DIGITAL CASH

Why Central Banks Should Start Issuing Electronic Money

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PositiveMoney

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EXECUTIVE SUMMARY

With the impending 'decline of cash' and the rise of digital currencies (such as Bitcoin), there are strong arguments for central banks to start issuing "digital cash" – an electronic version of notes and coins. But this raises a number of questions: how would central banks get new digital cash into the economy, and how would the public use it? What would the advantages be? And would there be any impact – positive or negative – on financial stability?

The Bank of England has already posed questions about the potential of digital cash, prompted by the ongoing rise of electronic means of payment, and the emergence of alternative currencies such as Bitcoin. One of the key questions to come out of the Bank's One Bank Research Agenda, released in early 2015, was: *"From a monetary and financial stability point of view, what are the costs and benefits of making a new form of central bank money accessible to a wide range of holders?"*

We argue that there are a significant number of of benefits to issuing digital cash:

- **It widens the range of options for monetary policy:** Implementing digital cash can allow new monetary policy tools to be used. If digital cash is used to completely replace physical cash, this could allow interest rates to be lowered below the zero lower bound (although this is not a policy we would advocate). Alternatively, digital cash can be used as a tool to increase aggregate demand by making 'helicopter drops' of newly created digital cash to all citizens, making it easier to meet the Bank of England's monetary policy target of price stability.

- **It can make the financial system safer:** Allowing individuals, private sector companies, and non-bank financial institutions to settle directly in central bank money (rather than bank deposits) significantly reduces the concentration of liquidity and credit risk in payment systems. This in turn reduces the systemic importance of large banks. In addition, by providing a genuinely risk-free alternative to bank deposits, a shift from bank deposits to digital cash reduces the need for government guarantees on deposits, eliminating a source of moral hazard from the financial system.

- **It can encourage competition and innovation in the payment systems:** The regulatory framework we propose would make it significantly easier for new entrants to the payments sector to offer payment accounts and provide competition to the existing banks. It would also reduce the need for most smaller banks and non-banks to run their payments through the larger banks (who are able to set transaction fees at a level that disadvantages their smaller competitors).

- **It can recapture a portion of seigniorage and address the decline of physical cash:** As physical payments are gradually replaced with electronic payments, the Bank of England will want to replace physical cash with its electronic equivalent. Doing so has the advantage of increasing the 'seigniorage' – the proceeds from creating money – earned by the Bank of England (and passed on to the Treasury).

- **It can help address the implications of alternative finance upon money creation and distribution:** Non-banks, such as peer-to-peer lenders, are competing with banks and taking on a larger share of total lending. This has implications for money creation and distribution. When a bank makes a loan, it creates new deposits – new money – for

the borrower. But when a peer-to-peer lending firm makes a loan, it simply transfers pre-existing deposits from a saver to a borrower; no new money is created. By proactively issuing digital cash, the Bank of England can compensate for any shift in lending away from money-creating banks, and the subsequent fall in money creation.

- **It can improve financial inclusion:** The firms providing Digital Cash Accounts would be payment service providers first and foremost, whereas banks are primarily lenders. Digital Cash Account Providers are therefore likely to offer accounts to those customers that are excluded from conventional banking services.

How to Implement Digital Cash

The Bank of England already issues digital money, in the form of deposits held by commercial banks in accounts at the Bank of England. It could provide digital cash simply by making these accounts available to non-bank companies and individuals (without the need for a Bitcoin-style distributed ledger payment system). There are two ways this can be done. In a Direct Access approach, the Bank of England could provide accounts to all citizens in the UK, along with the payment cards, internet banking and customer service requirements this entails. However, the Bank of England is likely to see this as inappropriate state involvement in the private sector and a significant administrative burden.

Consequently, we recommend an Indirect Access approach, in which the Bank of England would still create and hold the digital cash, but all payment and customer services would be operate through "Digital Cash Accounts" (DCAs) provided by (or 'administered' by) private sector firms. These private sector "DCA Providers" would have responsibility for providing payment services, debit cards, account information, internet and/or mobile banking, and customer support. Any funds paid into the DCA would be electronically held in full at the Bank of England, so that each DCA Provider could repay all its customers the full balance of their account at all times. DCA Providers are prohibited from lending or taking any risk with their customers' funds.

Indirect Access is a much more market-driven approach which will help to increase competition in current account and payment account services. It minimises the administrative burden on the Bank of England. Conveniently, the regulatory framework for this approach already exists in the form of the Payment Services Provider model (with minor adaptations).

Managing the Issuance of Digital Cash

The Bank of England currently issues central bank money reactively: it issues banknotes in whatever quantities are needed to meet demand from the public, and issues central bank reserves in order to meet demand from the banks. It could choose to issue digital cash in the same way, by providing the infrastructure for Digital Cash Accounts but letting the public determine how to split their holdings of money between bank deposits and digital cash. By making transfers from their bank deposit accounts, the public, rather than the Bank of England, would determine how much digital cash needs to be issued. In this case, the money issuance would be entirely reactive.

Alternatively, by taking a proactive approach to issuance, the Bank of England could use digital cash as a monetary policy tool to stimulate aggregate demand and influence the economy. If every citizen had a Digital Cash Account at the Bank of England (either directly or indirectly), then it would be a simple process for the Bank of England to make small and occasional 'helicopter drops' of newly created digital cash to every citizen. This could be done on a small scale (for example, just £100 per citizen) and at short notice. This new monetary policy tool may give the Bank of England a far more accurate and direct method of implementing monetary policy than conventional monetary policy (adjusting interest rates) or post-crisis policies such as Quantitative Easing.

INTRODUCTION

With the impending 'death of cash' and the rise of digital currencies (such as Bitcoin), is there a role for central banks to provide the public with a digital, electronic version of cash? If there is, how would the central bank get that digital central bank money into the economy, and how would the public use it? What would the advantages be? And would there be an impact – positive or negative – on financial stability?

The ongoing rise of electronic means of payment, and the emergence of Bitcoin, has raised questions about the future of cash. In a recent speech the Bank of England's Chief Economist Andrew Haldane (2015) went as far as to suggest that physical cash should be abolished and replaced with a digital currency issued by the central bank. The Bank of England has initiated a significant research programme which looks at these issues (amongst others). In their "One Bank Research Agenda", released in February 2015, the Bank of England's researchers consider the possibility of issuing a digital form of cash that can be held by the public, and pose a significant research question:

> "From a monetary and financial stability point of view, **what are the costs and benefits of making a new form of central bank money accessible to a wide range of holders?** What would be the impact on existing payment and settlement systems?" (Bank of England, 2015)

They elaborate:

> "[P]ayments and credit have seen innovations recently in the shape of digital currencies and alternative sources of finance. Digital currencies, potentially combined with mobile technology, may reshape the mechanisms for making secure payments, allowing transactions to be made directly between participants. This has potentially profound implications for a financial system whose payments mechanism depends on bank deposits created by banks in the act of granting loans.
>
> ...
>
> The emergence of private digital currencies (such as Bitcoin) has shown that it is possible to transfer value securely without a trusted third party. While existing private digital currencies have economic flaws which make them volatile, the distributed ledger technology that their payment systems rely on may have considerable promise. **This raises the question of whether central banks should themselves make use of such technology to issue digital currencies.**" (Bank of England, 2015)

There are two parts to this question. The first is whether there is any rationale for a central bank to issue a digital currency, supported by either a centralised payment system or a decentralized 'distributed ledger'. We address this question in Part 1, analysing the various reasons why the Bank of England (or any central bank) would wish to issue an electronic form of cash.

The second part to the question concerns the economic, technological and regulatory challenges facing central banks when issuing a digital cash. In Part 2 we outline two

different approaches that could be taken to design the infrastructure and regulatory regime that would allow the public to hold digital cash. We also consider the process by which the Bank of England would decide how much digital cash to create.

Another question put forward by the Bank of England is:

> "If transactions balances could migrate to digital currency, how would banks compete? Would there be any implications for the availability of credit?" (Bank of England, 2015)

We address this question in Part 3, where we consider the implications of having two competing forms of electronic money in the economy (namely, digital cash and bank deposits).

Issuing Digital Cash Does Not Require the Distributed Ledger

The Bank of England's research question couples the concept of digital currency with the technology of a distributed ledger[1] payment system. This distributed ledger is the technology underlying Bitcoin and it works by providing every user of the currency with a copy of the payments ledger: a file containing every transaction ever made using the currency. The technology allows for verifiable and irrevocable payments which can be validated by the decentralised network of computers, without the need for a centralised and trusted payment processor (such as the central bank).

But the Bank of England is capable of issuing digital cash even without the distributed ledger technology. As Haldane (2015) put it: *"In one sense, there is nothing new about digital, state-issued money. Bank deposits at the central bank are precisely that.",* and explained: *"A central bank's balance sheet is the foundation on which both money and monetary policy are built. A central bank's liabilities define the quantity of so-called base money in circulation."* However, whilst members of the public are allowed to hold physical cash, deposit accounts at the Bank of England are currently provided only to banks, building societies and a small number of systemically important financial firms. So members of the public have no way of holding digital state-issued money.

Consequently, a central bank can provide 'digital cash' simply by allowing members of the public (and businesses) to hold digital deposit accounts at the Bank of England. This requires a 'centralised ledger' – essentially a collection of computers owned and maintained by the Bank of England. This negates the need for a distributed ledger system modelled loosely on Bitcoin.

From a central bank's perspective, whether a distributed ledger is preferable to a centralised ledger depends on the advantages of the technology in terms of speed, resilience, cost and reliability. We prefer to focus here on the economic, rather than technological, issues, and so we will be exploring digital cash as a simple extension of the existing system, allowing members of the public to hold accounts at the Bank of England and using a *centralised* payment system to track transfers of digital cash.

Key Terms

For the rest of this discussion, we use the term **physical cash** to refer to metal coins and paper bank notes issued by the Royal Mint and Bank of England respectively (and their equivalents in other countries). We use "**digital cash**" to refer to electronic 'central bank reserves' issued by and held at the Bank of England and made available to be held by the general public. "**Digital Cash Accounts"** (DCAs) are the accounts in which digital cash will be held (explained in Part 2), and **DCA Providers** will be the companies that provide payment services attached to those Digital Cash Accounts. Finally, when we talk about

1 This technology has excited interest generally in all fields involving transfer of ownership, whether of money or property, since it does not rely on trust in the accuracy of the records held by individual institutions to establish proof of ownership.

the **payment system** that allows people to transfer and spend this digital cash, we are referring to a conventional centralised payment system (i.e. payment terminals connected to payment networks, which ultimately connect to a centralised payment processor at the Bank of England), rather than to a decentralized or 'distributed' ledger system as used by Bitcoin.

1. WHY MIGHT CENTRAL BANKS CHOOSE TO ISSUE DIGITAL CASH?

1.1 Enabling Conventional Monetary Policy to Operate at Negative Interest Rates

The existence of physical cash creates an obstacle to the usage of negative interest rates by a central bank, and so some central bankers have proposed abolishing physical cash and replacing it with digital cash. The reasoning for this requires some explanation.

Conventional monetary policy relies on the Bank of England's ability to set the 'base rate' or 'Bank Rate', which is the rate of interest that the Bank of England pays on balances ('reserves') that commercial banks and building societies"[2] hold on deposit at the Bank of England. This in turn influences the short-term (overnight) interest rates for loans that banks make to each other in the interbank market from these reserves.

If the economy is slowing and threatening to go into recession, the conventional monetary policy response is to reduce the base rate. This is typically followed by a fall in the interest rates paid to banks by the wider economy for longer-term loans, such as mortgages. This fall in interest rates reduces the cost to firms and households of borrowing.

