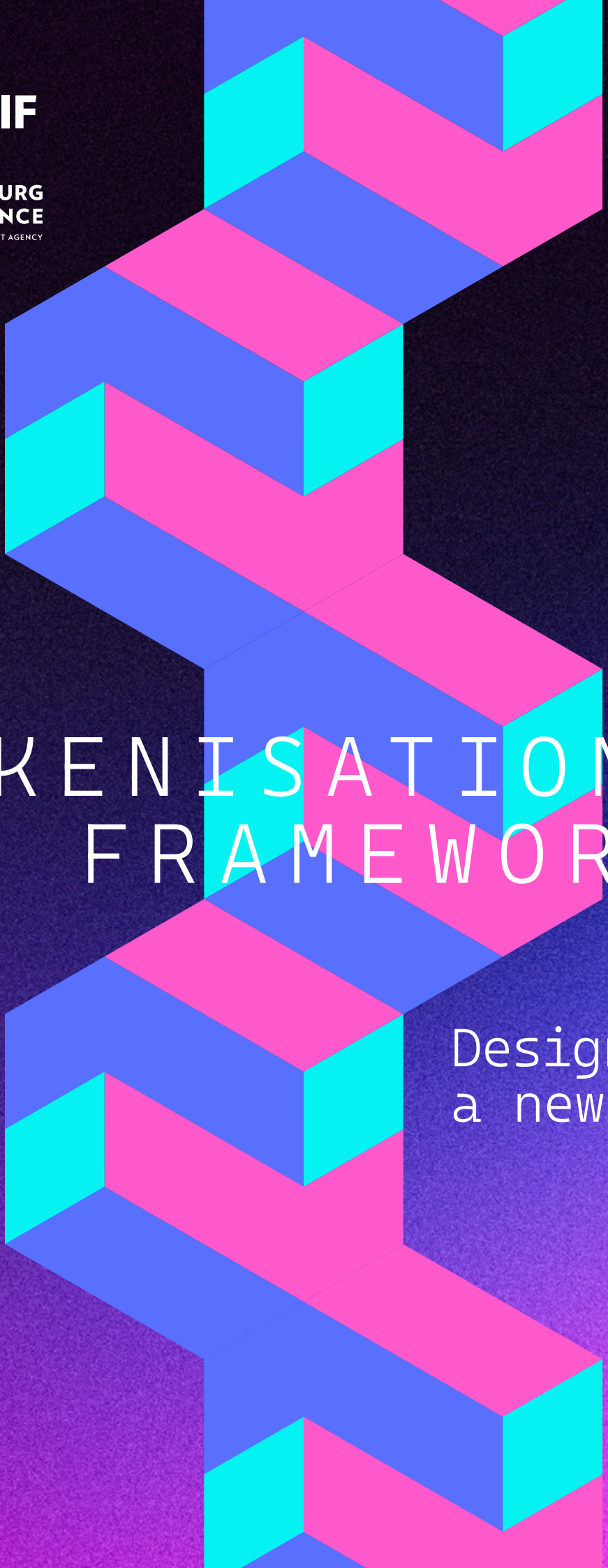
OMFIF

LUXEMBOURG FOR FINANCE
THE FINANCIAL CENTRE DEVELOPMENT AGENCY



TOKENISATION FRAMEWORKS

Designs for a new era

OMFIF

Official Monetary and Financial Institutions Forum
6-9 Snow Hill, London, EC1A 2AY
T: +44 (0)20 700 27898
enquiries@omfif.org
omfif.org

ABOUT OMFIF

With a presence in London, Washington and New York, OMFIF is an independent forum for central banking, economic policy and public investment – a neutral platform for best practice in worldwide public-private sector exchanges.

AUTHOR

Lewis McLellan, Head of Content, Digital Monetary Institute

EDITORIAL AND PRODUCTION

Simon Hadley, Director of Production and Development Planning

Sarah Moloney, Editorial Director

Prerna Kala, Editorial and Marketing Assistant

MARKETING

Ben Rands, Managing Director of Corporate Development, Marketing and Events

Ophelia Mather, Marketing Coordinator

LUXEMBOURG FOR FINANCE
THE FINANCIAL CENTRE DEVELOPMENT AGENCY

Luxembourg for Finance

12, rue Erasme, L-1468 Luxembourg-Kirchberg
T: +352 272021-1
F: +352 272021-399
lff@lff.lu
luxembourgforfinance.com

ABOUT LUXEMBOURG FOR FINANCE

Luxembourg for Finance is the Agency for the Development of the Financial Centre. It is a public-private partnership between the Luxembourg Government and the Luxembourg Financial Industry Federation (PROFIL). Founded in 2008, its objective is to develop Luxembourg's financial services industry and identify new business opportunities.

LFF connects international investors to the range of financial services provided in Luxembourg, such as investment funds, wealth management, capital market operations or advisory services. In addition to being the first port of call for foreign journalists, LFF cooperates with the various professional associations and monitors global trends in finance, providing the necessary material on products and services available in Luxembourg. Furthermore, LFF manages multiple communication channels, organises seminars in international business locations, and takes part in selected world-class trade fairs and congresses.

TOKENISATION FRAMEWORKS:
Designs for a new era

CONTENTS

FROM CONCEPT TO IMPLEMENTATION

Tokenisation is no longer just an experiment but is part of the future of finance. By Tom Théobald, Chief Executive Officer, Luxembourg for Finance.

FOR several years, blockchain innovation in financial services was largely characterised by experimentation. Today, developments point to a far more substantive shift, particularly around tokenisation, which has moved from concept to implementation across multiple areas of financial markets.

This report comes at a timely moment and highlights a clear trend: regulators, financial institutions and market infrastructure are increasingly aligned on the view that tokenisation can enhance the way assets are issued, managed and exchanged. Early use cases support this, already providing us with a glimpse of more efficient collateral management and new forms of capital market access.

At the same time, however, as the report clearly underlines, challenges remain and adoption is still uneven. Legal frameworks and regulatory treatment, particularly in relation to cash settlement, will continue to shape the development of tokenisation. These are not marginal considerations either; they are central to how tokenisation will integrate into the global financial system. Indeed, the benefits of tokenisation will only be fully realised if entire processes move on chain rather than merely duplicating off-chain processes.

Tokenisation thus represents a broader reconfiguration of financial infrastructure – one that combines distributed ledger technology, automation and evolving regulatory approaches. This could improve efficiency, expand financial services access and support new forms of intermediation. In fact, tokenisation has the potential to become the financial rails of tomorrow's real-time economy.

For Luxembourg, this evolution is closely aligned with our financial centre's role as the leading hub for cross-border finance. Our four blockchain laws providing legal certainty for digital securities, from issuance to account-keeping, combined with our expertise in global investment funds, capital markets and asset servicing position the country as a natural hub for the next phase of tokenised finance.

I would like to thank OMFIF and my team for the excellent work on this report, which contributes to a more informed and constructive dialogue on developments in tokenisation. The findings here reflect both the progress that has already been achieved, but also the challenges that remain. They also point to a direction of travel that is clear: tokenisation is set to play a central role in the future of financial services.

'THE FINDINGS HERE REFLECT BOTH THE PROGRESS THAT HAS ALREADY BEEN ACHIEVED, BUT ALSO THE CHALLENGES THAT REMAIN. THEY ALSO POINT TO A DIRECTION OF TRAVEL THAT IS CLEAR: TOKENISATION IS SET TO PLAY A CENTRAL ROLE IN THE FUTURE OF FINANCIAL SERVICES.'

Realising the promise of tokenisation

Regulators and financial markets alike are coming round to the benefits of tokenisation, but different legal frameworks and risk considerations remain sticking points.

IT is stretching a point to call blockchain a new technology. Bitcoin has been operating for 16 years and the potential of blockchain to reshape capital markets has been discussed by those at the intersection of technology and finance for well over a decade. Its promise has always been clear: a new infrastructure, enabling seamless and secure transfer of assets without the costly supervision of intermediaries. What we want is a platform that enables assets to trade between any eligible counterparties without being tied to a single company's infrastructure. Blockchain is the answer.

The technology was designed to create a robust means of exchanging value without a central authority, relying on the network itself to prevent double-spending or counterfeiting.

Some regulators find the replacement of intermediaries concerning, particularly when it comes to the use of public chains at commercial banks. For these regulators, it is important to reiterate that the freedom of movement and the reduction of intermediaries do not imply anarchy. Financial markets must still be governed by rules. Assets must only be held by people who are eligible to hold them. This means we need know-your-customer procedures and the technical capacity to enforce them. Public blockchains are manifestly capable of providing this functionality, as the growing number of on-chain financial assets shows.

Getting the legal nuances right

Although tokenisation emulates the protective features of traditional finance, moving assets to token form can result in novel legal risks. Financial assets exist within a legal framework. If we are to reflect this legal framework when the assets are in token form, the nuances of the legal relationship of the token to the assets they represent is of the first importance.

Not all tokenisation is created equal. The legal nuances can be subtle but are important to understand. It is possible for a token to fully embody the asset. Some issuers have made their assets available on chain and the transfer of tokens represents transfers of securities in the master record of ownership.

