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ADVANCING TOGETHER: LEADING THE INDUSTRY TO ACCELERATED SETTLEMENT

A WHITE PAPER TO THE INDUSTRY



Dear Colleagues:

The financial services industry has navigated a series of intensifying waves over the past 20 years — financial crises and systemic risk, changes to the regulatory landscape, the risks of sophisticated cyber-attacks, technology innovations, intense pressures on firms to reduce costs, volatility — and now we add to this growing list the unprecedented market shock of a pandemic.

Despite all these impacts, our markets have never faltered: massive volumes of transactions are cleared and settled through The Depository Trust & Clearing Corporation (DTCC) every day, ensuring that buyers received their securities and sellers are paid on time. In 2020, DTCC's subsidiaries cleared and settled over \$2.15 quadrillion in securities.

The market turmoil observed in 2020 – and now seen in early 2021 – has provided us with invaluable data and analyses, especially on the impact of margin procyclicality in the equities market. Today an average of over \$13.4 billion is held in margin to manage counterparty default risk in the system. In addition, our equities clearing subsidiary, National Securities Clearing Corporation (NSCC), often requires additional liquidity resources for peak settlement days or to manage concentrated risk in certain securities, further adding costs and risks to U.S. markets.

Without question, the material increase in intraday margin calls during these periods of volatility can greatly impact firms, and liquidity can be strained as members draw down credit lines and increase liquidity buffers. Time to settlement equals counterparty risk, and margin requirements, which are designed to mitigate those risks, represent cost to members. We believe the most logical way to reduce the risks that drive margin requirements is to shorten the settlement cycle.

Shortening the settlement cycle would help strike a balance between risk-based margining and reducing procyclical impacts. In fact, our risk model simulations have shown that the Volatility component of NSCC's margin could potentially be reduced by 41% by moving to T+1, assuming current processing and without any other changes in client behavior.

In 2017, we partnered with industry colleagues to shorten the U.S. settlement cycle to T+2, but there is more work to do. We believe the opportunity exists to accelerate the settlement cycle and optimize the process further, to T+1, T+1/2 or someday, even netted T+0, in which trades are netted and settled at the end of the same trading day. Accelerating settlement requires careful consideration and a balanced approach so that settlement can be achieved as close to the trade as possible without creating capital inefficiencies and introducing new, unintended market risks, such as eliminating the enormous benefits and cost savings of multilateral netting.

Our infrastructure is a natural extension of our clients' — focused on protecting market stability and maximizing value for the industry — and DTCC is prepared to move quickly to lead the industry to accelerate the settlement cycle. We encourage you to read the paper, join us at upcoming conferences and share your own views with us as we explore the exciting possibilities of accelerated settlement in more detail.

Murray Pozmanter

Managing Director and Head of Clearing Agency Services and Global Operations

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SETTING THE STAGE FOR ACCELERATED SETTLEMENT

For more than 45 years, The Depository Trust & Clearing Corporation (DTCC) has been the backbone of the U.S. financial industry's clearing and settlement systems. Centralized netting, clearing, and settlement of nearly every equity trade have contributed to making the U.S. markets the deepest and broadest in the world.

As a central counterparty (CCP), we net trades and payments among our participants, reducing the value of payments that need to be exchanged by an average of 98% each day. This dramatically increases the efficiency of U.S. markets by reducing capital requirements and overall risk. As an example, March 3, 2020 was one of largest transaction value days on record for DTCC's equities clearing subsidiary, National Securities Clearing Corporation (NSCC). On that day, the value of shares moving through the system exceeded \$3.51 trillion; however, the actual dollar value requiring final money settlement was reduced over 98%, to just \$80.3 billion.

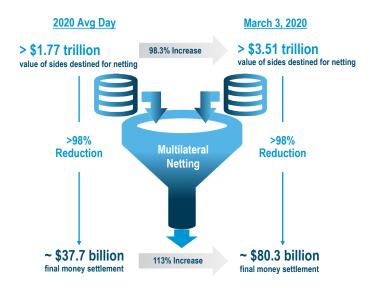
One of the most important ways that DTCC provides stability to the markets and the financial system is by ensuring that no matter what happens, day in and day out, we have the capacity to seamlessly handle daily trading volumes through our central counterparty clearing agencies.

