Volume 2, Number 6 November–December 2024

THE JOURNAL OF FEDERAL AGENCY ACTION

fastcase FULL COURT PRESS

The Journal of Federal Agency Action

Volume 2, No. 6 | November–December 2024

THE JOURNAL OF FEDERAL AGENCY ACTION (ISSN 2834-8796 (print) / ISSN 2834-8818 (online)) at $495.00 annually is published six times per year by Full Court Press, a Fastcase, Inc., imprint.

For customer support, please contact Fastcase, Inc., 729 15th Street, NW, Suite 500, Washington, D.C. 20005, 202.999.4777 (phone), or email customer service at support@fastcase.com.

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Cite this publication as:

The Journal of Federal Agency Action (Fastcase)

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https://www.fastcase.com/

POSTMASTER: Send address changes to THE JOURNAL OF FEDERAL AGENCY ACTION, 729 15th Street, NW, Suite 500, Washington, D.C. 20005.

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ISSN 2834-8796 (print)
ISSN 2834-8818 (online)

Atomic Settlement: Enabling Securities Transactions in Warp Speed

Kenny S. Terrero, Justin Peralta, Katherine Walsh, and Dina Khedr*

In this article, the authors explore the history of the settlement cycle and current advancements in technology to discuss the practicality and merits of a future instantaneous settlement cycle.

Settlement cycles have historically compressed and expanded based on the demands investors placed on the capital markets. In recent history, investor demands have increased significantly, driven by the lower barriers to entry afforded to retail investors, which increased the interest in trading by the general public as seen by the meme stock craze. Market participants and regulators took note and the U.S. Securities and Exchange Commission (SEC) issued a proposal to, among other things, shorten the standard settlement cycle under the Securities Exchange Act Rule 15c6-1(a).[1]

On February 15, 2023, the SEC adopted final rules that amended Rule 15c6-1(a) to shorten the standard settlement cycle from two business days after the trade date (T+2) to one business day (T+1).[2] With certain exceptions, the standard settlement cycle generally applies to purchase and sale transactions in securities that are effected or entered by an SEC-registered broker-dealer. In the SEC Release Letter proposing the T+1 settlement cycle (the Release Letter), the SEC addressed a multitude of comments advocating for T+0 or instantaneous settlement. Its response to comments advocating for T+0 or instantaneous settlement reflected a cautious stance rooted in the need for practical implementation and risk mitigation; however, the SEC is aware of technological advancements and market needs and it cannot dismiss the merits of exploring shorter settlement cycles beyond T+1.

There exists a compelling rationale for further reducing the settlement cycle. A shorter settlement cycle not only minimizes counterparty risk but also enhances market liquidity and reduces operational costs for market participants. Moreover, advancements

The Journal of Federal Agency Action / November–December 2024, Vol. 2, No. 6, pp. 429–453.

ISSN 2834-8796 (print) /ISSN ISSN 2834-8818 (online).

in technology and infrastructure, such as distributed ledger technology (DLT) and real-time gross settlement systems, offer promising avenues for achieving faster and more efficient settlement processes. These innovations may provide the foundation for implementing shorter settlement cycles without compromising the integrity and stability of the financial system. By leveraging these technological advancements judiciously, both regulators and market participants may be able to navigate the complexities of implementing shorter settlement cycles while mitigating associated risks.

The integration of blockchain technology into securities transactions marks a pivotal moment in the evolution of the securities market. The rise of technology, the speed at which the public consumes information, and the ability to trade securities through new platforms highlights the need for modernizing securities transactions and shortening the settlement cycle. The push to compress the settlement cycle in response to market demands and improvements in administrative and technological efficiency is not new. In this article, the authors explore the history of the settlement cycle and current advancements in technology to discuss the practicality and merits of a future T+0 and instantaneous settlement cycle.

The Settlement Cycle

The settlement cycle is understood as the amount of time between the execution of a securities transaction and delivery of the security. The clearance and settlement processes for securities are integral components of financial markets and ensure the smooth and secure exchange between buyers and sellers. The settlement cycle has expanded and contracted throughout history because of market developments necessitating significant changes and advancements of technology. Currently, the market is undergoing a technology-driven transformation with the implementation of blockchain technology and digital assets into the settlement process. These innovations include, but are not limited to, blockchain technology, tokenized assets, digital asset securities, and smart contracts and are revolutionizing the clearing and settlement processes by offering increased transparency, efficiency, and security.

The settlement cycle consists of two distinct processes: (1) clearance and (2) settlement. The cycle is finalized when the ownership of traded assets and the cash or other consideration underlying

the trade are finally transferred or settled.[3] Through these distinct yet interconnected processes, clearance lays the groundwork for seamless and efficient settlement, facilitating the timely transfer of ownership and funds between market participants.

Clearance

The clearance process ensures the accuracy and security of transactions.[4] After a trade is executed, relevant parties reconcile and confirm the details of the securities transaction for settlement.[5] This process varies depending on whether the buyer represents individual investors, also known as retail investors, or institutional investors.

