PwC Global CBDC Index and Stablecoin Overview 2022

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Welcome

Dear Clients and Friends,

We are excited to launch the 2nd edition of the PwC Global Central Bank Digital Currency (CBDC) Index and newly created Stablecoin Overview.

Once again, we hope the analysis and insights stimulate further discussion and debate with respect to the trajectory of this new type of central bank currency, alongside its privately issued complement, the stablecoin.

The PwC Global CBDC Index is designed to measure central banks' level of maturity in deploying their own digital currency. The inclusion of the Stablecoin Overview was considered a sensible evolution in the analysis, given the two frameworks co-exist. One framework is fully state backed whereas the other is only partly, and only to the extent that the underlying deposit taker is regulated and protected by the state through regulation and deposit protection schemes.

As in 2021, CBDCs are measured via a synthetic index capturing the central banks' progress and stance on CBDC development, in both a retail and wholesale context. For the stablecoins, we have deliberately chosen not to rank, instead providing an overview of the criteria by which they can be compared, depending on the use case which may be specific to the reader.

PwC offers a wide range of expertise, including strategy, financial crime, legal, regulatory, accounting, tax, governance, risk assurance, audit, cybersecurity as well as transaction advisory for working with both central bank digital currencies and stablecoins. Our global network is constantly evolving its thinking in how this technology can be applied, through research, client engagements and the development of thought leadership.

If you have feedback, we would be delighted to hear from you.

Haydn Jones
Director, Senior Blockchain Market Specialist
PwC United Kingdom

“Given the fall in public sector cash use and the rise in private sector cryptoassets, our new report gives a timely update on the progress and development of CBDCs and stablecoins.

Over 80% of central banks are considering launching a CBDC or have already done so.

At the same time, stablecoins are emerging as a complement to existing payment ecosystems, with market capitalisation reaching around USD 190 billion in early 2022.

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Duncan Fitzgerald
Partner, Digital Trust & Risk
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PwC is pleased to have played a key role in supporting various central banks in developing a CBDC platform.

CBDCs will facilitate more efficient, lower-cost and 24/7/365 cross-border payments for the financial services industry. We expect that CBDCs will greatly benefit cross border transactions and economies of all relevant jurisdictions.

CBDCs in 2022 – political reality bites

At first glance, it may seem that little has changed in the CBDC index from last year. This undoubtedly reflects the scale, breadth and complexity of the underlying debate which ranges from the impact on credit creation, cross border payments through to inclusion and controlling financial crime. Yet, according to the Bank of International Settlement (BIS), there are three live retail CBDCs and at least 28 pilot projects. At least 68 central banks have communicated publicly about their CBDC work.[1]

Overall, more than 80% of central banks are considering launching a CBDC or have already done so, either for retail or wholesale payments. To name a few, legal digital-tender is in use in The Bahamas and Nigeria with Jamaica and the Eastern Caribbean expected to follow soon. The People's Bank of China began its journey towards a digital yuan in 2014. The country is currently conducting large-scale public trials in selected cities and the e-CNY was one of only three payment methods accepted at the venue during the 2022 Winter Olympics. In February 2022, India's Finance Minister pledged to have a virtual version of the rupee later this year and the following month, the Philippines announced its own pilot implementation of a CBDC.[2,3]

The Central Bank of Nigeria (CBN) launched e-Naira in October 2021. The digital currency is expected to support the country's target to raise levels of financial inclusion from 64% to 95%. By making the e-Naira platform part of the financial ecosystem, the CBN hopes to grow new private sector use cases to support the uptake of the CBDC. According to the country's President, a properly managed e-Naira could add more than US$29 billion to Nigeria's GDP over the next ten years.[4]

In March 2022, the US Administration placed 'the highest urgency' on research and development efforts into the potential design and deployment of a US CBDC. The Executive Order highlighted a number of CBDC benefits, including expanding access to financial services, lowering the cost of funds transfers and reinforcing US leadership in the global financial system. The Administration expects regulators to submit a joint research assessment on CBDC implications by September 2022.[5]

In the UK, the Economic Affairs Committee of the House of Lords (Committee) declared CBDCs 'a solution in search of a problem'.[6] The Committee continued to state that they have yet to hear a convincing case for why the UK needs a retail CBDC, arguing that while a CBDC may provide some advantages on speed of settlement as well as cheaper and faster cross-border payments, it would present significant challenges for financial stability and the protection of privacy. The Committee was slightly more positive towards a wholesale CBDC, stating it would be less disruptive than a retail CBDC and comes with fewer economic and political risks. The Committee notes that although the wholesale operations of the monetary system are already highly efficient, a CBDC may help to further enhance efficiency in securities' trading and settlement. This carefully considered report lays out the most recent findings of one G7 country.

The UK's position should be contrasted to that of the European Commission which plans to propose a bill for a digital euro in early 2023, serving as the legal foundation for the virtual version of a euro banknote or coin.[7] In his March 2022 speech, the European Central Bank (ECB) Executive Board member Fabio Panetta emphasised that the digital euro project should be about access to central bank money in digital form for daily transactions, allowing users to benefit from high standards of privacy.[8]

While the ECB's Governing Council will make the final decision on whether a digital euro is needed, policymakers within the Commission and across Europe are already convinced. Germany and France last year urged the ECB to speed up the process amid fears that the eurozone could get left behind.[7]

All digital money, whether issued privately, or by the state, can be monitored and controlled - whether that is a desired feature, or not differs, country by country. However, people do do bad things with money of all types, and frameworks that help track and prevent such things happening are essential - the more transparent and simpler they operate, the better. More broadly, the frictional cost of any type of money within an economy does not add value - removing such cost is a smart move. Whilst CBDCs offer a way through some of these challenges, the use they are put to is ultimately motivated by a government's policy, eclipsing all other factors.

[1]BIS, Rise of the central bank digital currencies: drivers, approaches and technologies, BIS working paper, No 880, August 2020 (updated January 2022), Auer, R, G Cornelli and J Frost, [2]Government of India, Budget 2022-2023 (1 February 2022), Nirmala Sitharaman, Minister of Finance, [3]Bangko Sentral ng Pilipinas, Governor Benjamin E. Diokno for the Joint BSP-AFI Knowledge Exchange Program on Central Bank Digital Currency (28 February 2022), [4]Aso Rock Villa, Official Launch of the eNaira (1 October 2021), President Buhari, [5]The White House, Executive Order on Ensuring Responsible Development of Digital Assets (9 March 2022), [6]House of Lords, Economic Affairs Committee, Central bank digital currencies: a solution in search of a problem? (13 January 2022), [7]POLITICO, Digital euro bill due early 2023 (9 February 2022), Bjarke Smith-Meyer, [8]ECB, A digital euro that serves the needs of the public: striking the right balance, (30 March 2022), Fabio Panetta

The role for stablecoins

Set against the political factors driving central bank digital currencies, privately issued stablecoins offer a quasi, semi state-backed option and provide much of the same utility, without the possibly constraining aspects of government originated issuance. In its simplest sense, a stablecoin is a digital currency, collateralised on a one-to-one basis (for instance, by a fiat currency deposit held by a 3rd party, regulated custodian). This implies it is state-backed, but only to the extent that the deposits are insured.

Stablecoins offer all of the advantages of digital currencies, such as transmissibility, continuous settlement, traceability, cross-border interoperability, low transaction fees relative to traditional payment infrastructure and programmability. However, where they reference a fiat deposit, they allow a bridge to be created between the traditional financial ecosystem and digital technologies in a general sense. There are different categories of stablecoins, each displaying a different set of characteristics. In recent PwC analysis, we identified the following five groups:

1. **Fiat-backed stablecoins**
2. **Crypto-backed stablecoins**
3. **Algorithmic stablecoins**
4. **Security-backed stablecoins**
5. **Other asset-backed coins**

Stability in the price of the stablecoin is a function of the transparency of the coin provider's entire operations, including the custodian holding the relevant fiat deposits. For a fiat-backed stablecoin, it is paramount to demonstrate that the stablecoin is appropriately collateralised on a one-to-one basis, ideally continuously. At any given time, the balance of fiat currency held in deposit must be equal to (or greater than) the number of stable coins in circulation. This process also needs to account for the minting, redemption and burning of tokens against the underlying deposits. Further confidence in the operation of the stablecoin can be provided by subjecting the stablecoin operator to an external audit process, to validate that the stablecoins are continuously backed. The results of the audit should then be made available publicly. In our stablecoin overview, factors we reviewed include:

1. **Global regulation**
2. **Risks and vulnerability concerns**
3. **Redemption and issuance**
4. **Ownership**
5. **Stabilisation mechanisms**

Finally, and crucially, given the challenges of the current geopolitical situation, it is possible to deny transactions associated with specific public addresses, tied to sanctions lists associated with governments, legal entities and individuals.

Stablecoins offer full digital utility, being able to link directly in the core processes of an organisation (e.g. requisition, procure-to-pay, or treasury management). The transfer can be made conditional, offering efficiency opportunities for commodity categories, in the context of payments. Stablecoins offer an entirely new way of re-inventing the way organisations work, combining the latest digital hygiene and scanning tools.

Whilst the utility opportunity of a stablecoin is significant, there are regulatory challenges criss-crossing multiple jurisdictions. Most recently, this was evidenced by the Facebook project Diem and the eventual sale of the IP to Silvergate.

PwC Global CBDC index – top 10

Snapshot of global CBDC maturity for wholesale and retail projects.

Research methodology

Data source 1

BIS[1], Central Bank websites, Atlantic Council, Press, Central Banks, Google Trends, Baidu Index and PwC Analysis.

Index composition 2

The objective of the index is to provide an overview of the development of CBDC globally.

The primary variable is the CBDC project status, indicating the current stage of project development. Two other variables capture the stance of the central bank based on published speeches, and a public interest proxy (Google Trends or Baidu Index).

This index is technology agnostic: each countries' design choices (infrastructure, technologies, etc.) have no impact on the index.

Composition rationale 3

We analysed the following aspects of the three indicators introduced by BIS, based on the BIS data update release in January 2022:

CBDC projects' status tracks three stages of development – namely, research, pilot and production. Given the trend that more and more CBDC projects entered into pilot phases, we introduced more detailed development stages in the pilot phase (i.e. proof-of-concept, development, implementation, completion and near-live). The more advanced a CBDC project is, the higher score it receives. In addition, points are allocated, based on the duration of the corresponding pilot projects, to simulate the project progress. However, these points can be withdrawn if a pilot project did not have new developments for several years or if the central bank no longer focus on the project. CBDC projects' status represents 75% of the CBDC index.

CB speech stance measures the recent average opinion expressed by Central Bankers captured within the BIS central bankers' speeches databases. This indicator aims to provide information about the future of the project status and legal aspects. It represents 17% of the CBDC index.

Public interest proxy is the average score of Google Trends (for projects outside Mainland China) and Baidu Index (for Mainland China only) during the recent periods. It represents recent trends of general public interest. It suggests potential collaborative interest from private sectors, who could support future project advancement. Public interest proxy represents 8% of the CBDC index.

Quality review 4

PwC have made extensive use of the BIS data, and subjected the analysis to several rounds of review prior to publication. Furthermore, a quality review is performed on index distribution and ranking changes to evaluate data robustness.

A score review is realised by local PwC teams to each qualitative indicator, (i.e. CBDC projects' advancement status and CB speech stance) before each publication.

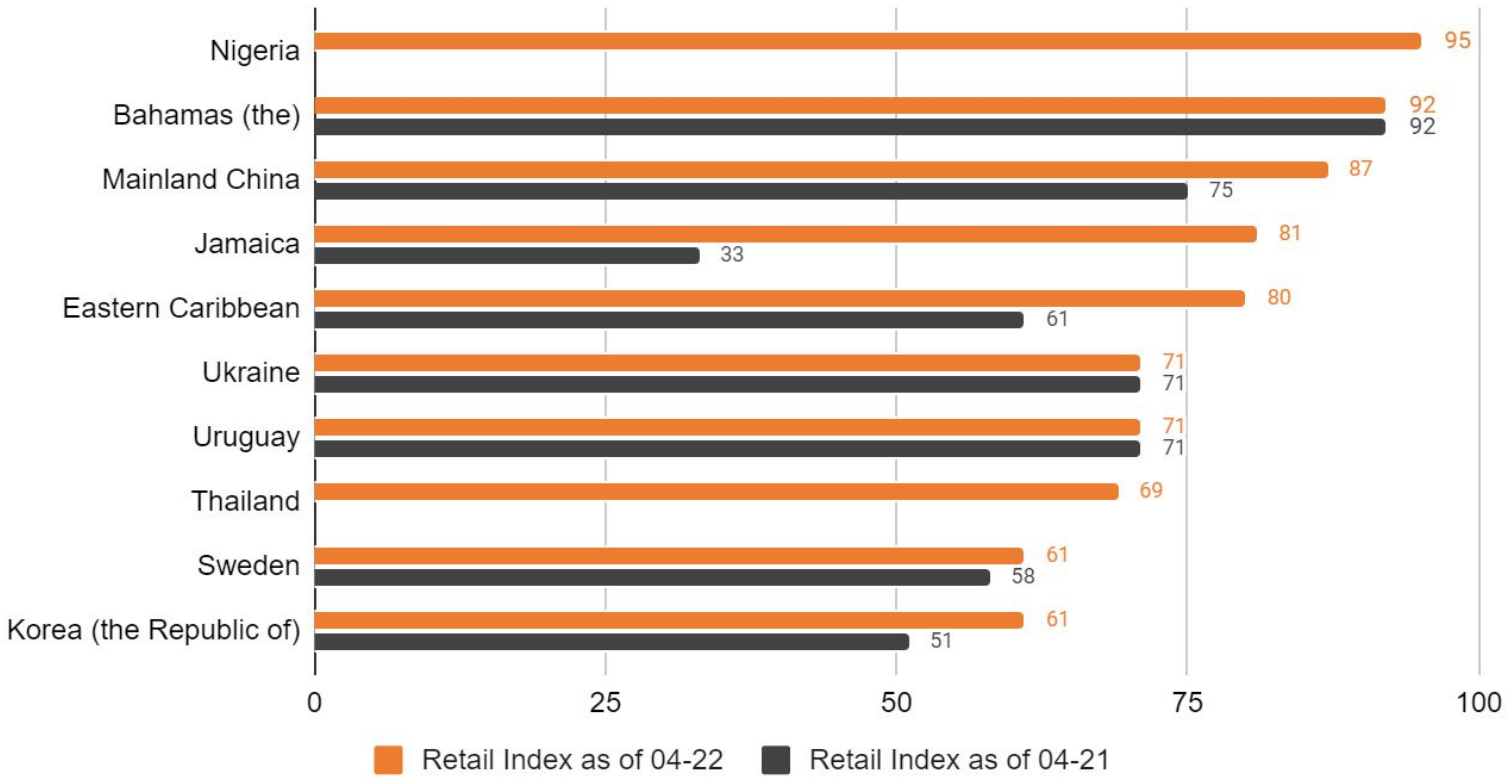
[1]BIS, Rise of the central bank digital currencies: drivers, approaches and technologies, BIS working paper, No 880, August 2020 (updated January 2022), Auer, R, G Cornelli and J Frost

