



THE BOSTON CONSULTING GROUP

Cost benefit analysis of shortening the settlement cycle

Prepared by The Boston Consulting Group – Commissioned by The Depository Trust and Clearing Corporation

October 2012

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1 Executive Summary

Rationale for study

The aftermath of the 2008 financial crisis and more recent industry problems have brought into greater focus the risks and inefficiencies in post-trade processes, a portion of which may relate to the length of the settlement cycle. Since 1995, the settlement cycle has remained at trade date plus three business days (“T+3”) for U.S. equities, corporate bonds and municipal bonds, despite significant improvements in post-trade processes and underlying technology over the same period. Accordingly, in May 2012, the Depository Trust and Clearing Corporations (DTCC) commissioned an independent study to examine and evaluate the necessary investments and resulting benefits associated with a shortened settlement cycle (SSC) for US equities, corporate and municipal bonds. The purpose of this study was to examine three of the industry’s critical areas of concern: reducing risk; optimizing capital; and reducing costs by streamlining processes. To ensure the independence of the study’s findings, DTCC selected The Boston Consulting Group (BCG) to lead the analysis. The Securities Industry and Financial Markets Association (SIFMA) provided an advisory role on the project and helped assemble a Steering Committee to advise on the project. As BCG was asked only to share research findings so that the industry could determine to accelerate the settlement time period or remain at T+3, there is no recommendation contained in this report.

Approach

BCG took a three step approach in testing the preparedness of the industry, feasibility and desire to move to a shortened settlement cycle. The three steps were:

1. Extensive industry outreach;
2. Quantitative modeling of investments required and savings impact; and
3. Articulation of key findings and insights.

Industry outreach included over 70 in-depth, one-on-one interviews with firms of various sizes, including institutional and retail broker-dealers, buy side firms (asset managers, hedge funds and pension funds), registered investment advisors, custodian banks, transfer agents, service bureaus, exchanges and market utilities. A quantitative survey was also sent to over 260 firms, and the combined industry outreach covered 109 entities representing 94 different institutions. This outreach was further complemented by interviews and benchmarks with clearing utilities from various international markets, including Germany, the European Union, Hong Kong and Canada. Leveraging

this outreach and several public and proprietary data sources and benchmarks, we developed a quantitative model of the investments and costs associated with shortening the settlement cycle to T+2 or T+1. Finally, we conducted several deep dive working sessions with 10 firms to validate the investments, cost savings, underlying assumptions and model outputs.

Results

Initial industry outreach, conducted prior to the cost benefit analysis, showed that the majority of participants within each constituent segment are in favor of a SSC, with 68% of all participants supporting a move. Twenty-seven percent of participants considered a SSC a high priority prior to consideration of an industry-wide cost-benefit analysis and without confirmation of support by regulators. Furthermore, there was broad consensus on the risk reduction benefits of a shorter cycle, with 55-60% of firms indicating risk reduction to their firms (and 70-75% of firms indicating risk reduction to the industry) from shortening the cycle by one day. Beyond risk reduction, constituent groups indicated different benefits and challenges from transitioning to a shorter settlement cycle. The nature of the benefits and challenges vary by the constituent segment. For example, institutional broker-dealers, and to a lesser extent retail broker-dealers, cited the benefits from process efficiency and risk reduction. On the other hand, buy side firms and custodians with a significant amount of cross-border activity mentioned the benefits of improved international harmonization with T+2. Buy side firms cited reductions in loss exposure on in-process trades and faster issue resolution as the primary benefits, significantly higher than any operational cost savings. Custodian banks mentioned increased operational efficiency as a primary benefit, especially from process improvements at buy side firms. Finally, correspondent clearers and service bureaus cited risk reduction and improvements in process efficiency as key benefits.

Constituents broadly stated that competing priorities and other regulatory initiatives represent a potential challenge to shortening the settlement cycle at this time. Assuming a decision to shorten the settlement cycle is made, these competing priorities would limit how soon a transition might occur. Several institutional and retail broker-dealers stated that settlement of physical securities could present another potential challenge were the cycle to be shortened. A subset of broker-dealers, buy side firms and custodian banks also cited potential issues with securities lending and the timing of foreign exchange (F/X) transactions to support cross-border trades particularly in a T+1 environment. T+0 was ruled out as infeasible for the industry to accomplish at this time, given the exceptional changes required to achieve it and weak support across the industry.

Separate models were developed to quantify the required investments and savings impact of a move to T+2 or T+1. Overall, industry participants were keenly aware that T+2 could be accomplished through mere compression of timeframes and corresponding rule changes but that doing so would limit the amount of savings across the industry. Alternatively, implementing T+2 with certain building blocks/enablers would be more effective considering the fact that different changes have various levels of impact for different constituent groups. These enablers include trade data matching, match to settle, a cross-industry settlement instruction (SI) solution, dematerialization of physicals, “access equals delivery”¹ for all products, and increased penalties for fails. T+1 could be built on the foregoing but would also require infrastructure for near-real time processing, transforming securities lending and foreign buyer processes, and accelerated retail funding.

Cost-benefit analysis² showed material differences between the investments required for each model as well as across constituent groups. Moving to a T+2 environment would require approximately \$550 Million (M) in incremental investments, whereas upgrading systems and processes across the market to support T+1 would require nearly \$1.8B. Although these values are large in aggregate, the required investments are small on a per-firm basis. For example, large institutional broker-dealers would need to invest, on average, \$4.5M for T+2 and about \$20M for T+1, driven by various degrees of systems/platform enhancements and end-to-end testing and analysis. Similarly, large retail broker-dealers would need to invest, on average, \$4M for T+2 and \$15M for T+1 for a comparable set of changes. Custodian investments would involve enhancements to interfaces to increase automation and standardization of data formats, with average investments for large firms of \$4M for T+2 and \$16.5M for T+1. Average investments for large buy-side firms would be \$1M for T+2 and \$2M for T+1, driven primarily by automation and standardization to enhance interfaces with broker-dealers and custodians and enable compressed timeframes.³

The benefits of each model vary by constituent group. The primary benefit to the buy side was attenuated loss exposure associated with market risk on in-process institutional trades, whereas it is

¹In 2005, the Securities and Exchange Commission (SEC) instituted “access equals delivery” rules whereby broker-dealers could satisfy their prospectus delivery requirements by uploading prospectuses onto the SEC’s website, and hence making them accessible to investors (SEC, 2005).

² Based on industry feedback, the analysis does not incorporate second order implications such as an increase in trading activity. The analysis also assumes NSCC is able to effectively fulfill its role as central counterparty for the street-side trades.

³ Further details on investments by constituent size segments provided in the appendix

operational cost for the other constituents. Broker-dealers would also gain from reduced Clearing Fund requirements, and significant additional cost reductions can be achieved in T+1 from full “trade date” adherence⁴. T+2 would result in \$170M in annual operational savings and \$25M in annual return on reinvested capital from Clearing Fund reductions, whereas T+1 would result in \$175M in operational savings and \$35M in return on reinvested capital. The assumed cost of capital in the above numbers is 3.5% and assumes firms are investing the proceeds in Fed Funds. Three and a half percent was the average Fed Fund rate for the 10 year period prior to the 2008 financial crises. If these funds were invested in alternative ways to Fed Funds, that yielded a 5% or 10% return, annual returns would be \$30M and \$60M for T+2, and \$50M and \$100M for T+1, respectively. For institutional broker-dealers, buy side firms and custodian banks, key drivers of operational savings included streamlining of institutional trade processing and exceptions management. Retail broker-dealers and custodian banks also anticipated savings associated with a reduction in physical certificate processing. The below table summarizes the investments and economic benefits associated with each model.

Summary results from cross-industry cost-benefit analysis of a shorter settlement cycle

	T+2	T+1
Required investments	(\$550M)	(\$1,770M)
Annual operational cost savings	\$170M	\$175M
Annual value of Clearing Fund reductions	\$25M	\$35M
Reduction in risk exposure on unguaranteed buy-side trades	Up to \$200M	Up to \$410M

For the whole industry, the implied payback period based on operational cost savings is ~3 years for the T+2 model and ~10 years for the T+1 model⁵. The significantly longer payback period for T+1 reflects skepticism among participants that the industry would broadly change behaviors and adhere to a “trade date” environment to unlock a significant portion of the value of T+1. If, by contrast, significant behavior changes do accompany a move to T+1, reduction in manual processing across exceptions management, client data management, and institutional trade processing would lead to

⁴ Standardization and automation of communication for various settlement processes, streamlined institutional matching processes, and other improvements to increase the proportion of trades for which settlement details are finalized on trade date would lead to material additional upside across the industry.

⁵ For T+2, \$550M divided by \$170M of operations cost savings yields an ~3 year payback period. For T+1, corresponding payback period is approximately 10 years (\$1,770M divided by \$175M)

an additional \$195M of operational cost reductions (corresponding to a ~5 year payback). Beyond the operational cost and Clearing Fund impacts considered in the calculation of payback periods, a material reduction in buy side risk was estimated at \$200M for T+2 and \$410M for T+1. The inclusion of these benefits would lead to a faster payback across the industry, but they were not included in the initially stated payback periods due to various values ascribed to risk reduction by different constituents.

The next step is to socialize the findings of this research with the financial services industry and have the industry decide the most appropriate path forward regarding a potential shortening of the settlement cycle. Should it be determined that a shortening of the cycle is the appropriate path forward, the industry should then clearly define a timeframe that accommodates current or planned regulatory initiatives, and involve regulators and rule-making bodies in the process of initiating change. Our research suggests that the industry could transition to T+2 within approximately 3 years once a clear direction for the industry is set. T+1 would be ‘aspirationally’ achievable within four to six years following a move to T+2 and require substantial investments for near-real time processing, major process redesign and tangible behavioral changes for “trade date” compliance. A direct move to T+1 is estimated to take seven to eight years.