Lending rates charged by banks tend to settle a few percentage points above the base rate. This means that even if base rates are near to zero, the higher lending rates may still not be low enough to encourage a rise in borrowing (and therefore an increase in money creation by the banking sector, and a subsequent rise in spending). So if base rates as low as 0.5% fail to stimulate demand, then the typical central bank will draw the conclusion that rates should be lowered even further.

However, this policy of lowering base rates eventually runs up against an obstacle known as the "Zero Lower Bound" (ZLB). The Zero Lower Bound refers to the fact that effective monetary policy becomes difficult when the base rate approaches zero. If base rates are lowered below zero (i.e. negative interest rates), then banks would effectively be charged to hold reserves at the Bank of England.

Charles Bean, then-Deputy Governor of the Bank of England, explained the obstacles to the use of negative interest rates:

> "If, however, the period of negative Bank Rate was likely to be long-lived, it might lead to more substantial changes in behaviour. First, banks might decide to convert their reserves into cash to avoid the charge. To do so might require some further investment in secure storage capacity and an expansion in the market for insuring securely stored bank notes. This would not be worth doing for a short period, but the necessary investment could become worthwhile if the period were longer. Second, banks might be more inclined to introduce or raise charges

2 Bank of England: http://www.bankofengland.co.uk/monetarypolicy/Pages/how.aspx

> for running current accounts if Bank Rate were significantly negative for a long period. In turn, that could mean that customers might prefer to hold cash rather than leave it with their bank so as to avoid the associated charges…" (Bean, 2013)

Consequently:

> "…it would probably not be possible to hold Bank Rate below minus 0.5 per cent (or thereabouts) for more than a year or two without provoking such a movement into cash, unless the convertibility of bank reserves into cash were to be restricted in some way." (Bean 2013)

Bean explains that, when looking for a short-term stimulus in response to the post-crisis depression, the Bank of England's Monetary Policy Committee determined that Quantitative Easing would provide "a more certain and effective route to increasing aggregate demand than a further reduction in Bank Rate [below 0.5%]".

However, in a recent speech, Andy Haldane, Chief Economist at the Bank of England, argued that negative interest rates may be needed not as a short-term stimulus, but as a long-term policy. This is because global real interest rates have been falling for the last 35 years:

> "Back in the 1990s, world real interest rates averaged around 4%. With an inflation target of 2%, that meant nominal interest rates averaging around 6% over the course of a typical cycle. At those levels, monetary policy would have plenty of room for manoeuvre above the ZLB – 6 percentage points – to cushion the effects of troughs in the business cycle. Over the past 30 years, however, world real interest rates have been in secular decline. At the dawn of the crisis, they had halved to around 2%. Since then they have fallen further to around zero, perhaps even into negative territory." (Haldane, 2015)

Consequently, if low real interest rates are here to stay, then the central bank may need to impose negative interest rates for much longer periods of time.

The problem is that central banks may have insufficient 'headroom' to lower interest rates before they hit the Zero Lower Bound. This is where digital cash becomes relevant. Haldane suggests that one way to eliminate the Zero Lower Bound is to abolish physical cash so that people can only hold either bank deposits, or digital cash at the Bank of England, on which negative interest rates could be levied:

> "One interesting solution, then, would be to maintain the principle of a government-backed currency, but have it issued in an electronic rather than paper form. This would preserve the social convention of a state-issued unit of account and medium of exchange, albeit with currency now held in digital rather than physical wallets. But it would allow negative interest rates to be levied on currency easily and speedily, so relaxing the ZLB constraint." (Haldane, 2015)

While there are strong arguments for starting to issue central bank money in the form of digital cash, we think that the Zero-Lower Bound is one of the weakest. If low interest rates fail to stimulate the economy, the answer is not to lower rates even further, but to use alternative tools of monetary policy. One such potential tool is discussed in the next section.

In addition, we think it will be politically and practically unfeasible to abolish physical cash at least for the next 20-30 years. Even if it were feasible to do so, it is probably undesirable, due to the disruptive impact it would have on certain groups, and the ability to use cash as a backup means of payment when electronic payment systems suffer technology failures. Consequently, this suggestion is more a thought experiment than a policy proposal at this point.

1.2 Enabling the Use of New Instruments of Monetary Policy, such as 'Helicopter Money'

Conventional monetary policy operates through the central bank's adjustment of 'base' rates of interest. In the aftermath of the financial crisis, base rates were lowered to near-zero (0.5% in the UK, 0.25% in the USA, 0.05% in Europe, and even negative rates in Switzerland and Sweden). However, this failed to stimulate bank lending, borrowing or economic activity.

In response, central banks resorted to the 'unconventional' monetary policy of Quantitative Easing: flooding the banking system with reserves to minimise the reliance on inter-bank lending and to push down interest rates across a wider range of financial markets and assets. There is a growing consensus that Quantitative Easing has been ineffective at stimulating the real economy, since it works primarily by increasing the prices of bonds and (as a knock-on effect) shares and other financial assets. This increases the wealth of bond-holders and shareholders. But since the majority of assets in the financial markets are held by a small percentage of the population, the ultimate effect of QE is to deliver a windfall profit to the wealthiest households, who have a much lower propensity to spend that extra wealth and income than lower-income households. Central banks that have implemented QE relied on a 'trickle down' effect to increase spending in the real economy, but there has been little evidence that this ever took place.

However, there are alternative approaches which would likely be more effective than Quantitative Easing in stimulating aggregate demand. A proposal that is gaining significant support at the moment is that of 'helicopter money', in which the Bank of England would create new money and distribute an equal amount, as a non-repayable grant, to every citizen, in order to increase their ability to spend (or repay debt).

Helicopter money in general has a number of advantages over both QE and the policy of relying on greater bank lending to stimulate the economy. By getting money into the hands of the public, it increases their ability to spend without simultaneously increasing their debt. This is an advantage because household indebtedness (relative to income) in the UK is close to historical highs, and there is strong evidence to suggest that rising household debt can lead to financial crisis (Schularick & Taylor, 2009).

Unlike QE, helicopter money benefits everyone equally rather than increasing the wealth of the already wealthy. It is also a much more direct mechanism than either QE or conventional monetary policy since it increases the cash holdings of the general public for spending on consumption, debt reduction or investment. QE acts only indirectly through increasing the price of financial assets. It relies heavily on the wealth effect – the hope that the already wealthy who own these assets will feel encouraged to cash in some of their expanding wealth to increase their consumption spending. Conventional monetary policy acts on the availability of bank credit, but this is predominantly directed towards property and financial markets and so similarly relies on the wealth effect when directed at stimulating the economy.

To implement helicopter money, the central bank would need a distribution channel that guaranteed that new money would find its way into the accounts of the intended recipients. A digital cash system linking the central bank's mechanisms for creating money with the digital cash accounts of those who were to hold it would provide this distribution channel. This approach avoids problems that would arise if a helicopter money drop is attempted in the current system (i.e. without the existence of digital cash issued by the Bank of England). These problems are explained in detail in **Appendix 1**.

1.3 Increasing Competition and Promoting Innovation in the Payment System

The Bank of England already issues an electronic equivalent to cash, in the form of central bank reserves held in accounts at the Bank of England. However, these reserve accounts are only available to licensed banks (and building societies), and a small number of other financial institutions. This acts as a significant barrier to entry to any firm that wishes to compete with the banks to provide payment services.

To connect to the major UK payment systems, such as BACS, FasterPayments or CHAPS, an entity must have a reserve account at the Bank of England. This means, effectively, that only banks and building societies are able to connect directly to the payment systems. Any firm, for example a technology startup, which felt it could offer a better current/checking account service than the incumbent banks, would be unable to offer payment services on an equal footing with the banks.

New entrants (smaller banks and non-banks who wish to provide payment accounts) must typically enter into an 'agency' agreement with a larger bank. The large bank provides the new entrant with the ability to provide payment services, running through the larger bank's technology and connection to the payment system. However, this means that it is the incumbent banks, who have no interest in encouraging competition, which get to set the cost base for any new competitors. (These barriers to competition are discussed in more detail in our paper *"Increasing Competition in Payment Services"* by Dyson & Hodgson, 2014).

By issuing a form of digital cash that is available to all citizens, the Bank of England would enable new entrants to offer payment accounts and payment services which were not dependent on access to the balance sheets of commercial banks. This would free such potential competitors from the cost and usage constraints imposed by the banks, allowing new entrants to provide competition to the banks in the form of technical innovation and customer service.

1.4 Increasing Financial Stability by Providing a Risk-free Alternative to Bank Accounts

Bank deposits are currently the only means by which the general public can make electronic payments. Even payment services offered by non-banks such as ApplePay, or by small Electronic Money Issuers (EMIs)[3] settle payments by transferring bank deposits across accounts held at their banks. In view of the critical importance of the payment systems to national and global economies, governments have, since the Great Depression, accepted the need to underwrite insurance schemes guaranteeing those bank deposit liabilities of the banking system[4]. In practice, the guarantees typically cover deposits made by private individuals and small businesses up to a limit equivalent to €100,000 in the EU.

These deposit insurance schemes amount to the government guaranteeing to honour the liabilities of commercial banks in the event that they cannot do so themselves. To have the government back a private firm's liabilities is an extraordinary privilege. There are arguments that this safety net encourages banks to take greater risks. A full critique of the perverse impacts of deposit insurance is given in Jackson & Dyson (2013).

3 A list of some EMIs can be found at: https://www.e-ma.org/our-members

4 In the UK, this is the Financial Services Compensation Scheme. The US has the Federal Deposit Insurance Corporation, while EU countries have a range of Deposit Guarantee Schemes.

The existence of the deposit insurance scheme shows that the authorities recognise that it is too dangerous to allow a bank failure to cause millions of people to lose access to the money in their bank accounts. So long as bank deposits serve as the money on which the rest of the economy runs, they must be risk free. There is clearly a need for a 'safe money asset' in the economy; one which cannot be exposed to the risk of bank failures. However, as Mervyn King, then Governor of the Bank of England, has highlighted, it may not be sensible to pretend that bank deposits can be backed by inherently risky financial assets:

> "[M]any treat loans to banks as if they were riskless. In isolation, this would be akin to a belief in alchemy – risk-free deposits can never be supported by long-term risky investments in isolation. To work, financial alchemy requires the implicit support of the taxpayer.
> ...
> If there is a need for genuinely safe deposits the only way they can be provided, while ensuring costs and benefits are fully aligned, is to insist such deposits do not coexist with risky assets.
> ...
> For a society to base its financial system on alchemy is a poor advertisement for its rationality." (King, 2010)

Therefore, as King argues, if there is a need for genuinely safe assets, these cannot truly be provided by banks, which are inherently risky. Deposit insurance simply creates the illusion that deposits are risk free; in reality, they are risk-bearing, but the risk falls upon the taxpayer rather than depositors.

By issuing a digital form of cash, the Bank of England could provide the public with a means to hold a *genuinely* risk-free asset, which is guaranteed by the government and connected to the electronic payment system (and so has significant advantages over physical cash). But unlike the government guarantee provided to bank deposits, the existence of digital cash does not put the government on the hook for the mistakes of private sector banks. By providing a risk-free, liquid alternative to bank deposits, the availability of central bank Digital Cash Accounts reduces the need for deposit insurance.

1.5 Increasing Financial Stability by Reducing the Concentration of Liquidity Risk and Credit Risk Within the Payment System

With the introduction of digital cash, more payments services providers could connect directly to the Bank of England's settlement systems, rather than being forced to operate through the larger banks. This means that a technology failure or the financial collapse of a larger bank will not cause the failure of payments managed by smaller banks and new entrants. Allowing more firms to settle directly using the central bank money in digital cash accounts would therefore reduce credit and liquidity risk within the payment system.

