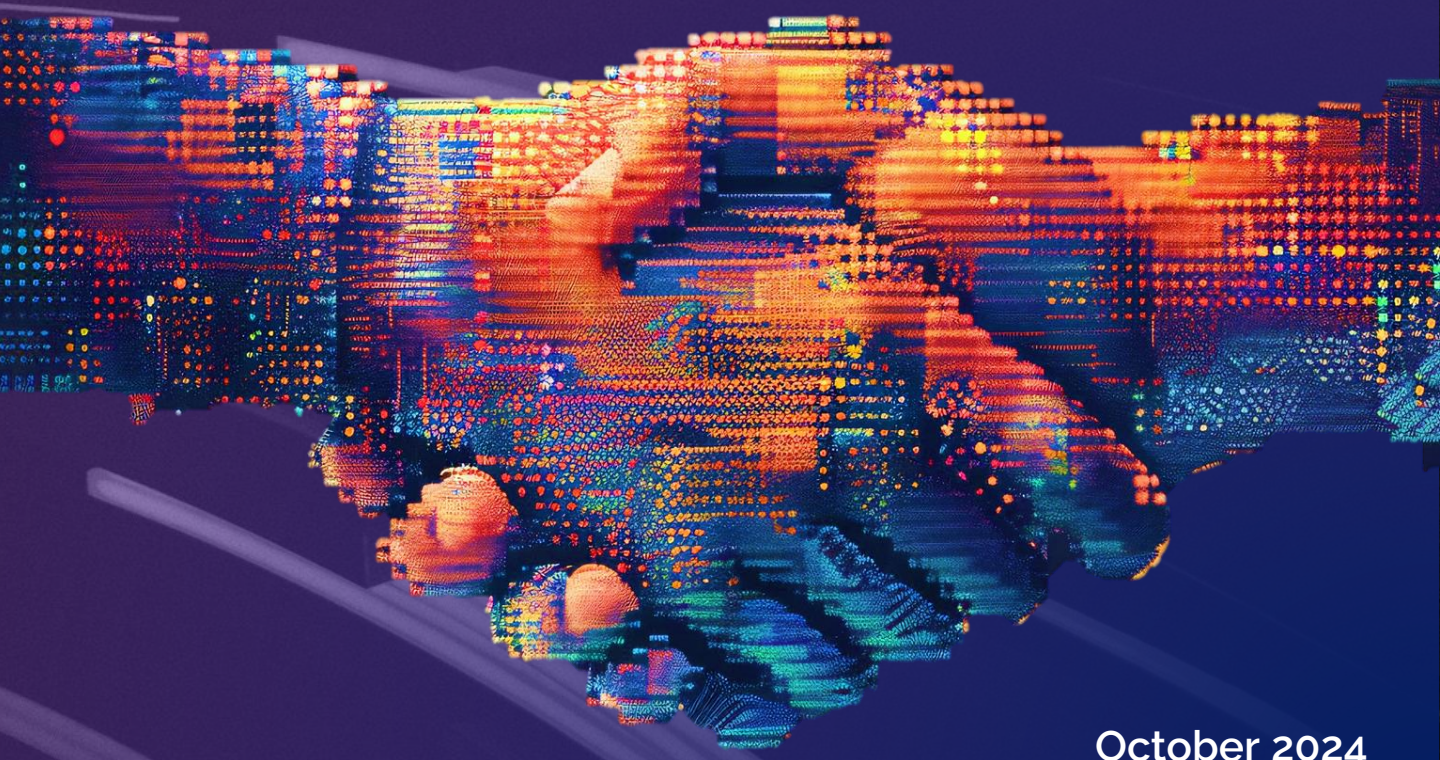
CLEARTOKEN

White Paper

Bridging the TradFi-DeFi Gap:

The Future of Finance Depends on Traditional Trust and Regulation



October 2024

In Summary

1 Trust is the Cornerstone of Every Market:

- Proving legally final and certain ownership of traded and collateralised assets is at the heart of market trust.
- Technological solutions alone cannot fully secure investor trust, especially for institutional participants.
- Trust does not *originate* from technology itself, but aspects of market confidence can be *facilitated* by it.

2 True Irrevocability is a Matter of Law, Not Code:

- Blockchain's transaction immutability is valuable, but only legal recognition guarantees true settlement finality to protect trades from being unpicked, essential for market trust and stability.
- A trusted, legally recognised, and regulated record of private asset ownership is essential for any market to function efficiently, cryptoassets included.

3 We Must Bridge Trust Mechanisms From TradFi To DeFi:

- The often overlooked 'nuts and bolts' of post-trade infrastructure is foundational to market stability, especially in responding to growth and change.
- Successfully evolving into a digital economy requires merging trust frameworks and regulatory oversight from TradFi with DeFi's technological advancements.

4 We Must Learn from Historical Past Parallels:

- Key lessons from the evolution of financial market infrastructure provide critical insights into how to strengthen market trust, increase operational efficiencies, and broaden investor access. It also builds robust digital asset markets as both institutional and retail exposure grows.
- These insights underscore the need for legal certainty and risk management; ignoring these lessons risks repeating inefficiencies, market disruption and systemic risks of the past.

5 Tokenisation Will Drive the Digital Future of Finance:

- Tokenisation on blockchain protocols innovates asset registration, transactions, and valuation, enabling liquid and accessible markets to be made for tangible and intangible, traditional and alternative assets.
- By opening broader investment opportunities to a wider audience, tokenisation has the potential to significantly enhance market accessibility and inclusivity.

Evolving Fundamentals:

From Book-Based Ledgers to Blockchain, Certificates to Cryptoassets

The development of digital assets is taking financial markets into a new era, but whilst the underlying technology is certainly innovative, digital assets are not actually a completely new asset class.

Asset ownership has to be recorded somewhere, and that record of ownership must be trustworthy to support subsequent sales, dividend payments, corporate actions etc. A trusted, legally recognised, and regulated ledger of private asset ownership is essential for any market to function efficiently — digital assets included. In that sense, digital assets are not that different from assets that we are already familiar with, they are simply a digital representation of ownership registered on distributed ledger technology (DLT) rather than a database, certificate or paper ledger.

As we will explore, the fundamentals of asset ownership and transfer have not actually changed much in over 400 years, as there are core processes that have grown from the issuance of the first shares in the 1600s to protect investors and make the settlement of asset transfers secure, whether paper certificates registered in books or programmable tokens on cryptographic digital ledgers.

The potential of DLT lies in its ability to institute trust, embed programmability into the records and innovate new ways to facilitate asset registration, transactions and valuations in real-time. In turn, this creates new potential to grow and mature our markets, but most importantly, make opportunities that have been only open to high-net worth individuals and institutions available to the public. However, in doing so, we have a responsibility to make sure that this flourishing market grows safely.