Settlement

Settlement involves the crediting and debiting of the cash and securities to the accounts of the buyers and sellers, as appropriate.[6] The settlement process has two components: a "delivery leg" and a "payment leg." The delivery leg is defined as the part of the transaction where the securities bought are delivered to the buyer. The payment leg is the part of the transactions where the buyer pays for securities that it purchased. Finalizing both delivery and payment legs marks the completion of settlement.

Clearance and Settlement of Trade Executions by Retail and Institutional Investors

The clearance and settlement process for transactions by retail investors is relatively straightforward. Broker-dealers play a crucial role in executing and clearing trades on behalf of retail investors, which eliminates the need for separate custodian banks or prime brokers. Broker-dealers primarily execute trades in two ways: (1) by using their own inventory of securities to fulfill the investor's order, or (2) by taking alternative steps to deliver the purchased securities.[7] This decision hinges on the broker-dealer's regulatory obligations strategy and available resources.

"Self-directed trading" is a practice among retail investors that involves the retail investor placing an order to trade securities with

a counterparty (often a broker-dealer) that executes the trade on behalf of the retail investor.[8] The confirmation of the trade is then issued by the counterparty and such confirmation contains a number of details that document relevant facts of the trade.[9]

Institutional investors follow a different process for the clearing and settlement of securities. Institutional investors often engage a broker-dealer for trade execution. Separately, a bank custodian provides custodial safekeeping and asset servicing for the investments.[10] Once a trade is agreed upon, the institutional investor will inform the bank custodian of the details of the transaction and authorize the bank custodian to begin the clearing and settlement process.[11] Institutional investors, along with their broker-dealers and bank custodians, may rely on the services of a central matching service provider (CMSP) "to transmit confirmations and affirmations or match the trade details in order to clear the trade."[12] CMSPs facilitate communication among a broker-dealer, institutional investor, and the institutional investor's custodian to reach an agreement on the details of a securities trade. This communication results in the agreement of trade details, generally referred to as an "affirmation" or "affirmed confirmation," which is sent to the Depository Trust Company (DTC) to effect settlement of the trade.[13]

Historical Practices

Historically, the process of settling securities transactions was conducted through a cumbersome and paper-intensive system.[14] Under the former system, physical paper certificates were the means of representing the transfer of ownership from the seller to buyer upon the completion of a transaction.[15] The clearance and settlement was represented literally by handing over of a paper certificate. For example, at the close of each trading day, a small army of couriers would traverse the financial district in New York City, hand-delivering these paper certificates to their respective purchasers.[16]

By the late 1960s, securities trading experienced an unprecedented surge in activity. This surge exposed the limitations of paper-based settlements and led to the "Paperwork Crisis."[17] Relying on the antiquated physical paper certificates while securities trading skyrocketed resulted in two significant problems within securities transactions: (1) significant delays and trading backlogs, and (2) errors resulting from the paperwork piling up.[18]

The Paperwork Crisis forced several changes to the financial system, including the length of time in the settlement cycle.[19] In the early 1960s, the SEC amended the rules governing the settlement cycle and increased "the time permitted between execution of a trade and settlement date to five days from four."[20] This allowed firms time to catch up and try to keep pace with the delays in processing the paperwork related to the securities transactions. The New York Stock Exchange (NYSE) even started to close its doors during times of the week to catch up with the backlog of unprocessed paper certificates.[21] While these changes alleviated some of the stresses that defined the Paperwork Crisis, they did not eradicate the problems of discrepancies in the paperwork and undelivered or incomplete certificates which were totaling hundreds of millions of dollars at some brokerage firms.[22] While the back offices of financial institutions still found themselves overwhelmed by the volume of paper transactions, leading to further delays and complications, the volume of paper certificates continued to skyrocket, resulting in substantial trading backlogs.[23]

National Market System Act of 1975—National Securities Clearing Corporation's Emergence

In response to these pressing challenges, after extensive studies and Congressional hearings, Congress enacted the Securities Act Amendment of 1975, also known as the National Exchange Market System Act, which amended the Exchange Act.[24] The Securities Act Amendments underscored the importance of streamlining the trading system nationally to protect investors, reduce costs, and ensure accuracy in the securities trading process.[25] This piece of legislation granted the SEC authority to collaborate with industry stakeholders in creating a national market system, with an efficient nationwide clearance and settlement infrastructure.

In the 1970s the NYSE, the American Stock Exchange (AMEX), and National Association of Security Dealers (NASD) merged their subsidiary clearing corporations into a new entity called the National Securities Clearing Corporation (NSCC).[26] This endeavor was driven by the desire to reduce redundancies, cut down on paperwork, and enhance the reliability of the clearance and settlement process.[27] By doing so, these market participants sought to achieve heightened operational efficiency and cost-effectiveness. The primary objective of NSCC was to establish a platform that

would enhance the efficiency of the marketplace and avoid disruption in trading markets.[28] NSCC member brokers and dealers, regardless of their geographic location, were required to submit their transaction data to a single clearing corporation for comparison and settlement.