2 Background, objectives and approach

Post-trade processes and underlying technology have improved significantly over the last decade. Considering this fact and the increased focus on risk and scarcity of capital, the industry considered it appropriate to reconsider the benefits of a shorter settlement cycle (SSC). This chapter describes previous industry efforts to shorten the settlement cycle, how the current market environment and appetite for risk has impacted perspectives, and how we approached the question of a shorter settlement cycle today.

2.1 Background and context

Despite numerous improvements in clearing and settlement over the last 15 years, some structural aspects have remained unaltered. The settlement cycle for U.S. equities, corporate bonds and municipal bonds is possibly the most notable aspect that has not changed since the move to trade date plus three days (T+3, from T+5) in 1995 despite the significant process and technological gains that have occurred over the last 15 years.

The industry initially considered and decided against a move to a shorter settlement cycle (beyond T+3) in 2000. At that time, a study sponsored by the Securities Industry Association (SIA), the predecessor to SIFMA, identified 10 building blocks that industry participants would need to implement prior to moving from T+3 to T+1 (SIA, 2000).

Although the plan to transition to T+1 was subsequently put on hold, the industry extracted benefits from independently implementing most of the building blocks outlined in the 2000 study. In 2004, both the SIA and DTCC refocused their efforts on pursuing straight-through processing (Bernstein, 2004) (Considine, 2004). Major changes across the industry since that time include:

- Significant progress on a majority of the building blocks identified by the 2000 study,
- A global push by regulators and industry bodies for higher standards in risk management and the consideration of shorter settlement cycles, especially following the financial crisis⁶, and

⁶ Global efforts are further outlined in the Committee on Payment and Settlement Systems of the International Organization of Securities Commissions' reports titled *Principles for financial market infrastructures* (April 2012) and *Recommendations for securities settlement systems* (November 2001)

- The European Commission's 2009 decision to move to a T+2 settlement cycle in the near future.

Given these changes and new attitudes toward risk, there was general agreement that the industry should re-engage in the analysis of the costs and benefits of a shorter settlement cycle for a broad subset of U.S. securities. Accordingly, DTCC undertook a new independent study to understand the industry perspectives regarding a SSC and quantify the costs of transition and benefits of risk reduction, cost savings and capital optimization that would result. In May 2012, DTCC announced the selection of The Boston Consulting Group ("BCG") to conduct this industry cost-benefit analysis.

The scope of the analysis covered all U.S. equities, corporate bonds and municipal bonds settling at DTC. The study covered clearing and settlement processes at various types of market participants (for example, broker-dealers, buy side firms, custodian banks and correspondent clearers), as well as processes closely related to clearing and settlement (such as corporate action processing and securities lending) and specific situations (such as post-trade processes for cross-border transactions involving securities settling in the U.S.).

DTCC and SIFMA assembled a Steering Committee of sixteen participants to guide this project. The Steering Committee included a broad set of participants and perspectives from across the industry. Participants represented fourteen firms of different sizes and types, including four institutional broker-dealers, three retail broker-dealers, two buy side firms, one custodian bank, one correspondent clearer and one service bureau, in addition to DTCC and SIFMA. Additional details are provided in the appendix in Section 6.1.1

2.2 Approach

Addressing the key aims and perspectives outlined by DTCC, the analysis focused on three primary objectives: identifying the key issues impacting the settlement cycle today, defining the types of changes that will address issues with most positive impact, and assessing the feasibility of proposed T+1 and T+2 settlement models that incorporate the associated initiatives.

Identify the current challenges with clearing and settlement today: We began with an overview of the current state of post-trade processes today, covering the levels of automation and process sophistication achieved since 2000 as well as the remaining gaps. We took both a process view

(covering all involved participants) and a segment view (covering all relevant activities of a type of participant) in assessing the current state of the industry.

Define the changes that will most positively impact post-trade processes: We examined both the impact of shortening the settlement cycle per se, as well as additional elements that either: (i) improve efficiency, simplify processes and enable shortened settlement, or (ii) mitigate one of the unintended consequences of these measures.

Assess the feasibility, costs and benefits of various shorter settlement models: Through our analyses and extensive industry engagement we developed and assessed T+1 and T+2 scenarios in detail, including the changes that would need to accompany each, the total investment required by the industry, the cost savings, capital optimization through Clearing Fund reduction, and risk impacts that would result from each model.

2.3 Data sources and methodology

Our analysis draws on six main sources listed below. For a full description of each item, please refer to 6.1.1.

- **Proprietary data sources and benchmarks:** We leveraged BCG experience and proprietary data, BCG Global Asset Management benchmarks, proprietary Expand®⁷ benchmarks in capital markets and wealth management operations and IT, and DTCC and Omgeo fee data to develop the cost model.
- **Background research and international interviews**⁸: Sources included interviews with representatives from foreign clearing agencies and regulators, as well as a review of published literature from 2000 onward.
- **U.S. industry interviews:** We conducted interviews with 73 entities, including 19 institutional broker-dealers, correspondent clearers and prime brokers; 9 retail broker-dealers; 15 asset managers, hedge funds and other buy side firms; 12 registered investment

⁷ Expand®, a company of The Boston Consulting Group, is a leading provider of business and technology research across global capital markets. For a more thorough description of Expand's experience and offering, please refer to Section 6.1.1 in the Appendix.

⁸ Markets currently with a standard settlement timeframe of T+2 include Germany, Hong Kong, Dubai, Abu Dhabi, Turkey, Bulgaria, and Bahrain.

advisors (RIAs); 9 custodians banks; and 9 other entities, including back and middle office technology providers and other service bureaus, transfer agents, and exchanges.

- **Cross-industry survey to quantify key dimensions of change and test potential future operating models:** We distributed a survey to 270 participants and received responses from 70, including 20 institutional broker-dealers, prime brokers and correspondent clearers; 12 retail broker-dealers, 17 buy side firms; 14 registered investment advisors (RIAs); and 7 custodian banks.
- **Targeted deep-dives to confirm understanding of process-level impacts and provide further context for model development:** We conducted in-depth working sessions with 10 firms to better understand: (i) the specific ways in which processes would be impacted by shortened settlement, (ii) the specific investments that firms would need to make for a shortened cycle, and (iii) the resulting operational, cost, and risk impacts these changes would have.
- **Steering Committee meetings and internal interviews with DTCC staff:** Biweekly meetings with the Steering Committee provided the team with the opportunity to share progress, analyses and findings and incorporate the Steering Committee's input, guidance, and feedback. In addition, internal interviews with DTCC staff provided background to our research.

Leveraging these data sources, we developed a post-trade cost baseline and a cost-benefit model to assess the impacts of a potential move to T+2 or T+1 across the industry. The cost-benefit model considered: different levels of required investments for different types of constituents; operations and IT cost implications resulting from the implementation of a shorter cycle and accompanying changes; and the financial impact due to a reduction in the Clearing Fund and in risk exposure under a shorter cycle. A diagrammatic overview of the cost-benefit model elements is shown in Figure 1 below. For a full description of the data sources and methodology, refer to 6.1.2.

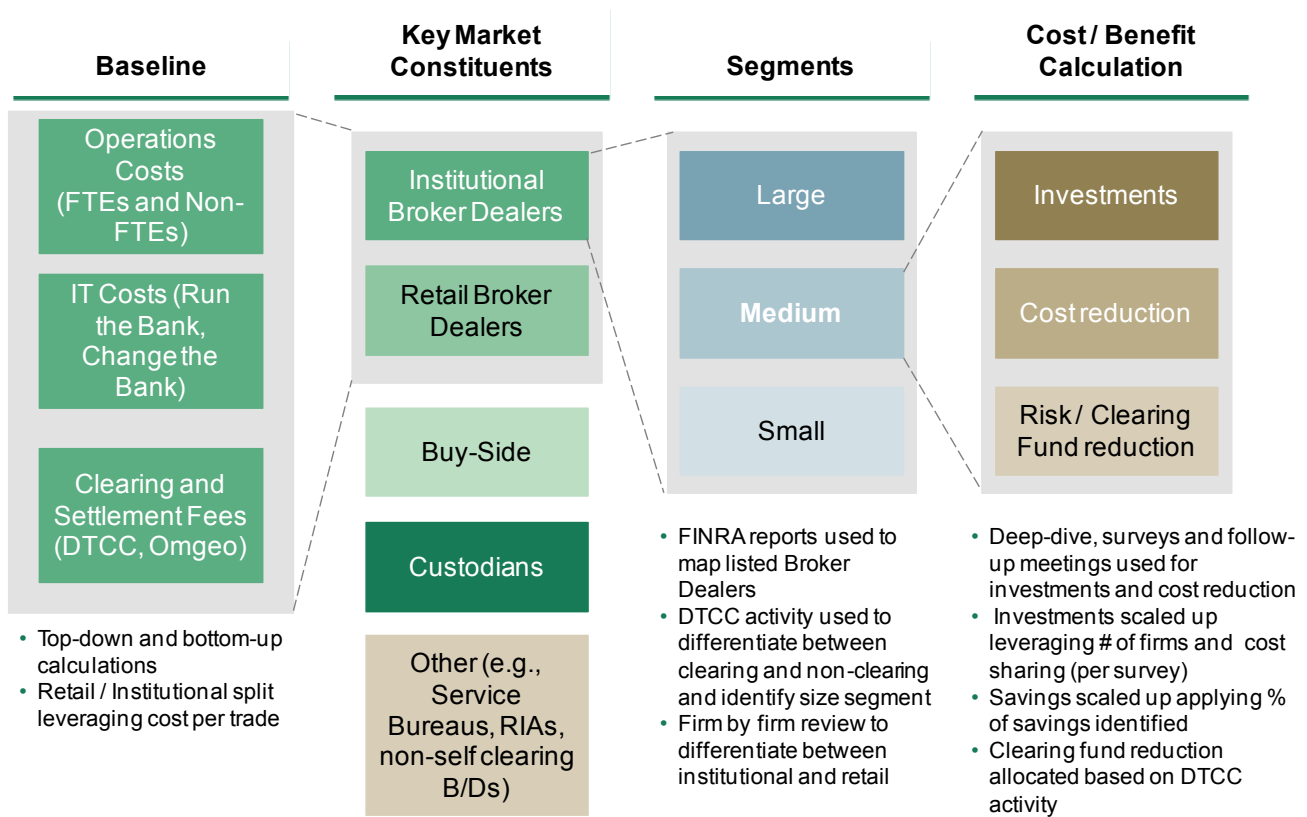


Figure 1. Cost-benefit model overview: Medium institutional broker-dealer⁹

⁹ For a description of the size categorization of each major market segment, refer to Table 4 in the Appendix.