Pauline Adam-Kalfon
Partner, Blockchain Lead
PwC France & Maghreb

Retail CBDC project completion accelerated over the past few months and first transactional data were communicated by leading central banks in this field.

The coming year should provide further insights on how central bank digital currencies may foster financial inclusion at large.

Index status – Top 10: **Retail** CBDC projects



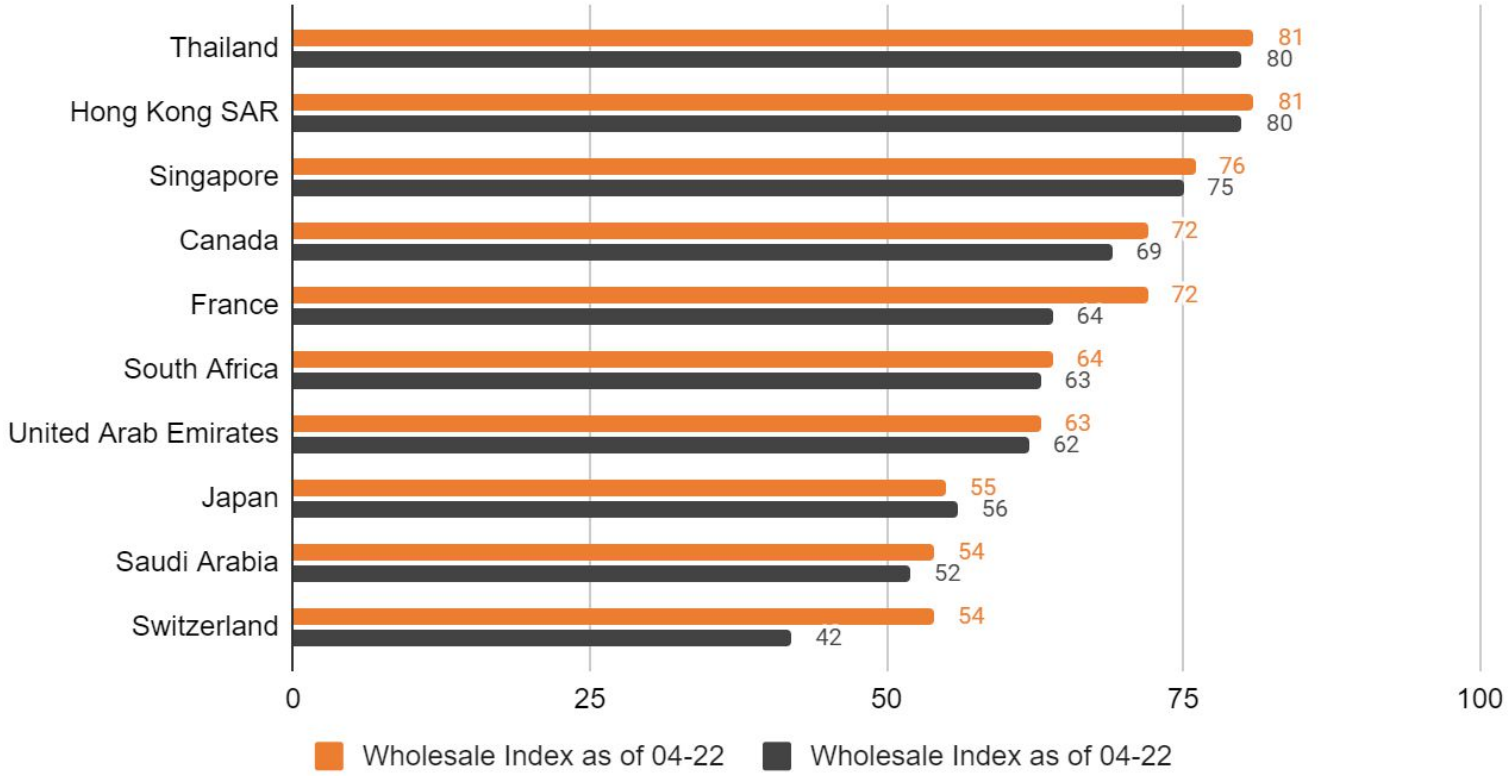
Key insights

- The composition of the Retail CBDC Index Top 10 has evolved substantially over the past twelve months, with three new top 10 entries and three exits
- **Top 10 new entries**
  - Nigeria (a live project)
  - Jamaica (launch planned for 2022)
  - Thailand (live pilot planned for 2022)
- **Top 10 exits**
  - Cambodia (the National Bank considers the Bakong project a digital payment system, not a CBDC)
  - Ecuador (Dinero electronico project was cancelled and has not been included on the central bank's agenda for more than three years)
  - Turkey (fell outside top 10, as other territories gained more maturity points)
- The first transactional data available has become available on the use of e-Naira and digital yuan, e-CNY

Benoît Sureau
Partner, Financial Services Risk & Blockchain
PwC France & Maghreb

> Wholesale CBDCs have the potential to streamline security token post-trade operations through atomic delivery-versus-payment and increase the market efficiency for several asset classes.

Index status – Top 10: **Wholesale** CBDC projects



Key insights

- The composition of the Wholesale CBDC Index Top 10 has remained robust, relative to 2021 rankings
- **Top 10 new entries**
  - Saudi Arabia (up from the 11th place in 2021)
  - Switzerland (up from the 12th place in 2021)
- **Top 10 exits**
  - United Kingdom (the Bank of England communicated that there is no need for a UK wholesale CBDC given they have RTGS)[1]
  - Eurozone (the European Central Bank digital euro project focuses on developing a retail CBDC with no further investigation specified on the wholesale index. As a result, the Euro area is on the 11th place in the Wholesale CBDC Index)
- Other distributed ledger technology (DLT) compatible wholesale payment solutions are being investigated by several central banks as alternatives to wholesale CBDCs. For instance, in Germany, a 'trigger solution' is investigated as a settlement solution for electronic securities by Deutsche Bundesbank, providing a bridge with existing Real Time Gross Settlement (RTGS) systems.

[1] House of Lords, Economic Affairs Committee, Corrected oral evidence: Central bank digital currencies, Q97 (23 November 2021)

Three trends to watch out for in 2022

Global CBDC projects continue at pace

- Over 80% of central banks are exploring CBDCs, for either retail or wholesale purposes.
- Several retail CBDC projects are now live or tested in a live pilot environment, ahead of their formal launch.
- Wholesale CBDC projects have not yet reached the same maturity level. However, many successful pilots have been reported on over the last 12 months.
- The speed of research, testing and implementation is set to intensify in 2022. This is particularly the case in developing countries where financial inclusion is often one of the key expected outcomes for a retail CBDC.

User stories are beginning to emerge

- User stories relating to the live or near-live CBDC projects begin to emerge from Nigeria, The Bahamas and Mainland China.
- In Nigeria and The Bahamas, all residents can access CBDCs through digital wallets and payment cards. In both countries, the adoption of a CBDC is expected to materially increase financial inclusion through private sector innovation.
- In Mainland China, near-live pilot programmes are available in several large cities. During the 2022 Winter Olympics, digital yuan was also made accessible to foreign visitors.
- Global authorities, including the International Monetary Fund, continue to provide reminders that countries adopting CBDCs must remain vigilant to various risks, including monetary policy implementation, bank funding, cyber security, operational resilience and financial integrity and stability, through regular risk assessment and contingency planning.

Technology decisions are made

- Central Banks need to align CBDC technology across G7/G20 for purposes of future interoperability.
- Key decisions must be made on the technology used, including a ledger, distributed ledger and the option to incorporate a blockchain, if at all needed.
- All CBDCs are traceable, but the relationship with identity (governmental, corporate and individual) needs to be determined.
- Further considerations include the role of a CBDC vs. historical settlement systems (for instance, Target 2 bridges in Europe) and the ability for the CBDC technology to reference and capture ESG credentials.

2

Retail CBDC

Top 10

Dr. Andrew S. Nevin
Financial Services Leader and Chief Economist
PwC Nigeria

DLT has the potential to be a game changer for sustainable and inclusive development, particularly for countries in Africa.

CBDCs will transform the payment system, as low value-added transactions become possible in a costless and secure way for everyone.

The success could also catalyse more complex and transformative CBDC uses, including Blockchain Identity Management, Land Registry, and Supply Chain Verification.

As each of the use cases develops, we can bring more people into the economic and financial system and lift tens of millions out of poverty.

Top 10 retail

Focus on Nigeria

1 **Global ranking**

1st
Retail index

2 **Index value**

95
Retail index

3 **Region**

Africa
1st in Africa

Project name: Project Giant

Further information: Official website for eNaira (https://enaira.gov.ng/)

Highlights

- In October 2021, Nigeria became the first African country to launch a CBDC - eNaira. The eNaira is issued by the Central Bank of Nigeria (CBN) as a legal tender.
- The CBN launched the eNaira to strengthen the payments ecosystem and drive financial inclusion.
- The financial inclusion opportunity of the eNaira will be facilitated by a number of design features and planned use of the currency by the CBN.
- The eNaira is a hybrid CBDC or a two-tiered CBDC architecture. With this architecture, the CBN is responsible for issuing the eNaira while it leverages the existing financial system and actors, such as the financial institutions directing engagement with users for distribution of the CDBC, payment facilitation, dispute resolution and other roles as may be defined by the CBN.
- A phased approach has been adopted for the implementation of the desired use cases for the eNaira, with unstructured supplementary service data (USSD) and offline payment options being planned for release in the short to medium term.
- The CBDC was designed on seven key principles – inclusive economy, innovation, efficiency, resilience, proudly Nigerian, scalability and transparency.
- The eNaira is expected to help build a sustainable payment system in Nigeria that is resilient, financially stable and continuously innovative.

Key eNaira statistics (as at December 2021)

~666k
Number of eNaira Speed Wallets created

700k
Number of eNaira Speed Wallet App downloads

35,000+
Total transactions

90%
Of transactions are person to business and business to person

~160
Countries the eNaira Speed Wallet App was downloaded from

The index data is based on BIS Working paper, No 880 (January 2022 update), the World Bank data and PwC analysis. Please note that the index depends on the availability of the BIS data, thus the index value is may be more conservative than the actual country progress.

Top 10 retail

Focus on The Bahamas

1 **Global ranking**

2nd

Retail index

2 **Index value**

92

Retail index

3 **Region**

The Americas

1st in The Americas

Highlights

- In October 2020, The Bahamas became the first country to launch a CBDC, Sand Dollar, issued by the Central Bank of The Bahamas as legal tender.
- All residents can access the digital wallet through the mobile application or a physical payment card. The records collected during daily operations, such as income and spending information, can support applications for micro-loans.
- The objectives of Sand Dollar are more efficient payments systems with more secure transactions and shorter settlement times, enhanced financial inclusion and wider access, reduced costs, stronger controls around AML, anti-counterfeiting and other illicit activities.
- Private sector payments providers continue to expand the services available for the CBDC use from payment cards to payroll.
- The Central Bank of The Bahamas has not released statistical data on the CBDC use.

Project name: Sand Dollar

Further information: Digital Bahamian Dollar (https://www.sanddollar.bs/)

The index data is based on BIS Working paper, No 880 (January 2022 update), the World Bank data and PwC analysis. Please note that the index depends on the availability of the BIS data, thus the index value is may be more conservative than the actual country progress.

William Gee
Partner, Innovation and Digitalisation
PwC Mainland China and Hong Kong SAR

In April 2020, four cities were selected as the initial pilot locations for China's Digital Currency Electronic Payment project.