In other cases, the token does not necessarily represent ownership of an asset. The asset can be immobilised and tokens sold against it, but tokenholders' interest in the asset is indirect. Still others provide exposure to the economic performance of an asset, but do not confer ownership, voting rights or any other claims regarding the asset.

Exactly what a token purporting to represent a financial asset entitles the holder to is discussed at length in the first chapter of this report. We examine first the different types of tokenisation across several asset classes, the benefits they bring and the legal structures that are enabling this activity. As these instruments become more common, market participants will need to exercise caution to ensure that they understand what the tokens they hold entitle them to.

Then, we look at some of the challenges holding back further adoption of tokenisation, particularly around regulators' treatment of public and permissionless blockchains at commercial banks.

Finally, we explore some of the potentially transformative impacts tokenisation could have in the future, including broader retail access, a new cadence for institutional funding and programmability integration with sustainable debt instruments.

KEY FINDINGS

1. The benefits of tokenisation include enhanced reach, reduced risk, greater efficiency and faster settlement, depending on the asset class.

2. The tokenisation presently taking place in financial markets typically falls into one of three categories: direct, indirect and incomplete tokenisation. These categories relate to the links between the token and the underlying asset and potential investors must carefully consider the implications of the legal framework in which a token exists.

3. Several public-sector borrowers have experimented with issuing tokenised bonds, including Slovenia, Hong Kong, Luxembourg, the World Bank, several Swiss cantons and the European Investment Bank.

4. There are many different blockchain protocols currently in operation, and more are being added since businesses are keen to develop their own blockchains as a means of differentiating their commercial offerings.

5. Early experiments with blockchain bonds have revealed that, unless the market agrees on a medium for settling cash, the benefits of tokenising bonds are unlikely to be fully realised.

6. One of the most promising use cases for tokenisation in capital markets is the tokenisation of collateral – assets can remain with the custodian, but the blockchain-maintained record of ownership can be updated quickly and easily.

7. In some cases, the obstacle to wider adoption of tokenisation is policy, rather than technical considerations. Tokenisation might be a catalyst for policy change.

8. In 2024, 16% of surveyed bond market participants said they would prefer T+0 settlement. The remaining 84% preferred a longer period – typically two days.

9. Many market participants and policy-makers hope that tokenisation will cut out intermediaries, but the incumbents do not intend to quietly watch their functions eroded and are developing their own tokenisation solutions.

1

Building the foundations

Many industry players are experimenting with tokenisation, but they are not all held to the same legal standards. While tokenisation brings considerable benefits, this variance also creates risks for banks and issuers.

KEY FINDINGS

- Although tokenisation is a broadly used term, it refers to several different processes with different legal implications. Careful scrutiny of the legal framework under which tokens are interested is a vital part of the investing process.
- Tokenisation brings different benefits – enhanced reach, reduced risk, faster settlement - depending on the asset class. Adoption will not be uniform across them. In fund units and other collateral markets, the benefits of tokenisation are already being felt. In bond markets, other operational developments are needed before tokenisation can take hold.
- The provider of the tokenisation platform and the priorities of their clients will largely shape the degree to which tokenisation represents a transformation of capital markets.

THE term 'tokenisation' refers to the representation of ownership via a token represented on a blockchain. However, this broad definition actually covers several different activities and the resulting assets can carry different legal statuses. There are many different tokenisation projects currently in progress in capital markets, and it is important to note that they are not all legally equivalent (Figure 1.1).

Broadly speaking, the legal representation of an asset can be divided into three categories: direct, indirect and incomplete tokenisation.

Direct tokenisation

In direct tokenisation, the token is the full embodiment of the asset. These native assets are similar to a paper share or an entry in a security register but stored on decentralised infrastructure. This model offers the highest degree of legal certainty. Bonds issued natively on chain, such as the 2025 issuance of Luxembourg's Digital Treasury Certificate, fit this category. Corporate bonds are also a frequently considered target for direct tokenisation.

However, in many jurisdictions, certain assets can only be issued in specific forms, preventing such native issuance until laws and regulations change. Some jurisdictions have already made the requisite changes. Luxembourg enacted

1.1. Tokenisation projects currently in progress

Asset/project	Instrument category	Domicile	Volume/ AuM (early 2026)	Representation (nature of asset)	Ownership rights (legal status)	Legal basis	Functional network
Slovenia government bond	Sovereign debt	Slovenia	**€30m** (inaugural issue)	**Digitally native security:** the token is the bond; no paper version exists	**Direct legal title:** recorded as the owner in the primary ledger	French law (Neobonds platform)	Canton (private)
World Bank Digitally Native Notes	Supra-national bond	UK/ Luxembourg	**€100m**	**Digitally native note:** issued via Euroclear's digital infrastructure	**Direct legal title:** direct ownership via Euroclear account	English law	Euroclear D-FMI (Corda)
Luxembourg Digital Treasury Certificates	Sovereign debt	Luxembourg	**€50m (pilot phase)**	**Digitally native security:** Issued natively on a blockchain platform; no paper certificates exist	**Direct legal title**: Direct ownership recorded via a central account keeper on a DLT platform	Luxembourg Blockchain Laws (I-IV)	HSBC Orion (Private)
Pax Gold	Commodity	US (New York)	**~$850m**	**Asset-backed wrapper:** one token = 1oz of a specific physical gold bar	**Beneficial ownership:** right to the physical gold held in Paxos vaults	NY banking law (New York State Department of Financial Services)	Ethereum/ Solana
BlackRock BUIDL	Money market fund	US (Delaware)	**~$1.8bn**	**Digital share class:** interests in a Delaware LP (BlackRock Liquidity Fund)	**Beneficial ownership**: rights as a limited partner to yield and net asset value	US Investment Company Act (Reg D 506c)	Ethereum
Franklin Templeton (Benji Fund)	Money market fund	US (Delaware)	**~$865m**	**Digitally native mutual fund:** The blockchain is the primary system of record for the fund's transfer agent	**Direct legal title:** Official record of share ownership is maintained via a blockchain-integrated system	US Investment Company Act (1940)	Multichain (Stellar, Polygon, Avalanche, Canton)
Ondo Finance USDY	Yield stablecoin	British Virgin Islands	**~$1.2bn**	**Tokenised debt:** a senior secured note (a loan you give to the issuer)	**Direct contractual claim:** right to repayment of principal and interest	BVI law	Multichain (Ethereum, Solana, Mantle)
Robinhood stocks	Equities (EU only)	Lithuania	**~$200m+** (growth phase)	**Contractual derivative:** tokenised claim on the value of a US stock	**Contractual claim:** no voting rights; claim against Robinhood Europe	EU Markets in Crypto-Assets Regulation / Lithuania law	Arbitrum (L2)
Broadridge Distributed Ledger Repo	Repo/ lending	US (New York)	**~$9tn** (monthly volume)	**Collateral shell:** 'lock-and-tokenise' existing US Treasuries	**Security interest**: legal right to the underlying collateral in a repo	US Uniform Commercial Code (NY law)	Canton (private)
RedSwan Digital Real Estate	Private equity (real estate)	US (Texas)	**~$5bn** (total platform)	**Asset-backed wrapper:** digital shares in a property-specific limited liability company	**Beneficial ownership:** LP rights to rental income and appreciation	US law (Reg D/S)	Hedera/ Stellar
Toucan carbon credits	Carbon credits	Swiss/ international	**~$4bn** (historical volume)	**Asset-backed wrapper:** digital representation of a verified carbon offset	**Direct title to offset:** right to 'retire' (burn) the credit for climate claims	Swiss contract law	Polygon/ Celo
KfW crypto bond	Corporate bond	Germany	**€100m**	**Crypto security:** digital bond registered under German DLT law	**Direct legal title:** ownership via an entry in the crypto registry	German Electronic Securities Act	Polygon (public)
European Investment Bank/HSBC bond	Supra-national bond	Luxembourg	**€100m**	**Digitally native note:** issued via HSBC Orion platform	**Direct legal title:** direct ownership via central account keeper	Luxembourg law	HSBC Orion (private)

Source: OMFIF analysis

its fourth iteration of blockchain legislation in December 2024.

In the context of real-world assets, a token would represent legal ownership of an ounce of gold, for example.

Indirect tokenisation (wrappers)

Indirect tokenisation means the token represents a right to an intermediary structure that holds the actual asset. These asset-backed tokens are the combination of securitisation via a fund or special purpose vehicle and direct tokenisation. A legal vehicle provides a wrapper for a given asset. The growing real-world assets industry leverages these strategies. One can create a series of limited liability companies to tokenise real estate or funds in a financial hub to tokenise shares and Treasury bonds.

In contrast to direct, indirect tokenisation of gold would take place through ownership of tokens representing exchange-traded fund shares or a similar legal structure.

Incomplete tokenisation

Incomplete tokenisation is where the token serves as an interface or a symbolic representation. Its possession does not confer legal ownership of an asset. For example, a bank can offer an investment in gold with associated tokens that remain legally and operationally dependent on the relationship with the bank. Tokens can also represent a derivative contract between holder and token-issuer, wherein the token tracks the value of a particular asset, but does not confer ownership of it. While these tokens can be useful tools, their customised nature requires precise legal arrangements and clear communication between the parties.

