Are Digital Currencies the Future?

Ganesh Viswanath-Natraj

Warwick Business School

February 22, 2023

References

- HMT and BOE digital pound Consultation
- BOE digital pound Technology Working Paper
- CBDC Design: Retail and Wholesale
- Financial inclusion in UK
- CBDCs and Financial Inclusion
- CBDC Pass-through to Deposit Rates
- CBDC Permissioned blockchain
- CBDC Project Dunbar
- China's CBDC Security/Trust
- Stablecoin and CBDCs: Policy Challenges
- Stablecoin Trilemma

Research Interests

Research and general interest articles available on my academic webpage: `https://ganeshvnatraj.netlify.app/`

1. **Macroeconomics of digital currencies**
   - Macroeconomic costs and benefits of digital currencies?
   - Financial stability implications?
   - Monetary policy implications?
2. **Stablecoins**
   - Arbitrage design and market efficiency
   - Risks and Regulations?
3. **Decentralised Finance**
   - Lending protocols, how are interest rates determined?
   - Exchanges, can Automated Market Makers beat a limit order book?

Roadmap of Talk

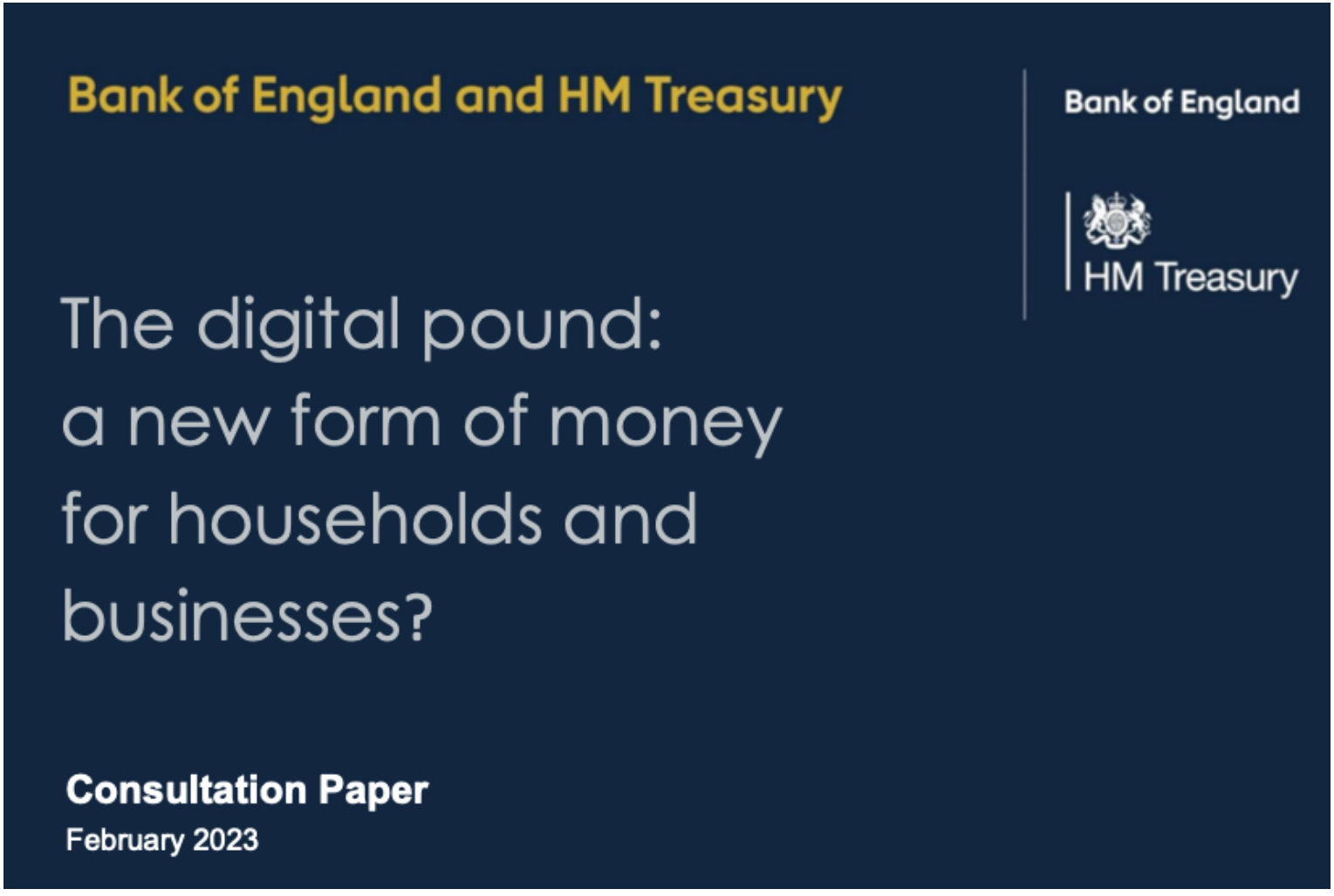
1. What potential benefits does the introduction of a digital pound bring?
2. What are the challenges in implementing a digital pound?
3. What are the risks of stablecoins as they become more prevalent in mainstream finance? How can we regulate them?
4. How can digital pounds support the growth of stablecoins?

Central Bank Digital Currency

- Central bank digital currencies are digital tokens issued by a central bank.
- They are pegged to the value of that country's fiat currency–for example a digital pound is backed 1-1 by reserves held at the Bank of England.
- Pilot projects: Sweden's E-Krona and China's Digital Currency Electronic Payment (DCEP).
- **This presentation**: Focus on Bank of England's and HMT digital pound consultation.