3 Perspectives on shortened settlement and definition of models considered

Our industry outreach revealed that a majority of participants are in favor of a SSC. Twenty-seven percent of participants also consider a SSC a high priority prior to consideration of an industry-wide cost-benefit analysis and without confirmation of support by regulators. Given the value that participants placed on shortening the settlement cycle, we developed separate models to gauge the investments required for and cost impact of a move to T+2 or T+1. A move to T+0 was ruled out as infeasible given the exceptional changes required to achieve it and weak support across the industry. Synthesizing input from the industry and lessons learned from international markets, these models incorporate enabling elements and add-on enhancements that would facilitate transitioning to either settlement timeframe.

3.1 Priorities have changed since the financial crisis

The financial crisis and ensuing events have highlighted risk and inefficiencies in post-trade processing. The failure of Lehman in 2008 made both buy side and sell side more cognizant of the importance of managing counterparty risk exposure. Characterized by the managing director of Wharton School of Business' Risk Management and Decision Processes Center as "the crossroad of massive financial interest," clearing and settlement processes, along with their related risks, have drawn a greater degree of attention from all parties involved in securities transactions (Steinberg, 2012). Several elements of the increased focus on risk reduction and inefficiencies in clearing and settlement emerged throughout the course of our research.

3.1.1 Increased focus on risk reduction

Counterparty exposure and other drivers of risk have become CEO and Board priorities since the financial crisis of 2008. Risks arising from clearing and settlement are relevant to these discussions in the following three ways:

- **Client side transactions** between buy side firms and their broker-dealers represent a significant amount of uncollateralized, unguaranteed exposure. The amount of this market risk is a function of time and volatility, and thus increases with a longer settlement cycle.
- Street side transactions executed on an exchange between broker-dealers are guaranteed by NSCC, but clearing firms collateralize this risk through their **Clearing Fund deposits**. As the Clearing Fund takes into consideration mark-to-market and volatility (among other factors), a T+3 cycle implies larger Clearing Fund requirements than a shorter cycle would. In addition,

DTCC's current plans to accelerate the trade guarantee to the point of validation (from midnight between T+1 and T+2), among other changes, would increase typical Clearing Fund requirements. A shorter cycle would mitigate some of this increase.

- **Systemic risk** is a third risk factor underscored by the financial crisis and recent events. Both the number of outstanding trades at any point in time and the concentration of risk impact systemic risk. Concentration of risk, either at correspondents or central utilities such as NSCC, also becomes a more critical issue when this magnitude of outstanding transactions increases.

3.1.2 *More attention to inefficiencies in settlement*

The financial crisis and recent events have also underscored inefficiencies in the current settlement process. The following three types of inefficiencies were highlighted in our research:

- **Lack of straight through processing and standardization in client side settlement:** Inefficiencies span allocation, confirmation and affirmation processes, and maintenance of settlement instructions and communication of trade instructions between buy side players and their custodians. Although systems exist to streamline many of these processes, many firms do not use these systems or use them partially and/or in non-standardized ways.
- **Persistence of physical certificates/ prospectus requirements:** The number of transactions involving physical certificates has dropped considerably over the last decade, but the continued use of securities in physical form adds unnecessary cost both on a per transaction basis as well as on a fixed cost basis to maintain infrastructure and processes to manage physical certificates or deliver physical prospectuses.
- **Little harmonization across international markets:** A lack of harmonization increases complexity and costs for firms with significant cross-border activity (considering the rebalancing burden to maintain sufficient currency-specific liquidity to settle all trades). In 2009, the European Commission group convened to address the issue of harmonization across markets, cited this as one factor in their decision to transition the European Union to T+2 in the next few years. (European Commission, 2009)
- **Limited harmonization across asset classes:** Various asset classes have settlement cycles that range from T+0 to T+3, creating inefficiencies in settlement processes and limiting the ability to hedge complex products efficiently.

3.2 A shortened settlement cycle could address current priorities

The industry is examining a shortened settlement cycle as a hypothesis to address the above-mentioned challenges in clearing and settlement. The hypothesis is that a SSC will reduce risk by reducing the amount of outstanding trades and drive efficiency improvements by causing participants to enhance processes and modify behaviors in adapting to best practices.

As noted, the amount of outstanding trades, and correspondingly, the amount of collateralized or uncollateralized risk borne by industry participants, is proportional to the length of the settlement cycle. Thus a SSC implies a reduction in risk across the industry. The financial crisis and recent events underscore the value of this risk reduction, which will be examined in more detail in Chapter 4.

Significant benefits could also follow from the increase in operational efficiency across the industry that will need to be put in place as a prerequisite to a SSC. Some of these benefits are intuitive, some were highlighted in the SIA's study of a SSC in 2000, and others are evident in the experiences of other markets operating at a shorter settlement cycle. We outline these benefits in Section 3.4 below.

3.3 Industry receptivity toward a shortened settlement cycle

Our research indicated that there is broad industry support for a SSC, but the degree of this varies by segment and scenario. Over a quarter of participants also consider a SSC a high priority prior to consideration of an industry-wide cost-benefit analysis and without confirmation of support by regulators. Most players considered a move to T+0 to be infeasible for various reasons, including the impact on foreign counterparties and limited timeframe for exception processing and reconciliation.

Without the benefit of the cost benefit analysis, 68% of participants surveyed and interviewed across all industry segments are in favor of shortening the settlement cycle, as shown below in Figure 2 below. Those favorable toward a SSC mentioned the benefits due to reductions in risk and cost as well as capital optimization and the potential benefits for international harmonization (for T+2). Those who were opposed to a SSC believed that the benefits would be limited compared to the investments required for the transition.

Over a quarter of firms even considered a SSC a high or highest priority today, prior to consideration of any business case or regulatory support of a shorter settlement cycle. These firms cited the

importance of reducing risk and optimizing capital, especially through reducing or mitigating increases to Clearing Fund requirements. Those not considering it a priority cited their bandwidth given other regulatory initiatives (e.g. Dodd-Frank, FATCA, Basel-III) and general skepticism toward behavioral change. Both points underscore the importance of: regulatory support of a shorter settlement cycle; coordinating with other industry initiatives; and building consensus across the industry in order to change behaviors and improve clearing and settlement efficiency.

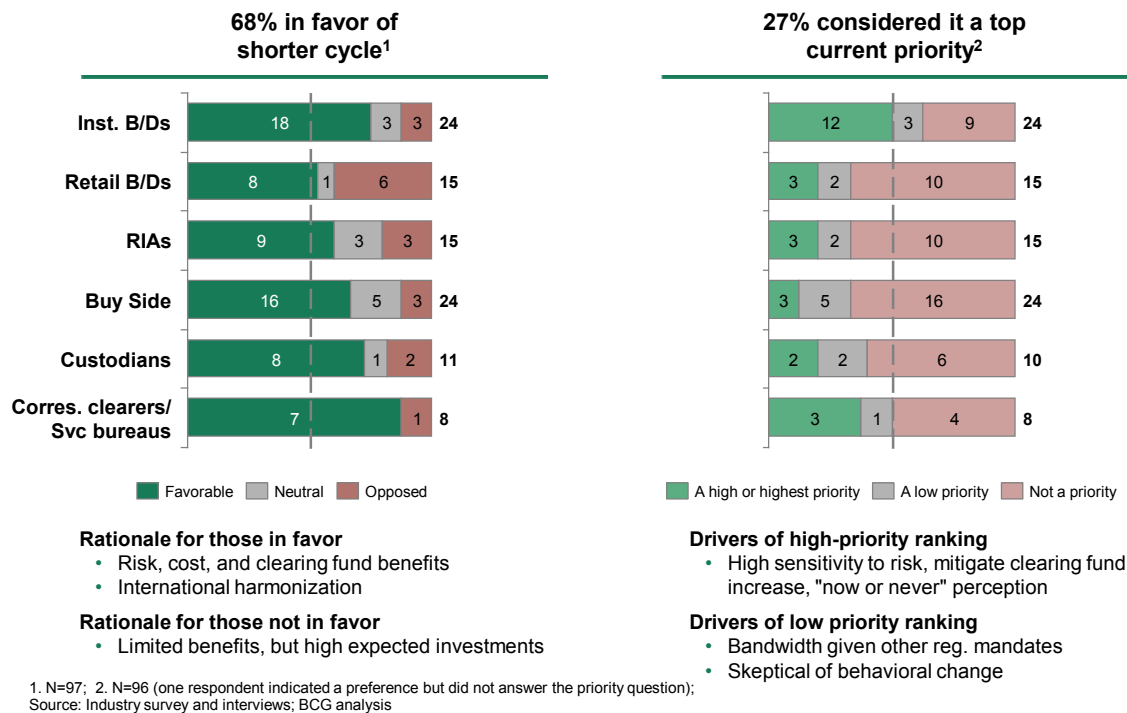


Figure 2. Industry preferences on a shorter settlement cycle

Although firms revealed various levels of support for either T+2 or T+1, most considered T+0 unattractive and infeasible in the near future, as is shown in Figure 3 below. It would result in major challenges with processes such as trade reconciliation and exception management, securities lending and transactions with foreign counterparties (especially where time zones are least aligned). Payment systems utilized for final settlement would also need to be significantly altered to enable transactions late into the day.