Some tokens representing ownership of fund units do not, in fact, confer legal ownership. In these cases, legal ownership is tracked by a separately maintained centralised ledger. In cases where there is a discrepancy between the ownership of the token and the central register, the latter is the final record.

Each of these categories has distinct implications. Direct tokenisation mostly changes operational aspects. Indirect tokenisation introduces risks common with securitisation, particularly when exotic structures are used. Incomplete tokenisation offers flexibility but with varying legal protection.

BOND TOKENISATION

Several borrowers have experimented with the issuance of their bonds represented natively as tokens on blockchains. In the public sector, blockchain bonds have emerged from Slovenia, Hong Kong, the World Bank, several Swiss cantons and the European Investment Bank among others.

In the past, institutions like these conducted experimental transactions in which the blockchain bonds were mirrors of traditionally issued bonds. These experiments laid the groundwork for the present generation of blockchain bonds, which are real financial instruments, natively issued on the blockchain.

While these demonstrate that regulations and technology are now set up for real legal funding instruments to be issued on blockchain, they are still a long way from forming a core part of these organisations' funding. As a result, tokenisation has not yet made a material impact on the market structure or operational aspects of bond-market funding.

Faster settlement

One of the most vaunted benefits of tokenising financial instruments is that transactions can be settled instantly. Reducing settlement times is a long-cherished ambition of regulators. Long settlement times introduce counterparty risks. If either of the counterparties, or any of the several intermediaries involved in a transaction, suffer a fault or an insolvency during that period, then the transaction could fail. There is also the risk that one leg of the transaction is executed but not the other, leaving one party with both the asset and the money. Unwinding these mistakes can be costly and risky.

Mitigating these risks requires the institutions that facilitate trades to hold capital in reserve against the possibility of failed trades. This locked-up capital is inefficient and expensive, and these costs are factored into the fees they charge market participants.

Conducting transactions on chain is a means of ensuring that settlement of both parts of the transaction happens 'atomically': either both legs are executed or neither. In blockchain contexts, this can happen instantly. However, it is not clear that instant settlement is always desirable in financial markets.

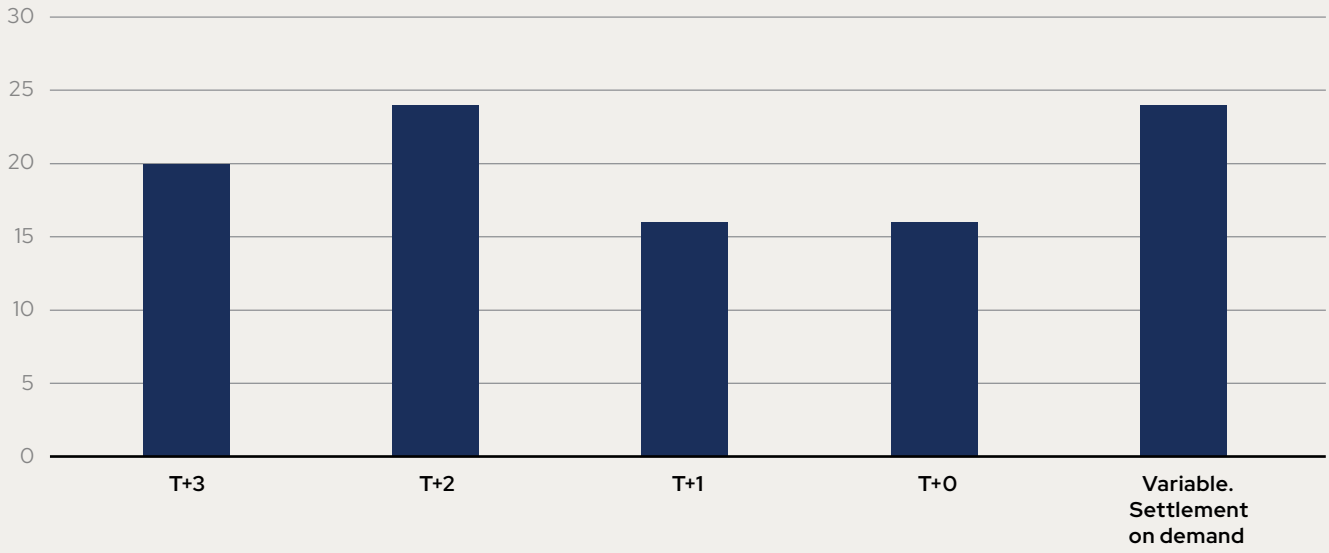
When OMFIF ran a survey of bond market participants in 2024, only 16% said that they would prefer T+0 settlement, with the remaining 84% preferring a longer period, typically two days (Figure 1.2). Some of this preference is explained by the operational challenges attendant on bond issuance with manual documentation.

Instant settlement also brings its own challenges. Most investors do not have the cash readily available to settle major primary market transactions immediately when a bond is priced. Investors typically make portfolio adjustments in the secondary market to raise the cash to take on a new position. These processes can take a few days. This is particularly true for offshore investors, who must find hedges for foreign exchange exposure very quickly or pre-fund the deal, which is costly from a liquidity perspective and can leave them long of cash if the deal does not go as expected.

At present, settlement between banks takes place on a netted basis, which reduces the demand for immediate liquidity. The most valuable configuration for settlement of tokenised assets then is not immediate settlement, but atomic settlement on demand. Balancing settlement speed with efficient use of liquidity will be a challenge, but it is one that financial institutions are well-used to making. It would even be possible to assign different prices to different

1.2. Instant settlement not always preferable

What is the most desirable settlement cycle for syndicated issuances? Share of respondents, %



Source: OMFIF Digital assets 2024

settlement speeds, properly pricing the time risk they represent.

Operational challenges

It is expected that, as blockchain bonds become more commonplace, their issuance will become more efficient than traditional bonds. The traditional method of issuing bonds is a manual process that requires the collaboration of multiple parties exchanging information and entering it into their own systems. This process results in a duplication of effort, and each manual re-entry of data introduces the possibility of human error.

While the actual pricing of a bond takes seconds, there is a great deal of work required to prepare and sign documentation before admitting to lawyers, issuer and paying agents, and central securities depositories. Bond-market settlement typically requires a period of five to seven days.

Automating the production of documentation does not necessitate blockchain. Rather, using blockchain for settlement requires that the documentation be machine-readable and digitally native. Delivering this allows the documentation to be automatically, rather than manually, drafted.

The technology required for automated documentation production already exists but has yet to be widely adopted. This may be because there has not yet been a sufficient catalyst to overcome the inertia of existing processes. A widespread move to tokenisation might give market participants the push to implement automation processes.

Blockchains should also make the issuance and settlement process simpler and more efficient, since every party will be using the same data format and the same 'golden record'. Although this promises real efficiency savings, at this stage, the technology is so new that blockchain bonds take much more time and effort than traditional bonds.

Secondary market limitations

A great deal of this effort stems from the need to educate the investor community on how to participate in blockchain bond deals. Integrating the new systems required to hold blockchain bonds with existing ones requires time, research and the approval of risk management committees.

The result of this is that the universe of potential holders of blockchain bonds is only a small fraction of the usual community that can hold these issuers' bonds. This severely compromises their liquidity and means that they must be treated primarily as buy-to-hold investments. If the bonds are locked into the platforms they are issued from, this risks creating walled gardens.

To some degree, there is a chicken-and-egg problem here. Many of the instruments so far issued as blockchain bonds – small, short-dated bonds from high-quality issuers – would only be infrequently traded even if they were issued on traditional infrastructure. As a result, there has been next to no secondary market transactions of most tokenised bonds.

When enough investors are set up to allow issuers to print a full-size benchmark bond on blockchain, it is likely that a critical mass will have been reached. Other investors will ensure that they are able to access the bond and a secondary market may emerge organically.

There is a secondary question about the types of protocols on which the bonds are issued. If bonds are issued on private blockchains, then the universe of potential investors is limited to the approved participants. Some might question if bonds issued in this way can ever match the liquidity of traditional bonds, since they will only be accessible to a subset of traditional investors. Bonds issued on public networks have at least a theoretically bigger audience, since it is easier to join a public network.

In practice, however, the potential universe of investors for many of the bonds issued by frequent borrowers is not large. It consists of qualified institutional investors that maintain direct relationships with the banks that facilitate the issuance.

Bonds of certain types must be held by qualified institutional buyers above a certain size. It is unlikely that there is a significant population of potential investors that have not been able to access these bonds that would be able to do so if they were on a public blockchain. In fact, these liquidity pools are quite defined in size. It is therefore feasible that all potential investors in bonds from a particular issuer could be onboarded onto a given private chain.

Changing the rules to lower the barriers to entry to holding these instruments is possible, but doing so is a legal challenge, not a technical one.

TOKENISED EQUITIES

Although public stock markets have been electronic for many years, many are still keen to see tokenisation take root and improve functionality. In principle, taking stocks out of centralised stock exchanges and brokerage accounts reduces the number of intermediaries, enables 24/7 trading, offers global access (subject to legal controls) and allows rapid settlement, while smart contracts can automate payment streams and voting rights.

There are three types of stocks on blockchain. First, there are direct blockchain shares, where a company's legal stock is directly available on a blockchain. Galaxy Digital used a tokenisation platform as its transfer agent, which allows stockholders to tokenise their shares on Solana. The transfer agent records changes in legal ownership on chain in real time as tokens are traded, so there is no reconciliation with an off-chain ownership register.

