How to Design a CBDC and Stablecoin?

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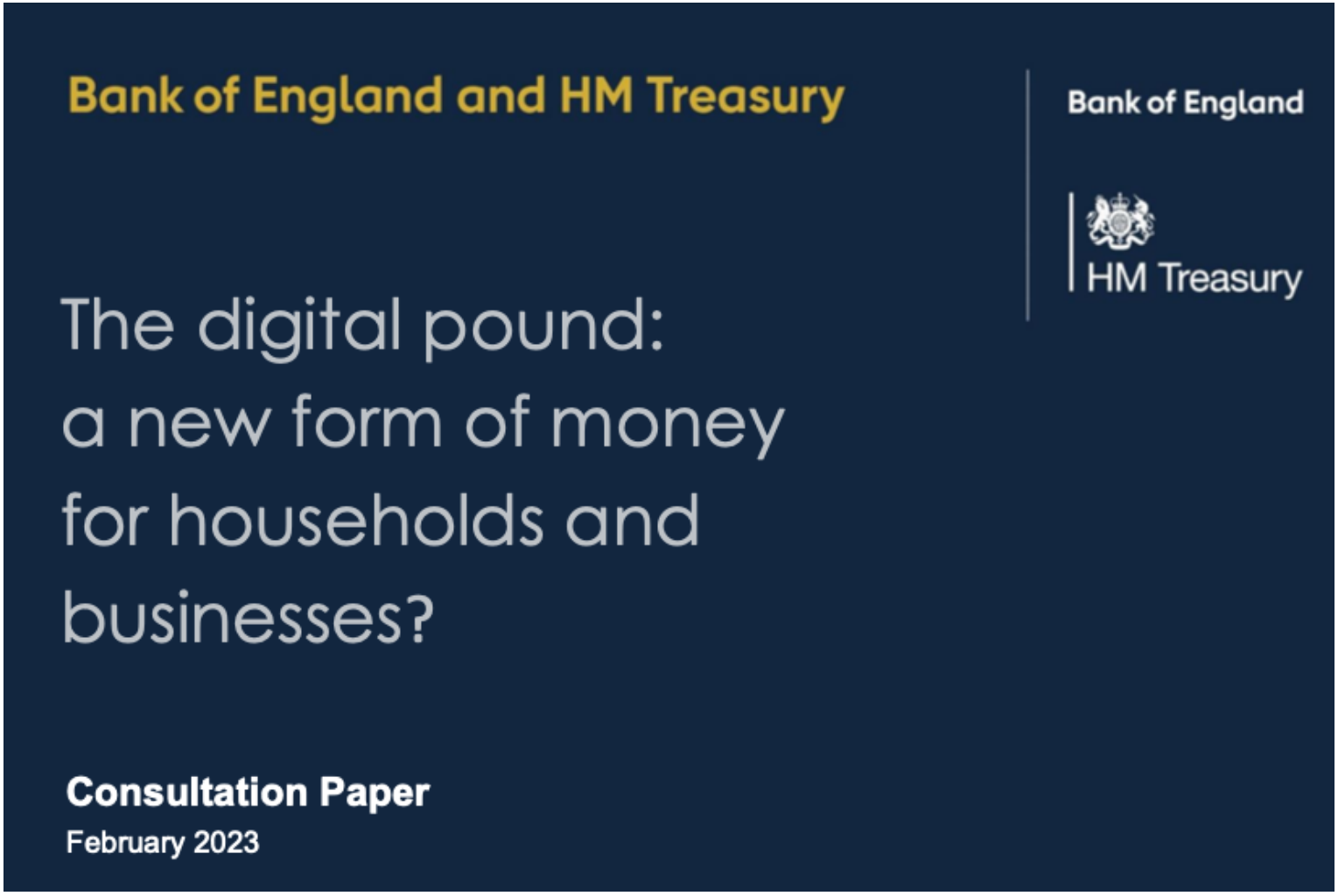
Part 1: CBDC Design

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`.

