



Tokenised money and the future of FX

Tokenisation has the potential to transform the way financial markets operate, from the movement of money and assets to the management of liquidity and risk. In this paper, we focus on tokenised forms of money and their impact on FX markets.

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Many emerging use cases for tokenised money are driven by a desire to reduce frictions associated with cross-border payments and FX settlement. Stablecoins enable 24/7 cross-border transfers but remain overwhelmingly US dollar-denominated. As a result, they are currently more relevant as digital dollar infrastructure and for bridge-currency arrangements, often creating a "stablecoin sandwich" in which the US dollar serves as an intermediary between two currency legs, rather than providing a complete solution to the two-currency FX settlement problem.

Tokenisation may play a bigger role in transforming the combined securities and FX settlement cycles involved in cross-border capital flows. This is an area of increasing complexity, as delays or failures in one part of the transaction chain can affect the timely completion of the wider transaction, increasing operational, liquidity, and settlement risks. For example, following the transition to T+1 securities settlement in North America and with Europe preparing to move to T+1, the need to coordinate FX, cash, and securities settlement across institutions, jurisdictions, and infrastructures is already increasing.

Tokenisation enables programmability, which allows atomic settlement and a range of operational and control functions across financial market infrastructures, including real-time liquidity management, margin management, collateral mobilisation and substitution, and automated compliance checks. Current implementations have focused primarily on supporting corporate treasury and liquidity management activities involving FX. However, the settlement of tokenised securities and the associated FX transactions may offer even greater efficiencies by enabling synchronised settlement and reducing some of the operational, funding, and coordination frictions associated with shorter settlement cycles.

Interoperability between different currencies, tokenised money arrangements, and payment systems remains one of the key challenges facing the development of tokenised cross-border payments and FX settlement. Several initiatives are exploring solutions involving tokenised central bank reserves or hybrid models that combine tokenised commercial bank money with central bank money. These may be particularly relevant for multi-currency settlement frameworks, preserving the

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two-tier monetary system while supporting settlement finality and more integrated cross-border processes. In parallel, other initiatives are building infrastructure that enables different forms of money, payment systems, and settlement architectures to operate together.

Tokenisation promises substantial benefits but unintended consequences are worth considering. Beyond faster settlement, wholesale FX markets also depend on liquidity efficiency. This means banks and other financial institutions can settle large transaction volumes safely while using less liquidity. Existing infrastructures such as Continuous Linked Settlement (CLS) combine settlement risk mitigation with significant liquidity savings through multilateral netting and liquidity optimisation mechanisms. Unlike CLS, most current tokenised settlement models do not yet provide multilateral netting at comparable scale. A number of initiatives are exploring liquidity-saving mechanisms and new approaches to liquidity management under tokenisation.

We expect a period of accelerating change in years ahead. Securities and currencies settlement involves a complex nexus of technology, market infrastructure, regulation, and legal frameworks, necessitating cooperation between both public and private sector participants across jurisdictions.

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Introduction

Tokenised money refers to **digital representations of money** that are recorded and transferable on shared or distributed ledger infrastructure. This includes both state and privately issued fiat-denominated forms of tokenised money, including **stablecoins, tokenised commercial bank deposits and tokenised central bank money**.¹ The potential role of tokenised money is increasingly being explored by both corporates and institutional investors. Several use cases have emerged ranging from cross-border payments, wholesale settlement, treasury and liquidity management, trade finance and capital market infrastructure. More recently, attention has expanded beyond using tokenised money for cross-border payments towards models that can support the coordination and settlement of FX transactions.

Wholesale: Refers to activity involving banks, financial institutions, and large corporates, rather than retail customers or consumers.

While tokenised money can support more efficient payments, FX settlement often requires the conditional coordination of payments across currencies. Unlike a simple payment, FX settlement requires the exchange of two currencies to occur simultaneously, creating a need for a synchronisation or **programmability layer** that enables **Payment-versus-Payment (PvP) settlement and reduces settlement risk**. Tokenised money operating on programmable ledger-based infrastructure can support this by embedding rules and conditions directly into settlement processes, facilitating the settlement of both tokenised money and other tokenised assets.

The settlement process, particularly for **wholesale FX transactions involving financial institutions and large corporations**, is exposed to settlement risk, often referred to as Herstatt risk. This arises when one party delivers its currency but the counterparty fails to fulfil its obligation. Cross-border transactions are particularly vulnerable because time zone differences can create a window in which one side has settled while the other has not. Over recent decades, this risk has been materially reduced in major currencies through infrastructure such as CLS, helping to support a large, liquid and operationally resilient FX market.

CLS mitigates FX settlement risk through PvP settlement, ensuring that one currency is transferred only if the corresponding currency is delivered, while reducing funding requirements via multilateral netting and liquidity optimisation tools, generating liquidity savings of over [96%](#) for settlement members. This [liquidity efficiency](#) is important in wholesale markets because it determines the amount of liquidity required for the system to settle its full volume of transactions safely.

However, these benefits are not universal. Many emerging-market currencies subject to current- or capital-account restrictions remain outside the CLS ecosystem and continue to rely on correspondent banking networks or local clearing systems. Settlement in these markets often involves bilateral pre-funding, fragmented payment chains and complex liquidity management, creating operational and funding frictions that can increase the cost and complexity of cross-border transactions.

While settlement risk and liquidity frictions remain important challenges in FX

¹ This definition is in line with CCAF and Fii (2026) Tokenised Money: Use Cases, Interoperability and Regulation



markets, changes elsewhere in the financial system are creating new demands on settlement infrastructure. As securities markets move from T+2 to T+1 settlement and continue to explore even shorter settlement cycles, the movement of cash, FX, securities and collateral has become increasingly interconnected. While existing infrastructure continues to support these markets, cross-border funding and settlement remain dependent on operating hours, time zones and multiple intermediaries.

These developments have brought two related challenges into focus. The first is improving cross-border settlement, particularly where correspondent banking and non-CLS arrangements create liquidity and operational frictions. The second is supporting a more integrated financial system in which cash, FX, securities and collateral can move more seamlessly across institutions and jurisdictions. Together, these challenges have strengthened interest in tokenised forms of money as a potential means of modernising both payment and capital market infrastructure.

The role of tokenised money in FX is closely linked to the broader tokenisation of financial assets. As [asset tokenisation gains momentum](#), tokenised money is increasingly viewed not merely as a payment instrument, but as an enabling layer for more integrated settlement processes. The key question is therefore not whether the technology is feasible, but whether it can achieve sufficient scale, interoperability and integration with existing financial market infrastructures to deliver meaningful improvements in cross-border settlement and capital market efficiency.

Many tokenised money initiatives have focused on improving the cross-border movement of money rather than directly settling FX trades. This reflects the scale of corporate payment frictions: [global corporates move an estimated US\\$23.5 trillion](#) across borders each year and remain heavily reliant on correspondent banking networks, which generate approximately **US\$120 billion** in annual cross-border transaction fees. These figures exclude additional costs related to FX conversion, trapped liquidity, pre-funding, settlement delays and operational complexity, suggesting that the overall cost of cross-border treasury activity is significantly higher. However, the scope of these initiatives is beginning to broaden. As tokenised money infrastructure matures, some projects are moving beyond payment efficiency towards models that could support FX settlement.

Against this backdrop, this paper examines the current FX settlement landscape before assessing the role of tokenised money in FX. It evaluates the opportunities and limitations of stablecoins, tokenised deposits and tokenised central bank reserves, and considers whether these innovations can address challenges that continue to characterise cross-border FX markets.