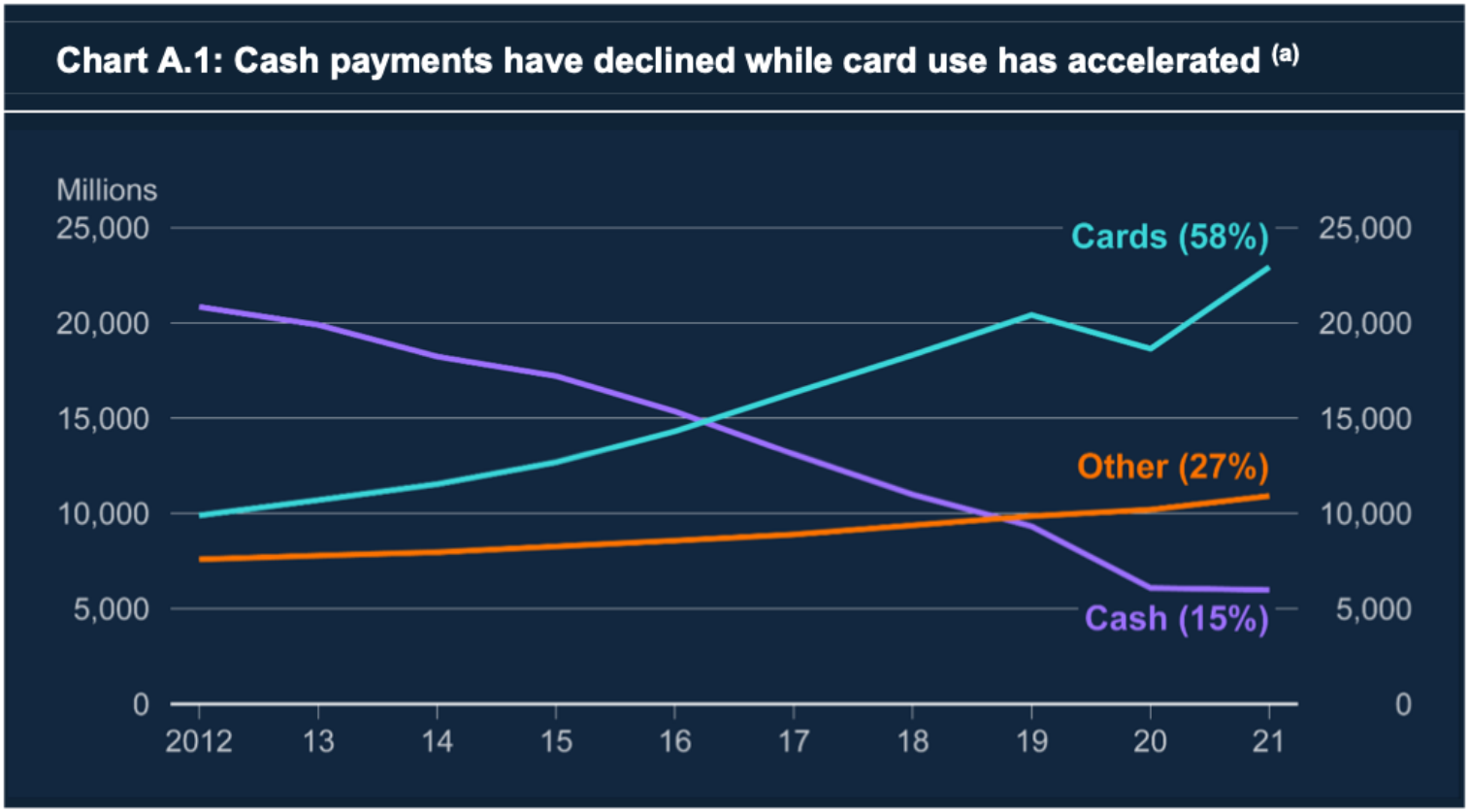
Digital pound consultation

You have until June 7 2023 to tell the bank what you think of its plan:
`https://www.bankofengland.co.uk/the-digital-pound`.



Motivation: declining role of cash in society

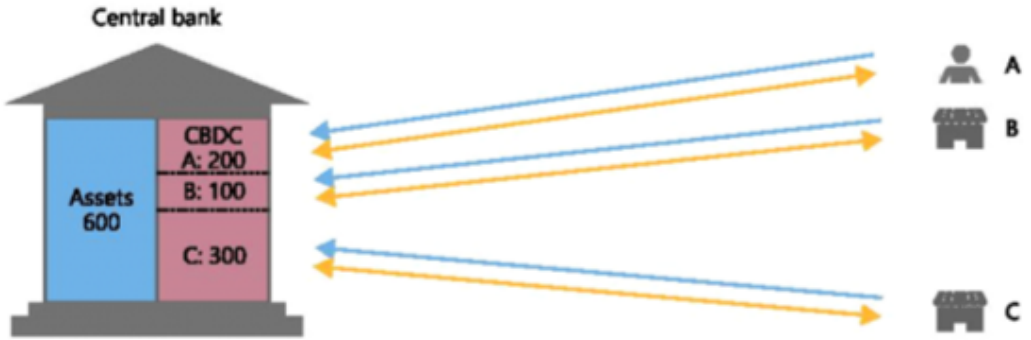
Cash use in UK has gone from over 50 per cent of payment transactions in 2012 to 15 per cent in 2021.