In addition, allowing non-bank financial institutions (NBFIs), such as pension funds and insurers, to settle directly using digital central bank money, removes a degree of liquidity and credit risk within the financial sector as a whole. At the moment, almost all NBFIs use bank deposits as their settlement asset, since they cannot directly access central bank reserves. The government guarantee that applies to the deposits in personal and small business accounts does not apply to the deposits held by NBFIs, meaning that in the case of a bank failure, they would lose access to their funds and have to wait months or even years for the liquidation process to release those funds. This means that liquidity problems or an outright collapse at a single bank can have significant knock-on impacts

on every financial firm that uses that bank. If NBFIs were able to hold funds directly at the central bank, they would no longer need to expose themselves to the risk of a large bank failing, reducing credit and liquidity risk across the financial system.

1.6 Recapturing a Portion of Seigniorage

'Seigniorage' refers to the profit or proceeds that comes from being able to issue money. In the case of Bank of England banknotes, these proceeds are transferred to the Treasury and are added to government tax revenue. Currently, seigniorage is only earned on the issuance of physical cash. Introducing digital cash could allow the state to 'recapture' some of the seigniorage that, indirectly, accrues to the banking sector when it issues bank deposits.

Historically, when coins were issued and spent by the crown, the seigniorage was simply the difference between the face value of a coin and the market value of the metal contained in that coin. Today the calculation of seigniorage is more complicated. As the Bank of England describes:

> "The Bank purchases low-risk assets to match this liability [i.e. banknotes issued] on its balance sheet, typically sterling money market instruments or government bonds. The income from these assets, after deducting the Bank's costs of managing the note issue, is paid to HM Treasury, as the Bank's shareholder. This net profit of the note issue is known as 'seigniorage' and can be a significant source of revenue for the government." [Our addition in square brackets.] (Allen & Dent, 2010)

When commercial banks require banknotes to fill their tills and ATMs, they purchase banknotes from the central bank by either (a) surrendering central bank reserves which the bank does not need for liquidity management purposes, or by (b) entering into a repo agreement (whereby the central bank buys securities from the note-purchasing bank, in exchange for notes, with the purchasing bank committing to buy the securities back at a later date at a higher price, thereby reversing the transaction). In the first case, the seigniorage arises from the reduction in the central bank's interest costs, since interest is payable on reserves but not on notes. In the second case it is the profit made by the central bank on the repurchase step of the repo agreement.

This seigniorage peaked at £2.4 billion in 2007-2008[5], but has fallen to just £0.5 billion in 2014-2015[6]. This fall in seigniorage income is not due to a fall in the demand for cash (since demand for cash is still rising in absolute terms) but due to the reduction of the Bank of England base rate to 0.5%, which has reduced the interest rates paid on reserves and the discount charged on repos.

Currently seigniorage is limited by the extent to which the public want to hold cash as opposed to bank deposits. This demand for cash is limited by the fact that cash can be inconvenient to hold and is disconnected from the electronic payment system. Since households and businesses do not currently have a way of holding electronic central bank money (i.e. digital cash), the demand for cash represents the demand to hold money in *physical form*, but does not tell us anything about the demand to hold *central bank money* as opposed to bank deposits. If the Bank of England provides the public with a way of

5 See Bank of England Financial Accounts for period ending 28th February 2009: seigniorage is denoted by the item "Payable to HM Treasury" on the Issue Department's balance sheet on page 97.

6 Bank of England Financial Accounts for period ending 28th February 2015. Seigniorage is now denoted by the item "Payable to National Loans Fund" on page 151.

holding digital cash which is as convenient as bank deposits (and connected to the electronic payment system), it may turn out that the total demand to hold central bank money in both physical *and* digital forms is much higher than the demand to hold physical cash alone.

Cash in circulation currently stands at around £67 billion,[7] having increased at about £15 million per month since 2012. The £0.5 billion figure for seigniorage thus represents about 0.77% of cash in circulation per year, with interest rates at 0.5% pa. Of the total amount of cash in circulation, at any one time almost £10 billion is held in bank tills and ATMs awaiting withdrawal[8]. From data published by the ATM operator *Link* it can be estimated that about £15 billion is withdrawn from cash machines each month[9]. This suggests that the other £42 billion circulates hand-to-hand without going through the banking system. This £42 billion can be taken as representing an underlying demand for physical banknotes by those who would not voluntarily switch to digital cash. The banks' cash float of £10 billion can be taken as the best estimate of people's preferences for cash holdings over and above their immediate spending needs, so this would suggest that if those who currently use ATM cash were to switch to digital cash accounts, the total demand for digital cash balances would be around £25bn or 167% of monthly cash spending.

If users simply switch from holding physical cash to holding the equivalent amount of digital cash, this will have no impact on the seigniorage collected by the Bank of England (since the amount of outstanding non-interest bearing liabilities of the Bank of England will not change). However, if users who currently hold bank deposits choose to switch to holding digital cash, this will increase the level of seigniorage revenue.

We can make an estimate of this increased level of seigniorage. Figures from the UK Cards Association[10] show that domestic spending using debit cards[11] is around £38 billion per month, having increased at about £200 million per month since the beginning of 2012. If all of this spending transferred to digital cash accounts (which is admittedly unlikely), and applying the earlier multiplier of 167% of monthly cash spending to allow for float, this would generate a maximum additional demand for digital cash balances of £63 billion (£25 billion by ATM users plus £38 billion by debit card users). This increased holding of digital cash would deliver additional annual seigniorage revenue of £490 million (if base rates stayed at 0.5%), rising by £27.5 million per year. If base rates were to rise to 1%, seigniorage would be double these figures.

1.7 Addressing the Implications of Alternative Finance upon Money Creation and Distribution

Recent technological and industry changes mean that non-banks such as peer-to-peer lenders are competing with banks and taking on a larger share of total lending. This has implications for money creation and distribution. When a bank makes a loan, it creates new deposits for the borrower. But when a peer-to-peer lending firm makes a loan, it simply transfers pre-existing deposits from a saver to a borrower; no new money is created.

7 Notes in Circulation: Bank of England data series RPWAEFA.

8 MFI sterling holdings of notes and coin: Bank of England data series RPMB3UO.

9 http://www.link.co.uk/AboutLINK/Statistics/Pages/Statistics.aspx

10 http://www.theukcardsassociation.org.uk/2015-facts-figures/debit_card_reports_2015.asp

11 We presume credit card users will not switch their spending to digital cash accounts, since these will not provide credit facilities, although there are a significant number of people who use credit cards for regular spending without making use of the credit facilities.

Whilst peer-to-peer lending is still small relative to total bank lending, the industry is growing rapidly. As it grows, a smaller proportion of loans will result in the creation of additional money. The implications of this are complex, and have already caught the attention of the Bank of England, who list one of their questions of interest as:

> "How might a shift towards alternative finance change the way in which new money is created and distributed through an economy?" (Bank of England, 2015)

Answering this question is outside of the scope of this paper. However, it is clear that if a lower share of lending is done by banks, then there will be less money creation from this source. If this causes problems, there will need to be another source of money creation. Consequently, the Bank of England may be able to compensate for the shift in lending away from money-creating banks by proactively issuing digital cash in the manner described later in this paper.

1.8 Addressing the Death or Decline of Physical Cash

Although the total amount of cash in circulation currently continues to rise, its use as a mean of payment is declining, while the use of credit and debit cards to make purchases is rising (Figure 1.8, overleaf). In 2014 cards were used for more consumer payment transactions than cash for the first time[12]. With the rise of contactless payment cards and mobile phone payment apps such as ApplePay, it is inevitable that physical cash will continue to become less relevant.

So it would seem natural to expect that, as physical payments are replaced by electronic payments, the Bank of England would want to replace its physical cash with an electronic equivalent. Failure to do so would lead to a situation where the only form of money used in the economy would be privately issued bank deposits, and the Bank of England would lose its role in issuing any form of money to the non-bank public.

1.9 Increasing Financial Inclusion

In Ecuador, the government has established a payment system infrastructure that allows any citizen to hold an account at the Central Bank of Ecuador, into which they can deposit physical cash in exchange for an electronic balance which can be spent electronically. One of the motives[13] for establishing this system has been to provide digital bank accounts to the large number of unbanked: currently only 46% of adults have a bank account[14].

In the UK, the problem of the 'unbanked' appears to be less severe. World Bank data[15] suggests that 98.9% of adults (aged 15+) hold an account at a financial institution and 96.4% have a debit card. However, other studies[16] present a different figure, suggesting

12 http://www.bbc.co.uk/news/business-32778196

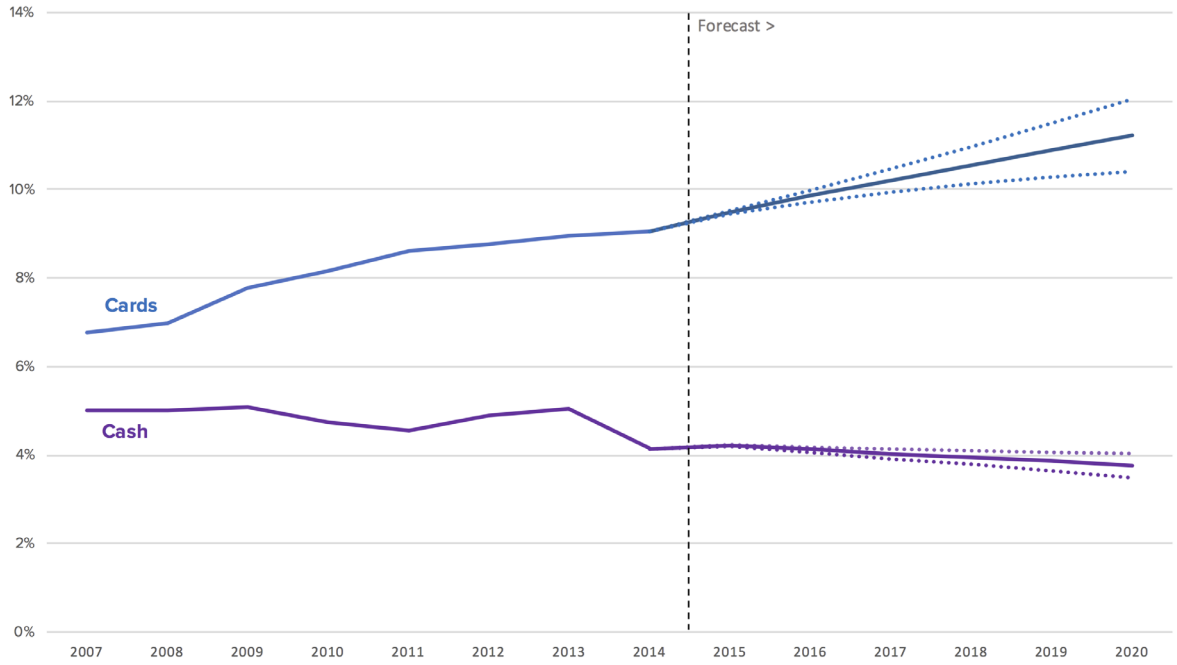
13 A further benefit peculiar to Ecuador is that, since the country uses US dollars as its national currency, the provision of digital cash in exchange for physical currency greatly increases the central bank's holdings of foreign reserves.

14 http://datatopics.worldbank.org/financialinclusion/country/ecuador

15 http://datatopics.worldbank.org/financialinclusion/country/united-kingdom

16 http://www.birmingham.ac.uk/Documents/college-social-sciences/social-policy/CHASM/annual-reports/chasm-annual-monitoring-report-2014.pdf

Figure 1.8: Use of Cash and Cards as a Percentage of Total Payments
(High, Midpoint and Low Estimates)



Source: Calculated using data from Bank of England, Payments UK, The Cards Association

that 3.6 million people are still unbanked. The Financial Inclusion Commission[17] reports considerable dissatisfaction amongst those who have newly acquired a bank account with about 50% incurring charges, half of whom pay more in charges than they gained in savings (e.g., from inducements offered by suppliers to switch to Direct Debit payments). About 15% closed or abandoned their accounts. Half of those with basic bank accounts (no overdraft or credit facilities) prefer to manage their money in cash. Central bank digital cash accounts could provide such people with the convenience of cash and the security of a bank account without the hassle of having to deal with a high street bank.