17th Century Amsterdam: Foundations of Modern Markets

In 1602, charters empowered the Dutch East India Company (VOC) to become the first company to issue registered, transferrable shares, allowing public trading and ownership.[3-1] This innovation enabled the pooling of capital, spreading risk across all sea voyages from the Netherlands to India, rather than wealthy financiers fully funding individual ventures to take the spoils or suffer the full loss.[3-2]

This was a revolutionary step for modern capital markets and marked the first significant move towards democratising wealth, as ordinary people, alongside the elite, could become shareholders. Participation surged and the *VOC's value eventually exceeded that of today's top 20 firms combined*.[3-3]

The VOC recorded share ownership by book entry in an enormous ledger. Shares could be transferred, for a fee, by personally meeting with the company bookkeeper and getting approval from two directors. Title transfers were recorded as credits and debits on the investors' accounts as were dividend payments. **The ledger balance was the only proof of ownership, the sole source of truth,** and personally showing up (or sending an authorised representative) was the only way for the VOC to verify your identity and trust you.

The Amsterdam Stock Exchange swiftly evolved to accommodate the extensive public trading activity in VOC. In 1609 the Bank of Amsterdam (the Bank) was established. Investors trusted the Bank to securely hold their Guilders in the basement vault, meaning that they did not have to physically move the currency when purchasing stocks. The Bank was able to enable broader book entry trading in currencies and shares, settling transactions across accounts held with it on its books.[3-4]

Parallels to The Past

> *'Crypto' has similarly captured public imagination as a means of providing democratic access to financial opportunities.*
>
> *The need to prove your credentials to execute trades is missing from public blockchain protocols which are built on anonymity.*
>
> *Immobilisation and book entry were implemented in the early 1600s to facilitate smoother trade settlement, yet DeFi proponents claim we can trade to similarly explosive levels without it. The knock-on effects are being ignored.*

18th-19th Century London: Establishing Trust to Protect the Evolving Market

Throughout the 18th century, a speculatory market for government bonds, East India Companies' shares, and derivatives grew in coffee houses across a small web of alleys in the City of London.[4-1] The club formalised as the "Stock Exchange", grew to 1,700 members by 1801, with provincial exchanges following across major cities.

Participation required attestable trust from all members. Potential members had their creditworthiness and good reputation personally vouched for by an established trusted member, who also had to act as guarantors in case of their default within 2 years. Bankruptcies precluded one from consideration and defaulters were expelled and inscribed upon a blackboard. Trading relied on news and rumours, frequently from wars abroad, and were frequently fraudulent to influence prices.[4-1] Counterparty and market risk were high.

Transactions were executed in pocketbooks, always in the presence of a third party. Cheques and deeds were exchanged between the brokers and jobbers (buy and sell sides) the next day to settle the trades. Mid-century, share ownership and transfers were formalised in two Acts:

- **Joint Stock Companies Act 1856:** required companies to maintain a register of shareholders and issue paper share certificates stamped with the company seal as legally binding proof of share ownership upon request for a small fee.[4-3]

> *"The deed of transfer shall be presented to the company accompanied with such evidence as they may require to prove the title of the transferor, and thereupon the company shall register the transferee as a shareholder."*
>
> *Joint Stock Companies Act 1856*

- **Companies Act 1862:** specified the wording required for both the buyer and seller to sign in the Company books in order to transfer shares. This settled the trade as "the transferor shall be deemed to remain a holder of such share until the name of the transferee is entered in the register book in respect thereof."[4-4] **The permanent record of ownership was still recorded in the Company books.**[4-5]

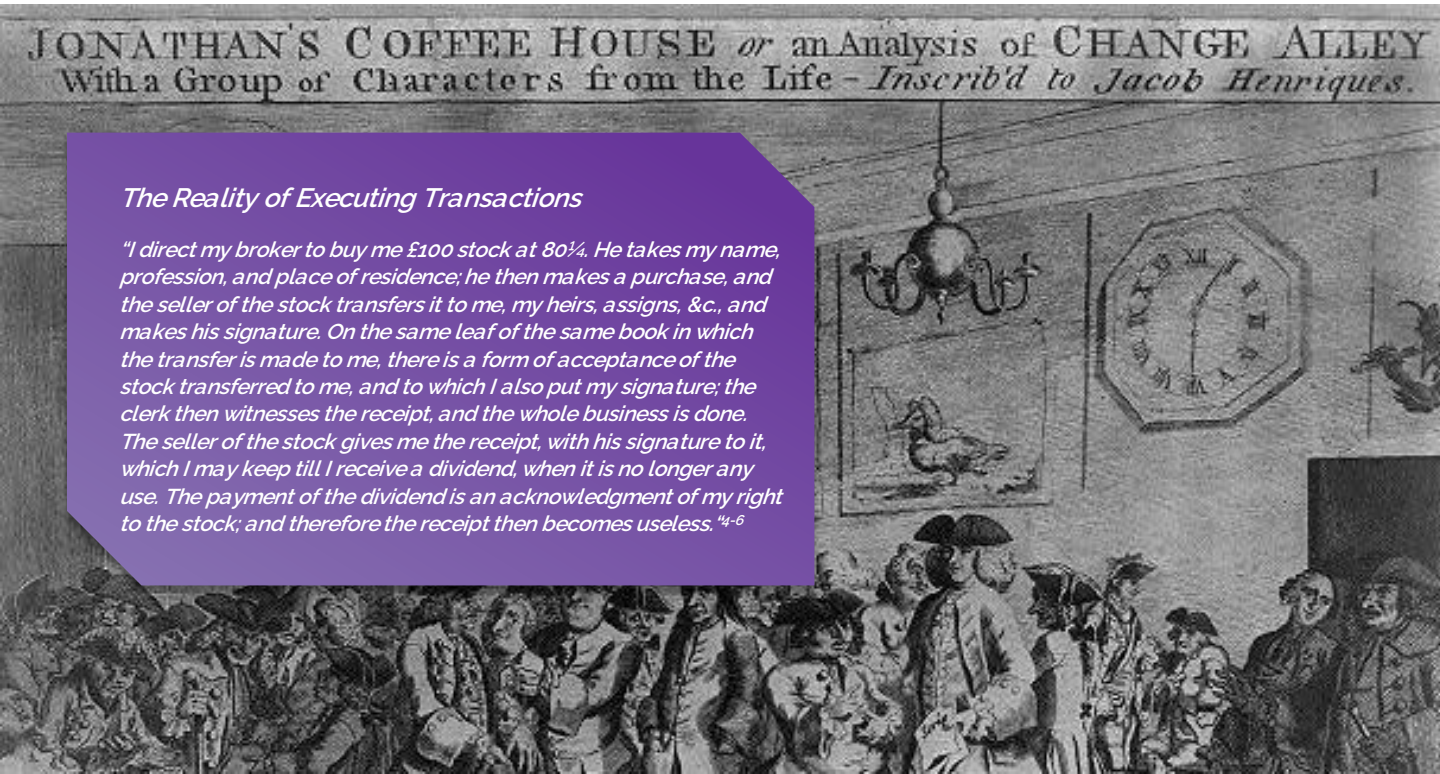
Parallels to The Past

Verifiable identity and creditworthiness is still critical to participation in modern financial markets and must be formalised in DeFi: you must be able to trust who you trade with.

Legally formalising ownership record management establishes the ultimate source of truth and protects against fraud; conventional registers have legal protections and recognition that blockchain-based public ledgers lack.

Third party intermediaries minimise counterparty risk and ensure smooth transactions; attempting to eliminate them removes unbiased accountability, standardised processes and confidence in settlement.

Rumours influenced early markets, much like information volatility impacts digital assets today. Without central regulation in DeFi, risks of price manipulation and insider trading persist with limited safeguards for fair trading.