Only a very small proportion of stockholders have availed themselves of the ability to tokenise their Galaxy Digital stock. In effect, this means that there are two formats of the stock. There is a single share class but they exist on two rails: Nasdaq and Solana. Since the transfer agent freely enables conversion between conventional and tokenised stock, any difference in price between the two is swiftly captured by market-makers. These tokenised shares are often placed as collateral in decentralised finance lending transactions.

Second, there is wrapped equity. This is a much larger sector, which includes tokens issued against underlying stock where the ultimate register of legal ownership remains off chain. This creates the useful product of representing stocks on chain with rapid settlement 24/7, but the tokens do not represent actual legal title to the share.

There is also a risk that these tokens trade as bearer-type assets outside of the regulatory safeguards. While it is perfectly possible to build tokens that can only be transferred to allow-listed wallets, it is also possible to create a token without these safeguards. This could theoretically allow the economic rights associated with an equity to be transferred to people who have not completed know-your-customer checks or are under sanctions.

It is imperative therefore that tokens representing regulated financial instruments are constructed with the technical ability to enforce all the appropriate safeguards in a decentralised context.

The third type of tokenised stock is synthetic exposure through derivatives, rather than ownership of the underlying asset. This can be offered by trading platforms and is typically retail-facing.

TRADING PLATFORMS

Retail-facing broker-dealers can also tokenise their products. Many of the other tokenisation projects mentioned so far focus on institutional markets, but trading platforms play an important role in offering financial products to individual investors. As such, the focus is different. Retail tokenisation focuses on adding products and features that retail investors want, rather than on back-end efficiency. However, this can result in retail investors facing novel risks and is therefore something on which financial regulators must keep a close eye.

Robinhood has begun offering a product known as stock tokens. These offer customers a variety of benefits. First, the tokens are settled in real time 24 hours a day, five days a week. Second, it offers a way for Robinhood's European customers to gain exposure to US stocks. The 24-hour trading is particularly important in this context since it does away with the challenges posed by the different time zones. Third, the tokens enable fractionalisation, allowing investors to take exposure in smaller units than the traditional stocks.

This is a form of incomplete or synthetic tokenisation, since the stock tokens are not really representing ownership of the asset itself. Rather, they are derivative contracts between customers and Robinhood that track

the price of the underlying asset. This means that they are C4 derivatives under the Markets in Financial Instrument Directive II framework.

This also means that, as well as the standard risks that investors face when purchasing any financial asset (that its value can go down as well as up), investors in these tokens do not actually own the underlying stock. Instead, their counterparty is the issuer of the token, so as well as evaluating the risk of the asset, investors are also exposed to Robinhood credit risk. If Robinhood Europe were to fail, holders of its stock tokens would be creditors of Robinhood, not holders of the stocks they have been buying exposure to.

Robinhood is not the only provider of these instruments. BitPanda offered a similar product known as A-tokens, which were synthetic derivatives tracking the value of particular stocks. However, BitPanda, which is pursuing an initial public offering and regulated in Austria and Germany, is phasing these products out, converting all A-tokens to sell-only.

BitPanda's replacement for its synthetic exposure derivative tokens is a much more traditional securities registry, centralised under the firm's control, which gives asset owners a legal beneficial ownership status.

Backed is another platform offering stocks on blockchain. It uses a 1:1 tracker model, backing each token with a share of the real stock, which the platform holds with a regulated custodian. Rather than representing a derivative contract with the issuer, the token is a debt note backed by the share. This means the tokens are structured as tracker certificates under Swiss law. Unlike stock tokens, Backed tokens are bankruptcy remote. If Backed were to declare bankruptcy, tokenholders would have recourse to the shares underlying the tokens.

TOKENISED FUNDS

The UK's Technology Working Group on tokenised funds has identified two use cases for tokenisation of funds: on-chain investment markets with tokenised funds investing in tokenised securities, and tokenised money market fund units for use as collateral.

Regulators believe that moving fund portfolios into tokenised assets will shorten settlement times and that cutting out intermediaries in favour of decentralised infrastructure will lower costs.

However, for fully on-chain investment markets to come to fruition, a host of other investible assets must also come on chain. At the moment, therefore, we have a halfway house where some funds are offering tokenised versions of conventional funds, but the fund portfolio is conventional non-tokenised assets. This is a very flexible tool and funds often provide a wrapper to allow all sorts of assets to be tokenised.

Even in this form, tokenising funds can improve the speed of settlement and the capacity for fund units to be traded on a 24/7 basis. Tokenising the fund means that

the custodian and fund manager all share the same record. By using an oracle, data on asset prices can be streamed onto the blockchain and, since all parties use the same record, this eliminates reconciliation and speeds up the process of calculating the fund's net asset value.

However, that speed will only apply while the markets in the underlying assets are open. If the fund unit is tradeable 24/7, that will mean there are periods when the fund can be traded but the underlying assets cannot. It is also important to remember that key decisions in many funds are made by humans who manage portfolios and sit on valuation committees, which cannot respond to market movements on a 24/7 basis.

Another important consideration around fund tokenisation is the question of whether the tokenisation is complete. In some cases, like BlackRock's Buidl, the tokens give the owner a legal right to the economic benefits of the fund unit, but ultimate ownership is tracked off chain on a private database. In other cases, like Franklin Templeton's tokenised Benji fund, or the Amundi Fund euro money market fund launched in partnership with CACEIS, token ownership itself is the legal record of ownership.

In cases of discrepancy between the internal ledger and the ownership of the tokens, it is the internal ledger that takes primacy. This creates a theoretical risk of mismatching, where the token may have changed hands without the internal ledger being updated, which could cause problems in the case of a bankruptcy.

Similarly, Buidl tokens do not offer holders ownership-based voting rights. By contrast, Franklin Templeton Benji tokens allow holders to participate in fund governance.

It is also worth considering how the role of the depositary might change in the context of on-chain fund units. Traditionally, depositories hold the assets and verify ownership in the case of transfers by monitoring and verifying databases and contracts, as well as monitoring entry and exit of the fund. Bringing fund units on chain does not eliminate the need for a depository, but by

$385.5bn

AS OF OCTOBER 2025, BROADRIDGE'S DISTRIBUTED LEDGER REPO PLATFORM WAS PROCESSING AN AVERAGE OF $385.5BN ACROSS 8,542 TRADES PER DAY

running a node on the blockchain, they can retain mint and burn controls over the tokens, ensuring that tokens are never minted inappropriately, but only when, for instance, a new investor subscribes to the fund.

On-chain depositories could also intercede to cancel and replace tokens in the event of an investor losing access to their private key.

TOKENISED COLLATERAL

One of the most promising use cases for tokenisation in capital markets is the tokenisation of collateral. Much of the trading in capital markets is done with money borrowed against collateral. This typically takes the form of cash or high-quality liquid assets like government bonds.

Sometimes, this money is needed quickly and the collateral must be leveraged on short notice. The assets to be posted as collateral can be held at different custodians, not all of whom are equipped to quickly exchange assets with each other, so transferring the assets is an operational challenge.

Blockchain infrastructure offers a solution. By creating a new record of ownership maintained on blockchain, one can keep the collateral asset immobilised at its custodian but update the owner of the asset. This creates a much simpler and easier means of exchanging collateral.

Many in capital markets rely on cash collateral. If they need more cash (to meet a margin call, for example) they must redeem MMF shares to obtain cash reserves. Often, once posted, this cash collateral is put into an MMF by the receiving custodian, indicating that the risk profile of MMFs does not disqualify them from being appropriate assets for collateral.

By creating tokens to represent MMF shares, they become an instrument that can be directly exchanged between investors and collateral custodians without having to be redeemed for cash first. This also allows holders to continue earning interest on their MMF holdings, and to do so much more precisely on small increments of time.

As MMF tokens are tradeable instruments, they should theoretically be less frequently redeemed with the issuer. Since investors can trade them between each other, this may often be the simplest way to exchange the tokens for cash.

However, there is a theoretical risk that a redemption run on the tokens could introduce additional risk. Because redemption is available 24/7, but the assets in the fund can only be sold during market hours, there is the possibility of a large number of redemption requests piling up during a period when the underlying assets cannot be traded. This would result in a liquidity mismatch, and the fund might be forced to resort to lines of credit to meet redemption requests.

Blockchain-powered repo

One of the earliest cases of blockchain improving the functioning of capital markets came in the repurchase market. Repo transactions are transactions where securities are sold to another party as collateral with an agreement to repurchase them at a specific price and date in the future (usually the next day or a week away). They are extremely well-used as a means of cheaply obtaining short-term cash and improving liquidity in the underlying securities markets.

With tokenisation, securities can be transferred instantly (and atomically with the cash payment), which means they can be used to facilitate intraday repo transactions. This allows for a much more dynamic and flexible use of securities in collateral management, meeting intraday margin calls as they arise, potentially lowering the overall amount of collateral required.

As of October 2025, Broadridge's distributed ledger repo platform was processing an average of $385.5bn across 8,542 trades per day. Broadridge's platform allows users to lock collateral securities to a custodial location, mint tokens to represent them, receive these in their wallet and trade them for repo purposes.