Two years on, the pilot has been extended to cover six major cities, plus another two which recently hosted the Winter Olympics.

Today, citizens in these 12 cities are participating in the ongoing pilot, making this by far the largest digital fiat initiative in the world.

We are already witnessing the transformational impact the project has on retail payments in China, and we believe further benefits will be realised as the project continues to mature and evolve.

Top 10 retail

Focus on Mainland China

1 **Global ranking**

3rd

Retail index

2 **Index value**

87

Retail index

3 **Region**

Asia

1st in Asia

Project name: Digital Yuan/e-CNY

Highlights

- In 2020, Mainland China became the first major economy to pilot a CBDC. In March 2022, pilots were running in 12 cities, including Beijing and Shanghai, with plans to expand to at least 11 more cities.
- The People's Bank of China (BPoC) has partnered with several state-owned commercial banks, online banks and multiple telecom operators and internet service providers to test various use cases. The project is currently ongoing with new commercial partners and use cases added in-scope.
- The aim of the digital yuan is to improve the convenience, efficiency, and resilience of the retail payment system, which could further strengthen the yuan's monetary sovereignty and internationalisation.
- Mainland China has adopted a hybrid approach for the CBDC's technical design, with the PBoC issuing digital yuan to commercial banks who distribute it to the public. This offers the possibility of recording the flow of the digital currency between users, providing the PBoC with visibility on the CBDC use.
- The digital yuan project has developed four tiers of wallets, with different balance and payment limits installed, depending on the amount of security details the user has provided.
- During the 2022 Winter Olympics, the digital yuan was made available at foreign visitors on a trial basis. Users were able to use hardware wallets that resembled payment cards or download the digital wallet application from app stores to store their Digital renminbi (e-CNY). It was estimated that roughly two million yuan worth of payments occurred daily in the recent trial.

Key eCNY Statistics (as at Feb 2022)

~261m

Wallets[1]

$13.7b

Total transactions

12 cities

Coverage area

$300k daily

Transactions in the Winter Olympics

Further information: The People's Bank of China, Progress of Research & Development of E-CNY in China (July 2021), [1]Excluding 3.5m corporate wallets

The index data is based on BIS Working paper, No 880 (January 2022 update), the World Bank data and PwC analysis. Please note that the index depends on the availability of the BIS data, thus the index value is may be more conservative than the actual country progress.

Top 10 retail

Focus on Jamaica

1 **Global ranking**

4th

Retail index

2 **Index value**

81

Retail index

3 **Region**

The Americas

2nd in The Americas

Highlights

- In March 2022, Jamaica's Minister of Finance announced that the country will launch its CBDC, Jam-Dex (Jamaica Digital Exchange), in April 2022.
- The country will use a non-blockchain CBDC to interface with Jamaica's existing payment infrastructures.
- After announcing its plans to develop a CBDC in May 2020, the Bank of Jamaica (BOJ) invited CBDC providers to develop and test potential solutions.
- In 2021, the BOJ completed an eight month pilot project with 57 customers, including four small merchants and 53 consumers.
- During the pilot, the BOJ procured the services of eCurrency Mint, minted Jamaica's first batch of CBDC, a total of J$230 million and issued J$5 million worth of CBDCs to a local retail bank. The CBDC name, logo design and tagline were developed via a competition.

Project name: Jam-Dex

Further information: Jamaica's Central Bank Digital Currency (CBDC) – JAM-DEX (https://boj.org.jm/core-functions/currency/cbdc/)

The index data is based on BIS Working paper, No 880 (January 2022 update), the World Bank data and PwC analysis. Please note that the index depends on the availability of the BIS data, thus the index value is may be more conservative than the actual country progress.

Top 10 retail

Focus on Eastern Caribbean

1 **Global ranking**

5th

Retail index

2 **Index value**

80

Retail index

3 **Region**

The Americas

3rd in The Americas

Highlights

- The Eastern Caribbean Central Bank (ECCB) launched its DCash CBDC pilot project for retail customers in March 2021, through a phased roll-out initially from four, through to now seven out of the eight ECCB countries.
- In March 2022, the ECCB re-opened the DCash platform after a temporary closure. The platform use was halted in January 2022, due to a technical interruption in the system's certificate management process. The ECCB also undertook several additional upgrades and enhancements on its platform before going live.
- The ECCB plans to add more features to the list of DCash functionalities and testing, as part of the ongoing pilot. These include the introduction of an e-commerce function, which will allow business owners to accept DCash via their websites, government to consumer payments, and the rollout of the pilot to the final ECCB member country, Anguilla.
- According to the ECCB, DCash provides a faster, safer and cheaper payment platform. The ECCB continues to evaluate the CBDC and its infrastructure in a live pilot environment, prior to commercialisation.

Project name: DCash

Further information: Eastern Caribbean Central Bank, ECCB Digital EC Currency Pilot (https://www.eccb-centralbank.org/p/about-the-project)

The index data is based on BIS Working paper, No 880 (January 2022 update), the World Bank data and PwC analysis. Please note that the index depends on the availability of the BIS data, thus the index value is may be more conservative than the actual country progress.

Top 10 retail

Focus on Ukraine

1 **Global ranking**

6th

Retail index

2 **Index value**

71

Retail index

3 **Region**

Europe

1st in Europe

Highlights

- In 2021, following an expert survey, the National Bank of Ukraine (NBU) announced three research areas for a potential CBDC, called e-hryvnia:
  - e-hryvnia for retail cashless payments with the 'programmable' money function and the option of targeted welfare payments;
  - e-hryvnia for transactions related to the virtual assets sphere (for example, exchange, reserve and other transactions with virtual assets); and
  - e-hryvnia for cross-border payments.
- In July 2021, the country's President signed 'On Payment Services' bill, allowing the NBU to issue a CBDC.
- In December 2021, the Ministry of Digital Transformation of Ukraine, announced a private sector partnership to run a pilot project testing a blockchain-based electronic currency. The purpose of the pilot is to test the underlying technology and is not directly related to the e-hryvnia. Once completed, the NBU will continue to develop the legal framework and technology requirements as well as select a technology provider for an e-hryvnia pilot.
- The NBU launched its first CBDC pilot in September 2018. During the pilot, it issued 5,443 e-hryvnia and tested the launch and the operation of the CBDC. The project included a test on distributed ledgers, formulating a provisional framework and regulations, establishing a temporary accounting model, and the study of various aspects from the impact on macroeconomic stability to the legal position of CBDC issuance and circulation.

Project name: e-hryvnia

Further information: National Bank of Ukraine, NBU Welcomes Ministry of Digital Transformation Pilot Project to Issue Programmable Electronic Money (https://bank.gov.ua/en/news/all/natsionalniy-bank-vitaye-pilotniy-proyekt-ministerstva-tsifrovoyi-transformatsiyi-schodo-vipusku-programovanih-elektronnih-groshey) (15 December 2021)

The index data is based on BIS Working paper, No 880 (January 2022 update), the World Bank data and PwC analysis. Please note that the index depends on the availability of the BIS data, thus the index value is may be more conservative than the actual country progress.

Top 10 retail

Focus on Uruguay

1 **Global ranking**

7th
Retail index

2 **Index value**

71
Retail index

3 **Region**

The Americas
4th in The Americas

Highlights

- In 2018, Banco Central de Uruguay (BCDU) completed a six-month retail CBDC pilot project, testing several technological aspects of the potential e-peso.
- The pilot used a limited level of issuance: $20 million for 10,000 mobile users, capped at $30,000 per wallet and $200,000 for registered businesses. E-peso was used for payment transactions in registered stores and businesses as well as peer-to-peer transfers. The system employed instantaneous settlement without an internet connection. At the end of the pilot project, all the e-pesos produced were cashed-out and destroyed.
- The BCDU concluded that a potential second Uruguay CBDC pilot would need to be based on different principles, including multiple vendors and the participation of commercial banks.
- The BCDU, has not announced further dates or investments to continue the CBDC development. According to the International Monetary Fund, resource constraints is one of the key reasons why Uruguay has not yet launched another e-peso pilot.

Project name: e-peso

Further information: International Monetary Fund, Behind the Scenes of Central Bank Digital Currency (9 February 2022), Gabriel Soderberg, et. al., Center for Latin American Monetary Studies, Seven lessons from the e-Peso pilot plan: the possibility of a Central Bank Digital Currency (16 June 2021), Adolfo Sarmiento

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Top 10 retail

Focus on Thailand

1 **Global ranking**

8th

Retail index

2 **Index value**

69

Retail index

3 **Region**

Asia

2nd in Asia

Highlights

- In August 2021 the Bank of Thailand (BoT) announced guidelines for the development and testing of retail CBDC in a live environment (pilot test) under two tracks.
  - The Basic Track: The purpose is to test and evaluate the use of CBDC in conducting cash-like activities on a limited scale, such as accepting, converting or paying for goods and services. This test phase is planned to begin in late 2022.
  - Innovation Track: The purpose is to test and evaluate ways in which a CBDC can be further developed for innovative use cases, allowing for participation by the private sector and technology developers. The BoT have not yet shared the test format or criteria for participation.
- While the BoT has previously conducted pilot projects for wholesale CBDC, this is the first time Thailand will test use case scenarios for retail CBDC. Based on the BoT's survey, the majority of the respondents agree with the approach to retail CBDC development and view it as a beneficial infrastructure to increase access and competition.
- The BoT plans to apply the following characteristics on its CBDC: cash-like and non-interest-bearing, distributed by financial institutions, conditions or limits for converting CBDC.

Project name: n/a

Further information: Bank of Thailand, Digital Currencies (https://www.bot.or.th/English/DigitalCurrency/Pages/default.aspx)

The index data is based on BIS Working paper, No 880 (January 2022 update), the World Bank data and PwC analysis. Please note that the index depends on the availability of the BIS data, thus the index value is may be more conservative than the actual country progress.

Top 10 retail

Focus on Sweden

1 **Global ranking**

9th

Retail index

2 **Index value**

61

Retail index

3 **Region**

Europe

2nd in Europe

Highlights

- Sweden is seeking to implement a retail digital currency to replace Swish, a digital payment app developed by six Swedish banks. In 2021, the Riksbank completed its phase 2 of the e-krona project, examining how the CBDC could be designed. The conclusion report is expected in spring 2022.
- In 2022, the Riksbank will continue to Investigate the need for and effects of an e-krona on the Swedish economy, testing the technical solution for the e-krona within the e-krona pilot, investigating whether and how an e-krona would affect Swedish legislation and the Riksbank's task, comparing different technical solutions and models for an e-krona and preparing for a possible procurement of an issuable e-krona.
- The Riksbank first began its e-krona project in 2017 to analyse the need for an e-krona. In 2019, the Bank tested e-wallets, distributed ledger technology and levels of interoperability, across participant banks.
- Less than 10% of all payments in Sweden are made with cash. The goal of e-krona would be to increase safety and efficiency of electronic transactions. No decision has been taken to issue an e-krona.

Project name: e-krona

Further information: Sveriges Riksbank, E-krona (https://www.riksbank.se/en-gb/payments--cash/e-krona/)

The index data is based on BIS Working paper, No 880 (January 2022 update), the World Bank data and PwC analysis. Please note that the index depends on the availability of the BIS data, thus the index value is may be more conservative than the actual country progress.

Top 10 retail

Focus on the Republic of Korea

1 **Global ranking**

10th
Retail index

2 **Index value**

61
Retail index

3 **Region**

Asia
3nd in Asia

Highlights

- In May 2021, the Bank of Korea (BoK) announced its intention to launch simulation testing on the technical feasibility of a CBDC. The main objective is to test if CBDC works as a currency and plan for its potential commercial use.
- The pilot began in August 2021 and is expected to continue until June 2022. The first phase, testing the basic functions of a CBDC, including manufacturing, issuing and distribution in a simulation environment, ended in December 2021. According to the BoK, the CBDC worked as normal, under the test conditions.
- Based on the results of the first phase, the BoK plans to explore implementing other functions such as offline payments and adding personal information protection technologies.
- After completion of the second phase in June 2022, the BoK plans to assess the project and continue usability experiments in cooperation with financial institutions.

Project name: n/a

Further information: The Bank of Korea, Central bank digital currency (https://www.bok.or.kr/viewer/skin/doc.html?fn=202201240938308670.pdf&rs=/webview/result/P0000559/202201)

The index data is based on BIS Working paper, No 880 (January 2022 update), the World Bank data and PwC analysis. Please note that the index depends on the availability of the BIS data, thus the index value is may be more conservative than the actual country progress.

3

Wholesale CBDC

Top 10

Klara Sok
Senior Manager, Blockchain Lab
PwC France & Maghreb

> The recent success of wholesale CBDC experiments and the strong involvement of committed stakeholders provide key insights on how digital currencies may accelerate institutional digital transformation at the industry level.

