



INVESTIGATING THE POTENTIAL IMPACT OF A RETAIL UK CBDC ON CREDIT CREATION AND FINANCIAL STABILITY

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FOREWORD

The Bank of England (“the Bank”) and HM Treasury (“HMT”) are currently considering whether the introduction of a UK retail Central Bank Digital Currency (“CBDC”) would be beneficial for the UK economy and the continued integrity of pound sterling in light of increasing use of digital money. This decision could have a significant impact on the way that the UK’s financial system operates and the ways in which consumers and businesses make payments on a day-to-day basis.

While the Bank has not yet made a decision on whether to introduce a UK retail CBDC, it has proposed that the launch of a UK retail CBDC would be done in collaboration with the private sector. In light of this, UK Finance and our members considered how the private sector might be mobilised to contribute to the collective challenge that is faced by industry and regulators in considering this important and strategic decision for the UK’s financial ecosystem. As a result of this, we have worked with members throughout the first half of 2022 to understand how some of the key technical hurdles could be overcome by the market. Our members identified with us three areas that required particular investigation:

- The level of interoperability between a CBDC and other forms of money
- The potential commercial considerations of private firms offering CBDC services
- The impact of CBDC implementation on credit creation for the UK economy.

This paper is one of three reports developed with UK Finance members that helps to discuss these potential impacts of the issuance of a UK CBDC and reflects a synthesis of thought from our members, associates and other stakeholders. We encourage you to read the other reports in this series as they cover complementary implications of CBDC issuance for the UK economy.

UK Finance and its members remain in full support of the consideration by the Bank and HM Treasury of all work investigating the potential development of a CBDC for the UK market. The Bank and HM Treasury are currently considering the practical challenges of implementing and operating a UK retail CBDC, including the roles of the public and private sectors ahead of the proposed consultation in 2022 to help assess the case for a UK retail CBDC.

We firmly believe that this development process is a vital opportunity to cement the ability for public and private bodies to work collaboratively and openly to understand the risks, technical concerns, operational benefits and public policy objectives that are all essential to answer through the development of a UK CBDC proposal. A CBDC could deliver to the UK a step change in the way that businesses and consumers use financial services and break off the boundaries imposed by legacy infrastructure while ushering in a new generation of innovation for the ecosystem. It is essential that both public and private bodies work together to ensure the potential of a CBDC can deliver these benefits.

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1. EXECUTIVE SUMMARY

1.1. INTRODUCTION

One of the key concerns raised by our members in light of the investigation by the Bank of England (“the Bank”) and HM Treasury (“HMT”) of the issuance of a retail CBDC is the potential impact that this issuance could have on the ability of the financial industry to create credit for the benefit of the UK economy.

In this report, we aim to further explore the Bank’s illustrative scenario presented in the “New forms of digital money” discussion paper¹, in particular, the impact of a retail UK CBDC on credit creation and financial stability, thus, helping to enhance the understanding of the risks posed by a UK CBDC and to support identification of mitigants.

Mirroring the Bank’s paper, our main analysis is structured in the form of an impact pathway: we start with the demand for a CBDC, then consider an initial impact on commercial banks, their potential response measure options (including lending reduction) and the resultant impact on credit creation, in terms of lending volumes and rates, i.e. the availability and cost of credit. This analysis is provided in Section 3 of the report, along with an assessment of implications for financial stability. Potential impact on the wider economy is discussed in Section 4.

We use a simplified illustrative bank model to demonstrate the mechanics of impact and highlight relevant parameters (including balance sheet and profitability metrics) from the perspective of an individual firm, supplementing this view with industry-level and business model considerations. However, we do not aim to arrive at a precise quantitative estimate of impact on credit creation, rather providing an illustration of the key considerations that should be taken into account and how the outcomes of our analysis compare to the Bank’s analysis under different scenarios. Furthermore, we expect these outcomes to evolve through the future, more nuanced, specification of the objectives, function, design and benefits of a CBDC by the Bank and HMT.

Any assessment of the impact of a CBDC on credit creation has to be undertaken in light of the wider state of the UK financial system.

Given that an issuance of a CBDC would represent a structural change for the system and wider economy, the implications of a CBDC need to be considered under the conditions of a future steady state. From this perspective, the current funding and liquidity position of the commercial bank sector is not representative, as we expect this position to be impacted by Quantitative Tightening (“QT”) and TFSME² repayment. We explore this further in Section 2.2. In our analysis, we assume that the loss of deposit funding to CBDC could not be in part accommodated by surplus liquidity.

1.2. CONCLUSIONS

Following our analysis, we are concerned that the central estimate³ in the Bank’s illustrative scenario is potentially significantly understating the risks to credit creation and financial stability. Therefore, we would welcome an opportunity to work with the Bank to better understand the assumptions and the range of potential outcomes⁴, also taking into account further CBDC design choices.

In our investigation, we use the same starting point as the Bank’s illustrative scenario – in a steady state, c. 20% of household and corporate deposits migrate into a new form of digital money (assumed to be a CBDC for the purposes of this report). However, we reach a different outcome in terms of potential severity of impact on credit creation.

Our analysis concludes that a large-scale displacement of deposit funding from the banking sector and the resultant increase in the banks’ funding costs (when they are necessitated to fund themselves via wholesale markets, while remaining within their regulatory balance sheet metrics) is likely to lead to a substantial contraction in the provision of credit and/or an increase in the cost of credit. Furthermore, stress vulnerability of the banking sector is likely to increase materially, due to greater reliance on wholesale funding and lower stability of deposit funding (see Section 3.6).

Specifically, under option 2 of our analysis (which challenges the assumption that there are no constraints on the volume of replacement wholesale funding), lending volume for an individual illustrative credit

¹ <https://www.bankofengland.co.uk/paper/2021/new-forms-of-digital-money>. Whereas the Bank’s paper has a broader scope, our report explores implications of a retail CBDC specifically, as risks to credit creation and financial stability would likely be most pronounced for this instrument, though also applicable across a range of stablecoin models, depending on specific design choices.

² Term Funding Scheme with additional incentives for SMEs (<https://www.bankofengland.co.uk/markets/market-notice/2020/term-funding-scheme-market-notice-mar-2020>).

³ The Bank’s discussion paper acknowledges considerable uncertainty with regards to estimated impact and presents a sensitivity analysis for some of the key outcomes, including increases in lending rates (Chart 3.4. in the Bank’s illustrative scenario).

⁴ Building on the sensitivity analyses included in the Bank’s analysis and this report.

institution declines by c. 8% and lending rates increase by c. 70-110bps,⁵ before non-bank sector response. At an industry level, there would likely be very significant second-order impacts, as any reductions in lending would lead to further contraction of deposit balances in the system.

An increase in bank lending rates could provide an opportunity for non-banks to compete, partially mitigating the impact on credit provision. However, reliable data on the way in which the non-bank financial sector supplies credit to the wider economy is limited, making it difficult to estimate the degree to which non-banks would be able to step in and partially replace commercial bank lending. In particular, whether they can do so reliably in times of stress. Furthermore, greater reliance on market-based financing would likely expose credit conditions to short-term volatility in market sentiment.

In contrast, the Bank's illustrative scenario determined that the impact of a CBDC adoption on credit creation will likely be manageable, with a modest increase in bank lending rates of 20bps⁶ before non-bank sector response. In the Bank's discussion paper, higher bank lending rates increase the scope for non-banks to compete in providing credit to the wider economy, though there is limited visibility of the underlying assumptions. Thus, the overall impact is a 1% fall in lending volumes and a modest increase in lending rates after the non-bank sector response. A 1% reduction represents borrowers that are unable to afford bank credit and are either unable or unwilling to access credit from alternative sources in the non-bank financial sector.

The differences in this main conclusion are likely due to the divergent assumptions forming the basis of preparation. Specifically, constraints on the volume of replacement wholesale funding (including for various business models), factors behind the delta in funding costs and, by extension, lending rates (including the asset price spill-over effect assumed by the Bank) and the non-bank sector response. These assumptions, as well as other aspects that could form the basis for further investigative work, are set out in Sections 3.8 and 3.9.

We also consider how the impact of a CBDC issuance could differ between market participants whose business models, balance sheets or statutory responsibilities prevent them from operating as the Bank presumes under their illustrative scenario. For example, building societies have statutory limits on the amount of wholesale funding they can use, as set out in the Building Societies Act. If smaller building societies have no option but to cut lending, industry-level credit provision would likely be further depressed or these business could be crowded out of the market. We discuss these business model considerations in Section 3.5.

1.3. RECOMMENDATIONS

As noted above, the significant difference in the main conclusion of the Bank's illustrative scenario and the analysis of this paper is likely due to divergent assumptions forming the basis of preparation.

In our response to the Bank's discussion paper on the "New forms of digital money", we highlighted the need for the industry and the Bank to collaborate on a joint modelling approach to understand the key assumptions, potential mitigants and the range of possible outcomes. We believe that the analysis presented in this report demonstrates even

more compellingly the case for a coordinated, transparent and public investigation into the implications of a retail CBDC for the UK economy, also taking into account the variable CBDC design choices (including limits and remuneration).

In particular, we recommend establishing a mechanism for joint public/private modelling exercises, with a view to helping achieve an optimal outcome of delivering the benefits of a retail UK CBDC without incurring excessive risk. The conclusions of this joint modelling exercise should inform the consideration of the design choices by the Bank and HMT in the exploration of a potential UK retail CBDC.

It is essential that the issuance of a retail UK CBDC is beneficial for the UK economy, does not result in significant detriment to either consumers or businesses and can continue supporting the ability of the UK economy to transact with a shared confidence in the value of GBP, whether that be in the form of Bank of England bank notes, Royal Mint coins, commercial bank money or a CBDC.

Our analysis has highlighted a number of areas for further investigation, potentially as part of the aforementioned joint public/private modelling exercises, including:

- The ability of wholesale funding markets to sustainably absorb the material increase in supply of bank debt (required to replace deposit funding lost to CBDC and with a view to restoring liquidity position and maintaining lending volume), including analysis of impacts on credit ratings and asset encumbrance;
- Further micro-level analysis (to complement the Bank's top-down view), in particular, impacts of a CBDC on different segments within the banking industry and resultant implications for credit creation and financial stability;
- The ability of the non-bank financial sector to provide an alternative form of credit to the wider economy, and whether the sector can do so reliably in a stress;
- The structural impact on the commercial banks' liquidity positions as the monetary policy backdrop normalises;
- Potential mechanisms that the Bank might utilise to redistribute the funds that a CBDC would displace from the banking sector and to support wider credit creation;
- Potential controls that could be deployed to mitigate the impact of a retail CBDC on credit creation, including an investigation of the feasibility of these controls in the context of the policy objectives of the Bank and HMT with respect to issuance of a CBDC;
- A comprehensive sensitivity analysis considering a range of potential outcomes for different assumptions with respect to CBDC take-up, wholesale funding market capacity and non-bank sector response.

