium Retail Sales Monitor, total sales year-on-year.	A forecast for retail sales is used for those months for which data have not yet been published (monthly data published with a two-week lag).
Wholesale (WS)	Monthly	1995	$WS_t = \alpha + \beta_1 WS_{t-1} + \beta_2 WS_{t-2} + \epsilon_t$	n.a.	n.a.
Motor trades (MT)	Monthly	1999	$MT_t = \alpha + \beta_1 MT_{t-1} + \beta_2 SMMT_t + \beta_3 CBIMT_t + \epsilon_t$ $SMMT_t = \alpha + \beta_1 SMMT_{t-1} + \epsilon_t$ $CBIMT_t = \alpha + \beta_1 CBIMT_{t-1} + \epsilon_t$	SMMT: total car registrations (seasonally adjusted in-house). CBIMT: CBI Distributive Trades Survey, reported volume of sales in motor trades.	Forecasts for the SMMT and CBI survey data are used for those months for which data are not yet available.
Manufacturing (MANU)	Monthly	1993	(1) $MANU_t = \alpha + \beta_1 MANU_{t-1} + \beta_2 CIPSo_t + \epsilon_t$ (2) $CIPSo_t = \alpha + \beta_1 CIPSo_{t-1} + \epsilon_t$	CIPSo: Markit/CIPS Manufacturing PMI, Output Index.	A forecast for Markit/CIPS data is used for those months for which data are not yet available. Equation (1) contains dummy variables for the Golden and Diamond Jubilees. (c)
Construction (CO)	Monthly	2010	(1) $CO_t = \alpha + \beta_1 CO_{t-1} + \beta_2 CIPSo_t + \epsilon_t$ (2) $CO_t = \alpha + \beta_1 CO_{t-1} + \beta_2 CIPSo_t + \beta_3 EXPlo_t + \epsilon_t$	CIPSo: Markit/CIPS Construction PMI, Total Industry Activity Index. EXPlo: Experian Construction Activity Index.	Equation (1) is used until the Experian survey is published, after which equation (2) is used.
Utilities (UT)	Monthly	1993	(1) $UT_t = \alpha + \beta_1 UT_{t-1} + \beta_2 UT_{t-2} + \epsilon_t$ (2) $UT_t = \alpha + \beta_1 UT_{t-1} + \beta_2 UT_{t-2} + \beta_3 TEMP_t + \epsilon_t$	TEMP: UK mean temperature anomalies data from the Met Office. The anomaly period used is 1961–90.	Equation (1) is used until temperature data are published for the month, after which equation (2) is used.
Extraction (EXTR)	Monthly	1998	$EXTR_t = \alpha + \beta_1 EXTR_{t-1} + \beta_2 DECC_t + \beta_3 DECC_{t-1} + \epsilon_t$	DECC: Oil and gas production forecasts from the Department of Energy and Climate Change (DECC), seasonally adjusted (in-house).	Oil and gas production is used as a proxy for total extraction.

(a) The start date varies across the different industry groupings because it depends on the availability of official data and indicators.  
 (b) All of the ONS output series in the equations are growth rates — that is, percentage changes on the previous month or quarter, depending on the frequency used in the model. Once ONS estimates of output in the first month of the quarter are released, these estimates are used for the first month of the nowcast, and the nowcasts for the second and third months are recalculated using the most recent data. Similarly, this process is repeated following the release of ONS estimates of output in the second month.  
 (c) Dummy variables are used in the following months: June 2002, July 2002, June 2012 and July 2012.  
 (d) Mapped into quarterly growth by assuming no change in output in the second and third months of the quarter.

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# Curiosities from the vaults: a Bank miscellany

By Jennifer Adam and Chris Shadforth of the Bank's Communications Directorate.<sup>(1)</sup>

An exhibition in the Bank's Museum showcases a selection of intriguing objects from a collection that the Bank has acquired throughout the course of its over 300-year history.

In a world of 24-hour news the Bank of England is seldom far from our television and computer screens. The focus on the economic and financial stories of the day, though, can understandably draw attention away from the fact that the central bank of the United Kingdom has been in existence for more than 300 years. So it is perhaps with little wonder that over the period since its foundation in 1694 the Bank has amassed an extensive collection of artworks,<sup>(2)</sup> coins, medals, banknotes and myriad other objects, mainly acquired in the course of its business. 'Curiosities from the vaults: a Bank miscellany', a new exhibition in the Bank's museum running from 31 March to 12 July 2014, sheds light on some of the more curious items in the collection, of which a selection is shown in this article. From secret ballot boxes to saddle bags and the signatures of historical luminaries, individually, each of the selected pieces has an intriguing tale to tell about the social history of the Bank. Together, they provide a snapshot of a unique public collection.

## Sir John Soane's secret ballot box

Sir John Soane is regarded as one of the great British architects. Soane was Architect and Surveyor of the Bank of England between 1788 and his retirement in 1833 and spoke of his creation as 'the pride and boast of my life'.<sup>(3)</sup> During his tenure he created a building that was not just a bank but a national monument, extending the Bank to its current 3.5 acre site and surrounding it with the imposing curtain wall which remains to this day.<sup>(4)</sup>

The son of a bricklayer, Soane went on to study architecture at the Royal Academy. So promising was his work that he was awarded a travelling scholarship that enabled him to embark on the 'Grand Tour'.<sup>(5)</sup> Soane spent two years in Italy, and this first-hand experience of the architectural glories of Ancient Rome was a key influence on his style. Having seen these sites himself he was able to produce the kind of architecture sought-after by his patrons (many of whom had 'toured' themselves), interpreting Classical architecture for his 'modern' age. As well as designing the Bank building itself he was also responsible for much of its decorative scheme, including several items of

The secret ballot box designed by Sir John Soane



- (1) The authors would like to thank Mike Anson for his help in producing this article.
- (2) The Bank's collection of oil paintings can be seen at the BBC's Your Paintings website, [www.bbc.co.uk/arts/yourpaintings/galleries/locations/bank-of-england-museum-3778](http://www.bbc.co.uk/arts/yourpaintings/galleries/locations/bank-of-england-museum-3778), as part of the Public Catalogue Foundation's efforts to digitise and publish all oil paintings in public ownership in the United Kingdom.
- (3) The Bank spent its first 40 years in rented premises, mainly in the Grocer's Company Hall on Princes Street, eventually moving to purpose-built premises on Threadneedle Street in 1734, in a building designed by the little-known George Sampson. This building was extended by Sir Robert Taylor between 1765 and 1788, the year in which Sir John Soane was appointed Architect and Surveyor.
- (4) The curtain wall is the only part of Soane's Bank which remains: the rest of the Bank's buildings were demolished in the 1920s in order to increase capacity of the Threadneedle Street site by replacing them with a larger building.
- (5) This was a trip traditionally enjoyed by young men of the wealthy upper classes. Both an education and a rite of passage, the Tour took in the great cities and monuments of Europe such that the Tourists might experience the arts and culture so valued in sophisticated society, particularly the masterpieces of Antiquity and the Renaissance, which could only be seen by visiting France and Italy.

furniture. For example, lattice-backed chairs made to Soane's 18th century design can be found in the Bank's Parlours,<sup>(1)</sup> as can the first curiosity featured in the exhibition.

The ballot box was designed by Soane for use by the Bank's Court of Directors, which performs a role similar to the Board of a company.<sup>(2)</sup> Its form is that of a miniature ancient Greek temple with a roof made of palm leaves, and is typical of Soane's Neo-classical style. Made of mahogany, the ballot box allowed a voter to cast their ballot by reaching inside and dropping a small wooden ball to either the left side for 'yes', or right for 'no'. The funnel allows the voter to cast their ballot in secret. The two drawers, lined with baize to muffle the noise, can be removed in order to count the number of balls — hence votes — in each direction.

The secret ballot box is no longer used for its intended purpose; the votes of the Monetary Policy Committee and the Financial Policy Committee, for example, are a matter of public record, and their minutes are published by the Bank. Yet this peculiar, beautiful object provides a special, tangible link to the early committees of the Bank of England who used it, and the distinguished architect Sir John Soane who made it.

## Is this Lawrence of Arabia's saddle bag?

At first glance this second curiosity looks like nothing more than a rather battered leather trunk, travel-worn and weary. It has a distinctive curved shape, and is lined with zinc. Yet it comes with a tantalisingly brief entry in the Museum's catalogue ledger: 'Camel pack, leather with metal lining, for carrying gold over deserts'. Over the years, this humble-looking object has been the subject of much speculation, which has grown into an association with a legendary name: could this really be Lawrence of Arabia's saddle bag, lent to him by the Bank for the transportation of gold during his wartime desert campaigns?

Thomas Edward Lawrence first travelled in the Middle East during his undergraduate years, furthering his interest in medieval archaeology by working on excavations in Syria between 1911 and 1914. During this time he became fascinated by the various cultures of the region, and his knowledge of the language and political undercurrents of the Arab world were the foundation to his work in military intelligence in the region during the First World War, most notably his role during the Sinai and Palestine Campaign, and the Arab Revolt against Ottoman rule. David Lean's 1962 biopic *Lawrence of Arabia* elevated Lawrence to legendary status, so perhaps it is little wonder that an object with such unclear provenance has been linked to the most famous British desert adventurer of all.

A saddle bag for a camel, supposedly used to transport gold



Sadly, the Museum's accessions register has nothing to prove a link between Lawrence and this particular object. Neither has the Bank's Archive, although it does note a connection between Lawrence himself and the Bank. As Lawrence neared the end of his military service, his friends grew concerned that the energies of such a dynamic and unconventional man might be wasted in civilian service, and began looking for roles that would allow him to focus on his literary work. In 1928 he had been offered a position as night-watchman at the Bank of England, a quiet post away from the

(1) The Bank's Parlours can be seen on a small number of open days each year. In 2014 these will be 5 and 12 July and 20 and 21 September. The same chairs, designed by Soane, can also be seen in the library of Sir John Soane's Museum on Lincoln's Inn Fields.

(2) See 'The Court of the Bank of England' in this edition of the *Quarterly Bulletin*.



glare of publicity which followed him, in which he might continue with his writing.<sup>(1)</sup> Yet more surprising, though, is a copy of a letter in the Bank Archive indicating a rather more high-profile offer that was made in 1935. Montagu Norman, Governor of the Bank of England at the time, was apparently seeking an individual 'with personality within and without the walls of the Bank' to fill the position of Bank Secretary and apparently made a private offer to Lawrence. This offer was never taken up, and there are no official records of it having been made, only private letters.<sup>(2)</sup> Yet the letters hint at a connection between Lawrence and the Bank of England which might have given rise to the notion that this bag had once belonged to him.

## Distinguished visitor books

Another curiosity — this time a set — provides links with historical figures whom we are certain did have a connection with the Bank. For over 200 years, distinguished visitors to the Bank have been invited to sign high-value notes, which are preserved in a series of albums, each surrounded by an elaborate decorative border.<sup>(3)</sup> The first of the collection dates from 1842, with a note signed by Prince Frederick of Prussia, and the tradition continues: a million pound note was signed by Her Majesty the Queen during her visit to the Bank in December 2012. Within the four volumes of notes there are many diverse, prominent figures from world history, ranging from great leaders to literary figures: for instance, the collection includes a million pound note signed by President Nelson Mandela on his visit to the Bank in 1996, and a note autographed by the novelist George Eliot in 1874.

A particularly unusual example, featured in this exhibition, is a thousand pound note dating from 1864. It is signed by the 'Choshu Five', five members of the Choshu clan who smuggled themselves out of Japan to the West in 1863, during a time of political isolation when it was illegal to leave Japan. Their signatures in Japanese characters are also shown transliterated into Roman letters: Shunsuke Ito (later Hirobumi Ito, the first Prime Minister of Japan and one of the men behind the Japanese Constitution), Monta Inoue (later Kaoru Inoue, the first Foreign Minister), Yozo Yamao (who studied engineering in Glasgow and later became Secretary of State for Industry, establishing the first Institute for Technology in Japan), Nomura Yakichi (later known as Masaru Inoue, a founder of the Japanese Board of Railways), and Kinsuke Endo (who became the head of the new Japanese Mint Bureau). The Choshu Five became the first Japanese students to study in Britain, at University College London, and spent much time finding out about national institutions such as the Bank of England. Their remarkable voyage would influence the rest of their lives, and that of their homeland: in their careers following their return the Choshu Five established themselves as some of the foremost modernisers of Japan. An object like this is a reminder that

£1,000 note, signed by the 'Choshu Five'



(1) Bank of England Archive file C17/29, Extracts from the Minutes of the Committee of Treasury, 6 June 1928 and T E Lawrence to Herbert Baker, 17 July 1928.

(2) Bank of England Archive file C17/29, Francis Rennell to Leslie O'Brien, 28 May 1969.

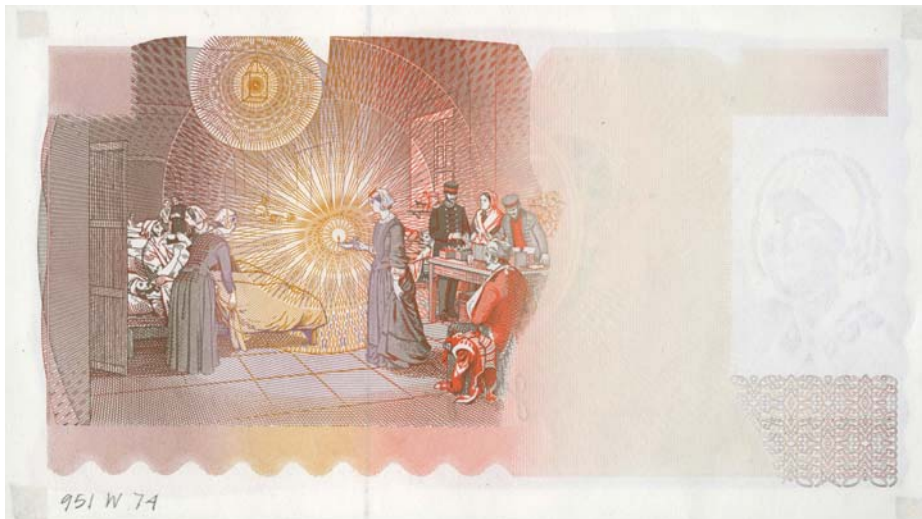
(3) While the face value of these notes appears high, they are not issued in the legal sense (they are unnumbered) and so do not appear under the Issue Department Balance Sheet. Formally, these notes remain within the Bank and form part of the Bank's stock of unissued notes. For a primer on money (including banknotes) see 'Money in the modern economy: an introduction' in this edition of the *Quarterly Bulletin*.

even in 1864 the Bank of England drew visitors from all over the world. Today the Bank continues to provide a forum for central bank staff from around the globe to learn and share experiences in the Bank's Centre for Central Banking Studies.<sup>(1)</sup>

## Also on display

Also among the Bank's curiosities are a set of sketches, printing plates and test prints that give an insight into the design process for the 'Series D' £10 note, in circulation between 1975 and 1994. The reverse of the note features a portrait of Florence Nightingale at work in the field hospital at Scutari during the Crimean War; a vignette on the front of the note depicts the lily, a symbol used by Nightingale. Together, such source materials, sketches, printing plates and test prints show the development of the design through to the finished note in the days before computer-aided design. The designs incorporated hard-to-copy security features such as guilloche patterns and micro-printing, which remain on banknotes today. These are now supplemented by advanced security features, such as the motion thread on the 2011 issue Boulton and Watt £50 note.<sup>(2)</sup>

Test print for the reverse of the Series D £10 note  
(Florence Nightingale is the figure holding the lamp)



Sketch for the lily vignette on the  
front of the Series D £10 note



The treasures in the Bank's collections extend to a number of Roman and Medieval finds excavated during building works. Sir John Soane's Bank of England may have been the pride of his career, but by the 1920s it was no longer adequate for the needs of a modern central bank. Between 1925 and 1939, a rebuilding programme saw Soane's Bank building on Threadneedle Street gradually demolished and replaced by a much larger building, seven stories high and with three further levels below ground. While excavating the vaults and foundations of the new Bank building, workers uncovered the rich archaeology of an area which forms part of the oldest settlement in London, dating back to Roman times. These finds included pottery, coins, wooden writing tablets, metal tools and leather shoes, all of which had been impressively preserved by London's clay soil.

(1) For more information about the Centre for Central Banking Studies see [www.bankofengland.co.uk/education/Pages/ccbs/default.aspx](http://www.bankofengland.co.uk/education/Pages/ccbs/default.aspx).