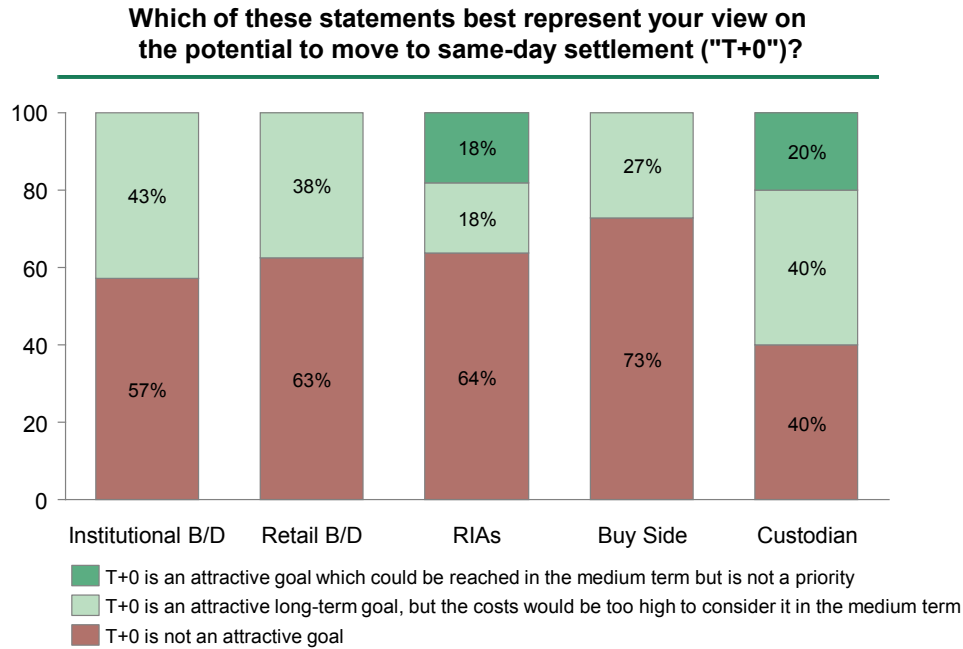


Figure 3. Industry receptivity toward a same-day settlement cycle

3.4 Changes required for a transition to a shorter settlement cycle

Moving to a SSC requires three sets of changes across the industry: operational (process and behavioral) changes across various industry practices; technological and infrastructure investments within firms to enable an increase in operational maturity; and changes to the market infrastructure to support a shorter cycle.

Early interviews identified several of the key enabling elements of a shorter settlement cycle that were subsequently validated in the cross-industry survey. Figure 4 below shows the industry perspective regarding these enablers and how this perspective varies by industry segment. These answers suggest that a package of changes accompanying a shorter settlement cycle is likely to be more palatable to the industry than implementing each or several independently.

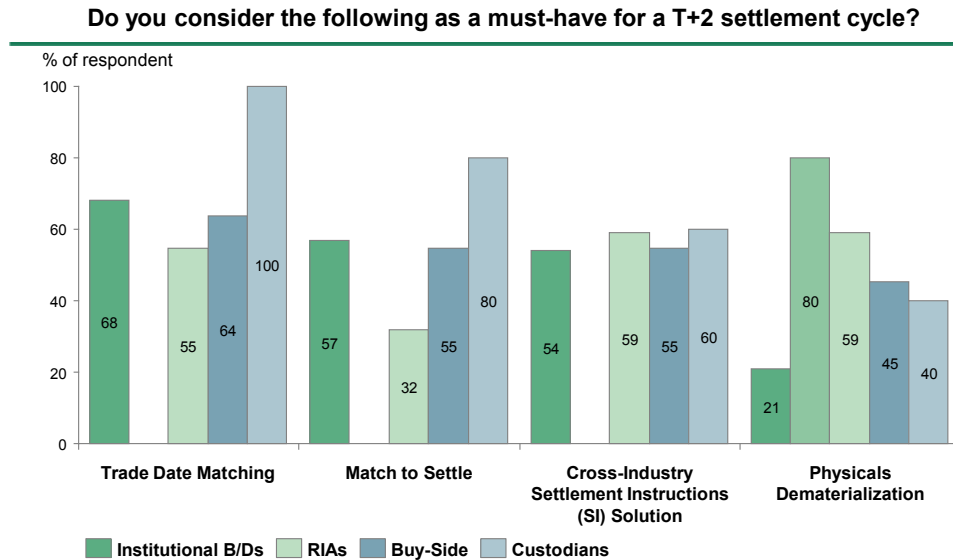
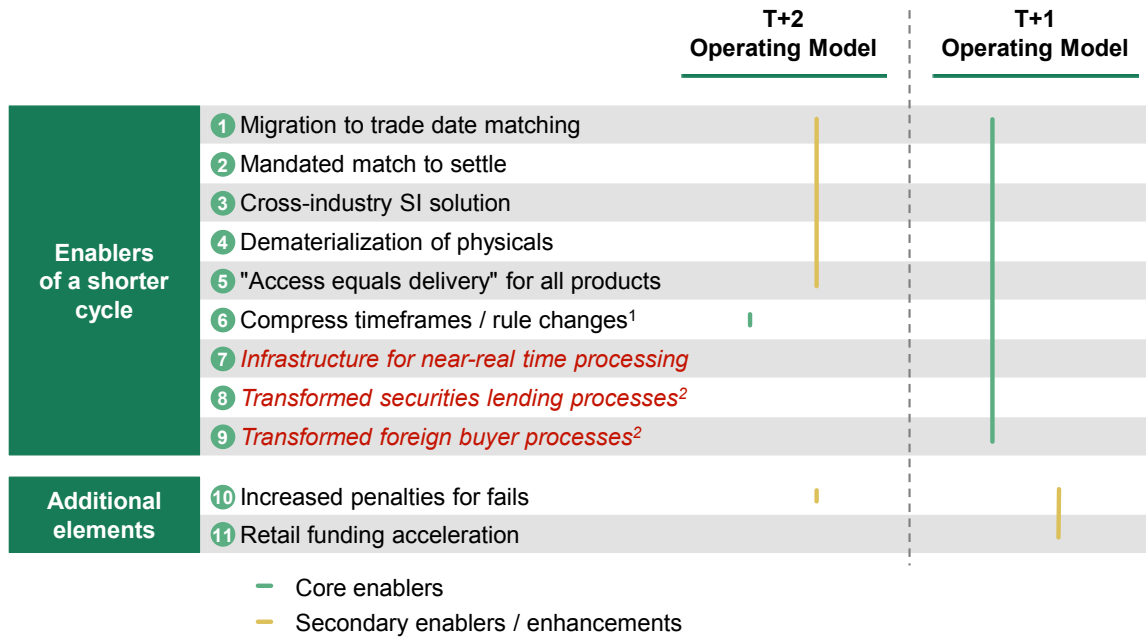


Figure 4. Industry perspectives on a subset of key enablers of a shorter settlement cycle

Additional interviews and deep dives identified several other key enablers or enhancements to a shorter settlement. These were validated by further industry outreach and by the project Steering Committee members.

The prerequisite operational, technological and market infrastructure changes for a shorter settlement cycle can be distilled into a set of 11 core enablers and additional enhancements for T+2 and T+1. Implementing a number of changes beyond the core enablers of T+2 will improve the industry-wide benefits attributable to moving to T+2 (making the move more palatable for a diverse set of constituents) and lay the groundwork for a future move to T+1. The core enablers and additional enhancements tied to our T+2 and T+1 models are shown in Figure 5 below. As indicated below, our research found that the settlement cycle could be shortened to T+2 ahead of full implementation of all additional enablers, although the set should be considered as an overall package. An effective move to T+1 would require implementation of a broad set of enablers and significant changes in industry behaviors prior to the transition.



1. Including adjusting Mutual Funds timelines to ensure consistency; Additional considerations to address Prime brokers challenges in T+1 (e.g., end-of day batch trade notifications from Hedge Funds)
 2. Less significant changes impacting stock loan processes and foreign buyers under T+2 (e.g. changes to FX settlement norms) are considered a component of Item 6. Compress timeframes/ rule changes

Figure 5. Core enablers and enhancements of T+2 model vs. T+1 model

These core and secondary enablers are described in Sections 3.4.1, 3.4.2, and 3.4.3 below. For a more thorough description of how each of these 11 core enablers and enhancements apply to the T+2 and T+1 operating models, refer to Appendix 6.3.