RECORD-BREAKING VOLATILITY AND VOLUME

In March 2020, the turmoil in the global financial markets drove record-breaking volatility and volume. On Thursday, March 12, DTCC set a new single day record, processing over 363 million equity transactions. This new peak was more than 15% higher than the last peak of 315 million transactions in October 2008, at the height of the financial crisis, and more than 240% greater than the average volume of 106 million transactions processed on a typical day by NSCC.

Despite the unprecedented activity and volatility of 2020, and now seen in early 2021 as well, the financial markets have never faltered: massive volumes of transactions are cleared and settled through DTCC every day, ensuring that buyers receive their securities and sellers are paid on time. Without centralized clearing and settlement, investors could not trade in the accessible, transparent and highly efficient securities markets that they do today.

Without question, the market volatility caused by the Covid-19 pandemic has reinforced the criticality of increasing automation and resiliency in the financial services industry, eliminating any remaining inefficient and manual processes, increasing the overall scale and speed of processing, reducing risks and lowering costs.



As a CCP, NSCC nets trades and payments among our participants, reducing the value of payments that need to be exchanged by an average of 98% each day. We know that firms are under pressure to reduce costs. And, while margin deposits to NSCC are a necessary part of managing the risks of market activity, capital committed to these deposits is not available to put toward other purposes. Regulation implemented after the 2008 financial crisis subjected CCPs to enhanced risk management standards, which require them to collect increased margin requirements from members. DTCC fees are very low when considered at a cost-per-trade, and notably, much less than the cost of capital that must be held in the clearing fund.

As part of DTCC's daily responsibilities in protecting the financial markets, each morning we issue margin calls to those NSCC member firms who may need to post additional collateral to cover their risk. Margin calls are calculated at the start of the day and intraday, using historical price moves to determine the value-at-risk and mark-to-market charges. All clearing fund charges are stipulated in our rules, which are published on our website and filed with the U.S. Securities and Exchange Commission (SEC). We provide reporting and calculation tools so that our clearing members can calculate their margin requirements for a particular portfolio in advance. NSCC's risk mitigation removes the settlement risk members have to each other (counterparty risk) and mitigates risk for the global financial marketplace by ensuring that a single firm's default does not spread into a market-wide contagion. NSCC's rules-based margin requirements manage risk and protect not only NSCC and its other clearing members, but all securities investors.

Time to settlement equals counterparty risk, and margin requirements, which are designed to mitigate those risks, represent cost to members. The most logical way to reduce the risks that drive margin requirements is to shorten the settlement cycle. In fact, risk model simulations have shown that the Volatility component of NSCC's margin could potentially be reduced by 41% by moving to T+1, assuming current processing and without any other changes in client behavior.

By continually evolving both our technology and our core processes, DTCC's clearance and settlement engine is among the most cost-effective and efficient systems in the world. While process changes like accelerated settlement provide immediate benefits for members, the greater opportunity is to reimagine these core clearance and settlement processes and the technologies on which these processes run.

FROM PROJECT ION TO ACCELERATED SETTLEMENT

As part of reimagining evolution of the financial services industry, DTCC introduced the Project Ion Case Study¹ in mid-2020, which will provide a platform to explore a number of enhancements to core clearance and settlement.

It's important to note that NSCC and DTC can support T+1 and even same-day (T+0) settlement today, using existing technology. In fact, NSCC clears T+1 and T+0 trades every day and DTC is already a T+0 settlement platform. However, the current T+2 settlement cycle is a convention of market DTCC is prepared to move quickly to accelerate to T+1 and beyond, and has implemented several key operational enhancements.

practice, and shortening that period as regular-way for all market participants will require industry coordination, similar to the change in 2017 from T+3 to T+2. The scale of the impact to the industry is dependent on duration (moving to T+1 or T+0). DTCC is prepared to move quickly to accelerate the settlement cycle to T+1 and beyond, and has already implemented several key operational enhancements that lay the foundation for this change.