(2) For information on current security features on Bank of England banknotes, and education materials, see [www.bankofengland.co.uk/banknotes/Pages/educational.aspx](http://www.bankofengland.co.uk/banknotes/Pages/educational.aspx).

A selection of these Roman and Medieval finds will feature in the exhibition, a reminder that the Bank's location, today the heart of the City of London, has been a centre of trade and commerce since ancient times.

Medieval water jug, found on the site during rebuilding work



The upper portion (neck and handles) of a Roman amphora, or storage jar



**Curiosities from the vaults: a Bank miscellany** is open from 31 March to 12 July. The Museum is in the Bank of England's Threadneedle Street building (entrance on Bartholomew Lane). Its regular opening hours are Monday-Friday 10.00–17.00 (except Bank Holidays). In addition, the Museum will open to the public on Saturday 5 July and Saturday 12 July, when we will be offering tours of the Bank of England building as part of the City of London Festival. For further information about visiting and special events see [www.bankofengland.co.uk/museum](http://www.bankofengland.co.uk/museum).



# Recent economic and financial developments



# Markets and operations

- The review period saw an improvement in the growth prospects of some developed economies with an associated rise in financial market prices. The relatively strong outlook for the United Kingdom also led to an increase in sterling short-term interest rates.
- Idiosyncratic risks in emerging market economies resulted in a bout of turbulence during the review period.
- In the February *Inflation Report* the Bank's Monetary Policy Committee (MPC) provided further guidance on the likely path of its policy once the unemployment threshold of 7% was reached. The MPC judged that there was scope for the UK economy to recover further before Bank Rate was raised and, even when Bank Rate did rise, it was expected to do so only gradually and to a level materially below its pre-crisis average of 5%.
- The year end saw some volatility in money markets internationally. This included sharp falls in UK overnight interest rates.

## Overview

In February, the Bank of England Monetary Policy Committee (MPC) provided further guidance on its monetary policy once the unemployment threshold of 7% was reached. The MPC judged that there was scope for the UK economy to recover further before Bank Rate was raised and, even when Bank Rate did rise, it was expected to do so only gradually and to a level materially below its pre-crisis average of 5%. This followed the decision of the Federal Open Market Committee (FOMC) in December to begin to slow the pace of its asset purchases. The FOMC also stressed that it would hold the main policy rate near zero 'well past' the time when unemployment reached the 6.5% threshold set out in its forward guidance.

Reflecting a broad improvement in the prospects for the world recovery, there was a strengthening in financial market sentiment and a rise in a range of asset prices. In the United Kingdom short-term interest rates rose and sterling appreciated, with the sterling exchange rate index ending the review period around 1.9% higher than at its start.

While the economic outlook for some developed economies had picked up, a number of idiosyncratic risks in emerging markets came to the fore during January, leading to a rise in risk aversion and falls in international equity indices and US and UK sovereign bond yields. Concerns about slowing growth and the health of the shadow banking system in China also served to dampen confidence more widely. Some of these worries subsequently abated to a degree, but further volatility was introduced by the intensification of political tensions between Ukraine and Russia towards the end of the review period.

The year end also saw some volatility in a number of developed-economy money markets. Sharp falls in UK secured and unsecured overnight interest rates were associated with banks' reluctance to accept deposits over the year end, partly given the increased focus of investors on leverage and other aspects of banks' balance sheets in parallel to the introduction of new regulatory requirements. There was also volatility in euro-area short-term interest rates, which might have been related to banks' ongoing efforts to pay back borrowings from the European Central Bank's longer-term refinancing operations.

In discharging its responsibilities to ensure monetary stability and protect and enhance financial stability, the Bank gathers information from contacts across a range of financial markets. Regular dialogue with market contacts provides valuable insights into how markets function, and provides context for the formulation of policy, including the design and evaluation of the Bank's own market operations. The Bank also conducts occasional surveys of market participants in order to gather additional information on certain markets.

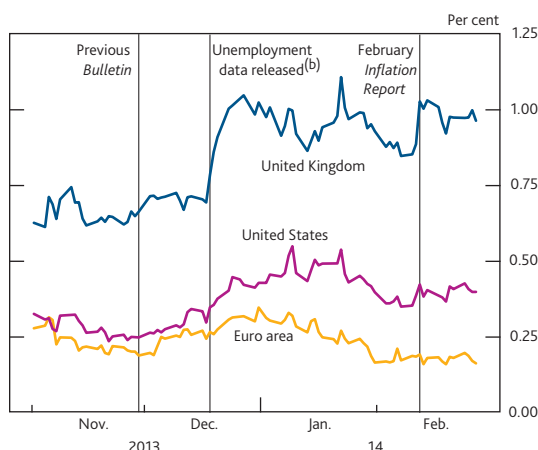
The first section of this article draws upon both data and the intelligence from contacts in order to describe and interpret recent developments in financial markets. The section contains two boxes, which discuss the short sterling interest rate futures market and the recent volatility in emerging markets respectively. The article goes on to describe the Bank's own operations within the Sterling Monetary Framework.

## Financial markets

### Monetary policy and interest rates

Sterling short-term interest rates rose in the first half of the review period. Contacts attributed this to an improved outlook for the UK economy. In particular, there was a larger-than-expected fall in the unemployment rate to 7.4% in the three months to October 2013 and then to 7.1% for the three months to November. The UK one-year overnight index swap (OIS) rate one year forward rose by around 25 basis points over the course of December, compared with increases of 12–15 basis points in the United States and euro area over the same period (**Chart 1**).

**Chart 1** One-year OIS rates, one year ahead<sup>(a)</sup>



Sources: Bloomberg and Bank calculations.

(a) Forward rates derived from the Bank's OIS curves.

(b) Labour Force Survey data released on 18 December 2013 showed that the unemployment rate for the three months to October 2013 was 7.4%.

Around the same time, the Federal Open Market Committee (FOMC) announced a reduction — or 'tapering' — in the pace of its asset purchases from US\$85 billion per month to US\$75 billion per month. A further US\$10 billion per month

reduction was announced in January. Short-term OIS rates in the United States and United Kingdom rose following the announcement, which came slightly earlier than had been anticipated by most market participants.

In January, developed market short-term market interest rates fell slightly. This followed a renewed bout of turbulence in emerging markets driven by a number of idiosyncratic risks which began to affect market sentiment at around the same time (the box on page 81 discusses this episode in more detail). It may also have reflected slightly weaker economic data in both the United States and United Kingdom.

Throughout the review period, the Bank of England's Monetary Policy Committee (MPC) maintained Bank Rate at 0.5% and the stock of asset purchases financed by the issuance of central bank reserves at £375 billion. With the publication of the February *Inflation Report*, the MPC noted that the unemployment rate was likely to reach the 7% threshold, which it set in August as part of its forward guidance, within the next few months. The MPC also provided further guidance on monetary policy as the UK economy recovered. The MPC judged that there was scope for the UK economy to recover further before Bank Rate was raised and, even when Bank Rate did rise, it was expected to do so only gradually and to a level materially below its pre-crisis average of 5%. The MPC also announced its intention to maintain the stock of assets purchased under its quantitative easing (QE) programme, including the reinvestment of cash flows associated with all maturing gilts held in the Asset Purchase Facility to at least until Bank Rate has been raised.

The one-year OIS rate one year forward rose initially on the publication of the February *Inflation Report*, by around 14 basis points. And there was a pickup in activity in the short sterling interest rate futures market (for further discussion of this market see the box on page 78). Contacts pointed to upward revisions to the MPC's assessment of the prospects for growth. Some market participants had also expected the MPC to update its forward guidance by, for example, reducing its unemployment threshold or by publishing a collective view of the most likely path of Bank Rate.

The rise in short-term interest rates dissipated over the following few weeks, however. Contacts thought the fallback in rates reflected weaker data and the impact of demand for safe-haven assets as a result of the increase in emerging market volatility. Some contacts also suggested that market participants had reappraised their expectations of the time at which Bank Rate was likely to rise in light of the MPC's updated guidance. Nonetheless, sterling forward OIS rates of most maturities rose between the Q4 *Bulletin* and the Q1 data cut-off (**Chart 2**).

## The short sterling market

On the day of the February *Inflation Report* the short sterling market saw over two million transactions, the highest daily volume ever recorded. This box examines the mechanics of the short sterling market and explains how it can be useful in interpreting market activity.

### The short sterling market

Short sterling is the colloquial name for the market in sterling London interbank offered rate (Libor) futures contracts. A futures contract is an instrument that allows a market participant to agree to exchange a financial asset at some future time at a fixed price. In the case of short sterling futures, a participant is agreeing the interest rate (the three-month sterling Libor rate) expiring at some point in the future.

Short sterling is an order-driven market, with an order book of bid and ask prices for each futures contract. Liquidity is provided by participants taking either side of a contract. Market makers operate only in the most illiquid contracts.

Futures contracts expire on international money market dates — the third Wednesday of March, June, September and December. There are 26 active short sterling contracts traded on the NYSE Liffe exchange, allowing participants to express views on the path of interest rates over the next five years.

The short sterling market is used by market participants wishing to express a view on the future path of interest rates, and by those wishing to hedge (or, protect themselves against losses that could result from) future changes to interest rates.

The breadth of participation makes short sterling the most liquid sterling interest rate derivative market. Almost all institutions and investors transacting in sterling markets (including banks, non-bank financials and non-financial firms) have an interest in hedging or speculating on the future path of Libor rates.

Short sterling contracts are structured as contracts for difference; that is, participants pay (or receive) the difference between the Libor rate agreed at the point of inception of their contract and the actual Libor rate on the date of expiry. In reality, few contracts are held to expiry: most participants will take out an offsetting position in order to close their trade and take profit (or limit losses) following market moves.

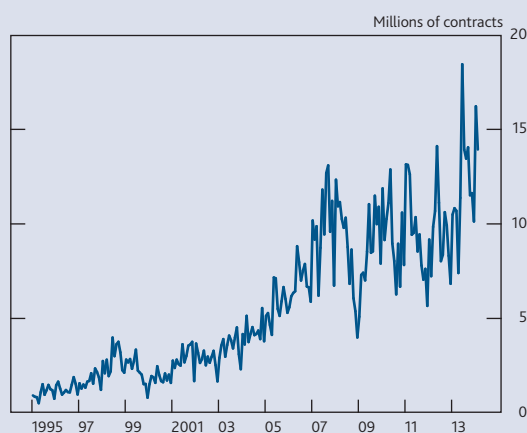
Unlike other interest rate derivatives markets, the short sterling futures also have options traded upon them, which allow market participants to express views on the uncertainty around the future path of short sterling interest rates.

Information from options prices is also used by the Bank to derive summary measures of the uncertainty that market participants attach to future interest rates, some of which are published on the Bank's website.<sup>(1)</sup>

### Interpreting market activity

Chart A shows that the number of daily transactions in the short sterling market has been steadily increasing since 1995, although it has been more volatile since the start of the financial crisis. These volumes data can shed light on the key data and events to which market participants are paying greatest attention.

Chart A Short sterling volumes (monthly)



Source: NYSE Liffe.

Table 1 shows the dates on which the largest daily volumes were recorded in recent years. Bank of England publications and policymaker speeches account for half of these days. Three days saw the release of data that differed materially from market expectations. The remaining two days occurred in early June 2013 when concerns regarding the pace of normalisation in US monetary policy dominated trading in the short sterling market.

Table 1 Recent peaks in the number of contracts traded

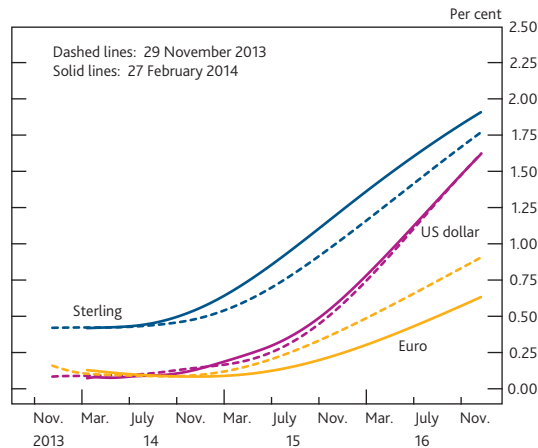
Rank	Date	Number of contracts	Event
1	12 Feb. 2014	2,043,884	February 2014 <i>Inflation Report</i>
2	22 Jan. 2014	1,985,457	ILO three-month unemployment rate (November 2013 data)
3	15 June 2012	1,774,039	Mansion House speech regarding further QE
4	24 Jan. 2014	1,735,895	Bank of England Governor's speech in Davos
5	11 June 2013	1,706,709	Concerns regarding US tapering
6	7 Aug. 2013	1,632,952	August 2013 <i>Inflation Report</i>
7	18 Dec. 2013	1,527,959	ILO three-month unemployment rate (October 2013 data)
8	25 Jan. 2011	1,491,967	First estimate of 2010 Q4 UK GDP
9	24 June 2013	1,484,442	Concerns regarding US tapering
10	13 Nov. 2013	1,470,628	November 2013 <i>Inflation Report</i>

Source: NYSE Liffe.



Sometimes, short sterling rates move on low volumes, however. For example, on 10 January 2014, weaker-than-expected US non-farm payrolls data led to an 11 basis point move in short sterling contracts

**Chart 2** Instantaneous forward interest rates derived from OIS contracts<sup>(a)</sup>

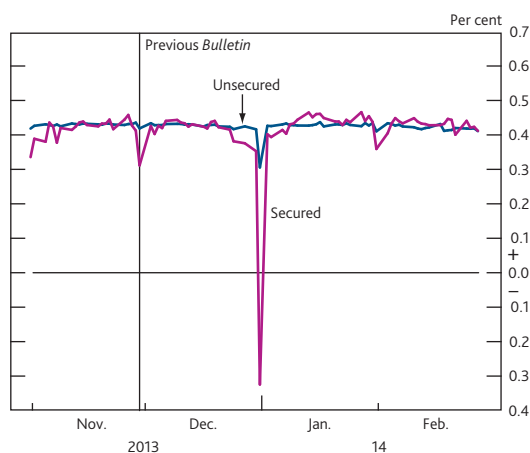


Sources: Bloomberg and Bank calculations.

(a) Instantaneous forward rates derived from the Bank's OIS curves.

The end of 2013 saw some volatility in sterling overnight interest rates, and the secured overnight interest rate fell materially below its recent average (**Chart 3**). While such volatility around the year end has been seen in previous years, these movements were particularly large. Contacts suggested that this largely reflected the increased focus of investors and rating agencies on particular aspects of banks' balance sheets, such as leverage and liquidity, in parallel with the introduction of regulatory requirements related to such metrics.

**Chart 3** Weighted average sterling overnight interest rates<sup>(a)</sup>



Sources: Bloomberg and Bank calculations.

(a) The unsecured overnight interest rate is measured by the sterling overnight index average (SONIA). The secured overnight interest rate is measured by the repurchase overnight index average (RONIA). Both indices are provided by the Wholesale Markets Brokers' Association. For further details, see [www.wmba.org.uk](http://www.wmba.org.uk).

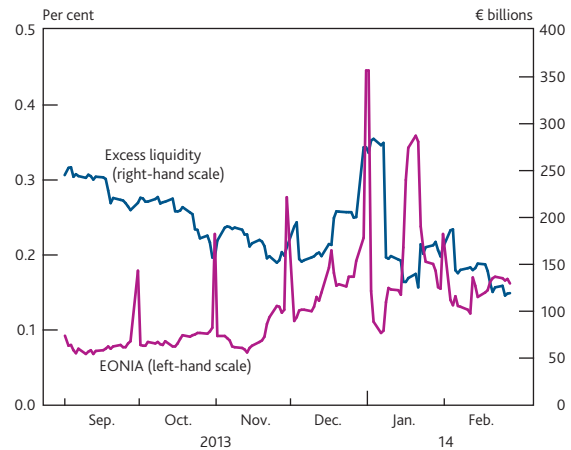
By contrast, euro-area short-term interest rates rose around the year end (**Chart 4**). Contacts suggested that this was

two years ahead. But volumes were not particularly large on the day, with only 699,000 contracts traded.

(1) [www.bankofengland.co.uk/statistics/Pages/IMPLIEDPDFS/default.aspx](http://www.bankofengland.co.uk/statistics/Pages/IMPLIEDPDFS/default.aspx).

because banks had sought to increase the liquidity of their assets over year end while also reducing their reliance on term funding provided via the European Central Bank's (ECB's) longer-term refinancing operations. The resulting increase in demand for short-term liquidity put upward pressure on euro money market rates. It also led to greater borrowing in the ECB's main refinancing operation, temporarily reversing the gradual decline in excess liquidity that has continued since mid-2012. Money market conditions appeared to stabilise after year end.