3.4.1 *Process and behavioral changes across a broad set of industry practices*

A number of operational processes and behaviors will need to change across the market to ensure an effective transition to T+2 or T+1, assuming a decision is made to shorten the settlement cycle. These include changes that will primarily impact parties to institutional transactions (such as moving to trade date matching and mandating match-to-settle) and others that would more broadly impact industry practices (for example, dematerializing physical securities and implementing market-based incentives to reduce fails).

1 **Migration to trade date matching¹⁰ for institutional trades** is a process and behavior change that could help enable a shorter settlement cycle while removing extraneous processing time and expense from client side post-trade processing. Streamlined matching processes that enable matching

¹⁰ In Q1 2012, Same Day Affirmation rate was 45% per Omgeo statistics. By noon of T+2, affirmation rate went up to 92%

in two steps (allocation and confirmation) rather than three (allocation, confirmation, affirmation) could help achieve this goal. As infrastructure already exists to support streamlined matching, we consider this a process and behavior change more than anything else, although some work may be required to enable or automate this functionality.

② **Mandating match to settle** and motivating additional behavioral changes across institutional processes are essential to improving client side settlement efficiency and finality. Requiring institutional trades to be matched before settling at DTC would significantly impact firms' behaviors and improve the rate at which these transactions settle.

④ **Migration away from physical securities** is a key change that will be necessary to support a shorter settlement cycle. The natural delays in the process of moving physical securities limit the speed at which settlement could occur, add processing cost, and could add complexity were a "dual track" for physicals clearance maintained once the industry moves to a shorter settlement cycle.

⑥ **Compression of timeframes across clearing and settlement processes** is a core element of change. Correspondingly, process schedules within firms would need to adjust accordingly.

⑧ **Transformation of stock loan processes** is especially important to enable a T+1 settlement cycle. Sale notifications from investment managers or custodians would need to become much more real-time, triggering an automatic recall notification once received and validated by a lending agent. Similarly, borrowers would need to significantly change their processes to ensure that recalls could be processed in a timely fashion (typically in less than 24 hours), without causing issues such as "Failures to Deliver" (FTDs) on other transactions.

⑨ **Transformation of foreign party transactions** is a second element of change that is essential to enabling a T+1 settlement cycle. Under current processes, the number of steps and lags in communication between domestic parties, global custodians, foreign custodians and foreign counterparties, in addition to time zone issues, creates structural challenges to settling transactions on a next day basis. In addition to making communications near real-time, these processes would need to be fundamentally rethought and redesigned to ensure effective T+1 settlement.

⑩ **Behavioral changes by delivering firms to reduce fails** are a final change that would enhance a shorter settlement cycle. As was indicated by research into Treasury and mortgage-backed security

(MBS) fails by the Treasury Markets Practice Group (TMPG), fails may also tend to increase when the cost of borrowing (to avoid a fail) equals or exceeds the penalty for failing. Before implementation of the recent TMPG recommendations for fail penalties, periods of low interest rates were associated with increases in fails in the Treasury and MBS markets (Garbade, 2010)(TMPG, 2011). For street side activity covering a broad set of securities, several markets including Germany and Hong Kong have implemented significant buy-in penalties that also create a disincentive to failing. These types of practices could be adapted to U.S. equities, corporate bonds and municipal bonds to reduce fails in these respective markets.

⑥ **Acceleration of retail client funding processes** may need to take place in order to enable T+1 settlement. Some retail client funding processes, such as physical checks, may take longer to clear than a T+1 trade itself, while others (such as ACH transactions) could be a source of increased risk due to rescission rules. Thus, under a T+1 environment, retail broker-dealers could migrate their customers to funded trading accounts (which decouples the funding process from cash settlement) or, alternately, decide to extend credit to customers who continue to rely on other processes.

3.4.2 *Technological investments to support operational change within firms*

Technological and infrastructure investments within firms are also required to enable a shorter settlement cycle. These changes primarily involve systems modifications and increased automation (across the industry) and investments in systems to standardize and streamline communications associated with institutional transactions.

⑥ **System modifications and increased automation** are essential enablers of a compressed settlement timeframe. Firms will need to modify timeframes and, where necessary, modify processes and systems in order to enable a shorter settlement cycle.

In addition, a T+1 settlement cycle would require ⑦ **infrastructure to support near real-time processing** and a complete migration away from manual and batch processes. As such, participants across the industry would need to invest in their systems and process infrastructure to enable near real-time processing. This infrastructure would reduce delays related to batch processes which would make T+1 settlement impossible in cases where clearing and settlement involves multiple steps and different parties.

① **Investments to standardize communications of trade and allocation details for institutional transactions** are key to improving efficiencies and enabling shorter settlement for client side activity. Our research has indicated that the buy side utilizes various methods to communicate instructions to their custodians, which is a contributing factor to high reclaim rates. To address this issue and enable a SSC, the buy side and custodian banks should make the necessary systems changes to standardize these communications (for example, potentially leveraging matching facilities) and move away from manual processes for the communication or verification of trade instructions. This could be largely achieved by adopting more streamlined matching systems, described in 3.4.1.

3.4.3 *Changes to market infrastructure for clearing and settlement*

In addition to investments within firms and behavior changes across the industry, improvements in clearing and settlement market infrastructure make up the third set of changes that would enable a shorter settlement cycle. Market infrastructure changes relevant to a SSC include extending “access equals delivery” for prospectus delivery requirements to all products, rule and process changes at regulators and utilities corresponding to a shorter cycle, and investments in systems to improve the accuracy of settlement instructions (SIs).

③ **Investments in cross-industry systems to improve accuracy of SIs:** Related to standardizing client side communications, investments in systems to improve the accuracy and capture of SIs will also drive down trade breaks and reduce exception management costs. Improvements in market infrastructure can help facilitate standardized SIs across the industry.

⑤ **Extending “access equals delivery” to all products:** In 2005, the SEC changed the rules affecting delivery of prospectuses for equities and corporate bonds to “access equals delivery,” whereby a broker-dealer could meet its delivery requirements by posting the prospectus to an online repository maintained by the SEC. This significantly reduced costs and made practical sense given the degree of digital connectedness (SEC, 2005). Extending this rule to other products that still require physical delivery of prospectuses would drive down costs and help enable a SSC.

⑥ **Rule and process changes required to shorten the settlement cycle:** Various rules will need to be changed at DTCC, other Self-Regulatory Organizations (SROs) and industry regulators (e.g., the SEC, FINRA, MSRB, etc.) in order to enable a shorter settlement cycle. These changes are discussed in detail in Chapter 5.

3.5 Potential benefits from a shorter cycle to be assessed in cost-benefit analysis

Although the industry will need to make a number of changes to enable a SSC, benefits will accrue over time to industry participants as a result of these changes and shortening the settlement cycle. The importance of each of these changes varies by segment, and the value accruing to firms sometimes relies on broad adoption of change across the industry. For these reasons, it is important to view any set of initiatives put forward in this white paper as a holistic package of changes.

Transitioning to a shorter cycle while implementing accompanying changes will bring material benefits to the industry. Three types of benefits will be realized: firstly, risk related to outstanding trades will be reduced due to the shortening of timeframes and reductions in the aggregate value of executed but yet-to-be-settled transactions; secondly, significant cost savings will be achieved as a result of the operational changes put in place to enable a shorter settlement cycle; thirdly, the broker-dealer community will benefit from capital optimization as a result of lower Clearing Fund requirements.

The value of shortening the cycle and implementing enhancements and enabling changes varies by constituent. On the operations cost reduction side, the benefit attributable to the individual elements of change incorporated in a SSC varies from firm to firm. From a capital optimization perspective, self-clearing broker-dealers and correspondent clearers, especially those with higher Clearing Fund obligations, will see the largest benefit. On the risk side, the economic benefit of risk reduction accrues essentially to buy-side firms and the underlying asset owners.

Firms will depend on the actions of other their peers, clients and counterparties to unlock a portion of the available benefits. In some cases, benefits follow directly from the investments made by an individual firm. In other cases, however, firms will need to make investments to collectively improve the ecosystem of post-trade processes. As firms and their counterparts make investments to improve STP and other cross-industry processes, the benefits of efficiency will accrue to them all.

Following from the above, **any set of initiatives put forward in this white paper must be considered and instituted as a holistic package of changes.** Synchronizing the implementation of this holistic package of changes is the only way to deliver on all the efficiency gains and mitigate the unintended consequences of a shorter settlement cycle, such as an increase in fails due to communication shortfalls or other operational risks driven by shorter timeframes.

In this section, we described the industry's perspectives toward a shorter settlement cycle prior to consideration of an industry-wide cost benefit analysis. We also outlined the changes that comprise each potential operating model (T+2 and T+1) for a shorter settlement cycle. In the following section, we will compare the outcomes of the cost-benefit analysis for each operating model.

4 Outcomes of cost-benefit analyses for T+2 and T+1 operating models

In this chapter, we describe the results of our business case analysis of each settlement model, which incorporated data points from surveys, interviews and deep dive working sessions. Our business case analysis of the two operating models revealed that T+2 investments would yield a ~3 year payback, whereas T+1 investments could yield a ~5 year payback. Significant transformation of behaviors across the industry is a key pre-requisite to moving to T+1, as without it the business case indicates payback of investments only within 10 years. Considering key tradeoffs and additional considerations, the required investments and benefits, the industry should decide upon the most appropriate path forward regarding a potential shortening of the settlement cycle.

4.1 Summary cost-benefit findings¹¹

Combining the requisite investments and resulting cost and Clearing Fund impacts across the two models, we see that, with respect to the investments required, the payback period of T+2 is shorter than that of T+1. The payback period across the industry is approximately three years for the T+2 operating model. For the T+1 operating model, the payback of investment is approximately five years, assuming significant transformation in behaviors and adherence to a “trade date” environment accompany the transition to T+1. The corresponding IRRs of each model are 18% and 14% for T+2 and T+1, respectively. The aggregated results of the cost-benefit analyses for T+2 and T+1 are compared in Figure 6 below.