Top 10 wholesale

Focus on Thailand and Hong Kong SAR

1 **Global ranking**

Joint 1st

Wholesale index

2 **Index value**

81

Wholesale index

3 **Region**

Asia

1st in Asia

Highlights

- In 2019, the HKMA and the BoT initiated a joint project, Inthanon-LionRock, to test the application of CBDC in cross-border payments. The project proved the viability of a common CBDC platform between two jurisdictions by testing critical features such as transaction privacy, foreign exchange matching, monitoring and compliance.
- In 2021, the project was renamed as Multiple CBDC Bridge project (mBridge) and joined by the BIS Innovation Hub, the Digital Currency Institute of the People's Bank of China and the Central Bank of the United Arab Emirates.
- The purpose of the project is to continue to develop a proof-of-concept prototype to facilitate real-time cross-border foreign exchange payments on distributed ledger technology. Over 20 private sector participants (including financial institutions, bank associations and an exchange) from the four participating central bank jurisdictions have contributed to use cases tested on the trial platform.
- The pilot phase is set to begin in 2022, mBridge will explore existing limitations of the current platform (e.g. privacy, liquidity management, scalability and performance of DLT), explore policy requirements and trial a CBDC with commercial banks and other market participants.

Project name: Inthanon-LionRock, mBridge

Further information: BIS, Multiple CBDC (mCBDC) Bridge (https://www.bis.org/about/bisih/topics/cbdc/mcbdc_bridge.htm), Hong Kong Monetary Authority, CBDC (https://www.hkma.gov.hk/eng/key-functions/international-financial-centre/fintech/research-and-applications/central-bank-digital-currency/), Bank of Thailand, Digital Currencies (https://www.bot.or.th/English/DigitalCurrency/Pages/default.aspx)

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Top 10 wholesale

Focus on Singapore

1 **Global ranking**

3rd

Wholesale index

2 **Index value**

76

Wholesale index

3 **Region**

Asia

3rd in Asia

Highlights

- The Monetary Authority of Singapore (MAS) has been exploring and participating in multiple wholesale CBDC projects for over five years. In 2021, it expanded into two new CBDC (mCBDC) projects, project Dunbar and the 'Liquidity Management in a Multi-Currency Corridor Network' project.
  - During Project Dunbar the MAS collaborated with the Reserve Bank of Australia, Central Bank of Malaysia, South African Reserve Bank and the BIS Innovation Hub to design and develop a platform facilitating settlements of multiple CBDCs. The project developed prototypes demonstrating how commercial banks can transact directly with each other, using wholesale CBDCs of their respective countries and eliminating the need for intermediaries and reduce the time and cost of cross-border transactions. The final report, released in March 2022, highlighted key design principles enabling trust issues to be addressed through governance mechanisms enforced by technological means. It also shared open questions and challenges across policy, business and technology for future projects to address.
  - During 'Liquidity Management in a Multi-Currency Corridor Network' Project the MAS and Banque de France collaborated to explore the possibility of facilitating cross-border, cross-currency CBDCs transactions. The mCBDC prototype contained an automated liquidity pool and market-making service for EUR/SGD currency pairs. It utilised smart contracts to manage the euro/singapore dollar currency exchange rate and ensured it was in line with live market transactions. The experiment demonstrated potential for cost efficiencies, with the ability to support multiple central and commercial banks located in various jurisdictions via a single touch point in an integrated platform.
- While the MAS continues the development of a wholesale CBDC for cross-currency payments, it has for the time being ruled out the need for a retail CBDC, digital Sing dollar.

Project name: Dunbar, Liquidity management in a Multi-Currency Corridor Network

Further information: BIS, Project Dunbar (https://www.bis.org/about/bisih/topics/cbdc/dunbar.htm), MAS, Liquidity Management in a Multi-Currency Corridor Network (12 November 2021) (https://www.bis.org/about/bisih/topics/cbdc/dunbar.htm)

The index data is based on BIS Working paper, No 880 (January 2022 update), the World Bank data and PwC analysis. Please note that the index depends on the availability of the BIS data, thus the index value is may be more conservative than the actual country progress.

Top 10 wholesale

Focus on Canada

1 **Global ranking**

4th

Wholesale index

2 **Index value**

72

Wholesale index

3 **Region**

The Americas

1st in The Americas

Highlights

- While the Bank of Canada (BoC) currently has no plans to launch a CBDC, it has conducted active research and international collaboration in preparation for the future of money and payments. This includes a case for a potential wholesale and retail CBDC, should the need to implement arise.
- For a number of years, the BoC has participated in international wholesale CBDC research programmes with other central banks and private sector participants. It was also the first central bank to conduct a DLT experiment in partnership with the private sector.
- In 2021, the BoC noted that a potential retail CBDC would be issued only if and when the time is right, keeping in mind the following developments:
  - A tipping point may be reached where the acceptance of cash sharply declines.
  - The use of cryptocurrencies created by the private sector is rising, but they are deeply flawed as methods of payment.
  - Only a central bank can guarantee universal access, privacy and complete safety of a digital currency, with public interest as the top priority.
- A CBDC would also need to meet a set of stringent criteria, ensuring safety, universal accessibility, privacy, resilience, efficiency and monetary sovereignty.

Project name: Jasper-Ubin

Further information: Bank of Canada, Digital Currencies and Fintech (https://www.bankofcanada.ca/research/digital-currencies-and-fintech/)

The index data is based on BIS Working paper, No 880 (January 2022 update), the World Bank data and PwC analysis. Please note that the index depends on the availability of the BIS data, thus the index value is may be more conservative than the actual country progress.

Top 10 wholesale

Focus on France

1 **Global ranking**

5th

Wholesale index

2 **Index value**

72

Wholesale index

3 **Region**

Europe

1st in Europe

Highlights

- In November 2021, Banque de France (BdF) announced the completion of the experiments launched in spring 2020. The objective was to test the case for a wholesale CBDC in several areas, supporting technology options and the macroeconomic and monetary policy implications of issuing a wholesale CBDC to a large set of participants, including other central banks.
- Nine different experiments tested the risks/benefits and technical implementations of a wholesale CBDC. The tests covered a variety of CBDC uses, from subscription/redemption of monetary funds to cross border settlement. A real bond issuance worth 100 million euros was settled with a wholesale CBDC designed for the experiments.
- According to BdF, the results highlight that blockchain and distributed ledger technologies based CBDCs can be effective in accelerating the settlement of security transactions between different currencies, while ensuring the security of exchanges. The central bank maintained control over the issuance and money circulation through the use of smart contracts while Interoperability with current wholesale settlement systems was also tried and tested.

Project name: Several (nine projects)

Further information: Banque de France, The Banque de France has successfully completed the first tranche of its experimentation programme in Central Bank Digital Currency (16 December 2021), Wholesale Central Bank Digital Currency Experiments with the Banque de France (November 2021)

The index data is based on BIS Working paper, No 880 (January 2022 update), the World Bank data and PwC analysis. Please note that the index depends on the availability of the BIS data, thus the index value is may be more conservative than the actual country progress.

Top 10 wholesale

Focus on the South Africa

1 **Global ranking**

6th

Wholesale index

2 **Index value**

64

Wholesale index

3 **Region**

Africa

1st in Africa

Highlights

- In 2021, the South African Reserve Bank (SARB) announced its participation in Project Dunbar, developing prototypes for shared platforms enabling international settlements with digital currencies issued by multiple central banks.
- During the project, the SARB collaborated with the Reserve Bank of Australia, Central Bank of Malaysia and the BIS Innovation Hub to design and develop a platform facilitating settlements of multiple CBDCs.
- The project developed prototypes demonstrating how commercial banks can transact directly with each other, using wholesale CBDCs of their respective countries and eliminating the need for intermediaries and reduce the time and cost of cross-border transactions.
- The final report, released in March 2022, highlighted key design principles enabling trust issues to be addressed through governance mechanisms enforced by technological means. It also shared open questions and challenges across policy, business and technology for future projects to address.
- Over the years, South Africa has also undertaken domestic research and exploration projects on CBDCs. Most recently, in 2021, the Intergovernmental Fintech Working Group, supported by industry participants, launched a second phase of Project Khokha 2, to explore the policy and regulatory implications of distributed ledger technology use in the financial markets. The project results have yet to be made public.

Project name: Dunbar

Further information: BIS, Project Dunbar (https://www.bis.org/about/bisih/topics/cbdc/dunbar.htm)

The index data is based on BIS Working paper, No 880 (January 2022 update), the World Bank data and PwC analysis. Please note that the index depends on the availability of the BIS data, thus the index value is may be more conservative than the actual country progress.

Top 10 wholesale

Focus on United Arab Emirates

1 **Global ranking**

7th

Wholesale index

2 **Index value**

63

Wholesale index

3 **Region**

Middle East

1st in Middle East

Highlights

- The Central Bank of the United Arab Emirates (CBUAE) continues to explore and test the possibility of issuing a wholesale CBDC through two international projects.
  - Project mBridge: In February 2021, the CBUAE joined the Multiple CBDC Bridge project (mBridge), run in partnership with the BIS Innovation Hub, the Hong Kong Monetary Authority, the Bank of Thailand and the Digital Currency Institute of the People's Bank of China. The purpose of the project is to develop a proof-of-concept prototype to facilitate real-time cross-border foreign exchange payments on distributed ledger technology.
  - The pilot phase is set to begin in 2022. mBridge will explore existing limitations of the current platform (privacy, liquidity management, scalability and performance of DLT), explore policy requirements and trial a CBDC with commercial banks and other market participants.
  - Project Aber: In 2019, the CBUAE and the Saudi Central Bank launched a joint CBDC project, Aber, to explore and test the feasibility of a dual-issued digital currency for wholesale cross-border payments. Supported by active participation of a number of commercial banks from both countries, the pilot project confirmed the possibility of using a digital currency issued by two central banks to settle payments, whether locally or across borders, by relying on an infrastructure based on DLT.
  - In 2021, the Central Banking Committee awarded the Central Banks the Global Impact Award for their innovative work on project Aber.

Project name: mBridge, Aber

Further information: BIS, Multiple CBDC (mCBDC) Bridge (https://www.bis.org/about/bisih/topics/cbdc/mcbdc_bridge.htm), Saudi Central Bank and Central Bank of the U.A.E. Joint Digital Currency and Distributed Ledger Project (December 2020) (https://www.centralbank.ae/sites/default/files/2020-12/Aber%20Report%202020%20-%20EN.pdf)

The index data is based on BIS Working paper, No 880 (January 2022 update), the World Bank data and PwC analysis. Please note that the index depends on the availability of the BIS data, thus the index value is may be more conservative than the actual country progress.

Top 10 wholesale

Focus on Japan

1 **Global ranking**

8th

Wholesale index

2 **Index value**

55

Wholesale index

3 **Region**

Asia

4th in Asia

Highlights

- The Bank of Japan (BoJ) continues to engage with globally coordinated wholesale CBDC exploration projects with the BIS and other national central banks.
- In April 2021, the BoJ launched a 12 month retail CBDC project, supported by an industry committee. During Phase 1, the BoJ developed a test environment for the CBDC system and conducted experiments on the core functions, including issuance, distribution and redemption, as well as institutional design.[1]
- Phase 1 was completed in March 2022. The BoJ is set to launch the Proof of Concept Phase 2 in April 2022, to test additional CBDC functions.
- The BoJ currently has no plans to issue CBDC, but continues the exploration before making its decision.

Project name: Several

Further information: Bank of Japan, Central Bank Digital Currency (https://www.boj.or.jp/en/paym/digital/index.htm/), [1]Japan ranks no. 11 on the retail CBDC Index

The index data is based on BIS Working paper, No 880 (January 2022 update), the World Bank data and PwC analysis. Please note that the index depends on the availability of the BIS data, thus the index value is may be more conservative than the actual country progress.

Top 10 wholesale

Focus on Saudi Arabia

1 **Global ranking**

9th

Wholesale index

2 **Index value**

54

Wholesale index

3 **Region**

Middle East

2nd in Middle East

Highlights

- The Saudi Central Bank continues to actively explore CBDC opportunities and their application.
- The Saudi Central Bank considers possible value propositions and use cases beyond CBDC, including smart contracts and digital assets. The country's target is to increase e-payments to 70% by 2030 (from 57% in 2021), with the current expectation to achieve the target five years earlier, in 2025. A CBDC is one of the initiatives considered to support the country's financial development program.
- In 2019, the Saudi Central Bank and the Central Bank of the United Arab Emirates launched a joint CBDC project, Aber, to explore and test the feasibility of a dual-issued digital currency for wholesale cross-border payments. Supported by active participation of a number of commercial banks from both countries, the pilot project confirmed the possibility of using a digital currency issued by two central banks to settle payments, whether locally or across borders, by relying on an infrastructure based on DLT.
- In 2021, the Central Banking Committee awarded the Central Banks the Global Impact Award for their innovative work on project Aber.

Project name: Aber

Further information: Saudi Central Bank and Central Bank of the U.A.E. Joint Digital Currency and Distributed Ledger Project (December 2020) (https://www.centralbank.ae/sites/default/files/2020-12/Aber%20Report%202020%20-%20EN.pdf)

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Top 10 wholesale

Focus on Switzerland

1 **Global ranking**

10th

Wholesale index

2 **Index value**

54

Wholesale index

3 **Region**

Europe

2nd in Europe

Highlights

- In January 2022, the Swiss National Bank (SNB), the BIS Innovation Hub and a financial infrastructure operator completed Phase II of Project Helvetia. The Phase was conducted together with five commercial banks and explored the settlement of interbank, monetary policy and cross-border transactions of a private sector exchange, the Swiss real-time gross settlement system (SIX Interbank Clearing) and core banking systems.
- According to the participants, the phase demonstrated:
  - Wholesale CBDC can be integrated into existing core banking systems and processes used by commercial and central banks.
  - Issuing a wholesale CBDC on a distributed ledger technology platform, operated and owned by a private sector company, is feasible under Swiss law.
  - Transition towards a tokenised financial ecosystem raises broader issues such as increased market and settlement complexity, liquidity management challenges or the complexity of integration of trading and settlement.
- The SNB has not confirmed whether it will issue a wholesale CBDC.