**Chart 4** Weighted average euro interbank unsecured overnight interest rate (EONIA) and excess liquidity in the Eurosystem<sup>(a)(b)</sup>



Source: Bloomberg.

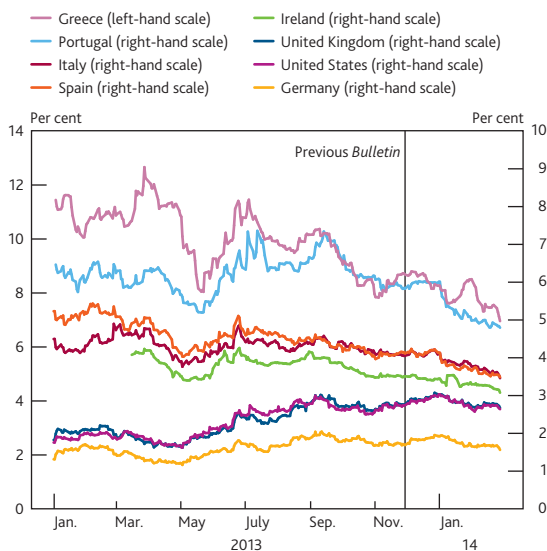
(a) Excess liquidity is defined as the total amount of reserves held in Eurosystem current accounts and the deposit facility, minus average reserves requirements and use of the marginal lending facility.

(b) EONIA is the weighted average of overnight unsecured lending transactions in the interbank market undertaken in the European Union and European Free Trade Association (EFTA) countries.

US and UK ten-year sovereign bond yields continued to comove closely (**Chart 5**). Long-run inflation expectations in the United Kingdom implied by inflation-linked gilts fell during January so that nominal gilt yields decreased by more than real gilt yields over the review period. The spread between German sovereign bonds and those of the United States and United Kingdom continued to widen, meanwhile, which contacts attributed to continued relative weakness of the economic outlook for the euro area versus other developed economies.

At the same time, euro-area periphery government bond yields fell and their spreads to equivalent-maturity German bonds compressed. Contacts attributed this to a reduction in the risks associated with the outlook for these economies and a return of foreign investors to those markets. In December, Ireland exited its Economic Adjustment Programme, which its government had arranged with the European Union,

**Chart 5 Selected ten-year government bond yields**



Source: Bloomberg.

International Monetary Fund and ECB in 2010. The issuance of its ten-year bond in January attracted significant demand.

**Foreign exchange**

The sterling exchange rate index (ERI) appreciated by 1.9% over the review period. Sterling has been trading within a reasonably narrow range since the middle of 2008 (Chart 6). But the recent appreciation of the pound has taken it above the upper limit of that range. Contacts attributed much of the recent strength of sterling to improvements in the economic outlook for the United Kingdom relative to other advanced economies.

**Chart 6 Sterling exchange rate index<sup>(a)</sup>**



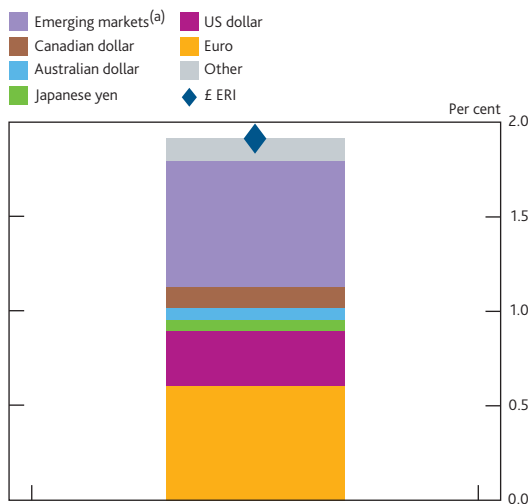
Sources: Bloomberg and Bank calculations.

(a) Dashed lines show period averages. Two standard deviation bands are given by dotted lines around the average. The first period covers 3 July 1997 to 4 July 2007. The second period covers 4 December 2008 to 27 February 2014.

Along with improving prospects for growth, the appreciation of sterling was thought to reflect a rise in demand for safe-haven assets during the pickup in volatility associated with emerging markets in January (see the box on page 81 for further

discussion), and, later, rising political tensions in Ukraine. As shown in Chart 7, emerging market currencies contributed over a third of the rise in sterling’s ERI during the review period, despite having a combined weight in the index of 17.5%. Contacts also reported that the sale of the US telecommunications company Verizon by its British parent Vodafone had temporarily supported the pound versus the dollar.

**Chart 7 Contribution to change in sterling ERI since 29 November 2013 by currency**



Sources: Bloomberg and Bank calculations.

(a) The emerging market currencies in the narrow sterling ERI are: Chinese renminbi, Czech koruna, Indian rupee, Polish zloty, Russian rouble, South African rand and Turkish lira.

Some commentators suggested that there was a risk of sterling depreciation due to the United Kingdom’s sizable current account deficit. The views of contacts on this were mixed. Some believed that market participants typically do not enter speculative trades on the basis of developed-economy current account positions, while others thought that markets had begun to look at such data more closely.

Towards the end of the review period, and following a prolonged period of appreciation, the People’s Bank of China lowered its reference rate for the renminbi against the US dollar (Chart 8). The move spurred a large decline in the renminbi and caught investors by surprise. Commentators suggested that the Chinese central bank action had effectively introduced more ‘two-way risk’ into the currency, and might perhaps presage a widening of the daily trading band (the renminbi is allowed to move ±1% around the reference rate on any given day).

**Corporate capital markets**

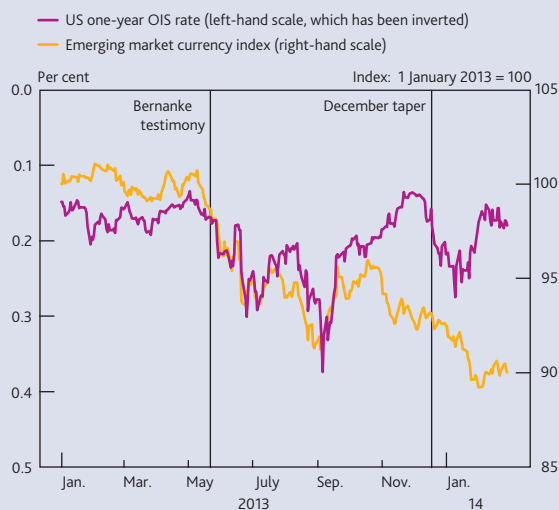
Developed market equity indices rose slightly over the review period as a whole, with much of that increase occurring following the December FOMC meeting (Chart 9). Despite the slightly earlier-than-expected decision by the FOMC to taper, contacts thought that investor demand for risky assets

## Recent episodes of turbulence in emerging financial markets

During the summer of 2013, following the testimony of the then US Federal Reserve Chairman Ben Bernanke, concerns about the pace of exit from current monetary policy settings in the United States sparked a sell-off across a range of emerging financial markets. Even some markets perceived to have strong fundamentals were affected, in part, because they were used to 'proxy hedge' exposures in other, less liquid markets. Markets later stabilised, however, and investors began to discriminate to a greater degree between different emerging markets on the basis of economic fundamentals.

Against that backdrop, the eventual decision by the Federal Reserve to reduce the pace of its asset purchases in December passed with relatively little reaction in most emerging financial markets. Indeed, the high correlation between movements in emerging market currencies and US short-term interest rates observed during the middle of 2013 was notably absent towards the end of the year and in 2014 (**Chart A**).

**Chart A** Emerging market foreign exchange index and US short-term OIS rates



Sources: Bloomberg, JPMorgan Chase and Co. and Bank calculations.

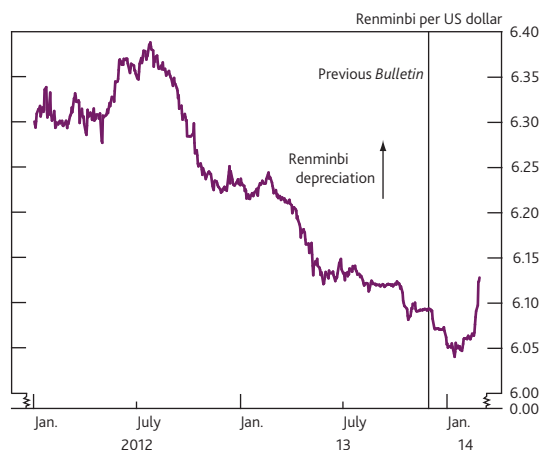
January saw a renewed bout of volatility in emerging markets, however. Contacts suggested this was sparked by a range of coincident but idiosyncratic vulnerabilities. These developments were felt particularly strongly in foreign exchange markets, with further depreciation of certain emerging market currencies (**Chart A**). Despite the view expressed by many contacts that the underlying risks were not related to a common factor, the period still saw some of the same 'proxy hedging' activity as was observed the previous summer.

Some emerging market equity indices also fell as real money investors allocated a smaller proportion of new capital to developing economies. Contacts reported that, in light of financial market volatility last summer, many investors had since bought emerging market equities with only limited conviction in the trade, and so were quick to sell those positions when volatility resurfaced in January. Broad emerging market equities remain down, with the MSCI emerging market equity index around 5.4% lower than at the start of the review period.

Although, on the whole, investors continued to differentiate between countries, concerns about a slowdown in China and risks associated with shadow banking there were thought to have contributed to downward pressure on emerging market assets in general. Contacts thought that the possibility of a hard landing in China would continue to weigh on the economic outlook internationally, although they remained confident of policymakers' ability to respond.

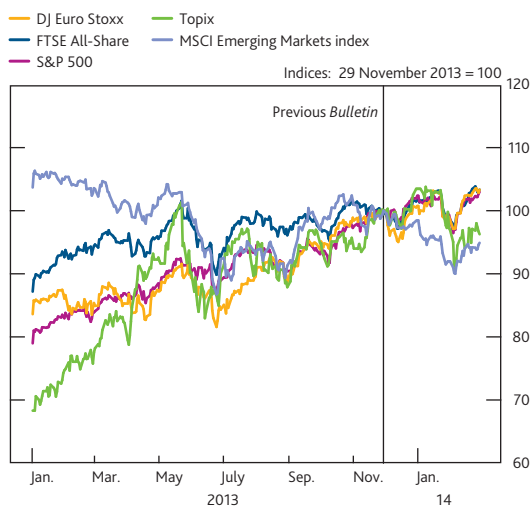
Volatility declined in February for a brief period, but many contacts felt that, despite attractive prices in some emerging market assets following the January sell-off, further adjustment was required. Following the data cut-off, intensification of political tension between Ukraine and Russia led to a sharp depreciation of both the Ukrainian hryvnia and the Russian rouble. The Russian central bank raised its main policy rate by 1.5 percentage points, citing financial stability concerns, and reportedly intervened in foreign exchange markets to try to avoid further currency depreciation. So far, contagion to other markets has been limited. But contacts expected political risk to remain a key concern for investors this year, and pointed to the large number of imminent elections in the emerging world.

Chart 8 US dollar versus renminbi



Source: Bloomberg.

Chart 9 International equity indices(a)(b)



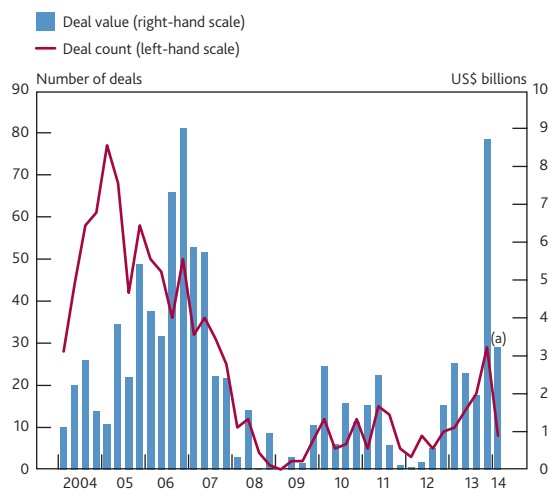
Sources: Bloomberg and Bank calculations.

- (a) Indices are quoted in domestic currency terms, except for the MSCI Emerging Markets index, which is quoted in US dollar terms.  
 (b) The MSCI Emerging Markets index is a free-float weighted index that monitors the performance of stocks in global emerging markets.

had been boosted by FOMC communication which stressed that rates would remain near zero until 'well past' the 6.5% unemployment threshold was reached. In addition, the decision to reduce the pace of asset purchases was taken by some as a signal that the Federal Reserve had become more confident in the resilience of the US recovery. International equity indices then fell in late January following market concerns about the fragility of a number of emerging market economies (for further discussion see the box on page 81). Developed market equity indices have recovered since, and are slightly higher over the review period as a whole.

There was a significant pickup in the overall value of initial public offerings (IPOs) over the course of 2013. The total value of IPOs by firms based in the United Kingdom was US\$16 billion in 2013, only slightly below the US\$16.4 billion seen in 2007. That said, a significant portion of this was concentrated in a few large deals and the total number of

Chart 10 Total value and number of initial public offerings by UK firms



Source: Dealogic.

(a) Data up to 27 February 2014.

UK IPOs remained below the average observed in the years running up to the financial crisis (Chart 10). Also, ongoing share buybacks meant that, overall, net equity issuance remained negative.

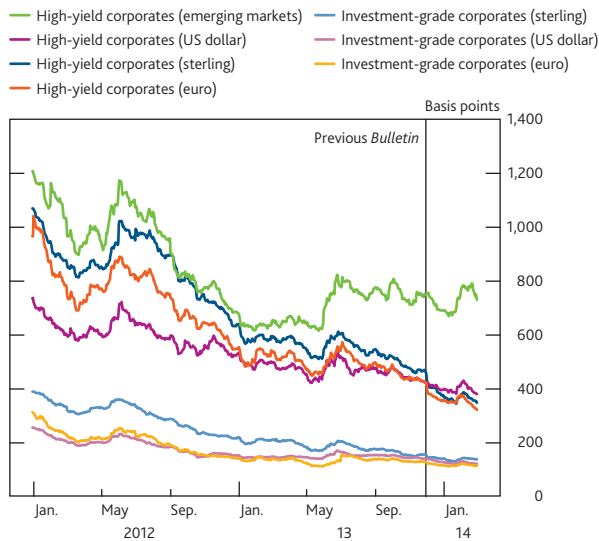
Contacts attributed the increase in the number of UK IPOs over the past year to a rise in equity valuations and reduced volatility in developed-economy equity markets. Private equity owners of corporates had also become more confident in IPOs as a means of exiting investments. And there had been large inflows into equity funds, which asset managers had to deploy. Contacts expected the IPO market to continue to perform strongly — conditional on general financial market conditions remaining conducive to corporate flotations — and pointed to a large number of deals 'in the pipeline'.

In corporate bond markets, advanced-economy investment grade and high-yield credit spreads continued to fall (Chart 11). Spreads increased slightly in January following concerns around conditions in emerging market economies, but quickly fell back, suggesting that there was little perceived spillover to corporate credit risk in developed markets.

Bond issuance by UK private non-financial corporations since the start of the year was broadly in line with the same period in 2013 (Chart 12). Contacts reported continued robust investor demand for new issuance, with most deals significantly oversubscribed and attracting only a very small premium compared with bonds trading in secondary markets. The review period also saw significant demand for bonds issued by firms based in the euro-area periphery economies.

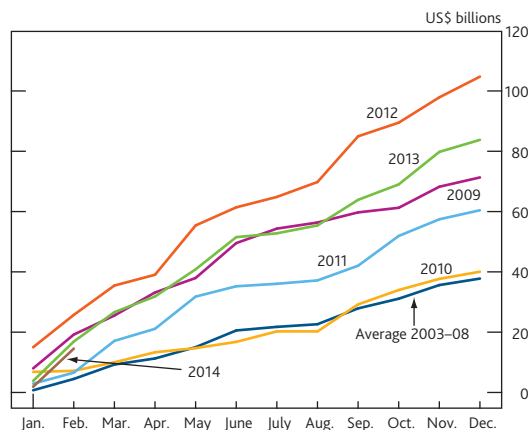
After a period of very strong issuance during much of 2013, issuance of collateralised loan obligations (CLOs) slowed in the United States following the publication of the Volcker Rule in December. Contacts thought that the regulation had left

**Chart 11** International corporate bond option-adjusted spreads



Sources: BofA Merrill Lynch Global Research and Bank calculations.

**Chart 12** Cumulative gross bond issuance by UK private non-financial corporations<sup>(a)</sup>



Sources: Dealogic and Bank calculations.

(a) Data up to 27 February 2014.