⁵ These figures represent a first-order impact at the level of an individual firm. From an industry-level perspective, there would likely be material second-order impacts, as lending reduction by an individual credit institution would lead to a further contraction of deposit balances in the system.

⁶ In acknowledgement of uncertainty, this central estimate is supplemented by a sensitivity analysis, highlighting that an increase in lending rates could be as high as 80bps (Chart 3.4. in the Bank's illustrative scenario).

2. CURRENT STATE

2.1. BACKGROUND

Under the current fiat money currency system, money⁷ exists in three main forms:

- Central bank notes⁸ (cash);
- Central bank liabilities (mainly commercial bank reserves); and
- Commercial bank liabilities (deposits) (c. 97% of M4)⁹; only a fraction of these deposits is backed by HQLA, with remainder effectively backed by loans and other assets.

Moving money between these different forms will have a corresponding impact on the liabilities of entities involved in the creation of credit for the UK economy. The majority of such credit is supplied within the UK from banks in the financial sector and current regulatory structures enable authorised institutions to generate credit from deposits held by their customers.

Banks are highly-regulated entities and work within strict guidelines and associated balance sheet guardrails. Prudential authorities have set these requirements to ensure appropriate financial resources are held to cover both financial and non-financial risks. The balance sheet resources generally manifest themselves in five main forms being: capital, liquidity, funding, leverage and encumbrance. Banks are structurally exposed to both balance sheet and cash flow insolvency risks,¹⁰ with the latter being more relevant for this analysis. Banks form the link between central bank money and deposit-based liabilities. If CBDC design choices are made without sufficient analysis of their impact, this could lead to an increased financial stability risk associated with the embedded financial maturity mismatch within bank balance sheets.

The mitigations to the above risks are generally measured through the Basel III global regulatory standardised metrics such as the Liquidity Coverage Ratio (“LCR”) and the Net Stable Funding Ratio (“NSFR”), alongside internal versions of these metrics, mainly designed to ensure the banks do not breach regulatory buffers required by the metrics under a range of idiosyncratic and market-based stresses.

The LCR is defined below (simplified):

$$LCR = \frac{\text{High Quality Liquid Assets (HQLA)}}{\text{Outflows - Inflows}} \geq 100\%$$

It is a 30-day forward-looking stress test that banks have to pass at >100% each day, however there are “add-ons” that mean banks in reality run positions of c. 120%-150% to ensure both regulatory compliance and the general confidence of their depositors and investors.

The NSFR is defined as (simplified):

$$NSFR = \frac{\text{Available Stable Funding (Liability concept)}}{\text{Required Stable Funding (Asset concept)}} \geq 100\%$$

This ratio also needs to be >100%. This is a longer-dated metric of greater than 1 year.

As market confidence is increasingly important for financial institutions, banks will only lend money and create credit if they are comfortable that these metrics are manageable and are not subject to excessive change (alongside linked requirements associated with capital metrics). This will likely be a function of both behaviour of the liabilities overlaid with the way these regulatory metrics treat these deposits.

2.2. MACRO AND MONETARY ENVIRONMENT

As the introduction of a CBDC would be a structural change for the UK’s financial industry and wider economy, its implications for credit creation need to be considered in a steady state. From this perspective, the current liquidity and funding positions of the commercial banks are not representative, as they are driven by the combination of exceptional monetary (Quantitative Easing, “QE”) and fiscal (government deficit) conditions. The Bank’s 2021 balance sheet stood at over £900bn¹¹ compared to the 2014 level of c. £400bn.¹²

⁷ As a stable store of value, unit of account and medium of exchange.

⁸ Noting that, in the UK, coins are minted by The Royal Mint on behalf of HM Treasury.

⁹ Bank of England Statistics, 30 June 2022 LPQAUYN, LPQB3SF, LPQVQJO, LPQVRGP

¹⁰ Alongside other market risks, such as maturity mismatch.

¹¹ RPQB75A, 31 March 2021, £952,316m

¹² RPQB75A, 31 March 2014, £403,564m

Currently ample liquidity positions could be used to argue that an issuance of a CBDC and associated displacement of deposit funding from the commercial bank sector could in part be accommodated by surplus liquidity, cushioning the potential impact on credit creation¹³. However, in the future steady state, we expect these positions to be significantly impacted by Quantitative Tightening (“QT”) and TFSME¹⁴ repayment. Thus, as QE unwinds, aggregate deposits will contract, reducing liquidity surpluses.

In Section 3, our main analysis of impact of a CBDC on credit creation reflects the eventual steady state (post QT and post CBDC) via a simplifying assumption that the banks would be seeking to maintain their current liquidity positions, i.e. we do not assume that the loss of deposit funding to CBDC could in part be accommodated by surplus liquidity.

¹³ For example, Chart 4.1 in the Bank’s discussion paper compares current liquidity positions of UK banks and drawing capacity with the Banks versus uninsured deposit balances. This chart appears to be making a simplifying assumption that surplus liquidity is measured with respect to Pillar 1 LCR requirements. In reality, banks are unlikely to be comfortable operating at 100% Pillar 1 LCR in business-as-usual conditions, due to such factors as Pillar 2 requirements and management buffers.

¹⁴ Term Funding Scheme with additional incentives for SMEs (<https://www.bankofengland.co.uk/markets/market-notices/2020/term-funding-scheme-market-notice-mar-2020>).

3. ANALYSIS OF IMPACT ON CREDIT CREATION

As noted in Section 1, this report is aiming to assist the Bank by exploring further the potential impact of a UK CBDC on credit creation and financial stability, thus, helping to enhance the understanding of the risks posed by a UK CBDC.

In this chapter, our analysis is structured in the form of an impact pathway with a view to assessing the implications of a CBDC issuance for credit creation, in terms of lending volumes and rates:

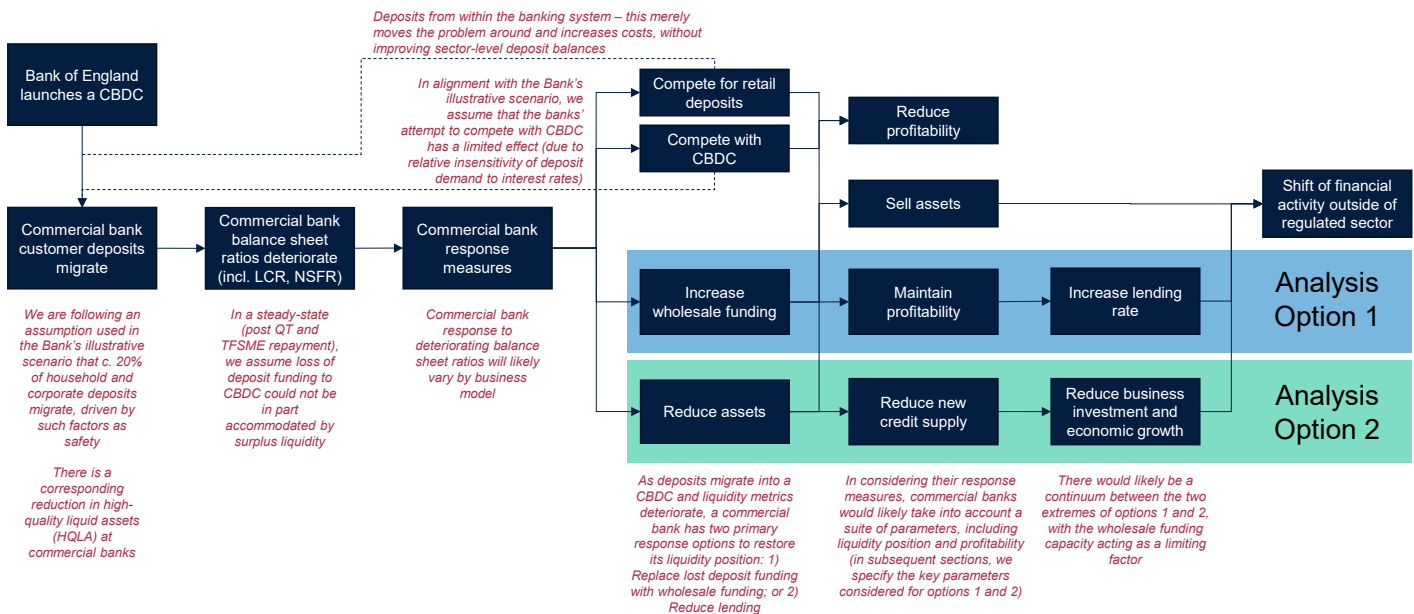
- Starting with the demand for a CBDC – we follow an assumption used in the Bank’s illustrative scenario that c. 20% of household and corporate deposits migrate (Section 3.1);
- We then assess the initial impact on commercial banks – a deterioration in balance sheet ratios (Section 3.2);
- We then consider an individual firm’s primary response measures – replacing lost deposits with wholesale funding or reducing lending (Section 3.3), and assess the potential implications of these measures for credit creation (Sections 3.4 and 3.5), including business model considerations;
- We then set out the potential impacts on financial stability and the implications for credit creation in periods of stress (Section 3.6), and consider a sensitivity of outcomes to the proportion of deposits migrating into CBDC (Section 3.7);
- We conclude with a summary of likely sources of differences vs. the Bank’s illustrative scenario and recommended areas for further investigation (Sections 3.8 and 3.9).

We use a simplified illustrative model¹⁵ to demonstrate the mechanics of the impact on financial variables and highlight relevant parameters (including balance sheet and profitability metrics) from the perspective of an individual firm, supplementing this view with industry-level considerations. However, we are not aiming to arrive at a precise quantitative estimate of the impact on credit creation, rather an illustration of the key considerations that should be taken into account and how the outcomes compare directionally to the Bank’s analysis under different scenarios.

As noted in Section 2.2, given that an issuance of a CBDC would be a structural change, the implications of a CBDC for credit creation need to be considered in a steady state. From this perspective, the current liquidity position of the commercial bank sector is not representative, as we expect this position to be impacted by QT implementation and TFSME repayment. Thus, in the below analysis, we assume that the loss of deposit funding to CBDC could not in part be accommodated by surplus liquidity and funding.

¹⁵ Informed by BIS report https://www.bis.org/pub/othp42_fin_stab.pdf

Figure 3 (a): An illustrative impact pathway: The pathway sets out the structure of our analysis and the key assumptions we have made at each point. Starting with the demand for a CBDC, we consider an initial impact on commercial banks (deterioration in balance sheet ratios), their potential response measures (including lending reduction) and the resultant impact on credit creation. The two alternative options explored within this paper are noted within the diagram below, other potential measures (non-exhaustive) are shown for completeness.