DTC and the Creation of the Book-Entry System

The establishment of NSCC coincided with the creation of the Depository Trust Company (DTC) in 1973, which was also established to alleviate the overwhelming burdens caused by the Paperwork Crisis.[29] DTC was jointly owned by key industry players who understood the issues surrounding the industry. One of DTC's most notable early developments was the pioneering of the use of a computerized book-entry system,[30] which largely replaced the conventional practice of physically transferring paper certificates for securities transactions. With the introduction of a computerized book-entry system, DTC was then able to keep stock certificates immobilized in a central location, while the transfer of ownership could be recorded electronically.[31] This resolved many issues associated with the Paperwork Crisis by eliminating the need to physically transfer stock certificates in every instance parties issued and traded securities.[32]

The transition from physical paper certificates to electronic recordkeeping not only streamlined the clearance and settlement process but also made it more secure and reduced the risk of loss or damage to valuable securities, which bolstered investor confidence in the markets. These improvements once again shifted the focus to reducing the settlement cycle even though there continued to be growth in trading volume.[33]

Rule 15c6-1 Under the Exchange Act—A Reversal of the Settlement Cycle

In 1993, the SEC adopted Rule 15c6-1 under the Exchange Act where the standard settlement cycle for securities transactions was reduced from T+5 to T+3.[34] A goal of the SEC when introducing Rule 15c6-1, was to reduce liquidity risks made worse by longer settlement cycles.[35] The SEC's underlying premise was that "time equals risk."[36] The length of a settlement cycle positively correlates with the risk involved in a securities transaction, therefore the SEC

found it in the best interest of the markets to shorten the standard settlement cycle.[37] Among the desire to reduce liquidity risks, some of the other notable goals were to also reduce market risk, credit risk, and enhance the operating efficiently of clearing agencies and broker dealers.[38]

Through the implementation of Rule 15c6-1 (and later subsequent amendments), the SEC was focusing on the issue of unsettled trades.[39] Unsettled trades are trades that fail to settle on the established settlement date and with their extended settlement periods, exposed market participants to potential market fluctuations and counterparty risk.[40] By shortening the settlement cycle to T+3, the SEC sought to reduce the period during which market participants were exposed to potential market fluctuations and counterparty risks.[41] Under the new T+3 settlement cycle the SEC imposed strict deadlines for both buyers and sellers to expedite the clearance and settlement process.[42]

On March 22, 2017, the SEC enacted an amendment to Rule 15c6-1(a) to further shorten the settlement cycle from T+3 to T+2.[43] Importantly, the SEC reasoned that shortening the settlement cycle would lead to a reduction in "credit, market, and liquidity risk,"[44] which would further reduce the overall systemic risk for U.S. market participants and promote harmony with foreign markets that had already moved to a shorter settlement cycle.[45] The SEC recognized that technological capabilities had matured to the point where capital and the ability to communicate were significantly more accessible and efficient than in the past. They stated that shortening the cycle would continue to "promote technological innovation and changes in market infrastructures and operations that will incentivize market participants to further pursue more operationally and technologically efficient processes."[46]

The decision to move from a T+3 to T+2 settlement cycle did not have the same dramatic impact compared with current attitudes toward accelerating toward a T+0, because market participants, both foreign and domestic,[47] had already invested in the technology and infrastructure to support a T+2 settlement cycle before the SEC proposed and established the rule.

The Road to T+1

The apparent need to further compress settlement cycles was exacerbated by the COVID-19 pandemic and changes in investor

behavior that resulted in market developments such as the meme stock craze. On February 15, 2023, the SEC announced that it was further amending Rule 15c6-1, in relevant part, to shorten the standard settlement cycle from the default T+2 settlement cycle to T+1 (for most security transactions).[48] By amending Rule 15c6-1, the SEC was, once again, aiming to reduce the time between trade execution and settlement while also reducing market risks brought about because of unsettled trades. During periods of high volume and volatility, shortening settlement cycles reduces the exposure to possible unsettled trades and underlying price movements.[49] Further, the SEC noted that a T+1 settlement cycle has the potential to bring standardized industry processes that create cost savings and greater transparency.[50]

While the United States' move to a T+1 settlement cycle presents a transformative step in the settlement process, there are several critiques that raise various concerns. This shift to a T+1 requires accounting systems to work more efficiently and quickly, which is costly in the short term.[51] Further, other parts of the world may not be as excited for the movement to a T+1, which is especially the case for asset managers in the Asia Pacific. These individuals will be left with "only a three-hour window between the close of the stock market in New York at 4pm [EST] . . . and the 7pm New York time cut-off for trade allocations."[52]

The regulatory changes became effective 60 days after publication in the Federal Register, with firms required to achieve compliance by May 28, 2024. This transition period was meant to provide market participants with the necessary time to adjust their operational processes and systems to accommodate the accelerated settlement timeline.[53]

The Technology That Will Drive the Change for T+0 and Atomic Settlement

With the market's desire for a shorter settlement cycle made abundantly clear by the meme stock craze, and market participants seamlessly adapting to the new T+1 settlement cycle, the question then becomes can we eliminate the time between execution and settlement. The answer may implicate additional regulations, legal and back-office processes, and innovative technological solutions. The inability of existing technology to handle shorter settlements

on a massive scale has been a challenge throughout the history of securities trading. Today, however, DLT and its progeny of related technological advances, such as blockchain, digital assets, and smart contracts may offer a viable solution.