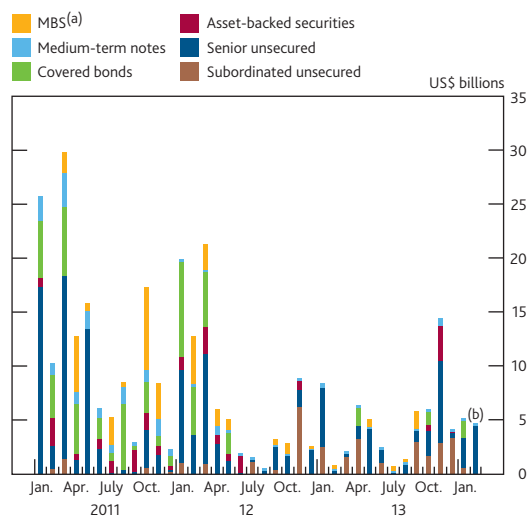
investors uncertain about whether US banks were allowed to invest in CLOs that contain assets besides loans, such as bonds and structured products. Market participants awaited clarification on the wording of the ruling.

Meanwhile, issuance of loans with few financial covenants, or 'cov-lite', continued apace in the United States. Total issuance of cov-lite loans was US\$381 billion in 2013, more than four times higher than the US\$84 billion issued in 2012. Contacts reported that loose terms on loans had become increasingly common in US markets amid strong demand for floating-rate corporate credit. To date, there has been little cov-lite loan issuance in Europe, with some European borrowers looking to raise finance directly from US investors. Contacts expected a pickup in European cov-lite this year, and several borrowers were thought to be in negotiations with syndicates of lenders.

## Bank funding markets

Term debt issuance by UK banks had picked up a little towards the end of last year, but was relatively weak during the current review period (**Chart 13**). Banks had drawn down a significant amount under the Bank of England Funding for Lending Scheme, however, taking £18.8 billion in the four months ending 31 January 2014. Contacts thought that UK bank funding needs remained relatively low, in the context of lenders' ongoing efforts to reduce leverage.

**Chart 13** Term issuance by UK lenders in public markets



Sources: Dealogic and Bank calculations.

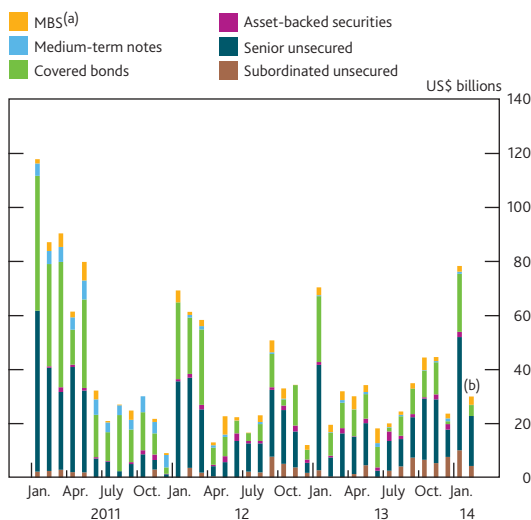
(a) Commercial and residential mortgage-backed securities.  
(b) Data up to 27 February 2014.

In contrast, following the typical seasonal pattern, there was a flurry of issuance by European lenders at the start of the year (**Chart 14**). Contacts noted that strong investor appetite allowed a number of euro-area periphery banks to issue unsecured debt, at long tenors, with deals tending to be oversubscribed and priced very competitively.

There was also further bank issuance of contingent convertible capital instruments during the review period. Contacts reported that the investor base for these relatively new instruments continued to broaden, pointing to the attractive yields that they offered. It was suggested, however, that some investors might find it difficult to price the implicit optionality in these instruments.

In the secondary market, UK banks' senior unsecured bond spreads remained broadly flat over the period (**Chart 15**). The wedge between credit default swap (CDS) premia — CDS contracts provide insurance against default on a bond — and bond spreads was also largely unchanged over the review period, after steady declines from around the middle of 2013. According to contacts, the difference between the two, or CDS-cash 'basis', had been falling in large part because of increased confidence among investors and growing willingness

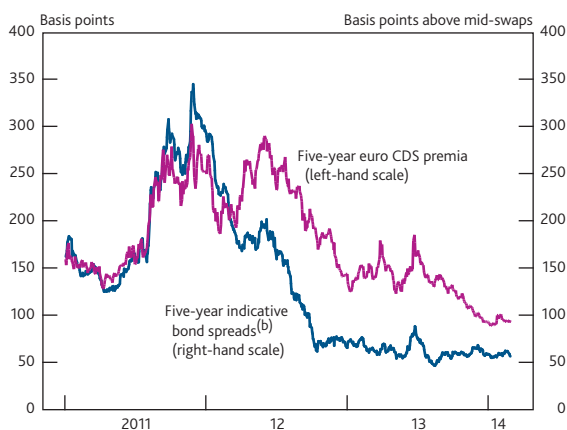
**Chart 14** Term issuance by European (excluding UK) lenders in public markets



Sources: Dealogic and Bank calculations.

- (a) Commercial and residential mortgage-backed securities.  
 (b) Data up to 27 February 2014.

**Chart 15** Indicative senior unsecured bond spreads and CDS premia for UK banks<sup>(a)</sup>



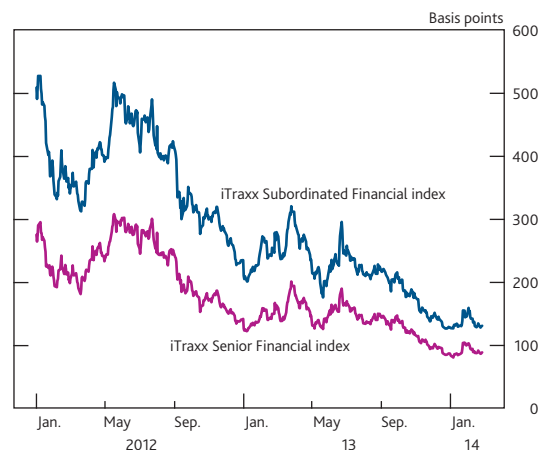
Sources: Bloomberg, Markit Group Limited and Bank calculations.

- (a) Average of Barclays, HSBC, Lloyds Banking Group, Nationwide, Royal Bank of Scotland and Santander UK.  
 (b) Constant-maturity unweighted average of secondary market spreads to mid-swaps of banks' five-year senior unsecured bonds, where available. Where a five-year bond is unavailable, a proxy has been constructed based on the nearest maturity of bond available for a given institution and the historical relationship of that bond with the corresponding institutions' five-year bond. If no bond is available for a given institution, a proxy has been constructed based on the ratio of credit default swaps between that institution and the issuer of the corresponding five-year bond.

to bear risk, leading to an increase in the supply of protection and a decline in CDS premia.

Contacts also noted strong downward pressure on CDS premia referenced to subordinated bank debt. This segment of the market has been particularly affected by uncertainty about whether CDS contracts would pay out if governments forced bondholders to bear losses in the event of a bank failure, following some recent test cases. This uncertainty regarding what constitutes such a 'bail-in' credit event has reduced the amount that investors are willing to pay for protection against default. As a result, there has been a marked decline in

**Chart 16** CDS premia for European financial entities<sup>(a)</sup>



Source: Bloomberg.

- (a) The iTraxx indices comprise equally weighted euro-denominated five-year credit default swaps on investment-grade European entities.

subordinated CDS premia, compared with those for CDS contracts referencing senior bonds (Chart 16). Contacts expected this uncertainty to be eliminated soon, with the introduction of changes to the standardised documentation by the International Swaps and Derivatives Association.

## Operations

### Operations within the Sterling Monetary Framework and other market operations

This section describes the Bank's operations within the Sterling Monetary Framework (SMF) over the review period, and other market operations. The level of central bank reserves is determined by (i) the stock of reserves injected via the Asset Purchase Facility (APF); (ii) the level of reserves supplied by operations under the SMF; and (iii) the net impact of other sterling ('autonomous factor') flows across the Bank's balance sheet.

### Operational Standing Facilities

Since 5 March 2009, the rate paid on the Operational Standing Deposit Facility has been zero, while all reserves account balances have been remunerated at Bank Rate. As a consequence, average use of the deposit facility was £0 million in each of the November, December and January maintenance periods. Average use of the lending facility was also £0 million.

### Indexed long-term repo open market operations

The Bank conducts indexed long-term repo (ILTR) operations as part of its provision of liquidity insurance to the banking system. These typically occur once every calendar month. On 16 January, the Bank launched new ILTR auctions designed to provide more liquidity at cheaper rates, longer maturities and against a wider range of collateral than previously available. In addition, the amount of liquidity available will rise

automatically if there is greater demand.<sup>(1)</sup> The first ILTR operation under the revised format took place on 11 February.

During the review period, the Bank offered £5 billion via three-month ILTR operations on both 10 December 2013 and 7 January 2014, and a minimum of £5 billion via the first of the revised ILTR auctions at a six-month maturity on 11 February 2014 (Table A).

**Table A** Indexed long-term repo operations

	Total	Collateral set summary		
		Set A	Set B	Set C
<b>10 December 2013 (three-month maturity)</b>				
On offer (£ millions)	5,000			
Total bids received (£ millions)	55	55	0	n.a.
Amount allocated (£ millions)	55	55	0	n.a.
Cover	0.01	0.01	0.00	n.a.
Clearing spread above Bank Rate (basis points)		0	n.a.	n.a.
Stop-out spread (basis points) <sup>(a)</sup>	n.a.			
<b>7 January 2014 (three-month maturity)</b>				
On offer (£ millions)	5,000			
Total bids received (£ millions)	200	200	0	n.a.
Amount allocated (£ millions)	200	200	0	n.a.
Cover	0.04	0.04	0.00	n.a.
Clearing spread above Bank Rate (basis points)		0	n.a.	n.a.
Stop-out spread (basis points) <sup>(a)</sup>	n.a.			
<b>11 February 2014 (six-month maturity)</b>				
Minimum on offer (£ millions)	5,000			
Total bids received (£ millions)	910	240	110	560
Amount allocated (£ millions)	910	240	110	560
Clearing spread above Bank Rate (basis points)		0	5	15

(a) Difference between clearing spreads for wider and narrow collateral.

Over the quarter, and in line with recent quarters, the aggregate level of reserves supplied by the Bank through QE remained in excess of the level that would otherwise be demanded by market participants. Usage of the facility therefore remained limited, though the launch of the revised operations prompted some additional interest (Chart 17).

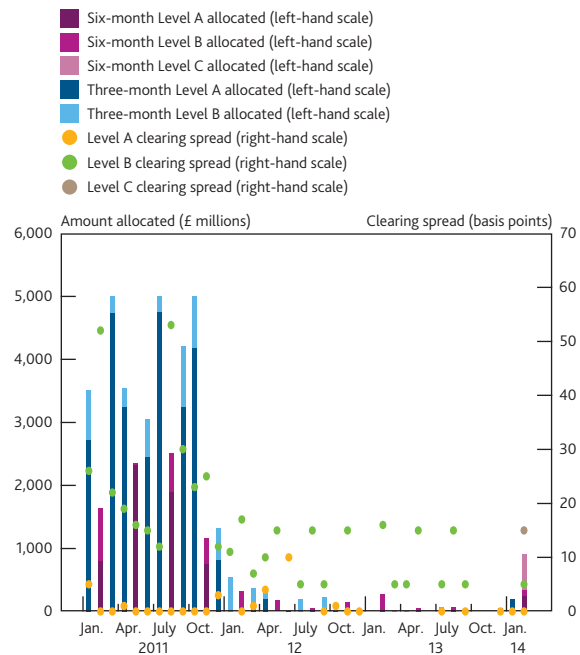
### Contingent Term Repo Facility

As all collateral previously accepted in the Extended Collateral Term Repo (ECTR) Facility is now accepted in the ILTR, the ECTR has been renamed as the Contingent Term Repo Facility. The CTRF is a contingent liquidity facility, designed to mitigate risks to financial stability arising from a market-wide shortage of short-term sterling liquidity.<sup>(2)</sup> The Bank judged that in light of market conditions, CTRF auctions were not required in the review period.

### Discount Window Facility

The bilateral on-demand Discount Window Facility (DWF) is aimed at banks experiencing a firm-specific or market-wide shock. It allows participants to borrow highly liquid assets in return for less liquid collateral in potentially large size and for a

**Chart 17** ILTR reserves allocation and clearing spreads<sup>(a)</sup>



(a) Where there has not been any allocation to a collateral set, no clearing spread is marked.

variable term. The average daily amount outstanding in the DWF between 1 July 2013 and 30 September 2013, lent with a maturity of 30 days or less, was £0 million.

### Other operations

#### Funding for Lending Scheme

The Funding for Lending Scheme (FLS) was launched by the Bank and the Government on 13 July 2012. The FLS is designed to incentivise banks and building societies to boost their lending to UK households and non-financial companies, by providing term funding at low rates. The quantity each participant can borrow in the FLS, and the price it pays on its borrowing, is linked to its performance in lending to the UK real economy. The initial drawdown period for the FLS opened on 1 August 2012 and ran until 31 January 2014.

The Bank and HM Treasury announced an extension to the FLS on 24 April 2013, which allowed participants to borrow from the FLS until January 2015. The extended drawdown period will run from 3 February 2014 to 30 January 2015, following the initial drawdown period.<sup>(3)</sup>

On 28 November 2013, the Bank and HM Treasury announced changes to the terms of the FLS to refocus the incentives in the Scheme towards supporting small business lending in 2014.<sup>(4)</sup>

- (1) Further details are available at [www.bankofengland.co.uk/markets/Documents/marketnotice140116.pdf](http://www.bankofengland.co.uk/markets/Documents/marketnotice140116.pdf).
- (2) Further details are available at [www.bankofengland.co.uk/markets/Pages/money/ctrf/default.aspx](http://www.bankofengland.co.uk/markets/Pages/money/ctrf/default.aspx).
- (3) Further details are available at [www.bankofengland.co.uk/markets/Documents/marketnotice130424.pdf](http://www.bankofengland.co.uk/markets/Documents/marketnotice130424.pdf).
- (4) Further details are available at [www.bankofengland.co.uk/markets/Documents/marketnotice131128.pdf](http://www.bankofengland.co.uk/markets/Documents/marketnotice131128.pdf).

The Bank publishes quarterly data showing, for each group participating in the FLS, the amount borrowed from the Bank, the net quarterly flows of lending to UK households and firms, and the stock of loans as at 30 June 2012. In the final four months of the first part of the Scheme ending 31 January 2014, 31 participants made drawdowns of £18.8 billion. This took outstanding aggregate drawings under the first part of the Scheme to £41.9 billion, with 41 participants making at least one drawing.<sup>(1)</sup>

### US dollar repo operations

Since 11 May 2010, in co-ordination with other central banks, the Bank has offered weekly fixed-rate tenders with a seven-day maturity to offer US dollar liquidity. Since 12 October 2011 the Bank has also offered US dollar tenders with a maturity of 84 days.

On 24 January 2014, the Bank, in co-ordination with other central banks, announced that in view of the improvement in US dollar funding conditions and the low demand for US dollar liquidity-providing operations, the current US dollar repo operations would be phased out. Monthly 84-day operations will cease on 30 April 2014, and the timetable for seven-day operations will continue through to 30 July 2014. The network of bilateral central bank liquidity swap arrangements provides a framework for the reintroduction of US liquidity operations if warranted by market conditions.<sup>(2)</sup> There was no use of the Bank's US dollar facilities during the review period.

### Bank of England balance sheet: capital portfolio

The Bank holds an investment portfolio that is approximately the same size as its capital and reserves (net of equity holdings, for example in the Bank for International Settlements, and the Bank's physical assets) and aggregate cash ratio deposits (CRDs). The portfolio consists of sterling-denominated securities. Securities purchased by the Bank for this portfolio are normally held to maturity, though sales may be made from time to time, reflecting, for example, risk or liquidity management needs or changes in investment policy. The portfolio currently includes around £4.8 billion of gilts and £0.4 billion of other debt securities.

### Asset purchases

As of 31 January 2014, outstanding asset purchases financed by the issuance of central bank reserves under the APF were £375 billion, in terms of the amount paid to sellers. There were no asset purchases, sales or maturities over the review period.