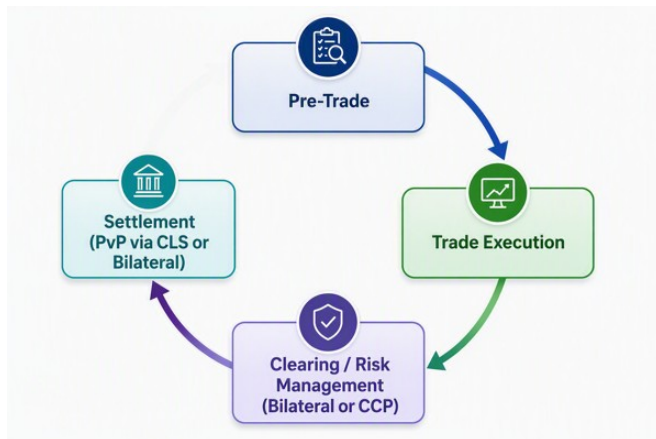
FX settlement today

FX trading takes place primarily in the over-the-counter (OTC) market, where banks, dealers, electronic platforms and other market participants facilitate the exchange of currencies. Once a trade is executed, it enters the post-trade process, during which trade details are confirmed bilaterally or cleared through a central counterparty (CCP), payment instructions are exchanged, and settlement obligations are established ([Figure 1](#)). This process spans the period between trade execution and final settlement, during which exposures are managed, liquidity is



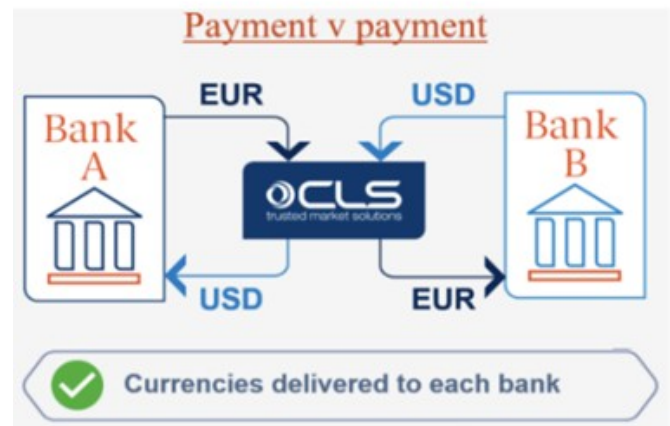
arranged, and currencies are transferred between counterparties. [Two types of credit risk](#) arise during this period: **replacement cost risk**, which exists from trade execution until settlement, and **principal risk**, which arises during the settlement process itself when one party may deliver the currency it sold but not receive the currency it purchased. Depending on the currency pair, FX spot transactions typically settle one or two business days after the trade date, while forwards and options settle on their contractual maturity date, which may range from days to several years after execution.

Figure 1: FX spot trading cycle



Source : Deutsche Bank

Figure 2: FX settlement via CLS



Source : Deutsche Bank, CLS

To reduce principal risk at settlement, often referred to as **settlement risk or Herstatt risk**, wholesale FX markets rely on infrastructure such as CLS, which enables participating banks to settle eligible FX transactions on behalf of themselves and their clients through a **Payment-versus-Payment (PvP) mechanism**, ensuring that one currency is transferred only if the corresponding currency is delivered ([Figure 2](#)).

How CLS works?

Today, CLS achieves simultaneous settlement through a defined funding and settlement process rather than instantaneous settlement. **Under this process, settlement is deferred to a daily settlement cycle, enabling multilateral netting and liquidity optimisation before final settlement occurs. This is important in wholesale markets because it determines the amount of liquidity required for the system to settle its full volume of transactions safely. Settlement finality is achieved through the use of central bank money.**

- For FX trades eligible for settlement using CLS, settlement members or their customers submit electronic payment instructions for both sides of the transaction. CLS validates and matches these instructions, providing legal confirmation and holding the transaction details until the settlement date.
- On each settlement date, CLS simultaneously settles matched payment instructions that satisfy its risk management requirements. Instead of every FX trade being funded individually, CLS calculates each member's net

Gross versus net settlement: what does it mean? Twenty currencies generate 190 unique bilateral currency pairs. Under gross settlement, each currency leg must be funded separately. Through multilateral netting, these obligations are reduced to 20 net currency positions, one for each currency, so participants fund only their net obligations rather than every bilateral payment.



obligation across all eligible trades and currencies.

- Members then make funding payments and receive pay-outs at specified times during the day. CLS holds accounts at the relevant central banks for the currencies it settles. Settlement members pay and receive funds through these CLS accounts via either their own central bank accounts or correspondent banking (nostro) arrangements. Settlement members' multicurrency accounts begin and end each business day with a zero balance.
- The settlement of payment instructions and the associated payments across the books of CLS Bank is final and irrevocable.

Nostro account: A bank account held by one bank with a foreign correspondent bank, typically to facilitate payments and settlements in a foreign currency. The term means "our account with you".

The PvP mechanism also illustrates that a form of **atomic settlement** already exists in today's FX market. Once settlement occurs in CLS, it is final and irrevocable, meaning the transfer of both currency legs cannot be unwound. However, as [CLS notes](#), atomic settlement can encompass both simultaneity and instantaneousness, which are distinct concepts. Settlement can occur on an all-or-nothing basis, with both currency legs settling simultaneously and with finality, without necessarily taking place at the moment a trade is executed.

The CLS function differs from that of a central clearing counterparty (CCP). While CLS's PvP mechanism eliminates FX settlement risk, **it does not eliminate replacement cost risk**, which arises when a counterparty defaults before settlement and the transaction must be replaced at prevailing market prices. These risks can be particularly significant for FX forwards and swaps, where the period between trade execution and final settlement may extend for months or even years. CCPs such as ForexClear help mitigate counterparty credit and replacement cost risk through central clearing and margining, whereas CLS is designed to address settlement risk at the point of settlement by ensuring the simultaneous exchange of both currency legs.

CLS mitigates FX settlement risk (Herstatt risk) at the point of settlement by ensuring that the two currency legs of an FX transaction are settled simultaneously on a payment-versus-payment (PvP) basis.

ForexClear mitigates counterparty credit and replacement cost risk before settlement through central clearing, novation and margining. Replacement cost risk arises after a trade is executed and before it settles, when an adverse move in market prices could leave one party exposed if the counterparty defaults.

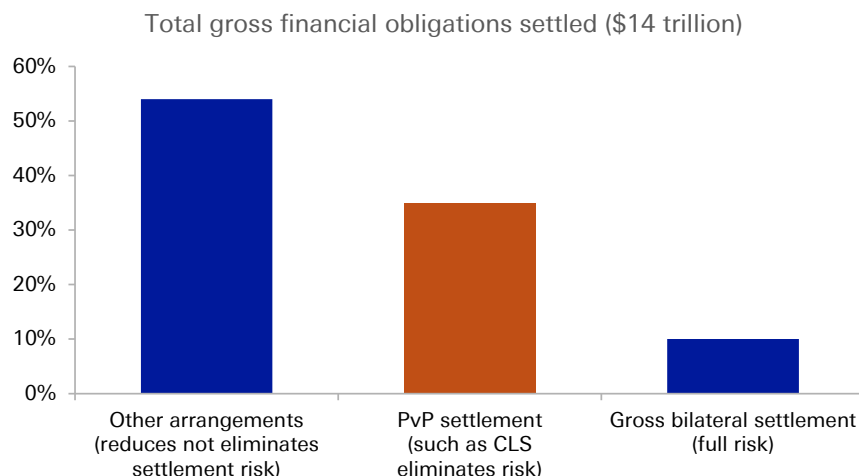
Settlement risks significantly reduced but not eliminated

According to the latest BIS Triennial Survey, banks and other financial institutions account for approximately 95% of global FX turnover, compared with around 5% for non-financial firms. Around 65% of financial-sector FX activity is cross-border in nature. As a result, wholesale FX settlement is overwhelmingly driven by financial institutions, underscoring the importance of robust cross-border settlement infrastructure.

Although infrastructure such as CLS has significantly reduced settlement risk, its coverage is not universal. CLS currently supports 18 currencies, and a significant share of global FX activity continues to settle outside PvP arrangements. Results from the [BIS Triennial Survey](#) show that just over US\$5 trillion, representing 36% of average daily FX settlement activity, was settled through PvP mechanisms that eliminate settlement risk. A further US\$7.6 trillion (54%) was settled through arrangements such as pre-settlement netting that reduce, but do not eliminate, settlement risk. Meanwhile, **more than US\$1.4 trillion (10%) of daily FX settlement continued to occur on a gross bilateral basis through traditional correspondent banking relationships, leaving participants fully exposed to settlement risk (Figure 3).**



Figure 3: FX settlement obligations by settlement type



Source : Deutsche Bank, BIS

Notably, around 25% of this volume (US\$1.4 trillion) was eligible for settlement through a PvP system but was not settled in this way. Potential reasons include operational challenges that result in trades missing PvP settlement cut-off times, difficulties in managing credit exposures to correspondent banks that support PvP-related payments, and the operational burden of meeting tight funding and payment deadlines ([Figure 4](#)).