While Broadridge focuses on high-volume overnight and term repo, HQLAx is focused on much more specialised intra-day liquidity borrowing. Its volume is only around $1bn per day, but it is providing important new functionality in opening up frictionless short-term liquidity provision and collateral swaps, including between different custodians.

Central banks are important counterparties in repo markets. In December 2024, Société Générale's digital assets unit Forge conducted a tokenised repo transaction with the Banque de France on a public blockchain. As yet though, such transactions involving central banks remain in experimental phases and have not yet become widely used market utilities in the way that private tokenised repo platforms have.

The International Capital Market Association created a Global Master Repurchase Agreement in 1992 to provide a standard template for repo transactions. It has been revised several times over the years and ICMA published a digital asset annex in 2024. This expands the original master document to cover asset-backed digital assets and platform-transferred securities, which can be used as collateral in repo transactions.

CIRCUMVENTING TRADITIONAL INTERMEDIARIES

Proponents of distributed ledger technology touted it as a disintermediating force for traditional finance throughout the late 2010s. Traditional capital markets run through intermediaries, all of whom have costs to meet, which must ultimately be borne by the transacting parties. Since blockchain was created to enable peer-to-peer payments, many hoped that its introduction in capital markets would allow a more direct connection between issuers and investors, thereby bringing down the cost of capital.

Policy-makers are keen to see capital markets simplified and the number of intermediaries reduced. They are enacting initiatives like the DLT Pilot regime in Europe to test this, allowing DLT trading and settlement systems to function in place of a CSD.

Luxembourg's fourth blockchain law adds a 'control agent' role, which issues the digital securities, tracks the issuance and maintains a record of ownership using DLT, rather than relying on a CSD, handling both issuance and custody, and reducing the number of intermediaries involved.

Both market participants and policy-makers would like to see extended trading hours, lower costs and rapid settlement. Many hope that cutting out CSDs and relying on tokenisation to maintain the golden record of asset ownership will do this. However, the incumbents do not intend to quietly watch their functions being eroded.

CSDs have two main advantages here. First, they are surrounded by a regulatory moat. Their role is enshrined in regulation, though regulators may slowly dismantle this moat with sandboxes. The moat has been enhanced by the European Central Bank's decision to accept as eligible collateral tokenised assets that have been issued through a CSD. Second is their network effects. Financial markets rely on networks. For any solution to build up the sort of critical mass to challenge the ubiquity of CSDs will be extremely challenging. These two advantages buy CSDs time. If they can adopt tokenisation themselves and leverage it to deliver cost reductions, extended trading hours and atomic settlement on demand, then the impetus to disintermediate these organisations will most likely wane.

Changing the form factor in which changes in the ownership of a regulated asset are recorded is not a simple matter. At present, this record-keeping is generally the responsibility of CSDs. As the organisation in charge of settling quadrillions of securities, CSDs have presided over generations of efficiency savings in capital markets, notably the digitisation of ownership certificates and the elimination of paper.

While initiatives like the European DLT Pilot regime offer market participants the chance to disintermediate organisations like CSDs and record ownership on blockchain, if CSDs can innovate and keep their suite of services on the cutting edge, then their position as incumbents will prove difficult to challenge.

Exchanges could offer an opportunity to alleviate the liquidity challenges that blockchain bonds may suffer. Exchanges that offer the listing of tokenised securities give investors a portal to manage their portfolios in just the same way as they do with conventional instruments.

SIX Group pioneered this in Switzerland by launching SDX, the first blockchain exchange and CSD. Its new suite of products and services can be applied to the full pot of securities, not just digitally native instruments.

Traditional incumbents are not far behind. In 2024, the three CSDs – the Depository Trust and Clearing Corporation, Euroclear and Clearstream – collaborated on a report entitled 'Building the Digital Asset Ecosystem', laying out the requirements and protocols that would underpin this infrastructure.

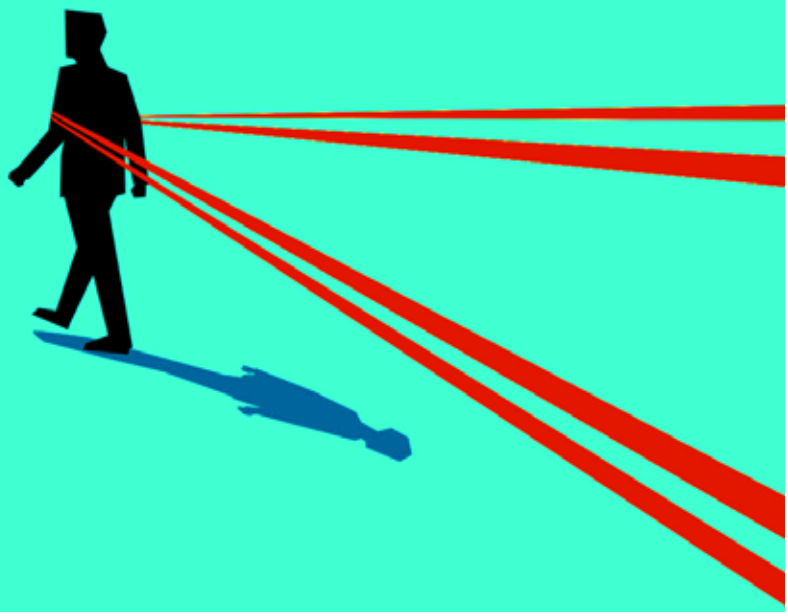
All three of them have launched initiatives to tokenise the assets whose ownership they are responsible for tracking. Because these initiatives are undertaken by CSDs, they can make use of blockchain for the settlement of regulated financial instruments without participating in the European Commission's DLT Pilot regime. The regime disapplies certain requirements, including that asset settlement take place through CSDs to allow participants to experiment with blockchain. CSD tokenisation platforms obviously do not need that requirement to be disapplied and are therefore able to experiment outside of the pilot regime.

A major challenge facing blockchain-native issuance of bonds spearheaded by issuers and banks is encouraging adoption by a critical mass of investors. CSDs do not face this challenge. Investors hold their assets through custodians and brokers and these intermediaries hold accounts with CSDs. Because there is only a small number of CSDs and because they fulfil a legally mandated role in regulated finance, they have huge networks of intermediaries already set up to use their systems.

2

Adoption hurdles

Despite blockchain existing for a while and the benefits of the technology becoming increasingly well known, there remain systemic obstacles to wide adoption in the financial system.



KEY FINDINGS

- The nature of the underlying blockchain protocol has profound implications for the potential impact of tokenisation.
- While public and permissionless chains are the dominant format for fund tokenisation, bank regulations present substantial hurdles and banks are therefore relying more on private chains.
- Cash settlement will prove an important input into the success of tokenisation. Solutions exist, but international consensus has yet to emerge.

ALTHOUGH the benefits of blockchain-based infrastructure are becoming more widely accepted, the technology's adoption throughout capital markets remains spotty at best. There are several reasons for this. A common answer is that expertise in this area is hard to come by. Many of the experts in blockchain prefer to operate in the crypto industry, rather than in traditional finance. However, with the first blockchain bonds issued around seven years ago, traditional finance should have managed to secure or train the necessary experts by now – and this has happened in some forward-thinking institutions.

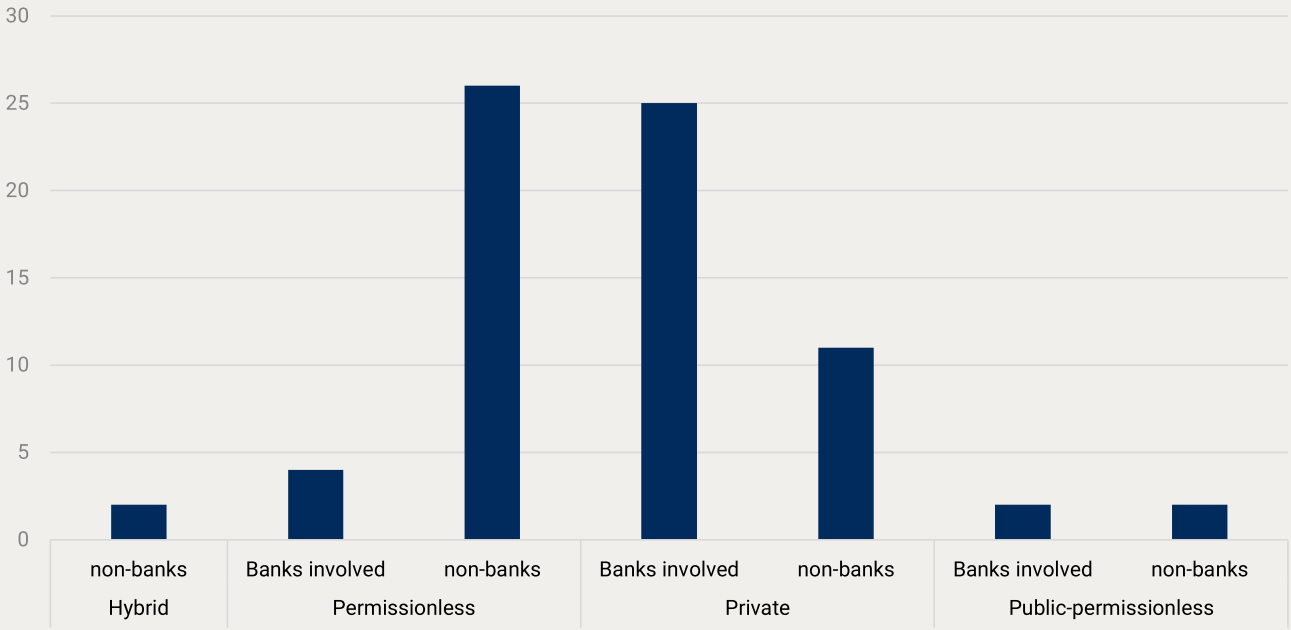
While institutional inertia no doubt plays a role, the absence of regulatory clarity around the use of decentralised infrastructure and the lack of a clear cash-settlement facility are likely to be bigger factors.