Distributed Ledger Technology

The implementation of technology in the securities settlement process is not new. However, what is new is the potential for DLT, blockchain, tokenization, digital asset securities, and smart contracts to deliver on the potential for instant settlements, also known as "atomic settlements." Digital asset securities can combine confirmation, affirmation, allocation, and the settlement of a security into a single instantaneous step.

DLT refers to the "protocols and supporting infrastructure that allow computers in different locations to propose and validate transactions and update records in a synchronized way across a network."[54] DLT is the backbone of blockchain technologies and its infrastructure allows for information to be stored more securely and reliably.[55] The process of storing information is done via cryptography, which uses nodes[56] to securely propose, validate, and record changes to the synchronized ledger.[57] DLTs do not rely on a central authority, but rather are able to operate on a consensus protocol as transactions are added to the ledger.[58] This eliminates the need for a central authority, and increases both speed and security of these transactions.[59]

Blockchain

Blockchain is a type of DLT that uses cryptography and inputs from a group of participants to jointly validate transactions through an ordered and absolute sequence of layering blocks.[60] Blockchain is said to be a "trustless" technology, because a computer network can verify transactions and enforce its validity without the involvement of a centralized institution,[61] while also eliminating the likelihood for manual error and delays.[62] As such, blockchain can be used to track transactions without the use of an intermediary.[63] Tracking transactions on a blockchain may vary based on the programming of the blockchain. Some blockchain technologies may validate and record a transaction immediately and others may place them on a

queue while others are validated.[64] There can be stark differences between blockchain technologies, or different blockchains (e.g., the Bitcoin and Ethereum blockchains), and some of the differences can be the validation methods, the quantity of transactions that can be processed at any point in time (scalability),[65] or whether it is a permissioned or public blockchain.

As mentioned above, there are generally two kinds of blockchains: permissioned and public.[66] A permissioned blockchain necessitates that an owner or member dictates who can participate on the network.[67] Permissioned blockchains are often more centralized and can be under the control of a singular or small group of entities. Participants join the blockchain after their identity is authenticated and verified by either a network operator or clearly defined protocol implemented by the network through smart contracts or automated approval methods.[68] Permissioned blockchains are often the preferred choice for businesses and private organizations.[69]

In contrast, a public blockchain allows anyone in the general public to join and partake in the core activities of the blockchain network.[70] Public blockchains allow all users the same rights to read, write, and audit the ongoing activities of the network without approval by a central authority to do so. The benefits often associated with public blockchains include being decentralized and having an extra layer of security because of the many nodes to validate transactions.[71] Public blockchains are most often associated with the mining and exchanging of cryptocurrencies.[72]

Smart Contracts

Smart contracts can be thought of as an "overlay" or additional function of digital assets. Smart contracts, as that term is used in connection with digital assets, are not contracts in the legal sense, but rather are a computer code imbedded in certain digital assets.[73] A smart contract code can be self-executing and may trigger commands to take an action to satisfy a provision of an agreement or to take an action at a future time, such as one based on the occurrence or non-occurrence of an action or event (e.g., receipt of payment).[74] After this execution takes place, the blockchain is automatically updated and the transaction is trackable and irreversible.[75]

The irreversibility of the execution of a smart contract, reduces counter-party risk, because no party to the transaction can alter or renege the programed terms.[76] Smart contracts create a sense of trust and transparency due to the lack of third-party involvement, the self-executing enforcement of terms, the record keeping features of blockchains, and the ability to eliminate the need for a clearing-house to facilitate the payment between parties. Thus, a consider-able amount of the back-office infrastructure can be improved by implementing blockchain technology and smart contracts.

Smart contracts can define the rules for how tokenized securi-ties and digital asset securities are issued and settled, including rules defining how security owners and counterparties can store and exchange the value of securities.[77] Smart contracts can handle a range of scenarios, from the agreement between a buyer and seller on settlement terms to error checking and compliance with ongoing regulatory and legal obligations throughout the life of the digital assets.[78] The use of smart contracts fosters a sense of trust and transparency due to the lack of third parties involved and the ability to eliminate the need for a clearinghouse to facilitate the payment between parties.[79] Because of these features, a considerable amount of the demands on the back-office infrastructure required for the clearance and settlement process can be improved.