Project name: Helvetia

Further information: BIS, Project Helvetia (https://www.bis.org/about/bisih/topics/cbdc/helvetia.htm)

The index data is based on BIS Working paper, No 880 (January 2022 update), the World Bank data and PwC analysis. Please note that the index depends on the availability of the BIS data, thus the index value is may be more conservative than the actual country progress.

4

Other CBDC projects

Laura Talvitie
Manager, Cryptoasset Regulation
PwC United Kingdom

Most central banks have not made the decision to issue a CBDC. Crucially, the same applies to the decision **not** to issue a new digital money.

Both conclusions have significant implications which countries around the world continue to explore and test.

CBDC retail maturity index

Focus on United Kingdom

1 **Global ranking**

24th
Retail index

2 **Index value**

43
Retail index

3 **Region**

Europe
6th in Europe

Highlights

- In June 2021, the Bank of England (BoE) and HM Treasury (HMT) issued a discussion paper on new forms of digital money and launched the CBDC Taskforce to coordinate the exploration of a potential UK CBDC. The authorities also established two external engagement groups, CBDC Engagement and Technology Forums, to gather strategic input from a diverse cross-section of expertise and perspectives.
- In January 2022, the Economic Affairs Committee of the House of Lords declared a UK retail CBDC 'a solution in search of a problem', stating they have yet to hear a convincing case for why the UK needs a retail CBDC.
- The BoE and HMT will launch a new public consultation during 2022, setting out the assessment of the case for a UK retail CBDC, including the merits of further work to develop an operational and technology model. The House of Lords has encouraged the authorities to also consult on a potential wholesale CBDC.
- In March 2022, the BoE and the Massachusetts Institute of Technology (MIT) announced a joint 12-month research project to explore potential technical challenges, trade-offs, opportunities and risks involved in designing a CBDC system.
- The UK has not made a decision on introducing a CBDC.

Project name: UK CBDC

Further information: Bank of England, UK Central bank digital currency (https://www.bankofengland.co.uk/research/digital-currencies), House of Lords, Economic Affairs Committee: Central bank digital currencies: a solution in search of a problem? (13 January 2022)

The index data is based on BIS Working paper, No 880 (January 2022 update), the World Bank data and PwC analysis. Please note that the index depends on the availability of the BIS data, thus the index value is may be more conservative than the actual country progress.

CBDC retail maturity index

Focus on United States of America

1 **Global ranking**

31st

Retail index

2 **Index value**

40

Retail index

3 **Region**

The Americas

7th in The Americas

Highlights

- In March 2022, the US Administration released an Executive Order (EO) on digital assets and blockchain technology. The EO places 'the highest urgency' on research and development efforts into the potential design and deployment options of a US CBDC. It also highlights a number of CBDC benefits, including expanding access to financial services, lowering the cost of funds transfers and reinforcing US leadership in the global financial system.
- The EO calls on several regulators and authorities to submit a joint report, within 180 days, on potential impacts of a CBDC.
- Earlier, in January 2022, the Federal Reserve Board (Fed) released a discussion paper inviting public comment on potential design, benefits, risks and policy considerations related to developing a CBDC. The paper reveals that the Fed will look to ensure that a potential CBDC balances privacy rights with protection against illicit activity, is intermediated by financial institutions, can be freely transferred and has identity verification requirements.
- Also in February 2022, the Boston Fed and its university partner released initial findings from joint CBDC research, demonstrating the ability to create a system capable of handling 1.7 million transactions per second.
- No decision has been made to launch a US CBDC and it would likely require Congressional authorisation.

Project name: tbc

Further information: The White House: Executive Order on Ensuring Responsible Development of Digital Assets (9 March 2022), The Federal Reserve Board, Money and Payments: The U.S.Dollar in the Age of Digital Transformation (January 2022), The Federal Reserve Bank of Boston and Massachusetts Institute of Technology, Project Hamilton Phase 1 (3 February 2022)

The index data is based on BIS Working paper, No 880 (January 2022 update), the World Bank data and PwC analysis. Please note that the index depends on the availability of the BIS data, thus the index value is may be more conservative than the actual country progress.

CBDC retail maturity index

Focus on the European Union

1 **Global ranking**

36th
Retail index

2 **Index value**

36
Retail index

3 **Region**

Europe
8th in Europe

Highlights

- In October 2021, the European Central Bank (ECB) began a two year investigation phase on digital euro. The purpose is to:
  - Examine and prioritise possible functionality and use cases
  - Uncover potential changes needed in the EU legislation
  - Assess the possible impact of a digital euro on the market, identifying the design options to ensure privacy and avoid risks for euro area citizens, intermediaries and the overall economy
  - Define a business model for supervised intermediaries within the digital euro ecosystem
- The ECB has introduced several work streams, including on the design choices guaranteeing confidentiality, on the prioritisation of different use cases and on the business options for intermediaries. The workstreams will also cover areas such as cyber security and operational resilience.
- In October 2021, the ECB launched a Market Advisory Group, with 30 professionals from the retail payments industry. It also interacts with relevant stakeholders, from intermediaries to consumers, merchants and authorities during the project. In March 2022, the ECB published findings from its research, noting that participants demonstrated little knowledge of the digital euro, but generally agreed that banks and/or central banks would be the safest and most reliable providers.
- The decision to launch a second, three year realisation phase, is expected by the end of 2023. This would include the development and testing of the technical solutions and business arrangements for a digital euro.
- In parallel, the European Commission announced in February 2022 it plans to propose a bill for a digital euro in early 2023. The bill will have to go through negotiations within EU capitals and Parliament before it can become law.
- The ECB has not made a decision to launch a digital euro. A potential digital euro is not expected to launch until 2025, at the earliest.

Project name: Digital euro

Further information: European Central Bank, Publications on Central bank digital currencies (CBDC) (https://www.ecb.europa.eu/home/search/html/central_bank_digital_currencies_cbdc.en.html)

The index data is based on BIS Working paper, No 880 (January 2022 update), the World Bank data and PwC analysis. Please note that the index depends on the availability of the BIS data, thus the index value is may be more conservative than the actual country progress.

5

Stablecoin overview

Henri Arslanian
Senior Advisor
PwC Hong Kong

Stablecoins have become an integral part of the crypto ecosystem. It is impossible for any crypto fund or institutional player to be active in crypto without using stablecoins.

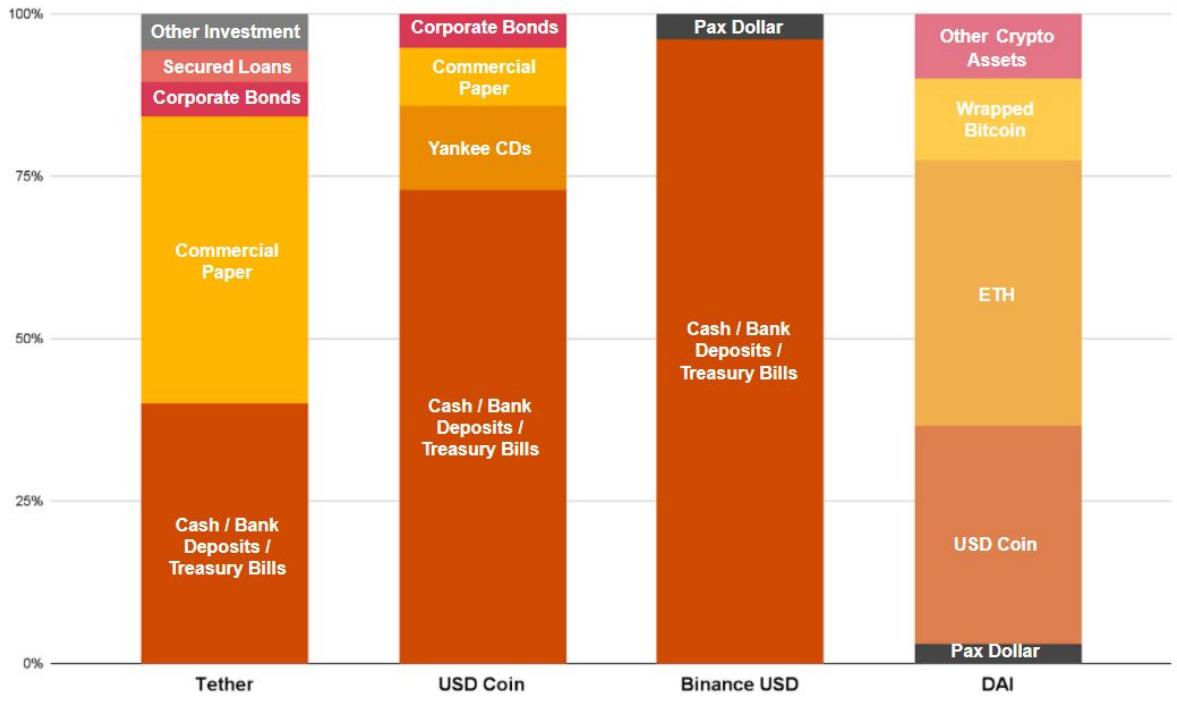
Overview

Stablecoins: privately issued cryptoassets which aim to minimise volatility by being pegged to an asset considered to have a stable value (for instance, a fiat currency or precious metals).

Types of stablecoins

Classification	Pegged to
Fiat-backed	Fully backed by cash or liquid assets. Redeemable by the issuer at face value. Reserves are normally maintained by regulated entities. May provide a higher level of transparency, such as detailed attestation disclosures on reserve assets and clear documentation of redemption rights.
Security-backed	Fully backed by non-cash equivalent assets (e.g. corporate bonds, commercial paper). In some cases, some issuers may be able to defer redemption, offer in-kind redemption or impose higher redemption fees.
Crypto-backed	Backed by other cryptoassets. Typically structured on a decentralised, non-custodial basis and are considered part of Decentralised Finance (DeFi)
Algorithmic-backed	Algorithmic protocols which increase or decrease the supply of tokens according to market conditions.
Other asset-backed	For example, by commodities (such as gold) or non-fungible tokens (NFTs)

Example distribution of assets held as reserves



Data sources: CoinGecko (https://www.coingecko.com/), Messari (https://messari.io/), stablecoin websites and attestations, March 2022

Three key trends dominating stablecoin projects

Use in capital markets

- Stablecoins are virtual fiat deposits, offering a link between traditional finance and digital finance, with very clear use cases in the context of capital markets.
- Conceptually, their design can be extended to be backed by conventional securities, such as debt and equity. This opens up a whole panacea of use cases within the primary debt and equity capital markets, as well as the secondary markets. Notwithstanding, standardisation of technology, regulatory approach and legal doctrine will be required.
- Alongside use cases directly involved in capital markets, they can play an effective supporting role in cross border payments, settling 24/7. Adherence to the highest standards of coin hygiene and sanctions compliance remain paramount.

Inter-company payments

- Liquidity and cash management are at the core of a Treasurer's role by ensuring liquid assets are available to pay expenses and debts as they become due. This means managing day to day cash needs as well as longer term debt requirements, facilitating cross border currency flows, optimising liquidity through mechanisms such as cash pools and utilising money markets and other interest bearing products to generate yield.
- As virtual currencies, stablecoins settle almost instantaneously, and can be easily transmitted anywhere in the world to beneficiaries requiring a relatively simple, secure, albeit technology centric set up.
- Sufficient resources and understanding now exists to create a virtual currency that is unique to an organisation, which is deployed purely for the purposes of moving virtual cash deposits, 24/7.

Next generation companies, driven by stablecoins

- At the simplest level, current software is designed to manage, move and process data, but it does not contain intrinsic stores of value. Stablecoins offer the possibility of building an organisation where the software moves real units of economic value, 24/7 – combining ledger, payment, value and conditions in one. This is similar to putting in a ring main system to support commerce, combining all aspects of the commercial transaction, in one place.
- Cryptoassets have the same capability, but they sit outside organisations. Central banks see the opportunity with their own digital currencies, but their remit is limited to monetary policy or financial stability, and does not extend into areas covering the full digitisation of money.
- Stablecoins may offer the opportunity of direct and standardised value transfer within, into and between organisations. This means that when software executes, it is transmitting real value, and not just numbers, triggered by the fulfilment of a set of conditions, namely the contract.

Matt Blumenfeld
Director, Digital Asset Specialist
PwC US

The role of the stablecoin in the crypto markets has and will continue to evolve, as adoption of crypto increases forcing a more prominent role of stablecoins across the larger financial ecosystem.

Regulation will only strengthen the importance and give credence to the role that stablecoins will play.

Stablecoin regulatory considerations

Global authorities continue to intensify the regulatory scrutiny on stablecoin arrangements, as their popularity increasingly expands from retail investors to traditional financial institutions.

Currently, no stablecoin arrangement is fully regulated. Certain coin arrangements may be licensed or otherwise partially regulated (for instance under AML/CFT requirements). Many stablecoin arrangements are fully non-regulated without any prudential or conduct regulation in place.