The Reality of Executing Transactions

"I direct my broker to buy me £100 stock at 80¼. He takes my name, profession, and place of residence; he then makes a purchase, and the seller of the stock transfers it to me, my heirs, assigns, &c., and makes his signature. On the same leaf of the same book in which the transfer is made to me, there is a form of acceptance of the stock transferred to me, and to which I also put my signature; the clerk then witnesses the receipt, and the whole business is done. The seller of the stock gives me the receipt, with his signature to it, which I may keep till I receive a dividend, when it is no longer any use. The payment of the dividend is an acknowledgment of my right to the stock; and therefore the receipt then becomes useless."[4-6]

1960s New York & 1980s London: Paperwork Crises

In 1963, the UK's Stock Transfer Act[5-1] **revolutionised market trust by simplifying stock transfers.** The Act enforced **proper authorisation and recording over third-party attestation** for legal validity, eliminating witnessed transfers. Transferring stock became a matter of completing mandated stock transfer forms with buyer and seller details and signature, complete with stamps from the broker and the certifying stock exchange alongside **physically giving the share certificate to the buyer**. Certificates would be transported across cities between brokers in envelopes and briefcases.

This significantly reduced administrative friction in securities trading at the time, and in the US, certificates were described in 1965 as "an easily negotiable instrument simplifying the problem of transferring property rights" under expectation of frequent trading.[5-2]

Post-war economic growth, deregulation and public interest in privatised companies allowed brokers to diversify their products and clientele. Adoption of advanced computer systems and trade automation made trading faster. In the US, trade volumes quadrupled from 3 million shares per day in 1960 to 12 million just a decade later.[5-3] In London, October 1986's 'Big Bang' (market deregulation coupled with trading electronification) led to trading volumes increasing by 60% in just one week. [5-4]

However, the surges in trading volumes, though two decades apart, overwhelmed back offices which struggled to keep up with the manual processes and physical deliveries required to individually settle trades. Both markets implemented weekly closures for back offices to try to keep up with the mounting backlog: in the US, reduced trading hours, closing the market on Wednesdays and an increase from T+5 from T+4 settlement cycles were temporarily implemented to allow back offices to catch up. but it was not enough.[5-5]

Settlement took place on a *free of payment basis* where cash and securities are not delivered simultaneously during long settlement windows, providing the perfect conditions for risk to rapidly escalate amidst the confusion and systemic risk to heighten. The resulting "paperwork crisis" in New York and "paper crunch" in London caused stock ownership uncertainties, illegitimate trades, high counterparty and settlement risk, frequent delays and failures, and even thefts.

Both markets were in settlement crisis. It makes sense why, just three years following the endorsement of physical certificates, a short question in The Business Lawyer journal asked, "*Have stock certificates outlived their usefulness?*".[5-6] The market's previous indifference towards 'nuts and bolts' post-trade processes soon changed to furious alarm as they fractured under the pressure, brokerages collapsed and demands grew for a robust solution.

Parallels to The Past

The 'nuts and bolts' of post-trade were undervalued until a settlement crisis occurred due to increased trading volumes, for which the markets were unprepared. Trading has become even faster with advanced infrastructure and technology; trading is to the nanosecond, is the market prepared for the ramifications in post-trade?

The lack of standardised and centralised infrastructure necessary for settlement creates similar inefficiencies in digital assets today to those experienced in the 'paperwork crises', such as fragmented processes, increased transaction times and increased potential for error and fraud.

Access to digital assets is typically off-chain for institutional participants and settled free of payment (FoP) on a gross basis. This creates high settlement and counterparty risk that are eliminated by a CSD which facilitates simultaneous delivery vs payment (DvP). There is currently no CSD for digital assets.

The digital asset market is highly fragmented and is limited in its scope to grow safely and coherently. Multiple un-coordinated platforms cause operational inefficiencies and increased costs.

Gross settlement, whether physical or digital, comes at a cost, increases risk of failure and is complex to manage, whilst eliminating the benefits of netting.

1990s London:
Solving Settlement with CSDs & Legal Finality

Failing to Take the Bull by the Horns: The Lessons from TAURUS

The London Stock Exchange (LSE) conceived of a plan to resolve the critical causes of the settlement crisis and evolve:

- Paper certificates -> Dematerialise shares and provide statements to confirm stock ownership.
- Physical delivery -> Electronic book-entry settlement, ensure stockholders' rights and benefits were protected.
- 2–4 week settlement periods -> 3-day settlement cycles.
- Free of payment (FoP) settlement -> Delivery versus payment (DvP).

A central database settlement system called TAURUS (Transfer and Automated Registration of Uncertified Stock) would enable these improvements. However, there were two key problems that led to its failure.

First, the **central principle of dematerialisation was unsupported by law** as there was no provision for statements to provide legally recognised proof of ownership in lieu of share certificates and the legally specified transfer forms from the 1963 Act were still required to effect a trade.

Second, **fierce resistance from registrars** (whose role of facilitating the necessary processes and storage for paper certificates would be eradicated), pushed the LSE to redesign the project from a simple centralised database to a far more complex 'hub and spoke' model which kept them alive.[6-1]

Instead, a decentralised web of databases would send messages between each other to update records on each database. Ultimately the disparate parts failed to work together securely and accurately. Despite the Companies Act 1989 opening the door for regulations that could allow the "title to securities to be evidenced and transferred without a written instrument";[6-2] (effectively laying the groundwork for dematerialisation and an electronic register), it was not mobilised through the TAURUS debacle, rendering the project impotent.[6-3]

The project was finally abandoned in March 1993, wasting over £400m of market participants' investment and hurting London's international reputation.[6-3] The Bank of England quickly assembled a settlement Task Force which had similar objectives to TAURUS but had strong market support due to fears of being overtaken by Paris and Frankfurt.[6-4]

"Our mistake was to treat building Taurus as a technical problem. In fact, it was always a political and business problem"[6-5]

The Rise of CREST: the UK's First CSD

Dematerialisation was finally made possible with the Uncertificated Securities Regulations (USR 1995)[6-6] which authorised electronic records as legal evidence of title ownership and computer-based systems to transfer securities without depending on paper certificates and forms.

The recognition of legal title hitherto restricted to certificate possession was now extended to entries on an authorised register, laying the foundations for a centralised electronic settlement system.

CREST (Certificateless Registry for Electronic Share Transfer) subsequently launched in 1996, serving as the UK and Ireland's central securities depository (CSD).[6-7]

CREST removed the risk of FoP settlement, acting as a trusted, legally backed, and highly regulated intermediary to facilitate the irreversible and legally-protected simultaneous exchange of cash and assets to safely complete a trade through DvP settlement.[6-8] CREST shared that data with brokers and registrars who then confirmed back to CREST that the ownership of securities had been legally transferred within 2 hours. CREST later developed direct interaction with central bank money and legal title was transferred in CREST as of 2001.

Parallels to The Past

Explicit legal frameworks are essential for validating proof of ownership, finality and advancing markets, regardless of the technology or assets involved.