3.1. DEMAND FOR A CBDC

For greater comparability of impact pathways and outcomes, we are following an assumption used in the Bank's illustrative scenario that in a steady state c. 20% of household and corporate deposits migrate into a new form of digital money (for the purposes of this paper, we assume this form to be a CBDC). The Bank's assessment attributes this migration largely to non-financial factors, principally safety considerations.¹⁶

There remains considerable uncertainty regarding the anticipated scale of CBDC adoption which would have significant consequences for the impact on commercial banks' balance sheets and credit creation. We note that the take-up and associated migration of deposits could be much higher than 20% (e.g. due to network effects), were a CBDC to get traction (and in the absence of effective mitigants). On the other hand, if a CBDC fails to get traction, the impact could be minimal.

The scale of deposit migration will likely depend on the category of deposits a CBDC would be competing with, which in turn is impacted by the CBDC design choices (remuneration, holding limits, transaction limits, etc.). For example, it could compete with transactional deposits, uninsured balances or potentially savings accounts.

Further to the discussion by the Bank in their own paper, various CBDC adoption scenarios are investigated by the staff of other central banks. For example, a recent ECB occasional paper presented a detailed investigation, concluding that between 0.5% and 18% of aggregate euro area bank liabilities could migrate based on adoption limit decisions made by the ECB.¹⁷ Similarly, a staff paper from the Bank of Canada uses a range of scenarios between 10% and 40% of deposit migration.¹⁸ From a UK perspective, the illustrative scenario of the Bank of England is the initial basis for our further investigation. We illustrate some of the sensitivities to this assumption in Section 3.7 below.

Finally, as a CBDC would provide a safer alternative for depositors, one of the key risks is that it will increase the likelihood of deposit outflows in a crisis, increasing the vulnerability of the banking sector to stress. Not only does this pose a financial stability concern, but it also risks further constraining the supply of credit during periods of market stress. Financial stability considerations are discussed in Section 3.6 below.

¹⁶ Chart 3.2, <https://www.bankofengland.co.uk/paper/2021/new-forms-of-digital-money>

¹⁷ <https://www.ecb.europa.eu/pub/pdf/scpops/ecb.op293-652cf2blaa.en.pdf>; p. 6-13

¹⁸ <https://www.bankofcanada.ca/2022/05/staff-analytical-note-2022-5/>

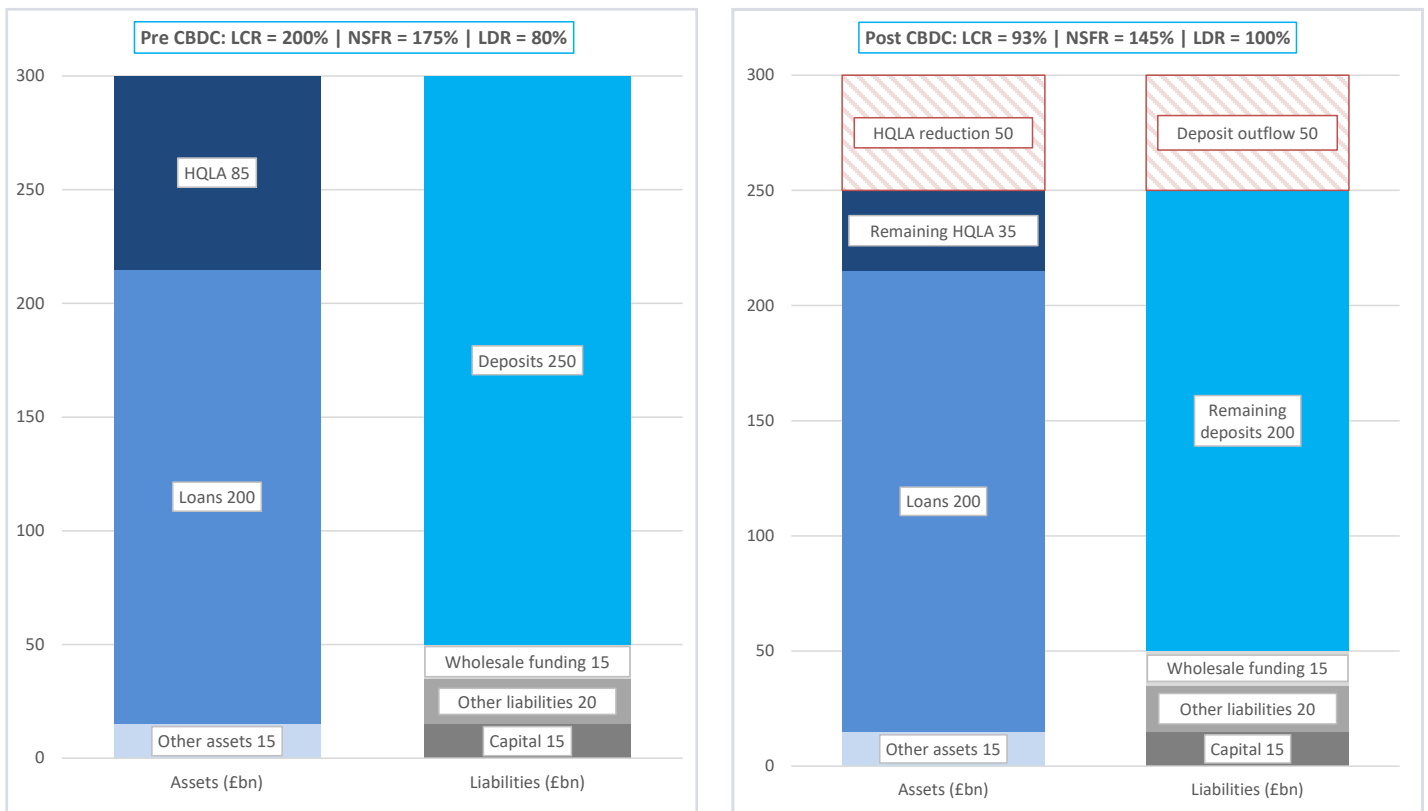
3.2. INITIAL IMPACT ON A COMMERCIAL BANK BALANCE SHEET, FUNDING AND LIQUIDITY POSITION

All else equal (and ahead of any response measures), as deposits migrate into a CBDC, high-quality liquid assets (“HQLA”) would decline. For an illustrative individual bank with £250bn in deposits, this would amount to £50bn. At an industry level, the equivalent quantum would be c. £400bn, as household and corporate deposits total c. £2,000bn¹⁹.

The initial outcome is a deterioration in a bank’s liquidity position and its ability to meet its regulatory liquidity requirements as measured by firms’ LCR) and NSFR, as well as an increase in its Loan-to-Deposit Ratio (“LDR”), assuming lending is maintained constant at this stage. This is illustrated in Figure 3.2 (a) below.

For a given bank, the ability to accommodate this initial impact would depend on such factors as the starting liquidity position (LCR/NSFR) and proportion of deposits in the funding stack.

Figure 3.2 (a): An illustrative balance sheet pre and post CBDC issuance: As 20% of deposits migrate (amounting to £50bn), there is a corresponding reduction in HQLA (£50bn), a deterioration in liquidity metrics (LCR / NSFR) and an increase in LDR. No other changes are assumed at this stage, specifically lending is maintained constant.



¹⁹ Money and Credit - April 2022 release gives M4 from households and Private Non-Financial Corporations (excluding OFCs) at £ 2,364.8bn in April 2022. We have rounded this result for ease of illustration.

3.3. A COMMERCIAL BANK'S RESPONSE – PRIMARY OPTIONS

As deposits migrate into a CBDC and liquidity metrics deteriorate, an individual commercial bank would have two primary market response options to restore its liquidity position:

- **Option 1:** Replace lost deposit funding with wholesale funding (see Figure 3.3 (a) below);
- **Option 2:** Reduce lending (see Figure 3.3 (b) below).

In actuality, there would likely be a continuum between the two extremes of options 1 and 2, as option 1 would work to the extent there is wholesale funding capacity. The implications of these options are set out in Sections 3.4 and 3.5, respectively, including an illustration of the aforementioned continuum.

In alignment with the Bank's scenario, we assume that the banking sector's attempt to compete for deposits migrating into a CBDC by offering higher rates has a limited effect, due to the noted relative insensitivity of deposit demand to interest rates. Section 5.3 considers central bank facilities as a non-market funding alternative.

Figure 3.3 (a): An illustrative balance sheet post CBDC implementation and post option 1: Lost deposit funding is replaced with wholesale funding, restoring the liquidity position and allowing to maintain lending volume, whilst LDR remains at an elevated level. Replacement funding is assumed to be in the form of long-term wholesale debt, resulting in a lower replacement HQLA requirement of £40bn (due to lower LCR outflow rate) and allowing to restore NSFR.