DTCC kicked off Project Ion with a proof of concept (POC) testbed for functional and technical innovations that could ultimately be incorporated into DTCC's clearance and settlement platforms. With a focus on DTCC's core capabilities of

¹ DTCC's Project Ion Case Study (May 2020)

netting, clearing and settlement, the intention of the POC was to demonstrate, in a working application, state-of-theart technology and enhanced clearance and settlement functionality which could be incorporated into DTCC's modernization program – including the potential acceleration of the standard settlement cycle.

Starting with functional innovations, as part of a robust industry engagement over the past 6 months following the case study, DTCC has engaged with the industry to speak directly with a representational cross-section of our clients and stakeholders – including institutional brokers, retail brokers, agency brokers, custodians and service providers – about their appetite and readiness for a series of clearing and settlement modernizations including settlement optimization² and an accelerated settlement cycle of T+1, settling just one day after trade date, or T+0, settling on trade date.

Turning to technology, Project Ion explores ways that emerging innovations such as distributed ledger technology (DLT) could also create new opportunities to reimagine post-trade processing. Project Ion is based on the concept of an alternative settlement system that is underpinned by digitalization of DTC-eligible securities and able to offer several optional process improvements for clients, all while retaining the advantages of central netting.

Our clients were candid about their appetite for innovation and readiness for change and were forthcoming with ideas for a settlement system of the future. This report is the result of what we've heard in over 100 hours of one-on-one conversations since May 2020.

THE POSSIBILITY AND PROMISE OF T+1

Currently, the settlement of U.S. equity trades has a standard two-day settlement cycle (T+2), an industry milestone achieved in September 2017. The multi-year effort to move from T+3 to T+2 – a highly complex, coordinated and time-consuming initiative – marked the most significant change to the U.S. market's settlement cycle in more than 20 years. The resulting benefits of accelerated settlement, including reduced market risk and lowered margin requirements, prompted almost immediate discussions on how to achieve additional value through initiatives such as settlement optimization, intraday settlement of money and a closer integration of processes in DTCC's equities clearing and settlement subsidiaries, DTC and NSCC.

It was also discovered from this work in 2017 that the biggest challenge was not the systems and technology, but process and procedure. In fact, as we revisit the coordinated work done across the industry to move to T+2, there is a growing speculation among firms that perhaps the industry should have continued the work to accelerate the settlement cycle, and begun the work to move to T+1 in September 2017.

DTCC'S MODERNIZATION INITIATIVE

DTCC's Modernization effort is an all-encompassing, multi-year initiative that is currently evaluating all core functions and processes.

As we partner with the industry to plan and strategize what the future clearance settlement systems could look like, we can only begin to imagine the exciting possibilities that newer technology and improved process and systems can bring, to further create resiliency, to streamline processes, to reduce risk and costs – all while improving operational efficiencies, and without compromising the significant cost savings and risk reduction benefits of centralized clearing, the CCP's trade guaranty and netting.

What follows in this report are some of the major themes and settlement innovations discussed with clients.

² DTCC White Paper: Modernizing the US Equity Markets Post-Trade Infrastructure (January 2018).

FEEDBACK FROM CLIENTS

A key point of discussion with clients was assessing the industry's readiness and potential barriers to accelerating settlement to T+1 or T+0. The feedback, coupled with our own deep-dive risk modeling and simulations, indicate:

- The primary motivation for accelerating the standard settlement cycle is the significant risk reduction and the related reduction to margin requirements that could result, especially during times of high volatility and stressed markets.
- Any barriers, real or perceived, apply primarily to T+0, not T+1.
- The concept of Real-Time Gross Settlement (RTGS) should not be confused with a netted T+0 settlement. In netted T+0 settlement, trades would be netted and settled at the end of the same trading day; with real-time gross settlement, trades would be settled instantly, without the benefit of netting. Real-time gross settlement could potentially require that transactions in the U.S. market be funded on a transaction-by-transaction basis, and thus lose the liquidity and risk-mitigating benefits of today's netting features. Instantaneous settlement would require trades to be prefunded and on an unsecured basis, which could limit market liquidity.³

The message we heard from our clients is that the industry is now, more than ever, prepared to advance the dialogue about accelerated settlement to T+1 – but the hurdles to netted T+0 and especially to instantaneous, real-time gross settlement are too great at this time.

NIGHT CYCLE REENGINEERING

DTCC has begun steadily implementing a series of operational improvements that optimize current processes to further accelerate settlement times, and to lay the foundation for what we see as an eventual move to T+1.