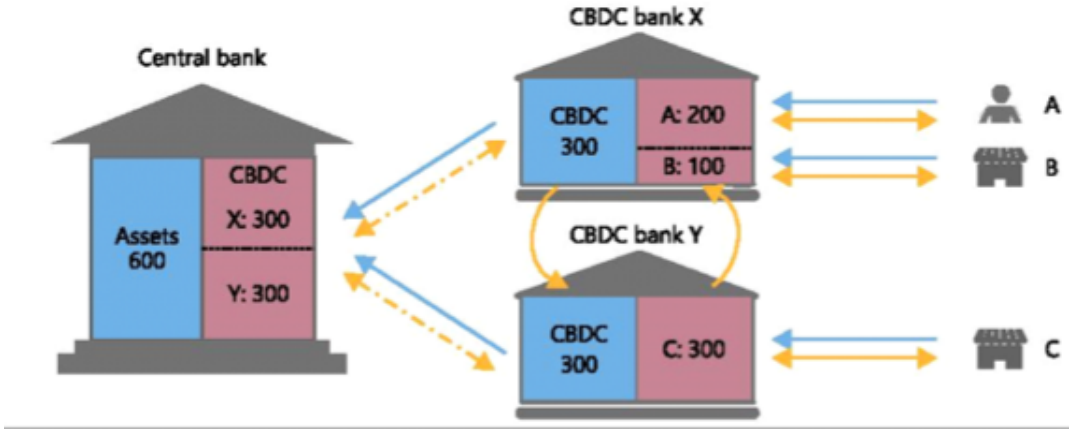
Source: BOE and HMT digital pound Consultation

Retail CBDC Designs

Direct Retail: Direct claim on central bank



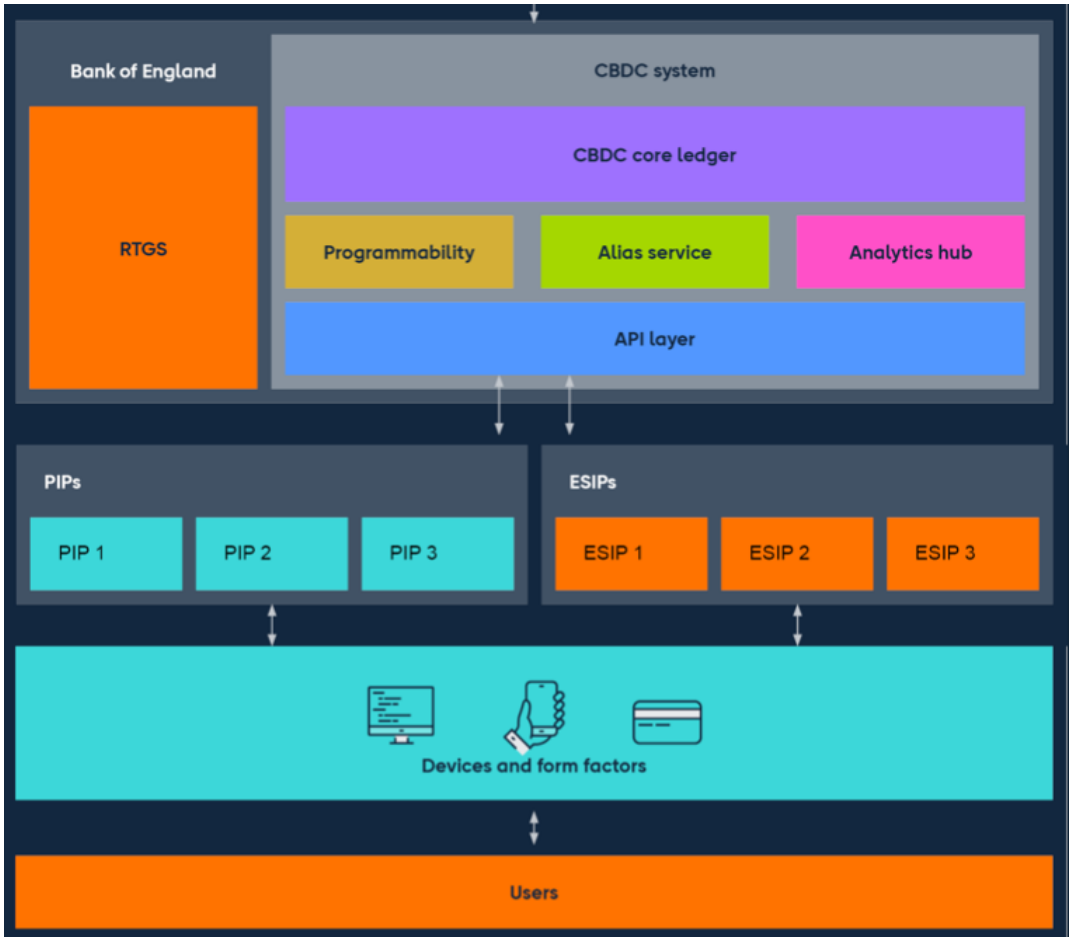
Indirect Retail: Indirect claim on central bank through banks/payment providers



Source: BIS Report

Digital pound design: retail indirect CBDC

Digital pounds distributed to users via payment interface providers (PIPs) and external service interface providers (ESIPs)



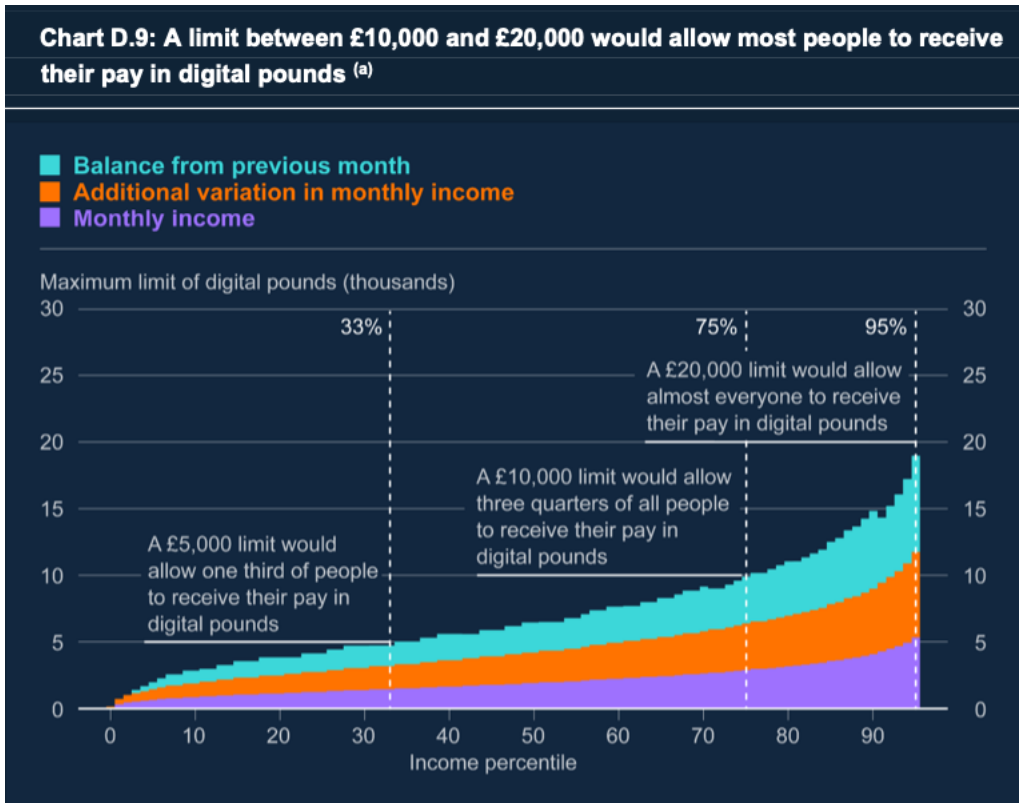
Source: BOE and HMT digital pound Consultation