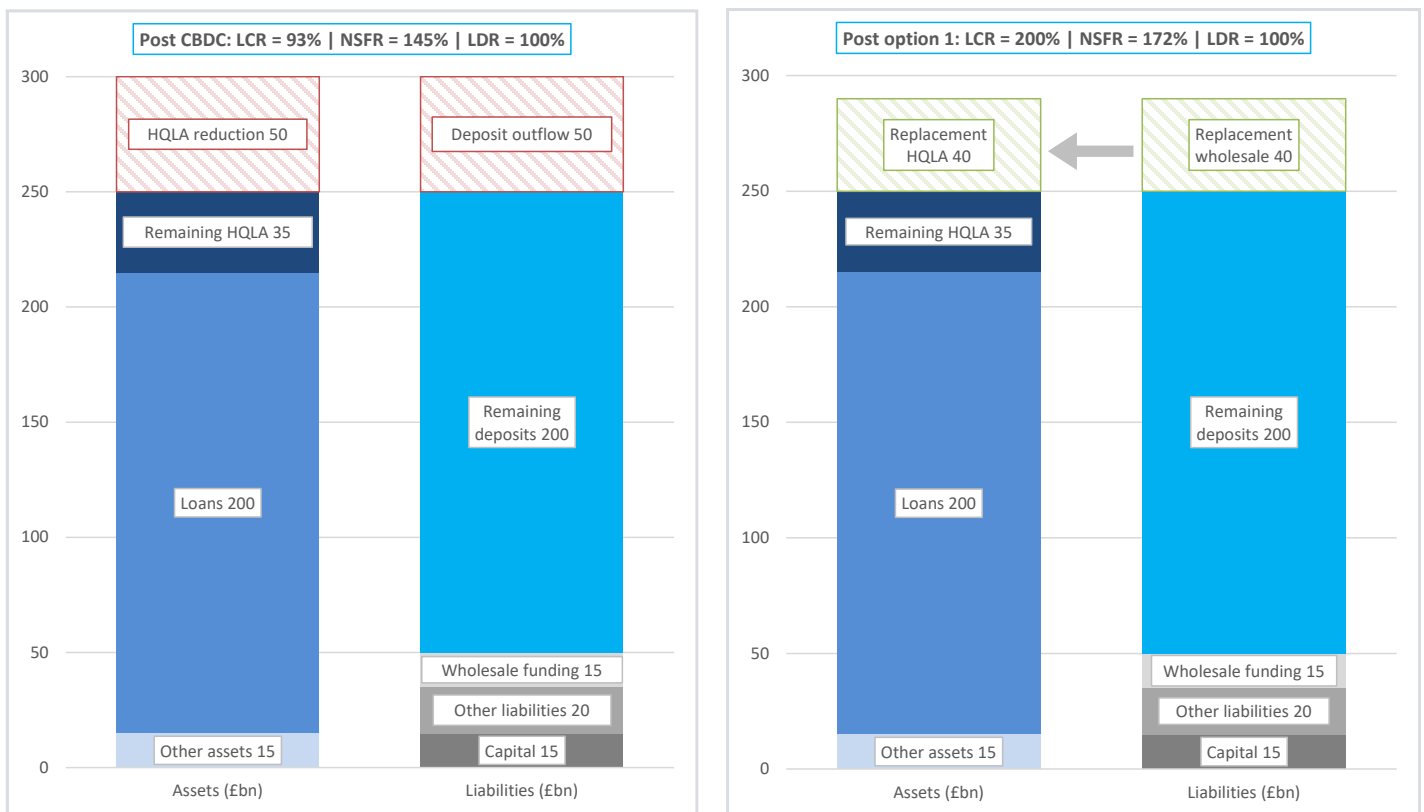
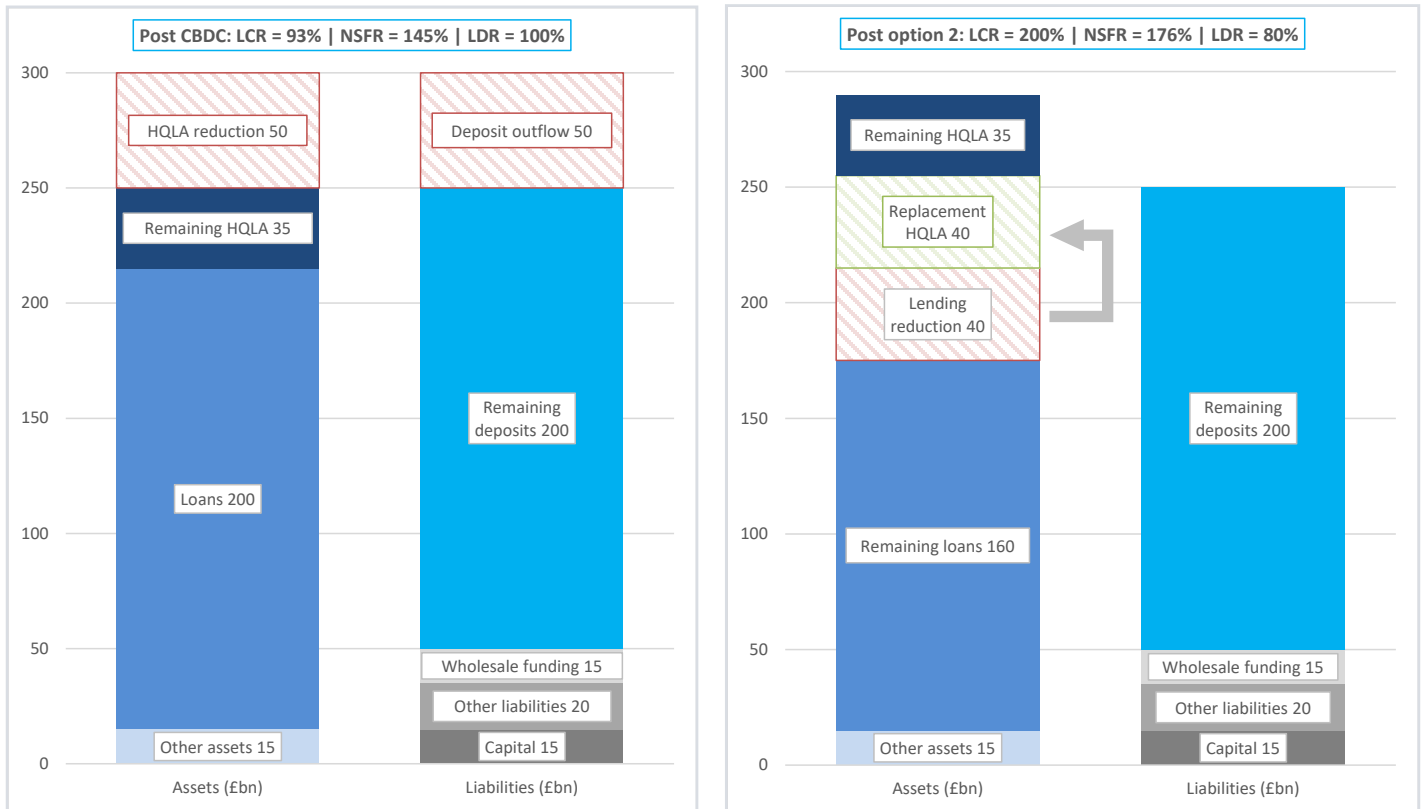


Figure 3.3 (b): An illustrative balance sheet post CBDC implementation and post option 2: Lost deposit funding is not replaced, instead lending volume is reduced, restoring the liquidity position and lowering LDR. It is important to note that there are significant impacts of this option, when viewed from a sector level perspective (Section 3.5).



3.4. OPTION 1: REPLACEMENT WHOLESALE FUNDING RESPONSE MEASURE

The deployment of option 1 would restore a bank’s liquidity position, whilst maintaining lending volumes. The key underlying assumption for this option is that the wholesale funding markets can sustainably absorb the material increase in supply of bank debt and that there are no limits on the volume of wholesale funding an individual credit institution can obtain. The validity of this assumption is explored in Section 3.5 below. A likely outcome of option 1 is a substantial increase in the funding costs due to the factors set out below in Figure 3.4 (a), which will in turn lead to an increase in lending rates.

Figure 3.4 (a): Implications for funding costs: Changes in the funding composition, deposit rates and wholesale rates would result in a material increase in funding costs.

Factor	Explanation
Delta in composition	<ul style="list-style-type: none"> Changing composition of funding (higher proportion of more expensive wholesale funding) Replacement funding is assumed to be in the form of long-term wholesale debt, allowing the restoration of NSFR
Delta in deposit rates	<ul style="list-style-type: none"> Increasing deposit funding costs (as banks would likely be attempting to compete for deposits)
Delta in wholesale funding rates	<ul style="list-style-type: none"> Increasing wholesale funding costs, stemming from the supply and demand dynamics and reduced credit quality (increased reliance on wholesale funding, higher LDR and increased asset encumbrance, in the case of secured funding)

Assuming a bank would seek to maintain profitability, higher funding costs will in turn result in an increase in lending rates. In the illustrative example (where Net Interest Income (“NII”) is maintained constant), the lending rate increases by c. 60-100bps. The key assumptions and outcomes for option 1 are summarised below in Figure 3.4 (b).

Figure 3.4 (b): Key assumptions and outcomes for option 1: Lost deposit funding is replaced with wholesale funding, which restores the liquidity position and allows to maintain lending volume. Higher funding costs lead to an illustrative increase of c. 60-100bps in lending rates, were NII to be maintained constant.

Key assumptions
20% of commercial bank deposits migrate
LCR and NII maintained constant
Volume of replacement funding unconstrained
Increase in funding costs passed through to lending rates
Key outcomes
Lending volume constant (-%)
Lending rates increase (c. 60-100bps)

3.5. OPTION 2: LENDING REDUCTION RESPONSE MEASURE

As described above, option 1 is based on several key assumptions, including that a bank would be able to fully replace lost deposit funding with wholesale funding. In this section, first we consider factors that could restrict a firm’s borrowing capacity, as well as other circumstances that could lead to a reduction in lending. We then note the industry-level implications of option 2 and business model considerations. In this analysis, we do not consider the impact of lending reduction on capital – this and other limitations are summarised in Section 3.9 and could form the basis for future investigative work.

The following factors could impact a firm’s ability to fully replace lost deposits with wholesale funding:

- **Market competition:** In the environment, where the entire commercial bank sector is seeking to replace large volumes of deposit funding, the wholesale markets will likely be oversupplied and a bank may struggle to issue all of the bonds it has to offer, whilst investors will have a much broader choice. In particular, smaller firms and start-ups may face more limited investor appetite.
- **Asset encumbrance:** This would likely place a cap on the level of secured issuance, as a bank would need to ensure that it is not over-encumbering its book.
- **Concentration:** Including counterparty, currency and tenor.
- **Statutory limits:** Certain types of firms (building societies) are subject to statutory limits.

To estimate a potential cap on the volume of replacement funding that can be obtained, we consider an industry-level funding requirement and compare it against historical levels of issuance for UK banks.