¹¹ Based on industry feedback, the analysis does not incorporate second order implications such as an increase in trading activity. The analysis also assumes NSCC is able to effectively fulfill its role as central counterparty for the street-side trades.

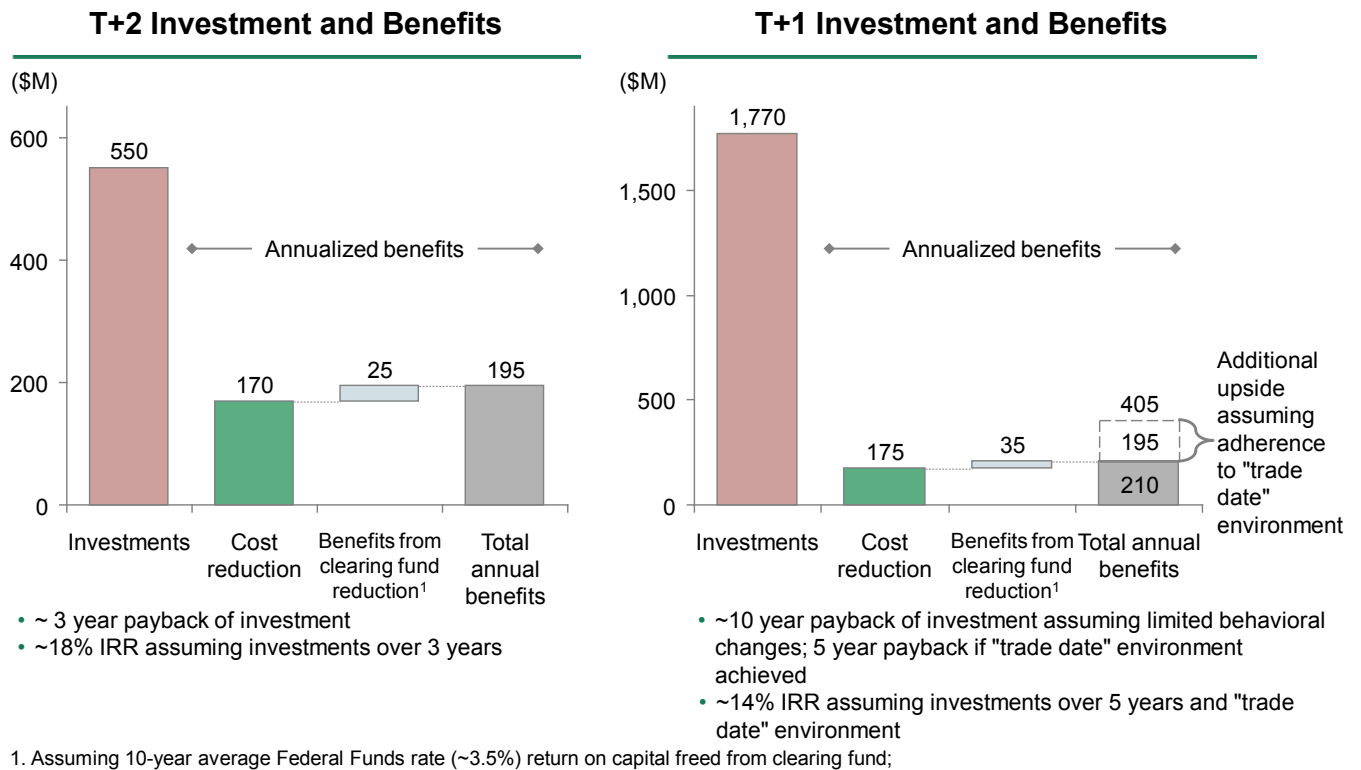


Figure 6. Aggregated industry-wide investments and benefits for T+2 and T+1 models

The above comparison does not include the effect of risk reduction to the buy side, as participants ascribed various values to this benefit. If included, the loss exposure impact of shortening the settlement cycle would double the benefit of T+2 and T+1 by adding up to \$200M of loss exposure reduction in T+2 and up to \$410M of loss exposure reduction in T+1. In the following sections, we describe the individual elements of each economic model and then compare them again in detail.

4.2 Economic cost-benefit analysis of T+2 operating model

The business case for the T+2 operating model is based on the upfront required investment versus the annual cost savings, capital optimization benefits and reduced buy-side loss exposure.

Required investments

Implementation of the T+2 operating model, along with the enablers described above in section 3.4, will require investments across all segments of the industry. As shown in Figure 7 below, the average level for these investments per player ranges from \$1-5M for large players, with large institutional broker-dealers incurring the largest amount of investments, on a per firm basis, and buy side firms at

the opposite end of the spectrum. Across the board, most of these investments involve enhancements to interfaces and limited systems changes, as well as the cost associated with end-to-end analysis and testing associated with changes to processes and systems.

	Average investments	Examples of investments
Institutional B/Ds	Up to \$4.5M for large players	<ul style="list-style-type: none"> • End-to-end analysis and testing • Limited systems change • Tighter controls on inventory management
Retail B/Ds	Up to \$4M for large players	<ul style="list-style-type: none"> • End-to-end analysis and testing • Limited systems change to accommodate new processes
Buy Side	Up to \$1M for large players	<ul style="list-style-type: none"> • Enhancements to interfaces with B/Ds and custodians <ul style="list-style-type: none"> – Standardizing and automating instructions • Process redesign to accommodate shorter timeframes
Custodian Banks	Up to \$4M for large players	<ul style="list-style-type: none"> • Enhancements to interfaces to increase automation • Standardization of data formats/ exchanges
Others	Investments vary by type of player	<ul style="list-style-type: none"> • Service bureau investments similar to B/Ds • Limited DTCC investments (e.g., extensive testing) • No investments required for RIAs • Limited investments for non-clearing B/Ds

Figure 7. Range of required investments by player type to transition to T+2

Although the investment amounts in the above table reflect the average for the large segment of each player type, the medium and small players typically have much lower required investments to enable the T+2 operating model. Medium and small self-clearing institutional investors would need to invest approximately \$1M by player. By contrast, medium and small retail broker-dealers would invest \$3M and \$1.5M, respectively, on average. Broker-dealers that do not clear for themselves would have to make very minimal investments as most of the required investments for T+2 are picked up by correspondent clearers whose investments are already captured in the model.

The required investments for the buy side and custodian banks are significantly smaller, on average. Medium buy side players would need to invest approximately \$600k, while small players would only need to invest ~\$300k. Representing less than 1 to 3 basis points (bps) on their asset bases, these numbers are material but not anticipated to be a significant burden. Medium and small custodians

would have to invest approximately \$4M and \$500k, respectively, to implement the T+2 operating model.

Benefits to participants of the T+2 operating model

If a T+2 operating model is implemented, the benefits to industry participants will come from three distinct sources: operational cost savings, capital optimization, and risk reduction.

Operational cost savings will accrue in different ways to various players. The specific differences and level of cost savings resulting from the T+2 operating model are outlined in Figure 8 below, but generalizing across participants, the benefits primarily come from operations savings. Up to ~5% reduction in overall operations cost would be realized from reduction in FTEs by institutional broker dealers leveraging systematic usage of enhanced and accurate cross-industry SIs, increased affirmation rate, and improved settlement finality as a result of match-to-settle. Reduction in manual processing for custodian banks would yield even higher operational savings. Retail broker-dealers would achieve significant savings – both FTE and non-FTE operations costs¹² – from the elimination of physical certificates. The reason that players reported no significant IT cost savings is that many will be leveraging similar IT systems and platforms that are in place today.