It is unlikely that a central bank would take on itself the task of managing the accounts of individual holders of digital cash. That would be outsourced to companies who could provide the necessary communications services to provide digital cash holders with access to their electronic wallets and to the payment system. As the example of the Central Bank of Ecuador demonstrates, these service companies could well be mobile phone operators but could equally be internet service providers or companies established primarily to manage Digital Cash Accounts on behalf of the account holders. All such companies are likely to prove accessible, flexible and welcoming to those who are currently financially excluded from or struggle to deal with the traditional banking sector. The characteristics of such Digital Cash Account providers are considered in more detail later.

17 http://www.financialinclusioncommission.org.uk/facts

2. HOW TO IMPLEMENT DIGITAL CASH

2.1 The Infrastructure for Digital Cash

There are broadly two ways that the Bank of England could provide digital cash to the public. In a 'Direct Access' approach, it could offer every citizen an account at the Bank of England, alongside the payment services to make such an account useful. Alternatively, in an 'Indirect Access' approach, it could provide a mechanism for holding the digital cash at the Bank of England, but leave the job of administering the accounts and payment services to the private sector. The second option is believed to be more in line with current thinking in the Bank of England.

Option 1: Direct Access via Accounts at the Central Bank

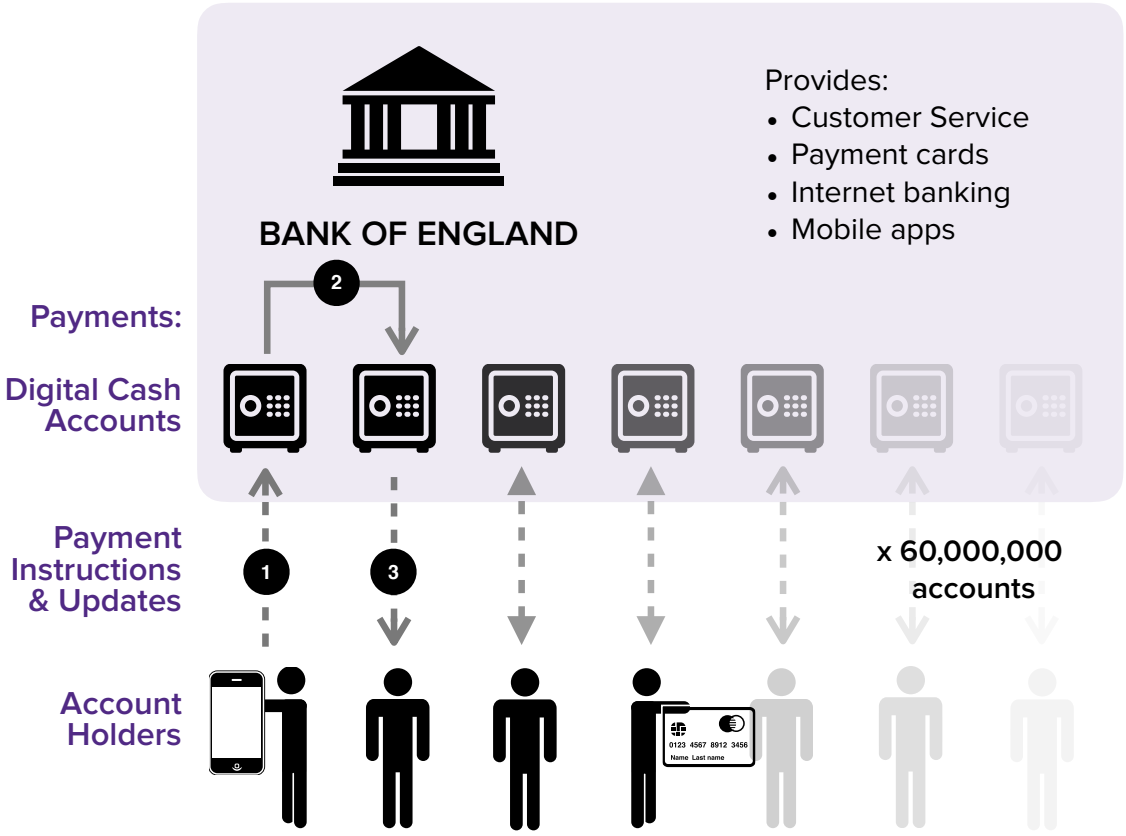
In a Direct Access approach, the central bank would need to give every citizen an account at the Bank of England (Figure 2.1.1). This would also imply providing sort codes, account numbers and payment cards so that the money in those accounts could be used to make payments. In addition, customers would need a way to check their balance and transactions, so internet or mobile banking would be a minimum requirement, and telephone banking would be necessary for some account holders. A dedicated branch network would probably be financially unviable, although agent branches could be used (for example, the Post Office branch network). The Bank of England would need to implement fraud prevention and anti-money laundering regulations on all accounts.

This is similar to the approach taken by the Central Bank of Ecuador, which now provides 'e-money' accounts to all citizens:

> "[T]he Central Bank of Ecuador (CBE) established itself as the sole e-money issuer in the country. Central banks do not normally offer retail banking services, but customers in Ecuador will now be able to open an e-money account at the CBE. Ecuadorian e-money accounts can be opened remotely using any mobile phone provider and national identity number. All customer fees and tariffs have been set unilaterally by the CBE. A website explaining the service offering, pricing, and agent locations is now available for consumers. Setting up e-money distribution is expected to be a collaborative effort of the public and private sector. Namely, financial cooperatives, credit unions, payment networks, and local mobile operators will be contracted by the CBE to build out agent networks."
> (Almazan & Frydrych, 2015)

However, the Bank of England is likely to argue that taking on such a large administrative burden could distract from its other functions in regulating the banks and managing monetary policy. There would also be the perception that the Bank of England – a state-owned enterprise – would be competing with commercial banks for the provision of payment services, something which would be frowned upon. The Bank of England would have no commercial incentive to innovate the services around this payment mechanism, and therefore may be inclined to provide the minimal acceptable service.

Figure 2.1.1: Direct Access to Accounts at the Bank of England



For that reason, an indirect access approach (described below) is likely to be much more acceptable to both the Bank, to government policy makers, and to the financial services sector.

Option 2: Indirect Access via Digital Cash Accounts (DCAs)

In this Indirect Access approach, the Bank of England would still create and hold the digital cash, but all payment and customer services would be provided by (or 'administered' by) private sector firms.

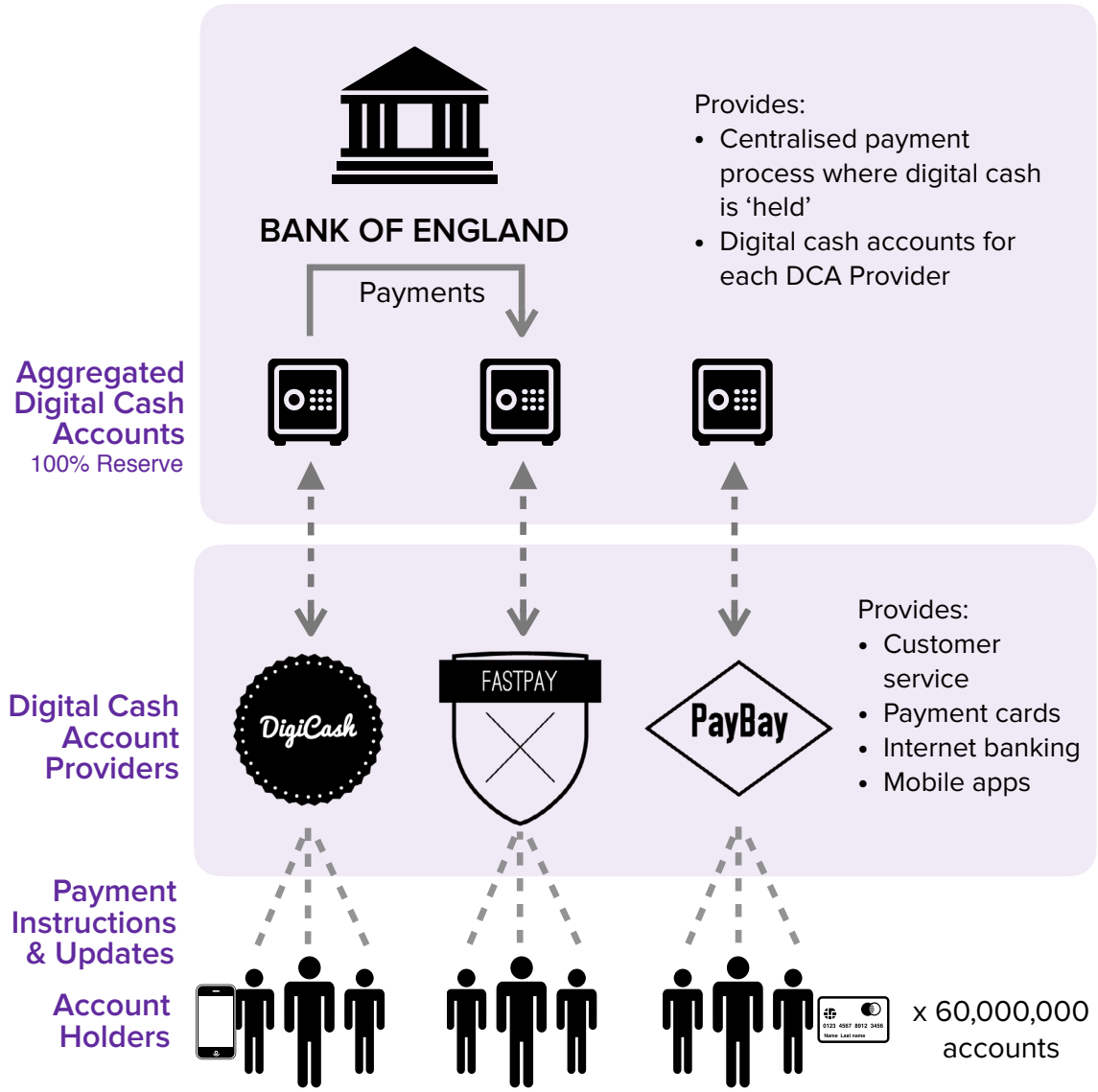
The model for this is outlined in detail in our paper *Increasing Competition in Payment Services* (Dyson & Hodgson, 2014). In this model, banks or technology companies (such as smartphone app developers) would provide a special type of account, which we will call "Digital Cash Accounts" (DCAs) throughout this paper. The firms providing these accounts will be referred to as "DCA Providers".

The DCA Provider would have responsibility for providing account statements, payment cards, balance checks, sort codes, account numbers, internet and/or mobile banking, and customer support by phone or email. They would also be responsible for allowing the DCA holders to make payments via the normal payment networks – BACS, FasterPayments, Visa, MasterCard etc. This would enable DCA holders to spend digital cash in the same way that they can spend bank deposits.

Any funds paid into the DCA would be held electronically in full at the Bank of England[18] (Figure 2.1.2). This means that the DCA Provider would always be "fully liquid": it could

18 Customers would acquire digital cash balances by (a) making a payment from their own bank deposit account to their Digital Cash Account, (b) receiving payments from third parties, either from their bank deposit accounts or their DCAs, (c) if the option is provided, by depositing physical cash with agents for

Figure 2.1.2: Indirect Access via Digital Cash Account Providers



repay all its customers the full balance of their account at all times. This is in contrast to conventional banks, which can only ever repay a fraction of their depositors at any point in time.