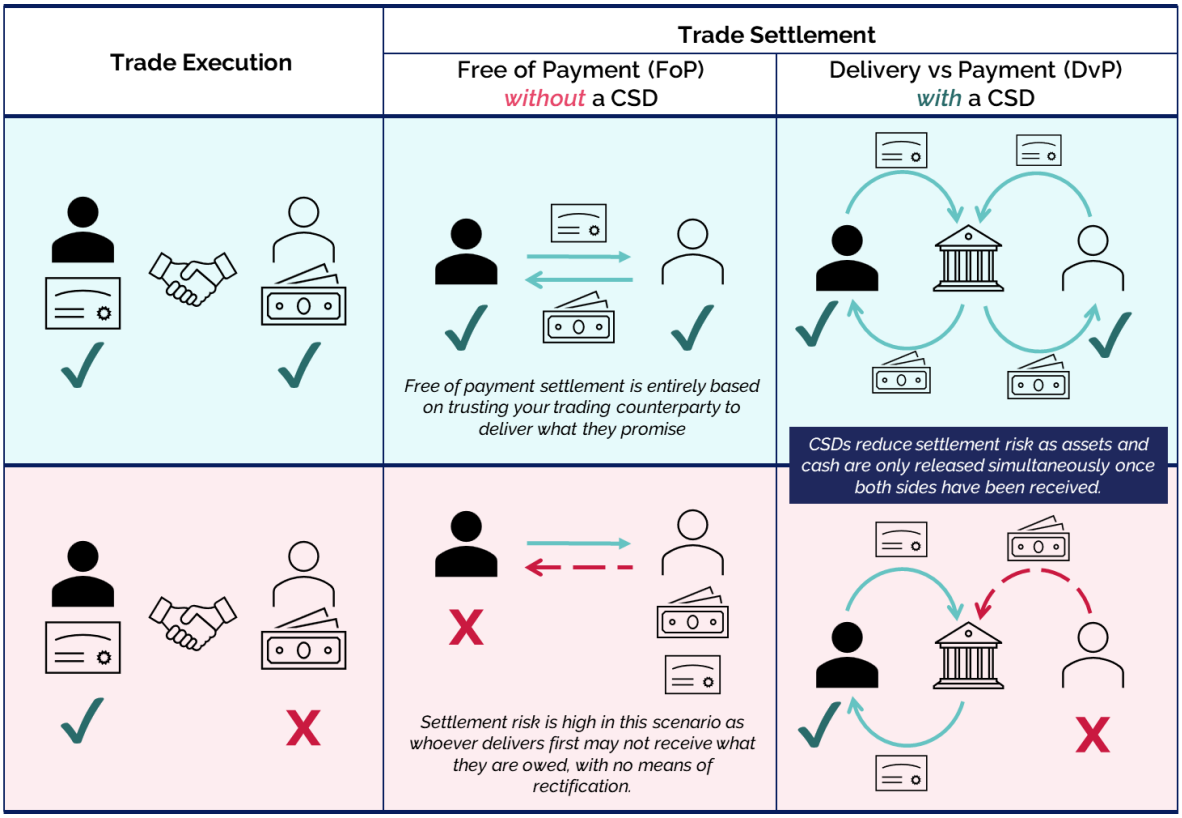
TAURUS' failed complex hub-and-spoke model is being replicated in digital assets with isolated blockchains and interoperability protocols, adding complexity and increasing risk.

With no CSD in digital assets to facilitate DvP simultaneous asset/cash exchange, market participants heavily rely on FoP mechanisms, with one counterparty delivering first, at higher risk.

Market crises and systemic risk forces intervention and regulatory change. Digital asset market participants need to work with regulatory efforts to build a robust market.

CSDs enabled the simplification of settlement instructions through netting; digital assets are settled on a gross basis, eliminating well established benefits and efficiencies.

The Importance of Delivery vs Payment Settlement



Trades Must Not Just Be Complete, But Final

At that time, a trade was considered final with the exchange of assets as per the terms of the contract and the change in legal ownership being reflected on a ledger. There was no legal enshrinement of ***settlement finality***, the principle that guarantees the irrevocability of a settlement and enables participants to operate with confidence in financial markets.

Without it, trades are not final, just complete. This changed in 1999, with the Financial Markets and Insolvency (Settlement Finality) Regulations (SFR) which ensured:

- Once the settlement process is initiated in a *government-mandated, regulated, recognised settlement system*, (i.e. central banks and CSDs) it must be completed.
- Settlements cannot be unpicked or undone. The rights and obligations of the parties involved in the transaction are protected from the moment that the settlement process commences through to its completion.
- Title transfer orders cannot be revoked or amended and transferred assets (including collateral, repos) cannot be claimed by other parties, for example, due to the insolvency of counterparties or related parties when settled *within designated payments or securities settlement systems*.
- The trade settlements are truly final, unconditional and irrevocable.[7-1]

> ***Once a transaction has been settled in a relevant system, it becomes legally binding and cannot be unwound or invalidated, even in the face of insolvency or other legal proceedings.***
>
> *UK Settlement Finality Regulations 1999 (SFR)*

All contracts and transactions must be backed up by legal and regulatory enforcement, else and they are at best, a source of risk, the source of systemic unravelling, at worst. In trading, it is the codification of settlement finality in law that actually guarantees a trade is final, unconditional, irrevocable and cannot be unwound, not just 'complete' on the balance sheet.

Establishing settlement finality through recognised settlement systems is an international standard practice that underpins traditional financial markets. The legislative aim is to manage systemic risk by legally enforcing transfer orders and protecting them against ordinary insolvency laws and clawbacks, forcing previously settled trades into unforeseen failure. This provides deep protection against collateral being seized and creating a catastrophic domino effect of liquidity withdrawal and settlement failures in the market. Participants could trust that once a trade was accepted into the settlement system, it would be completed and protected in a court of law, providing a safeguard to promote confidence and certainty in the settlement process.

Legislative and regulatory regimes are necessary to protect property rights and guarantee settlement finality as well as the entity operating the required settlement system. The way we trade and achieve efficient markets is fundamentally a legal question, not a technological question. As the TAURUS failure and CREST's subsequent success shows, **without legal recognition of title ownership, transfers and settlement, the 'big idea' and its technology are of no consequence.**

2010s Globally Online:
Ethereum, Smart Contracts & An Existential Fork

Launched in 2009, Bitcoin became the most recognised decentralised digital asset, but whilst revolutionary, the cryptocurrency's blockchain was limited in scope, primarily being used to facilitate and record peer-to-peer transactions. The subsequent 2015 launch of Ethereum revolutionised blockchain technology by making financial assets programmable, through introducing smart contracts.

Smart contracts are self-executing agreements written into the code that automatically trigger actions, or combinations of actions in a workflow, when certain predefined conditions are met. They operate on an *if-then* logic: *if* condition *x* is met, *then* predetermined action *y* happens. This can facilitate a wide range of tasks such as executing payments, verification and automated loans; enforcing governance rules and conditions such as time-locks, transfer restrictions and rights to dividends; and compliance checks (e.g., AML/KYC). By operating automatically without intermediaries, smart contracts offer ***trustless transfers***, wholly dependent on the code executing correctly, that the "***immutable rules of mathematics... would eliminate the need to trust anyone***".[8-1] Once executed, the smart contract cannot be changed, reinforcing the immutability of blockchain, which all involved parties can audit and verify for themselves.