In February 2022, the Financial Stability Board highlighted in its report that, as stablecoins are often used as a bridge between traditional fiat currencies and cryptoassets, they have the potential to impact the stability and functioning of cryptoasset markets. As a result, a failure of a major stablecoin, could risk liquidity within the broader cryptoasset ecosystem, disrupt trading and cause stress in those markets.[1]

Regulatory concerns tend to centre around regulatory compliance, quality and sufficiency of reserve assets as well as standards of risk management, operational resilience and governance underpinning stablecoin arrangements.

Particular vulnerability concerns include:

- Opacity and lack of fully developed regulatory frameworks (e.g. risk management, competition, prudential requirements, AML/KYC, financial crime and coin hygiene)
- Increasing linkages between cryptoasset markets and the regulated financial system
- Liquidity mismatch
- Credit and operational risks, making stablecoins susceptible to sudden and disruptive runs on their reserves, with the potential to spill over to short term funding markets
- Increased use of leverage in investment strategies
- Concentration risk related to trading platforms
- Transfer of ownership of stablecoin value between parties in a transaction
- The adequacy and composition of reserves[2]
- Wider public policy concerns related to cryptoassets, such as:
    - Low levels of investor and consumer understanding of cryptoassets
    - Scams where stablecoins are issued without any underlying assets
    - Cyber-crime and ransomware

[1]FSB, Assessment of Risks to Financial Stability from Crypto-assets (16 February 2022), [2] Commodity Futures Trading Commission, Tether to Pay $41 million Over Claims that Tether Stablecoin was Fully Backed by US Dollars (15 October 2021, release number 8450-21)

Global regulatory frameworks for stablecoins are developing

While the guidance issued by global standard setting bodies is not binding, national authorities are likely to consider how to incorporate them into their regulatory, supervisory and authorisation frameworks.

Financial Stability Board (FSB)

In its report, published in February 2022, the FSB detailed its concerns over stablecoin regulatory compliance, quality and sufficiency of reserve assets, and standards of risk management and governance.[1]

In October 2020, the FSB outlined its recommendations and a roadmap for national authorities to implement a global stablecoin framework.[2]

By July 2022, national authorities should have established or adjusted their regulatory, supervisory and oversight frameworks consistent with the FSB recommendations and other international standards. The FSB and other authorities will review the progress and potential gaps by July 2023.

The Financial Action Task Force (FATF)

In October 2021, the FATF issued updated guidance for a risk-based approach to virtual assets and virtual asset service providers.[3]

The FATF sets the expectations on countries, virtual asset service providers and other obliged entities to identify and to assess potential money laundering and terrorism financing risks relating to stablecoins.

The Committee on Payments and Market Infrastructures (CPMI) and the Board of the International Organisation of Securities Commissions (IOSCO)

In October 2021, CPMI-IOSCO issued a consultative report proposing to apply the Principles for Financial Market Infrastructures (PFMI) to systemically important stablecoin arrangements (SAs). The preliminary guidance confirms that stablecoin arrangements should observe international standards for payment, clearing and settlement systems.[4]

The paper outlines the key terminology and identifies four overarching considerations for determining the systemic importance of an SA, the size of the SA, nature and risk profile of the SA's activity, type of stablecoin users and type or nature of transactions.

The final report will be published at a later date.

[1]FSB, Assessment of Risks to Financial Stability from Crypto-assets (16 February 2022), [2]FSB, Regulation, Supervision and Oversight of 'Global Stablecoin' Arrangements, (13 October 2020), [3]FATF, Updated Guidance for a Risk-Based Approach (October 2021), [4]CPMI-IOSCO, Application of the Principles for Financial Market Infrastructures to stablecoin arrangements (October 2021)

National regulatory frameworks: Selected examples

Examples of some of the national regulatory frameworks developing for stablecoin arrangements.

United Kingdom

Currently, stablecoins are not subject to regulation in the UK, unless they have characteristics of E-money or a security. Accordingly, the regulatory status will depend on the structure and arrangement of the stablecoin.

In April 2022, HM Treasury (HMT) announced moves which will see stablecoins recognised as a valid form of payment in the UK.

HMT intends to amend the the Electronic Money Regulations 2011 and Payment Service Regulations 2017 to deliver a consistent framework to regulate stablecoin issuance and the provision of wallets and custody services.

It plans to extend the applicability of Part 5 of the Banking Act 2009 to include stablecoin activities. Where the risks have the potential to be systemic, the Bank of England (BoE) supervision threshold is met.

HMT also plans to extend the scope of the Financial Services (Banking Reform) Act 2013 to ensure relevant stablecoin-based payment systems are subject to appropriate competition regulation by the Payment Systems Regulator.

European Union

Generally, stablecoins are not regulated as financial instruments, unless they have the characteristics of E-money or a security. Issuers are unlikely to require authorisation. This will vary on a state-by-state basis.

The Markets in Cryptoassets Regulation (MiCA) is set to create a harmonised regulatory framework for cryptoassets and related services. It is due to come into force by 2023.[2]

MiCA will only apply in EU member states 18 months after it has entered into force. The exception of the provisions in Title III (asset-referenced tokens) and Title IV (E-money tokens) which will apply from the date the Regulation enters into force.

MiCA will make it possible to obtain a license in one member state and use it in all other member states of the European Economic Area (passporting).

United States

In March 2022, the US Administration released an Executive Order (EO) on digital assets. On stablecoins, the EO notes that the US will work with the G20 and FSB towards 'the potential of well-regulated stablecoin arrangements'.[3]

Currently, stablecoins are subject to a patchwork of Federal and state regulation. Advice will need to be obtained on a state-by-state basis. Some issuers hold a limited number of money transmission licenses to compliment a state trust bank charter.

Key regulators include the Financial Crimes Enforcement Network, the Securities and Exchange Commission, Commodity Futures Trading Commission and state authorities. The Office of the Comptroller of the Currency (OCC) approves banks to issue stablecoins and to hold fiat that backs stablecoins (none to date). The Federal Deposit Insurance Corporation (FDIC) also regulates many of the banks that hold fiat reserves for the largest stablecoins. The State banking regulators also license, charter and examine many of the companies issuing stablecoins in the US.

In November 2021, the President's Working Group on Financial Markets, the OCC, and the FDIC released a report recommending that Congress enact legislation requiring that stablecoin issuers become insured depository institutions, which would subject them to a bank-like regulatory regime that includes capital and liquidity requirements, examination by federal banking regulators, and a suite of risk management and consumer protection requirements. The Bill could be released in H1 2022.[4]

[1]HMT, UK regulatory approach to cryptoassets, stablecoins, and distributed ledger technology in financial markets (4 April 2022), [2]European Union Law, Proposal for a Regulation of the European Parliament and of the Council on Markets in Crypto-assets, and amending Directive (EU) 2019/1937 (Document 52020PC0593), [3]The White House, Executive Order on Ensuring Responsible Development of Digital Assets (9 March 2022), [4]U.S. Department of the Treasury, President's Working Group on Financial Markets Releases Report and Recommendations on Stablecoins (1 November 2022)

6

Stablecoin framework

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As the global stablecoin market is growing fast, we note an increasing demand for trust and transparency towards stablecoin issuers.

Key characteristics of a viable stablecoin

There are four key characteristics of a stablecoin which are possible indicators of its future utility.

Attestation

An attestation report is a vital component in the stablecoin architecture. It confirms the existence of the underlying assets which back the stablecoin. The reporting should be completed by a certified professional services organisation.

Regulatory oversight and registrations

The stablecoin and the legal entity responsible for its operation must be subject to the auspices of a robust regulator, established in a legally sophisticated, well governed, jurisdiction. At the operational perimeter, suitable controls and coin hygiene are required to mitigate any risk of financial crime.

Continued research and legislative consultation is required to build a stablecoin framework fit for purpose and to support transformed digital economies.

Nature of reserve holdings

A range of high quality, liquid assets are required to collateralise the proper operation of a well designed stablecoin.

Technology

The overall usefulness of the stablecoin depends on how well its underlying technology integrates with conventional, non-blockchain technologies.

7

Selected stablecoin arrangements

Stefano Rossi
Manager, Blockchain Competence Center
PwC Italy

Stablecoins enable cheaper and faster payments.

They have the potential to revolutionise the future payment landscape, by bringing people who are currently unbanked or underbanked into the financial system.

However, to maintain their actual stability, it is critical that stablecoins have solid regulatory and economic foundations.

Data presentation

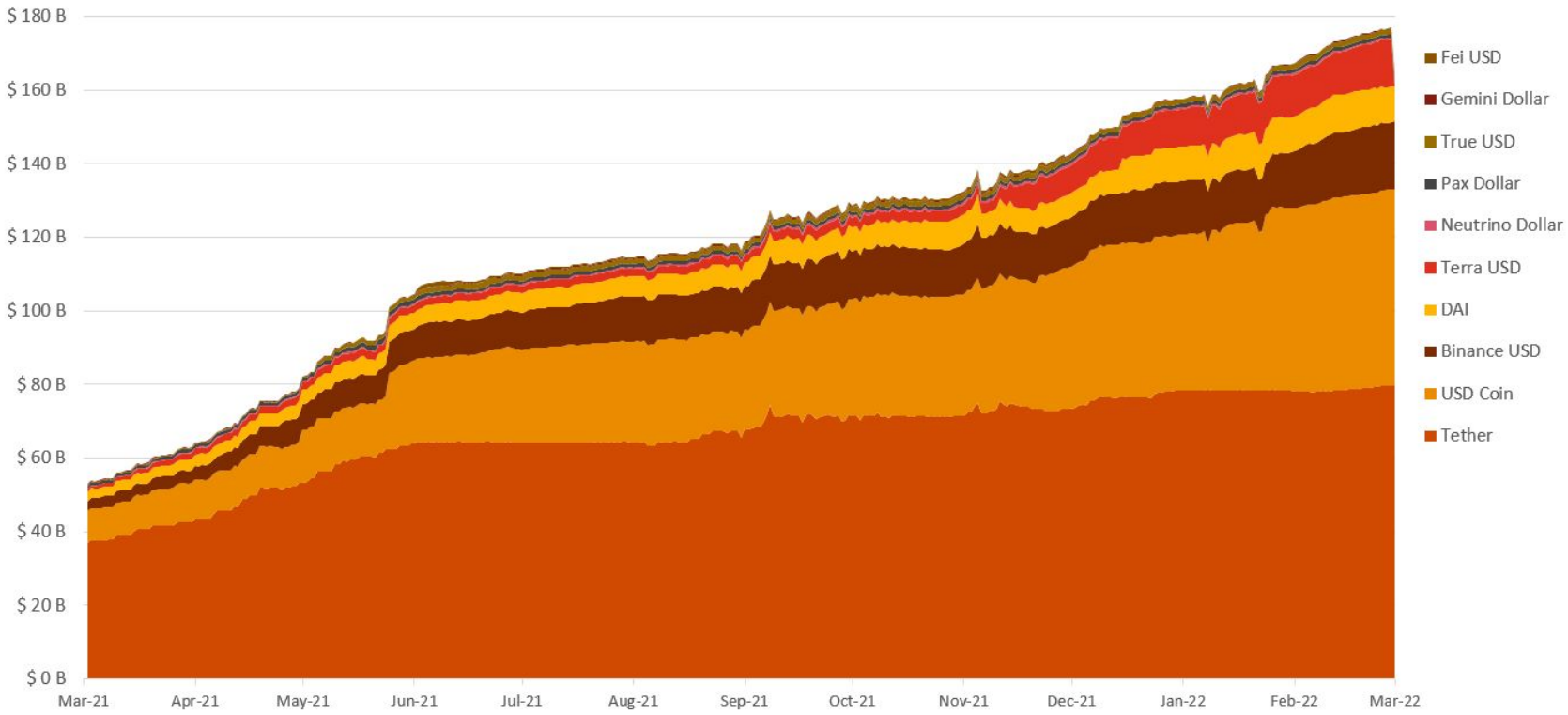
Composition and data sources

The following pages provide further details on the ten largest stablecoins, measured by market capitalisation (as at 01 March 2022).

The data is selected to give a point in time snapshot of some of the largest stablecoin projects. The information is provided purely for educational purposes and should not be considered as an endorsement towards any stablecoin or investment or other advice.

All data has been collated from individual stablecoin websites, Messari and CoinGecko in March 2022.

Market capitalisation of selected stablecoins



Data sources: CoinGecko (https://www.coingecko.com/), Messari (https://messari.io/), March 2022

Tether (USDT) – Overview

Size by market capitalisation

1st

Key facts and figures

Issued	Currency peg
2014	USD
Owner(s)	**Classification**
Tether Holdings Limited	Fiat, security, other assets and crypto

Over 25
no. of exchanges available

Legal entity

Tether Holdings Limited
British Virgin Islands

Attestation

The attestation opinion is expressed by mha Cayman, as related to the assertion made by the management of Tether Holdings Limited. In accordance with:

- ISAE 3000 (Revised)
- ISQC 1
- IESBA Code

Regulatory oversight /registrations

Tether Holdings Limited is incorporated in the British Virgin Islands and, as such, a licence to issue digital currencies is therefore not required.