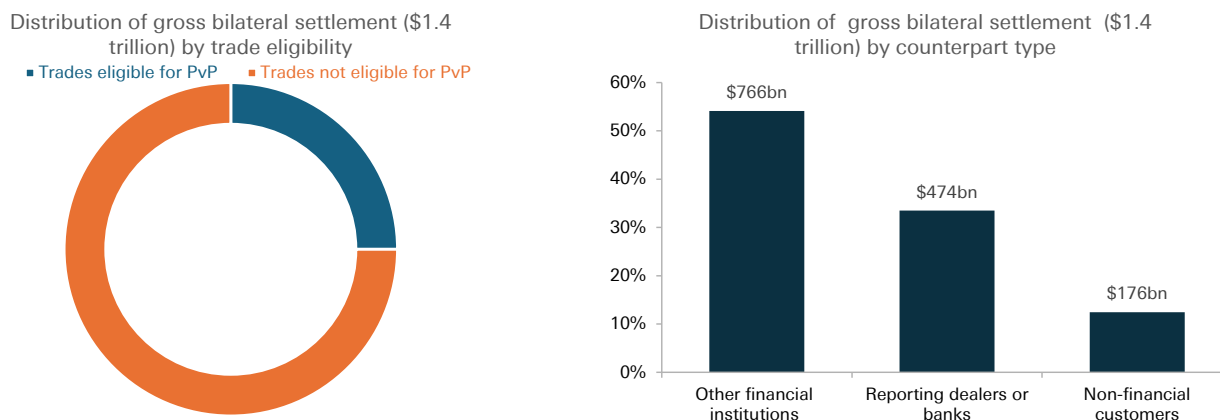
The remaining 75% of gross bilateral settlements were not eligible for PvP settlement systems, primarily because one or both counterparties lacked direct or indirect access to a PvP system. Other constraints included currency pairs that were not eligible for PvP settlement, often involving emerging market currencies, as well as trade types, such as certain same-day (T+0) transactions, that cannot currently be settled through existing PvP arrangements. As a result, much of the residual settlement risk reflects limitations in market access, currency coverage and infrastructure capabilities rather than the voluntary non-use of PvP systems.

Given the dominance of financial institutions in FX trading, gross bilateral settlements were also concentrated among financial counterparties. Of the US\$1.4 trillion settled gross bilaterally, approximately 54% involved other financial institutions, 33% involved reporting dealers, and 12% involved non-financial institutions ([Figure 4](#)).

Digging deeper into trades within each counterparty category, PvP system to mitigate risk is most common for transactions between reporting dealers or banks. Only **11% of inter-dealer trades** are settled on a gross basis and exposed to maximum risk. Consequently, FX trades most exposed to settlement risk are either between reporting dealer and other financial institutions or reporting dealers and non-financial institutions such as corporations. **Around 19% of FX trades** between reporting dealers and other financial institutions are settled on a gross basis. As non-bank financial institutions play an increasingly important role in cross-border securities investment and funding activities, these exposures remain a relevant source of risk outside the core PvP settlement infrastructure. Similarly, **22% of FX trades** between reporting dealers and non-financial institutions also settled through gross bilateral settlement, exposing participants to the full principal amount at risk.



Figure 4: Settlement risk emanating from trades not eligible for PvP. In absolute terms driven by other financial institutions.



Source : Deutsche Bank, BIS

These findings indicate that while the largest settlement risk exposures remain concentrated among financial institutions in absolute terms, the proportion of transactions exposed to risk is higher for non-bank financial institutions and corporates. Many of these residual risks stem from market access, currency coverage and operational constraints that fall outside existing PvP infrastructures. We therefore examine how these constraints create settlement frictions across selected corporate and financial-sector use cases, with a particular focus on institutional investors and cross-border securities transactions, reflecting the dominant role of financial institutions in wholesale FX markets.

FX settlement frictions: corporations versus institutional investors

The challenges associated with FX settlement are often most acute when transactions are cross-border, requiring the movement of currencies across different jurisdictions, payment systems, market infrastructures and operating hours. These challenges can arise whether FX settlement supports an underlying commercial payment or forms part of a broader securities transaction.

Corporations and FX

For **corporations**, FX spot settlement is typically a standalone transaction that supports cross-border trade, commercial payments and treasury activities. Cross-border payments and liquidity management are closely linked to the efficient functioning of the FX market. Corporates frequently need to convert currencies to support international trade, meet cross-border payment obligations and fund activities across multiple jurisdictions. More broadly, treasury functions rely on the seamless movement of currencies to manage cash positions, fund subsidiaries and address short-term liquidity needs.

Effective liquidity management facilitates domestic and cross-border payment obligations, supports the optimisation of cash flows and enables corporates to respond to changing funding requirements. These activities often involve access to wholesale FX markets to convert currencies and mobilise liquidity across jurisdictions. During periods of market volatility, the ability to execute FX transactions and move liquidity efficiently becomes particularly important, allowing institutions to respond swiftly to changing market conditions and maintain confidence in their operations.



FX settlement frictions: These include settlement risk where transactions cannot be settled on a PvP basis, delays arising from cut-off times and operating-hour constraints, liquidity and funding requirements associated with settlement, and the need to coordinate processes across multiple infrastructures and intermediaries. Such frictions can increase operational complexity and affect the timely movement of funds across borders.

Payment frictions: FX spot settlement represents only one component of a broader cross-border payment process. Even where banks settle eligible FX transactions through CLS on behalf of corporate clients, the associated commercial payments generally continue to rely on correspondent banking networks, SWIFT messaging and domestic payment systems. As a result, although CLS can mitigate settlement risk for eligible FX trades, many cross-border payment frictions remain, including delays, cut-off times and intermediary costs.

US dollar payments, for example, are ultimately settled through infrastructures such as Fedwire or CHIPS. Since relatively few non-US banks have direct access to these systems, many rely on correspondent banking relationships to access dollar liquidity and payment services. Corporates, in turn, have no direct access and must depend on commercial banks to intermediate these transactions.

These challenges are distinct from wholesale FX settlement and relate primarily to the underlying payment process. For many corporations, the costs and operational frictions associated with cross-border payments may exceed those arising from the FX conversion itself.

Institutional investors and FX

For **institutional investors** buying or selling securities across jurisdictions, FX spot settlement is part of a broader cross-border securities transaction, where FX settlement, cash movements and securities settlement must be coordinated across multiple intermediaries and jurisdictions. When an investor purchases a foreign equity or bond, they must first obtain the currency required to complete the transaction. As a result, cross-border investments involve two interconnected settlement processes: FX settlement, where one currency is exchanged for another (PvP), and securities settlement, where cash is exchanged for the asset through a Delivery-versus-Payment (DvP) mechanism. Where currencies are not eligible for settlement through PvP infrastructures such as CLS, investors may rely on correspondent banking networks to settle the FX transaction. In these cases, the two currency legs are typically settled through separate payment systems, leaving participants exposed to residual settlement risk.

International investors do not typically interact directly with domestic market infrastructures such as DTCC in the United States. Instead, they access these markets through custodians, which act as intermediaries between investors and local settlement systems. Custodians are responsible for safekeeping assets, managing settlement instructions, coordinating cash movements and arranging funding across jurisdictions. When a foreign security is purchased, the custodian must ensure that the appropriate settlement currency is available before the transaction can be completed through the relevant central securities depository.

This creates a dependency between the FX funding trade and the securities settlement process, meaning that delays or frictions in obtaining the required currency can have direct implications for the timely settlement of the underlying security. The ongoing transition from T+2 to T+1 security settlement cycles, and the



potential move to T+0, increases these challenges by compressing the time available for investors to execute FX transactions, secure funding, and complete settlement processes across jurisdictions.

Key challenges for institutional investors under compressed timelines

The move to shorter securities settlement cycles has increased the operational challenge of coordinating processes. For example, under T+1, a UK investor purchasing a US equity at the market close (9pm London time) may have only around two hours before the CLS submission cut-off at 11pm to determine the final USD funding requirement, execute the associated GBP/USD transaction and submit it to CLS for settlement. Once the FX transaction settles and USD funds are made available to the custodian, the securities transaction can proceed through the relevant securities clearing and settlement infrastructure. Missing this window may require investors to pre-fund transactions, creating cash drag and unwanted currency exposure, or settle the FX transaction outside CLS, potentially increasing settlement risk and transaction costs.

Cross-border transactions involve a range of operational and settlement challenges, particularly under compressed timelines. Local currency cut-off times constrain the window available to execute and settle FX transactions, while settlement risk remains where trades cannot be processed through CLS and must settle bilaterally. Currency controls and market restrictions may further complicate settlement in certain emerging-market currencies and necessitate pre-funding. Shorter settlement cycles also leave less time for trade matching, confirmation, settlement instruction processing and the resolution of failures, increasing the importance of coordinating multiple post-trade processes.²

As FX settlement, cash movements and securities settlement occur across separate infrastructures and timelines, shorter settlement cycles increase the importance of post-trade coordination. Although the [Global Foreign Exchange Committee \(GFXC\)](#) described North America's transition to T+1 as operationally smooth from an FX perspective, this reflected extensive industry preparation. Similar challenges are likely to arise in Europe and the UK, where a more fragmented market structure may add complexity. As settlement windows compress, market participants have less time to execute FX transactions, source funding and complete settlement obligations, making cut-off times and cross-border coordination increasingly important.