Digital pound design nomenclature

- **Core ledger**: The CBDC core ledger would record the state information of CBDC in issue and the movement of funds.
  - **Programmability**: Ability to execute smart contracts triggered when pre-conditions are met.
  - **Analytics**: Metadata that is effectively anonymised.
  - **Alias service**: Compatability with other payment platforms.
- **API**: This would allow PIPs and ESIPs to access the core CBDC infrastructure offered by the Bank.
- **PIPs**: These entities would have API access to the core ledger. They would provide wallet services, which would allow retail users to make payments.
- **ESIPs**: Provide non-value services such as business analytics, fraud monitoring, digital identity or smart contracts.
- **RTGS**: Real-time-gross settlement used to clear balances between banks in the wholesale funding market.

Limit on digital wallet balances

- Bank of England has suggested limiting digital pound wallet balances at between £10,000 and £20,000.
- Allow most users to deposit their monthly salary paychecks into their wallets and use them for everyday spending.



Source: BOE and HMT digital pound Consultation

Benefits of a digital pound?

Benefit #1: Financial Inclusion

- The main benefit a digital pound can bring is to households that do not have access to savings device.
- Up to 1.2 million UK residents do not have access to a bank account.
- One reason for a significant share of unbanked households is a lack of identification to register for banking services.
- It is crucial that digital pound wallets administer minimal identification to be as inclusive as possible and be used by the unbanked.
- **Retail or Wholesale**: A retail CBDC is more useful in emerging markets with a large unbanked population, whereas a wholesale CBDC can reduce transaction costs in inter-bank markets in advanced economies.
- Consultation paper does mention the potential for a wholesale CBDC, but insists that viable alernatives are to upgrade the existing RTGS infrastructure in inter-bank markets.