Digital Assets

Digital assets are defined as any "digital representation of value which is recorded on a cryptographically secured distributed led-ger or any similar technology."[80] Convertible virtual currency and cryptocurrency CBDCs (central bank digital currencies), tokenized assets, digital asset securities, and stablecoins are all within the definition of digital assets.[81] Digital assets can represent various conventional securities, but are not traded outside of the blockchain they reside on.[82] The benefit in trading digital assets is relatively straightforward; for example, parties that decide to execute a trade consisting of digital assets via a smart contract eliminate the need for a third-party intermediary to clear and settle the trade. They are also able to be executed and finalized instantly, which provides many of the same benefits that originally persuaded the SEC to amend Rule 15c6-1 to shorten the settlement cycle.

Digital Asset Security

A digital asset can be used to represent securities such as equity, debt, or investment contracts. However, a digital asset may or may not meet the definition of a "security" under securities laws.[83] In this article, a digital asset that would be considered securities by the SEC under securities laws are referred to as a "digital asset security."[84]

Tokenization

Tokenization is the method that allows ownership of real assets to be represented by digital assets.[85] The Federal Reserve Board defined tokenization as "the process of linking reference assets to [digital] tokens via design features that link the token's price to the value of the token's reference assets."[86] In simpler terms, the process of asset tokenization occurs when real assets (the reference asset) are represented as "tokens" on the blockchain's ledger, and the price of the tokens is a reference to the economic value of the real asset. Reference assets are categorized in a variety of ways such as tangible assets (real estate and commodities) versus intangible assets (intellectual property rights, stocks, and bonds) and are typically placed in custody to ensure that the tokens are constantly backed by these assets.[87]

While there are a wide variety of design features for tokenizing assets, there are five steps that tokenization processes have in common: "(1) a blockchain, (2) a reference asset, (3) a mechanism to assess the value of the reference asset, (4) a means to store and/or provide custody for the reference asset, and (5) a mechanism to facilitate the redemptions of the token and/or the reference asset."[88]

Tokenization facilitates the ownership interest in assets typically not accessible to retail investors. In real-world application, a building, painting, or tangible asset can be represented via numerous tokens, thus creating fractional ownership and another method for investors to optimize the timing and strategy of their trades, and mitigating risk. Certain financial technology start-ups have already implemented the tokenization of real estate, in such a way that individuals can purchase or sell fractional ownership of buildings or real estate portfolios, through a common platform.[89] The use cases for tokenization are still evolving and developers continue to experiment with additional features that enable additional

programmability of digital tokens, ability to leverage smart contracts, and the facilitation of lending through tokens as collateral.[90]

T+0 and Atomic Settlement—The Difference Between "Same Day" and "Instant"

T+0 Same Day Settlement

The Release Letter addressed the possibility of transitioning to T+0 settlement while also acknowledging the various challenges of implementing a shorter cycle.[91] Market participants have taken notice and institutions have begun testing the infrastructure to facilitate T+0 settlement and make the use and implementation of atomic settlement possible on a large scale. The Depository Trust & Clearing Corporation (DTCC) has publicly stated that the clearing agencies it operates already facilitate settlements at T+0 and accomplish roughly one million T+0 settlements a day;[92] however, while one million may appear voluminous, it is still far from being able to match the number of trades that are processed daily.[93] To put this into perspective, the 10-day moving average for number of trades on April 1, 2024, was over 70 million.[94] Therefore, DTCC's current capabilities would only be able to process roughly 1.5 percent of trades on T+0 settlement cycles.

Early Experimentation of Reduced Settlement Cycle Platforms

DTCC has created a platform to provide for a T+0 settlement. "Project Ion" is the creation of a parallel production environment in which an alternative settlement platform exists using DLT.[95] Project Ion is an initiative designed to test the viability of DLTs with securities transactions while upholding the resiliency and safety standards required by DTCC. The stated goal is to determine the resiliency, security, and scalability of this alternative platform.[96] As of the time of writing this article, Project Ion is in a pilot program that has demonstrated a possible effective use case for DLTs due to its capability of processing bilateral transactions on the existing settlement systems.[97] It is important to note that Project Ion is considered a prototype[98] and is being developed to support a T+0 settlement cycle, but not an atomic settlement.[99] Regulators and

market participants have emphasized that a T+0 settlement cycle will first need to prove it is viable before atomic settlements will be seriously considered. While Project Ion is not an atomic settlement platform, it is a step toward increasing market enthusiasm for shorter settlement cycles.

Atomic Settlement

Atomic settlement is a subcategory of the T+0 settlement cycle that is defined as the "instant exchange of two assets whereby the transfer of one asset occurs if and only if the transfer of the other asset also occurs" simultaneously.[100] Instantaneous or atomic settlement implies near real-time settling of trades, in lieu of the industry standard of multilateral netting and settlement of trades. Atomic settlement eliminates the gap in time between trading and settlement, so that both legs of the settlement happen instantly. For an atomic settlement to happen the delivery of the securities and the corresponding payment (DvP) must be simultaneous. In order for the payment to be exchanged without the lengthy processing times or costly fees involving intermediaries off-the-chain, a tokenized form of currency on the blockchain must be available and used for the payment leg of the transaction. The existence of a tokenized form of currency allows for certainty around delivery and near real-time processing of payment.