Shorter securities settlement cycles may not always require instantaneous FX settlement. However, for CLS-eligible currency pairs, a move to T+1 compresses the time available to execute FX transactions and complete funding processes across institutions and jurisdictions. While shorter cycles can reduce counterparty exposure and costs, they also increase the need for automation and efficient post-trade coordination. A further move to T+0 [would amplify these challenges](#), sharpening the trade-off between risk reduction and operational efficiency.

Similar coordination [challenges](#) are emerging across securities, derivatives and collateral markets as settlement cycles shorten. [BIS \(2020\)](#) estimates that securities trade processing costs USD 17–24 billion annually, underscoring the broader cost of fragmented post-trade workflows. Technologies that improve automation, synchronisation and risk reduction in securities processing are also relevant for FX.

² See [GFMA's Global FX Division \(GFXD\)](#) for more details.



When settlement processes are fragmented across multiple institutions, jurisdictions and infrastructures, delays or failures in one part of the transaction chain can affect the timely completion of the wider transaction, increasing operational, liquidity and settlement risks. ***Against this backdrop, interest has increasingly turned to whether tokenised forms of money can improve the coordination and synchronisation of settlement processes across institutions and market infrastructures.***

Tokenised money on programmable infrastructure

Tokenised money on programmable infrastructure offers a potential approach to addressing some of the challenges outlined in the previous section. Tokenised money refers to digital representations of money that are recorded and transferable on shared or distributed ledger infrastructure. In many current implementations, its use is enabled by two key elements: distributed ledger technology (DLT) and programmability. DLT provides a shared infrastructure on which multiple institutions can record and observe ownership changes in a common ledger, potentially reducing the need for reconciliation across separate systems. ***Programmability refers to the ability to embed executable logic, such as conditions, rules and constraints, directly into instruments, or via smart contracts.*** Such functionality can range from basic automation to more sophisticated smart contract applications.

At the simplest level, programmability can automate settlement processes by ensuring that transactions are executed only when predefined conditions are met, such as Delivery-versus-Payment (DvP) in securities transactions and Payment-versus-Payment (PvP) in FX settlement. More advanced applications can support operational and control functions across financial market infrastructure, including real-time liquidity management, margin management, collateral mobilisation and substitution, and automated compliance checks. At a more sophisticated level, programmability can coordinate multiple parties and obligations within a single workflow, enabling applications such as trade finance arrangements, treasury and cash management, automated disbursements and other multi-party payment processes. These capabilities extend beyond process automation by embedding business, risk and compliance logic directly into financial transactions (CCAF and Fii, 2026). An emerging but largely underdeveloped area is the integration of tokenised money with artificial intelligence and autonomous systems, where programmable money interfaces could enable AI agents to initiate, manage and execute financial transactions within predefined controls.

The approach to settlement risk mitigation in a tokenised environment differs from the current CLS model, which achieves Payment-versus-Payment (PvP) settlement through a centrally coordinated process operating within defined funding and settlement windows. While CLS ensures that one currency is exchanged if and only if the corresponding currency is delivered through a centralised settlement mechanism, tokenised infrastructures could, in principle, embed PvP conditions directly into the settlement process through programmable rules or smart contracts on a shared ledger, enabling settlement to occur automatically when predefined conditions are met. However, tokenised settlement models need not rely solely on transaction-by-transaction atomic settlement. Some emerging platforms, such as [ClearToken](#), also incorporate queues, netting arrangements and liquidity-saving mechanisms.

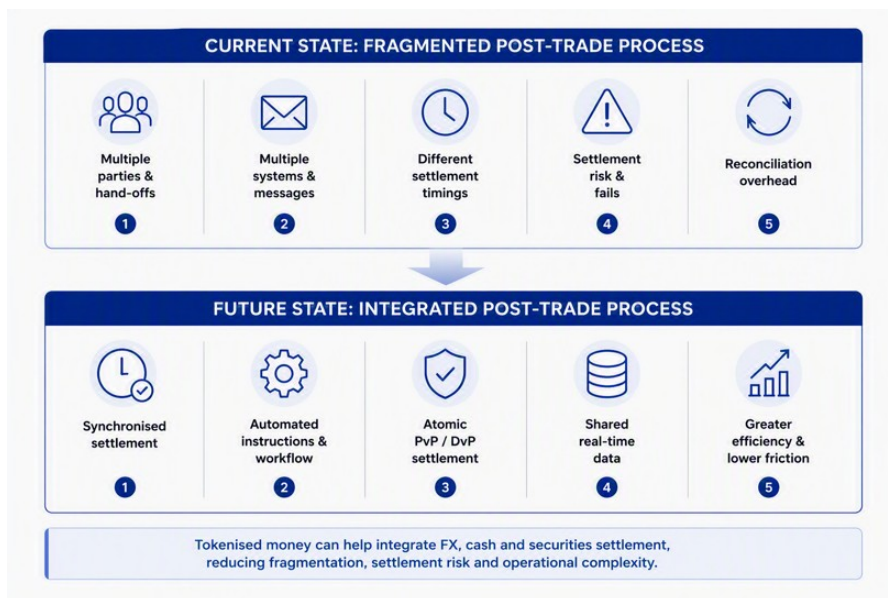


Tokenised post-trade environment for a cross-border securities trade

Many of the potential benefits of tokenised money become more apparent when viewed alongside the broader tokenisation of financial assets. In domestic securities, collateral and derivatives markets, these technologies are already being explored as a means of improving post-trade processes (BIS 2020). When tokenised money is combined with tokenised securities, it may support atomic settlement, greater automation and more efficient movement of cash and collateral, helping to reduce operational complexity, settlement risk and inefficiencies associated with the mobilisation, allocation and coordination of liquidity.

Figure 5 summarises the potential benefits of tokenised money and tokenised securities for post-trade processes. These technologies may support more synchronised settlement, reducing some of the operational, funding and coordination frictions associated with shorter settlement cycles. However, they do not eliminate the need for liquidity provision, risk management, netting or regulatory oversight. Ultimately, technology alone is unlikely to shorten settlement timelines without corresponding changes to market conventions, operating models and regulatory frameworks.

Figure 5: A more integrated post-trade process



Source : Deutsche Bank

The three routes for tokenised money

In practice, the use of tokenised money for financial institutions and corporations is emerging through three principal forms of tokenised money. The first is stablecoins, privately issued digital tokens typically backed by cash, bank deposits or high-quality liquid assets. The second is tokenised bank liabilities, including tokenised deposits, which represent commercial bank money in tokenised form and remain embedded within the existing banking system. The third is tokenised central bank money, which represent tokenised central bank reserves, also sometimes referred to as wholesale central bank digital currencies (wCBDCs).

While these models differ in their issuer, regulatory treatment and underlying infrastructure, they all seek to combine the trust associated with traditional forms

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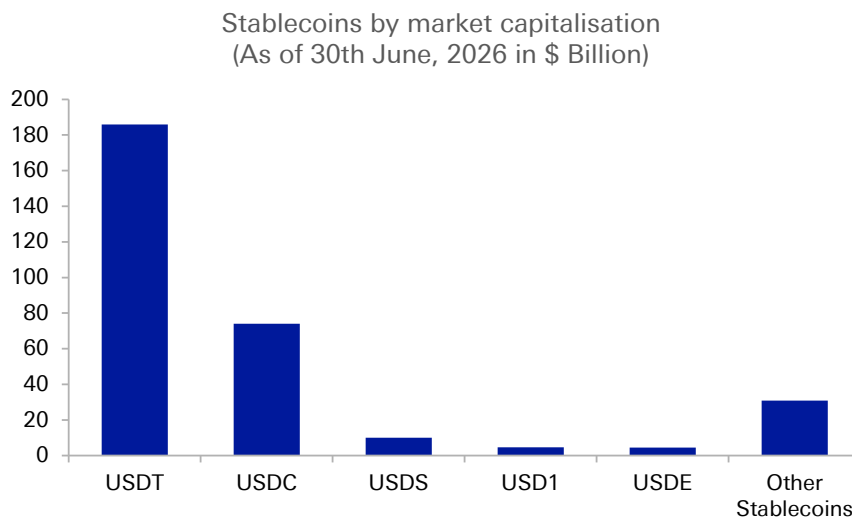


of money with the programmability, interoperability and automation enabled by modern digital technologies. Their potential role in FX settlement is therefore best assessed through the lens of how they address existing challenges.