Crucially, the digital cash held in a DCA would legally belong to the account holder, not the DCA Provider. The digital cash would be held in a separate client account[19] at the Bank of England, and so would not be held on the balance sheet of the DCA Provider. The DCA Provider would 'administer' the digital cash, but would never own it. Again, this is in contrast to conventional banks: when you deposit physical cash into a bank, the cash becomes the property of the bank (i.e. an asset of the bank) and you are instead given a bank deposit (which is a liability, or IOU, of the bank to you).

Because DCA Providers would not own the digital cash held by their customers, and because these funds would necessarily be held in full at the Bank of England, DCA Providers would never be able to lend out their customer's digital cash or expose it to any kind of risk. DCA Providers would therefore not provide loans or overdrafts. DCAs would therefore be inherently as risk free as physical cash. There could be only two risks relating to a DCA. The first is the possibility of the same kind of payments fraud that applies to all bank accounts. The second is the possibility that the DCA Provider itself could be badly managed, fail to cover its operating expenses and ultimately go bankrupt. But even in this case, no DCA holder would lose a penny because the funds would be safely held in full at the Bank of England, and would not be part of the DCA's assets, and are therefore would not be available for seizure by the DCA Provider's creditors.

Since the funds in Digital Cash Accounts would be liabilities of the Bank of England, they would necessarily be balanced on the Bank of England's balance sheet by equivalent assets. These backing assets would simply be perpetual zero-coupon (i.e. non-interest bearing) bonds that would be issued by the government specifically for the purposes of 'backing' the issuance of digital cash. These bonds would not be considered part of the government debt, since they would have no interest cost or repayment date for the government. (The argument that digital cash issued by the state is not a form of state debt is supported by International Accounting Standards, and will be developed in more detail in the forthcoming paper *Accounting for Sovereign Money*, by the authors of this paper.)

There are significant advantages to taking this "indirect access" approach:

1. **It minimises the burden upon the Bank of England:** By leaving the provision of account services to existing banks or (ideally) new entrants from the technology industry, the Bank of England would be able to focus on the underlying infrastructure (i.e. issuing the digital cash and providing a payment system for it to be transferred) rather than providing customer services to millions of account holders.

2. **It is a much more market-driven approach:** Rather than the Bank of England providing DCAs as a public service, they would be provided by firms that are competing for customers and market share. This means there would be more of a competitive incentive to encourage firms to innovate to improve and expand the services they provide.

3. **The regulatory framework already exists:** The Bank of England, in its One Bank Research Agenda, asked the question "How could institutions offering access to

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the DCA Provider, such as the Post Office network or supermarkets (in a similar way to top ups for Pay-as-you-go mobile phones). The funds transferred by all such payments would be held electronically by the DCA provider in a separate client account at the Bank of England.

19 Including the words "Client Account" or something similar in the name of the account signals to banks, auditors and receivers/liquidators that the account is not an asset of the bank customer (which could be seized by its creditors) but is held in trust for the firm's clients.

central bank issued digital currencies be regulated?" (Bank of England, 2015). The good news is that the bulk of the necessary regulatory framework already exists under the FCA's Payment Services Provider model (and in legislation in the form of the Payment Services Regulations 2009). Payments services providers are companies which receive money from clients for the purpose of making payments to third parties, or from third parties on behalf of clients. **Appendix 2** explains the current regulatory regime around payment services providers. Such firms are required to 'safeguard' the funds they receive on behalf of their customers by holding these funds at a licensed bank or in other very safe assets; this requirement would need to be modified so that all payment service providers would be required to hold 100% of their customers' funds in digital cash accounts at the Bank of England.

4. **It can increase competition in current and payment account services:** Because DCA Providers would never put their customers' funds at risk, they would require much less intensive regulation. For example, there would be no need for DCA Providers to be subject to Basel capital requirements, because they would hold no risk-bearing assets. This would make it easier to allow new entrants from the technology industry to provide some competition to the incumbent banks, and would ensure that there would be incentives for these firms to innovate.

For these reasons we think the indirect access approach is much more likely to be favoured by the Bank of England.

Box 2.2: 'Central Banking for All'

Gruen (2014) has suggested that, rather than the Bank of England providing the payment services directly, these accounts should be provided by National Savings and Investments (NS&I). NS&I is a government agency that accepts deposits from the public, and therefore serves as a way for the government to borrow from the public cheaply. Since NS&I is fully backed by the government, it is perceived by the public as a safe place to store funds. NS&I savings accounts are therefore as safe as any form of government bonds (and unlike bonds, the price of your investment will not change).

At the moment NS&I does not provide any current accounts, or indeed any account that is connected to the payment system. In addition, there are quantity limits on how much money NS&I will accept from the public, in order to not be seen to compete with the banks for the public's savings. Gruen suggests that NS&I should lift these quantity limits and provide current accounts with a full range of payment services. Such accounts would be equivalent to digital cash, as they would be fully backed by the government in the same way that central bank cash is. It is unclear what role the Bank of England would have in managing the issuance of this digital cash.

2.2 Managing the Issuance of Digital Cash

The Bank of England has two options with regards to how it can issue digital cash. The first option is to issue digital cash *reactively* in response to demand from the public to hold it. This is the situation with physical cash today. A second approach is to *proactively* issue digital cash by creating new money and distributing it, as a non-repayable grant, to citizens.

Option 1. Reactive Issuance

The Bank of England currently issues banknotes in whatever quantities are needed to meet demand from the public. In other words, it issues banknotes *reactively* in response to demand. As the Bank of England describes:

> "The Bank of England makes sure it creates enough banknotes to meet the public's demand for them. ... The demand for banknotes has also generally increased over time.[20] To meet this extra demand, the Bank also issues banknotes over and above those needed to replace old banknotes. 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." (McLeay et al, 2014)

Banks will order banknotes from the Bank of England to meet expected demand for cash withdrawals from their customers, and the Bank of England will always meet that demand by selling additional notes to the banks. (The banks then effectively 'sell' these notes to their customers in exchange for a reduction in the balance of their deposits.)

In a similar manner, the Bank of England provides central bank reserves on demand to banks so that they can meet their liquidity needs. (This process is explained in detail in Jackson & Dyson (2013) or in the Banking 101 video course on the Positive Money website[21].)

Since digital cash would be simply an equivalent of physical cash and central bank reserves, the Bank of England could adopt the same demand-led approach to its issuance. In practice, this would work as follows:

1. Joe, a member of the public, would open an empty (i.e. balance of zero) account at a DCA Provider. He would then instruct his existing bank to transfer £100 from his deposit account, to his new Digital Cash Account (Step 1 in Figure 2.2.1 overleaf).

2. When the bank processes the transfer, it instructs the Bank of England to transfer £100 from its reserve account to the account of the DCA Provider (Step 2).

3. The Bank of England transfers the funds from the bank's reserve account to the account of the DCA Provider. (Step 3), (Remember that central bank reserves and digital cash are just two forms of the same thing: electronic liabilities of the central bank.)

4. The Bank of England informs the DCA Provider that a payment has been made to one of its customers (Step 4).

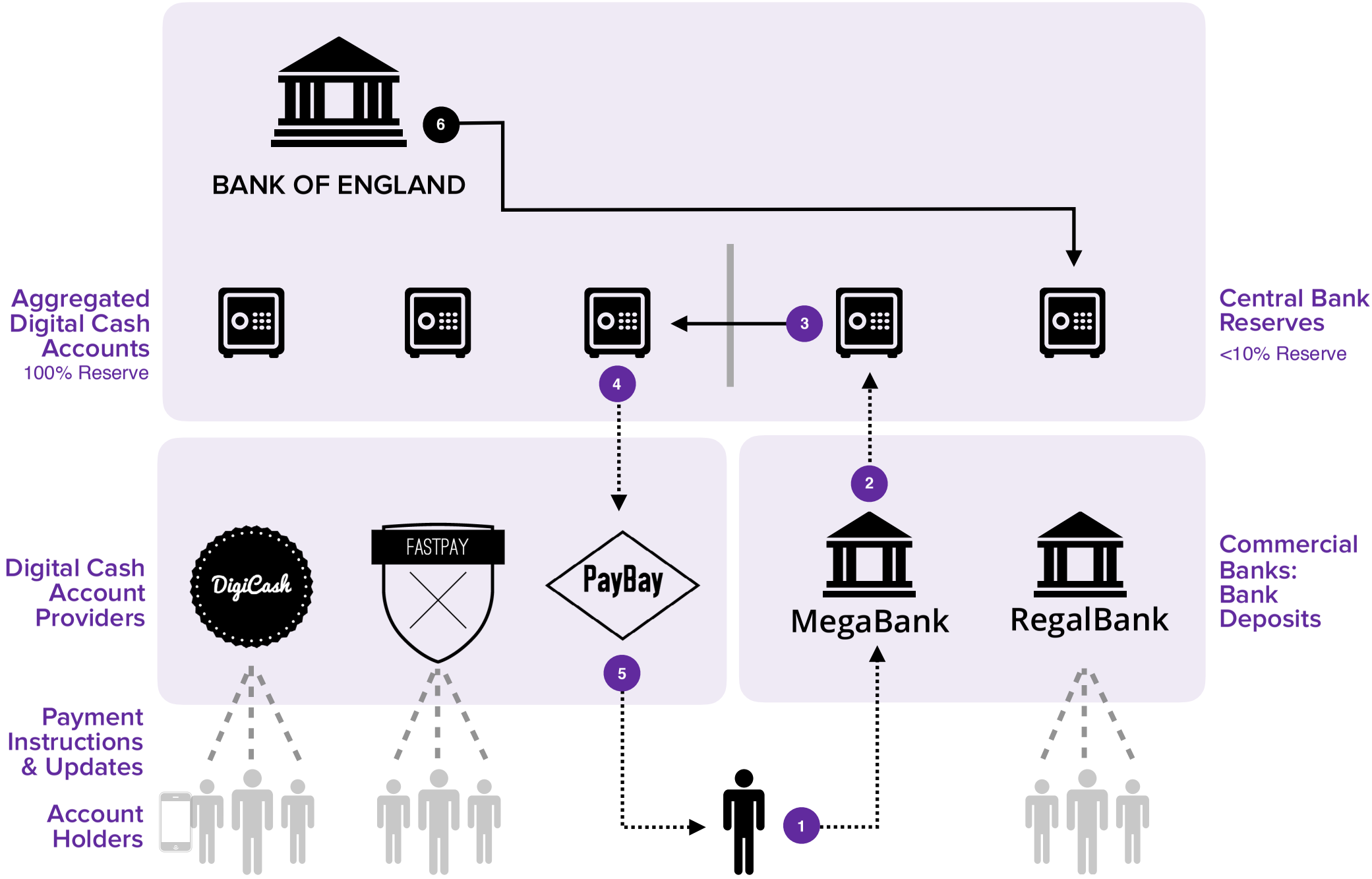
5. The DCA Provider updates Joe to confirm that his Digital Cash Account has received a payment of £100.

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20 Even if cash is becoming less significant as a means of payment, a growing population and inflation will mean that the nominal value of total physical cash in circulation will rise over time.

21 For more information see www.positivemoney.org

Figure 2.2.1: Reactive Issuance of Digital Cash



Through this process, Joe has chosen to give up holding £100 of bank deposits, instead choosing to hold £100 of central bank reserves or digital cash directly at the Bank of England.

Through this process Bank of England would provide the accounts to allow the public to hold digital cash, and then would allow the public to choose how to split their holdings of money between bank deposits and digital cash.