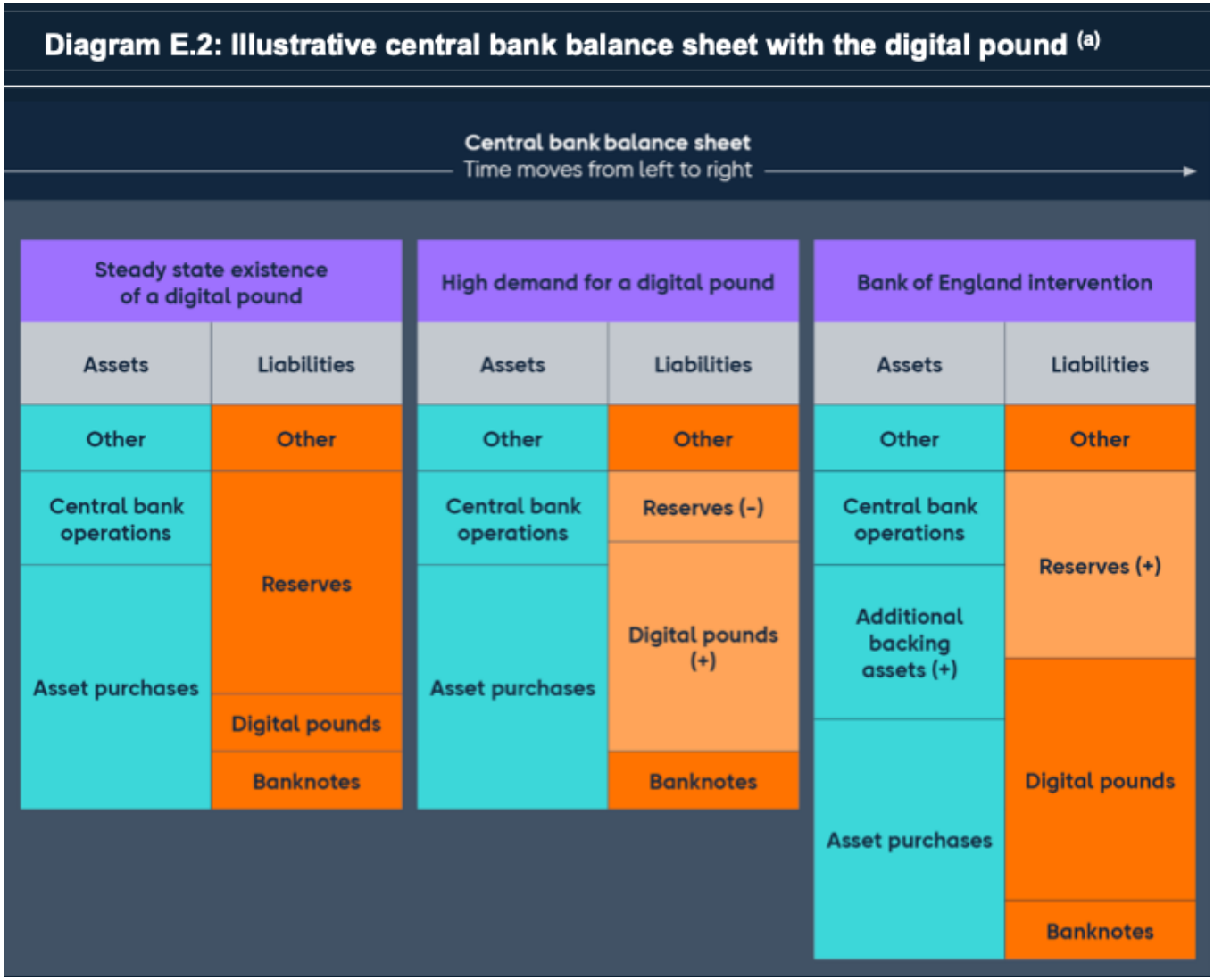
Benefit #2: Monetary Policy tools

- The Bank of England is not proposing to pay interest on balances.
- However, an interest rate on digital balances could increase the "transmission effects" of monetary policy – that is, the effectiveness of the bank's efforts to control inflation, for example.
- By passing through its interest rate changes to digital wallet balances, the bank can increase pass-through to deposit and lending rates in the economy, making it more effective at addressing inflation.
- It could use negative rates during periods of low demand for goods and services within the wider economy.
- The bank could also use the wallets for "fiscal transfers", such as passing tax subsidies or support payments on to households and businesses.

Benefit #3: Financial Stability

- A common concern about CBDCs is that they could cut commercial banks out of the picture when it comes to handling people's money.
- This "dis-intermediation" would happen if everyone started holding money in digital wallets, rather than keeping their cash in a bank.
- If banks have a lower deposit base they might cut lending, leading to a contraction in the economy.
- To counter the potential effects on financial stability, the bank can:
  1. Cap digital pound balances (currently in the limit of 10k-20k GBP)
  2. BOE interventions to increase reserves when deposit outflow is large.

Benefit #3: Financial Stability



Source: BOE and HMT digital pound Consultation

Challenges of a digital pound

Challenge #1: Are digital pounds on a blockchain?

- The BOE Technology Working Paper outlines the general infrastructure through which the CBDC will operate.
- This involves a core ledger, which is the public database governed by the Bank and records all transactions using the digital pound. Will this database be managed using a blockchain technology?
- The core ledger is required to support a large scale of up to 30,000 transactions per second, and any blockchain solution would have to be sufficiently scalable to meet this.
- Bitcoin's proof of work system is poor in this regard with large power consumption by miners to validate transactions.
- An interesting alternative is a **permissioned blockchain** which validates transactions through a vote.

Challenge #2: Who are the PIPs? Will there be take-up?

- A key aspect of the CBDC is a public-private partnership. While digital pounds remain a claim on a central bank, private sector firms are responsible for providing digital 'pass-through' wallets to end users.
- How would these digital wallets look like? Current examples of private wallets we use on a day-to-day basis are Revolut and Monzo.
- These firms could potentially on-board a digital pound, and it would require more compliance with regulations and potentially a banking charter, which may affect their profitability.
- PIPs need sufficient incentive to on-board the digital pound, and if they face increased regulation take-up may be low.

Challenge #3: Data Privacy

- As part of the public-private partnership, user's holdings of digital pounds are recorded anonymously on the Bank's core ledger, in order to safeguard their privacy.
- While the PIPs are unable to access the ledger, it is still unclear if the government can exploit the ledger to trace crime or fraud and to exercise government control and restrict economic freedom.
- The programmability feature of the digital pound allows the Bank to flag transactions that may be fraud, for example, and potentially freezing accounts.
- Privacy concerns are typically highlighted in opposition to China's proposed digital currency project (DCEP). The DCEP features *controllable anonymity*, allowing China's government the ability to freeze and close accounts.

Challenge #4: Cross-border payments

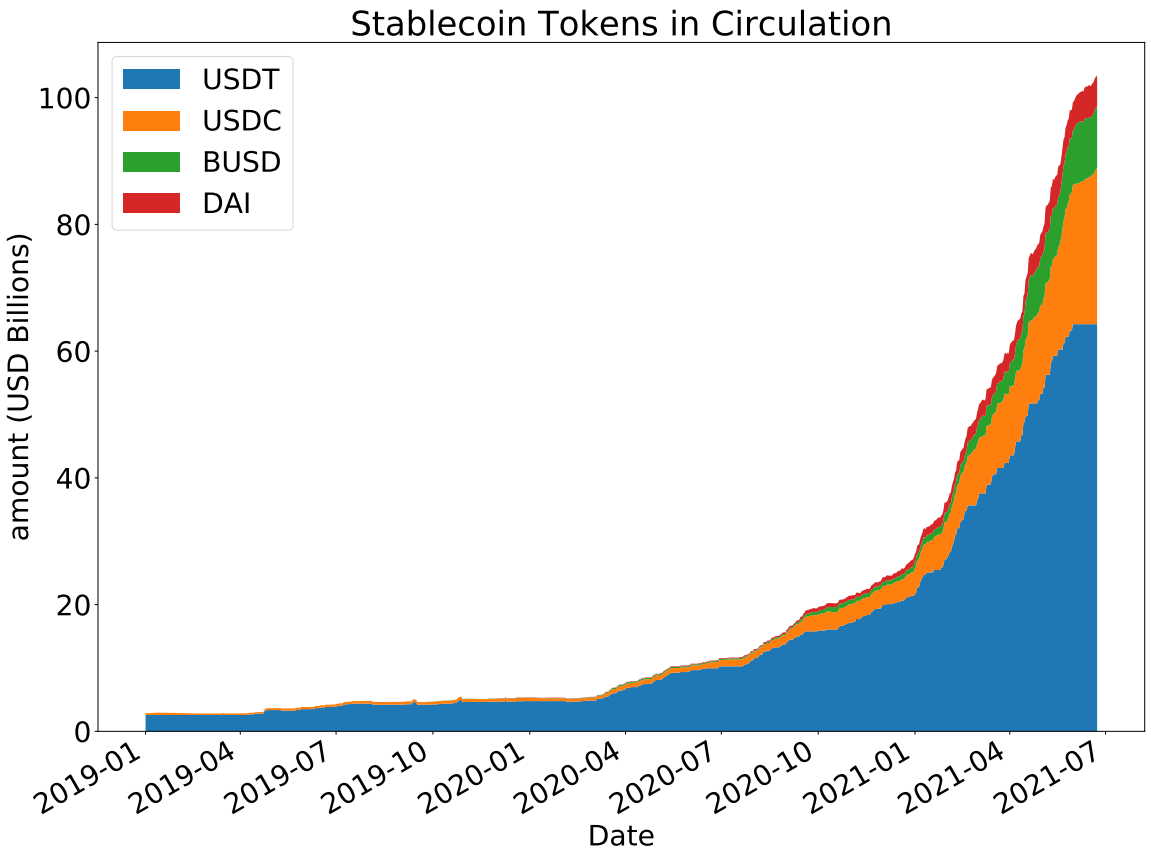
- Can digital pounds be converted to e-currencies at more favourable exchange rates and lower transaction costs than cross-border payments through correspondent banking?
- A large part of whether it reduces transaction costs is if digital currencies are inter-operable, so a digital pound can be exchanged with a digital euro.
- For example, does a digital dollar on a Federal Reserve core ledger (blockchain) transfer to a BOE core ledger (blockchain) for USD/GBP trades?
- For this to be a reality, central banks need to agree on a unifying blockchain infrastructure.
- Project Dunbar is a BIS sponsored project with multiple central banks and is testing cross-border settlement.