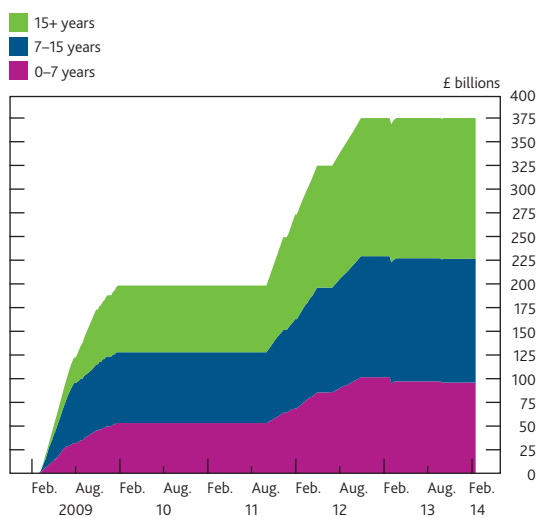
### Gilts

Alongside the publication of the *Inflation Report* on 12 February 2014, the MPC announced that it intends to maintain the stock of purchased assets, including reinvesting the cash flows associated with all maturing gilts held in the

APF, at least until Bank Rate has been raised from its current level of 0.5%.<sup>(3)</sup>

The total stock of gilts outstanding, in terms of the amount paid to sellers, was £375 billion; of which £95.9 billion of purchases were made in the 3–7 years residual maturity range, £130.5 billion in the 7–15 years residual maturity range and £148.6 billion with a residual maturity of greater than 15 years (Chart 18).

Chart 18 Cumulative gilt purchases by maturity<sup>(a)(b)</sup>



(a) Proceeds paid to counterparties on a settled basis.  
(b) Residual maturity as at the date of purchase.

### Gilt lending facility<sup>(4)</sup>

The Bank continued to offer to lend some of its gilt holdings via the Debt Management Office in return for other UK government collateral. In the three months to 31 December 2013, a daily average of £225 million of gilts was lent as part of the gilt lending facility. Average daily lending in the previous quarter was £274 million.

### Corporate bonds

There were no purchases of corporate bonds during the review period and future purchase or sale operations will be dependent on market demand, which the Bank will keep under review in consultation with its counterparties in the Corporate Bond Scheme.<sup>(5)</sup> The Scheme currently holds no bonds.

(1) Further details are available at [www.bankofengland.co.uk/markets/Pages/FLS/data.aspx](http://www.bankofengland.co.uk/markets/Pages/FLS/data.aspx).

(2) Further details are available at [www.bankofengland.co.uk/markets/Documents/marketnotice140124.pdf](http://www.bankofengland.co.uk/markets/Documents/marketnotice140124.pdf).

(3) Further details are available at [www.bankofengland.co.uk/publications/Documents/inflationreport/2014/ir14febo.pdf](http://www.bankofengland.co.uk/publications/Documents/inflationreport/2014/ir14febo.pdf).

(4) For more details on the gilt lending facility see the box 'Gilt lending facility' on page 253 of the *Bank of England Quarterly Bulletin*, Vol. 50, No. 4.

(5) More information can be found in the Market Notice at [www.bankofengland.co.uk/markets/Documents/marketnotice130627.pdf](http://www.bankofengland.co.uk/markets/Documents/marketnotice130627.pdf).



### Secured commercial paper facility

The Bank continued to offer to purchase secured commercial paper (SCP) backed by underlying assets that are short term and provide credit to companies or consumers that support economic activity in the United Kingdom.<sup>(1)</sup> The facility remained open during the review period but no purchases were made.

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(1) The SCP facility is described in more detail in the Market Notice available at [www.bankofengland.co.uk/markets/Documents/marketnotice120801.pdf](http://www.bankofengland.co.uk/markets/Documents/marketnotice120801.pdf).



# Report



# Monetary Policy Roundtable

On 17 December, the Bank of England and the Centre for Economic Policy Research (CEPR) hosted their eleventh Monetary Policy Roundtable. These events provide a forum for economists to discuss key issues relevant to monetary policy in the United Kingdom.<sup>(1)</sup> As with previous Roundtable discussions, participants included a range of economists from private sector financial institutions, academia, public sector bodies and industry associations. There were two topics of discussion:

- state-contingent forward guidance: rationale and reactions; and
- how quickly can the UK economy grow following the Great Recession?

This note summarises the main issues raised by participants.<sup>(2)</sup> The Roundtables are conducted under 'Chatham House Rule' and so opinions expressed at the meeting are not attributed to individuals. This summary does not represent the views of the Bank of England, the Monetary Policy Committee (MPC) or the CEPR.

## State-contingent forward guidance: rationale and reactions

In August 2013, the MPC issued explicit forward policy guidance, committing not to raise Bank Rate at least until the unemployment rate, as measured by the Labour Force Survey, falls to 7%, provided that such an approach remains consistent with its primary objective of price stability and does not endanger financial stability. The first session of the Roundtable discussed the rationale for introducing forward guidance, and participants' views on the design and usefulness of such guidance.

On the rationale for introducing forward guidance, there was general agreement that a key objective was to reduce uncertainty about the future conduct of monetary policy, by explaining in more detail how policymakers would envisage reacting to certain economic developments. One speaker noted that understanding policymakers' reaction functions was particularly difficult at the present juncture as the policy rate had been unchanged for many years while there was little previous experience of how policymakers might vary other instruments such as asset purchases. The nature of the interaction between monetary policy and macro and

microprudential policies added an additional source of uncertainty.

Other motivations for adopting forward guidance were also discussed. One speaker felt that forward guidance could be particularly effective at the current juncture by preventing market participants overreacting to early signs of a recovery in economic growth, so allowing market interest rates to normalise at an appropriate pace. Another speaker thought that forward guidance might be particularly valuable where market expectations of interest rates have diverged from those of policymakers. While noting the Bank's view that forward guidance was not intended to provide additional economic stimulus by committing to hold interest rates lower for longer than would be justified by the inflation target, that speaker felt that if forward guidance did lower market expectations about short-term interest rates, then that would provide a boost to economic activity.

There was much discussion of how best to design a framework for forward policy guidance. Participants generally favoured state-contingent forward guidance, given uncertainty about the macroeconomic outlook. One participant likened state contingency to providing an 'automatic stabiliser', building in a response to changing economic circumstances. But some participants questioned whether the unemployment rate was the right variable against which one should link state-contingent forward guidance. One speaker felt that this design placed too much emphasis on a single and imperfect measure of economic slack. Another participant noted that the focus on the unemployment rate stood in contrast to Milton Friedman's belief that central banks should focus on nominal variables. But there was little support among participants for alternative reference variables, such as nominal GDP growth.

The discussion touched upon the 'knockouts' that apply to the MPC's forward guidance. One speaker questioned whether the focus the MPC placed on anchored inflation expectations might be unhelpful, given that lower expected inflation might be associated with higher real interest rates and lower growth.

(1) This report was prepared by Lai Wah Co, Will Dison, Michael Goldby and Katharine Neiss of the Monetary Analysis area of the Bank. Roundtables are held twice a year. The next Roundtable is scheduled for Summer 2014.

(2) For both this and previous summaries, see [www.bankofengland.co.uk/publications/Pages/other/monetary/roundtable/default.aspx](http://www.bankofengland.co.uk/publications/Pages/other/monetary/roundtable/default.aspx).

But another participant countered that this was an important part of the guidance, noting the likely difficulty and cost of regaining control of inflation expectations if they became less well anchored to the inflation target. One participant noted the importance of the financial stability knockout at the current juncture, given potential risks arising from the housing market.

One of the main areas of discussion centred on whether the MPC should provide additional guidance about what might happen to policy once the 7% unemployment threshold is reached. Two speakers argued that UK monetary policy makers should set out their preferred paths for Bank Rate and asset purchases, conditional on the state of the economy. They argued this would further reduce uncertainty, which they thought remained significant, and provide more clarity about policymakers' reaction function. They favoured the approach taken by the US Federal Open Market Committee and the Swedish Riksbank, who publish projections for the policy rate.

But other participants argued against publishing projections for the policy rate. Some participants were sceptical that a published path for the policy rate and the stock of asset purchases would be useful given the substantial uncertainty surrounding the evolution of the economy and therefore the appropriate future setting for policy, and were concerned that such projections might be interpreted as a commitment to follow a particular policy. One participant thought that there were important procedural difficulties associated with publishing projections where monetary policy is set by a committee with rotating membership. Another participant noted that if central banks published 'too much' information, this could reduce the incentives for private agents to invest in producing their own forecasts, and lead to herding behaviour in financial markets.<sup>(1)</sup> But other participants were sceptical that this would happen in practice.

On the impact of the MPC's forward guidance, one speaker noted that it was very difficult to test for this, given the objectives of the policy and the lack of knowledge of how the economy would otherwise have evolved. That speaker cited the fall in the implied volatility of UK short-term interest rates since the policy announcement as being consistent with some reduction in uncertainty. Some participants thought forward guidance had influenced the interest rate expectations of the private sector to some degree.

In summary, most participants felt that the forward guidance issued by the MPC was helpful. But there were differing views about the optimal design of such guidance, and some participants thought that forward guidance would be improved by the publication of policymakers' conditional forecasts for Bank Rate and the stock of asset purchases.

## How quickly can the UK economy grow following the Great Recession?

The UK recovery since the end of the Great Recession in 2008/09 had been weak compared with previous and current recoveries in many other advanced economies and compared with the average experience following past regional banking crises. At the time of the Roundtable discussion, the level of real GDP remained 2.5% below its pre-crisis peak. The second session of the Roundtable considered the outlook for UK growth, in light of considerable uncertainties regarding: the strength of headwinds generated by the global financial crisis; the degree of spare capacity in the economy and how productivity will evolve as the economy recovers; and unprecedented monetary stimulus over the recent past. How fast could the UK economy grow without posing risks to price stability?

Participants discussed the strength of the latest UK Purchasing Managers' Index (PMI) output and employment indices in relation to the official Office for National Statistics (ONS) data. The UK PMI output data had recently reached their highest levels since the late 1990s, outperforming those for the United States, euro area and Japan, with growth broad-based across sectors. Other survey measures of recruitment, pay growth and investment intentions had also improved. For one speaker, these presented a particularly encouraging picture, with above-trend growth in the UK economy considered possible over the next year. Another participant questioned the signal from the PMI surveys however, suggesting that the historical relationship with measured GDP growth may have changed since the financial crisis.

One window onto the strength of recent and prospective growth is employment, which increased strongly through 2012. There was some discussion over how strong employment had been, with a weaker steer from the PMI surveys causing some to question the official data, although others noted that the ONS employment figures have historically been subject to relatively small revisions. It was therefore uncertain just how weak productivity had been and why, complicating the question of how fast the recovery in GDP growth might be.

Two of the speakers thought that the United Kingdom's trend annual growth rate was now in the range of 1.0%–1.5%, much lower than historical average rates. One speaker thought that the United Kingdom's sustainable growth rate will remain subdued because output sectors that had benefited from cheap external finance pre-crisis would continue to struggle in

(1) Morris, S and Shin, H S (2002), 'Social value of public information', *The American Economic Review*, Vol. 92, No. 5, pages 1,521–34.

the face of more restrictive and keenly priced credit. Those sectors were construction, distribution, financial services and real estate, where output growth has been much weaker than prior to the recession. The other speaker noted that they did not believe the estimated strength of productivity growth prior to the recession, which may have exaggerated the reduction in productivity growth that we have seen.

On aggregate supply, one of the speakers cited OECD estimates which imply that falls in total factor productivity had been the main drag to UK potential GDP growth.<sup>(1)</sup> Such a negative supply shock was consistent with a worsening growth and inflation trade-off that was evident from persistent growth underperformance and inflation overshoots relative to Consensus forecasts. The key reasons cited for modest productivity growth were, first of all, fewer less productive companies going out of business, given relatively low interest rates, meaning that employees were not moving to more productive businesses; and second, insufficient business investment.

This characterisation of the United Kingdom was contrasted with the United States, where labour productivity had grown much more strongly. There was much discussion among participants about the nature of the supply shocks thought to have hit the UK and US economies, with a range of alternative views put forward. One participant suggested that tight credit conditions may have weighed on potential supply growth in the United Kingdom, which may therefore pick up as conditions ease. Labour supply growth in the United Kingdom, meanwhile, had held up. By contrast the United States had experienced a sharp fall in labour participation, such that overall supply growth in the United States looked less favourable than measures based on productivity.

Regarding inflation, one speaker expected wage inflation to creep upwards over the next year, given the trend in recent survey data. Another speaker was worried that the United Kingdom would hit 'speed limit' constraints as the output gap closed by mid-2014, so that interest rates might rise sooner than expected.

One speaker argued that structural policies were needed to tackle the productivity problem in the United Kingdom, with demand stimulus alone not being sufficient. Another speaker even thought that quantitative easing (QE) may have had a negative supply-side impact, since it distorted the allocation of capital. Unlike interest rate movements, it was argued that companies find the impact of QE difficult to understand and calibrate. The term structure of inflation expectations had shifted up, and companies perceived an uncertain real rate of return, so they favoured equity buybacks and accelerated dividend payments as opposed to capital spending. But participants differed in their views on this, since QE had driven equity prices and therefore 'Tobin's Q' higher, implying a greater incentive for capital investment; and QE had also prompted greater corporate debt issuance, likely in part to fund capital spending.

In summary, participants thought the current UK recovery was likely to be sustained, but predictions for growth over the coming year varied, and some thought the United Kingdom's sustainable growth rate was now in the range of 1.0%–1.5%. Participants differed in views on whether UK productivity growth had been as weak as reported in the official data, and there were more mixed opinions about the nature of the supply shocks in the UK and US economies.

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(1) Inferred from calculations based on the OECD *Economic Outlook* projections for potential GDP, potential employment and productive capital stock.

# Summaries of speeches and working papers



## Bank of England speeches

A short summary of speeches and *ad hoc* papers made by Bank personnel since 1 December 2013 are listed below.

### [The transition to a new normal for monetary policy](#)

David Miles, Monetary Policy Committee member, February 2014.

[www.bankofengland.co.uk/publications/Documents/speeches/2014/speech707.pdf](http://www.bankofengland.co.uk/publications/Documents/speeches/2014/speech707.pdf)

David Miles argued that the 'neutral' level of Bank Rate will probably be below its long-run average of 5% for some time to come. He defined the neutral rate as the level of Bank Rate which, once inflation is at target and output in line with potential, keeps the economy there on average. It could be seen as the sum of the rate of return on safe, inflation-proof assets and the inflation target.

Miles argued that the rate of return on safe assets would remain lower, and the spreads on risky assets higher, in the years to come than before the crisis: 'Households, firms, and investors now attach a higher probability to financial crises and sharp, prolonged downturns in economic activity: events that many may have thought close to inconceivable. This makes assets which generate a real return with little risk more attractive, driving down the real risk-free interest rate'. He estimated that the neutral level of Bank Rate might fall to around 3%. Miles did not believe that the composition of the Bank of England's balance sheet would materially affect this estimate.

### [The UK economy and the world economy](#)

Ben Broadbent, Monetary Policy Committee member, February 2014.

[www.bankofengland.co.uk/publications/Documents/speeches/2014/speech708.pdf](http://www.bankofengland.co.uk/publications/Documents/speeches/2014/speech708.pdf)

In a speech at the Institute of Economic Affairs State of the Economy Conference, Ben Broadbent discussed the relationship between UK and global growth. He stressed the importance of developments in the global economy and international capital markets for both short-run domestic demand and economic performance over longer horizons. Over the short term, international factors beyond the direct effects from trade have a substantial impact on domestic demand, perhaps reflecting the greater integration of capital markets. This can be beneficial, when country-specific risks are shared more widely, but can also be damaging if greater financial interconnectedness creates or amplifies risks. Over the longer run, Ben discussed evidence which indicates that

greater openness allows countries to converge more quickly to higher levels of productivity. He suggested that this could be driven by open capital markets which allow countries to tap other sources of finance, or international investment bringing with it intangible benefits. He concluded that, on balance, the UK economy is likely to benefit from its exposure to the world.

### [The economics of currency unions](#)

Mark Carney, Governor, January 2014.

[www.bankofengland.co.uk/publications/Documents/speeches/2014/speech706.pdf](http://www.bankofengland.co.uk/publications/Documents/speeches/2014/speech706.pdf)

The Governor provided a technocratic assessment of what made an effective currency union between independent nations — having noted that any arrangement to retain sterling in an independent Scotland would need to be negotiated between the Westminster and Scottish Parliaments, and that the Bank of England would implement whatever monetary arrangements were put in place.

The success of a currency area hinged on whether its features mitigated the costs of losing the flexibility that came from an independent monetary policy. These features generally promoted the alignment of economic cycles, and the maintenance of price and financial stability within the union.

The ingredients of a successful union included mobility of labour, capital and goods; institutional structures promoting financial stability (a 'banking union'); and institutions that mutualise risks and pool fiscal resources.