In this case the money issuance would be entirely reactive. It would be members of the public, rather than the Bank of England, who would decide how much digital cash they wanted to hold. The Bank of England would create that amount of digital cash reactively, in response to demand. (In practice it would only be necessary to create more digital cash or central bank reserves (the same thing) if the flow of reserves from conventional banks to Digital Cash Accounts created a shortage of reserves in the interbank market. This process is explained in more detail in **Appendix 3**, and could be handled adequately through the Bank of England's existing interactions with commercial banks.

Option 2. Proactive Issuance

In the reactive issuance approach, digital cash would be issued reactively in response to demand from the public. This approach precludes the use of digital cash as a tool of monetary policy to influence aggregate demand or inflation. However, if the Bank of England were to *proactively* issue digital cash, it could use this issuance as a monetary policy tool to stimulate aggregate demand and thus influence the economy.

Historically, the Bank of England has chosen to create cash and reserves reactively, to meet demand from banks and the public. It left the proactive creation of money to commercial banks (which create new bank deposits when they issue loans). It is only really with the launch of the Quantitative Easing programme in 2009 that the Bank of England started to use its power to create money in a proactive way. It used £375 billion of newly created reserves to purchase bonds from investors in the financial markets (such as pension funds and insurance companies). The process created both additional reserves on the balance sheets of banks, and an equivalent amount of new deposits in the bank accounts of the bond sellers. However, there are numerous criticisms of the effectiveness of this policy, which are addressed in Jackson (2013), and it is not an approach that we would advocate.

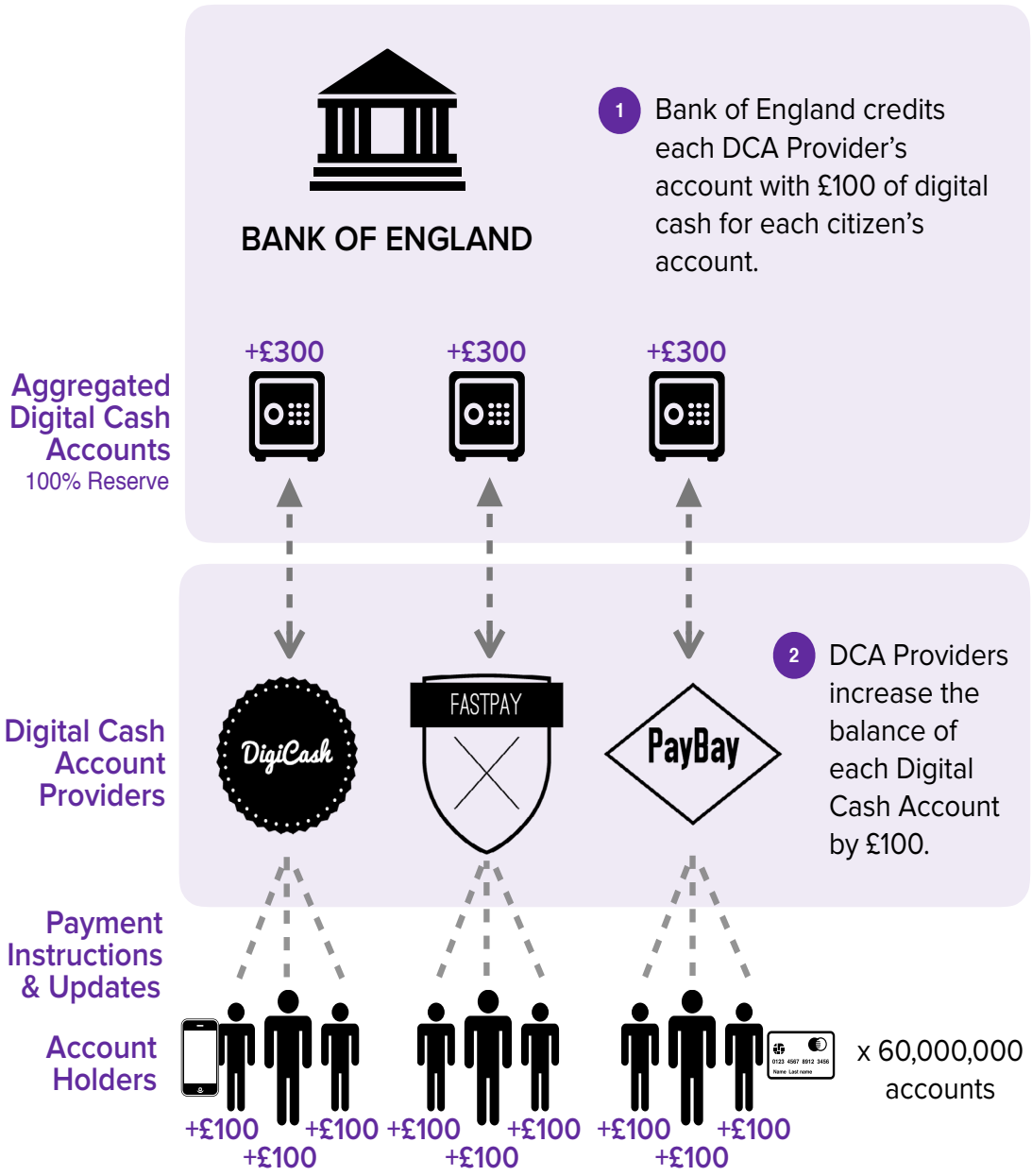
Instead, the most useful way to proactively issue digital cash would be to implement a 'helicopter drop' – a non-repayable grant paid to every citizen, also known as a "citizens' dividend" – in order to quickly boost spending and aggregate demand.

Implementing Helicopter Money via Digital Cash Accounts

If every citizen had a Digital Cash Account at the Bank of England, then it would be extremely easy for the Bank of England to make small and regular 'helicopter drops' to every citizen, as a tool of monetary policy (Figure 2.2.2). This may give them a far more accurate and direct method of implementing monetary policy than the use of interest rates or Quantitative Easing, and could be used on a small scale (for example, just £100 per citizen) and at short notice. Researchers at HSBC[22] are reported as suggesting a similar idea, using the blockchain technology underlying Bitcoin to distribute central bank money to every citizen, although as discussed earlier, there would be no need to use the blockchain technology if everyone had an account (either directly or indirectly) at the central bank.

22 "*HSBC says the blockchain could be used for radical central bank 'helicopter money' policies",* Business Insider, Nov 9th 2015.

Figure 2.2.2: Proactive Issuance of Digital Cash



Helicopter money drops via DCAs would avoid a number of the problems that would arise from a helicopter money drop in the current system (i.e. without the existence of digital cash issued by the Bank of England). These problems are outlined in detail in **Appendix 1**.

Such a helicopter drop may also be an ideal way to encourage people to start using their Digital Cash Accounts, if the Bank of England stated it would only make the payments into DCAs.

Of course, there would still be some logistical issues to consider. If a helicopter drop were announced, it would be necessary either to ensure that each citizen has one and only one DCA (to prevent people receiving two payments) or that the Bank of England has a database of unique accounts for each citizen. There would be some citizens who may not open an account in time, and so some people would not receive the payment (although this problem is similar to the problem of under claiming by eligible people for certain state benefits, and is not an argument against using the policy *per se*).

In addition, if people are to hold their Digital Cash Accounts directly at the Bank of England, then the Bank would have a huge amount of work to do to establish the

technology infrastructure for tens of millions of accounts[23]. Alternatively, if the Indirect Access approach (discussed above) is used, it would take time for DCA Providers to enter the market and scale up their operations in order to cover all citizens.

Despite these logistical challenges, we should not write off the idea of helicopter money via DCAs. While helicopter money has been proposed as a response to a crisis, it may be a more effective tool of monetary policy in the long run than conventional monetary policy (raising and lowering interest rates). So while the infrastructure does not currently exist to allow a helicopter drop via DCAs as an emergency measure, it may be well worth while for the Bank of England to plan ahead with a view to being able to use the policy in the future. The potential effectiveness of helicopter drops alone may justify the time and expense required to build the infrastructure for DCAs.

23 The need to build this technology infrastructure for a centralized digital cash system will be one of the factors driving the Bank of England's interest in the decentralized 'distributed ledger' technology used by Bitcoin.

3. ISSUES & CHALLENGES

3.1 Implications of Having Two Competing Currencies

With the introduction of digital cash issued by the central bank, we would have two 'competing' forms of electronic money: bank deposits, and digital cash issued by the central bank. These two forms of electronic money would be near equivalents, or in economic terms, almost "perfect substitutes", and would effectively be in competition. This would create some interesting dynamics, both in normal times and during a financial crisis or panic.

Why Digital Cash and Bank Deposits are in Competition

Digital cash and bank deposits would be equivalents in a way that bank deposits and physical cash never were. Both digital cash and bank deposits would be connected to the electronic payment system and so could be spent electronically. The choice for the consumer would no longer be between holding physical cash or electronic deposits, but between holding physical cash, electronic money issued by banks (deposits), or electronic money issued by the Bank of England (digital cash).

One of the key differences between these two different forms of electronic money is that one (bank deposits) has credit risk above the level of the government guarantee (currently £75,000 in the UK; €100,000 in Europe). This means that for those with larger sums of money to store, or businesses and corporates that are not covered by the guarantee, digital cash may be appealing, as it would be completely risk free[24] regardless of the amount held. Likewise, there is always the fear that, in the event of a future crisis, governments may find ways to 'bail in' depositors, thereby failing to honour the deposit guarantees; this fear again would make digital cash appealing to a certain group of cautious depositors.

Implications in Normal Times

In the absence of a financial panic (addressed below) there should be no significant implications of having two competing currencies, either for the central bank's management of the supply of reserves (and the interbank interest rate), or for the commercial banks' liquidity management.

From the central bank's perspective, as discussed in **Appendix 3**, Quantitative Easing has meant that there are currently far more reserves in the interbank system than are needed to settle daily payments. There is scope for a significant flow (e.g. up to £250bn) of funds from bank deposit accounts to Digital Cash Accounts before the Bank of England would even need to pay attention to the supply of reserves in the interbank market. If we eventually reach a situation where there is a shortage of reserves, meaning that interbank interest rates rise above the Bank of England's target, then the Bank can inject reserves by its conventional measures (using repos to 'buy' bonds from banks in exchange for reserves).

Net flows in the opposite direction – from DCAs to banks – may inject excessive reserves into the interbank market, causing the interbank interest rate to fall below the Bank's

24 The term 'risk free' used in the context of liabilities of the state assumes that there is no possibility of the state itself collapsing.

target rate. In this case, the Bank of England can 'sell' bonds to the market, in exchange for reserves (which would be destroyed) by reversing existing repos or issuing new 'reverse repos'.

Since both of these actions are conventional central bank operations, there are no major issues in normal times with moderate net payment flows between banks and DCAs and vice versa.

From the perspective of an individual bank, a net payment flow from itself to DCA accounts results in an exactly equal loss of assets (central bank reserves) and liabilities (bank deposits). This shrinks the bank's balance sheet, but has no impact on equity or capital adequacy requirements (since equity remains the same, and reserves have a risk-weighting of zero and therefore aren't considered in the calculation of Basel capital requirements).

However, the flow from bank deposits to DCAs does reduce the bank's liquidity ratio. A simplified example will make this clear. A bank will typically have reserves equivalent to only a fraction of customer deposits. At a simple level, liquidity could be measured as a ratio between the bank's reserves (which it can use to make payments to other banks) and its demand deposits (which enable customers to require banks to make payments immediately or at very short notice).