Stablecoin risk and regulations

Stablecoin systems and properties

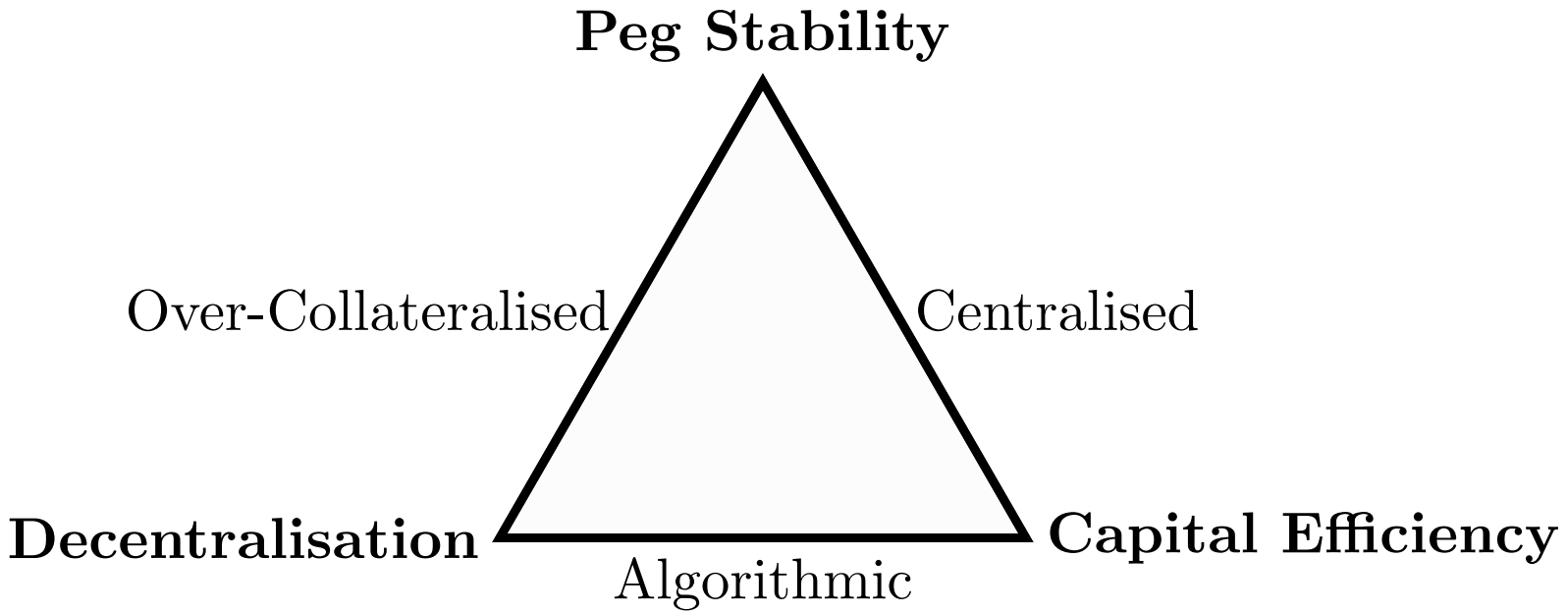
- Stablecoins operate on the blockchain and are pegged at parity to the US dollar.
- Two systems of collateral: **National-Currency backed** or **Cryptocurrency backed**, with the former predominating.
- **Vehicle currency**: They serve as vehicle currencies for trading crypto assets generally due to a reduction in intermediation costs by operating on the blockchain
- **Use in DeFi applications**: Stablecoins used as vehicle on Uniswap (DEX) and DeFI lending protocols to earn high savings rates (eg. Compound)
- **Alternative payments**: Remittance and cross-border payments. Residents in developing countries may use stablecoins to evade capital controls/high inflation.

Stablecoin Ecosystem



Stablecoin Trilemma

Stablecoin designs typically meet two of the following three objectives.