¹² For example, fees related to physical certificates

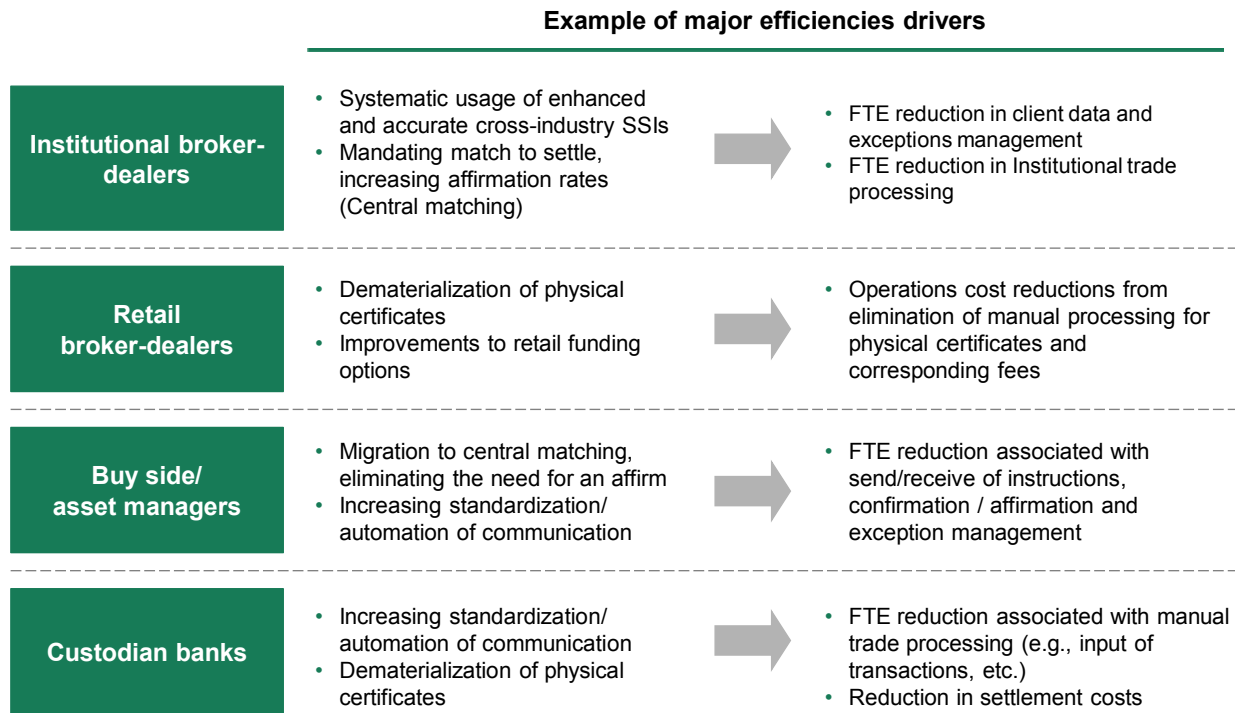


Figure 8. Efficiency drivers of components of change

Capital optimization could be realized with a shorter cycle through reduction in clearing firms’ Clearing Fund requirements. To estimate the Clearing Fund impact to self-clearing broker-dealers and correspondent clearers, we leveraged a recent DTCC analysis that looked at what the Clearing Fund would have been, given a variety of different scenarios, during a “typical” 10-month period, and also during a 1-month “high volatility” period (August 2011). As is shown in Figure 9 below, the move from T+3 to T+2 implies a 15% and 24% reduction in the average Clearing Fund amount, during the typical and high volatility periods, respectively. It is important to note that the Clearing Fund calculation involves various components calculated at the firm level (mark-to-market, volatility, market dominance, etc.), so although these reductions would apply to the industry on average, the reduction to an individual firm could be greater or less than these amounts.

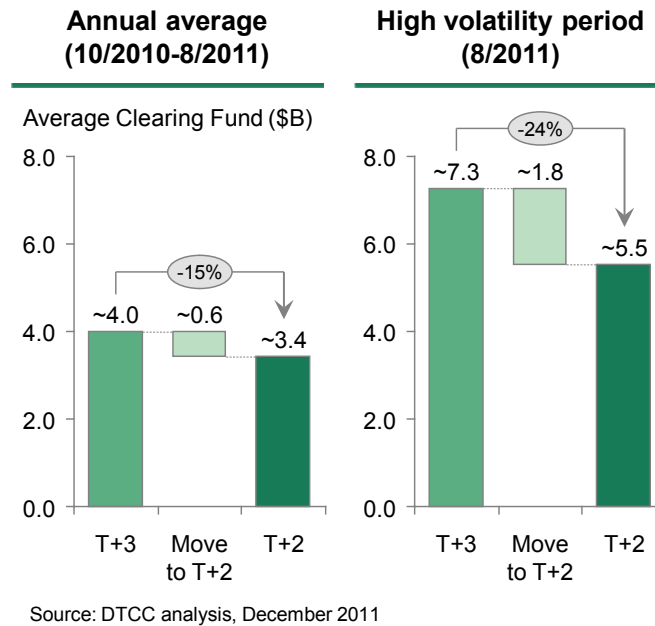


Figure 9. Impact of T+2 on average and high volatility Clearing Fund requirements¹³

As a reduction in the Clearing Fund is effectively a release of capital, we then had to apply an interest rate to convert this into an income figure for purposes of the cost-benefit analysis. Assuming a rate of 3.5% (the average Federal Funds rate over 10 years up to 2008) for this purpose, the annual returns attributable to capital optimization are \$25M¹⁴.

Buy side counterparty¹⁵/ mark-to-market risk associated with institutional trades can exist on either side of the transaction: the buy side’s exposure to the street side, or vice versa. As participants only raised this concern with respect to buy side exposure to the street, we did not include any benefit attributable to reduction in broker-dealers’ exposure to the buy side. The rationale for this exclusion is that, in general, buy side players have a more conservative business model, and are significantly less likely to default than broker-dealers.

¹³ The estimated T+3 Clearing Fund requirements assume implementation of the accelerated trade guarantee, which would advance the time at which street side activity is guaranteed by NSCC.

¹⁴ If these funds were invested in alternative ways to Fed Funds, that yielded a 5% or 10% return, annual returns would be \$30M and \$60M for T+2, respectively

¹⁵ The analysis assumes NSCC is able to effectively fulfill its role as central counterparty for the street-side trades.

We developed a “stress scenario” loss which captures broker-dealers risk of default consistent with probabilities implied by their credit ratings, and a “major failure scenario” which captures the loss from a very high volume / very high volatility event, which occurs much less frequently but could be up to once every ~10 years. We used broker-dealers’ credit ratings and estimates of default likelihood but did not assume any domino effects.

The results of our buy side mark-to-market exposure analysis are presented in Figure 10 below. The reduction in buy side losses is approximately \$100M, or 35%, for the stress scenario and \$1B, or 40%, for the major failure scenario. Because these two potential losses are additive, the reduction in expected annual loss is approximately \$200M across the industry (assuming a stress scenario once per year, and a major failure once per decade). It is worth noting that some buy-side firms can put in place certain strategies to mitigate these potential losses ahead of failures, for example by reducing their business with troubled counterparties or hedging their outstanding exposure. Conversely, operational cost and complexity arising from dealing with a failure and the requirements to replace all outstanding trades are additional costs that are not captured in this analysis.

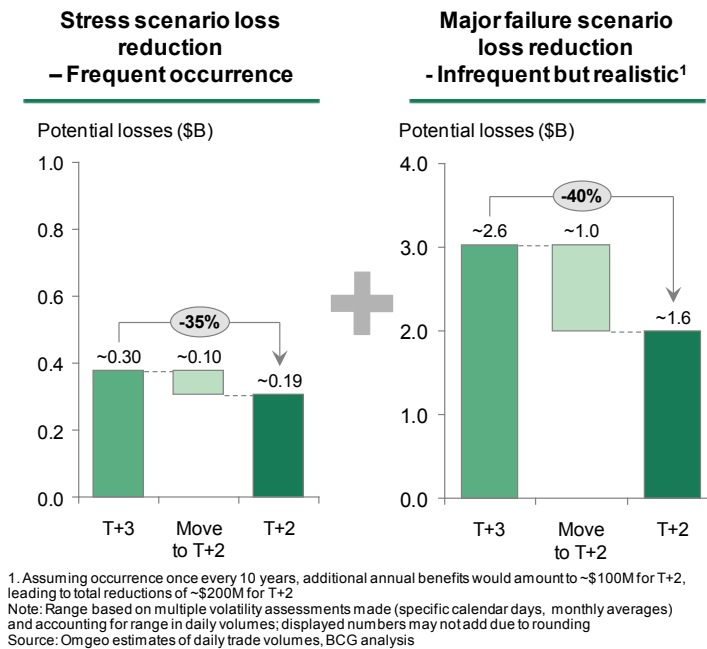


Figure 10. Reduction in potential DvP mark-to-market loss following transition to T+2

Having concluded the summary of the economic implications of the T+2 operating model, we will now describe the results of the T+1 operating model analysis.

4.3 Economic cost-benefit analysis of T+1 operating model

Following the same approach as in the economic analysis of the T+2 operating model described above, we will look at the investments required for and benefits resulting from implementation of a transformative T+1 operating model. In this case, as in the last, the required investments and resulting benefits are assessed assuming our current T+3 model as a starting point. It is worth noting that, for a shift to a T+1 model to succeed, adherence to a “trade date” environment for clearing and settlement has to be established throughout the industry. We modeled the cost reduction upside from such an industry outcome in Section 4.4.1.

Required investments

Transitioning to a T+1 model would require a significantly larger level of effort across the industry, as more firms would need to make significant investments to put in place new systems and/or transition existing systems and processes from a batch mode of operation to near real-time.

The types of changes driving investments and upper range of dollar values for these are summarized in Figure 11 below. Although these amounts are much higher than anticipated for a T+2 model, the range of investments across segments and sizes of firms is similarly broad.

	Average investments	Examples of investments
Institutional B/Ds	Up to \$20M for large players	<ul style="list-style-type: none"> • Core platform changes to move to near-real time <ul style="list-style-type: none"> – Segregation processes, trade reconciliation, matching and break management • Stock loan and borrow (and recall) overhaul
Retail B/Ds	Up to \$15M for large players	<ul style="list-style-type: none"> • Infrastructure upgrades • Platform changes to move to near-real time <ul style="list-style-type: none"> – Matching and break management, settlement processing
Buy Side	Up to \$2M for large players	<ul style="list-style-type: none"> • Infrastructure build • Platform changes to move to near-real time interactions • Further automation to accelerate timeframes
Custodian Banks	Up to \$16.5M for large players	<ul style="list-style-type: none"> • Infrastructure upgrade • Platform rewrite and core process redesign to move to near-real time processing
Others	Investments vary by type of player	<ul style="list-style-type: none"> • Additional system changes at DTCC (e.g., near-real time processing) • Process review and interface updates for non-clearing B/Ds

Figure 11. Range of required investments by player type to transition to T+1

Core platforms and security loan recall overhaul are two primary investment drivers, for self-clearing institutional broker-dealers. Whereas average investments per firm are \$20M for large broker-dealers, medium and small firms would need to invest \$12M and \$4.5M, on average, respectively.