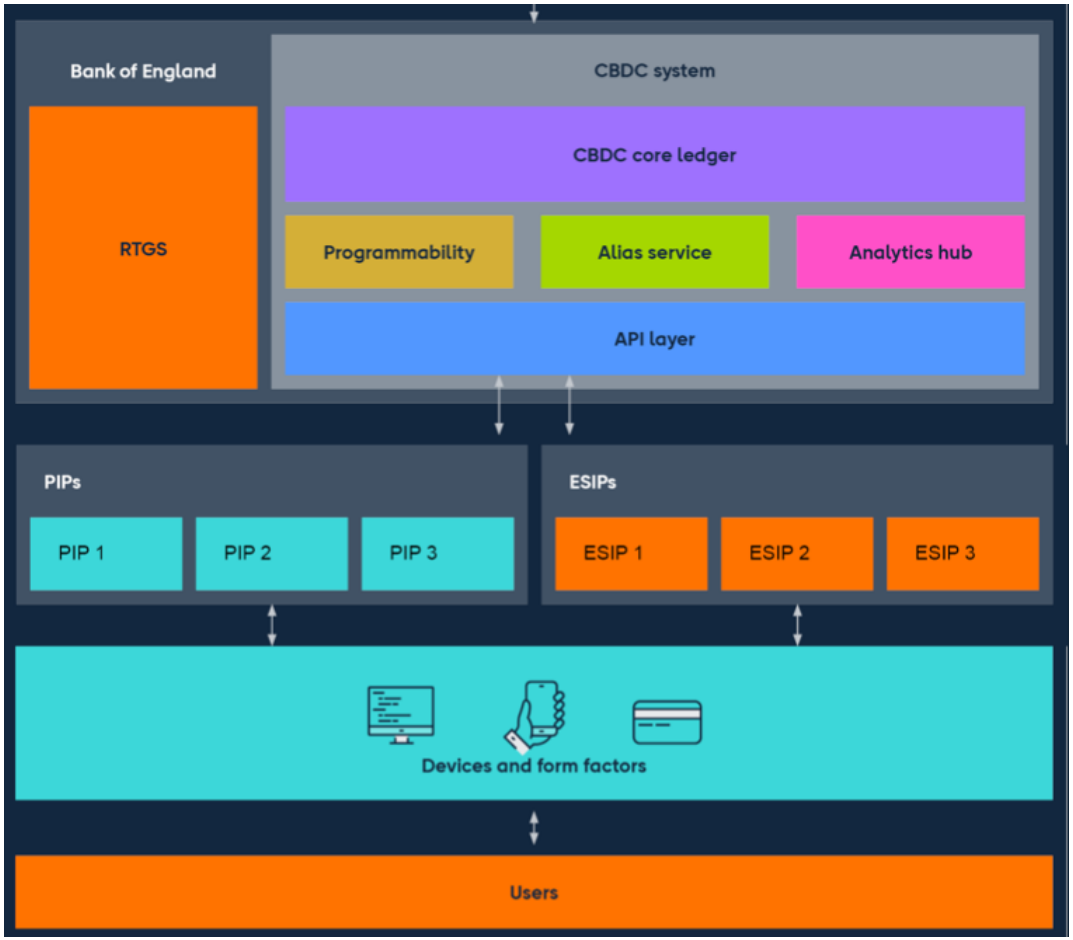


Motivation: declining role of cash in society

- 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.
- **Motivation**: Cash use in UK has gone from over 50 per cent of payment transactions in 2012 to 15 per cent in 2021.
- **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.
- Consultation proposes an **indirect retail CBDC**, where digital pounds are distributed to households via private payment services.

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

CBDC design considerations

1. Core ledger
2. Payment interface providers (PIPs)
3. Monetary policy tools
4. Financial stability
5. Cross-border payments

#1: Core ledger

Blockchain

- 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.

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 privacy.
- The programmability feature of the digital pound allows the Bank to flag transactions that may be fraud, for example, and potentially freezing accounts. Will this increase in government control affect take-up?