BLOCKCHAIN ARCHITECTURE CHOICES

There are many different blockchain protocols, with different consensus mechanisms and features. These can be divided into three basic types: public permissionless, public permissioned and private.

2.1. Bank projects prefer private chains, non-banks prefer permissionless

Blockchains in use in financial services



Source: Accenture, Chainlink, OMFIF analysis

Private blockchains are run and maintained by a consortium of nodes. Only parties approved by this community can participate in validating transactions or building on the network. This is the most restrictive form of blockchain. Although the ledger is distributed among the nodes, it is still a closed system.

This gives it a relatively simple model of governance in comparison to other types of blockchains. The private, permissioned blockchain model allows control of the network to be maintained in well-defined boundaries. Because of this, many in the official sector prefer to build on this architecture. Private blockchains struggle to build the level of community required for a liquid financial market. Network effects are an important part of a financial infrastructure, and these are difficult to create with permissioned networks. Some also believe that they centralise control, potentially creating structures that entrench incumbent advantages.

Public, permissionless blockchains are the most open type of network. Anyone can participate, either as a validator of transactions, participating in transactions or in issuing tokens and building on the network. Their accessibility allows them to amass impressive networks. This is valuable from a liquidity perspective, and also because they enable the building of a large and vibrant developer community, which improves tooling and security for the network.

Public, permissioned blockchains are a middle ground. They are more open than private networks in that anyone can build on the network, but only permissioned nodes can validate transactions and participate in governance. Hedera and the Canton Network are examples. This removes the challenges associated with validator screening, while still allowing anyone to build and issue tokens on the network.

REGULATORY RELUCTANCE

The regulatory community is yet to fully embrace public blockchains. While many regulated financial instruments like funds have been issued on public blockchains, their use remains rare in banking. Figure 2.1 shows that, of the 72 chains in use in financial services that Accenture and Chainlink analysed, a roughly equal number are private and permissionless with a small number of alternative protocols. Strikingly, when banks are involved in the project, the preference for private chains is stark. When the asset-issuer is a fund manager or other non-bank, there is an even stronger preference for permissionless chains.

The Basel Committee on Banking Supervision published guidance on the prudential treatment of cryptoasset exposure for banks in 2022. The guidance made it extremely expensive for banks to hold any assets on public blockchains, assigning a 1,250% capital weighting to these assets regardless of their risk or

72

ACCORDING TO ACCENTURE, SOME 72 BLOCKCHAINS ARE PRESENTLY IN USE IN FINANCIAL SERVICES

quality. Although the Basel Committee conceded in late 2025 that this guidance would need to be changed, several of the Basel Committee jurisdictions had begun implementing rules shaped by this guidance.

Extensive off-record interviews with financial regulators around the world indicate that there are two key concerns. First, the nature of their decentralised governance structures means that they cannot be counterparties to contracts, and no one can be held directly liable for outages. Regulators must therefore get comfortable with the idea that they can effectively supervise financial markets by supervising issuers of securities and those who provide services on blockchains, without directly regulating the blockchains themselves. Many in the community working on these blockchains believe that decentralised governance is a strength, not a weakness, since they are designed to prevent double-spending and protect the integrity of the network without relying on trust in an institution.

Second, regulators are also uncomfortable with the idea of anonymous validator communities that can potentially contain sanctioned elements. While this is a reasonable concern in some blockchains, it is not a necessary feature of all public, permissionless chains. Many of these protocols give users the ability to select communities of known validators or otherwise ensure that they do not contain sanctioned elements.

Others argue that validator communities, as neutral parties that maintain the integrity of the network without making choices about transactions, should not be considered counterparties at all, and that banks should therefore not be concerned about gas fees going to them.

It is important to note that the term 'permissionless' does not mean that assets on these chains can flow entirely freely. Regulated financial assets must not be held by entities that have not completed a know-your-customer process. It is still possible to apply these kinds of controls in public, permissionless blockchain environments. Token standards, such as ERC-3643, can ensure that only wallets that have been allow-listed can hold them.

INTEROPERABILITY CONSIDERATIONS

A situation where all assets are represented on a single blockchain protocol is unlikely. According to Accenture, some 72 blockchains are presently in use in financial services. There is a risk that each one of these operates as an island without being able to interact with other chains. This proliferation is driven by a number of factors. Given the fairly narrow uses of some blockchain projects, widespread interoperability is not always the aim.

Businesses are also keen to develop their own blockchains as a means of differentiating their commercial offerings. Often this means adding features that are necessary for institutional finance, particularly around privacy and confidentiality, which are widely

regarded as areas where tooling for public blockchains is not yet proven at an institutional level.

If tokenisation is going to deliver a world of seamless transference of assets, then either we must converge on a single protocol (which is unlikely), or assets must be able to move from one chain to another.

It is important to note that this problem exists both for public and private chains. While public chains typically have the advantage of better reach because it is easier to join them and participate in transactions, unless the reach is universal, tokens must still be able to move between chains. Another advantage of public chains is that they tend to make heavier use of open-source standards. This makes it easier to develop tooling to allow tokens to move from one chain to another.

Solutions for moving tokens across chains are emerging. Chainlink's Cross-Chain Interoperability Protocol enables cross-chain token transfers. For instance, it can allow USDC tokens across 14 chains. The basic principle is that tokens are burned on the sending chain and minted on the destination chain. As tokens become more sophisticated, embedding programmability, it becomes important that not just value but also functionality are transferred, sending data and commands to facilitate cross-chain applications.

CASH SETTLEMENT FACILITIES

Early experiments with blockchain bonds have revealed that, unless a medium for settling cash is found, the benefits of tokenising bonds are unlikely to be fully realised. If a financial instrument is tokenised but there is no equivalent cash facility, then the cash and securities legs of the transaction will be settled separately, exposing the transacting parties to settlement risk. There is a variety of approaches to this.

Central bank money settlement

For many in capital markets, the simplest answer would be for the central bank to provide a solution that allows delivery-versus-payment settlement of tokenised securities transactions to take place in central bank money. This would satisfy the Bank for International Settlements' Principles for Financial Market Infrastructures and mean that no additional risk would be assumed by incorporating a private form of money.

There are a number of different ways the central bank could do this. The Bank of England favours an approach whereby the movement of money within the existing real-time gross settlement system is synchronised with the transfer of assets or funds on external ledgers, including distributed ledgers. This gives it the capacity to deliver atomic or DVP settlement in central bank money for tokenised securities transactions.

Tokenised repurchase providers like Broadridge use a synchronisation link to Fedwire for cash transfer. This occurs on a synchronised basis with the on-chain asset transfer, mitigating settlement risk.

However, some argue that synchronisation solutions will be limited in functionality in comparison to native wholesale central bank digital currency solutions, particularly regarding their ability to facilitate the initiation of smart contracts. It may be possible to deliver this functionality with research and investment over time, but it is likely to be more complex than for native tokenised cash solutions.

Stablecoins

Stablecoins are the most common form of on-chain cash: blockchain tokens that attempt to maintain a stable value either through 1:1 collateralisation with high-quality reserves, or via algorithmic manipulation of supply. The latter was at the centre of the high-profile collapse of Terra Luna, and has waned in popularity.

The former is enjoying rapidly increasing popularity and is now a regulated instrument in several jurisdictions. The use cases of stablecoins continue to grow. In particular, they are carving out an important role as a bridge currency to facilitate cross-border payments.

Since they are a form of on-chain cash, they might be able to provide the means for settling the cash leg of tokenised securities transactions. Platforms like BitPanda and Ondo Finance use stablecoins for settlement. In projects led by traditional finance, it is much rarer, although Franklin Templeton enables purchases of its Benji token in USDC.

Banks and other traditional financial market participants are not yet experienced at evaluating the credit and liquidity risk that arises from the use of stablecoins. These instruments, though increasingly well supervised, have not been tested through a cycle at anything like the scale that use for settlement in institutional capital markets would necessitate.

Since a large proportion of the reserves of stablecoins will be held in short-term government bonds, there is also the question of the degree to which these can be scaled. If stablecoin volumes grow into the trillions, we may face a scarcity premium for the high-quality liquid assets that back them.

Tokenised commercial bank money

Although the BIS PFMI state that central bank money should be the default, in certain contexts, commercial bank money is already widely used. When European banks want to transact in dollars, this often results in them using commercial bank money.