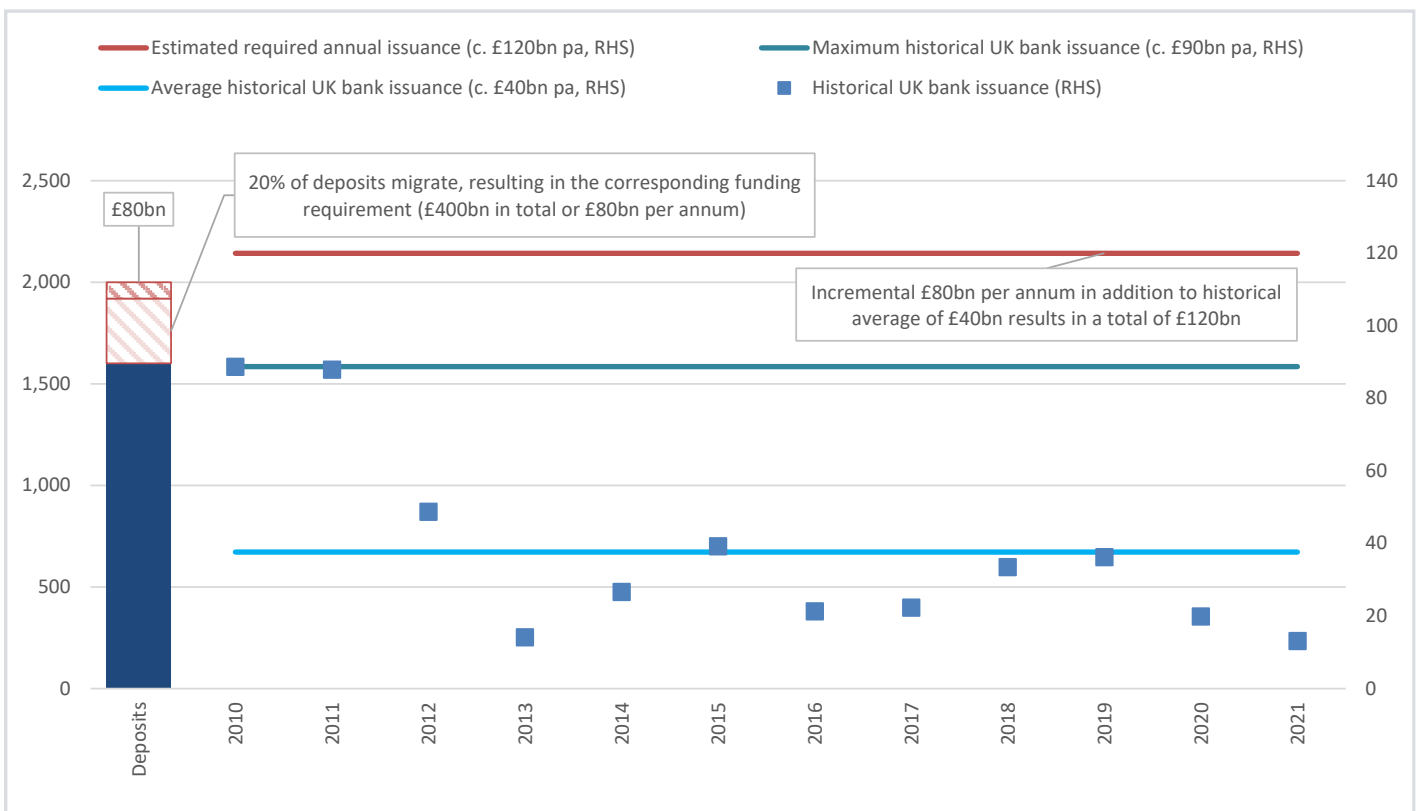
At an industry level, household and corporate deposits stand at c. £2,000bn.²⁰ 20% of this amount is equivalent to c. £400bn, resulting in the corresponding total illustrative funding requirement, if firms were seeking to restore their liquidity positions to the previous levels, whilst maintaining lending volumes. This would translate into c. £80bn of incremental wholesale funding issuance per annum (at a 5-year weighted average maturity). For context, Figure 3.5 (a) sets this requirement against the historical annual issuance volumes. Since 2010, the volumes averaged c. £40bn, with a maximum of c. £90bn.

In this context, an incremental £80bn (added to the £40bn average) would result in a total average annual issuance of £120bn, which is significantly higher than the historical average and maximum. Limiting the volume of replacement funding in line with the historical maximum of c. £90bn, would result in a c. 60% cap (i.e. only £50bn out of the required £80bn is assumed to be obtained).

Figure 3.5 (a): Estimated funding requirement in the context of historical issuance volumes: To fully replace lost deposit funding, c. £400bn of wholesale funding would be required in total, or c. £80bn of incremental issuance per annum (at a 5-year weighted average maturity), compared to the average and maximum historical annual issuance for UK banks of c. £40bn and £90bn, respectively²¹. Thus, an incremental £80bn (added to the £40bn average) would result in a total average annual issuance of £120bn, which is significantly higher than the historical average and maximum.

If the full amount of required funding cannot be obtained and lending is cut, all else equal, a lower volume of lending would necessitate a greater increase in lending rates, assuming a bank would seek to maintain profitability. This would be over and above the already considerable upward pressure on the lending rates exerted by the factors described in Section 3.4. Rising lending rates would in turn likely result in a decline in demand for bank credit, as some borrowers may not be able to accommodate higher costs. As set out in the Bank’s illustrative scenario, an increase in bank lending rates could provide an opportunity for non-banks to compete, partially mitigating the impact on credit creation, though the Bank’s analysis does not elaborate on the mechanism by which this would occur.

As noted earlier in Section 3.3, there would likely be a continuum between the two extremes of options 1 and 2, with the wholesale funding capacity acting as a limiting factor. Figure 3.5 (b) illustrates this by showing the potential impact of: (i) option 1, (ii) the extreme version of option 2 (lost deposit funding is not replaced) and (iii) other scenarios forming a continuum. In particular, the chart includes a scenario where the replacement funding is capped at 60% (per the aforementioned historical maximum annual issuance of £90bn) and the corresponding impact on lending volumes and rates. The key assumptions and outcomes for option 2 are summarised below in Figure 3.5 (c).



20 Money and Credit - April 2022 release gives M4 from households and Private Non-Financial Corporations (excluding OFCs) at £ 2,364.8bn in April 2022. We have rounded this result for ease of illustration.

21 Source: Bloomberg

Figure 3.5 (b): Delta in lending volume and rate for a given proportion of funding obtained: The key assumption for option 1 is that there are no restrictions on the volume of replacement funding (100% of required funding is obtained). If instead the volume of replacement funding is constrained (or completely not available as in the hypothetical extreme version of option 2), there would likely be a significant decrease in lending volume and an increase in lending rate. As an illustration, for the aforementioned estimated cap of 60%, the decline in volume would be 8% and the lending rate would increase by c. 70-110bps.

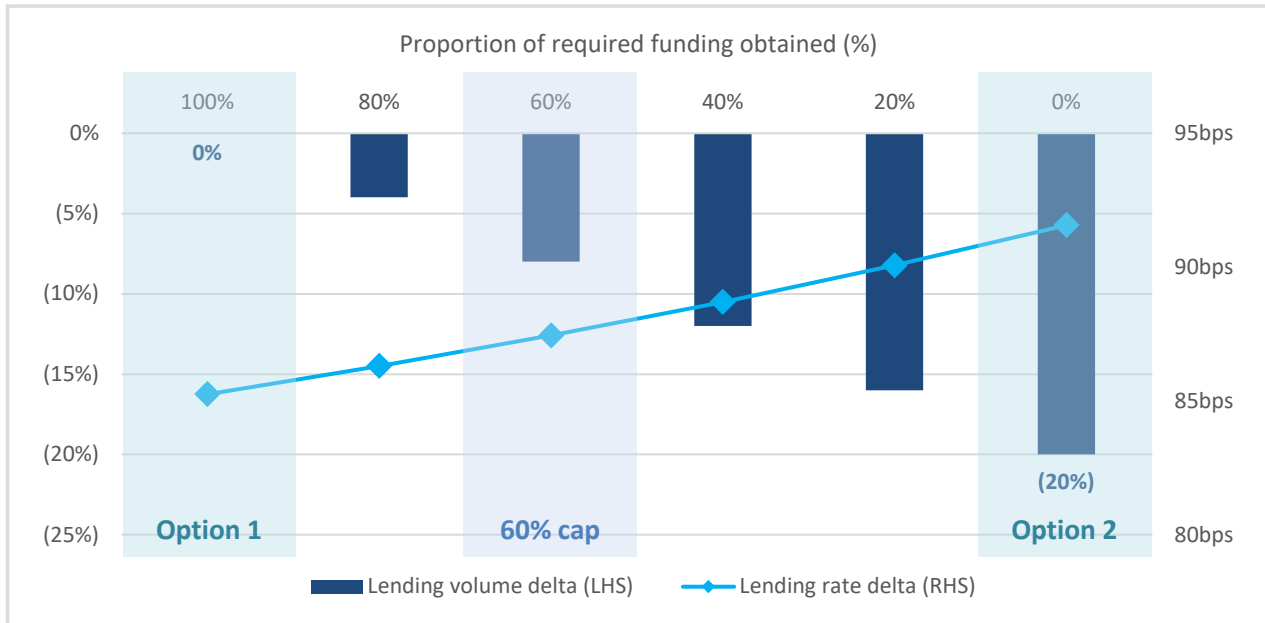


Figure 3.5 (c): Key assumptions and outcomes for option 2 (60% cap version): With a 60% cap on the volume of replacement funding (based on the maximum historical issuance volume of c. £90bn), lending volume for an individual illustrative firm declines by 8% and lending rates increase by c. 70-110bps.

Key assumptions	
20% of commercial bank deposits migrate	
LCR and NII maintained constant	
Volume of replacement funding capped at 60%	
Increase in funding costs passed through to lending rates	
Key outcomes	
Lending volume declines (8%)	
Lending rates increase (c. 70-110bps)	

Industry-level impacts

From an industry-level perspective, there would be an important further impact if individual firms started reducing lending. When credit institutions cut loans, they also cut deposits in the system. Thus, in aggregate, the deposit balances would decline by more than the amount attributable to the initial migration into a CBDC, exacerbating impacts on funding costs, credit creation and real economy. This impact is not currently quantitatively reflected in our simplified model.

Furthermore, in this new steady state, the stress vulnerability of the financial system and wider economy could increase. For example, in a situation where the term of an asset being financed is greater than the term of the borrowing financing it, if the bank stops lending and no other creditor is prepared to step in to take over the financing, this would result in an equivalent of a “hard credit crunch” or “dislocation” in credit financing. Generally, this would lead to assets being sold at “fire sale” prices, outright defaults or a requirement for sovereign or supra-national intervention. Further factors that could lead to increased stress vulnerability are discussed in Section 3.6 below.

Business model considerations

The building societies segment is expected to be particularly constrained in the extent of its potential use of wholesale funding as many smaller societies have no access to wholesale markets and even the largest societies are subject to the statutory nature limits as set out in the Building Societies Act, leaving them particularly exposed to a large-scale take-up of a CBDC. If smaller societies have no option but to cut lending, the aggregate lending at industry level would likely be further depressed due to the aforementioned aggregate impacts or they would be crowded out of the market, putting into question the viability of a business model reliant on deposit funding.

There are similar concerns for other, smaller, firms that have no access to wholesale markets, or for newer banks whose business is more dependent upon wholesale funding in the first place. There may arise a situation where some firms are able to secure wholesale funding to support their full balance sheet and other firms are only able to obtain a limited proportion of their required funding. This will likely emphasise a competitive pressure within the market.

Similarly, if a CBDC was intended to be used as a medium of exchange and for transactional purposes, firms that are largely reliant on current account funding could be significantly more impacted than firms with a wholesale funded or savings account based business model.