#2: Payment interface providers (PIPs)

- 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 will also have to be designed to impose minimal requirements for access to an account to increase financial inclusion.

#3: 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.

#4: 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.

#5: 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.

Recap: CBDC Design

1. Core-ledger: Permissioned blockchain can achieve scalability
2. Payment interface providers: Designed to increase access to financial services and face less compliance costs than banks
3. Monetary policy tools: Interest rate on digital pound can increase transmission effects of policy
4. Financial stability: Cap on wallet balances and BOE interventions to increase reserves
5. Cross-border payments: Unifying infrastructure with other central banks can reduce transaction costs

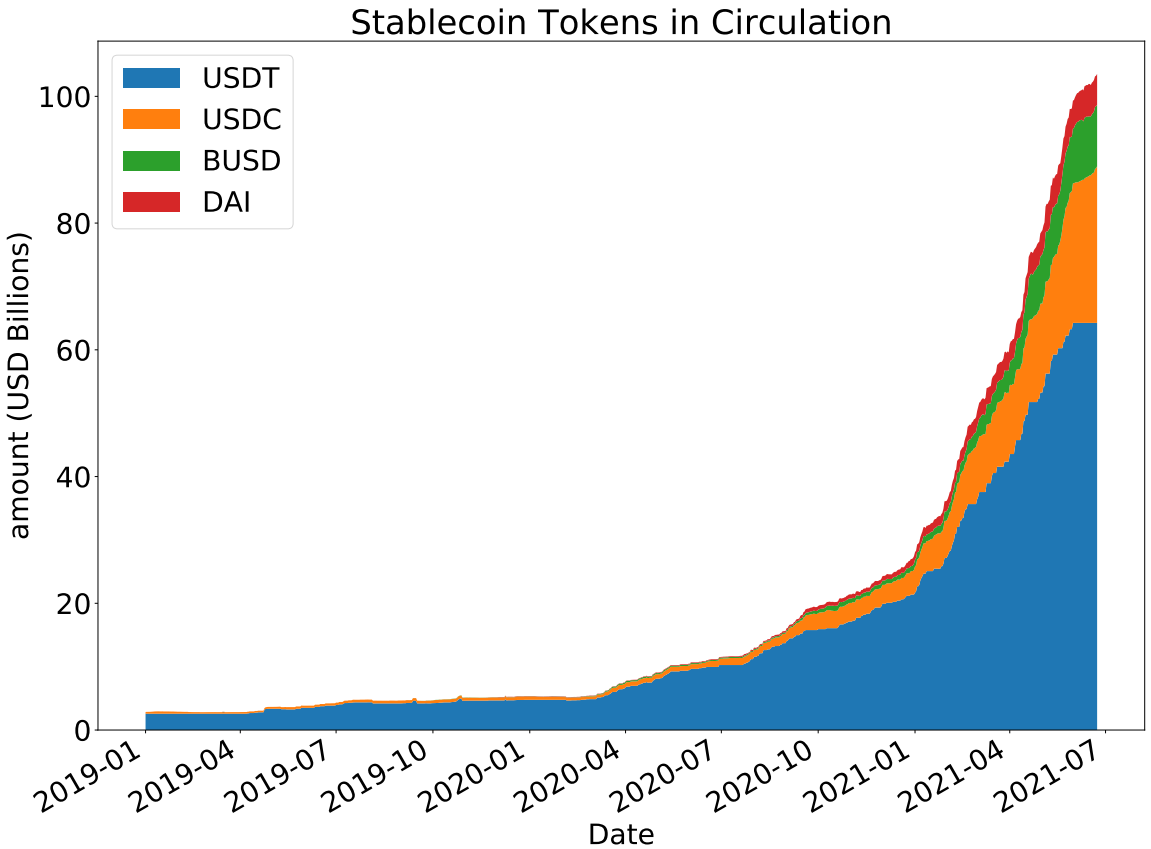
Part 2: Stablecoins

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

Most common type are centralised stablecoins lead by Tether and USDC. Typically backed by dollar reserves and interest-yielding assets like Treasury bonds.