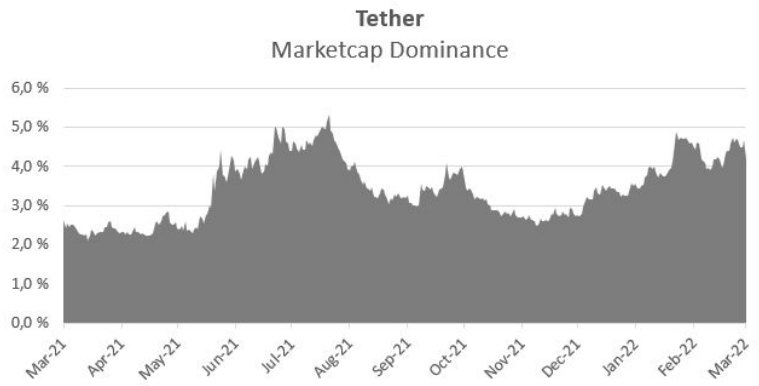
It is an unregulated financial institution.

Nature of reserve holdings

Cash, cash equivalents, other short-term deposits, commercial papers, corporate bonds, funds, precious metals, secured loans, other investments, including digital assets.

Blockchain platforms (non-exhaustive)

Ethereum, Tron, Solana, Omni, Algorand, Avalanche, Binance Smart Chain.



Data sources: CoinGecko (https://www.coingecko.com/), Messari (https://messari.io/), stablecoin websites and attestations
March 2022, All information is subject to change

USD Coin (USDC) – Overview

Size by market capitalisation

2nd

Key facts and figures

Issued	Currency peg
2018	USD
Owner(s)	**Classification**
Circle, Coinbase	Fiat, security and other assets

Over 25
no. of exchanges available

Legal entity

Centre Consortium LLC
NY, USA

Attestation

Monthly attestation reports on the US dollar denominated reserves are issued by Grant Thornton LLP.

In accordance with the standards established by the American Institute of Certified Public Accountants.

Regulatory oversight /registrations

USDC is regulated as a stored value instrument.

USA: sale of checks and money transmitter licenses.

UK: E-Money Issuer License.

Nature of reserve holdings

Cash and equivalents, short-duration U.S. Treasury bonds.

Blockchain platforms (non-exhaustive)

Algorand, Ethereum, Solana, Stellar, Tron, Hedera, Avalanche, Flow, Cronos.

Data sources: CoinGecko (https://www.coingecko.com/), Messari (https://messari.io/), stablecoin websites and attestations
March 2022, All information is subject to change

Binance USD Coin (BUSD) – Overview

Size by market capitalisation

3rd

Key facts and figures

Issued	Currency peg
2019	USD
Owner(s)	**Classification**
Binance, Paxos	Fiat and crypto

Less than 25
no. of exchanges available

Legal entity

Binance (in partnership with Paxos)
Cayman Islands

Attestation

Monthly attestation reports issued by Withum.

In accordance with the attestation standards established by the American Institute of Certified Public Accountants.

Regulatory oversight /registrations

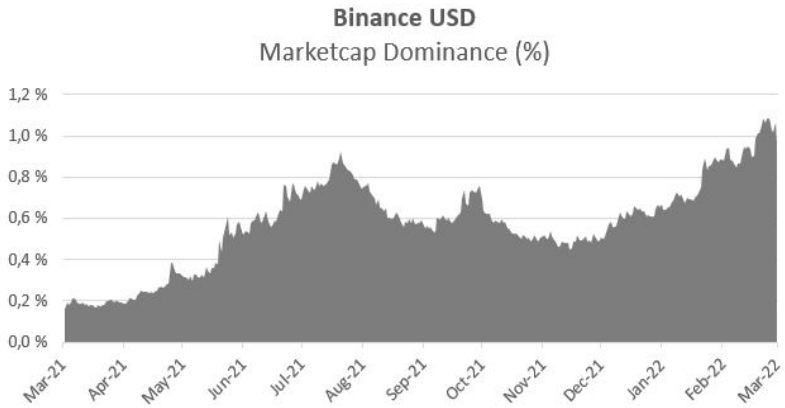
BUSD is regulated by the New York State Department of Financial Services.

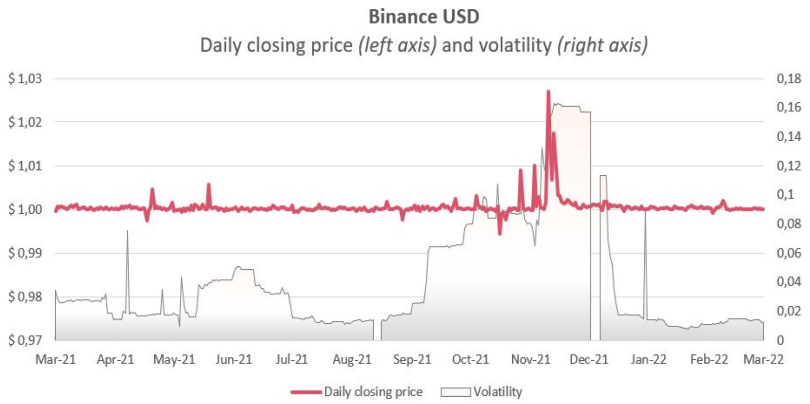
Nature of reserve holdings

Cash, US Treasury bills.

Blockchain platforms (non-exhaustive)

Binance Smart Chain, Ethereum, Polygon, Solana, Terra.





Data sources: CoinGecko (https://www.coingecko.com/), Messari (https://messari.io/), stablecoin websites and attestations
March 2022, All information is subject to change

TerraUSD (UST) – Overview

Size by market capitalisation

4th

Key facts and figures

Issued	Currency peg
2020	USD
Owner(s)	**Classification**
Terraform Labs	Algorithmic, crypto

Less than 25
no. of exchanges available

Legal entity

Terraform Labs
Seoul, South Korea

Attestation

None found.

Regulatory oversight /registrations

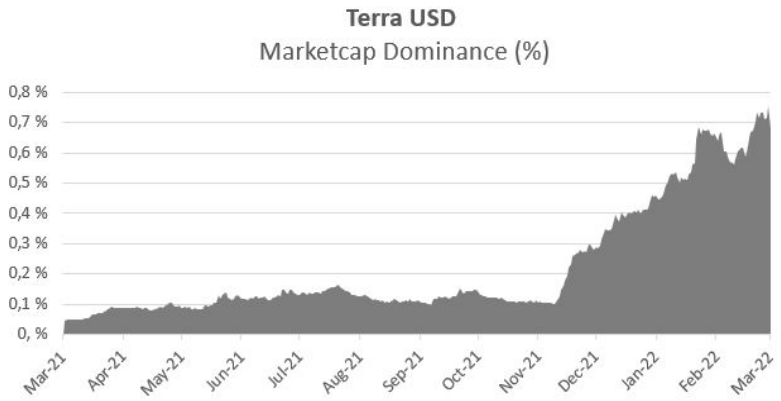
None found.

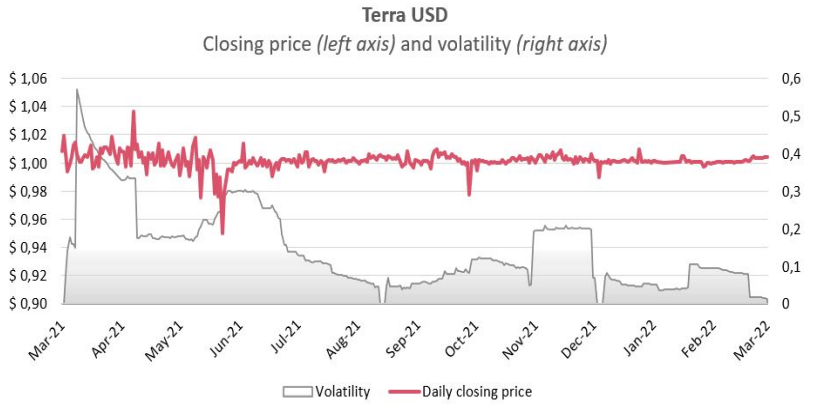
Nature of reserve holdings

None found.

Blockchain platforms (non-exhaustive)

Binance Smart Chain, Ethereum, Polygon, Solana, Terra, Cosmos, Avalanche.





Data sources: CoinGecko (https://www.coingecko.com/), Messari (https://messari.io/), stablecoin websites and attestations
March 2022, All information is subject to change

Dai (DAI) – Overview

Size by market capitalisation

5th

Key facts and figures

Issued	Currency peg
2019	USD
Owner(s)	**Classification**
Marker DAO	Crypto

Less than 25
no. of exchanges available

Legal entity

MakerDAO
CA, USA

Attestation

None found.

Regulatory oversight /registrations

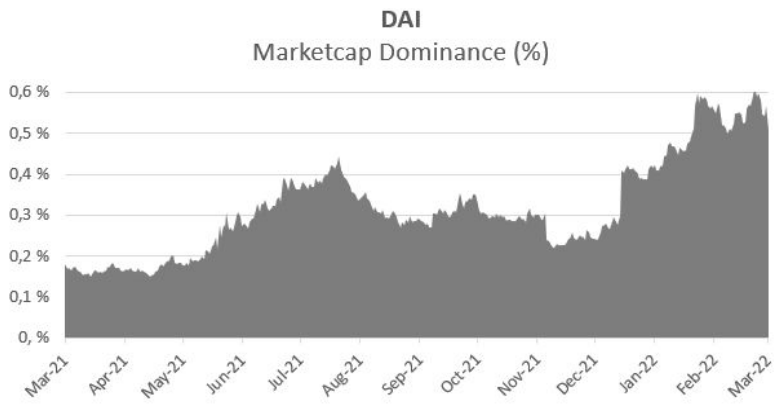
None found.

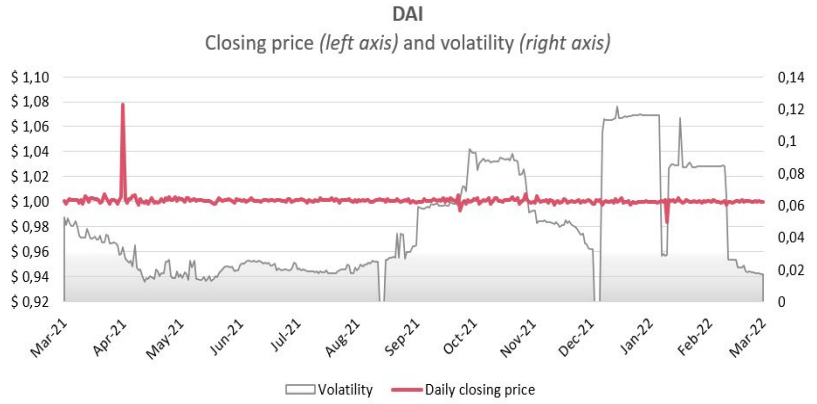
Nature of reserve holdings

Crypto collateralised.

Blockchain platforms (non-exhaustive)

Binance Smart Chain, Ethereum, Polygon, Solana.





Data sources: CoinGecko (https://www.coingecko.com/), Messari (https://messari.io/), stablecoin websites and attestations
March 2022, All information is subject to change

True USD (TUSD) – Overview

Size by market capitalisation

6th

Key facts and figures

Issued	Currency peg
2018	USD
Owner(s)	**Classification**
Techteryx	Fiat

Less than 25
no. of exchanges available

Legal entity

Techteryx, Ltd.
Shenzhen City, Mainland China

Attestation

Real-time attestation is issued by Armanino LLP.

In accordance with the attestation standards established by the American Institute of Certified Public Accountants.

Regulatory oversight /registrations

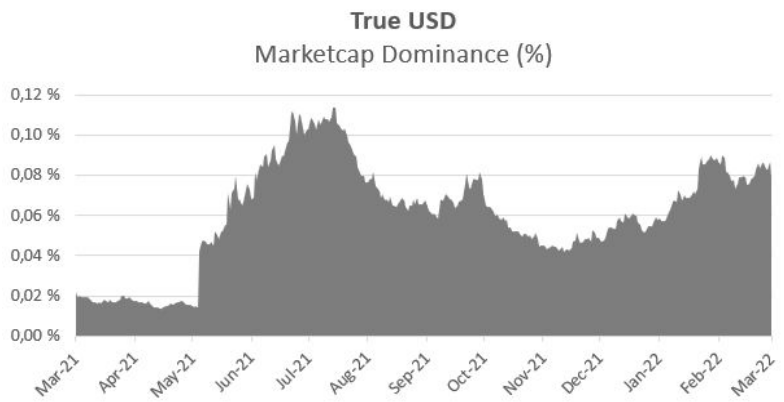
None found.

Nature of reserve holdings

USD denominated collateral.

Blockchain platforms (non-exhaustive)

Ethereum, Avalanche, Binance Smart Chain, TRON.



Data sources: CoinGecko (https://www.coingecko.com/), Messari (https://messari.io/), stablecoin websites and attestations
March 2022, All information is subject to change

Pax Dollar (USDP) – Overview

Size by market capitalisation

7th

Key facts and figures

Issued	Currency peg
2018	USD
Owner(s)	**Classification**
Paxos Trust Company	Fiat

Less than 25
no. of exchanges available

Legal entity

Paxos Trust Company LLC
NY, USA

Attestation

Monthly attestation reports issued by Withum.

In accordance with the attestation standards established by the American Institute of Certified Public Accountants.