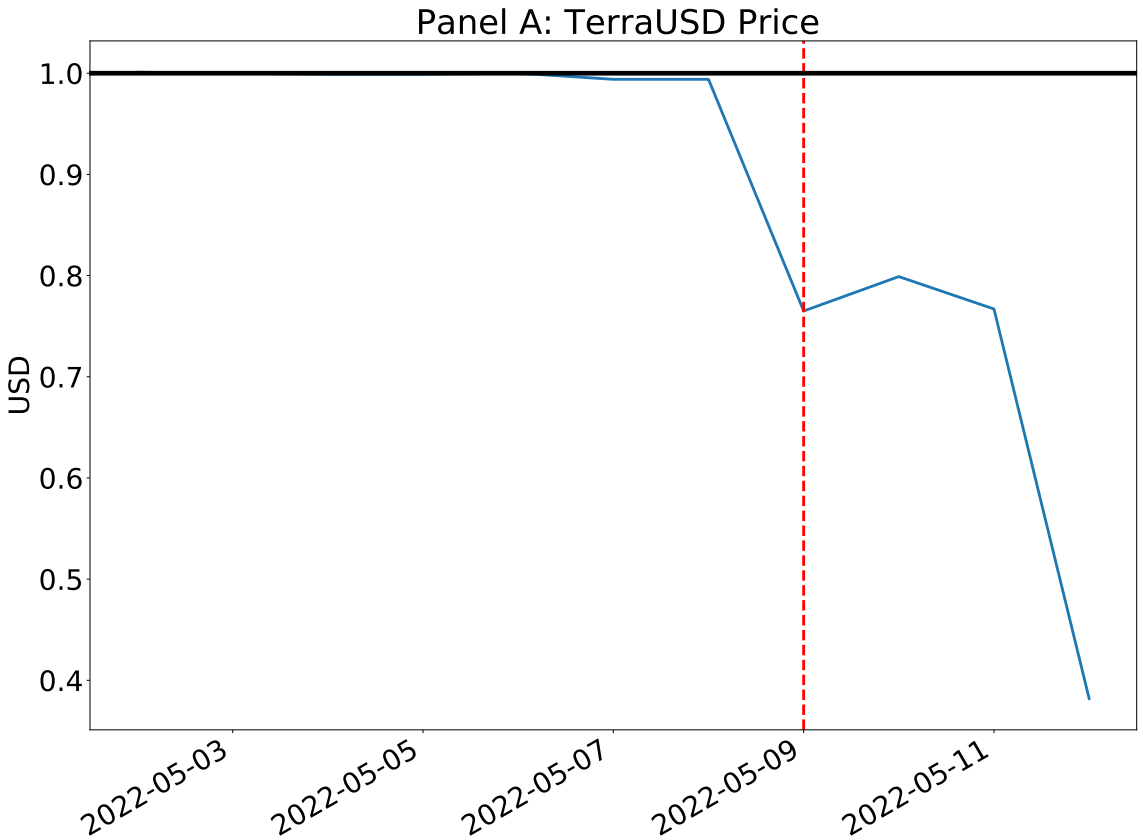


Stablecoin Designs

1. **Centralised**:
   - Most common stablecoin type, lead by Tether. Typically backed by dollar reserves, although not all dollar reserves are cash or cash-equivalent.
   - Tether's balance sheet includes commercial paper and less liquid assets.
2. **Decentralised (over-collateralised)**:
   - Lead by MakerDAO's DAI. Allows individuals to issue DAI tokens through over-collateralised positions in which they deposit cryptocurrency collateral (typically ETH).
   - Drawback is that it is less capital efficient.
3. **Algorithmic**:
   - Stablecoins that typically have zero collateral.
   - While it is capital efficient, it has the drawback that it is prone to speculative attacks and can trade at large discounts.

Case Study: Algorithmic Stablecoin TerraUSD collapse

- Algorithmic stablecoins typically have little or no collateral.
- Vulnerable to speculative attacks and can trade at large discounts.