Ethereum's smart contract standardisation paved the way for creating complex digital assets: **tokens**. Managed by smart contracts, tokens can digitally represent ownership rights to anything including securities and other financial instruments (e.g. private equity, bonds), real world assets (e.g. property, art), intangible assets (e.g. intellectual property, royalties), commodities (e.g. gold, oil), and alternative investments (e.g. carbon credits, wine). Tokenisation also allows for fractional ownership, democratising access to illiquid but valuable markets previously reserved for institutions and high-net-worth individuals.

By combining blockchain, smart contracts and tokenisation, Ethereum and other Layer 1 base blockchain protocols utilising the technology that executes smart contracts, present a revolutionary future for financial markets. However as with any technological innovation, unforeseen challenges arise and underscore that the system is only as good as the code that underpins it: no matter how advanced the technology, there will always be unexpected limitations or bad actors ready to exploit bugs.

In 2016, an investor-led venture capital fund called The DAO (Decentralized Autonomous Organization) managed entirely through smart contracts, launched on Ethereum.[8-2] No human oversight or intermediaries would be involved, with decisions made by majority vote. It raised $150 million-worth of the platform's ether (ETH) token, subsequently exchanged to its 11,000 investors for DAO tokens. These tokens gave investors voting rights on which projects to fund and automatically collect their share of dividends, as well as benefit from the fund's appreciation through the DAO's token value. However, a bug in the smart contract's code allowed hackers to steal around $60 million of ETH just months later.[8-3]

This presented a philosophical crisis for the fledgling platform: backdate the Ethereum blockchain to before the hack and return the stolen tokens or allow the theft to stand and maintain the immutability of the blockchain in line with the principle that 'code is law'. With no consensus, the blockchain was 'forked' in two, resulting in Ethereum for the majority in favour of the rollback which reversed the theft, and Ethereum Classic for the minority against which upheld immutability. Identical transaction histories, wallets and account balances were duplicated at the time of the fork before diverging.

This event highlights the risks of community-led governance without regulatory oversight or a clear legal framework. In the event of a dispute taken to court, which version of the truth would hold legal standing? Such a situation would be unthinkable in traditional financial markets, but as the growing global decentralised blockchain ecosystem merges with global finance, these risks expose institutions and the public to increasing uncertainty.

Critical Lessons for the Safe Evolution of the Digital Economy:

Regulatory Frameworks are Critical	Market trust is dependent on legal recognition of ownership and settlement finality. Clear regulations for digital assets, tokens and smart contracts are critical to ensure ownership rights and reduce market disputes. Assets must be immobilised and segregated.
Trusted Financial Market Infrastructure Cannot Be Fully Eliminated	FMI (e.g. CSDs) has proven key to ensuring safe and reliable settlement. Even in decentralised systems, there must be an accountable party subject to legally-enforceable oversight to manage risk, resolve disputes, and address failures and fraud.
Settlement Finality is a Bedrock of Market Stability	Legal frameworks must evolve to enshrine the finality of digital asset transfers and ensure that transactions on the blockchain are legally binding, secure, and protected against external legal challenges.
Transparency and Accountability	Early markets relied on personal trust, but blockchain systems emphasise technologically driven transparency and accountability which can broaden participation. Whilst transparency is one of blockchain's strengths, it must be paired with accountability mechanisms to address misuse or malfeasance. Trust cannot be fully decentralised.
Innovation Must Be Balanced with Stability	As new financial products and technologies develop, infrastructure and legal frameworks must evolve in parallel to prevent innovation from outpacing the systems that support them. Unchecked growth, like during the paperwork crisis, can expose vulnerabilities and undermine market stability.

In Code We Trust?

Blockchain, the ubiquitous form of distributed ledger technology (DLT) near-synonymous with its parent principles of decentralised finance (DeFi), has been heralded as the digital harbinger of a financial revolution. Crypto advocates prophesise that it will embed instantaneous atomic settlement recorded on immutable ledgers, all but erasing settlement risk and with it the need for post-trade functions, intermediaries and regulatory oversight.

However, our journey through four centuries of market evolution teaches us a fundamental truth: markets function with collective confidence and resilience only when participants and processes are underpinned by legally backed throughout the trading ecosystem.

How does it work?

Blockchain technology securely groups transactions into 'blocks', creating a digital ledger. New transactions are added to a block, which must be verified by consensus before being chronologically linked to the previous chain of blocks. This establishes a ledger of permanently encrypted, unalterable records. The record's immutability serves to encourage confidence in the data's reliability. It is also transparent as the underlying code and transaction records in public, permissionless blockchains are open source and publicly accessible for anyone to inspect and audit.

Blockchains are still fundamentally ledgers in that they record transactions, but they replace traditional finance's (TradFi) centralised authority and responsibility for the data with decentralised management across the platform's users ('nodes'); each node gets a distributed copy of the ledger and are responsible for its verification, updates, and governance. Participants can verify the truthfulness of information and affirm confidence in the data through its proven reliability, authentications and auditability.

By utilising cryptographic truth and other mechanisms to establish immutable and irrevocable records - a 'golden source of truth' – proponents believe that unequivocal trust can be placed in the blockchain. Instituting trust has been viewed as just a matter of the right technology: once ownership is recorded on-chain, it is argued that settlement can be regarded as complete and final.

How is trust established in our markets today?

Trust in TradFi is typically established through institutional and participant reputation, backing from large balance sheets, legislative regimes, government policies, regulatory supervision and accountable avenues for legal recourse should things go wrong.

A key facilitator of market trust are financial market intermediaries (FMIs); legally empowered neutral bodies tasked with clearing, settling and recording financial transactions, crucial to establishing and sustaining the robust market structure that participants trust in. FMIs are subject to strict regulatory oversight due to their central role in safeguarding the resilience and stability of the financial markets.

However, these elements are largely absent in DeFi, where the core values diverge sharply from TradFi.

Can Blockchain completely replace these trust mechanisms?

DeFi seeks to remove the need for trusted intermediaries and detach financial activity from law, regulation, oversight, and government, offering a rebellious alternative to conventional market mechanisms. **Trust minimisation is one of DeFi's core principles.** This eliminates traditional means of ascertaining trustworthiness, including reputation, relationships and meeting regulatory standards, in authorised third-party operators, intermediaries or trading counterparties.

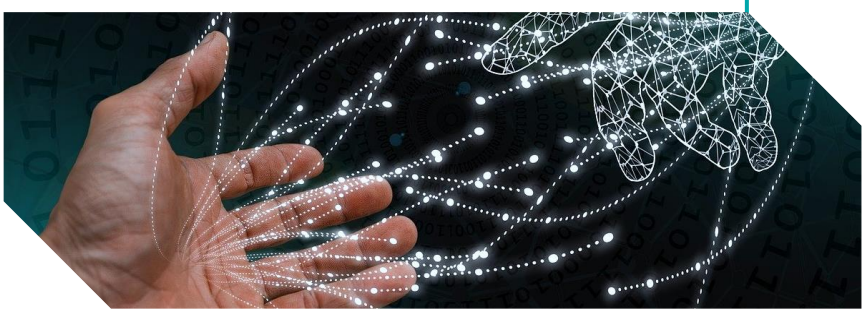
Rather than legal empowerment of the registrar operator (e.g. a central securities depository), trust in the record is not dependent on any one entity but established through DeFi mechanisms and technology including cryptographic algorithms and proofs. This is a range of techniques including hashes and digital signatures used to encrypt, decrypt and verify transactions, ensure the integrity of the ledger and prevent it from being corrupted or manipulated, creating **cryptographic truth**.