In January 2020, DTCC's depository subsidiary, DTC, implemented some important changes to reengineer the settlement night cycle to maximize transaction throughput by optimizing member available position and controlling the order in which transactions are processed. This enhancement, known as Night Cycle Reengineering, produced greater operational efficiencies, improved intraday settlement finality and delivered substantial savings in the form of lower transaction costs for clients. This work further increased our processing efficiencies by increasing night cycle settlement rates by 15% – all with little to no development work for our clients. In addition, night cycle reengineering, which was the first in a series of settlement optimization enhancements, also paved the way for many of the proposed clearance and settlement enhancements currently under review.

A few months after introducing night cycle reengineering, DTCC's Clearance & Settlement Product Management team, in partnership with the Business Innovation team, kicked off Project Ion, meeting with a diverse subset of participant firms to gather their feedback on proposed functionality and technical innovations in the clearance and settlement space.

3 Greenwich Associates and DTCC White Paper: Steampunk Settlement: Deploying Futuristic Technology to Achieve an Anachronistic Result (June 2019)

THE INTEGRATED SETTLEMENT MODEL

DTCC explored with clients the benefits and possibilities of a new enhancement, Integrated Settlement. The Integrated Settlement Model would process NSCC's Continuous Net Settlement (CNS) "shorts" and "longs" (CNS obligations) for value in The Depository Trust Company (DTC), subject to DTC's risk management controls to the extent possible. Items settling under these controls would be subject to DTC's Failure to Settle (FTS) procedures in the event of member default and because of this, would no longer require margining in NSCC.

To determine the impact the Integrated Settlement Model would have on member margin requirements, DTCC simulated Integrated Settlement processing in DTC by processing CNS obligations delivery-vs-payment (DVP) in DTC and subjecting CNS obligations settling at DTC to DTC's risk management controls. CNS obligations passing DTC's control checks were removed from the member's portfolio for purpose of calculating NSCC margin requirements, and a new, simulated, Value at Risk (VaR) requirement was calculated on the remaining portfolio. Results of the study, using data from August, September and October 2020 were consistently positive, suggesting daily average reductions in NSCC VaR of approximately 11%.

Following feedback from clients, DTCC is exploring options for the implementation of Integrated Settlement. One proposal currently being evaluated is to have the Integrated Settlement Model applied to night cycle activity first, before subjecting day side processing to the integrated settlement rules. In this model, CNS activity would be processed DVP in DTC and subjected to DTC's risk controls in the night cycle. CNS activity processed in the DTC day-cycle would continue to be processed free of payment for a period of time before the entire settlement model is migrated to the Integrated Settlement model.

Proposed as a staged rollout, perhaps over the next 2-3 years – Integrated Settlement for the Night Cycle, an industry move to T+1, and finally, Integrated Settlement for the Day Cycle – the Integrated Settlement Model has been widely socialized. While simulation results have not been shared, feedback has been overwhelmingly positive.

- H2 2022 **PROPOSED:** Transition NSCC's CNS activity to a DVP model during the night cycle, laying the foundation for an Integrated Settlement model.
- H2 2023 **PROPOSED:** Move the U.S. "regular way" settlement date to T+1 Settlement.
- H1 2025 **PROPOSED:** the DVP model, implemented during the night cycle in 2022, will also be applied to the day cycle, further reducing the marginable portfolio and decreasing capital requirements.

All proposed timelines are subject to further development and review with clients and stakeholders and are subject to the review and approval of the proposals by NSCC's and DTC's regulators through public rule filings.

BENEFITS OF ACCELERATED SETTLEMENT

Below are some of the key areas of feedback we've received from clients with respect to the benefits of accelerated settlement:

Margin Relief, Risk and Volatility	Even at T+2, one of the last remaining exposures in the settlement system is time. Time increases the risk that an unpredictable event could significantly affect the transfer of cash or ownership of securities from the point of trade execution through settlement. Because a key component of risk management is the time between trade and settlement, shortening the standard settlement cycle to just one day after trade execution could further reduce operational and systemic risk across the industry. The market stress of the past year brought on by the COVID-19 pandemic provided additional data with respect to margin procyclicality, a topic that continues to be in focus. ⁴
Reduction in Liquidity Requirements	Accelerating the settlement cycle reduces the number of unsettled positions in a member's portfolio, and thereby reduces the liquidity resources NSCC needs to maintain in the event of a default.
Capital and Operational Efficiencies	Accelerating settlement to T+1 would not require large operational or technical changes by market participants, nor would it cause fragmentation and risk to the core clearance and settlement ecosystem. In fact, many of the technical and operational issues that were previously seen as barriers apply only to T+0 settlement, and T+1 can today be largely supported with current systems and processes – which means the industry can retain the core benefits of DTCC's centralized netting and risk management, even while moving to an accelerated settlement model.

4 DTCC White Paper: COVID-19: Impact and Implications for Financial Market Infrastructures (January 2021)

BARRIERS TO NETTED T+0 AND REAL-TIME GROSS SETTLEMENT (RTGS)

Despite the benefits outlined above, the industry also highlighted several challenges that will need to be overcome prior to netted T+0 becoming a reality. Clients observed that moving to a system of real-time gross settlement, while very appealing in theory and aspirational in nature, could increase risk for investors and make markets less efficient.

While it may be possible at some future point to implement real-time gross settlement, market participants have indicated that they are unprepared for such a significant change as it would require a fundamental restructuring of operational processes throughout the industry.

Challenges with Predictive Financing	One of the significant barriers to T+0 is that it does not allow for predictive financing needs of clients. In other words, clients generally will not know their financing needs for a given day until trading has stopped – which means securing end-of-day funds, or determining intraday investment amounts, will be difficult and excessively expensive.	
Challenges with Reconciliations	There are several challenges for clients with reconciliation, with many clients believing a move to T+0 would necessitate the development of real-time reconciliation process and real-time stock records to comply with regulations such as 15c3-3. Real-time reconciliation process and real-time stock records would also be needed to fully understand securities lending and borrowing requirements, which could further exacerbate the financing concerns as many clients use securities lending as a financing tool.	
Institutional Trade Processing	The current institutional trade process workflow entails several actions that, in certain cases, do not occur until trading is complete. Although significant improvements are currently underway within institutional trade processing, led by DTCC's ITP subsidiary, an industry move to T+0 would still likely require a complex reengineering of the institutional trade workflow.	
Loss of risk-mitigation and liquidity benefits of netting	Real-time settlement eliminates important netting and financing opportunities because it requires that all transactions be funded on a transaction-by-transaction basis. With real-time settlement, the entire industry – clients, brokers, investors – loses the liquidity and risk-mitigating benefit of netting, which is particularly critical during times of heightened volatility and volume.	
Increased fails	Without the benefit of netting, hundreds of millions of shares and trillions of dollars would be moving through the markets at any given moment. The total number of transactions to be settled would soar and the number of failed transactions are also likely to increase dramatically.	
Loss of CCP Trade Guaranty	Implementing real-time gross settlement would require that all transactions be paid in full by investors, with cash in hand and securities owned for each transaction at the moment of execution. This means investors would need to have complete confidence in their trading partner to make good on the transaction even though that person would be anonymous to them.	

RISK MODEL SIMULATIONS

To estimate the potential reductions to margin requirements from shortening the settlement cycle to T+1, DTCC conducted a series of simulations using data from August, September and October 2020 to estimate the possible reduction in NSCC's margin for clearing members. DTCC will share individual simulation results with each member firm to inform their case for change.

Risk model simulations have shown that the Volatility component of NSCC's margin could potentially be reduced by 41% by moving to T+1, assuming current processing and without any other changes in client behavior. Over the last year, the Volatility component has accounted for approximately 60% of NSCC's total margin.

Margin Savings of T+1	Margin Savings and Benefit of Integrated Settlement
Simulations have shown a 41% reduction in the Volatility component of NSCC margin with a move to T+1.	Integrated Settlement can be applied to T+2 or T+1 and has shown an 11% reduction in the Volatility component of the NSCC margin when simulated using T+2 data.

NEXT STEPS ON PARTNERING WITH THE INDUSTRY ON ACCELERATED SETTLEMENT

DTCC believes that the time is right to explore a new approach to post-trade processing. Whether that new approach is the adoption of new emerging technologies, or the development of creative new business processes, DTCC believes we can create cost and balance sheet efficiencies for our clients and solidify the U.S. markets as the deepest, broadest and most efficient markets in the world.