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.

Stablecoin design considerations

1. Stablecoin arbitrage
2. Stable versus risky collateral
3. Exogenous versus endogenous collateral
4. Auditing and transparency
5. CBDC-backed stablecoin

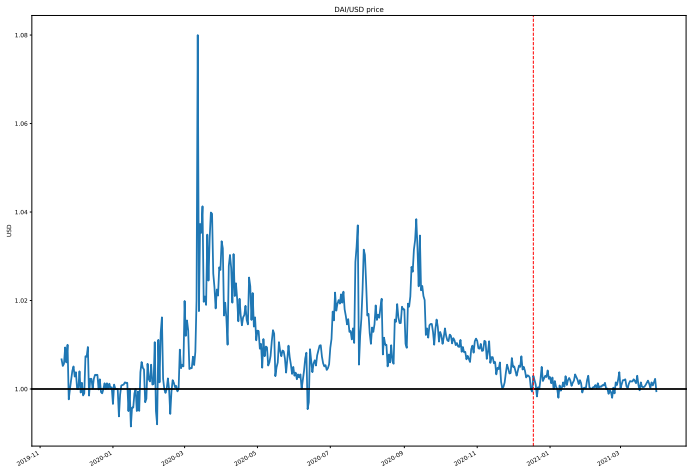
#1: Stablecoin arbitrage

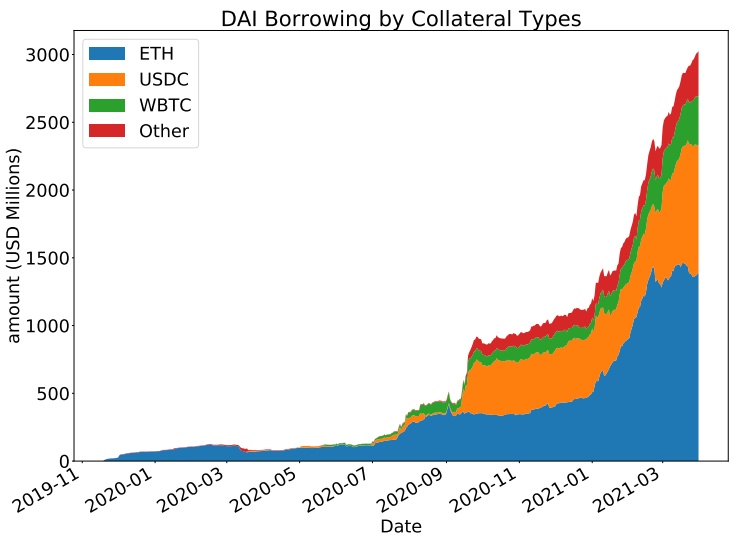
- **Access to primary market/stablecoin issuer**: Investors require access to trade with the Stablecoin treasury to take advantage of pricing differences between the primary and secondary market.
- **Redemption rights**: In response to a panic, issuers should enable easy access to redeem tokens at par to stabilise the peg.
- **Arbitrage trade**: Investors can buy a stablecoin in the secondary market if it is trading at 95 cents, and redeem token at 1 USD at issuer to make a profit.
- Both Tether and USDC have processed redemptions in response to speculative attacks, and this has stabilised the peg.

#2: Stable versus risky collateral

Access to stable collateral increases efficiency of the peg. With reference to the DAI stablecoin:

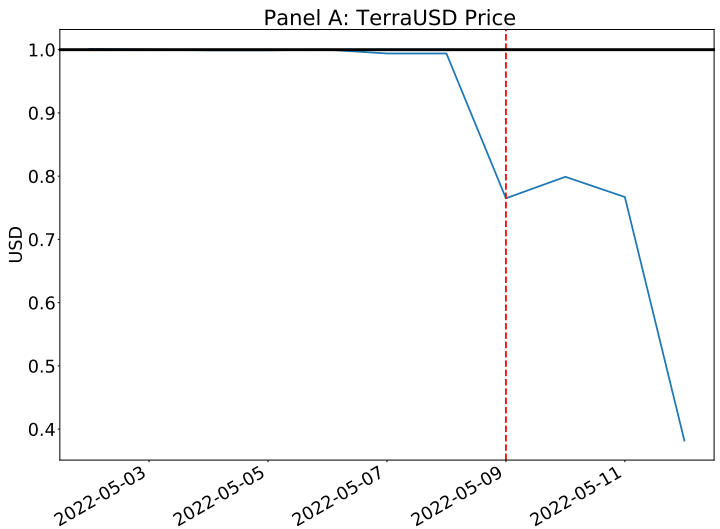
1. USDC Stable collateral type introduced in March 2020
2. Peg Stability Module (PSM) in December 2020 allows users to swap DAI with the USDC stablecoin at a 1:1 rate without needing to create a vault and deposit collateral.

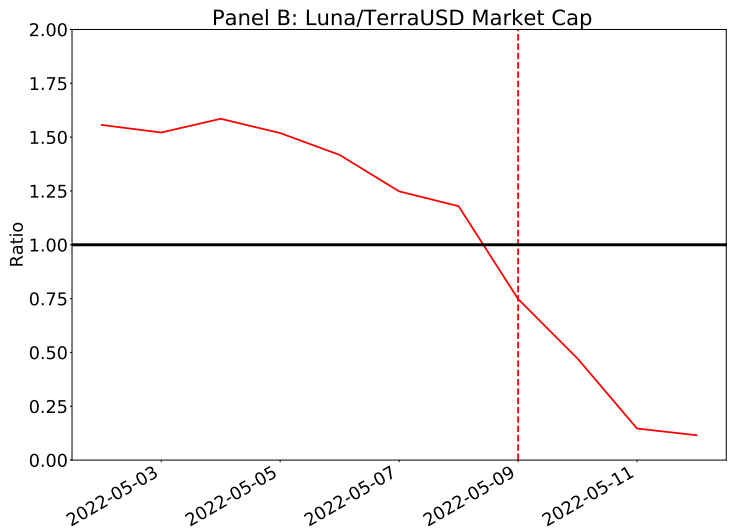




#3: Exogenous vs Endogenous collateral

- It is important for a stablecoin to be backed by exogenous collateral for stability. Adverse feedback loops can occur if the stablecoin and collateral backing belong to the same blockchain.
- TerraUSD price and ratio of value of TerraLuna to TerraUSD in May 2022





#4: Auditing and transparency

- Centralized stablecoins have the drawback of holding assets off-chain.
- Increased transparency and auditing of stablecoin assets are useful to minimise run-risk.
- A potential solution is Chainlink's proof-of-reserve system using blockchain technology.
- Third party verification of the stablecoin-issuer assets at a block-time frequency can mitigate run-risks and custodial risk of an issuer absconding with funds off-chain.
- By publishing real-time audit reports, Chainlink can prevent systemic failures in DeFi applications and protecting users from unexpected fractional reserve activity.
- Currently TrueUSD is the only stablecoin that uses proof of reserve.

#5: CBDC-backed stablecoin

- In their digital pound consultation paper, the Bank of England argue that stablecoins can be backed by digital pounds held entirely with the central bank.
- **auditing**: In this model, the central bank could regularly audit stablecoin providers' reserves and impose capital requirements.
- **risk management**: 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. The central bank can also provide insurance for customers.
- **profitability**: Extreme capital requirements could affect the profitability of stablecoins.

Recap: Stablecoin Design

1. Stablecoin arbitrage: Access to issuer and redemption rights $\uparrow$ peg efficiency
2. Stable versus risky collateral: Stable collateral $\uparrow$ peg efficiency
3. Exogenous versus endogenous collateral: Endogenous collateral increases risk of speculative attacks
4. Auditing and transparency: Real-time auditing through proof of reserve can reduce run-risk
5. CBDC-backed stablecoin: Regulate stablecoins, imposing capital requirements can reduce run-risk

Thank You!