A detailed assessment of impacts of a CBDC (under various design choices) on different sectors within the financial services industry is beyond the scope of this paper. This and other considerations noted in Section 3.9 could form the basis of future investigative work.

3.6. IMPACT ON FINANCIAL STABILITY

The issuance of a CBDC could create risks to financial stability by reducing stress resilience of the banking sector – through greater reliance on wholesale funding and lower stability of deposit funding.

If banks were to replace a material proportion of deposit funding with wholesale funding, this would increase the exposure of banks, and credit conditions, to refinancing risk and short-term volatility in market sentiment. Increased reliance on secured funding would result in higher levels of encumbrance and increase the sector’s vulnerability to stress.

As a CBDC would provide a safer alternative for depositors, one of the key risks is that it will increase the likelihood of deposit outflows in a stress (the opportunity cost of holding a CBDC is presumed to be much less than that of cash and similar to holding commercial bank deposits). This would increase the vulnerability of the banking sector to stress, potentially further destabilising credit supply and could require the central bank to act as a lender of last resort more quickly than it otherwise would need to.

Reduced stability of deposit funding will likely in due course be reflected in a higher stressed outflow rate (within internal liquidity stress tests and potentially the LCR standard) and also a higher target operating range for liquidity metrics, likely necessitating a correspondingly larger holding of HQLA. This is acknowledged in the Bank’s discussion paper, which notes that increased flightiness of certain types of deposits could warrant an amendment of the LCR standard to reflect the additional liquidity risk.²² A similar reassessment will likely be required regarding the treatment of deposits in the NSFR, leading to an increase in the proportional amount of stable funding that would need to be maintained and, thus, exacerbating the impact on credit creation.

As deposit growth becomes more cyclical, with possibly greater number of depositors moving their money into CBDC during a period of stress, this will, in turn, increase the cyclicity of credit provision by banks, which will likely have negative implications for macroeconomic stability and economic growth. At its limit, this would result in a negative equilibrium and a bank run, leading to a systemic sudden reduction in the provision of credit, or a requirement for the central bank to supply liquidity to the system via emergency operations.

²² <https://www.bankofengland.co.uk/paper/2021/new-forms-of-digital-money>

3.7. POTENTIAL IMPACT OF ALTERNATIVE CBDC ADOPTION SCENARIOS

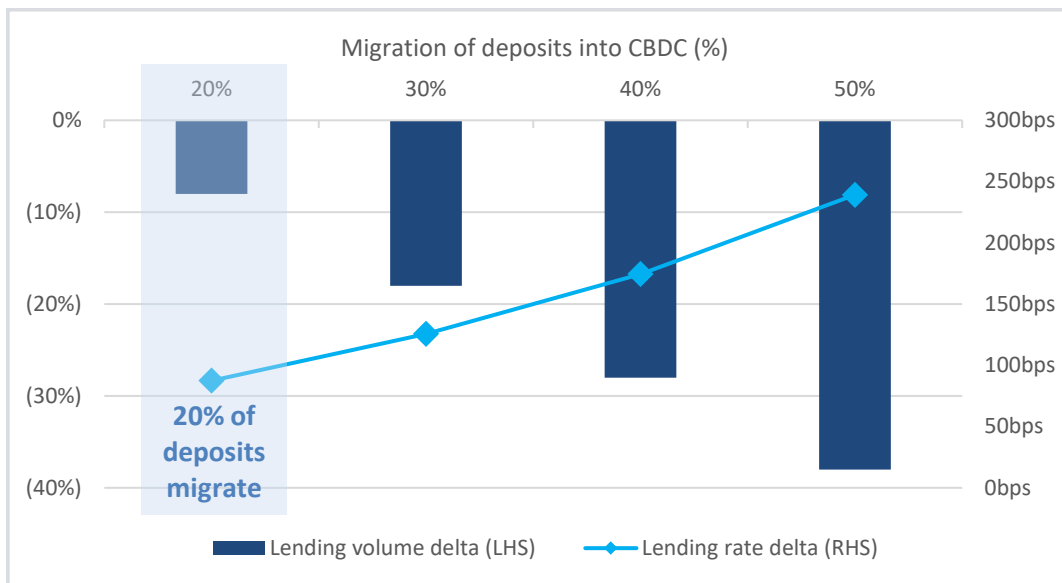
In Section 3.1, we noted that there remains considerable uncertainty regarding the anticipated scale of CBDC adoption, and that the take-up and associated migration of deposits could be much higher than 20% were a CBDC to get traction (and in the absence of effective mitigants). The first-order impact on commercial banks' balance sheets and credit creation would likely be correspondingly more severe, especially if a greater number of firms would need to resort to lending reduction (option 2 in our analysis), resulting in further second-order effects.

For illustration, Figure 3.7 (a) shows a series of outcomes based on option 2 individual bank response (lending reduction) against increasing levels of CBDC uptake (beyond the base assumption of 20% presented within the Bank's illustrative scenario). The first-order impact on lending rates and lending volumes is correspondingly significantly more material.

The CBDC take-up scenarios used in this illustration are not based on an analytically-derived set of adoption pathways. Furthermore, at this stage, we are not considering how secondary impacts could potentially ameliorate or exacerbate these trends.

Although the Bank has provided a helpful start in assessing potential demand for new forms of digital money (including a CBDC), a number of assumptions and design choices for a CBDC remain to be clarified. These aspects could materially impact the level of take-up of a CBDC by UK consumers and businesses. Our view is that these more nuanced adoption scenarios (and the corresponding impacts on credit creation) will require further analysis and iteration by the Bank, HMT and industry (potentially as part of pilots), as the design of a CBDC is developed further.

Figure 3.7 (a): An illustrative sensitivity of option 2²³ outcomes to the proportion of deposits migrating into CBDC: As noted in Section 3.1, in our analysis we are following the Bank's assumption that c. 20% of deposits would migrate (leftmost scenario in the chart). The below figure illustrates that if the take-up is much higher than 20%, first order impacts on credit creation would be correspondingly more severe.



23 Option 2 bank response with a 60% cap on replacement funding.

3.8. SUMMARY OF IMPACT ON CREDIT CREATION AND COMPARISON TO THE BANK'S ILLUSTRATIVE SCENARIO

In our analysis, we use the same starting point as the Bank's illustrative scenario – in a steady state, c. 20% of household and corporate deposits migrate into a new form of digital money (assumed to be a CBDC for the purposes of this report). However, we reach a different outcome in terms of potential severity of impact on credit creation.

Our analysis concludes that this large-scale displacement of deposit funding from the banking sector is likely to lead to a significant contraction in the provision of credit and/or an increase in the cost of credit (both absolute cost and volatility of that cost). Furthermore, the stress vulnerability of the banking sector is likely to increase materially, due to greater reliance on wholesale funding and lower stability of deposit funding.

The Bank's illustrative scenario concludes that the impact on credit creation will likely be manageable, with a 1% fall in lending volumes and a modest increase in lending rates²⁴ (after non-bank sector response).

The differences in this main conclusion are likely due to the divergent assumptions forming the basis of preparation. Several examples are listed in Section 3.9 and summarised in Figure 3.8 (a) below, including magnitude of increase in funding costs (and, correspondingly, lending rates), capacity of wholesale funding markets and the response of the non-bank sector. Therefore, we would welcome an opportunity to work with the Bank to better understand the assumptions and the range of potential outcomes, also taking into account the variable CBDC design choices. In particular, we recommend establishing a mechanism for joint public/private modelling exercises, with a view to helping achieve an optimal outcome of delivering the benefits of a CBDC without incurring excessive risks.

Furthermore, we think that it would be beneficial to consider any potential actions that the Bank might take to redistribute the funds that a CBDC would displace from the banking sector and to support wider credit creation. This is discussed further in Section 5.

Figure 3.8 (a): Comparison of key assumptions and outcomes for options 1 and 2, and the Bank's illustrative scenario: There are several potential reasons for differences in outcomes, including constraints on volume of replacement wholesale funding, scale of increase in funding costs (and correspondingly lending rates) and the response of the non-bank sector.

Option 1	Option 2	Bank's illustrative scenario
Key assumptions		
20% of commercial bank deposits migrate	20% of commercial bank deposits migrate	20% of commercial bank deposits migrate
LCR and NII maintained constant	LCR and NII maintained constant	Liquidity position restored
Volume of replacement wholesale funding unconstrained	Volume of replacement wholesale funding capped at 60%	Volume of replacement wholesale funding appears to be assumed unconstrained
Funding costs increase: (i) delta in funding composition, (ii) delta in deposit rates, (iii) delta in wholesale funding rates	Funding costs increase: (i) delta in funding composition, (ii) delta in deposit rates, (iii) delta in wholesale funding rates	Funding costs increase: (i) deposit rates increase, (ii) spill-over between asset prices limits wholesale rates increase
Increase in funding costs passed through to lending rates	Increase in funding costs passed through to lending rates	Banks are assumed to price lending off a mix of both wholesale and deposit funding
Key outcomes (before non-bank sector response)		
Lending volume constant (–%) ²⁵	Lending volume declines (8%) ²⁶	Lending volume constant (–%)
Lending rates increase (c. 60-100bps)	Lending rates increase (c. 70-110bps)	Lending rates increase (20bps) ²⁷
Key outcomes (after non-bank sector response)		
The non-bank sector response is not modelled (reliable data on the way in which the non-bank financial sector provides credit to the wider system is limited, making it difficult to estimate the degree to which non-banks will be able to step in and supply alternative lending)		Lending volume declines (1%)
		Lending rates increase (<i>modest impact</i>)

²⁴ We note that the Bank's discussion paper acknowledges considerable uncertainty with regards to estimated impact and presents a sensitivity analysis for some of the key outcomes, including increases in lending rates (Chart 3.4. in the Bank's illustrative scenario).

²⁵ This is an initial first-order impact. As a second-order impact, lending volume may reduce, as higher lending rates could make bank credit unaffordable for some borrowers.

²⁶ This figure represents a first-order impact at an individual bank level. There would likely be material impacts from an industry-level perspective, as lending reduction by individual firms would lead to a further contraction of deposit balances in the system.

²⁷ In acknowledgement of uncertainty, this central estimate is supplemented by a sensitivity analysis, highlighting that an increase in lending rates could be as high as 80bps under different assumptions (Chart 3.4. in the Bank's illustrative scenario).

3.9. ASSUMPTIONS AND LIMITATIONS

To conclude the main analysis of impact on credit creation and financial stability, we highlight several assumptions in the Bank's illustrative scenario, which could potentially be contributing to divergent outcomes summarised in Section 3.8 above. As there is a relatively limited visibility of the workings behind these assumptions, some of them have not been fully incorporated in our analysis and could be investigated further through the recommended joint modelling exercises.