Stablecoins

A stablecoin is a privately issued digital token designed to maintain a stable value relative to a reference currency, typically through backing by cash, bank deposits or high-quality liquid assets. While other types of stablecoins exist as suggested by Kosse et al (2023) and [BIS \(2026\)](#), the focus of this study would be to discuss fiat-backed stablecoins. BIS (2026) reports that 99.4% of fiat-backed stablecoins (by market valuation) are pegged to the US dollar. Recorded and transferred on distributed ledger networks, stablecoins could potentially function as digital means of payment and settlement.

Figure 6: The market dominated by US dollar-denominated stablecoins



Source : Deutsche Bank, Coingecko

The market for stablecoins has grown rapidly, with more than US\$300 billion outstanding globally, dominated by US dollar-denominated stablecoins such as USDT and USDC ([Figure 6](#)).

From an FX settlement perspective, stablecoins offer an always-on settlement asset that can move across borders on a 24/7 basis without relying on traditional banking hours. They can also support tokenised settlement logic, including conditional payments and automated transaction processing.

Stablecoins' strongest use case today is cross-border payments, particularly in corridors where correspondent banking infrastructure is less efficient. Although total stablecoin transaction volumes were estimated at roughly [US\\$62 trillion in 2025](#), only around US\$350-550 billion is estimated to be associated with real-economy payments, highlighting that adoption in traditional payments remains at an early stage.

Currently, stablecoins are increasingly being used for remittances, business-to-business payments and access to US dollars in markets experiencing currency



instability or limited access to international banking services. Stablecoins are helping improve the movement of the bridge currency—typically the US dollar—rather than the settlement of both currency legs. As roughly 99% of stablecoins in circulation are denominated in US dollars, they function primarily as digital dollar infrastructure rather than a broadly adopted multi-currency settlement network. Consequently, ***most current stablecoin implementations focus on facilitating the transfer of a single currency, typically the US dollar, rather than solving the full two-currency FX settlement problem. This has also been referred to as the "stablecoin sandwich".***

Stablecoin adoption is increasingly moving beyond the lowest-cost blockchain towards a multi-network ecosystem spanning Ethereum, Solana, Polygon, BNB Chain and other networks. This reflects growing demand for compliance, programmability and institutional-grade infrastructure alongside low transaction costs. However, it also highlights an important limitation: stablecoins do not automatically solve interoperability. Instead, the challenge increasingly becomes enabling value to move seamlessly across multiple networks and settlement rails.

Stablecoin liquidity remains fragmented across issuers, networks and jurisdictions, while regulatory treatment continues to evolve across markets. In addition, institutional adoption requires custody solutions, compliance frameworks, treasury integration and industry standards comparable to those available for traditional bank money. As a result, while stablecoins can reduce some correspondent banking frictions, they do not by themselves provide a comprehensive solution to PvP settlement across non-CLS currencies.

Despite these complexities, stablecoins are beginning to attract interest from banks for institutional and corporate cross-border settlement. A notable example is [Nomura's partnership with Circle](#), which aims to explore the use of fiat-backed stablecoins such as USDC in Japan as part of next-generation market infrastructure. The collaboration is focused not only on cross-border payments, but also on FX transactions, treasury operations, fund transfers, on-chain collateral management and tokenised capital markets transactions. More [recently](#), a group of 21 financial institutions plan to issue dollar stablecoin in 2027.

[BNY Mellon](#) expanded its institutional stablecoin services in 2026 to support custody and minting of Circle's USDC, reflecting growing client demand for regulated stablecoin infrastructure rather than the issuance of a proprietary stablecoin. Société Générale's [Forge](#) subsidiary, on the other hand, issued the euro-denominated stablecoin EURCV and used it within tokenised capital market transactions.

Regulatory developments have also helped accelerate experimentation in this area. In Japan, amendments to the Payment Services Act established a regulatory framework for fiat-backed stablecoins. Under this framework, Circle's USDC became the first global US dollar stablecoin approved by Japan's Financial Services Agency for institutional use in Japan. Recent legislative developments in the United States, including the [GENIUS Act](#), have also provided greater clarity around payment stablecoins. Together, these developments have encouraged banks, payment providers and financial institutions to explore stablecoins as settlement assets within regulated financial markets.

These developments suggest that stablecoins are increasingly being viewed not only as digital payment instruments, but also as potential settlement assets for



cross-border transactions. A [recent study](#) notes that regulatory development has progressed furthest in the stablecoin sector, reflecting both growing adoption and policymakers' efforts to address the associated risks.

Key challenges

In some emerging market and developing economy (EMDE) currency corridors, USD stablecoins already act as intermediary settlement assets, performing a role similar to that of the US dollar in traditional correspondent banking arrangements by linking transactions between two non-USD currencies. While stablecoins may reduce frictions in cross-border value transfers, their current concentration in US dollar-denominated issuance limits their ability to support widespread Payment-versus-Payment (PvP) settlement across currency pairs.

While USD stablecoins may facilitate the payment leg of transactions involving tokenised US assets, investors must still exchange their domestic currency for US dollars and subsequently convert any proceeds back into their home currency. Unless digital settlement assets exist for both currencies and can be exchanged through a PvP mechanism, the underlying FX settlement risk remains. Consequently, current stablecoin models primarily improve the transfer of a single currency rather than addressing the settlement risks associated with the exchange of two currencies.

Figure 7: Stablecoins

Metric	Stablecoins
Market size	>US\$300bn outstanding
Dominant currency	~99% USD-denominated
Key benefit	24/7 cross-border transfers
Main use case	Cross-border payments & remittances
FX settlement role	Improves movement of USD as a bridge currency, rather than full two-currency PvP settlement
Key challenge	Fragmented liquidity and interoperability
Institutional adoption	Growing bank interest (e.g. Circle, BNY Mellon, Nomura)

Source : Deutsche Bank

Tokenised commercial bank money

A **tokenised deposit** is not a new form of money, but a commercial bank deposit represented or issued in tokenised form on a shared or tokenised ledger. Economically, it remains a claim on a commercial bank, just as a conventional bank deposit does today. The key difference is that the deposit, or rights linked to that deposit, can be transferred and settled using tokenised infrastructure, smart contracts and shared ledgers.

Classifying tokenised commercial bank money

Several public-sector and industry initiatives have proposed frameworks for



classifying tokenised commercial bank money. The [Bank of England](#) defines tokenised deposits as deposit claims represented on programmable platforms and distinguishes between non-transferable and transferable forms. This distinction is important because it determines whether tokenised deposits can circulate directly across institutions or continue to require interbank settlement in central bank money.

[Project Guardian](#) adopts the broader term tokenised bank liabilities and argues that these instruments could help address existing frictions in cross-border payments and FX settlement, including pre-funding requirements, settlement risk and fragmented post-trade processes. It classifies tokenised bank liabilities according to how the underlying claim is represented, distinguishing between digital twin and digital native models, and according to how they are deployed, ranging from single-bank ledgers to interoperable multi-bank and network-based arrangements.

Industry participants have developed related taxonomies, distinguishing between account-based and token-based representations of commercial bank money, as well as native and non-native ledger structures. Although these approaches differ in terminology, they broadly reflect alternative methods of representing, recording and transferring commercial bank money on distributed ledger infrastructure. Further details are provided in Appendix A.

Current implementation models and infrastructure

Current models are developing along two main lines. The first is **single-bank or single-bank-group infrastructure**, where blockchain-based deposit accounts or tokenised commercial bank money are used between customers of the same institution or banking group. J.P. Morgan's Kinexys Digital Payments is an example of an account-based blockchain deposit model rather than a deposit-token model. It operates on a single-bank ledger, enabling participating J.P. Morgan clients to transfer deposit balances across J.P. Morgan's blockchain-based payments rail. The BMW transaction illustrates this model: BMW executed a programmable on-chain EUR/USD FX transaction using [Kinexys Digital Payments](#), involving automated balance checks, conditional auto-deposits, near-real-time FX execution and transfers between BMW's Blockchain Deposit Accounts in Frankfurt and New York.

The second, more complex model is the **interbank model**, where tokenised bank liabilities issued by different banks, in different currencies and potentially on different ledgers, need to be exchanged or coordinated. [Project Guardian](#) explores several approaches to these interoperability challenges. One model uses a liquidity provider to facilitate the exchange of tokenised deposits in different currencies, with off-chain FX prices fed into the shared ledger through an FX quote oracle. Another model, demonstrated by BNY and OCBC, uses Hash-Time Locked Contracts to coordinate transfers across two private permissioned bank ledgers. A third model, involving HSBC and OSTTRA, focuses on settlement interoperability, using a shared-ledger PvP orchestration layer to match, confirm, fund and settle FX cash flows, helping to reduce Herstatt risk and improve visibility across the settlement.

