



BANK OF ENGLAND

Speech

The notes in your wallet

Speech given by

Chris Salmon, Executive Director for Banking Services and Chief Cashier, Bank of England

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I would like to thank Victoria Cleland, Mona Naqvi, Roy Whymark and Kevin Wills for their contributions and am grateful for helpful comments from other colleagues.

I am grateful to you for inviting me to speak this morning.

Plymouth is a fitting location to discuss the changing nature of banknotes. Since 2000, Charles Darwin has appeared on the ten pound note and it was from Plymouth Sound that a young Darwin set sail on the HMS Beagle in 1831. The evidence that Darwin collected during his voyage laid the foundation for his celebrated theory of evolution by natural selection.

Outside the natural world, we now observe “evolution” in everything from culture to technology. It is the evolution of technology on which I intend to focus today, since it has provided both opportunities and challenges for the Bank of England, and our international central bank colleagues, in managing the issuance of banknotes.

The Bank’s key objective in issuing banknotes is to maintain public confidence in the currency. To do this, we need to meet two goals. First, we need to ensure that the public are able to access our banknotes in the quantities and denominations they require – no trivial task when there are three billion notes in circulation with a total value of over £55 billion. Second, we need to ensure that the public has confidence in the integrity of our banknotes. To achieve this, we need to ensure that our notes are secure - easy to authenticate and technically difficult to copy. Technological change over the past four decades has profoundly impacted how we achieve both of these goals.

Cash in the economy

One of the most notable of these impacts for our generation is that technological change has made cash a more convenient means of payment. You have to be slightly, but not that much, older than me to remember when access to cash was constrained to bank branch opening times. But from a standing start forty years ago, around three-quarters of the public’s cash is now acquired via ATMs.¹ Over the same period note-accepting machines have broadened their scope – no longer being relegated to the confines of car parks and train stations. There are now, for example, more than 30,000 self-service checkouts² in supermarkets which accept and dispense cash.

Another obvious development is the emergence of alternative payments mechanisms. From debit cards in the 1990s to more recent innovations such as contactless cards or (coming soon to the UK) the ability to make and receive payments using mobile phone numbers, more and more alternatives to payments by cash have become available.

And these alternative methods have unsurprisingly had an impact on the use of cash as a means of payment. While cash accounted for 71% of all payments in the UK just a decade ago, this declined to 54%

¹ Source: Payments Council.

² Source: Payments Council.

last year.³ Because of the migration of higher value payments to plastic cards, the average cash transaction value has also decreased.⁴

The Bank does not set a target for the value of notes issued: our aim is simply to satisfy the public's demand for notes. And in that sense we are sanguine about the impact of technology upon the use of cash. But technological change can and does raise new challenges for the Bank as it seeks to fulfil its note issuing responsibilities.

Cash still circulates through the UK according to a traditional wholesale model which, in simplified form, involves individuals taking cash out of an ATM and spending it at a shop. The shop then returns the note to a bank and the bank deposits it to the wholesale system where note sorting machines verify authenticity and sort for quality (including looking for tears, holes, and tape). In recent years, technological innovation - for example, high-specification note sorters which process around 30 notes per second - has greatly increased the efficiency of this system.

One major challenge for the Bank is to understand how innovation is affecting this traditional model, so that we can anticipate and offset any unintended adverse consequences. To illustrate this let me give two examples: one where we failed to anticipate an adverse effect and a second where (hopefully) we are making an early intervention to avoid unintended consequences.

The first example centres on 'tatty fivers'. One major contributor to the tatty fivers problem was the rapid growth of ATMs. As they became the dominant channel through which new notes entered circulation, ATMs' dispense patterns began to materially influence the mix of denominations circulating in the UK. During the first decade of the 21st century, the vast majority of ATMs dispensed only £10 and £20 notes, helping to lead to a gradual erosion of £5 availability. And as fivers became more scarce, retailers tended to hold on to them rather than return them to wholesale cash handlers for quality sorting. On average it took longer before the average £5 returned to the wholesale system, and notes which would normally have been withdrawn on quality grounds remained in circulation.

This is a classic example of an unintended consequence. Once we became aware of the issue the Bank had to react. In 2007, the Governor publically committed the Bank to working with the banks to solve this problem,⁵ and in 2010, following a successful pilot with HSBC, the ATM operators agreed a target to boost their £5 ATM dispense. That target was exceeded last year and nearly ten times as many £5 notes are now dispensed from ATMs than before the summer of 2010.⁶ The indications are that as the availability of new fivers has picked up, they have been held on to for less time, and returned more frequently to the wholesale cash system. As a consequence, the incidence of tatty fivers has declined.

³ Source: Payments Council.

⁴ Source: British Retail Consortium.