Regulatory oversight /registrations

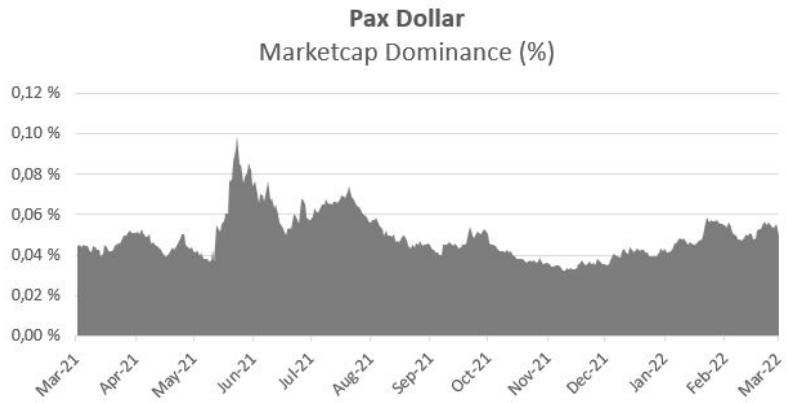
USDP is regulated by the New York State Department of Financial Services.

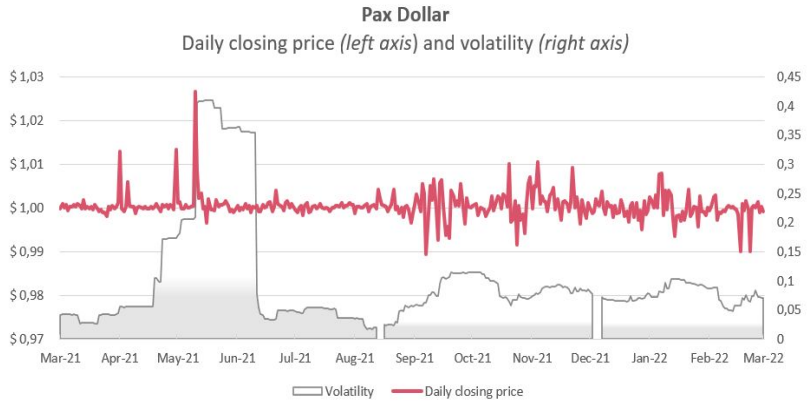
Nature of reserve holdings

Cash and cash equivalents.

Blockchain platforms (non-exhaustive)

Ethereum, Binance Smart Chain.





Data sources: CoinGecko (https://www.coingecko.com/), Messari (https://messari.io/), stablecoin websites and attestations
March 2022, All information is subject to change

Neutrino USD (USDN) – Overview

Size by market capitalisation

8th

Key facts and figures

Issued	Currency peg
2019	USD
Owner(s)	**Classification**
Waves Protocol	Algorithmic

Less than 25
no. of exchanges available

Legal entity

Waves.Exchange
Victoria, Mahe, Seychelles

Attestation

None found.

Regulatory oversight /registrations

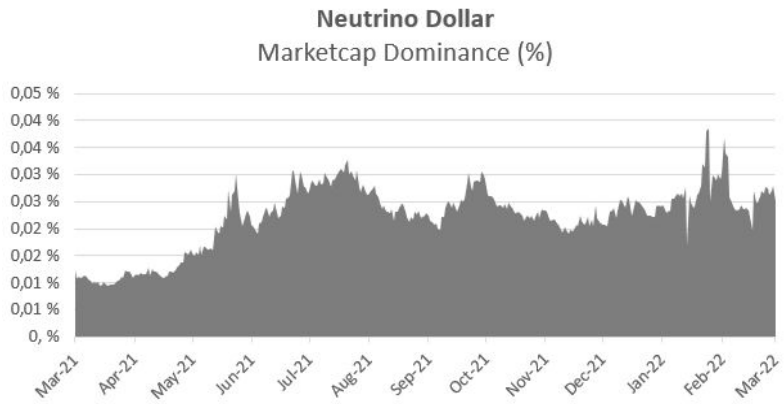
None found.

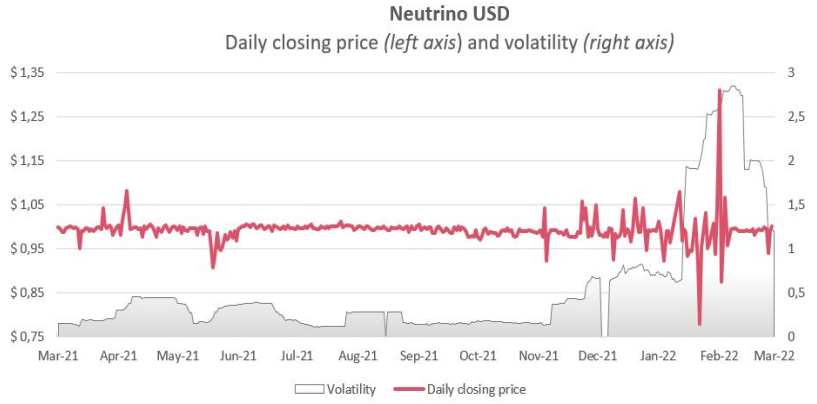
Nature of reserve holdings

Collateralised by WAVES token.

Blockchain platforms (non-exhaustive)

Ethereum, WAVES, Binance Smart Chain.





Data sources: CoinGecko (https://www.coingecko.com/), Messari (https://messari.io/), stablecoin websites and attestations
March 2022, All information is subject to change

Fei USD (FEI) – Overview

Size by market capitalisation

9th

Key facts and figures

Issued	Currency peg
2021	USD
Owner(s)	**Classification**
Fei Labs	Crypto, algorithmic

Less than 25
no. of exchanges available

Legal entity

Fei Labs
CA, USA

Attestation

None found.

Regulatory oversight /registrations

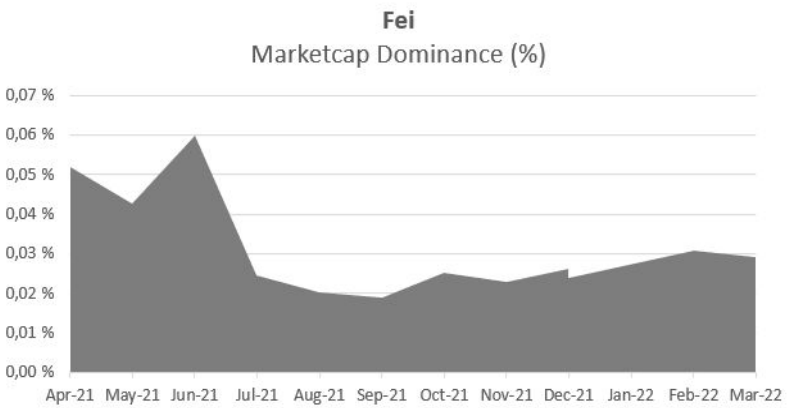
None found.

Nature of reserve holdings

Crypto collateralised.

Blockchain platforms (non-exhaustive)

Ethereum, Heco.



Data sources: CoinGecko (https://www.coingecko.com/), Messari (https://messari.io/), stablecoin websites and attestations
March 2022, All information is subject to change

Gemini Dollar (GUSD) – Overview

Size by market capitalisation

10th

Key facts and figures

Issued	Currency peg
2018	USD
Owner(s)	**Classification**
Gemini Trust Company	Fiat, security and other assets

Less than 25
no. of exchanges available

Legal entity

Gemini Trust Company LLC
NY, USA

Attestation

Monthly attestation issued by BPM LLP.

In accordance with the attestation standards established by the American Institute of Certified Public Accountants.

Regulatory oversight /registrations

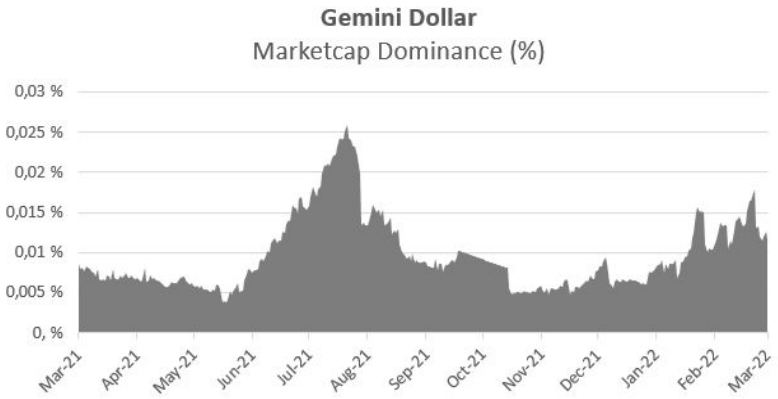
Gemini is regulated as a limited purpose trust company by the New York State Department of Financial Services.

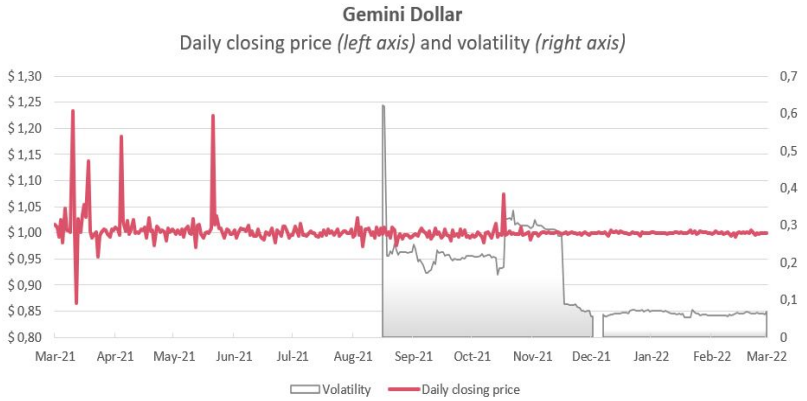
Nature of reserve holdings

Cash, short-duration U.S. Treasury bonds.

Blockchain platforms (non-exhaustive)

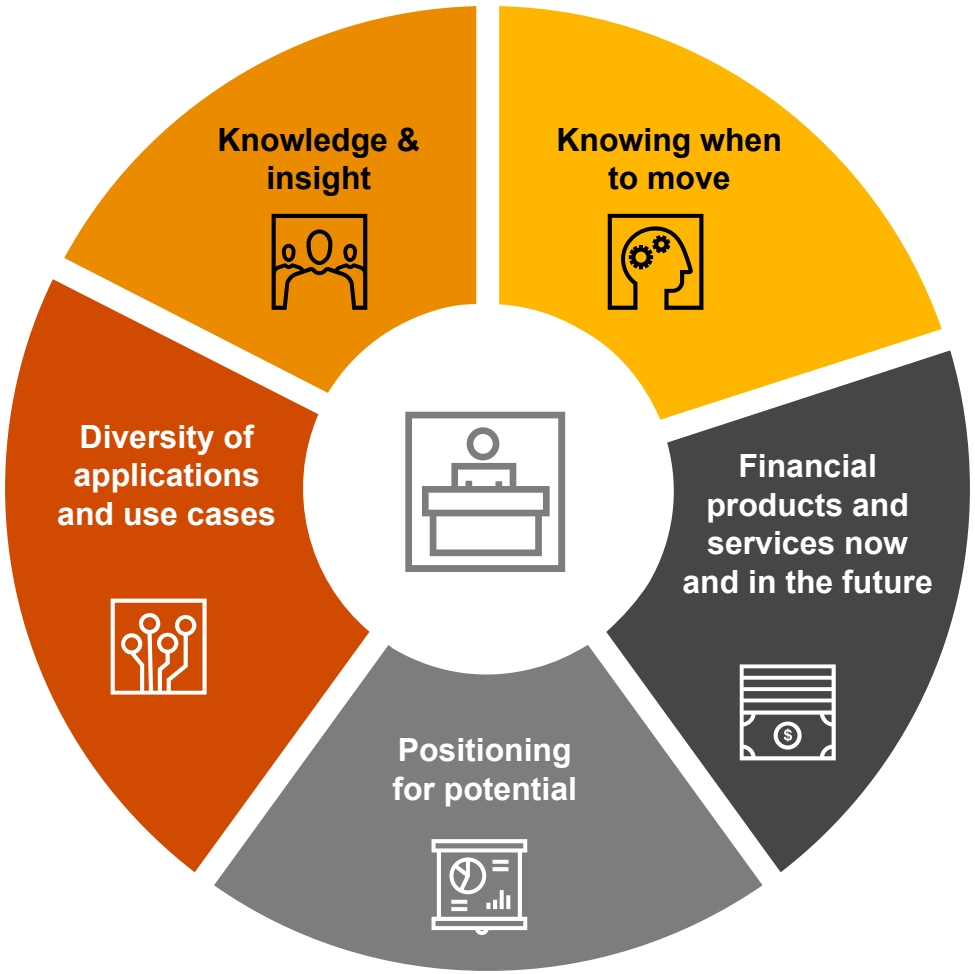
Ethereum.





Data sources: CoinGecko (https://www.coingecko.com/), Messari (https://messari.io/), stablecoin websites and attestations
March 2022, All information is subject to change

How can PwC help?



PwC has worked on numerous CBDC and stablecoin projects globally, supporting central banks and private companies to assess and launch CBDCs and stablecoins. We support our clients from design to deployment and use.

Obtain a 360 degree view of CBDCs, stablecoins and other digital assets.

Understand the regulatory and competitive environment.

Transform trade finance, treasury liquidity, debt, equity, asset management and other products and services.

Realise commercial opportunities.

Implement CBDCs and other digital assets in a retail and commercial context.

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Thank you

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