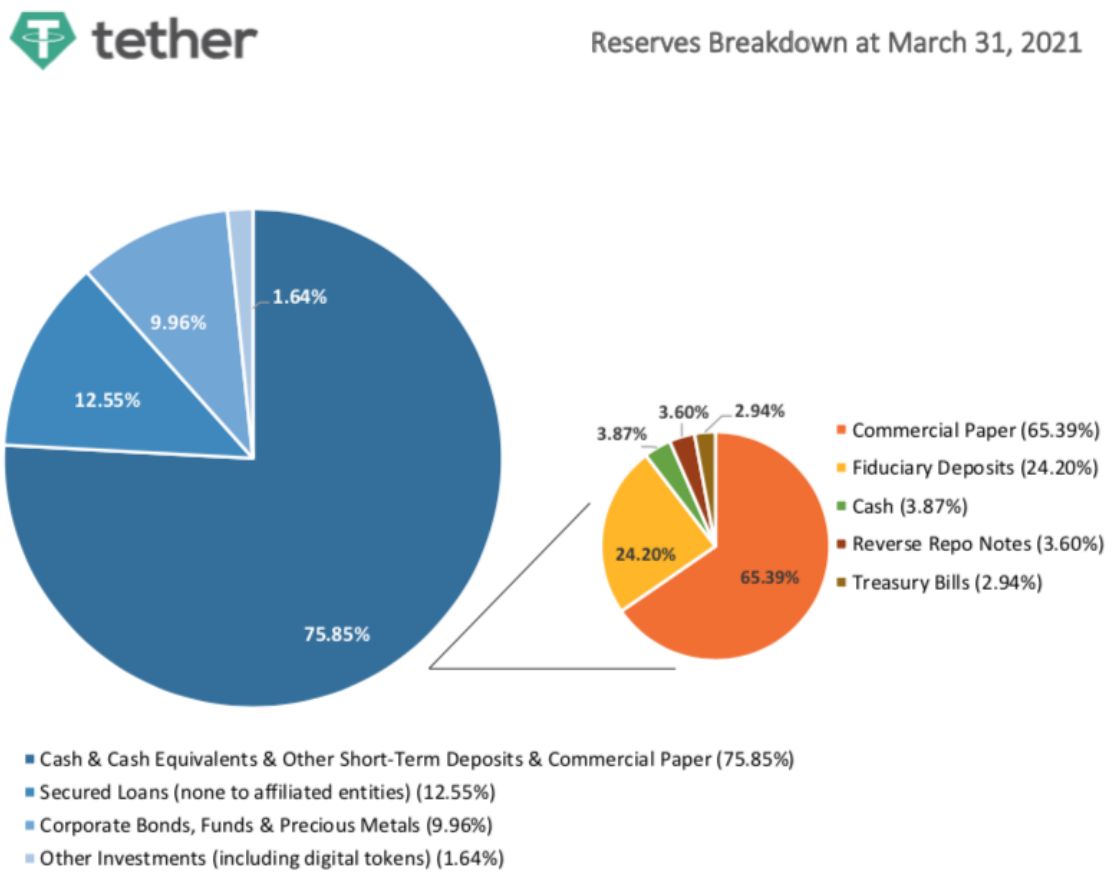


Stablecoin Risks

- **Custodial Risk**: Centralised issuer absconding with funds.
- **Run-risk**: Redemptions exceed liquid cash reserves.
- **Systemic risk** Stablecoins used in crypto derivatives increase risk exposures of financial intermediaries.
- **Payments risk**: Stablecoin devaluations can trigger insolvency of firms and consumers with savings/payments.

Run risk: Illiquid assets

2021 Q1 Quarterly statement released by Tether Ltd on breakdown of reserves. Only 75 % backed by cash or cash equivalents. Since then have scaled down their commercial paper to nearly 0!



Stablecoin Regulations

- Capital requirements and audits to ensure full collateralisation.
- Insurance through a deposit guarantee scheme.
- Liquidity support by the central bank to enable the bank to meet redemptions.
- Macroprudential regulation to limit risk exposures of banking sector, households and firms in crypto.
- **Question**: Can a digital pound be used to help regulate stablecoins?

Can a digital pound support growth of stablecoins?

Coexistence of CBDCs and Stablecoins

- In the consultation paper, the BOE argue that they could "coexist" in a mixed payments economy.
- The BOE suggests a model in which these backing assets could be "held entirely with the central bank", adding that this would make the stablecoin "economically similar to the digital pound" and reduce financial risk.
- If the digital currency was used to back a stablecoin, this would mean that the issuer would provide holders with stablecoin tokens based on the value of digital pounds
- The stablecoin tokens can then be used by customers for payments (both domestic and international) as well as trading in cryptocurrencies.

CBDC-backed stablecoin: capital requirements

- Stablecoins managed by private banks are not regularly audited.
- A stablecoin backed by a digital pound in an account held with the central bank would be much more transparent and trustworthy.
- The central bank could regularly audit stablecoin providers' reserves.
- Legislators could also impose capital requirements, for example requiring what percentage of issuers' reserves are kept in the account with the central bank.
- **Trade-off**: Extreme capital requirements could affect the profitability of stablecoins.
- Stablecoin issuers typically hold yield-bearing assets like Treasury bonds. In contrast, a digital pound-backed stablecoin issuer would be unlikely to earn interest on its account at the central bank.

CBDC-backed stablecoins: risk management

- CBDC-backed stablecoins address some of the systemic issues surrounding this type of crypto asset.
- This typically happens when a market event prompts holders to rush to redeem their stablecoins for the reserve currency and the issuer has difficulties fulfilling so many redemptions at once.
- If issuers were holding a certain percentage of liquid digital currency reserves at the central bank, this would ensure they had funds to process redemptions or withdrawals while maintaining the coin's value against the digital pound.
- Even if an issuer bankruptcy did occur, a central bank could also provide insurance to stablecoin customers to protect their assets to a certain level.

Conclusions

- **Benefits of digital pound**:
  1. Financial inclusion
  2. More monetary policy tools
  3. Financial stability
- **Challenges of digital pound**:
  1. Is there a blockchain?
  2. Take-up by payment interface providers (PIPs)
  3. Data privacy
  4. Cross-border payments
- **Stablecoins and CBDCs can coexist**: A stablecoin backed by the digital pound can address systemic risk of cryptoassets, and allowing legislators to mandate capital requirements.

WBS Gillmore Centre for Financial Technology

- **Vision**: to conduct world-class, cutting-edge research at the intersection of finance and technology that has the transformative potential to impact theory, policy and practice.

- **Mission**: to become an effective contributor and thought leader to stakeholders in the fintech sector

- **Imperative**: world-class, cutting-edge research will inform new educational initiatives for undergraduate, graduate and executive programs to meet the skills needs of the fintech sector

WITS-Gillmore Centre Feeder Workshop & Conference

- **Digital Currencies & The Frontiers of AI and FinTech**
  - Highlight recent AI and Digital Currency developments and their implications for financial activity
  - The workshops aim to initiate conversations about new business applications, novel datasets, advanced technical developments and the social & economic impacts of FinTech and AI
- **17/18th March at Warwick Business School (Coventry) & Livestream**
- **View Agenda https://warwick.ac.uk/fac/soc/wbs/subjects/finance/gillmore/industryconference2023/**
- **Register interest https://www.wbs.ac.uk/events/view/7931**

Introducing the Global Central Banking and Financial Regulation Qualifications

WARWICK BUSINESS SCHOOL
THE UNIVERSITY OF WARWICK

In collaboration with **Bank of England**

Developed and delivered in collaboration with the Bank of England, this flexible programme is designed for professionals working in the banking and financial sectors

- Taught by industry experts and leading academics, combining latest thought leadership with practical application
- Studied part-time and via our bespoke learning platform enabling you to gain a qualification alongside work and personal commitments
- Pick and choose from a selection of seven modules
- Choice of qualification levels, from a Postgraduate Award for a single module through to Masters
- Choice of start dates in October, February and June

Find out more at wbs.ac.uk/go/banking

Thank You!