- Wholesale funding market capacity:** In the Bank's illustrative scenario, there is limited visibility of the underlying assumptions with respect to the ability of the wholesale funding markets to sustainably absorb the material increase in supply of bank debt. Additionally, as the Bank's analysis represents an industry-level view, firm-level considerations are not presented. This point is explored in Section 3.5 above, further to the factors that could constrain the volume of replacement wholesale funding for specific business models, such as building societies.
 - Spill-over between the prices of gilts and long-term bank debt:** In the "New forms of digital money" discussion paper, the banks are assumed to replenish deficits in their HQLA (that arise from the migration of deposits) by buying gilts from non-banks. However, if the initial impact of deposit migration on the commercial banks' balance sheets is a corresponding reduction in reserves, it is not clear whether the banks would be seeking to replace these reserves with gilts; in particular, in light of the regulatory constraints on the composition of liquidity pools. The Bank's analysis also assumes that gilts and bank debt have some degree of substitutability, which means that increased gilt demand would reduce yields on bank debt, partly offsetting the overall increase. This assumption contributes to the relatively modest impact on funding costs and, by extension, lending rates. As acknowledged in the Bank's discussion paper, if these assets were not substitutable, the increase in lending rates would be more severe – up to c. 80bps (as illustrated in the Bank's sensitivity analysis²⁸), which is within the range we identified for option 1 (c. 60-100bps).
 - Non-bank sector response:** The Bank's scenario assumes that higher bank lending rates could increase the scope for non-banks to compete in lending to both households and companies. This assumption contributes to the relatively modest overall impact on credit creation; however, the Bank's analysis does not elaborate on the precise mechanisms by which this would occur. Reliable data on the way in which the non-bank financial sector provides credit to the wider system is limited, making it difficult to estimate the degree to which non-banks would be able to step in and supply alternative lending, and critically whether they can do so reliably in times of stress. It is worth noting that non-banks would also be subject to constraints on the cost/availability of wholesale funding. Furthermore, greater reliance on market-based financing would likely expose credit conditions to short-term volatility in market sentiment (such as volatility in credit spreads observed during the liquidity stress in early stages of the COVID-19 pandemic).
 - Recycling of lost deposits back into the commercial bank sector:** In the Bank's discussion paper, banks are assumed to replenish their liquid assets by purchasing gilts from non-banks, then 'terminating out' the resulting wholesale deposit inflows by issuing long-term wholesale debt. In the first step of this mechanism, it is not clear where the banks would be getting the funds from in order to purchase gilts, following the partial loss of deposit funding to CBDC.
- Further to the above assumptions in the Bank's analysis, which could be explored further through the aforementioned joint exercises, our simplified illustrative bank model does not currently take into account the following aspects quantitatively. These areas could also form the basis for future investigative work, in particular, once CBDC design choices (such as holding/transaction limits, remuneration and backing models) are clarified.
- Beyond a simplifying assumption that the loss of deposit funding to CBDC could not be accommodated by surplus liquidity (as the current liquidity position of the commercial bank sector is not representative), our main quantitative analysis set out in this Section does not adjust the starting balance sheet and liquidity position for effects of QT and TFSME repayment.
 - We do not currently assess how the industry would transition to steady state post issuance of a CBDC (our analysis focuses on steady-state impacts).
 - The supply / demand curves for loans are not taken into account, instead we assume that lending rates move as a function of bank profitability. Likewise, we do not consider the value of deposit beta to banks and how this might also impact loan pricing.
 - We do not factor in quantitatively whether higher stressed outflow rates for deposits and/or greater target operating ranges for liquidity metrics would be required, as necessitated by lower stability of deposit funding due to the availability of a safer alternative (a CBDC). A qualitative discussion of these considerations is included in Section 3.6 above.
 - We do not take into account the loss of other income (e.g. fees and FX) from the migration of deposits into CBDC, nor do we consider the potential business models for CBDC issuers (which may include banks).²⁹
 - We do not consider the variability of impact on different categories of borrowers, i.e. if banks reduce lending, they may be disproportionately cutting the supply of credit to the lowest credit quality (or lowest return on equity) borrowers, meaning their cost of credit will likely rise by more than the averages stated in our analysis. More generally, future analysis in this area should consider in greater detail the impacts of a CBDC on different sectors within the banking industry and assess the resulting implications for financial stability. For example, if a segment of banks mainly funded by current accounts lends to a specific sector of the economy, this sector could be disproportionately impacted by the introduction of a CBDC (were a CBDC to be competing with current accounts).
 - A detailed impact on the capital position of the commercial bank sector is not assessed. For example, greater reliance on wholesale funding may increase G-SIB capital charges. Furthermore, we do not consider how capital might be redeployed following lending

²⁸ Chart 3.4 in <https://www.bankofengland.co.uk/paper/2021/new-forms-of-digital-money>

²⁹ For a further discussion on the potential business models, please see our recent report on "Commercial models of a potential UK retail CBDC": <https://www.ukfinance.org.uk/policy-and-guidance/reports-and-publications/commercial-models-potential-uk-retail-cbdc>

reduction and alternative mechanisms for obtaining market financing, which could be more capital-efficient.

- Impacts on the balance sheet duration and associated hedging costs are not currently factored in.
- Beyond an illustrative sensitivity analysis, we do not re-assess the drivers behind CBDC demand and resultant adoption scenarios, instead, we rely on the Bank's assumption that c. 20% of household and corporate deposits migrate into a new form of digital money (for the purposes of this paper, we assume this form to be a CBDC).

4. POTENTIAL ECONOMIC IMPACT

In Section 3, we found that the introduction of a retail CBDC may have a material impact on both the lending rate and lending volume. In this Section, we explore how such changes to the cost and availability of credit can translate into an impact on the wider economy. In particular, we consider the effect of a 20bps increase in rates and a 1% fall in credit provision, per conclusions of the Bank’s illustrative scenario.

The economic impact of higher lending rates and lower lending volume would affect consumers, households and businesses. For consumers, increases in lending rates may increase their cost of unsecured borrowing. Households with mortgages may face higher lending rates, increasing their mortgage repayments and reducing the money available for consumption. For businesses, higher lending rates will, on average, increase the cost of capital and thereby reduce profitability and business investment. Together, a step down in lending volumes and higher lending rates due to CBDC will reduce GDP in the long run, relative to the scenario where there is no CBDC.

Figure 4 (a): Summary of assessments of a reduction in GDP resulting from a 1% fall in credit supply: The outcomes vary from c. 0.1% to 0.6%.

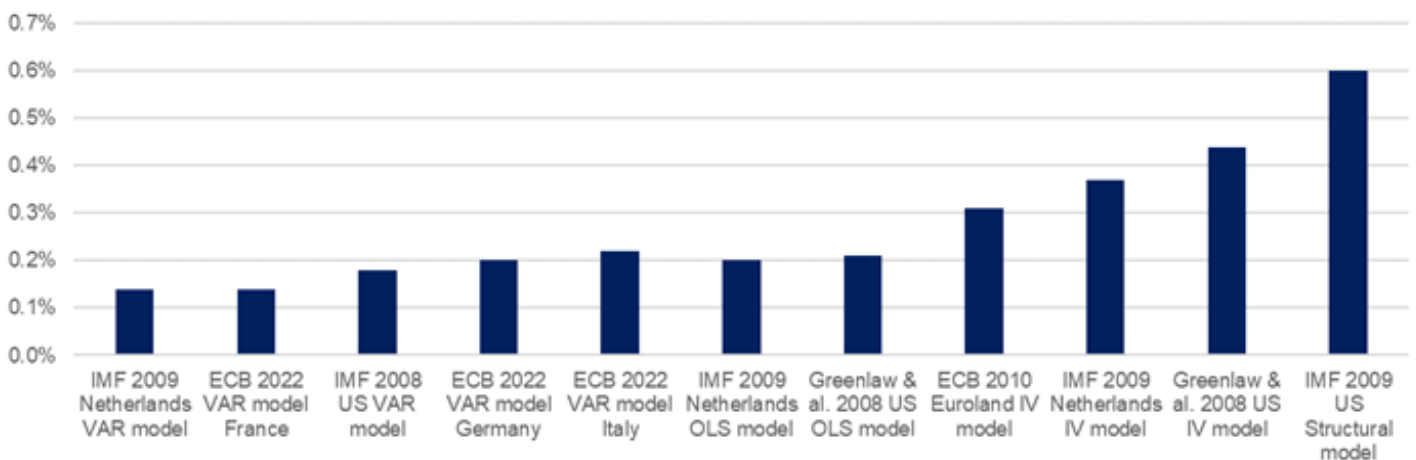
One way of assessing the GDP impact of an increase in lending rates is using a simple production function.³⁰ Under this model, a change in output relative to the cost of capital is calculated using:

$$\Delta x = \sigma \times \frac{\alpha}{(\alpha - 1)}$$

Where σ , the elasticity of substitution between capital and labour; and α , the output elasticity of capital. Using this approach, BIS found that a 1bps increase in lending rate would reduce GDP by 0.0054%.³¹ This means that a 20bps increase in lending rate (as set out in the Bank’s illustrative scenario) would reduce GDP by 0.11%.

To assess the possible impact of a lower credit supply on GDP, we draw upon studies that have analysed this relationship. Figure 4 (a) below shows various economic assessments of impact on GDP due to the reduction in credit provision. Based on these studies, we find that the relationship between changes in credit supply and GDP is 0.1-0.6% per 1% reduction in credit availability. If the lending volume reduces by 1% (as set out in the Bank’s illustrative scenario), the GDP will reduce by 0.1-0.6%.

Reduction in GDP from 1% reduction in credit



30 Please see section 3.2 in <https://www.bis.org/publ/bppdf/bispap60j.pdf>.

31 Please see section 3.2 in <https://www.bis.org/publ/bppdf/bispap60j.pdf>. BIS has assumed that as bank lending represents only part of a firm’s total borrowing, the increase in the cost of capital is only a third of the increase in spread.

We estimate that the potential combined impact of higher lending rates and lower lending volumes could result in a reduction of GDP in the region of 0.21-0.71%. For illustration, the UK GDP was c. £2.2tn in 2021³². Assuming that (i) GDP continues growing at 1.7% per annum in real terms (in line with the assessment of trend growth by the OBR) and (ii) it takes 10 years for the steady-state impact of CBDC to materialise (the aforementioned 0.21-0.71% reduction), then the outcome would be a cumulative reduction in GDP of around £28-95bn over 10 years³³. In reality, there is likely to be some overlap between the two mechanisms.