Equity clearing and settlement is part of a much larger ecosystem of linked financial markets. Accelerating the settlement cycle would have upstream and downstream impacts on other parts of the market structure, including derivatives, securities lending, cash borrowing, foreign exchange and collateral processing, and developing a new accelerated settlement system could fundamentally change current market structure. As the evolution of settlement converges with the fintech revolution, we are actively exploring ways to advance a shorter settlement cycle to further enhance the settlement process in the public markets.

Building industry consensus around a T+1 settlement cycle will be a key step, and early indications suggest there is an appetite for such a move in the industry, and the resulting benefits of cost savings and lower risk.

We are now taking steps to restart the industry-wide discussions around T+1, with an eye towards gaining strong industry support in 2021. DTCC is prepared to support the move to T+1 at the pace set by the industry, and we remain focused on continuing to deliver optimizations and enhancements that mitigate risk, enhance efficiencies, achieve margin reductions and lower costs.

To become an active part of this industry conversation or to obtain more information on any of the material presented in this paper, please contact us at **settlement_optimization@dtcc.com**.

THE ROADMAP: 25 YEARS OF ADVANCING SETTLEMENT

DTCC has worked with the industry over the past 25 years to advance financial markets. Significant operational and technology improvements have occurred, especially since the early 2000s, which makes today a prime opportunity to revisit all these proposals and models and make the push to T+1.

1995 NSCC and DTC lead the industry moving the U.S. equity settlement cycle from T+5 to T+3.

1999 DTCC is created to meet the industry's needs for greater operational efficiency, lower costs and more robust risk management.

2001 Amid devastating tragedy on 9/11, DTCC provides critical services to maintain liquidity and confidence in the U.S. markets, remaining fully operational despite a lockdown across lower Manhattan. DTCC settles \$1.8 trillion by the end of the week, ensuring the markets could reopen on Sept. 17.

2004 DTCC reaches a historic milestone, settling more than \$1 quadrillion in securities transactions for the first time.

September 2008 The bankruptcy of Lehman Brothers, the largest liquidation in U.S. financial history, was another defining moment. DTCC played a critical role in protecting the industry and ensuring stability, resolving over \$500 billion in market exposure.

2015 DTCC finalizes settlement matching, enhancing intraday settlement finality and substantially reducing systemic credit and liquidity risk. The initiative removed approximately \$525 billion of risk from DTC's settlement system.

September 2017 In collaboration with the industry, DTCC completed the transition to T+2, further accelerating settlement by an entire day.

January 2018 DTCC releases *Modernizing the U.S. Equity Post-Trade Infrastructure*, a white paper proposing settlement optimization and accelerated settlement models.

January 2020 The advanced settlement processing algorithm is completed, enabling DTCC to further optimize settlement by maximizing night cycle settlement rates without changes to the existing night cycle timeframes.

May 2020 The *Project Ion* case study is released, a proof of concept that evaluates the benefits of accelerated settlement for the U.S. equities market to determine if digitization of assets can pave a path to modernizing the capital markets infrastructure.

September 2020 DTCC completes industry outreach and begins Project Ion prototype development.

October 2020 DTCC teams conduct various analyses (T+1 combined with integrated settlement, and T+1 combined with accelerated settlement) with measurable simulation results. In support of this, DTCC begins working to deliver a prototype settlement system that provides a T+1 environment for the industry.

1Q 2021 – **ANTICIPATED** DTCC intends to complete prototype development on Ion and begin industry testing.

H2 2022 – **PROPOSED** Transition NSCC's CNS activity to a DVP model during the night cycle, laying the foundation for an Integrated Settlement model.

H2 2023 - PROPOSED Move the U.S. "regular way" settlement date to T+1 Settlement.

H1 2025 – **PROPOSED** DVP model, implemented during the night cycle in 2022, will also be applied to the day cycle, further reducing the marginable portfolio and decreasing capital requirements.⁵

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⁵ All proposed timelines are subject to the further development and review of these proposals and are subject to the review and approval of the proposals by NSCC and DTC's regulators through public rule filings.

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