Imagine that a bank has £200 of reserves, and £500 of customer deposits. This would be an unrealistically high level of liquidity, at 40% (£200/£500). If the bank's customers transfer £100 to their Digital Cash Accounts, then the bank must pay £100 of reserves to the DCAs. The bank would then have £100 in reserves, and £400 in customer deposits, a liquidity ratio of 25%. If customers transfer a further £80 of deposits to DCAs, the bank would then have to pay away another £80 of reserves. The bank would then have reserves of £20, and deposits of £320 – a liquidity ratio of just over 6%. This simplified example shows that larger flows from deposit accounts to DCAs could significantly affect the liquidity ratios of individual commercial banks. And if this flow pattern is the same across other banks, then the liquidity of the whole commercial banking sector falls.

In practice, the Bank of England can always address any shortage of liquidity. Initially, as described above, it can deal with a shortage of reserves by buying bonds from the commercial banks in exchange for newly created reserves. Problems may arise, however, in a panic situation, which will be considered below.

Implications in a Financial Crisis

Imagine a rumour starts about the health of a bank and the bank's account customers want to withdraw their money as soon as possible. When this happened to Northern Rock (a UK bank) in 2007, customers had only two ways to withdraw their money from Northern Rock: they could either request physical cash, or request a bank transfer to another bank. Withdrawing physical cash is problematic, since many bank accounts have limitations on how much cash each customer can withdraw on any particular day (£300 a day from many ATMs, and slightly more from branches). There is also the concern that cash stored at home is inconvenient and may be unsafe. Consequently, in the case of Northern Rock, most people withdrew their funds via electronic transfer to the bank they assumed was safest.

However, the choice changes significantly with the existence of Digital Cash Accounts. In a similar panic, customers withdrawing funds from a bank would have two choices. They could take a guess at which bank they think is sufficiently safe, with the chance that they will get it wrong, choose a bank that subsequently fails, and face either losses or a long wait to regain access to their funds. Alternatively, they could transfer funds to a Digital Cash Account, secure in the knowledge that those funds are 100% risk free, connected to the electronic payment system, and available to spend electronically at any time.

The fact that Digital Cash Accounts offer the safety of physical cash and the convenience of bank deposit accounts means that runs on commercial banks could be faster and deeper when there is a concern about the health of a bank. It is conceivable that even in a minor panic, more people will say "I'll just move my money across to a Digital Cash Account for the next few weeks until this settles down, and then move it back to the bank again if everything turns out to be fine." In other words, the existence of digital cash may exacerbate bank runs.

This risk could be used to argue that the Bank of England should not introduce digital cash. But such an argument would be hard to support. It is true that whenever confidence in the economy falls, those holding risky assets often want to switch to holding safer assets. This is why stock prices rise in an economic boom and then often fall rapidly as people sell stocks and switch to holding bonds or bank deposits. But any argument against the Bank of England issuing digital cash on the basis that it would exacerbate the shift from potentially risky bank deposits to safer digital cash, is logically the same as arguing that the state should not issue government bonds because it provides a safe asset for investors in stocks and corporate bonds to switch to, thereby exacerbating instability in the stock market. It is also equivalent to arguing that deposit insurance on bank deposits makes the system less safe because, by making bank deposits a safe asset, it encourages stock and bond investors to switch back to them in times of uncertainty. So we see no logically coherent argument against issuing digital cash on these grounds. The risk undoubtedly needs to be managed, but it is not an argument to abandon the idea of digital cash.

What would be the impact on individual banks of a run from bank deposits to digital cash? As discussed above, net flows from bank deposits to DCAs would reduce the liquidity ratios of individual banks and the banking system as a whole. Any resulting shortage of reserves could easily be addressed by the Bank of England issuing additional central bank reserves to banks (in exchange for government bonds). However, if the run was severe enough that it depleted the banks' holdings of both reserves and bonds, there would be two options. Firstly, the banks could sell off other assets in order to acquire reserves from other banks. This would be unlikely to be successful, though: in a panic, and particularly if all banks were trying to sell assets at the same time, then the sale price would be below the fair value or book value of the assets, and this would reduce the bank's equity and bring it closer to insolvency. Secondly, the Bank of England could offer to buy a wider range of assets, such as corporate bonds and even packages of mortgage securities, in exchange for newly created reserves. But if the flow of funds to DCAs was so significant that we reached this point, it would suggest a deeper insolvency crisis, rather than a short-term liquidity crisis, and it would be much more fundamental problems in the banking system, rather than the existence of digital cash, which was to blame.

Would Non-Residents Use Transaction Accounts to Hold Digital Cash in a Flight to Safety?

In the discussion above, we have only looked at the context within the UK. However, even if the UK financial and banking system is stable, at any point in time there is likely to be a panic or uncertainty in at least one country around the world. For example, during the peak of uncertainty around the safety of Greek banks, there were significant withdrawals of cash and significant transfers of euros to banks outside of Greece. In similar situations, the possibility of holding money directly at the Bank of England, along with the current trust in sterling as a safe currency, could mean that in future non-residents would want to use sterling Digital Cash Accounts as a safe asset or safe haven currency when there is a panic in their own country.

This could plausibly lead to large flows of funds from foreign banks into sterling DCAs. If these flows were large enough they would have the effect of pushing up exchange rates – making life harder for exporters, but lowering the cost of imports, and therefore worsening the trade balance.

Further research would be needed to identify what level of 'safe haven' flows would be sufficient to cause problems with the exchange rate. However, if this is a serious risk, then a simple preventative measure may be to restrict DCAs to UK-resident individuals and businesses.

3.2 Implications for Banks and the Supply of Credit

In the Bank of England's *One Bank Research Agenda,* the following key research question is asked:

> "If transactions balances could migrate to digital currency, how would banks compete? Would there be any implications for the availability of credit?" (Bank of England, 2015)

We address these two issues below.

How would Banks Compete?

Until now, banks have had an effective monopoly on payment services. Members of the public have had a choice of making payments in physical cash, or making electronic payments using bank deposits. Institutions such as Electronic Money Issuers (EMIs), that offer electronic payments facilities using financial instruments other than bank deposits, are starting to enter the market. However, as discussed earlier in this paper, the fact that the Bank of England restricts access to reserves to banks, building societies and a small number of non-bank financial institutions makes it very difficult, if not commercially impossible, for new entrants who wish to provide payment accounts to compete with the incumbent banks.

Consequently, banks have until now had very little competition for the provision of current/checking accounts. This would change if the Bank of England started issuing digital cash via the Indirect Access approach outlined above. Banks would then need to compete with Digital Cash Account Providers to provide the best payment services to customers.

There are of course inherent differences in the services provided by these two different types of firm. Because banks use their deposits to 'fund' revenue-earning assets (such as loans), they would be able to pay interest on account balances, unlike DCA Providers, who would be required to store all customer funds at the central bank. (Of course, if interest rates offered on many current accounts remain at or close to zero, as at present, this may not be a significant loss to most depositors.)

DCA Providers would also need to charge account fees, either monthly or per transaction, to cover their costs. In contrast, it appears that for the time being at least, the large banks would continue to offer current accounts 'free if in credit' (recouping their costs from overdraft fees, unexpected charges and net interest income from the loans they make). So on the surface, Digital Cash Accounts might appear to be more expensive than bank deposit accounts.

However, bank deposit accounts will be inherently riskier. Funds over £75,000 are not guaranteed, whilst larger firms and non-bank financial institutions have no protection at all. Even for those depositors who fall within the £75,000 government guarantee, there will be those who would prefer the idea of holding a form of digital cash than entrusting their funds to a bank. In addition, non-bank DCA Providers may be able to provide a more user-friendly service overall, given that they would start with modern technology and no legacy systems to limit their innovation.

This competition challenge to banks is unlikely to be fatal, although they may lose some customers and deposits as a certain number of people switch to using DCAs as their primary account. However, it would be the first time that the banking sector as a whole has had true competition for the provision of payment services (current and checking accounts).

Implications for Credit

The existence of DCAs would have no immediate impact on the *demand* for credit. As discussed earlier, since DCA Providers would have to hold all of their customers' funds in full at the Bank of England, they would be unable to lend these funds. Consequently, DCA Providers would not be able to use these to fund any form of loans or alternative source of credit. Institutions such as DCA Providers wishing to provide digital cash credit facilities would need to fund these with loans of digital cash borrowed from their customers or the customers of other DCA Providers specifically for the purpose. (This would need to be covered by a separate regulatory framework.) In time, therefore, there could emerge an alternative source of credit, operating on similar lines to mutual building societies or credit unions, but using digital cash rather than bank deposits as the sources of funding. This would not necessarily lead to an increased demand for credit overall, but would affect the demand for bank credit specifically.

Would the existence of digital cash have an impact on the *supply* of credit? Capital requirements are one of the few factors that have a limiting effect on bank lending. However, since reserves are zero-weighted for the purpose of calculating capital requirements, movements from bank deposit accounts to DCAs would make no difference to the bank's required or actual capital. Therefore, the introduction of digital cash would have no impact via capital requirements on banks' ability to supply credit.

It would also be unlikely that there would be any impact on banks' ability to provide credit as a result of reserves (digital cash) moving from banks to DCAs. Net payment flows from bank deposit accounts to DCAs would have the effect of withdrawing or 'draining' reserves from the banking system. Economists who subscribe to the 'multiplier model' explanation of money creation would be likely to assume that this would limit the lending multiplier and so limit the level of credit. In reality, the level of money creation by banks is not limited by the amount of reserves held by the banks, as discussed in detail in Ryan-Collins *et al.* (2011) but by the availability of loss-absorbing capital. In any case, as discussed earlier, if the flow of funds from banks to DCAs led to a significant shortage of reserves in the interbank system (making it difficult for banks to settle their payments to each other) then the central bank could easily inject more (new) reserves into the interbank system to offset this.

However, there is potentially one way that the introduction of digital cash may make banks less willing or able to lend. When banks lend today, they do so by creating new deposit liabilities (i.e. bank deposits which function as money). In effect, they can issue loans by creating money. Every loan results in some reserves flowing to other banks as the borrower spends their borrowed money. However, since all banks are doing the same, reserves are also flowing in the opposite direction, back to the lending bank. Normally, if a loan of £100 is issued, a bank will know that in net, it only needs to pay a fraction of that amount in reserves to other banks.

However, if the borrower makes a payment to a DCA, then the bank will need to transfer the full value of the payment in reserves to the DCA. As DCAs become more popular, it may be the case that the ratio between the value of the loan and the amount of reserves that actually must be paid by the bank becomes closer to 100%.

Of course, at the same time, there would be DCA holders who choose to invest their digital cash by making transfers to a savings account at a bank, and recipients of digital

cash payments who prefer to hold their money in the form of bank deposits. Banks are free to compete for these funds and would tempt DCA holders to transfer their digital cash to banks for them to hold in the form of reserves. This would offset the payments to DCAs.

Banks may initially err on the side of caution in arranging funding for payments consequential on new lending, and this would increase the cost to banks of extending loans, and therefore the charges levied by banks for credit facilities. Familiarity with usage would need to be acquired, but eventually bank lending should be unimpaired by the existence of digital cash, although the cost of bank credit may increase slightly.

What is important is the net effect. Should there be a significant shift from people using deposit accounts to DCAs over time, banks will find that for a loan of a certain size, they must pay away a greater percentage of reserves. This may result in banks needing to borrow back reserves equivalent to a greater percentage of the loans issued, in effect raising the funding cost to the bank of issuing a loan. This may have some effect on the bank's willingness to issue loans and extend credit, although the effect is very difficult to quantify, and is likely to be negligible compared to other factors affecting bank lending (such as capital requirements, regulation, and banks' confidence in the future health of the economy).

In principle, therefore, the supply of credit from banks should be unaffected by the availability of digital cash, although, as deposits are transferred to digital cash accounts, an increasing proportion of bank loans would need to be funded by loans from the money markets and therefore the cost of credit would slightly increase. With the possibility of credit becoming available from digital cash lenders alongside the continuing availability of bank credit, the supply of credit under a digital cash system may actually increase.