The risks arising from the absence of these foundations had been demonstrated clearly in the euro area over recent years, with sovereign debt crises, financial fragmentation and large divergences in economic performance. The euro area was now beginning to rectify its institutional shortcomings, but further, very significant steps were necessary to expand the sharing of risks and pooling of fiscal resources. In short, a durable, successful currency union required some ceding of national sovereignty.

It was likely that similar institutional arrangements would be necessary to support a monetary union between an independent Scotland and the rest of the United Kingdom.

Decisions that cede sovereignty and limit autonomy were rightly choices for elected governments and involved considerations beyond mere economics. For those considerations, others were better placed to comment.



Remarks given by Mark Carney, Governor, at the Davos CBI British Business Leaders Lunch, Switzerland

Mark Carney, Governor, January 2014.

[www.bankofengland.co.uk/publications/Documents/speeches/2014/speech705.pdf](http://www.bankofengland.co.uk/publications/Documents/speeches/2014/speech705.pdf)

The Governor discussed the prospects of the global and British economies achieving escape velocity — the momentum necessary for an economy to escape from the many headwinds following a financial crisis. Although the global economy had picked up over the previous year, and tail risks had decreased, it would take sustained growth, more balanced demand and a recovery in the supply side for advanced economies to break free into a more normal universe.

The Governor noted that the global economy had been in similar circumstances before. In the aftermath of the Great Depression, demand was persistently weak because policy mistakes were legion. This time, thus far, was different. Protectionism was being resisted, banks recapitalised, and the global financial system rebuilt. In parallel, monetary policy remained exceptionally stimulative.

Staying the course on these policies would be decisive to achieving escape velocity. As the leading global financial centre, the United Kingdom was central to building a more resilient, open global financial system, setting the stage for monetary policy to support a supply-side recovery.

Given the surprisingly poor supply-side performance and the considerable, uncertain slack in the economy, it made sense for monetary policy to test the extent to which supply performance was 'endogenous' to demand. This was one of the main advantages of the Bank's forward guidance policy. Though there were several reasons to expect productivity growth to pick up as the recovery proceeded, unemployment remained above the level that was likely to be consistent with maintaining inflation at the target in the medium term, which suggested that the recovery had some way to run before it would be appropriate to consider moving away from the emergency setting of monetary policy.

The Monetary Policy Committee had noted that when the time eventually came to begin to move away from emergency settings of policy, any such move would be gradual. The Bank's assessment of how to evolve guidance to changing circumstances would begin in its February *Inflation Report*.

Inflation, interest rates and forward guidance

Paul Fisher, Executive Director for Markets, January 2014.

[www.bankofengland.co.uk/publications/Documents/speeches/2014/speech704.pdf](http://www.bankofengland.co.uk/publications/Documents/speeches/2014/speech704.pdf)

Paul Fisher highlighted the importance the Monetary Policy Committee (MPC) attaches to inflation being back close to its 2% target. He explained that although inflation is costly for many reasons, it had been appropriate not to have tighter monetary policy in recent years, as the sources of the inflationary pressure were not persistent and tighter policy would have led to the threat of deflation and depression.

Since the introduction of forward guidance, unemployment had fallen unusually precipitously. Although welcome, he stressed that in order to see rising living standards on average it is crucial to see rising productivity too. Looking ahead, price pressures seemed to be subsiding and inflation expectations remained well anchored. The MPC therefore had a favourable situation in which to explore how much more capacity the economy has, before inflationary pressures begin to build.

Against this backdrop, Paul explained that even if the 7% unemployment rate threshold were to be reached in the near future, he saw no immediate need for a tightening of policy and that when it is time, it would be appropriate to do so only gradually.

Achieving a sustainable recovery: where next for business investment?

Ian McCafferty, Monetary Policy Committee member, January 2014.

[www.bankofengland.co.uk/publications/Documents/speeches/2014/speech703.pdf](http://www.bankofengland.co.uk/publications/Documents/speeches/2014/speech703.pdf)

In this speech, Ian McCafferty reviewed the factors likely to underpin a recovery in UK business investment over the next 12–18 months. Setting the recent weakness of business investment in a historical context, he argued that investment is a late, but essential, contributor to economic recoveries. Two main factors have depressed business investment since the crisis: low confidence/heightened uncertainty and adverse financing conditions. The ongoing decline of uncertainty is a prerequisite for any recovery in business investment. And improving financing conditions are making possible the realisation of investment plans — first to replace equipment, but also to expand capacity and, in time, keep up with competitors. While large firms rely on bond markets and the smallest firms have only limited recourse to bank finance, mid-size firms have yet to benefit from easier bank credit. But they rely heavily on internal funds and should gain from waning pension deficits as yields rise.

### The balance of growth

Ben Broadbent, Monetary Policy Committee member, January 2014.

[www.bankofengland.co.uk/publications/Documents/speeches/2014/speech702.pdf](http://www.bankofengland.co.uk/publications/Documents/speeches/2014/speech702.pdf)

In a speech at the London School of Economics, Ben Broadbent addressed concerns that the composition of the recent recovery in UK output growth might make it unsustainable. According to an oft-cited view, the pickup in consumer spending will subside as real wages remain weak, while perpetually stagnant business investment will fail to compensate for that eventual slowdown in household consumption. He first explained that the decline in real wages during the previous recession was not due to a rise in firms' profit margins but to higher inflation in consumer relative to output prices. Next, he showed that business investment lags rather than leads near-term output growth. Other imbalances in expenditure or income are also poor predictors of future growth. He concluded that other factors such as relative prices, foreign demand and UK productivity growth are more likely to determine how sustainable the UK recovery proves to be.

### The Commercial Property Forum twenty years on

Andrew Haldane, Executive Director for Financial Stability, December 2013.

[www.bankofengland.co.uk/publications/Documents/speeches/2013/speech701.pdf](http://www.bankofengland.co.uk/publications/Documents/speeches/2013/speech701.pdf)

In this speech, Andrew Haldane celebrated the 20th anniversary of the Bank's Commercial Property Forum. Historically, commercial property has been highly procyclical. Over the past century, the UK commercial property market experienced five distinct boom-bust cycles. The Bank's Commercial Property Forum was itself born out of the commercial property crash of the early 1990s.

The industry recognises the need for change. Recent proposals by the industry to base lending decisions not on spot, but medium-term or sustainable valuations are one way of slowing that procyclical spiral. Regulatory change is needed too. The deep and lasting impact of the credit cycle has shown that we need to take prompt and corrective action to lean against financial swings.

In the United Kingdom, that task of leaning against procyclicality in the financial system falls to the Bank's new Financial Policy Committee. And recent policy actions by the authorities to reduce the stimulus to the mortgage market are a sign of this big philosophical shift.

### The United Kingdom's economic recovery: why now; will it last; and what next for monetary policy?

Spencer Dale, Executive Director and Chief Economist, December 2013.

[www.bankofengland.co.uk/publications/Documents/speeches/2013/speech698.pdf](http://www.bankofengland.co.uk/publications/Documents/speeches/2013/speech698.pdf)

Speaking at the Confederation of British Industry Midwinter Lunch, Spencer Dale addressed three questions about the UK recovery: why now; will it last; and what next for monetary policy?

The improved availability of credit had helped support a recovery, in part by fostering a thawing in the housing market. A healthy housing market was important for the UK economy, although the Bank would remain vigilant for it heating up and would be far better equipped to respond should this happen than in the past.

Spencer contended that a reduction in uncertainty may have been more important still in driving a pickup in growth, as companies in particular exit from a strategy of survival and hunkering down and start to pursue risky, but productive and profitable, ventures.

Despite these reasons for optimism, some effects of the crisis may persist, for example a reluctance of some companies to depend on bank credit. Although understandable, such behaviours may hamper the efficient functioning of the economy.

On policy, and in the context of the MPC's policy guidance, Spencer emphasised that the economy faced a long road back to normality, and that this would not be brought about by a couple of quarters of strong growth.

### Solvency II — a turning point

Julian Adams, Deputy Head of the Prudential Regulation Authority and Executive Director of Insurance, December 2013.

[www.bankofengland.co.uk/publications/Documents/speeches/2013/speech699.pdf](http://www.bankofengland.co.uk/publications/Documents/speeches/2013/speech699.pdf)

In a speech given to representatives from the insurance industry at the Prudential Regulation Authority's (PRA's) offices in London, Julian Adams set out what recent policy developments meant for the implementation of Solvency II in the United Kingdom. Julian's speech centred on the work that needed to be completed by the PRA and insurers to be ready for the new regime on 1 January 2016, based on the preparatory guidelines issued by the European Insurance and Occupational Pensions Authority. As the speech supported the publication of Supervisory Statement 4/13, Julian highlighted

particular areas of the Statement before relating the PRA's expectations of insurers. Julian referred to the initiatives in insurance supervision — more immediately in Solvency II and also the upcoming work of the International Association of Insurance Supervisors — and the imperative for insurers to stay abreast of policy developments.

#### Forward guidance and its effects

Martin Weale, Monetary Policy Committee member, December 2013.

[www.bankofengland.co.uk/publications/Documents/speeches/2013/speech697.pdf](http://www.bankofengland.co.uk/publications/Documents/speeches/2013/speech697.pdf)

In a speech given to the National Institute for Economic and Social Research, Martin Weale explained some of the theoretical issues around forward guidance and offered his initial thoughts on what its impact had been. He used a simple New Keynesian framework to explore the effects of forward guidance, which pointed to the strongest impact of the policy being at the start of the period of forward guidance. To investigate this impact, Martin first looked at market rates. He said he saw no obvious impact on expected future rates immediately after the announcement of forward guidance — although he noted that the discussion of forward guidance prior to August may have already been reflected in market expectations. Next, Martin turned to an analysis of the impact on uncertainty. Studying the volatility of Libor options, he found that the policy appears to have brought about a marked reduction in uncertainty at the shorter end of the market, at around three to six months.

#### The spirit of the season

Mark Carney, Governor, December 2013.

[www.bankofengland.co.uk/publications/Documents/speeches/2013/speech696.pdf](http://www.bankofengland.co.uk/publications/Documents/speeches/2013/speech696.pdf)

The Governor started by noting that a recovery was gaining pace in the United Kingdom, underpinned by a reduction in extreme uncertainty, significant progress in repairing the core of the financial system and a marked improvement in

household balance sheets. The question was whether such progress was sufficient for a durable, strong and balanced recovery over the medium term.

The Governor considered two possible explanations for why advanced economies could have entered a low-growth phase. First, on the demand side, a persistent liquidity trap, making it difficult for resources to be fully utilised, and second, a persistent deterioration in the supply side such that full utilisation of resources was consistent with slower growth.

The Governor argued that, although the United Kingdom had been in a situation in which conventional monetary policy had not been able to stimulate demand sufficiently to keep economic activity at its potential level, this had not generated a deflationary spiral and there was early evidence that this 'liquidity trap' would be escaped over time.

The Governor also challenged those who maintained that weak potential supply growth would constrain the pace of recovery. While the United Kingdom's experience did not rule out the possibility that supply growth had slowed, the nature of the slowdown, particularly in the labour market, suggested that supply would likely increase with demand for some time.

The risks to supply and the risks associated with the liquidity trap meant that central banks needed to deploy a wide range of policies in a co-ordinated fashion. Forward guidance would continue providing reassurance that monetary policy would not be tightened prematurely. The synergies of combining the monetary and macroprudential authorities in one institution would also be considerable — by addressing risks to financial stability, the Bank's Financial Policy Committee was helping to ensure that monetary policy would remain as stimulative as necessary. The third aspect of the policy response was better financial regulation and supervision — supporting a transparent, resilient global financial system, and the rebalancing of the global economy. Nevertheless, the most important drivers of long-term prosperity would be measures taken by others to increase the growth of supply, particularly those that reinforced an open, global economy.

# Likelihood inference in non-linear term structure models: the importance of the lower bound

**Summary of Working Paper No. 481** Martin Andreasen and Andrew Meldrum

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The yields on government bonds are of interest to monetary policy makers partly because they reflect financial market participants' expectations of future policy rates. As with any asset price, however, they also reflect the additional return — or 'risk premia' — that investors require to compensate them for the uncertainty surrounding future returns on the asset. And yields also play an independent and important role in the transmission mechanism of monetary policy. Central banks therefore make widespread use of models to both forecast yields and to decompose them into expectations of future policy rates and risk premia.

Perhaps the most popular type of model among central bankers, academics and financial market practitioners is the 'affine term structure model' (ATSM), where yields are a linear function of some underlying variables. This makes for tractability. These statistical models of bond yields are consistent with the standard assumption that investors cannot make risk-free arbitrage profits (ie investors cannot make profits by buying and selling different categories of bonds in such a way that the expected return from holding that portfolio is positive). But ATSMs do not impose the restriction that nominal interest rates are subject to a lower bound. This feature of the model is likely to have become more important in recent years given the historically low level of nominal bond yields.

Quadratic term structure models (QTSMs), in contrast, are more general and can be specified to be consistent with a lower bound. They are, however, substantially harder to estimate than ATSMs. This paper demonstrates for the first time that it is possible to use a numerical technique known as

'Particle Markov chain Monte Carlo' to estimate these models. This technique involves the random generation of many different candidate values for the model parameters. Each candidate draw of parameter values depends on the previous draws. Whether the candidate is accepted or rejected depends in part on how well it matches the observed data. This in turn is established using a different simulation technique known as a 'particle filter', which involves simulating many possible scenarios from the model and establishing how likely each scenario is given the observed data. Once we have considered a sufficiently large number of draws, the distribution of possible parameters will cease to change, known as convergence. This way of estimating these models has some desirable features relative to the methods that have been used previously. In particular, the statistical properties of the estimated model parameters can be more accurately established.

We apply the technique to estimate a QTSM using US nominal bond yields for the period 1962–2012. We find that the presence of the zero lower bound on nominal interest rates has important implications when using term structure models to forecast bond yields and short-term policy interest rates. Standard ATSMs imply around a 5%–15% probability of negative policy rates in ten years' time throughout the estimation period. During the recent financial crisis the ATSM implies probabilities of negative policy rates of more than 40% at shorter horizons. The QTSM rules this out by construction. The difference between policy rate forecasts from the two models becomes more important as bond yields approach the lower bound.

# Has weak lending and activity in the United Kingdom been driven by credit supply shocks?

## Summary of Working Paper No. 482 Alina Barnett and Ryland Thomas

The recent financial crisis has focused attention on the importance of credit supply and other financial shocks on the real economy. Prior to the crisis macroeconomists were typically interested in explaining movements in macroeconomic variables in terms of only a small number of aggregate level shocks, such as those from aggregate supply, aggregate demand and monetary policy. As a result the specific role of credit and financial market shocks were implicitly subsumed within one or other of these aggregate macroeconomic shocks. This paper attempts to disentangle the impact of credit market shocks on lending and activity in the UK economy. In particular we address three related questions that have been prompted by the recent financial crisis:

- (i) **Are shocks to the supply of credit more like aggregate demand or supply shocks?** There is a growing literature that suggests shocks to the credit market can have permanent effects on potential supply. In some models that can mean that inflation rises rather than falls in response to a contraction in credit supply and a fall in output. What does the UK evidence suggest?
- (ii) **How does a credit market shock differ from a monetary policy shock?** Both have an observationally equivalent effect on loan rates in the economy, but are they similar enough that monetary policy is able to offset a substantial part of a shock to credit supply. And how easily can we distinguish their separate effects in the data? In particular, do credit supply shocks have an additional quantitative effect via rationing and other non-price terms in addition to an effect operating via loan rates?
- (iii) **What has been the role of credit supply shocks in the recent crisis?** Have credit supply shocks rather than shocks that affect credit demand been the most important factor driving the slowdown of UK bank lending during the financial crisis? And how much of the slowdown in UK activity can we attribute specifically to UK-specific credit shocks and how much to other factors such as global activity and uncertainty?

To address these issues we estimate a structural vector autoregression (SVAR) model for the UK economy over a data set that goes back to the late 1960s. The SVAR approach involves estimating a set of variables where each variable is regressed on past movements of itself and the other variables in the system. The unexplained component of each variable is then decomposed into the impact of different fundamental or 'structural' shocks using a theoretically based set of sign and timing restrictions for the shocks we wish to identify.