Given that the analyses presented within this paper and the Bank's illustrative scenario provide only an indicative set of values for the potential reduction in credit availability, and that other effects (such as the potential partial transition of credit creation to the non-bank financial sector) remain to be modelled in detail, the impacts on GDP estimated in this Section should be considered as an illustration. Nonetheless, this analysis should serve as a useful indication of the potential scale of impact of a deterioration in credit conditions and potentially material implications for the UK economy. The conclusions of this Section highlight the social imperative for both public and private institutions to continue collectively assessing the potential risks of a CBDC issuance to the UK economy and develop effective solutions that will help mitigate potential detriments, while enabling benefits that a CBDC can deliver to the UK economy.

32 Statista

33 This calculation aggregates the impact of increase in lending rate and reduction in credit supply. There is likely to be some overlap between these two impacts. However, given the relatively small changes in lending rate and credit supply, any overlap is also likely to be small.

5. CONTROLS AND OPPORTUNITIES

As our analysis in Section 3 indicates, there is a significant risk that the introduction of a retail CBDC to the UK market could have a more material impact on credit creation than the Bank's illustrative scenario suggests. Therefore, in this section we consider a range of opportunities that the Bank, industry and HMT could investigate to help mitigate potential negative impacts of a CBDC. A number of these controls would have significant policy implications for a retail CBDC launched in the UK. We believe that it is important that the Bank and HMT consider carefully the objectives that a retail CBDC would be achieving for the UK economy, its use cases and impact on the UK financial system and choose the controls that best support these desired outcomes.

5.1. CONTROL – CBDC LIMITS

One of the more obvious mechanisms to control the impact of a CBDC issuance on credit creation would be through the introduction of limits on the ability of individuals and corporates to hold CBDC balances. While other mechanisms (such as limits on payment volumes) could be considered, broadly, there are two types of limits that could mitigate credit creation concerns:

- Fixed or variable holding limits – a limit on the ability of firms or individuals to hold CBDC balances.
- Fixed or variable purchase limits – a limit on the ability of firms or individuals to purchase a CBDC balance in exchange for other forms of money.

The first limit above could provide the authorities with a means of controlling the level of deposits held within CBDC balances at an industry level. This could prove to be an effective way for policy makers to support the ability of banks to provide credit, while enabling the realisation of the competitive and societal benefits of a CBDC. However, this control could also have a detrimental impact on the ability of a CBDC to operate as a consistent medium of exchange and store of value if firms and individuals were unable to hold the amount of CBDC necessary for their use cases. There are potential solutions that could help to mitigate this concern, such as setting up a mechanism for excess inbound payments to be swept automatically into a nominated commercial bank account. Implementation of an industry limit would provide a more consistent and predictable market for a bank to operate within and help to ensure the maintenance of stability upon a CBDC issuance.

Similarly, a purchase limit that controls the ability of firms or individuals to cash in (or out) of a CBDC could be effective, particularly in limiting the risk of a mass exodus from commercial bank money, which would

threaten the stability of the financial markets and the credit creation functions undertaken by financial institutions. With the introduction of purchase limits, the market could arrive at a competitively balanced equilibrium between a retail CBDC and other forms of money while controlling the speed at which the market status quo could change, providing regulators and industry with the opportunity to react proportionately within a crisis. Of course, this model could have complexities associated with the ability of commercial organisations to accept large volumes of CBDC if 'cash out' limits were imposed. This restriction of supply could result in CBDC transacting within the market at a price higher (or lower) than the face value, presenting issues for monetary stability.

Both of these limits could be introduced separately or in tandem and would have different impacts on the ability for a CBDC to operate as money within the UK economy. We recommend that further analysis be considered to understand the impact of the introduction of these types of limits, in particular, in the context of intended benefits of a retail CBDC.

5.2. CONTROL – ECONOMIC INCENTIVES AND DIS-INCENTIVES

The Bank could also consider implementing economic incentives or dis-incentives within the structure of a CBDC – through remuneration of a CBDC (via interest rates) or fees imposed by the Bank on CBDC holders. While the Bank, in their illustrative scenario, assume that CBDC demand is not materially affected by interest rate changes, and thus any difference between the remuneration of a commercial bank deposit compared to a CBDC would have only a limited effect on deposit migration into CBDC, further investigation of these mechanisms could offer an additional pricing control for the market to incentivise holdings of commercial bank money to support ongoing credit creation.

In our paper on CBDC business models³⁴ we briefly consider that the Bank may need to implement fees for CBDC providers in order to cover its own infrastructure costs. Additionally, at this stage it is unclear whether the Bank's policy position would require any charges or remuneration to be paid directly to a CBDC holder or to a firm providing CBDC services. In order for an effective economic control to be implemented, we consider that it may be necessary for these incentives or dis-incentives to be extended directly to the end-user. There may also be a possibility for a CBDC to be subject to negative

³⁴ <https://www.ukfinance.org.uk/policy-and-guidance/reports-and-publications/commercial-models-potential-uk-retail-cbdc>

interest rates, if that was a functional criterion in the design of a CBDC.

These controls would also impact the function of a CBDC from a policy perspective and may have differential effects on the intended use cases. For instance, the store of value function of a CBDC could be significantly impacted by the remuneration control, while its use as a payment mechanism may be only marginally affected by this particular solution. The effectiveness of these controls could also be compounded by the introduction of the aforementioned limits. We suggest that both the introduction of interest rates and fees should be subject to further investigation by the Bank and industry, potentially in a joint modelling exercise.

5.3. OPPORTUNITY – CREDIT RECYCLING AND OTHER FACILITIES

We think that it would be beneficial to consider any potential actions that the Bank might take to redistribute the funds that a CBDC would displace from the banking sector and to support wider credit creation. This could be directly via the Bank's existing (or similar) sterling market operations (e.g. ILTR, TFSME) or indirectly via the Asset Purchase Facility. It is important to highlight that either route would bring a variety of associated costs that should be explored further (e.g. higher encumbrance via the direct route and increased reliance on wholesale funding via the indirect route), as well as effectively constituting a reinstatement of quantitative easing.

This opportunity may require the Bank to run a much larger balance sheet in BAU and also, possibly, have a wider collateral schedule than it currently operates or, given QT, intends to operate. The Bank will need to consider how any market operations or discount facilities would be administered, as well as possible stigma associated with the firms or the UK market relying upon these operations. It would likely be necessary for these facilities to be designed to enable bank LCR and NSFR positions to be improved, as such the facilities would need to provide funding of appropriate quality and tenor. The Bank would also need to consider the risks associated with running a larger balance sheet on a long-term basis and the wider implications of incurring credit risk.

If operated on a longer-term, standing basis, such facilities could be expanded, or operationalised, into a credit recycling facility through the creation of an institution similar to Fannie Mae/Freddie Mac. Consideration must also be given to the implications of ring-fencing. It is important that an instituted standing facility has the ability to provide replacement funding to the market segment that has lost sources of deposit funding. As adoption rates of a CBDC by different market segments (e.g. corporate, consumer, SME etc.) may vary, the Bank may need to consider dynamically how to structure such facilities in order to redistribute funding to an appropriate ring-fenced banking entity.

We note that the primary rationale for the institution of these market facilities in the US was to implement changes to the mortgage market, and not in relation to the ability for a central bank to offer a novel form of money. The implications of creating this form of a standing market facility should be investigated in greater depth by the Bank and HMT, as they consider the opportunity for the UK economy to be supported in this manner.

5.4. OPPORTUNITY – BORROWING AND LENDING CBDC

Another opportunity that could be explored further is the enablement (through regulation and design) of CBDC borrowing (in a certificate or token format) to allow credit institutions to borrow CBDC balances from the Bank's depositors. This could allow firms to recover some of their lost LCR assets and achieve an equilibrium of CBDC issuance and borrowing, which would enable the financial sector as a whole to meet the demand for credit by the market, while avoiding material increase in the cost of credit. The Bank could also investigate the possibility for banks to lend balances in CBDC to other CBDC customers, therefore enabling credit creation via central bank liabilities and providing a novel source of credit for the economy.

5.5. OPPORTUNITY – PAYMENTS DATA AND INCOME

Should migration of commercial bank deposits occur as the Bank's illustrative scenario assumes, and consumer payment volumes follow suit, banks may also lose access to spending data. As this data is often essential in lending decisions for the market, there is a risk that the quality of lending decisions will deteriorate. This could result in increased defaults, as credit institutions would lose the ability to accurately predict a customer's capacity to repay. With an increase in defaults, the impacts on consumers and their ongoing credit scores would threaten their ability to access future sources of credit.

This situation could also have an impact on the market's ability to provide credit. Increased defaults will mean that banks would need to increase the cost of credit to cover the value of defaults and maintain profits. This will also result in higher impairments and less capital available for credit creation, reducing the amount of credit that banks can provide the economy.

Further, income derived from transaction fees will also be impacted (this aspect is explored further in our paper on the commercial model for a CBDC). The overall business model of many banks is dependent, in part, on their ability to derive income from payment transaction fees, with some banks more reliant on this revenue stream than others. In general, banks compete for shareholder capital by meeting their investors' required Return on Tangible Equity ("ROTE"). Part of the ROTE is generated by transaction fees; in particular, challenger banks' business models tend to be based significantly on these fees. Therefore, this revenue stream in turn subsidises the cost of credit creation. A drop in transactions would have a double impact. To maintain credit creation banks will have to raise more wholesale funding and possibly encumber more assets to secure that wholesale funding. As wholesale funding and encumbrance increases costs to banks, the ROTE that they are able to deliver to investors will fall and result in further increases to the cost of funding for banks, driving up credit creation costs further.

Some of these market trends already exist through the growing use of account-to-account payment mechanisms for retail transactions. As such, the introduction of a CBDC could, in this regard, exacerbate a growing policy concern for the industry, rather than introduce new risks concerning data access for credit scoring. On the other hand, the growth of Open Banking and the greater availability of data across the industry could help mitigate the loss of payments data due to migration to a CBDC – provided that the Bank considers how obligations will rest

upon CBDC providers to make payment data available both through Open Banking channels, as well as to existing credit reference agencies.

Finally, depending on the policy objectives that the Bank adopts for a CBDC and corresponding design choices, there may be variability in the impact of a CBDC on various market segments. For example, there could be a distinction between the use of a CBDC as a means of exchange or a store of value. If used predominantly as a store of value, then the effect on the ability of the banking sector to provide credit to the UK economy may be exacerbated, as a higher proportion of stable deposits migrate to a CBDC. Conversely, if a CBDC is predominantly used as a means of exchange, then the business models of firms reliant on transaction fees will be impacted to a greater extent. As the Bank and HMT consider the policy objectives of a CBDC, they should carefully assess the potentially disproportionate impact on various market segments.