Cryptographic truth allows participants to verify the truthfulness of information and affirm confidence in the data through its proven reliability, authentications and auditability, as opposed to needing to have trust in an authorised third-party operator or trusted intermediaries by way of relationships, reputation and regulation to manage and maintain records or conduct transactions.

Trust is firmly placed in the code. DeFi proponents believe that the 'golden source of truth' created and secured by the code is enough to grant unequivocal confidence in the technology, and that financial market structure can be entirely rebuilt in its image.

***Cryptographic Truth**:*

Trust in the record established through a range of algorithms, proofs and techniques including hashes and digital signatures used to encrypt, decrypt and verify transactions, ensure the integrity of the ledger and prevent it from being corrupted or manipulated.



However, whilst blockchain is often spoken of in abstract terms, no-one just *'goes on the blockchain'* to trade directly with one another without any third-party intermediation. Transactions are enabled through various parties including specialised trading venues, digital wallet providers, banks, custodians and applications. All of these intermediaries currently operate outside established regulatory frameworks, to the danger of the market and its participants.

Due to a lack of centralised authority empowered by government legislation, DLT-based activity is really at the mercy of faith in the system and its operators behaving as promised, and hope that processes won't fail. There is no guarantee that a public blockchain or its asset will even exist or retain value from one day from the next; just one calamitous security breach or the development of quantum computing which can break blockchain algorithms could cause immense ramifications from which there is no return. Unlike legally protected institutions, processes and currency, there is no legal backing, certainty or futureproofing for any part of DeFi.

Technology is only as perfect as the human developers behind it can create, it does not exist in a vacuum: over 5,570 developers worked on Ethereum alone in 2023, 16% of all crypto developers.[10-1] No matter the resources, bugs and errors will arise, integration with legacy IT will pose challenges, institutional transaction volumes will severely stress test DLT's scalability, and vulnerabilities will be exposed as they have already. Even the largest financial institutions do not have the level of expert resource necessary to deploy onto managing smart contracts across all their trading activities.

With no clearly responsible and accountable authority over protocol governance, disagreements in how to run or update the protocol amongst its decentralised operators can lead to a "fork", effectively resulting in two separate, independent blockchains with duplicated histories. As with the 2016 DAO hack on Ethereum resulting in Ethereum and "Ethereum Classic", a 'hard fork' also happened on bitcoin in 2017 spinning off "bitcoin cash". A developer that stuck to Ethereum Classic said of the latest split **"I fork Ethereum once, I will fork it again!"**[10-2]

Aside from the alarming concern that unknown and unvetted people can have incredible power over significant market infrastructure, the longevity of each forked chain depends on market support, and whilst there is often a clear winner, it muddies faith in a single golden source of truth.

Trustworthy Markets Cannot Be Anonymous

The concept of anonymous participants verifying transactions is a fundamental technical mechanism and philosophical principle that blockchain is built on: 'proof of work' is an algorithmic race to solve complex mathematical problems in order to verify transactions and update the block, the 'miner' or 'validator' are then rewarded by taking a cut from the transaction's value in the blockchain's cryptocurrency as a 'network fee'.

Anonymity and unrestricted access may not concern retail users or those who intend to use the systems nefariously, but for regulated institutional market participants with KYC, AML and anti-terrorist financing responsibilities, this presents a non-negotiable dealbreaker.

Such concerns preclude institutional trading from bringing liquidity and legitimacy to public blockchains due to the rigorous standards of regulated institutional finance. There is a risk of oversimplifying market functions by assuming that blockchain and automated self-executing smart contracts will bring about a utopian market structure of seamless, instant, unproblematic transactions, settled instantly, eliminating settlement risk and post-trade workflows, whether for traditional or digital assets. However, **the demand for trust is not limited to the cryptographic limits of the protocol, but its every touch point through the trade lifecycle and thereafter.**

In reality, without a strong and enforceable legislative regime, investors have little to protect them but for the promises of charismatic leaders, persuasive marketing and media status.

Cryptographic truth is not legal trust, which is the only single form that offers legal certainty.

Markets cannot thrive without trust

- Trust in market resiliency, how you trade, who you trade with, what you trade and trust that trades are legally certain and final, are critical for market operation and efficiencies.
- Trust does not *originate* from technology itself but can be *facilitated* by it, for which we see great potential.

Types of Trust in Financial Markets:

Core Needs & Considerations that Must Be Delivered in Digital Assets

Trust in Market Integrity, Legality and Resiliency

(Market infrastructure)

- Safeguards enforcing market fairness & protecting investor interests.
- Transparent and accessible: fair and equal opportunities for all.
- Robust mechanisms preventing market abuse, fraud and manipulation.
- Systemic risk identification and management in the financial system.
- Enterprise-grade standards to ensure FMIs withstand risks and stress.
- Government backed legal frameworks and strong regulatory oversight.
- Long-term sustainability in a changing regulatory landscape.

Trust in how you trade

(Technology, data, exchanges, custodians)

- Compliance with industry standards and regulations from all market participants and infrastructure providers (trading platforms, clearing houses/CCPs, CSDs, custodians etc)
- Secure asset immobilisation
- Robust clearing and settlement mechanisms
- Trustworthy, tamper-proof, accurate and secure transaction data.
- Interoperability and cybersecurity measures

Trust in who you trade with

(Counterparties)

- Institutional and participant reputation, backing from large balance sheets
- Financially stable, creditworthy and reliable counterparties
- KYC and AML standards compliance
- Strong collateral and default management practices
- Mitigated risk exposure
- Continuous monitoring and transparency in relationships

Trust in what you trade

(Instruments)

- Legality of instruments
- Transparent product structuring
- Honest and accurate ratings
- Market liquidity
- Asset backing

Trust that trades are legally certain and final.

(Legal protection)

- Strong settlement discipline and certainty
- Irreversible and legally binding trade settlements
- Protection against unwinding in the event of a third-party default, insolvency or court judgement
- Assets are secure and cannot be claimed in insolvency (bankruptcy remote)
- Cross-border legal certainty and dispute resolution mechanisms

DeFi can bridge the trust gap with mechanisms long-proven in TradFi

The Warning in FTX's Collapse:

Increasing Risk of Public Harm & Systemic Exposure

In November 2022, FTX, one of the world's largest cryptocurrency exchanges at the time, declared bankruptcy after it was revealed that it improperly transferred custodied customer assets to its sister investment firm, Alameda Research. **Despite being trusted to protect their assets in full, FTX was found to only hold 0.1% of the Bitcoin and 1.2% of the Ethereum expected.**[12-1]

While the liquidation of FTX's assets raised enough to compensate investors, they received an arbitrary dollar amount based on the value of their holdings at the time that FTX went bankrupt, not their actual cryptocurrencies. Between November 2022's bankruptcy and May 2024's recompensation announcement, bitcoin had nearly quadrupled from around $16,000 to $63,000[12-2], meaning that investors lost both the coin's substantial appreciation, in addition to the chance to reinvest at the price they originally paid. ***Customer compensation is not the same as being made whole.***

Trust was central to both FTX's rise and its fall:

- Significant investments by blue chip venture capital firms, high profile sponsorships, extensive marketing, appearances before government and glowing profiles across reputable media solidified FTX as a name you could trust in crypto. Its young founder, Sam Bankman-Fried (aka 'SBF'), was widely praised as an altruistic visionary.
- The reputation of the endorsing individuals and firms encouraged confidence from institutional and retail investors. FTX and SBF were well 'vouched for' by trusted voices in the market.
- In fact, when other crypto entities were struggling, FTX often attempted to act as a 'saviour', seen as the "lender of last resort" spending hundreds of millions of dollars in lending to, and acquiring, both BlockFi[12-3] and Liquid Group[12-4].
- Investors trusted FTX to securely hold their assets in custody in accordance with the terms of service which confirmed the customer retained the legal title and that FTX could not use or borrow them. However, a further clause conflictingly permits FTX and its affiliates to use customer account balances for trading or collateral. [12-5]
- When FTX's proprietary coin, FTT, was found to make up a substantial portion of its sister firm's balance sheet, FTX customers lost trust in FTX and rushed to withdraw their assets, which exposed that FTX did not have them as they should have. FTX relied on investors trusting their records and not acting to recover their assets. FTX had to halt withdrawals and file for bankruptcy.

The lack of a robust regulatory framework and strict oversight rendered declared investor protections meaningless. Centralised digital exchanges typically hold user's funds and tokens in custody, which introduces significant counterparty risk.[12-6] Ironically, decentralisation creates centralised sources of risk and single points of failure.

Such unregulated control of assets with a single person (such as the CEO of Canada's then largest crypto exchange, QuadrigaCX, who died in sole possession of the private keys to wallets containing 115,000 investor's assets)[12-5] or entity is unthinkable in traditional institutional markets. Exchange risk drove the idea of "*not your keys, not your crypto*" and had a significantly detrimental effect on the market. However, it encouraged custodians to offer off-exchange settlement solutions for institutions in the wake of FTX's collapse.

Despite this, 58.2% of institutional investors surveyed in 2023 still store their cryptoassets directly on centralised exchanges (though down from 92% in 2018), with only 20.2% using institutional custodians.[12-6] Without oversight, such risks are overlooked for convenience which pose systemic significance in the cryptoassets markets that would not be permissible in TradFi. Despite the risk, it is often a more convenient way for traders to meet the typical 100%+ prefunding requirements in lieu of the counterparty trust established by TradFi's CCP and CSD mechanisms.

In the UK, the Financial Services and Markets Act 2000 (as amended in 2023) [12-7] requires firms to segregate and client assets from being co-mingled with their own and safeguard their rights to their assets in the event of insolvency. In traditional securities markets, the CSD immobilises assets and settles transactions, with no obligations for the exchange to custody or organise assets. ***In crypto markets, there is no legal protection of finality in the absence of a depository.***

FTX was just one of many high-profile crypto failures that reaffirms that legally backed trust, not technology, is the critical driver of our markets.

DeFi Must Seek to Maximise Trust

We have explored some key innovations and challenges throughout the evolution of financial markets that demonstrate how means of establishing trust have proven essential for market stability, investor protection and legal certainty.

In DeFi, trust is often framed around the immutability of decentralised ledgers and the underlying code: as DeFi proponents say, '*code is law*'.

As such, the blockchain's ability to execute transactions in near real-time on an atomic basis (simultaneous exchange of assets/cash) is confidently touted as the inevitable path to eliminating traditional post-trade clearing and settlement processes and market infrastructure. Aside from whether eliminating settlement cycles, netting opportunities and oversight is even desirable or operationally possible for the complexities of institutional finance, **instant real-time settlement presents a new trust issue.** By trading with unknown counterparties in a system that updates immediately, there is no room to rectify errors or fraudulent behaviour: the system must be flawless and its participants unimpeachable.

While distributed ledger technologies offer significant opportunities, it has operational flaws particularly around off-ramp asset/cash leg settlement, centralised risk, and scalability. DLT, and its subtypes including blockchain, was designed for individuals to exchange assets they already had in hand and is not fit to fully replace the current settlement system for institutional transaction value and volumes. Legislators and regulators are on high alert worldwide to assess the systemic risks that the breadth of digital assets and their decentralised ecosystems could pose for the global markets.

Considerations of trust must extend beyond protocols and be embedded at every touchpoint throughout the trade lifecycle. For further innovation in digital markets to flourish, often-overlooked, legally enforceable trust codified in law is essential. Without regulatory enforcement, contracts settled without finality can pose, at best, a source of risk, and at worst, a catalyst for systemic failure.

High profile failures in crypto have often occurred where regulatory standards have not migrated from TradFi to DeFi. **Whether traditional or decentralised, and whatever the assets, markets rely on trust — trust in the system, the counterparty, and the security of transactions.**

In DeFi, settlement finality is often considered achieved once a transaction is validated on the immutable blockchain. But while cryptographically irreversible, it can be undone by a court judgement or even the blockchain's own governance (as seen in Ethereum's DAO fork). Settlement finality is not just about the physical exchange of assets but also legal protection from unwinding trades: there is a difference between 'trade completion' and 'settlement finality'.

Recording ownership on a blockchain is not the same as legal recognition subject to real-world contract enforcement. Put in other words, "*A blockchain contract may say you own a house but only the police can enforce an eviction.*" [13-1]

Code is *not* law and cannot replace legal trust. It is not technology, but the legislative guarantee of settlement finality that quietly secures transactions as truly final, that is the foundation of reinforcing market trust. It is just as desirable for these rules to apply to digital assets as to traditional securities.

There are currently 10 designated settlement systems under UK-law, but none for digital assets. This means that **no DeFi system, protocol or entity can provide trust through legally-backed, irrevocable and enforceable settlement finality** for digital assets**.** Furthermore, settlement finality laws protect collateral holders from insolvencies, preventing liquidity crises and settlement failures. With no equivalent oversight in DeFi, there's a dependence on good faith that assets are as secure as claimed, a risky assumption as seen in FTX's downfall.

As exposure to established markets increases, the risks to the broader financial system are heightened and cannot go unchecked. As Sir John Cunliffe of the Bank of England stated, "*there is a need to think now about systemic consequences.*"[13-2]

Technology cannot replace the legal frameworks that secure market confidence. Therefore, it is an inevitable reality that the largely unregulated DeFi landscape will give way to expanded regulation, jurisdictional prudence and oversight. Market intermediaries' roles in managing a swathe of risks will not be surrendered by regulators to the almighty code; they'll evolve. However, far from stifling innovation, a strong regulatory framework will provide the stability needed for institutional investment, enabling DLT and digital assets to flourish, and usher in the next phase of market evolution.

The future of the digital economy depends on building upon the lessons, structures and regimes of the past from which we have built strong resilient markets. Inclusive, efficient, and safe markets for digital assets will only emerge by balancing the strengths of both systems by bridging the gap between TradFi processes and legal frameworks with DeFi's technological advancements. This will ensure innovation thrives while preserving trust and stability.

Tokenisation is the Key to Unlocking the Digital Economy

Tokenisation, the process of converting rights to a physical, or intangible, asset into a digital token on a blockchain, brings a slew of advantages such as reduced processing costs, lowered settlement risk, and broader access to markets via fractional ownership and cryptographic ID verification.