3.3 Should Digital Cash Be Remunerated?

A final issue relates to the impact of the issuance of digital cash on the central bank's balance sheet. Digital cash would simply be a form of central bank reserves that could be held by the public. Reserves (held by banks) show up on the Bank of England's balance sheet as liabilities of the Bank, and so would digital cash (held by the public). But the central bank currently pays interest at the 'Bank Rate' on the reserves that it issues; remunerating reserves is currently crucial for monetary policy as it sets the floor to the rates at which banks will lend to each other.

The question then is whether the Bank of England should also pay interest on digital cash / reserves that are held in DCAs. As the Bank of England asks in its *One Bank Research Agenda:*

> "Should central bank issued digital currency balances be remunerated and if so, should remuneration be linked to the official monetary policy interest rate? How would the monetary policy transmission mechanism then be affected?" (Bank of England, 2015)

If digital cash were not to be remunerated, but central bank reserves (i.e. digital cash held by banks) continued to be, then this would give preferential treatment to the existing banks. Interest on reserves held by banks delivers a risk-free income to the banks, which helps in a small way to cover the cost of providing payment accounts. If digital cash were not to be remunerated, then DCA Providers would not receive the same benefit. This preferential treatment seems hard to justify.

However, remunerating digital cash would create a number of significant problems. These problems lead us to recommend that digital cash should *not* be remunerated at any rate.

The first of these problems is the impact on government finances. Should the Bank of England choose to issue digital cash proactively, then the asset balancing digital cash would be zero-coupon (i.e. non-interest bearing) government bonds (as explained in Part 2). However, the digital cash would be an interest-bearing liability, with interest paid at Bank Rate. This interest would have to come either from the Bank of England's revenues from its other activities, or from the Treasury (and therefore from tax revenue or further borrowing). Since the public are currently willing to hold physical cash even though it pays no interest, there seems to be no justification for paying interest on digital cash given the significant expense this would impose on the government.

A second problem is that remunerating digital cash would have the effect of setting a floor to the rate of interest paid on all bank deposits. Since the Bank Rate is widely known, DCA holders would be aware that their DCA Provider is earning interest on the funds in their account. There would be strong pressure for DCA Providers to pass on this interest revenue in full to their customers (and those who don't would find themselves losing customers to those who do). But because bank deposits and digital cash would be such close substitutes for one another, holders of bank deposits would have an incentive to switch their funds to DCAs whenever the Bank Rate was above the rate paid on deposits paid by banks. (Strictly speaking, the fees charged on DCAs would mean that bank deposit rates could still be slightly below the Bank Rate.) Such a flow of funds from banks to DCAs could cause liquidity problems for the banks, forcing them to raise deposit rates to match the Bank Rate in order to stop the flow.

Consequently, the rate paid on digital cash would set the floor for the rates paid by banks on bank deposits. The Bank Rate is currently intended to influence the rates banks pay to borrow central bank reserves; these reserves make up a small part of each commercial bank's balance sheet, and so the Bank Rate currently affects a small proportion of commercial banks' liabilities. Bank deposits, on the other hand, make up a very significant part of a commercial bank's liabilities, often over half of the balance sheet. By remunerating digital cash at the Bank Rate, the Bank of England would inadvertently set the minimum rate that banks are able to pay on bank deposits, and therefore affect the cost of a much larger part of each bank's liabilities. This turns the Bank Rate into a very different tool, which may have unintended consequences or simply be unmanageable.

Consequently, we strongly recommend that digital cash should not be remunerated at any rate. This is of course unfortunate for DCA Providers, who do not benefit from the risk-free income that banks receive on their reserve holdings. However, this disadvantage could be countered by giving DCA Providers a much simpler and less burdensome regulatory regime, lower barriers to entry, or even by waiving any costs that would be charged to DCAs to use Bank of England payment services.

APPENDICES

Appendix 1: Challenges of Implementing Helicopter Money in the Current System

Implementing helicopter money in the current system (without digital cash issued by the Bank of England) is problematic. Printing physical cash and manually distributing it to citizens is impractical and unfeasible. So a similar approach to QE must be taken, whereby the Bank of England would create new reserves, which would be credited to the reserve accounts of commercial banks, and those commercial banks would simultaneously create new bank deposits in the accounts of their customers.

An example will make this process clearer. Imagine that, in the middle of a recession, the Bank of England's Monetary Policy Committee surveyed the economy and realised that the high level of household debt, and low level of business confidence, meant that simply lowering interest rates would not be sufficient to increase borrowing (so increasing money creation by the banks) in order to boost spending and aggregate demand. Instead, they decide that the most effective way to boost demand would be to give every single citizen a one-off grant of £1,000, to use as they wish. Each citizen must provide details of one bank account into which the payment will be made. (We'll leave aside the logistical challenges of this process for now.) Suppose 10 million citizens nominate their current account at Royal Bank of Scotland (RBS). The Bank of England would credit RBS's reserve account with £10 billion (£1,000 x 10 million people) of newly created reserves, and RBS would credit each of those 10 million deposit accounts with £1,000 of newly created deposits. The process would therefore create £10 billion of new deposits in the hands of the public, which they could spend.

Note that this process would not improve the financial position of RBS in any way: both its assets (the reserve account at the Bank of England) and its liabilities (the 10 million deposit accounts) would have increased by the same amount, so RBS's net worth would be unchanged.

However, the problems that would arise are as follows:

1. Currently, the Bank of England pays interest to banks on the central bank reserves they hold (reserves are 'remunerated'). Whilst this is currently only at 0.5%, it is expected that rates will rise in the future. Meanwhile, banks (in the UK at least) are currently paying 0% or close to zero percent interest on deposits. This would mean that, as a result of helicopter money in the current system, banks would acquire risk-free interest-bearing reserves (which they would not have had to borrow) and a corresponding amount of almost interest-free deposits. The interest they would earn on these reserves would therefore effectively be 'free money' for the banks, since they would not have had to take any risk.

2. In addition, because reserves are remunerated, issuing helicopter money in the current system would incur an ongoing interest cost for the central bank, and in turn, for the government. This would mean that, from the perspective of government finances, helicopter money would have a similar cost to simply borrowing money through the markets by issuing bonds.

3. Should it be desirable to avoid paying interest on the reserves issued through helicopter money, then it would be necessary to find a way of differentiating interest-bearing and non-interest bearing reserves. While this could be done, it would complicate the reserves system.

The introduction of digital cash issued by the central bank would allow helicopter money to be implemented without creating these problems (assuming that no interest would be paid on digital cash).

Appendix 2: The Current Regulatory Regime For Payment Services Providers

Payments services providers are companies which receive money from clients for the purpose of making payments to third parties, or from third parties on behalf of clients. They must be registered with the Financial Conduct Authority (FCA), and must meet FCA requirements covering suitability of personnel and money-laundering regulations. If payments transactions volumes are to exceed €3 million per month they must also meet initial and ongoing requirements covering capital adequacy and procedures for the safeguarding of client money. These requirements are described in guidance notes issued by the Financial Conduct Authority[25].

Capital held by each payment services provider must be sufficient to absorb unexpected losses arising from the normal operation of the payments services activities of the company, plus those arising from a winding-up of the payments services activities of that company.

Authorised companies must always hold sufficient capital to meet the initial minimum requirement (which depends on the level of service they are authorised to supply) plus an ongoing requirement based on the level of their overheads, the volume of payments they process or their revenue. The choice of method for calculating ongoing capital adequacy is at the company's preference, but subject to agreement by the regulators. Payments services providers which are also Electronic Money Issuers are also required to hold a further capital buffer equal to 2% of the level outstanding of the electronic money which they have issued[26]. (There would be no requirement for a DCA Provider to hold capital against customer funds, since these funds would be held as risk-free digital cash in accounts at the Bank of England.)

Capital must be allocated to the payments services activities of the company or group, and ring-fenced from capital allocated to any other activities of that company or group. (If a DCA Provider were run by an existing bank, it would be necessary to ring-fence its operations from those of the rest of the bank.) The form in which capital is held (shareholders' equity, retained earnings etc.) must meet the requirements set out in the regulations.

Companies authorised to administer payments in excess of 3 million euros per month must safeguard the money they receive from clients for the purpose of making payments to third parties, or on behalf of clients through payments by third parties. This money must either be (a) covered by an insurance policy or bank guarantee from a third party institution or (b) 'safeguarded' by being separately accounted for in the company's internal accounting system and, if held overnight, by being held on deposit in a separate bank account, or invested in secure, low-risk assets held by an authorised custodian (basically government bonds or shares in mutual funds invested in government bonds). (DCA

25 See FCA's guidance on the Payment Services Directive.

26 See FCA guidance notes on the e-money approach.

Providers would have only one option for 'safeguarding' the funds: storing them in full in the form of digital cash at the Bank of England.)

Appendix 3: Managing the Stock of Central Bank Reserves in the Interbank Market with Digital Cash

Because of the operations of interbank settlement systems, the Bank of England may need to create additional digital cash as the Digital Cash Accounts became more popular, to avoid creating a shortage of reserves amongst conventional banks.

In the current system, when a bank's customer makes a payment to a customer of another bank, the payment is queued in a settlement system (such as BACS or Faster Payments), and at the end of a certain period, all the queued payments going in opposite directions are 'netted' against each other. Only the net difference between payments is actually 'settled', in the form of a payment of reserves from one bank to another. This means that if customers made £1000 of payments from say, Barclays to Lloyds, there would likely be anything between £900 and £1,100 in the opposite direction (from Lloyds to Barclays). Only the net difference, around £100, would have to be transferred between Barclays' and Lloyds' central bank reserve accounts. Whilst these numbers are for illustration only, the key point is that the payment flows of central bank reserves will always be a fraction of the total payment flows between customers in any period of time.

In contrast, a transfer from a conventional bank to a Digital Cash Account would require that the full amount be transferred in the form of central bank reserves. So, if Digital Cash Accounts are launched and the public choose to transfer and hold £10 billion from their deposit accounts to their digital cash accounts, then the banks in aggregate must transfer £10 billion of reserves from their own central bank reserve accounts to the digital cash accounts.

This would mean that net flows to Digital Cash Accounts could effectively drain central bank reserves (i.e. digital cash held by commercial banks) out of the interbank settlement system. The Quantitative Easing (QE) program of 2009-2012 has flooded the interbank settlement system with reserves, so that there are currently £316 billion[27] of reserves in the system. However, in the years before QE, the entire interbank settlement system operated smoothly on less than £30 billion of reserves. That implies that there is room for a flow of at least £250bn from bank deposits to digital cash accounts (and therefore a flow of £250 billion of reserves away from commercial bank reserve accounts into Digital Cash Accounts), before there is even the possibility of a shortage of reserves in the interbank system.

Assuming, however, either that QE was reversed (therefore destroying many of the reserves that it created), or that DCAs were extremely popular and saw a very significant shift of funds from commercial banks to DCA Providers, at some point a shortage of reserves would arise in the interbank system. The Bank of England would need to create new reserves to ensure that there are sufficient reserves for banks to settle their payments between each other, and so that the interest rate in the interbank market was in line with the Bank of England's target policy rate. It could do this through its normal open market operations, using repo transactions to create new reserves.

27 Bank of England Statistical Database, Series RPWB56A as of 28th October 2015.

Consequently, the Bank of England would not need to use any special measures to cope with a flow of funds from the commercial banks into Digital Cash Accounts. It could simply use its normal reserves policies.

Of course, any net flow of funds in the opposite direction – from digital cash accounts into bank deposits – would create a significant influx of reserves into the conventional banking system. This may also require offsetting action by the Bank of England to 'drain' (or destroy) some of those reserves, to avoid there being an excess of reserves and interest rates falling below the policy rate. Again, it could do this through its normal open market operations; no special measures would be required.

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