FX quote oracle: A service that securely uploads off-chain FX prices and token exchange rates to a shared ledger, allowing liquidity providers to offer exchange rates and facilitate cross-currency exchanges between tokenised deposits issued in different currencies.

Bank-led shared-ledger settlement platforms are also emerging as infrastructure that can support tokenised commercial bank money. [Partior](#) is an example of a consortium-based model: a controlled environment in which a defined group of institutions jointly governs and participates in shared infrastructure. It operates as a bank-led shared-ledger settlement platform for real-time cross-border payments



and FX settlement, using a private permissioned ledger where access is restricted to authorised financial institutions and governed participants. Partior's relevance for FX further lies in its ability to support atomic Payment-versus-Payment, or PvP, settlement, where the two currency legs of an FX transaction are coordinated so that settlement of one leg occurs only if the other leg also settle.

Recent initiatives led by [The Clearing House \(TCH\)](#) seek to provide a common clearing and settlement framework for tokenised deposits, addressing one of the key challenges facing tokenised commercial bank money: interoperability across banks. The initiative aims to connect on-chain activity with existing payment rails, enabling the clearing and settlement of tokenised commercial bank money at scale while combining the regulatory, operational and settlement frameworks of established payment infrastructure with the programmability and interoperability of blockchain-based systems.

Market adoption and FX settlement relevance

Commercial bank deposit claims, including tokenised deposits, have progressed beyond early pilot stages and are seeing notable institutional adoption. While data on outstanding tokenised deposit balances remains limited, reported transaction volumes are significant. [J.P. Morgan's Kinexys platform](#), for example, has processed more than US\$4 trillion since inception and averages more than US\$7 billion daily in tokenised deposit movements for institutional payments. Other initiatives include DBS Token Services, Citi Token Services, the USDF Consortium, TassatPay, and projects from UOB and Standard Chartered.

The scale opportunity is potentially significant. Tokenised bank deposits and similar bank-token models could support around [US\\$100–140 trillion](#) in annual transaction flows by 2030, potentially rivalling or surpassing stablecoins in institutional transaction volumes. This reflects the view that corporates and financial institutions may prefer programmable forms of regulated bank money for treasury, liquidity and FX settlement workflows where integration with existing banking infrastructure, compliance processes and balance-sheet treatment is important.

Overall, tokenised deposits appear more directly relevant to institutional FX than stablecoins because they preserve the existing bank-money model while adding programmability, potentially allowing new settlement capabilities to be integrated more easily into existing banking, liquidity and risk-management frameworks. Current implementation models appear more developed for transaction banking, treasury and corporate payment use cases than for the broader wholesale FX market, where achieving interoperability across banks, currencies and settlement networks remains a more complex challenge.

Key challenges

Tokenisation does not, at least in the early stages, fully resolve time-zone mismatches or the need for pre-funding as noted by Project Guardian. Hybrid models are likely to coexist with traditional RTGS systems, correspondent banking infrastructure and fiat-to-token conversion processes for some time, meaning liquidity may still need to be positioned across both traditional and tokenised systems.

A practical issue in cross-currency tokenised deposit models is how the FX rate itself is determined. Project Guardian notes that early-stage on-chain trading volumes may not be sufficient to generate reliable FX prices purely from on-chain



activity. As a result, tokenised deposit models may initially rely on off-chain FX prices sourced from bank liquidity desks, benchmark rates or market data providers, with those prices fed into the shared ledger through an oracle. Over time, if on-chain liquidity develops, more native on-chain FX price discovery may become possible, but this depends on market depth, data integrity and privacy-preserving mechanisms.

Tokenised deposits also do not automatically address all FX settlement challenges. This is particularly relevant in wholesale FX markets, where activity is concentrated among financial institutions. A key strength of existing settlement infrastructure is multilateral netting, which significantly reduces liquidity requirements. Replicating similar levels of liquidity efficiency in tokenised interbank networks remains challenging. Unlike CLS, emerging tokenised deposit arrangements do not yet support multilateral netting at scale, meaning participants may need to trade some liquidity efficiency for faster or more flexible settlement unless netting and liquidity-management mechanisms evolve alongside the technology.

Settlement finality presents a further consideration. Existing wholesale settlement infrastructure ultimately relies on central bank money, which remains an important foundation for wholesale FX settlement. As a result, alternative models that combine tokenised commercial bank money with tokenised central bank money may prove more relevant for wholesale FX applications.

More broadly, the success of tokenised deposits will depend on interoperability across banks and ledgers, sufficient liquidity in each tokenised currency, legal recognition of tokenised claims, clear settlement finality, robust governance frameworks, regulatory consistency, and integration with existing systems.

There may also be balance-sheet costs for issuing banks. If tokenised deposits are treated as more liquidity-sensitive than conventional deposits, banks may need to hold additional high-quality liquid assets against them, reducing their usefulness as a source of funding for lending or maturity transformation.

Figure 8: Tokenised deposits

Metric	Tokenised deposits
Market size	Early-stage but growing institutional adoption
Dominant currency	Multi-currency potential (dependent on issuing banks)
Key benefit	Programmable regulated bank money
Main use case	Institutional payments, treasury and liquidity management
FX settlement role	Supports on-ledger PvP settlement and programmable settlement workflows
Key challenge	Interoperability across banks, currencies and networks
Institutional adoption	Highest within single-bank platforms and consortium-based networks; broader cross-bank adoption remains evolving

Source : Deutsche Bank



Tokenised central bank money

Rather than tokenising private bank money or relying on privately issued settlement assets, an alternative approach is to make wholesale central bank money available on DLT-based infrastructure. In this context, wholesale central bank money used in DLT experiments is often referred to as wholesale central bank digital currency (wCBDC) or, more precisely, tokenised central bank reserves. The latter term is often preferred because it emphasises that the underlying asset, central bank reserves, already exists in digital form, with the innovation lying primarily in the technology used to represent and transfer it. While wCBDC is frequently used interchangeably with tokenised central bank reserves, its definition varies across institutions and may encompass a broader range of innovations in wholesale central bank money that are not necessarily tokenisation-based ([IMF, 2025](#)).

Central bank reserves are already held digitally by eligible financial institutions through RTGS systems such as T2 in Europe, Fedwire in the United States and CHAPS in the United Kingdom. From this perspective, tokenised central bank money initiatives represent not the introduction of a new form of public money, but the extension of existing central bank liabilities into tokenised and programmable environments.³

Although existing infrastructures already eliminate principal risk through DvP and PVP mechanisms, tokenised reserves may support a more integrated settlement process by bringing cash and assets onto the same ledger. This allows transactions to be completed simultaneously and irrevocably using DLT and smart contracts, while enabling programmability.

A number of initiatives have examined the use of multilateral platforms that make wholesale central bank money available in tokenised form for cross-border settlement. Examples include [Project mBridge](#), [Project Jura](#) and [Project Agorá](#). Leveraging shared infrastructure and governance frameworks, these projects have demonstrated real-time and atomic PVP settlement between commercial banks in different jurisdictions using tokenised reserves. Smart contracts can further automate and coordinate multicurrency transactions, improving operational efficiency.

Multi-currency model based only on tokenised central bank money

[Project mBridge](#) is an example of a pure multi-CBDC architecture. We use the term CBDC, as used by the project, which is synonymous with tokenised central bank reserves. Developed by the Hong Kong Monetary Authority, People's Bank of China, Bank of Thailand and Central Bank of the UAE, with Saudi Arabia joining later, the project was designed to enable direct cross-border payments and FX transactions using wholesale CBDCs issued by participating central banks on a shared distributed ledger platform. Following a successful pilot involving 20 banks and 164 real-value transactions, mBridge reached minimum viable product (MVP) status in 2024, indicating that the platform had progressed beyond proof-of-concept testing and was capable of supporting real-value cross-border settlement. Subsequent growth has been substantial, with the platform reportedly processing more than 4,000 cross-border transactions worth [approximately US\\$55 billion by late 2025](#). While the BIS transferred responsibility for the platform to participating

[Tokenised central bank reserves \(IMF, 2025\)](#): Wholesale central bank money, commonly known as reserves, refers to money issued by central banks to eligible financial institutions for interbank settlement and monetary policy implementation. With growing interest in tokenised financial assets, central banks are exploring ways to make reserves available on programmable ledgers. In this context, tokenised reserves are direct central bank liabilities issued using DLT and accessible only to a predefined group of financial institutions.

³ Digital Money – a perspective on stablecoins, tokenised deposits, and CBDCs – Deutsche Bank



central banks in late 2024, mBridge remains one of the most developed publicly disclosed multi-CBDC initiatives.