Despite the recognised innovation behind blockchain, an early but still pervasive criticism of '*crypto*' is that digital-native assets, including cryptocurrencies, platform utility coins and NFTs, lack real-world application or value creation.

We believe that the true transformative power to reimagine our economies lies not in a specific asset class, but in **tokenisation**, an application of DLT that has the power to bridge digital assets with real economic activity.

Tokenisation allows any asset, whether traditional, alternative or real-world, to be digitally represented, enabling it to be securitised and traded on a fractional basis. Unlike electronic records of dematerialised paper certificates, tokens are not static but programmable ledger entries that represent active, trackable and auditable ownership, visible in real-time. This capability creates new avenues for value creation and significantly increases transparency in financial transactions.

As with electronic book entry, the deeds or rights to the physical underlying assets for tokenised assets must be securely immobilised to ensure that they cannot be traded outside of the tokenised system, safeguarding against potential double-counting or fraud.

Tokens, like traditional paper certificates represent fractional ownership of an underlying custodied asset and can confer fractional beneficial interest (e.g. dividends). A key feature of DLT is its ability to manage fractional legal and beneficial interest more accurately, efficiently and securely than can currently be achieved with paper-based and electronic records. In turn, manual operational processes, long checking times and high costs are significantly reduced.

DLT also has the capability to provide Immediate and secure access to cryptographically verifiable tokenised ID credentials to prove identity when combined with trusted third parties and tokenisation, limiting participation to validated and appropriate participants, The financial and operational costs required to vet individuals in accordance with regulatory compliance requirements (e.g. KYC, AML) is a major barrier to broad investor participation. Combined, DLT and tokenisation create simpler and cheaper ways of vetting applicants, opening up opportunities to investors that currently wouldn't meet the typically high net worth/income qualifications required for investment or vetting.

By embracing decentralised finance principles, tokenisation can address existing flaws in the financial system, such as illiquidity and various operational and capital inefficiencies. When aligned with traditional regulatory and infrastructure, tokenisation has the power to reshape our economic landscape, access illiquid assets and broaden investors, unlocking new paths for growth and innovation.

ClearToken foresees a future of frictionless transactions where ownership in any asset (tangible or otherwise) can be:

- digitally recorded through tokenisation
- instantly verifiable
- invested in on a fractional basis
- easily transferred
- used as collateral

- all within seconds or minutes 24/7, 365 days a year. Continuous operation vastly increases market opportunities while also reducing inefficiencies, risks and capital requirements associated with weekend positions.

Join us in the next white paper in our 3-part series as we delve further into CSD FMI, and their continued relevance in a digital asset world.

Unlocking Real World Assets:
The Power of Tokenisation In Property

To illustrate the practical application of tokenisation in real-world assets (RWAs), we take a look at the powerful example of property. Tokenisation can revolutionise markets by enhancing security, increasing investor access and streamlining transaction processes for . Here are just 4 key benefits:

1. Modernise and Secure Ownership Records

In the UK, HM Land Registry is mandated to manage and safeguard the definitive record of land and property ownership, mortgages and collateralised charges: 25.5 million titles valued at £8 trillion, underpinning over £1 trillion of personal and commercial lending.[15-1]

Tokenising these records on a secure digital ledger could streamline the management of these extensive assets by automating tracking and updating ownership changes in real-time. This could increase transparency, improve efficiency, and reduce costs associated with manual record-keeping, making asset management more resilient to errors and fraud.

2. Increase Opportunities & Investor Base

Tokenisation enables fractional ownership, opening property investment up to smaller investors markets and expanding the investor pool. Individuals who otherwise couldn't access such opportunities can now purchase equity fractions through security tokens.

Tokenisation also simplifies managing legal and beneficial interests (economic rights such as rental income), which can be administratively complex to divide among multiple parties. By automatically tracking each owner's share and rights on a blockchain, and enforcing AML/KYC compliance, tokenisation reduces errors, fraud, and administrative costs, lowering barriers to entry.

3. Boost Liquidity & Market Efficiency

Real estate is traditionally illiquid, often requiring significant time and cost to sell. E.g., in the UK, over a third (36.8%) of HM Land Registry updates take longer than a month to complete.[14-2]

Tokenisation allows portions of property ownership to be bought and sold on secondary markets, providing liquidity to investors who otherwise would have been locked into long-term investments.

This increased liquidity leads to more dynamic pricing, better aligning property valuations with current market conditions, whilst significantly reducing transfer processing times and costs, creating a faster, more accessible property market.

4. Strengthen Securities & Enhance Transparency

Tokenisation can make securities and complex instruments safer by enabling accurate real-time valuations. For example, mortgage-backed securities (MBS) and collateralised debt obligations (CDOs) were significant contributors to the 2008 financial crisis, largely due to their opaque and inefficient structures, disconnected to mortgage payments and default records.

Tokenisation can enable the securities to be tied to their underlying cash flows (individual mortgage payments and defaults) and to be tracked in real-time. This transparency offers immediate accurate valuations, giving investors the ability to make fully informed decisions based on real, secure data.

Tokenisation in Action:
St. Regis Aspen Resort

In 2018, the luxury St. Regis Aspen resort became the first major commercial property to be tokenised. When traditional capital-raising efforts for business improvements failed, tokenisation offered an alternative solution. A portion of the hotel's equity was tranched into a real estate investment trust (REIT) and was made available on a fractional basis through tokenisation.

At only $1 per AspenCoin token for the initial security offering, qualified investors (in compliance with SEC regulations) faced very low capital entry requirements, democratising access to a high-value asset that would otherwise have been restricted to high-net worth individuals and institutions. The offering was fully subscribed and raised $18m to regenerate the resort when traditional routes failed.[15-4]

Contrary to traditional private investments, the tokens are liquid and able to buy and sell on secondary markets, providing investors with an exit strategy without an exit event. Additionally, the transparency and efficiency provided by blockchain technology helped streamline the process of ownership verification and transfer, reducing administrative costs and increasing trust in the system.

The St. Regis Aspen Resort tokens are still in circulation and have increased in value. It is a clear example of how blockchain and tokenisation can revolutionise traditional asset ownership, making real world asset investments more accessible and flexible.

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About ClearToken

ClearToken is building a Central Counterparty (CCP) and settlement system to deliver robust financial market infrastructure to the digital asset ecosystem. This infrastructure will mitigate bilateral counterparty risk for settlement, financing, and derivative transactions by centralising clearing, collateral, and risk management arrangements. DvP settlement will also be achieved for digital assets. The systems will operate 24/7 to provide uninterrupted service while managing risk in real-time through margin and default fund contributions.

As a horizontal CCP coupled with the settlement system, ClearToken will facilitate the clearing and settlement of transactions from multiple venues and OTC markets globally. ClearToken intends to be multi-custodial and adhere to the highest AML and KYC standards. ClearToken's team comprises established corporate governance and financial markets professionals who share the objective of implementing the necessary framework for the digital asset market.

As a planned financial market infrastructure, ClearToken is seeking authorisation and recognition with the relevant regulatory bodies and will adhere to the IOSCO principles for financial market infrastructures together with all relevant legislation applicable to clearing houses, payment systems, securities and derivatives depositories.

For more information, please visit: https://cleartoken.io/

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