⁵ Source: Speech by Sir Mervyn King at the Lord Mayor's banquet at Mansion House, 20 June 2007.

⁶ Source: News Release – Bank of England announces success in its initiative to increase the availability of quality £5s, 26 April 2012.

The second example centres on the impact of innovation on how our banknotes are checked. Until very recently virtually all cash circulated through the UK according to the traditional wholesale model mentioned earlier. Increasingly, however, retailers and ATM operators are considering the merits of using a local recycling model where they refill their ATMs or self-checkout tills themselves, using the notes that they received at the till rather than returning those notes to the wholesale system.

The potential benefits of this model, for example a reduction in the cost of transporting cash, have led a number of key players to move towards local recycling. But local recycling also implies that each note will be authenticated by the wholesale cash industry less frequently – weakening one of the pillars which supports the safety of our cash. Over the past two years we have been working in collaboration with Payments Council and key stakeholders in the cash industry to introduce a Code of Conduct for local recycling. Following consultation with the industry the Code will be introduced this summer. Our intention is to ensure that those businesses that self-fill their ATMs or self-service checkouts will authenticate their banknotes to the same high standards as those employed in the wholesale cash industry.

The second challenge we face is in correctly anticipating trends in the demand for cash in a period of rapid technological change. Just like any other business, we need to make assumptions about the demand for our product – banknotes – when investing in the infrastructure that defines our long-term supply capability: the contracts which underpin banknote production and the storage capacity that we build. And when making these long-term decisions we need to balance the risk of not having enough new notes to meet the public's demand for cash against the desirability of avoiding expenditure that proves not to have been needed.

One of the current puzzles in the cash world is that, despite the emergence of many new competing payment mechanisms, the underlying demand for cash seems, if anything, to have become more resilient. Having contracted in the 1970s and 1980s as electronic payments and plastic cards became more widely used, cash has grown roughly in line with the economy, measured in cash terms, since the early 1990s.

Some of this resilience probably reflects the underlying utility of cash as a means of payment: it is easy to use, anonymous and does not require any third party intervention (unlike say a debit card which relies on the ability to get an authentication code). For some groups cash may be particularly attractive: one example is individuals with low-incomes, for whom cash budgeting can be a helpful tool; another is the elderly for whom cash's ease of use can be appealing. From the retailers' perspective, cash remains cost effective for many transactions: the British Retail Consortium found that while cash accounted for just under a third of retail transactions in 2012 (by value), it accounted for just 10% of the payment handling costs incurred by retailers. These types of factors are likely to persistently support the demand for cash.

Set against that view, there are good arguments to suggest that some current strength in demand for cash will eventually prove to be temporary. Initially 'network' effects can slow the adoption of new payments methods and create inertia which favours established payments mechanisms, including cash. But in these

situations tipping points can emerge when a critical mass of early adopters prompt a rapid migration away from the old network (cash) to the new ones. In so far as the use of cash is being supported by network externalities, then the underlying demand for cash has some fragility.

A further complication in assessing how the demand for cash will emerge comes from a different, and in this case not technology based, source. It is that the relative decline in the use of cash for payments has been accompanied by an apparent increase in saving by cash. Over the past decade, while transactional usage of cash has remained static, per capita cash holdings in the UK have increased markedly from around £500 at end-2002 to almost £900 today.⁷ This trend is not unique to the UK and has been experienced elsewhere including in the United States and across much of the euro area. It is possible to identify factors which might have contributed to this rise, including the financial crisis, lower interest rates, an increase in self-employment, but its scale nevertheless remains somewhat surprising.

Drawing these considerations together, it is certainly plausible that cash will continue to remain in rude health, growing in line with the cash value of the economy. But the possibility of an accelerated move away from cash for transactions cannot be dismissed, and it is difficult to judge whether the factors driving the pick-up in cash saving will persist. In this context, while I take it as given that cash will remain an important part of our lives for the foreseeable future, striking the balance to ensure we can meet the public's demand for cash over the next ten to twenty years while avoiding unnecessary expenditure is not straightforward.

Ensuring that our banknotes remain secure

Aside from the impact of payment behaviour and the cash distribution system, technology has also had a profound impact on the physical nature of cash itself.

The Bank of England issued its first banknote in 1694. The first counterfeit was passed in 1694 too. And so it has gone ever since. Since 1694 the Bank has faced the same basic challenge: how to design a banknote which can be manufactured in large scale at relatively low cost (just a few pence per note), and is easy to authenticate but hard to counterfeit. For most of the time since 1694 we have succeeded in meeting that challenge, but it is not easy to do. Technology acts as our friend and foe: friend because it allows us to introduce new difficult to imitate features and foe because eventually progress gives counterfeiters the tools to copy them.