In this paper we identify six structural shocks using this SVAR analysis. We use standard sign restrictions on the pattern of reactions on specific variables to identify the three standard macroeconomic

shocks mentioned above that are typically analysed in this framework — aggregate demand, aggregate supply and monetary policy. These shocks are commonly identified as aggregate demand if it moves inflation and GDP in the same direction, whereas an aggregate supply shock moves them in the opposite directions. The sign of the interest rate impact is then used to distinguish between monetary policy shocks and other aggregate demand shocks. Namely, a monetary policy shock leads to output and interest rates moving in an opposite direction whereas other aggregate demand shocks would usually lead to an interest movement in the same direction as output (as monetary policy attempts to offset the impact). We then use an additional set of timing and sign restrictions to identify specific credit and financial market shocks. One of these is identified uniquely as a shock to the supply of credit by banks. The other two are identified as shocks to the corporate bond and equity markets that affect the demand for bank credit for a given level of activity in the economy. So overall we are able to identify a shock to credit supply and a number of shocks that will affect credit demand in the economy. The identified shocks look plausible when we use them to explain the past 50 years of UK economic history.

When we apply this analysis to the crisis we find that:

- **Credit supply shocks look more like aggregate supply than aggregate demand shocks.** Credit supply shocks that lower bank borrowing and output appear, if anything, to have a positive effect on inflation. Our analysis suggests that some of this may reflect an effect of credit supply shocks on the exchange rate as well as an effect on potential supply. This could reflect the importance of financial services in UK trade. That means that credit supply shocks are also significantly different to monetary policy shocks which push output and inflation in the same direction for a given impact on interest rates in the economy.
- **Credit supply shocks look to have an important quantitative dimension.** When compared to a monetary policy shock that has an equivalent effect on loan rates, the quantity of credit appears to move almost (three) times as much.
- **Credit supply shocks can account for most of the rise in credit spreads and most of the slowdown in bank lending over the crisis.** Shocks affecting credit demand only appear to be marginally important in 2010 and 2011.
- **Credit supply shocks can account for up to a half of the fall in UK GDP relative to its pre-crisis trend.** Other shocks to aggregate demand and supply appear to have also played an important role in driving weak demand. Monetary policy (both through interest rates and quantitative easing) appear to have had a significant role in offsetting these shocks.

# Risk news shocks and the business cycle

## Summary of Working Paper No. 483 Gabor Pinter, Konstantinos Theodoridis and Tony Yates

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How does uncertainty affect the financial system and the aggregate behaviour of the economy? Recent events have led to increasing attention to the question of how uncertainty might shape the depth and duration of financial and economic crises. In addition, macroeconomists have emphasised the role of shocks originated in the financial system in driving macroeconomic fluctuations. This paper develops a multivariate statistical model as well as a theoretical framework to show that uncertainty related to financial markets has played a considerable role in explaining the past 30 years of US business cycles.

In our model, a financial disturbance is defined as an exogenous process that drives the dispersion of returns on investment. As these forces govern the state of investment risk in the economy, we refer to these perturbations as 'risk shocks'. Moreover, we distinguish between contemporaneous (unanticipated) and news-type (anticipated) components of these exogenous processes. By doing so, we build on recent academic papers which suggest that most of the economic effects of financial shocks occur as economic agents respond to advance information, 'news', about the future realisation of these processes. Some of these papers find that the overall effects of these disturbances to financial markets account for about 60% of output fluctuations in the United States.

The empirical part of our paper develops a multivariate statistical model which we use to identify risk and risk news shocks in the data. This allows us to quantify and distinguish the partial impact of risk and risk news shock from that of other, more standard, macroeconomic shocks such as monetary policy, supply and demand shocks.

Our empirical results suggest that the combined effects of risk and risk news shocks explain approximately 20% of US output fluctuations over the 1980–2010 period. This is a more modest effect than that found in previous studies. Nevertheless, we find that these types of financial disturbances have a large impact on the federal funds rate, suggesting that revelations about future uncertainty induce a vigorous and

protracted response of the US monetary policy authority. With central bank rates pinned at their zero lower bound for some time now in the United States, United Kingdom and Japan, our results would suggest that risk news shocks may have impacted on the real economy more recently, and could in the future, until such time as conditions allow the central bank to raise rates to more normal levels.

The theoretical part of this study then develops a relatively standard quantitative 'dynamic stochastic general equilibrium' (DSGE) model. Models of this type capture the evolving and interconnected dynamics of the entire economy, allowing for the presence of random ('stochastic') shocks. The model is made realistic by the presence of various nominal and real frictions. These include the assumption that a fraction of households are 'non-Ricardian', meaning that they do not base their decisions on their expectations about future income, as they do not have access to financial markets and their consumption is a function of their current (rather than future) disposable income. In addition, our model features a form of 'financial accelerator' mechanism stemming from the riskiness of business loans in the model, as the returns on projects are subject to idiosyncratic (ie firm-specific) shocks. We refer to the distribution of these idiosyncratic shocks as risk shocks, reflecting on the underlying investment risk in our model economy. A sufficiently adverse draw from this distribution can make a particular borrowing firm insolvent, which causes lenders to charge an *ex ante* higher interest rate compared to the risk-free rate. This premium moves countercyclically with business equity (borrower's net worth) and procyclically with investment risk.

The estimated version of our theoretical model reveals that in order to match the quantitative responses of risk shocks implied by our statistical analysis, the degree of real rigidities in the model such as the fraction of non-Ricardian households must be remarkably high. From this, we conclude that there is still more work to be done in order to improve the endogenous propagation of financial shocks in DSGE models.

# GDP-linked bonds and sovereign default

## Summary of Working Paper No. 484 David Barr, Oliver Bush and Alex Pienkowski

This paper investigates the conditions under which GDP-linked bonds help to protect governments (or 'sovereigns') from unexpected poor growth outturns that might otherwise push them into a debt crisis. This is because the return on these bonds varies in proportion to the country's GDP — when growth is weak, the debt-servicing cost and repayment amount automatically declines; and when growth is strong, the return on the bond increases. This helps to stabilise a sovereign's debt to GDP ratio and makes it less likely that a deep recession will trigger a debt crisis and cause a default. GDP-linked bonds, therefore, can be viewed as a form of 'recession insurance' for sovereigns. While all countries might experience some benefit from the use of GDP-linked debt, economies with higher GDP growth volatility (such as emerging market economies) or countries where monetary policy is constrained (such as those in a monetary union) are likely to benefit most.

We use a calibrated model of sovereign default based on work by International Monetary Fund authors, which delivers a calculation of the maximum level of debt that a sovereign is likely to be able to sustain before it risks facing a crisis. This model is estimated for a 'representative' sovereign in two scenarios — (i) when all debt is issued as conventional bonds; and (ii) when all debt is in the form of GDP-linked bonds.

Given the simplicity of the model, these debt thresholds should not be interpreted as hard limits. In fact, historical experience suggests that many countries can exceed these levels without facing repayment problems. Instead, the focus of this paper is to consider how GDP-linked bonds can help to reduce the risks to a sovereign within this simple framework. This implies more attention should be focused on the amount GDP-linked bonds can potentially increase debt limits, rather than the absolute value of the debt limits themselves. Under the simplest model set-up we find that GDP-linked bonds have a substantial impact on a sovereign's debt limit — raising it by around 100% of GDP.

This analysis abstracts from a number of important considerations, so the baseline model is then made more

realistic with two innovations. First, investors are now assumed to be risk-averse and require an additional premium to hold risky assets. This means that when the return on the asset is uncertain — either due to a risk of payment default, or in the case of GDP-linked bonds, because future growth outturns are uncertain — investors will charge a higher interest rate on debt. Second, it is assumed that when a sovereign changes its fiscal policy stance in order to try and stabilise debt, this has an impact on growth. For instance, when a sovereign increases its primary balance this will drag down on GDP growth. When these two modifications are included in the model, the additional 'fiscal space' derived from the introduction of GDP-linked bonds is around 45% of GDP.

The final section of analysis considers the welfare implications of issuing GDP-linked bonds. Sovereign defaults have the potential to damage the domestic economy significantly, so reducing the incidence of this will improve welfare. A stable and predictable fiscal policy is also desirable, as taxpayers are not faced with unexpected and erratic changes in tax. GDP-linked bonds help both to reduce the incidence of sovereign default and to stabilise fiscal policy. But on average taxpayers will have to pay higher interest payments on GDP-linked bonds (at least at low and moderate debt levels) compared to conventional bonds, which will lower taxpayer welfare. On balance, however, we conclude that GDP-linked bonds may provide a substantial net benefit in welfare terms — in our calibration this is equivalent to consumption equal to between 1% and 9% of GDP in perpetuity.

In summary, GDP-linked bonds have the potential to reduce the incidence of costly sovereign default and allow fiscal policy to be more stable and predictable. The welfare gains from this outweigh any additional costs associated with issuing such debt, especially for sovereigns with volatile GDP. GDP-linked bonds also have the potential to improve the functioning of the international monetary and financial system, by encouraging greater country self-insurance, and reducing the reliance on large-scale official sector support programmes to resolve crises.

# Identifying channels of credit substitution when bank capital requirements are varied

**Summary of Working Paper No. 485** Shekhar Aiyar, Charles W Calomiris and Tomasz Wieladek

One goal of macroprudential policy is to limit systemic risk by raising capital requirements in response to lending-fueled booms, whether at an economy-wide or sectoral level, so that banks will be able to weather adverse shocks from a sudden change in market conditions. The raising of capital requirements has two effects on financial resilience. First, it improves the capital position of banks. Second, to the extent that the capital requirement increase reduces the aggregate supply of credit, it may prevent credit-driven asset bubbles from forming in the first place. Given that a central channel of macroprudential regulation is the use of capital ratio requirements to control the aggregate supply of credit as a means of limiting systemic risk and maintaining financial resilience, policymakers need to gauge the extent to which changes in requirements on regulated banks affect the aggregate supply of credit. The two challenges in this task are identifying the effects of capital requirement changes on regulated banks and measuring the size of 'leakages' — the extent to which non-regulated forms of credit offset changes in the supply of credit from regulated institutions. This study explores the latter.

The size and nature of potential leakages, however, remains uncertain. In particular, leakages can occur through at least three different channels. First, a foreign-based banking group may operate both a foreign subsidiary, which is subject to UK capital regulation, and an affiliated foreign branch, which is subject to capital regulation in its home country. In that case, raising the capital requirement on the subsidiary may simply produce a shift of assets from the subsidiary to the branch. Second, interbank competition between domestically regulated banking enterprises and foreign branches operating in the same sectors of the economy can lead to credit substitution between the former and the latter. Finally, it is also possible that leakage occurs outside the banking system. Firms that experience reductions in bank credit may seek funding from capital markets.

The United Kingdom during the period 1998–2007 provides a unique environment for addressing highly policy-relevant questions about the nature of leakages as a result of changes in bank minimum capital requirements. The UK regulators set bank-specific capital requirements on the basis of perceived operational and market risks. Cross-sectional differences in capital requirements were large, and changes in bank-specific capital requirements were frequent. This paper focuses on identifying and comparing the relative strength of different channels of credit substitution in response to changes in banks' minimum capital requirements. We expect the substitutability of credit supply between regulated subsidiaries and affiliated branches to be

greater than between regulated subsidiaries and unaffiliated branches, for several reasons. First, the affiliated branch has a stronger incentive to lend than an unaffiliated branch because it may be able to preserve a valuable lending relationship with relatively little effort on the part of loan officers. Second, the affiliated branch may be able to originate the loan at low transacting cost, by simply transferring the asset from one balance sheet to another. Finally, affiliated branch lenders would enjoy an information advantage about the impending change in regulatory policy toward the affiliated subsidiary. Changes in subsidiary capital requirements were not a matter of public information over our sample period. The affiliated branch would be privy to knowledge of the regulatory policy change affecting its affiliated subsidiary, and that information likely would be shared with the affiliated branch several weeks or months in advance of the change in the requirement.

Our results are consistent with these predictions. 'Leakage' between affiliated branches and subsidiaries is roughly twice as large as 'leakage' that arises as a result of interbank competition between UK-regulated entities and unaffiliated foreign branches competing in the same sectors of the economy. A simple calculation suggests both types of leakages together could offset aggregate changes in credit, following changes in capital requirements, by roughly 43.1%. But we do not find evidence for a reaction of securities issuance in response to changes in capital requirements. Regulators are of course aware of this problem. In particular, they have pledged to find ways to co-operate internationally to co-ordinate capital requirement policies in the interest of minimising leakage. Basel III contemplates a reciprocity arrangement whereby foreign regulators of branches located abroad will match changes in the host country's capital requirement over the cycle for this purpose.

In summary, our findings have significant implications for economic policy. They suggest that co-ordination among national regulators is important in ensuring that changes in capital requirements have the desired impact on a country's banking system. Current regulatory initiatives, such as Basel III and the European CRD IV directive, already attempt to address the problem of 'leakage' from foreign branches through a provision for international reciprocity. When the capital requirement in one country is raised, capital requirements on foreign branches operating in that country will be raised correspondingly by their home country regulator. By identifying and quantifying leakages from foreign branches, this paper validates the importance of the reciprocity component of the new regulatory framework.



# The impact of capital requirements on bank lending

**Summary of Working Paper No. 486** Jonathan Bridges, David Gregory, Mette Nielsen, Silvia Pezzini, Amar Radia and Marco Spaltro

This paper investigates the effect of changes in regulatory capital requirements on bank capital and lending to UK households and firms. It is an empirical study drawing on a new bank-by-bank data set, exploiting variation in individual bank capital requirements in the United Kingdom between 1990 and 2011. There are two key results. First, regulatory requirements impact bank capital ratios; banks typically rebuild the 'buffer' in their capital ratios above the regulatory minimum following an increase in that minimum requirement.<sup>(1)</sup> Second, changes in regulatory capital requirements affect bank lending. Results vary across sectors, but in response to an increase in capital requirements, loan growth typically falls in the year following the regulatory change and recovers within three years.

Empirical evidence on the link between regulatory capital requirements and bank lending is also of interest to policymakers. The financial crisis has led to support for the use of capital requirements as a tool to mitigate risks in the financial system. In the United Kingdom, the Financial Policy Committee (FPC) is responsible for setting time-varying capital requirements on sectoral lending.

The effect of such capital requirements might differ from the effect of microprudential policy. As a result, the results from our study cannot be directly mapped across to how changing capital requirements are likely to affect bank capital and lending in a macroprudential framework; but they provide a useful guide to how banks have adjusted their capital ratios and lending structure on average in response to past microprudential supervisory actions. For example, banks might take a different approach to restoring capital buffers when other banks are subject to the same policy change and measures are public; expectations of forthcoming policy changes might lead to earlier reactions by banks; and there might be a different degree of 'leakages' where entities not domestically regulated step in with new lending. Also, during the transition to higher global regulatory standards, increasing capital requirements might augment rather than reduce lending for initially undercapitalised banks if confidence effects boost their resilience and capacity to lend. Furthermore, macroprudential regulators are often required to consider the wider implications of changing capital requirements, which could include any adverse impact on lending — for example, while the FPC's primary objective is to protect and enhance the resilience of the UK financial system, it also has a secondary objective to support the economic policy of the Government.

This paper uses a rich new data set constructed at the bank group level. It matches high-quality lending data with supervisory data on bank capital and capital requirements. Supervisory data include confidential bank-specific and time-varying capital requirements set by the Bank of England and the Financial Services Authority (FSA) in the United Kingdom between 1990 and 2011, which allow us to

estimate directly the relationship between changes in capital requirements and individual bank lending behaviour. Lending data are adjusted to give a unique measure of true lending flows, rather than relying on changes in stock positions as a proxy; and we analyse lending responses at the sectoral level, such that both credit supply and demand conditions are allowed to vary across different sectors of the economy.

The bank-by-bank data set is exploited using two sets of panel regressions. First, we regress the actual capital ratio held by each bank on that bank's regulatory minimum capital ratio. That allows an assessment of whether regulatory requirements affect the capital banks hold. Second, the loan growth of each bank to different parts of the economy is regressed on that bank's individual regulatory requirement and on its actual capital ratio. By estimating these two equations, both the direct impact of a change in capital requirements on lending and any indirect impact via the response of bank capital can be taken into account when plotting the response of bank lending over time.

These regressions suggest that changes in regulatory capital requirements did impact bank behaviour over the sample period. First, we find that changes in regulatory requirements typically lead to a change in actual capital ratios — in response to an increase in the minimum ratio, banks tend to gradually rebuild the buffers that they initially held above the regulatory minimum. Second, capital requirements affect lending with different responses in different sectors of the economy — in the year following an increase, banks tend to cut (in descending order) lending to commercial real estate, to other corporates and household secured lending. The response of unsecured household lending is close to zero over the first year as a whole. Loan growth mostly recovers within three years. Finally, preliminary analysis suggests that banks' responses vary depending on bank size, capital buffers held, the business cycle, and the direction of the change in capital requirements.