Several commercial banks, such as JP Morgan, are experimenting with creating tokens representing customers' deposits, so the economic features are unchanged. But unlike traditional deposits, these tokens can exist on blockchains. JP Morgan initially launched this product on its own Kinexys platform – a private blockchain developed in-house. In November 2025,

‘WITH THE FIRST BLOCKCHAIN BONDS ISSUED AROUND SEVEN YEARS AGO, TRADITIONAL FINANCE SHOULD HAVE MANAGED TO SECURE OR TRAIN THE NECESSARY EXPERTS BY NOW.’

the bank announced that its deposit tokens would be available on Base, a Layer 2 version of Ethereum built for Coinbase.

At present, JPM Coin can only be used by JP Morgan’s institutional customers. HQLAx users with JPM Kinexys accounts can use JPM coin to handle the cash leg of their repo transactions. At some point in the future, however, it is possible that commercial bank money tokens like this could enable interbank payments.

There are two possible models for this. First, the model posited by the Regulated Liability Network project. Payments between customers of different institutions would result in the sending institution extinguishing the sender’s tokens and the receiving institution minting tokens for the recipient. The settlement between the institutions would take place via a wholesale CBDC.

The second is a model where commercial bank money tokens are considered bearer assets and can be exchanged between parties who are not necessarily customers of the issuing bank, making them much more akin to stablecoins. For bank money to be used by individuals or businesses that have not completed a KYC process through the issuer is a somewhat radical notion.

However, an analogy can be drawn with correspondent banking. JP Morgan may not have a relationship with the end user, but if they have been KYCed by a platform or service provider with whose procedures JP Morgan is familiar, then the situation is similar to one in which offshore customers of a correspondent bank are able to transact in JP Morgan commercial bank money. This might give commercial bank money tokens the flexibility to be transacted on an inter-bank basis. Use of the tokens would still be restricted to accounts that have completed a KYC process with an institution that the issuing bank has empowered to distribute its tokens.

As with stablecoins, using commercial bank money tokens requires parties to price credit risk when assessing the risk of their money instruments. However, financial institutions are much more used to making this assessment for commercial bank money than they are for stablecoins.

Project Pontes

In 2024, the European Central Bank conducted the Central Bank Money trials, in which the Banque de France, Bundesbank and Banca d’Italia all developed solutions to enable DVP settlement of the cash leg of tokenised securities transactions in central bank money.

Following the results of these trials, the ECB has launched Project Pontes, the pilot phase of which is expected to go live towards the end of Q3 2026. Under Pontes, institutional users will have wallets on a Eurosystem distributed ledger technology in which they will hold and transact with wholesale CBDC tokens. An application programming interface will allow this platform to be synchronised with transactions of tokenised securities on other ledgers. Another synchronisation solution will allow transactions on the Eurosystem DLT to be written to the Target 2 RTGS.

Wholesale CBDCs are emerging in other jurisdictions like Switzerland, where the Swiss National Bank has offered wholesale a CBDC for use within the SDX Digital Exchange.

In the US, political resistance to the concept of CBDCs will make it difficult for the Federal Reserve to launch a tokenised version of the dollar. That stipulation is designed to prevent the Fed from issuing a retail CBDC, so it is possible that the Fed could circumvent this and create a tokenised dollar available for wholesale use, or that it will produce its own version of a synchronisation system to connect the settlement of tokenised securities with its existing payments systems. At present, there are no indications that this is in the Fed's plans. It is also possible that US financial markets will adapt to private tokenised money solutions like stablecoins and commercial bank money tokens.

Tokenised MMF as cash settlement

Just as tokenised money market funds have begun to overhaul the repo and collateral management markets, they could also perform a role in cash settlement. In many ways, MMFs have similar economic profiles to stablecoins, since they are backed by similar types of assets. When tokenised, they can deliver an instrument for DVP settlement versus other tokenised assets.

Unlike stablecoins, they have the advantage of being remunerated. However, this might actually complicate their use in payments, since the recipient may prefer to receive a more generously remunerated MMF, which might complicate the pricing of a transaction.

While the asset side of tokenisation is often the focus, the nuances of cash settlement are perhaps equally important. How we choose to meet the challenge of cash settlement in a tokenised environment will have important implications for the benefits tokenisation can

'IN THE US, POLITICAL RESISTANCE TO THE CONCEPT OF CBDCs WILL MAKE IT DIFFICULT FOR THE FEDERAL RESERVE TO LAUNCH A TOKENISED VERSION OF THE DOLLAR.'

3

Transforming financial markets

Tokenisation has not yet lived up to its potential to bring about transformation in financial markets. But this is starting to change, and some of the biggest improvements can be made in opening access to new investors.

KEY FINDINGS

- So far, the effect of tokenisation has primarily been felt in some corners of the institutional market for collateral but, as it spreads, it promises to reshape other asset classes too.
- Tokenisation can create liquidity in illiquid assets and open up access to new pools of investors through fractionalisation and offering access across borders.
- In some cases, the obstacle to unlocking the value of tokenisation is related to policy, rather than technicalities. Tokenisation might be a catalyst for policy change.

ALTHOUGH its progress is erratic, tokenisation is beginning to take hold in different parts of financial markets. Already it is delivering improved efficiency in collateral markets by allowing money market funds to be exchanged as collateral rather than requiring them to be liquidated into cash, which causes a loss of interest.

As the tools required to automate the production of machine-readable documentation for financial instruments become more widely used, catalysed by a desire to improve tokenised settlement, the process of issuance can also be substantially sped up.

New bond market dynamics

By reducing the work required to issue bonds, it is possible to reduce the cost associated with issuance. As the cost of issuing bonds falls, it makes it economically feasible to issue to borrow smaller amounts. There are many potential capital markets participants who might wish to raise just a few million. The cost of issuing a bond for that amount would outweigh the potential benefit, so the prospective borrower will take out a loan from a bank.

While there is nothing wrong with bank loans as a source of funding, there are efficiency savings that emerge from the ability

‘THE OBSTACLES TO GREATER RETAIL OWNERSHIP OF BONDS ARE NOT TECHNICAL BUT A COMBINATION OF REGULATORY RESTRICTIONS AND A LACK OF DEMAND.’

to raise debt in a market instead. It also transforms the debt from an asset locked to a bank’s balance sheet to a tradeable instrument. Combined with tokenisation, this creates an instrument that can move much more freely and flexibly than a bank loan.

Lowering the marginal cost of issuance may also allow established bond issuers to change how they use the market. At present, large bond issuers use syndicates of banks to sell ‘benchmarks’, raising billions of dollars or euros at a time, supplementing these with ‘taps’ – reopening established lines to issue more debt – and ‘private placements’ – small, bespoke instruments typically sold to one investor, frequently used for unusual maturities or currencies.

Currently, the infrequent issuance of large, syndicated benchmarks is an efficient way of raising large amounts of funding in a short time while minimising the fees that accessing markets requires. However, enticing investors to absorb a large amount of new supply requires issuers to pay a new-issue premium – paying more than the issuer’s comparable bonds are trading for in the secondary market.

This creates an opportunity for investors to buy the bond and quickly sell it to turn a profit. Syndicate banks must carefully assess the intention of investors who are offering to buy the bond. If too many sell in the after-market, the price of the bond will fall and investors who hold the asset will be disappointed. Efficient pricing of these instruments is therefore a complex and highly skilled exercise.

Issuers also have a responsibility to their investor base to provide a liquid curve – a full spectrum of debt issued throughout the maturity spectrum. Many large issuers maintain a presence in multiple currencies. Meeting their funding needs is a complex dance, ensuring that they issue enough of the right types of bonds, in the right currency and at the right maturities to keep their diverse investor bases happy.

An additional layer of complexity stems from the fact that bond markets are not always accessible. A single bad deal or a geopolitical announcement can make a bond market in a particular currency, or at a particular maturity, inaccessible for weeks. To protect themselves from this risk, issuers frontload their programmes, selling as many bonds as possible early in the year to minimise the risk of being shut out later. While this strategy is effective, it is a constraint on issuer behaviour that risks inefficient pricing.

If the cost of issuing a new bond drops substantially, there would be less need for the infrequent issuance of large, syndicated benchmarks. Instead, issuers could be present in the market as often as daily, issuing small amounts of bonds into specific pockets of demand identified by investment banks. This would also give issuers the ability to manage their curve much more flexibly, ensuring that they meet demand for all maturities.

If bonds can be issued quickly and cheaply, then issuers can (with the help of banks) respond dynamically to fluctuations in demand, creating a more efficient market for their debt.

It is important to note that the primary innovation here is not tokenisation, but the automated production of bond documentation. Tokenisation, however, since it also requires bond documentation to be machine-readable, may be the catalyst that drives adoption of this technology.

Retail access

Democratisation of finance is one of the most commonly touted aims of tokenisation. There is an apparent social benefit: opening up a much broader universe of investible assets to individuals, creating new sources of capital for borrowers. This may be true in some cases. However, when considering the ‘transformational impact’ of this, it is worth noting that vehicles already exist for extending access to financial instruments to the retail investor.