The current basic template for our banknotes dates back to 1970 when William Shakespeare became the first historic character to appear on Bank of England money. The Shakespeare twenty was significantly more sophisticated than its predecessor. Its integrity was protected by the quality of the paper it was printed on, its

⁷ This calculation does not allow for notes held overseas or that are held by banks or other businesses. Nevertheless, the available evidence clearly suggests that average individual cash holdings have increased over the past decade.

raised print, a watermark, an embedded thread, and the complexity of the multi-colour design. By the standards of its time the Shakespeare was very secure.

As the technology available to us all to capture and print images has advanced since 1970, the security of our banknotes has evolved considerably. For example, our most recent note, the Boulton and Watt fifty pound note, augments the traditional features used on the Shakespeare note with a number of much more modern components. These includes a wide windowed thread which contains images of a pound sign and the number fifty which move and switch as the note is tilted, and other images which are only visible using UV light.

The journey from the Shakespeare £20 to the Boulton and Watt £50 has been something of a technology arms race between us and the counterfeiters. The UK's experience mirrors that of many other countries, and one notable consequence has been that the banknote market place has evolved markedly. Central banks have needed to employ increasingly innovative methods to protect their notes; often borrowing technologies from other industries. To give one prominent example, holograms were imported from credit and debit cards. Unheard of a quarter of a century ago, holograms are now common place on banknotes.

Another development in the banknote market has been the emergence of alternative materials on which to print banknotes. Australia was the pioneer, first introducing polymer or plastic banknotes in 1988.⁸ Since then a number of countries have copied Australia's example. In most cases countries have switched to polymer on cost grounds – it lasts longer than paper and wears better – but in recent years some central banks have also been motivated by the view that polymer may offer some security benefits.

The trend to more sophisticated features is set to continue. Over the next few years we are likely to see more novel security features which will use state-of-the-art technology to deliver distinct image movement and novel colour changes to enable cash users to check genuine notes with improved speed and ease. And we are likely to see greater diversity in the materials on which banknotes are produced. Morocco has recently issued a banknote printed on a substrate comprising a sandwich of polymer between two paper layers and Swaziland has issued notes of a sandwich of paper between two polymer layers. Another trend is to incorporate see-through windows on banknotes. Complex windows can be easily achieved on polymer and simple windows are now being promoted with paper-based substrates.

⁸ The Reserve Bank of Australia issued a commemorative AUD 10 note in January 1988 to mark Australia's bicentenary. Between 1992 and 1996, the RBA issues a new series of banknotes, all printed on polymer. Source: <http://banknotes.rba.gov.au/historybanknotes.html>

In this changing world, the Bank's job is to make sure that it stays fully on top of all of the latest technological developments so that it can make the correct choices for our future banknotes. We need to assess which features best combine the ability to be authenticated when genuine and hard to copy with today's and tomorrow's technology. To enable us to do that we have a dedicated research team which casts its net wide in considering all available options for our banknotes.

The Governor announced in April that Sir Winston Churchill will appear on the next banknote, and we shared with the public the image of Churchill which will appear on the note.⁹ Given what I have said it should be no surprise that even before we had decided on Churchill, our research team had initiated a multi-year research programme to identify the technical design which will enable us to issue the most secure Churchill note possible. Once we have made our final technical decisions we will start the process of manufacturing the new-style note, with the aspiration of issuing it in 2016.

Going back to 1694 for a moment, the Bank's first counterfeiting scare was solved by the arrest of the perpetrator. And it remains the case that we can only succeed in keeping counterfeiting rates low by combining good design with effective law enforcement - for which we are always grateful - to deter counterfeiters and education to ensure that the public can identify genuine banknotes and spot counterfeits.

Despite technology increasing the tools available to counterfeiters, we continue to succeed in keeping counterfeit rates low. Last year, over 700,000 counterfeits were removed from circulation. I wish the number were lower - zero to be precise - but that level represents a tiny fraction of one percent of the three billion genuine Bank of England notes in circulation; with the implication that you or I as individuals are very unlikely ever to come across a counterfeit.

So next time you pull a £10 note from your wallet and you see the image of Charles Darwin, I hope that you will have more of an appreciation of the evolving life of your banknotes. The march of technology has had a tremendous impact on banknotes over the past four decades. This has offered many benefits - more choice to us as individuals about how to make payments, more efficient ways of distributing cash, and the opportunity for the Bank to issue more sophisticated banknotes. But it also creates challenges for us, perhaps most importantly the challenge of keeping ahead of the counterfeiters so that we can continue to safeguard the security of your banknotes. The Bank has met these challenges in the past, and we are committed to exploiting technological advances to meet these challenges in the future.

Thank you very much for listening.

⁹ The plan is for the Churchill note to be issued as a £5 note, and that it shall be issued during 2016; but those choices may be reviewed as plans for issuing the new note are finalised.

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