These findings contribute to the debate on whether the Modigliani-Miller propositions hold (ie whether changes in the composition of a bank's liabilities affect the bank's overall cost of funds and credit supply), in which case changing banks' capital requirements would not affect lending. In practice, the empirical literature has identified a range of frictions (with taxation of debt versus equity being frequently mentioned) such that the debt/capital structure of banks may not be neutral for credit supply. Our paper confirms that regulatory requirements tend to affect capital ratios permanently and credit supply temporarily.

(1) A bank's capital ratio is given by total regulatory capital as a proportion of total risk-weighted assets. A bank's capital 'buffer' is given by the actual capital ratio minus that bank's minimum required capital ratio, as determined by the regulator.



# Appendices



## Contents of recent Quarterly Bulletins

The articles that have been published recently in the *Quarterly Bulletin* are listed below. Articles from December 1960 to Winter 2003 are available on the Bank's website at:

[www.bankofengland.co.uk/archive/Pages/digitalcontent/historicpubs/quarterlybulletins.aspx](http://www.bankofengland.co.uk/archive/Pages/digitalcontent/historicpubs/quarterlybulletins.aspx).

Articles from Spring 2004 onwards are available at:

[www.bankofengland.co.uk/publications/Pages/quarterlybulletin/default.aspx](http://www.bankofengland.co.uk/publications/Pages/quarterlybulletin/default.aspx).

### Articles

#### 2009 Q4

- The financial position of British households: evidence from the 2009 NMG survey
- Accounting for the stability of the UK terms of trade
- Recent developments in pay settlements

#### 2010 Q1

- Interpreting equity price movements since the start of the financial crisis
- The Bank's balance sheet during the crisis
- Changes in output, employment and wages during recessions in the United Kingdom
- Monetary Policy Roundtable

#### 2010 Q2

- Collateral risk management at the Bank of England
- The impact of the financial crisis on supply
- Public attitudes to inflation and monetary policy
- A review of the work of the London Foreign Exchange Joint Standing Committee in 2009

#### 2010 Q3

- Understanding the price of new lending to households
- Interpreting the world trade collapse
- What can we learn from surveys of business expectations?
- Residential property auction prices
- Chief Economists' Workshop: state-of-the-art modelling for central banks
- Monetary Policy Roundtable

#### 2010 Q4

- The history of the *Quarterly Bulletin*
- Index of articles 1960–2010
- The UK recession in context — what do three centuries of data tell us?
- The Bank's money market framework
- Managing the circulation of banknotes

- Understanding the weakness of bank lending
- Evolution of the UK banking system
- The financial position of British households: evidence from the 2010 NMG Consulting survey
- The foreign exchange and over-the-counter interest rate derivatives markets in the United Kingdom
- Global finance after the crisis

#### 2011 Q1

- Understanding the recent weakness in broad money growth
- Understanding labour force participation in the United Kingdom
- Global imbalances: the perspective of the Bank of England
- China's changing growth pattern
- Monetary Policy Roundtable

#### 2011 Q2

- Assessing the risk to inflation from inflation expectations
- International evidence on inflation expectations during Sustained Off-Target Inflation episodes
- Public attitudes to monetary policy and satisfaction with the Bank
- The use of foreign exchange markets by non-banks
- Housing equity withdrawal since the financial crisis
- Using internet search data as economic indicators
- A review of the work of the London Foreign Exchange Joint Standing Committee in 2010

#### 2011 Q3

- The United Kingdom's quantitative easing policy: design, operation and impact
- Bank resolution and safeguarding the creditors left behind
- Developments in the global securities lending market
- Measuring financial sector output and its contribution to UK GDP
- The Money Market Liaison Group Sterling Money Market Survey
- Monetary Policy Roundtable

#### 2011 Q4

- Understanding recent developments in UK external trade
- The financial position of British households: evidence from the 2011 NMG Consulting survey
- Going public: UK companies' use of capital markets
- Trading models and liquidity provision in OTC derivatives markets

#### 2012 Q1

- What might be driving the need to rebalance in the United Kingdom?
- Agents' Special Surveys since the start of the financial crisis

- What can the oil futures curve tell us about the outlook for oil prices?
- Quantitative easing and other unconventional monetary policies: Bank of England conference summary
- The Bank of England's Special Liquidity Scheme
- Monetary Policy Roundtable

### 2012 Q2

- How has the risk to inflation from inflation expectations evolved?
- Public attitudes to monetary policy and satisfaction with the Bank
- Using changes in auction maturity sectors to help identify the impact of QE on gilt yields
- UK labour productivity since the onset of the crisis — an international and historical perspective
- Considering the continuity of payments for customers in a bank's recovery or resolution
- A review of the work of the London Foreign Exchange Joint Standing Committee in 2011

### 2012 Q3

- RAMSI: a top-down stress-testing model developed at the Bank of England
- What accounts for the fall in UK ten-year government bond yields?
- Option-implied probability distributions for future inflation
- The Bank of England's Real-Time Gross Settlement infrastructure
- The distributional effects of asset purchases
- Monetary Policy Roundtable

### 2012 Q4

- The Funding for Lending Scheme
- What can the money data tell us about the impact of QE?
- Influences on household spending: evidence from the 2012 NMG Consulting survey
- The role of designated market makers in the new trading landscape
- The Prudential Regulation Authority

### 2013 Q1

- Changes to the Bank of England
- The profile of cash transfers between the Asset Purchase Facility and Her Majesty's Treasury
- Private equity and financial stability
- Commercial property and financial stability
- The Agents' company visit scores
- The Bank of England *Bank Liabilities Survey*
- Monetary Policy Roundtable

### 2013 Q2

- Macroeconomic uncertainty: what is it, how can we measure it and why does it matter?

- Do inflation expectations currently pose a risk to the economy?
- Public attitudes to monetary policy
- Cross-border bank credit and global financial stability
- The Old Lady of Threadneedle Street
- Central counterparties: what are they, why do they matter and how does the Bank supervise them?
- A review of the work of the London Foreign Exchange Joint Standing Committee in 2012

### 2013 Q3

- Macroprudential policy at the Bank of England
- Bank capital and liquidity
- The rationale for the prudential regulation and supervision of insurers
- Recent developments in the sterling overnight money market
- Nowcasting world GDP and trade using global indicators
- The Natural Rate Hypothesis: an idea past its sell-by date
- Monetary Policy Roundtable

### 2013 Q4

- SME forbearance and its implications for monetary and financial stability
- Bringing down the Great Wall? Global implications of capital account liberalisation in China
- Banknotes, local currencies and central bank objectives
- Banks' disclosure and financial stability
- Understanding the MPC's forecast performance since mid-2010
- The financial position of British households: evidence from the 2013 NMG Consulting survey
- What can company data tell us about financing and investment decisions?
- Tiering in CHAPS
- The foreign exchange and over-the-counter interest rate derivatives market in the United Kingdom
- Qualitative easing: a new tool for the stabilisation of financial markets

### 2014 Q1

- Money in the modern economy: an introduction
- Money creation in the modern economy
- The Court of the Bank of England
- Dealing with a banking crisis: what lessons can be learned from Japan's experience?
- The role of business model analysis in the supervision of insurers
- Nowcasting UK GDP growth
- Curiosities from the vaults: a Bank miscellany
- Monetary Policy Roundtable

## Bank of England publications

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[www.bankofengland.co.uk/publications/Pages/default.aspx](http://www.bankofengland.co.uk/publications/Pages/default.aspx).

### Working papers

An up-to-date list of working papers is maintained on the Bank of England's website at:

[www.bankofengland.co.uk/research/Pages/workingpapers/default.aspx](http://www.bankofengland.co.uk/research/Pages/workingpapers/default.aspx)

where abstracts of all papers may be found. Papers published since January 1997 are available in full, in portable document format (PDF).

**No. 474** Not all capital waves are alike: a sector-level examination of surges in FDI inflows (June 2013)  
*Dennis Reinhardt and Salvatore Dell'Erba*

**No. 475** Policy multipliers under an interest rate peg of deterministic versus stochastic duration (June 2013)  
*Charles T Carlstrom, Timothy S Fuerst and Matthias Paustian*

**No. 476** Oil shocks and the UK economy: the changing nature of shocks and impact over time (August 2013)  
*Stephen Millard and Tamarah Shakir*

**No. 477** Non-uniform wage-staggering: European evidence and monetary policy implications (August 2013)  
*Michel Juillard, Hervé Le Bihan and Stephen Millard*

**No. 478** Capital over the business cycle: renting versus ownership (August 2013)  
*Peter N Gal and Gabor Pinter*

**No. 479** Financial factors and the international transmission mechanism (August 2013)  
*Abigail Haddow and Mariya Mileva*

**No. 480** Central counterparties and the topology of clearing networks (August 2013)  
*Marco Galbiati and Kimmo Soramäki*

**No. 481** Likelihood inference in non-linear term structure models: the importance of the lower bound (December 2013)  
*Martin Andreasen and Andrew Meldrum*

**No. 482** Has weak lending and activity in the United Kingdom been driven by credit supply shocks? (December 2013)  
*Alina Barnett and Ryland Thomas*

**No. 483** Risk news shocks and the business cycle (December 2013)  
*Gabor Pinter, Konstantinos Theodoridis and Tony Yates*

**No. 484** GDP-linked bonds and sovereign default (January 2014)  
*David Barr, Oliver Bush and Alex Pienkowski*

**No. 485** Identifying channels of credit substitution when bank capital requirements are varied (January 2014)  
*Shekhar Aiyar, Charles W Calomiris and Tomasz Wieladek*

**No. 486** The impact of capital requirements on bank lending (January 2014)  
*Jonathan Bridges, David Gregory, Mette Nielsen, Silvia Pezzini, Amar Radia and Marco Spaltro*

### External MPC Unit discussion papers

The MPC Unit discussion paper series reports on research carried out by, or under supervision of, the external members of the Monetary Policy Committee. Papers are available from the Bank's website at:

[www.bankofengland.co.uk/research/Pages/externalmpcpapers/default.aspx](http://www.bankofengland.co.uk/research/Pages/externalmpcpapers/default.aspx).

The following papers have been published recently:

**No. 40** Is the 'Great Recession' really so different from the past? (June 2013)  
*Adrian Chiu and Tomasz Wieladek*

**No. 41** The relevance or otherwise of the central bank's balance sheet (January 2014)  
*David Miles and Jochen Schanz*

### Monetary and Financial Statistics

*Monetary and Financial Statistics (Bankstats)* contains detailed information on money and lending, monetary and financial institutions' balance sheets, banks' income and expenditure, analyses of bank deposits and lending, external business of banks, public sector debt, money markets, issues of securities, financial derivatives, interest and exchange rates, explanatory notes to tables and occasional related articles.

*Bankstats* is published on a monthly basis, free of charge, on the Bank's website at:

[www.bankofengland.co.uk/statistics/Pages/bankstats/default.aspx](http://www.bankofengland.co.uk/statistics/Pages/bankstats/default.aspx).

Further details are available from: Leslie Lambert, Statistics and Regulatory Data Division, Bank of England: telephone 020 7601 4544; fax 020 7601 5395; email [leslie.lambert@bankofengland.co.uk](mailto:leslie.lambert@bankofengland.co.uk).

Articles that have been published in recent issues of *Monetary and Financial Statistics* can also be found on the Bank's website at:

[www.bankofengland.co.uk/statistics/Pages/ms/articles.aspx](http://www.bankofengland.co.uk/statistics/Pages/ms/articles.aspx).

## Financial Stability Report

The *Financial Stability Report* is published twice a year under the guidance of the Financial Policy Committee (FPC). It covers the Committee's assessment of the outlook for the stability and resilience of the financial sector at the time of preparation of the *Report*, and the policy actions it advises to reduce and mitigate risks to stability. The Bank of England intends this publication to be read by those who are responsible for, or have interest in, maintaining and promoting financial stability at a national or international level. It is of especial interest to policymakers in the United Kingdom and abroad; international financial institutions; academics; journalists; market infrastructure providers; and financial market participants. The *Financial Stability Report* is available at:

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## Payment Systems Oversight Report

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## Handbooks in central banking

The series of *Handbooks in central banking* provide concise, balanced and accessible overviews of key central banking topics. The *Handbooks* have been developed from study materials, research and training carried out by the Bank's Centre for Central Banking Studies (CCBS). The *Handbooks* are therefore targeted primarily at central bankers, but are likely to be of interest to all those interested in the various technical and analytical aspects of central banking. The *Handbook* series also includes '*Technical Handbooks*' which are aimed more at specialist readers and often contain more methodological material than the *Handbooks*, incorporating the experiences and expertise of the author(s) on topics that address the problems encountered by central bankers in their day-to-day work. All the *Handbooks* are available via the Bank's website at:

[www.bankofengland.co.uk/education/Pages/ccbs/handbooks/default.aspx](http://www.bankofengland.co.uk/education/Pages/ccbs/handbooks/default.aspx).

## The framework for the Bank of England's operations in the sterling money markets (the 'Red Book')

The 'Red Book' describes the Bank of England's framework for its operations in the sterling money markets, which is designed to implement the interest rate decisions of the Monetary Policy Committee while meeting the liquidity needs, and so contributing to the stability of, the banking system as a whole. It also sets out the Bank's specific objectives for the framework, and how it delivers those objectives. The framework was introduced in May 2006. The 'Red Book' is available at:

[www.bankofengland.co.uk/markets/Documents/money/publications/redbook.pdf](http://www.bankofengland.co.uk/markets/Documents/money/publications/redbook.pdf).

## Cost-benefit analysis of monetary and financial statistics

The handbook describes a cost-benefit analysis (CBA) framework that has been developed within the Bank to ensure a fair balance between the benefits derived from good-quality statistics and the costs that are borne by reporting banks. Although CBA is a well-established approach in other contexts, it has not often been applied to statistical provision, so techniques have had to be adapted for application to the Bank's monetary and financial statistics. The handbook also

discusses how the application of CBA has enabled cuts in both the amount and the complexity of information that is required from reporting banks.

[www.bankofengland.co.uk/statistics/Pages/about/cba.aspx](http://www.bankofengland.co.uk/statistics/Pages/about/cba.aspx).

## Credit Conditions Survey

As part of its mission to maintain monetary stability and financial stability, the Bank needs to understand trends and developments in credit conditions. This survey for bank and non-bank lenders is an input to this work. Lenders are asked about the past three months and the coming three months. The survey covers secured and unsecured lending to households and small businesses; and lending to non-financial corporations, and to non-bank financial firms. Copies are available on the Bank's website at:

[www.bankofengland.co.uk/publications/Pages/other/monetary/creditconditions.aspx](http://www.bankofengland.co.uk/publications/Pages/other/monetary/creditconditions.aspx).

## Trends in Lending

This quarterly publication presents the Bank of England's assessment of the latest trends in lending to the UK economy. The report draws mainly on long-established official data sources, such as the existing monetary and financial statistics collected by the Bank of England. These data have been supplemented by the results of a new collection, established by the Bank in late 2008, to provide more timely data covering aspects of lending to the UK corporate and household sectors. The report also draws on intelligence gathered by the Bank's network of Agents and from market contacts, as well as the results of other surveys. Copies are available on the Bank's website at:

[www.bankofengland.co.uk/publications/Pages/other/monetary/trendsinlending.aspx](http://www.bankofengland.co.uk/publications/Pages/other/monetary/trendsinlending.aspx).

## Quarterly Bulletin

The *Quarterly Bulletin* explores topical issues relating to the Bank's core purposes of monetary and financial stability. Some articles present analysis on current economic and financial issues, and policy implications. Other articles enhance the Bank's public accountability by explaining the institutional structure of the Bank and the various policy instruments that are used to meet its objectives. The *Quarterly Bulletin* is available at:

[www.bankofengland.co.uk/publications/Pages/quarterlybulletin/default.aspx](http://www.bankofengland.co.uk/publications/Pages/quarterlybulletin/default.aspx).

## Inflation Report

The Bank's quarterly *Inflation Report* sets out the detailed economic analysis and inflation projections on which the Bank's Monetary Policy Committee bases its interest rate decisions, and presents an assessment of the prospects for UK inflation. The *Inflation Report* is available at:

[www.bankofengland.co.uk/publications/Pages/inflationreport/default.aspx](http://www.bankofengland.co.uk/publications/Pages/inflationreport/default.aspx).

The *Report* starts with an overview of economic developments; this is followed by five sections:

- analysis of money and asset prices;
- analysis of demand;
- analysis of output and supply;
- analysis of costs and prices; and
- assessment of the medium-term inflation prospects and risks.

## Publication dates

Publication dates for 2014 are as follows:

<i>Quarterly Bulletin</i>	<i>Inflation Report</i>
Q1 14 March	February 12 February
Q2 16 June	May 14 May
Q3 16 September	August 13 August
Q4 11 December	November 12 November





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