T+0 settlement is already being implemented for securities transactions and atomic settlement has moved from an abstract concept to a process worthy of pursuit, due in large part to the SEC's push toward T+1, the acceleration of technology in conjunction with utilizing the blockchain, and the overall growing enthusiasm for faster settlements.

Atomic Settlement in Action

In November 2022, the European Investment Bank (EIB) launched Project Venus where EIB issued a digital bond[101] on two interoperable permissioned blockchains, which allowed for the settlement to occur atomically.[102] In Project Venus, a CBDC was exchanged with a blockchain-native digital bond atomically, by utilizing cross-chain DvP atomic settlement that entailed a cross-distributed ledger process involving a securities ledger and

a cash ledger. The security ledger was used to issue, record, and settle the digital bond.[103] The cash ledger was used to issue and distribute tokenized representations of euro-based CBDC to settle the purchase and sale of the digital bonds. [104] Settlement required a trusted message exchange protocol to coordinate the simultaneous processes being executed by the securities ledger and the cash ledger in accordance with DvP.[105] The combination of multiple blockchains, digital asset securities, payment tokens in the form of a CBDC token, and smart contracts facilitated the atomic settlement of this digital bond. Project Venus has pioneered the way for future chain derivative solutions by (1) testing the use of CBDC tokens in the primary issuance settlement process, and (2) utilizing "the first interest rate swap hedge represented through the industry developed common domain model."[106]

Challenges

Current Market and Technological Challenges for Implementing Atomic Settlement

As discussed above, there is market enthusiasm surrounding the potential to move to a T+0 settlement cycle. This possibility appears more likely as key players in the securities industry increasingly participate in transactions with shorter and shorter settlement cycles. This move pushes the advancement of technology. However, there are some outspoken critics who argue that a T+0 settlement cycle is not practical in the near term.[107] Some of the challenges that critics have raised include issues related to (1) securities netting, (2) pre-funding requirements, and (3) reengineering of the existing settlement process.[108]

Securities Netting

Securities netting is defined as the process of aggregating all financial obligations between multiple parties and resolving them down to the net obligations that exist once all transfers are accounted for.[109] The result of netting is that numerous individual transactions can be reduced to a single transaction. There are purported benefits to netting, including the reduction of: credit, settlement, liquidity, and systemic risks.[110] In the United States,

NSCC is the clearing agency that handles netting of equity and corporate debt security transactions that are cleared through a central counterparty clearing agency.[111] The NSCC provides final settlement instructions to the DTC on the movement of securities and how to settle payments.[112] The DTC claims that on typical trading days, NSCC processes an average of $1.7 trillion in equity transactions and through the multilateral netting process the amount is brought down a staggering 98 percent to around $38 billion.[113]

Netting is incompatible with atomic settlements, because an atomic settlement requires that every leg of the trade is able to be settled at the time the trade is executed.[114] The speed of an atomic settlement would leave no time for a third-party intermediary to organize the trading volume. In some sense that may seem like a net loss, but the benefits would come from the zero latency between the execution of the trade and settlement.

Strict Pre-Funding Requirements at the Moment the Trade Is Executed

The second issue raised are the increased pre-funding requirements needed to execute and settle a trade.[115] A transaction settled via T+0 or atomic settlement requires parties to have the funds before executing the trade and parties would be unable to secure funds after market close.[116] In a typical settlement, there is an intervening period between the trade date and the settlement of the transaction when the payment of the securities occurs. This period allows for an orderly funding process. However, this intervening period also creates risks of default that is ameliorated in some securities transactions by margin requirements. For an atomic settlement, there is no such intervening period because a smart contract automates the trade independent of either party, so long as the agreed upon conditions of the smart contract are met. An atomic settlement does not provide any time after executing the trade to arrange for the funding of payment because payment happens instantly.[117]

A Significant Reengineering of Securities Processes

Another criticism is the extensive overhaul of the current securities settlement process that would be required to broadly

implement atomic settlement. The Release Letter noted, "achieving a T+0 standard settlement cycle . . . may not be possible until existing market infrastructure has sufficient capacity to support the full range of market participants who would settle their transactions on T+0, and that the challenges to achieving T+0 derive in part from insufficient capacity or capability to serve those market participants."[118] If the SEC's analysis is correct, even if there is a demonstrable use case for atomic settlements, it will not be broadly implemented until there is a well-developed infrastructure that can support the process.

The payment leg of the settlement cycle presents the biggest challenge to the broad implementation of atomic settlement. It would be impossible to execute atomic settlements on a globalized scale for complex international transactions, without a system in place that can coordinate multiple currencies and institutions, or significantly reduce the number of institutions required for a single transaction. A single inefficient payment system anywhere during the chain of execution would bottleneck any large-scale implementation of an atomic settlement cycle.