The obstacles to greater retail ownership of bonds are not technical but a combination of regulatory restrictions and a lack of demand. Retail investors are prevented from holding the usual funding instruments of major bond-market issuers like the European Investment Bank. The EIB could certainly launch a line of retail-accessible

bonds (with or without tokenisation) but chooses not to because it can meet its funding needs without doing so.

It is possible that the process may become cheaper and simpler as a result of tokenisation, but it is far from a strategic aim of most borrowers. Where tokenisation and fractionalisation (issuing tokens representing fractional ownership of an underlying asset) may deliver transformation is in the creation of personalised investment portfolios.

At present, investors are limited in the assets they can buy by the denomination size of the instrument. For a retail investor with a portfolio of under $100,000, this can be a major obstacle when a single Berkshire Hathaway share is over $724,000.

Many trading platforms offer fractions of shares. They do so by buying whole shares and recording fractional ownership for their clients on internal ledgers. However, these fractions cannot be traded in a secondary market and can only be redeemed for cash. Tokenisation is a means of creating tradeable fractions. This means that fractions of assets are no longer tied to the silo of the platform provider but can trade freely among market participants, improving liquidity.

International access

As with retail access, the ability to broaden the potential universe of investors is an important feature of tokenisation. The global nature of blockchain networks theoretically removes the requirement for a bank or brokerage account to be in the same jurisdiction as the issuer. This is particularly likely to be useful for retail or small institutional investors in countries with less advanced banking services. In such cases, the ability to open a wallet to receive an asset or send stablecoins is a much lower barrier to entry than opening a bank or brokerage account.

Generally, regulated financial instruments can only be held by people or institutions that have completed a know-your-customer process so, unless this global accessibility is to circumvent these requirements, it is only useful insofar as the spread of tokenisation is combined with the spread of easily completed, standardised compliance procedures.

In practice, regulation or capital controls may be the limiting factor in many cases, rather than the absence of a technical workaround.

Real-world asset tokenisation

Along with private equity, there is a variety of other assets that can benefit from the enhanced liquidity and flexibility that tokenisation offers. Fractionalisation, 24-hour settlement and asset mobility can turn all sorts of illiquid assets into financial instruments with effective capital mobility.

Real estate is an early contender. However, some important regulatory developments must occur if this is to become a widespread development. RedSwan Real Estate is an example of this, having brought approximately $5bn of real estate tokens onto Hedera and another $100m or so onto Stellar.

In Luxembourg, Digibrixx sells tokens for each square metre of a property, co-financing with a local bank that provides two-thirds of the capital. These tokens represent shares in a securitisation. The token registry is the ultimate record of ownership. This renders real estate a much more liquid asset class and, with standardised KYC processes and the ability to accept payments in cryptoassets, the barriers for global entry are lower since it is not necessary to have a bank account in the same country as the asset.

Although tokenising real estate will create an easily tradeable asset representing entitlement to the economic benefits accruing from the asset, in practice, this is likely to represent an indirect or incomplete form of tokenisation. The legal ownership of the underlying asset will, in most cases, remain with the token issuer, since ownership of real estate is typically centrally tracked by land registry offices. Unless the actual title of the land is tokenised at the level of the registry, real estate tokens are likely to remain economically similar to shares in a special purpose vehicle that owns a building.

The appropriate comparator here is real estate investment trusts or SPVs. Tokenising shares in these can still be a powerful tool for all the reasons discussed throughout this report around speeding up settlement times and extending hours of trading. However, it will not address the underlying frictions entailed in property transactions and the value of the tokens are likely to still depend on the solvency of the issuer, since it will ultimately be responsible for meeting maintenance costs, for example.

Programmability

The integration of smart contracts into tokens has a number of benefits. Many of these relate primarily to the replication of existing functionalities within traditional financial markets in a decentralised context. These include allow-listing to ensure only KYC-compliant counterparties are able to hold assets, freezes and clawbacks for bankruptcy and the automation of instrument life cycle processes, payments and shareholder voting rights.

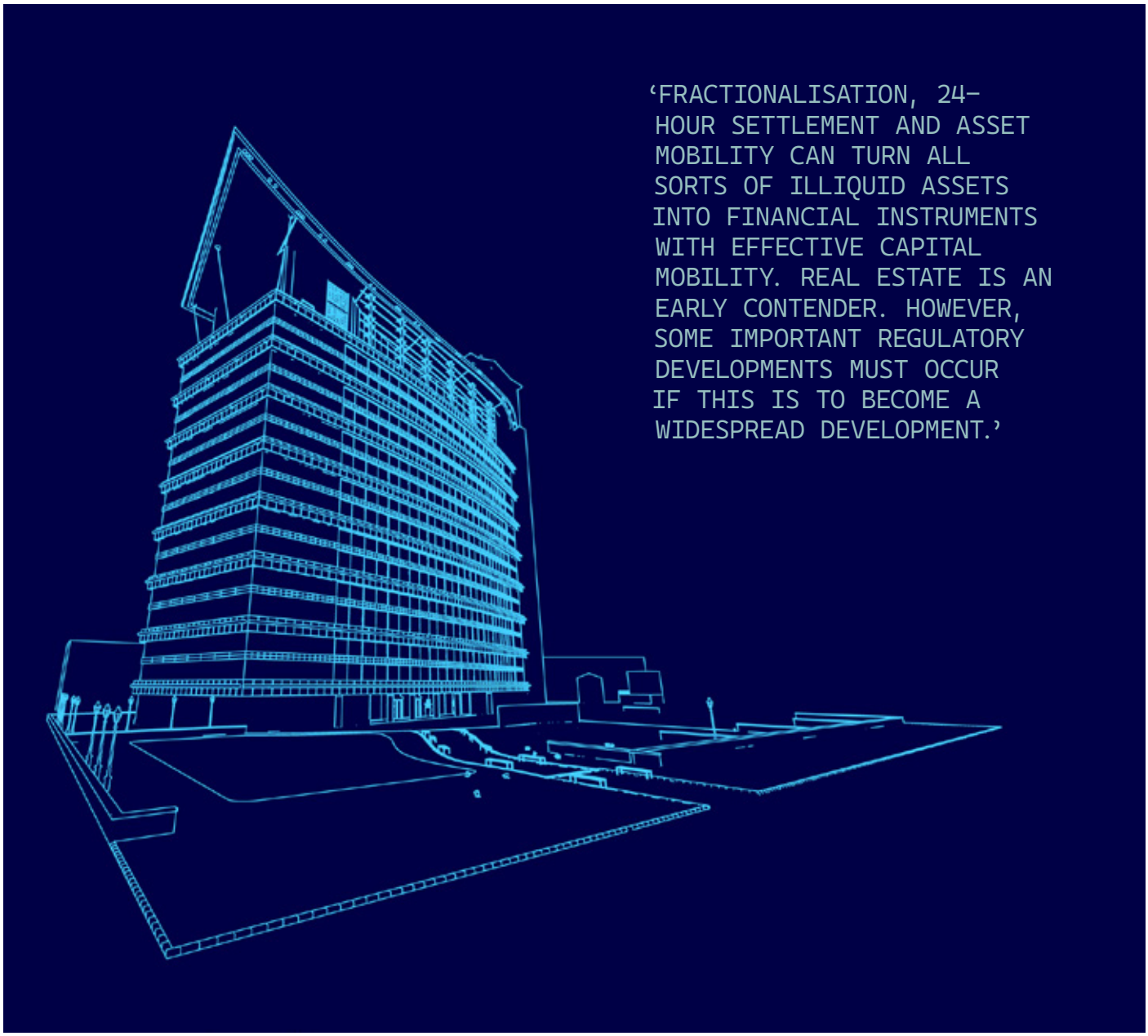
However, it is also possible for tokenisation to introduce more ambitious features, particularly in the context of sustainable investment. Sustainability-linked bonds are financial instruments with payouts determined by the achievement of certain milestones, typically related to environmental impact. At present, these are usually large instruments and the determination of whether a given milestone has been achieved is assessed by a third-party auditor. However, something similar might be achieved on a smaller scale by the integration of Internet-of-Things devices, monitoring carbon dioxide output or other variables. These can be connected to a blockchain by an oracle, providing automated triggers to

financial instruments.

This creates the possibility of a new type of incentive-driven finance, where the major costs of independent audit are reduced by the simple and cryptographically secure incorporation of blockchain-connected devices.

This might even take place in retail products where loans incentivising certain types of behaviour might be offered by some lenders. However, this would certainly introduce concerns around privacy and surveillance. On a purely voluntary basis, though, it might result in people receiving cheaper loans if they adhere to certain habits, in a similar way to insurers offering reduced premiums contingent on gym attendance.

Tokenisation, and the resulting automation of an asset's life cycle events, is ultimately a tool to make financial transactions cheap, secure and near instantaneous without relying on centralised controllers. Many of the benefits of this innovation will be invisible – marginal efficiency improvements that go unnoticed by the end user. But drastic lowering of the cost of market access, or the input required to create a product tailored to specific needs, can reshape an industry in ways that can be hard to predict. The range of possible outcomes is enormous and what emerges will be determined not just by the capabilities of the technology, but by the priorities of the businesses that drive the innovation.



OMFIF

LUXEMBOURG FOR FINANCE
THE FINANCIAL CENTRE DEVELOPMENT AGENCY

Company number: 7032533.
ISSN: 2398-4236