Beyond wholesale payments, experiments have also explored how tokenised central bank reserves could support more advanced settlement arrangements involving multiple currencies, assets or transaction legs. One example is delivery-versus-payment-versus-payment (DvPvP), where interconnected transactions are settled atomically. [Project Jura](#) illustrates these capabilities by enabling the direct transfer of euro and Swiss franc wholesale CBDCs (wCBDCs), representing tokenised central bank reserves, between French and Swiss commercial banks on a shared DLT platform operated by a third party. The project demonstrated how tokenised asset and foreign exchange transactions can be settled safely and efficiently using both payment-versus-payment (PvP) and delivery-versus-payment (DvP) mechanisms, highlighting the potential for programmable, multi-leg transactions across currencies, asset classes and jurisdictions.

Hybrid models

Alongside tokenised central bank money initiatives, [Project Agorá](#) is exploring alternative architecture that retain central bank money as the settlement anchor while preserving a significant role for commercial bank money.

[Project Agorá](#), launched by the BIS in 2024 in collaboration with the central banks of France (representing the Eurosystem), Japan, South Korea, Mexico, Switzerland, the United Kingdom and the United States, explores a hybrid cross-border settlement model that combines tokenised commercial bank deposits with tokenised central bank reserves on a shared programmable platform. In 2026, the BIS reported that the prototype had successfully demonstrated atomic multi-currency settlement across participating jurisdictions using a unified ledger architecture linking tokenised deposits and tokenised central bank reserves. The project also highlighted potential improvements in speed, transparency and operational efficiency while preserving the existing two-tier monetary system.

Key challenges

Tokenised central bank reserve models, particularly multi-CBDC wholesale arrangements, are among the most challenging forms of digital money to implement. Unlike stablecoins or tokenised deposits, they require extensive coordination across central banks, legal jurisdictions and financial market infrastructures. Cross-border deployment raises complex questions around governance, access, interoperability, regulatory alignment, and the legal recognition of settlement finality. As a result, industry attention has increasingly broadened beyond pure wCBDC architectures towards hybrid models that combine tokenised central bank money with tokenised commercial bank money. By building on the existing two-tier monetary system, these models may face fewer implementation barriers and are often viewed as more compatible with current market structures.

[Recent industry commentary](#) suggests that digital settlement infrastructure may develop along regional or architectural lines rather than converge on a single global model. The emergence of mBridge as a multi-CBDC platform centred on Asia and the Middle East, alongside Agorá's hybrid model involving major advanced-economy central banks and commercial banks, highlights the possibility that multiple settlement ecosystems could emerge over time. Whether these systems ultimately converge through interoperability standards or develop as parallel networks remains uncertain.



Figure 9: Tokenised central bank reserves

Metric	Tokenised central bank reserves
Market size	Limited live volumes; activity remains concentrated in pilots, proofs of concept and early production deployments
Dominant currency	Typically designed as multi-currency infrastructures involving multiple central bank jurisdictions
Key benefit	Provides settlement in central bank money with potential for atomic PvP settlement and programmability
Main use case	Wholesale financial market settlement, cross-border payments and settlement of tokenised assets
FX settlement role	Potential common settlement asset for cross-currency transactions, reducing settlement risk and enabling programmable FX settlement workflows
Key challenge	Cross-border coordination among central banks, legal and regulatory harmonisation, governance, access and interoperability.
Institutional adoption	Active experimentation through initiatives such as mBridge and Jura, as well as hybrid models such as Agorá, although large-scale production adoption remains limited.

Source : Deutsche Bank

Other settlement solutions and related infrastructure

Going beyond the three forms of tokenised money, other settlement solutions and supporting infrastructures are evolving in parallel. One example is [Finality](#), a privately operated settlement system backed 1:1 by central bank reserves. It provides a central-bank-money-backed settlement asset for wholesale transactions. The [Sterling Finality Payment System](#) went live in 2023 and received Bank of England settlement-finality designation in 2024, with the platform targeting use cases including PvP FX settlement and tokenised asset settlement. It uses the [Bank of England's omnibus account solution](#) to hold participant funds and issues DLT-based settlement tokens representing claims on this pool of funds.

Omnibus account arrangements allow for settlement using tokens on the DLT platform outside of RTGS operating hours and with added functionalities, such as programmability, provided that the FIs have prefunded their omnibus accounts (Bank of England 2021)

Rather than tokenising central bank money directly, the [Bank of England's synchronisation model](#) enables funds held in RTGS to be synchronised with transactions taking place on external ledgers through a synchronisation operator. Settlement in central bank money occurs if and only if the corresponding transaction on the external platform is completed. Through initiatives such as Project Meridian FX and the Synchronisation Lab, the Bank has explored how this approach could support Payment-versus-Payment (PvP) settlement for cross-border FX and Delivery-versus-Payment (DvP) settlement for tokenised securities, while preserving settlement in central bank money. The Bank has also highlighted that extended RTGS operating hours may be an important enabler of such synchronised settlement models.

Industry initiatives such as the Regulated Settlement Network (RSN), which builds on earlier Regulated Liability Network (RLN) initiatives, are exploring a shared ledger environment in which regulated liabilities, such as commercial bank deposits and central bank money, and tokenised assets can settle in real time across multiple entities. RSN involves a consortium of institutions, including Citi, the New York Fed Innovation Center and Swift, and creates a shared ledger environment in which these assets can settle in real time across multiple entities. A [December 2024](#) proof of concept demonstrated 24/7 settlement capabilities in a controlled environment, although questions remain around broader ecosystem integration



and cross-border scalability.

[SWIFT's blockchain ledger](#) is another example that emphasis on connectivity. Rather than introducing a new settlement asset, it enables participating banks to coordinate transfers of tokenised deposits across their own ledgers while continuing to settle through existing payment infrastructure. The initiative is intended to support 24/7 cross-border payments and improve liquidity efficiency.

These initiatives highlight the importance of infrastructure that enables different forms of money, payment systems and settlement architectures to operate together. If FX settlement evolves through multiple architectures, synchronisation and interoperability may become as important as the characteristics of the settlement asset itself.

Technology alone is not enough: risk reduction or transformation?

Tokenised money is often discussed in terms of faster settlement, reduced operational complexity and atomic execution. While these technologies may help reduce certain forms of settlement risk, particularly where payment-versus-payment (PvP) and delivery-versus-payment (DvP) mechanisms can be embedded into the settlement process, they do not eliminate the need for liquidity provision, risk management, netting arrangements or regulatory oversight. In many cases, the effect may be better described as risk transformation rather than risk elimination. Settlement risk may be reduced, but liquidity, operational, legal and governance considerations remain.

Regulation: Regulatory frameworks for tokenised deposits, stablecoins and digital settlement assets continue to evolve across jurisdictions. While progress has been made, important questions remain around legal treatment, settlement finality, prudential requirements and the use of tokenised money in cross-border transactions.

Liquidity: Tokenised money does not create liquidity; rather, it may improve how liquidity is mobilised and deployed. Potential reductions in pre-funding requirements and trapped liquidity depend on sufficient market participation, transaction volume and interoperability across networks. Today, many initiatives remain fragmented across separate platforms and participant groups, limiting the extent to which liquidity benefits can be realised. Moreover, unlike CLS, most tokenised settlement networks **do not yet provide multilateral netting at scale**, meaning some participants could **face higher gross funding requirements** even as settlement processes become more automated. This is important because multilateral netting and the resulting liquidity savings have been identified as critical features of wholesale FX payment and settlement systems, including in discussions at the [Jackson Hole Economic Policy Symposium](#).

Interoperability and integration: Many of the potential benefits depend on the ability of different forms of money, payment systems and settlement infrastructures to operate together. Successful adoption will require integration with existing banking, payment, custody, accounting and regulatory reporting processes. Programmable and traditional infrastructures are likely to coexist, creating additional operational and implementation challenges.



Market infrastructure: The benefits of programmable settlement are greatest when cash, securities and collateral can move on the same, or fully interoperable, infrastructure. While technological capability is advancing rapidly, broader adoption depends on custodians, central securities depositories, asset managers, banks and market infrastructures adapting their operating models and processes.

Operational resilience and cybersecurity: Tokenised settlement infrastructures introduce new operational dependencies, including distributed ledger networks, smart contracts, wallets, bridges and external data providers. Coding errors, cyberattacks, failures in oracle services or vulnerabilities in cross-chain connectivity can disrupt settlement processes or lead to unintended outcomes. As networks become increasingly interconnected, disruptions may propagate more rapidly across participants and platforms.

Legal certainty and governance: The legal treatment of tokenised money continues to evolve. Questions remain around ownership rights, insolvency treatment, the enforceability of self-executing smart contracts, dispute resolution mechanisms and the alignment of technical and legal settlement finality. Governance arrangements, including liability allocation, system upgrades and contingency procedures, remain critical to ensuring trust and resilience.