Industry leaders are developing the needed infrastructure and implementing innovative technology and back-office processes. The successful use of CBDCs for atomic settlement is a great example of technology providing a solution. Many central banks and jurisdictions are today experimenting with implementing CBDCs utilizing blockchain or DLTs.[119] A properly implemented and broadly accepted CBDC would accelerate the speed of post-trade clearing and settlement.[120]

The Need for Cross-Border Harmonization

The last challenge to note comes in the form of cross-border harmonization. There have been numerous trials and experiments with a functional blockchain or DLT-based CBDCs.[121] Some of these experiments have included multiple banks and governments as participants; namely, m-CBDC and Project Dunbar.[122] These partnerships imply there is a recognition that mutually compatible cross-border payments are a preferable outcome. The creation of a functional CBDC implies a commitment to development in financial infrastructure that is reliably faster. A DLT CBDC would allow foreign banks to achieve transactions that collapses trading and settlement into a single operation.[123]

Currently, financial institutions require correspondent banks to facilitate currency exchanges between two local counter-party banks.[124] However, DLT CBDCs propose a solution in that they are more efficient and rely on the fact that a CBDC used as a medium of exchange represents a claim on the central bank, all of which would be a safe settlement asset for an institution or trader.[125] A properly implemented and broadly accepted CBDC can facilitate the cross-border harmonization necessary for atomic settlement.

Conclusion

The trend toward a shorter settlement cycle demonstrates the market participants' and regulators' understanding of investors' desire for speedier settlements. The current move to a T+1 settlement cycle has resulted in the T+0 and atomic settlement cycles being seriously discussed today with significant consideration and enthusiasm from forward-thinking institutions and market participants who desire to modernize the settlement cycle. The question for some blockchain enthusiasts and technologists is not whether the technology can support atomic settlement, but rather how quickly can our financial institutions build the necessary legal and back-office infrastructure to support atomic settlement?

Notes

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1. See SEC Adopts Rule 15c6-1; Establishes Three-Business-Day Settlement for Security Transactions, FINRA (1993), https://www.finra.org/rules-guidance/notices/93-77 (hereafter FINRA).

2. See Shortening the Securities Transaction Settlement Cycle, U.S. Securities Exchange Commission, https://www.sec.gov/investment/settlement-cycle-small-entity-compliance-guide-15c6-1-15c6-2-204-2 (hereafter Shortening the Securities Transaction Settlement Cycle).

3. The Depository Trust & Clearing Corporation, A Guide to Clearance & Settlement (Apr. 2. 2024), https://www.dtcc.com/clearance-settlement-guide/#/chapterOne; Virginia B. Morris & Stuart Z. Goldstein, Guide

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4. Id.

5. Shortening the Securities Transaction Settlement Cycle, Securities and Exchange Commission, Exchange Act Release No. 34-96930, IA-6239 (Mar. 6, 2023) (hereafter Shortening the Settlement Cycle Adopting Release).

6. Clearing and Settlement of Debt Securities. Overview by Practical Law Corporate & Securities.

7. Shortening the Securities Transaction Settlement Cycle, Exchange Act Release No. 34-94196, IA-5957 (Feb. 24, 2022), at 23 (hereafter Shortening the Settlement Cycle Proposing Release).

8. Id.

9. Id. at 23-24.

10. Id. at 25.

11. Id. at 26.

12. Id.

13. Id. at 21.

14. Morris & Goldstein, supra note 3, at 4.

15. Id.

16. Id.

17. Wyatt Wells, Certificates and Computers: The Remaking of Wall Street, 1967 to 1971, The Business History Review, Vol. 74, No. 2 (Summer, 2000), pp. 193-235.

18. Id.

19. David Kala, The Nervous System: How Computers Saved Wall Street (May 3, 2023). https://www.lexology.com/library/detail.aspx?g=1f852fff-a3f8-475b-96c2-6badec65358a (hereafter The Nervous System).

20. Morris & Goldstein, supra note 3, at 4. This Act's official name is the Securities Act Amendment of 1975.

21. Id.

22. See The Nervous System, supra note 19.

23. Morris & Goldstein, supra note 3, at 4.

24. 15 U.S.C. 78q-1(a)(2)(A); see also S. Rep. No. 94-75 (1975), reprinted in 1975 U.S.C.C.A.N. 179, 183; Securities and Exchange Commission, Study of Unsafe and Unsound Practices of Brokers and Dealers, H.R. Doc. No. 92-231 (1971); 15 U.S.C. 78q-1(a)(1)(A)-(D) (setting forth the Congressional findings for Section 17A of the Exchange Act). "Clearance and settlement" refers generally to the activities that occur following the execution of a trade. These post-trade processes are critical to ensuring that a buyer receives securities and a seller receives proceeds in accordance with the agreed upon terms of the trade by settlement date.

25. Id.

26. Virginia B. Morris, Guide to Clearance and Settlement An Introduction to DTCC, at 5, https://www.dtcc.com/-/media/Files/Downloads/

Press-Room/DTCC-Clearance-Settlement-Interactive-2021.pdf (hereafter Morris).

27. Id.

28. Id.

29. Will Kenton, What Is the Depository Trust Company (DTC) In Banking?, Investopedia, https://www.investopedia.com/terms/d/dtc.asp.