Market concentration and fragmentation: Network effects may favour a small number of tokenised money issuers, settlement platforms or infrastructure providers, potentially creating new forms of concentration risk. At the same time, the proliferation of non-interoperable networks may fragment liquidity across multiple platforms and tokenised money instruments, reducing the fungibility and efficiency that underpin effective settlement.

Data, privacy and compliance: The transparency of shared ledgers can improve auditability and oversight but may also create challenges around confidentiality, commercial sensitivity and data protection. Compliance obligations, including AML/CFT controls, sanctions screening and cross-border regulatory requirements, remain significant considerations and may be difficult to implement consistently across multiple networks and jurisdictions.

Financial stability and monetary considerations: As tokenised money adoption grows, regulators have raised broader concerns around financial stability, including the implications of large-scale migration into digital settlement assets, the concentration of reserve assets, and changing funding dynamics within the financial system. In some jurisdictions, particularly emerging economies, the growing use of foreign-currency-denominated stablecoins has also raised concerns around monetary sovereignty and the effectiveness of domestic monetary policy transmission.

Conclusion

Existing infrastructure plays an important role in mitigating settlement risk in wholesale FX markets. CLS combines Payment-versus-Payment (PvP) settlement with multilateral netting and liquidity optimisation, generating liquidity savings of approximately 99% for participants. However, coverage is not universal, and a significant share of global FX activity continues to settle outside PvP arrangements due to constraints related to currency coverage, participant access, operating windows and market structure.

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While tokenised money may help address some of these frictions, its potentially stronger use case for wholesale FX lies in the wider tokenisation of capital markets. Tokenised money could enable more integrated settlement processes for tokenised assets. Reflecting this potential, a [recent study](#) identified capital market tokenisation as one of the most important long-term use cases for tokenised money. Although activity remains small relative to overall market volumes, it has the potential to change how securities, bonds and other financial instruments are issued, traded and settled. The vision is an integrated ecosystem in which tokenised money is used to settle tokenised securities and other assets, enabling atomic settlement that reduces counterparty risk and shortens settlement times from days to seconds.

The [Bank of England's](#) analysis highlights an important financial stability consideration. While tokenised deposits extend commercial bank money into programmable environments, central bank money remains the ultimate risk-free settlement asset and anchor of confidence in the financial system. Future tokenised markets may therefore require mechanisms such as RTGS synchronisation or hybrid models combining tokenised commercial bank money and central bank money to preserve the singleness of money and settlement finality. More broadly, the proliferation of multiple forms of tokenised money could fragment liquidity, reduce fungibility and create new market structure and financial stability challenges.

Over time, programmable settlement arrangements may replicate some functions currently performed by existing infrastructures, particularly if interoperable tokenised deposit or tokenised central bank money frameworks achieve sufficient scale. However, this will depend not only on technological capability but also on the development of comparable liquidity networks, legal frameworks, governance arrangements and interoperability with existing payment and settlement systems. The transition towards programmable settlement is therefore likely to involve both risk reduction and risk transformation.



Appendix A: Detailed classification of tokenised commercial bank money

Several public-sector and industry initiatives have proposed different frameworks for classifying tokenised commercial bank money. The [Bank of England](#) describes tokenised deposits as “deposit claims represented on programmable platforms” that enable new techniques for payments and settlement. It distinguishes between non-transferable and transferable tokenised deposits. Non-transferable tokenised deposits resemble existing deposits and may still require settlement in central bank money when transferred between customers of different banks. Transferable tokenised deposits, by contrast, could be self-settling upon transfer, with the recipient becoming a customer of the issuing bank. This distinction matters for FX because it affects whether tokenised deposits can circulate across banks directly or whether interbank settlement in central bank money is still required to preserve singleness and finality.

[Project Guardian](#) uses the broader term tokenised bank liabilities to refer to tokenised representations of commercial bank money on a shared ledger, without asserting any specific legal or regulatory interpretation. Tokenised deposits are therefore a specific form of tokenised bank liability. It further classifies tokenised bank liabilities along two dimensions: token level and ledger level. At the token level, it distinguishes between digital twin tokens and digital native tokens. Digital twin tokens represent ownership interests in underlying traditional bank liabilities, with ownership rights represented on-chain through digital tokens. Digital native tokens are issued and custodied natively on a shared ledger, which serves as the primary record of ownership and rights. The distinction therefore relates to the legal and operational representation of the underlying bank liability rather than to transferability, as both forms can potentially support programmable payments and settlement.

At the ledger level, Project Guardian distinguishes between three deployment models. A **single-bank ledger** is a shared ledger operated within the same banking group, enabling transfers between customers, entities or branches connected to that bank's infrastructure. **Between-bank models** enable tokenised bank liabilities issued on separate banks' shared ledgers to be used for payments and settlement between customers of different banks. **Interlinking network models** connect distinct networks, each potentially having its own governance framework and design, allowing tokenised assets to move across a broader ecosystem of participating institutions and currencies.

Beyond the terminology used by Project Guardian, industry participants have developed more detailed taxonomies to describe how commercial bank money can be represented on distributed ledger infrastructure. A related [industry taxonomy](#) describes these instruments as blockchain-based deposits: distributed-ledger-based deposit claims issued by a licensed depository institution and recorded on blockchain. Within this category, they distinguish between account-based models, such as blockchain deposit accounts, and token-based models, such as deposit tokens. The taxonomy also distinguishes between native models, where the blockchain is the primary record of value, and non-native models, where the blockchain mirrors an off-chain record.

Both account-based and token-based models are forms of commercial bank money, but they differ in how the deposit claim is represented and transferred on ledger. Blockchain deposit accounts represent deposit balances as account

Project Guardian also identifies several pain points in the current cross-border payment and FX settlement process, including time-zone frictions, pre-funding requirements, settlement risk outside CLS, fragmented infrastructure and the continued separation of messaging, reconciliation and settlement. It argues that tokenised bank liabilities could help address some of these frictions by enabling commercial bank money to move across shared infrastructure and, where supported by appropriate legal, operational and interoperability frameworks, by enabling atomic PvP-style settlement for a broader range of currencies and participants.



balances on a blockchain-based ledger. Deposit tokens are transferable tokens issued on a blockchain by a licensed bank, representing a claim on that bank for a stated amount of fiat money. J.P. Morgan's SGD deposit token, issued in connection with the MAS Project Guardian pilot, is one example of a deposit token. More recently, JPM Coin/JPMD is a bank-issued deposit token on Base, an Ethereum Layer 2 network, enabling approved institutional clients to move money, post collateral and settle transactions on public blockchain infrastructure while retaining the credit-risk profile and balance-sheet characteristics of commercial bank money.

Figure 10: Defining tokenised commercial bank money

Organisation / Framework	Term Used	Classification	Description
Bank of England	Tokenised deposits	Non-transferable	Tokenised deposit that still relies on interbank settlement.
		Transferable	Tokenised deposit that can circulate through transfer.
Project Guardian	Tokenised bank liabilities (Token level)	Digital twin token	On-chain representation of an existing bank liability.
		Digital native token	Bank liability issued and recorded natively on a shared ledger.
	Tokenised bank liabilities (Ledger level)	Single-bank ledger	Shared ledger operated within a banking group.
		Between-bank model	Tokenised bank liabilities exchanged across separate banks' ledgers.
CCAF and Fii (2026) Tokenised Money: Use Cases, Interoperability and Regulation	Tokenised money: commercial bank deposits	Tokenised deposits	Represent an off-chain bank deposit recorded in traditional account systems, with the token serving only as a representation of that off chain position
		Deposit tokens	Deposit itself is issued solely on a distributed ledger constitute a DLT native form of the claim
Industry taxonomy	Blockchain-based deposits	Blockchain deposit accounts Deposit tokens	Account-based representation of deposits on blockchain infrastructure. Transferable token representing a deposit claim on a bank.
	Ledger architecture	Non-native model Native model	Blockchain mirrors an off-chain record. Blockchain is the primary record of ownership.

Source : Deutsche Bank

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Appendix 1

Important Disclosures

*Other information available upon request

*Prices are current as of the end of the previous trading session unless otherwise indicated and are sourced from local exchanges via Reuters, Bloomberg and other vendors. Other information is sourced from Deutsche Bank, subject companies, and other sources. For further information regarding disclosures relevant to Deutsche Bank Research, please visit our global disclosure look-up page on our website at <https://research.db.com/Research/Disclosures/FICCDisclosures>. Aside from within this report, important risk and conflict disclosures can also be found at <https://research.db.com/Research/Disclosures/Disclaimer>. Investors are strongly encouraged to review this information before investing.

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