30. Morris, supra note 26, at 5.

31. Id.

32. Id.

33. Morris & Goldstein, supra note 3, at 2 ("[I]n a single day more than 19.3 billion shares of stock can be traded across equity markets in the United States.").

34. FINRA, supra note 1.

35. See Securities Transaction Settlement, Exchange Release No. 33-8398 (Mar. 18, 2004) at 12929.

36. Id. at 12926.

37. Id.

38. Id.

39. Securities Transaction Settlement Cycle, Exchange Act Release No. 34-80295 (Mar. 29, 2017), at 4 (hereafter Securities Transaction Settlement Cycle).

40. Failed Trades, PricewaterhouseCoopers, https://www.pwc.co.uk/services/business-restructuring/administrations/lehman/lehmans-stakeholder-failed-trades.html.

41. See FINRA, supra note 1.

42. Id.

43. Amendment to Securities Transaction Settlement Cycle—A Small Entity Compliance Guide, The Securities and Exchange Commission, https://www.sec.gov/tm/t2-sbrefa.

44. Securities Transaction Settlement Cycle, supra note 39.

45. Securities and Exchange Commission, 17 CFR Part 240, Release No. 34-80295, at 31.

46. Id. at 5.

47. See T+1 Securities Settlement Industry Implementation Playbook, DTCC (Dec. 2023), https://www.dtcc.com/-/media/Files/PDFs/T2/T1-Industry-Implementation-Playbook.pdf, at 90 (hereafter T+1 Securities Settlement Industry Implementation Playbook).

48. Shortening the Securities Transaction Settlement Cycle, supra note 2.

49. Jason Rocha, Daniel Nussen & Christopher Carreon, SEC Adopts Move to T+1 Settlement Cycle, White & Case LLP (Feb. 17, 2023), https://www.whitecase.com/insight-alert/sec-adopts-move-t1-standard-settlement-cycle#:~:text=On%20February%2015%2C%202023%2C%20the,1%22%20in%20common%20parlance).

50. T+1 Securities Settlement Industry Implementation Playbook, supra note 47 at 13.

51. See T+1 Securities Settlement Industry Implementation Playbook, supra note 47 at 51-52.

52. Ernest Chan, Asia-Pacific Asset Mangers Face Graveyard Shift After Move to T+1, Financial Times (Apr. 9, 2024), https://www.ft.com/content/274e2c7c-22a1-4f63-981c-64ccfd15630e.

53. Shortening the Securities Transaction Settlement Cycle, supra note 2.

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55. Id.

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57. What Is DLT?, supra note 54.

58. Timothy M. Persons, Science & Tech Spotlight: Blockchain & Distributed Ledger Technologies, GAO: Science, Technology Assessment, and Analytics (Sept. 2019), https://www.gao.gov/assets/gao-19-704sp.pdf.

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63. See Benjamin Van Adrichem, Howey Should Be Distributing New Cryptocurrencies: Applying the Howey Test to Mining, Airdropping, Forking, and Initial Coin Offerings, 20 Colum. Sci. & Tech. L. Rev. 388, 392 (2019).

64. Deloitte & Touche LLP, Blockchain: How It Works, https://www2.deloitte.com/content/dam/Deloitte/us/Documents/financial-services/us-fsi-blockchain-how-it-works.pdf.

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71. Id.

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77. See generally Kenny Terrero & Emily Chazen, The Smartest Securities on the Block: Blockchain-Based Digital Securities Look to Disrupt Securities Offerings and the Capital Markets, Westlaw Today (March 2023).

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79. What Are Smart Contracts on Blockchain?, IBM, https://www.ibm.com/topics/smart-contracts.

80. Digital Assets, IRS, https://www.irs.gov/businesses/small-businesses-self-employed/digital-assets#:~:text=Digital%20assets%20are%20broadly%20defined,as%20specified%20by%20the%20Secretary.

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82. Id.

83. Framework for "Investment Contract" Analysis of Digital Assets, Securities Exchange Commission, https://www.sec.gov/files/dlt-framework.pdf.

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97. DTCC Connection Staff, Innovation Insight: DTCC's Project Ion, https://www.dtcc.com/dtcc-connection/articles/2022/october/13/innovation-insight-dtccs-project-ion (hereafter Innovation Insight).

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103. Id.

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105. See Kenny Terrero, Teaching an Old Bond New Tricks: Blockchain-Based Digital Bonds Are Reinvigorating the Global Bond Market: Part 1, ALM Global LLC (Oct. 31, 2022), https://www.law.com/newyorklawjournal/2023/10/31/teaching-an-old-bond-new-tricks-blockchain-based-digital-bonds-are-reinvigorating-the-global-bond-market-part-1/.

106. Project Venus the First Euro-Denominated Digital Bond, supra at note 102.

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119. See Project mBridge, UBS, https://www.ubs.com/content/dam/assets/ib/global/doc/m-cbdc-bridge.pdf.

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