Self-clearing retail broker-dealers would primarily invest in infrastructure upgrades, including platform changes to enable real-time processing. Average investment per firm is \$15M, \$7M, and \$3M for large, medium and small broker-dealers, respectively.

As with a transition to the T+2 operating model, smaller institutional and retail broker-dealers that do not clear for themselves would need to make a minimal amount of investment to transition to T+1. This is due to the fact that most required investments will be made by service bureaus and correspondent clearing firms, and hence are captured elsewhere in the model.

Custodians would need to invest significantly in order to transition to T+1, primarily for infrastructure and platform builds to support near real-time clearing and settlement processes, as well as ancillary processes such as those related to stock loan for custodians that are also lending agents. Average investments per custodian would be \$16.5M, \$12M and \$1M for large, medium and small banks, respectively.

Compared to the other segments, the required investments of the buy side to transition to a transformed T+1 model are relatively smaller, but still approximately twice what buy side players would need to invest for the T+2 operating model. Again, system and platform changes to adapt to real time processing for clearing, settlement and related (for example, stock loan) processes are the key drivers of these investments. The average level of investments is \$2M, \$1.5M, and \$600k for large, medium and small buy side players, respectively.

Benefits to participants of the T+1 operating model

Similar benefits as described for T+2 would result from the implementation of a T+1 operating model, but with different magnitudes.

The **operations cost savings** that result from the above-described investments to enable the T+1 operating model are similar in nature to the savings described for the T+2 operating model. A T+1 model would require wide compliance with the described enablers across the industry. Interestingly, our engagement with industry participants through survey, interviews and deep-dives reflected

widespread skepticism of the feasibility of this change. Thus, on average, the incremental benefits reported (beyond T+2 operating model) were extremely limited. However, if behaviors were to change, as would be required for a T+1 settlement cycle, we estimate an additional \$195M in annual industry savings, as discussed further in Section 4.4.1 below.

The benefits attributable to **capital optimization** under T+1 are also significant. For street side transactions, the average Clearing Fund balance across all participants would fall by an additional \$400-900M (for a total reduction of \$1-2.7B from T+3), across the industry, the range representing typical versus high volatility periods. Converted to an annual profit and loss impact, this translates to up to \$35M in annual returns to industry participants compared to T+3 (assuming 3.5% return for a range of volatility scenarios)¹⁶. The reduction in industry-wide Clearing Fund requirements due to a T+1 settlement cycle is shown in Figure 12 below.

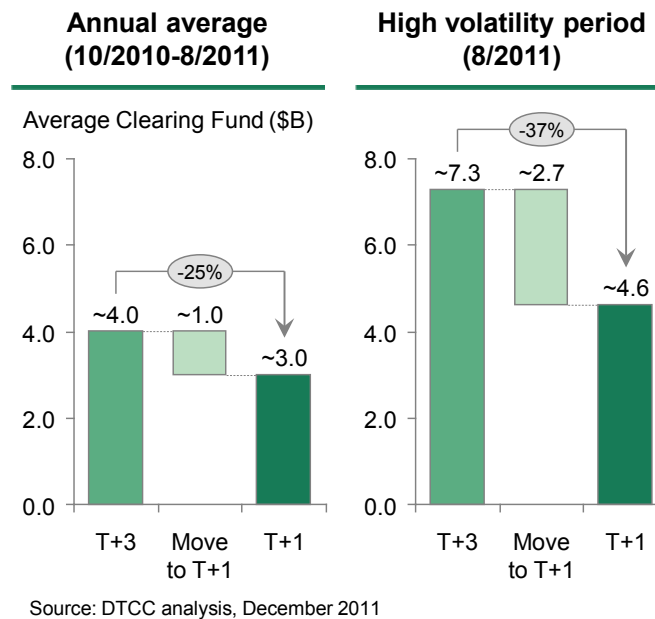


Figure 12. Impact of T+1 on average and high volatility Clearing Fund requirements¹⁷

Finally, the positive impact to buy side **risk reduction** in a T+1 environment is even more significant than under T+2. The total reduction in expected buy side losses following a move to T+1 is almost

¹⁶ If these funds were invested in alternative ways to Fed Funds, that yielded a 5% or 10% return, annual returns would be \$50M and \$100M for T+1, respectively

¹⁷ The estimated T+3 Clearing Fund requirements assume implementation of the accelerated trade guarantee, which would advance the time at which street side activity is guaranteed by NSCC.

twice the corresponding amount for a move to T+2. These reductions of 70-75% for a stress and major failure scenario are shown in Figure 13 below, and the approximate combined impact is a \$410M reduction in expected annual losses to the buy side.

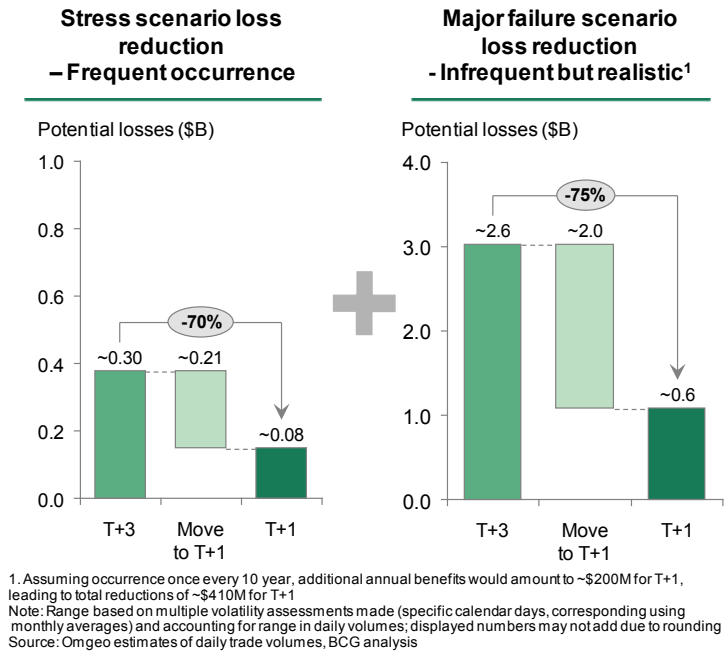


Figure 13. Reduction in potential DvP mark-to-market loss following transition to T+1

Although it is essential to understand the detail of the business case for the T+2 and T+1 operating models, as well as their differences, additional considerations also play into the comparison of the two models, especially in light of the tradeoffs discussed in Section 4.4.4 below. We discuss these additional considerations in the following section.

4.4 Economic comparison of T+2 and T+1 operating models

Having defined the elements of the T+2 and T+1 economic models, we now look at a detailed comparison of each (across investments, cost savings, capital optimization, and risk benefits), highlight additional considerations and suggest a set of tradeoffs that the industry should take into consideration in deciding next steps.

4.4.1 Cost benefit comparison between T+2 and T+1 operating models

Aggregating the firm-level investments and benefits described above across the industry provides a perspective on the overall impact of the two options under consideration: whereas the T+2 operating

model implies a significantly lower level of total investments and shorter payback period, a T+1 model results in roughly double the level of absolute benefits to the industry.

Investments are significantly higher for a T+1 operating model than for a T+2 model. Furthermore, although aggregate investments across the industry are significant, they are more modest on a per-firm basis, as is shown in Table 1 below.

	Number of firms	T+2 Investments	T+1 Investments
Industry total		~\$550 M	~\$1,770 M
Average investment per firm by segment (range)			
Institutional B/Ds	106 ¹	\$1 - 4.5 M	\$4.5 - 20 M
Retail B/Ds	101 ²	\$1.5 - 4 M	\$3 - 15 M
Buy side	546	\$0.3 - 1 M	\$0.6 - 2 M
Custodian banks	137	\$0.5 - 4 M	\$1 - 16.5 M
Others	Includes DTCC, Omgeo, Service bureaus, RIAs and non-self-clearing broker-dealers	<u>Total investments</u> ~\$70M	<u>Total investments</u> ~\$290M

1. Represents self-clearing institutional broker-dealers and correspondent clearers (capturing activity of institutional broker-dealers that do not clear their own trades);
 2. Represents self-clearing retail broker-dealers. Non-self-clearing firms investments included in "other" category
 Note: Total industry investment calculation takes into account leverage from Service Providers; Average investment per firm by size segment does not take into account leverage from service providers.

Table 1. Cost-benefit model outputs: Investments¹⁸

Each operating model will also have material **operations cost savings**. As shown in Table 2 below, there is limited difference between T+2 and T+1 driven by skepticism about behavioral changes.

¹⁸ For a description of the size categorization of each major market segment, refer to Table 4 on page 59 of the Appendix.

Cost-benefit model outputs: Operational cost savings

	Operations Cost Baseline¹	T+2 Ops cost savings	T+1 Ops cost savings
Industry total		~\$170 M	~\$175 M
Range of segment cost impacts² (%) and totals			
Institutional B/Ds	~\$0.9 B	~5% = ~\$45 M	~5-6% = ~\$50 M
Retail B/Ds	~\$1.8 B	~2 - 4% = ~\$55 M	~2 - 4% = ~\$55 M
Buy side	\$1.7 B	~2% = ~\$30 M	~2% = ~\$30 M
Custodian banks	\$0.3 B	~10 - 15% = ~\$40 M	~10 - 15% = ~\$40 M
Examples of operational cost reductions	<ul style="list-style-type: none"> • FTE reductions in client data management, exceptions management and institutional trade processing • FTEs and fees reductions from elimination of manual processing for physical certificates • FTE reduction associated with send/receive of instructions, confirmation / affirmation and exception management • FTE reduction associated with manual trade processing (e.g. input of transactions, etc.) 		

1. Baseline of clearing and settlement operations costs (FTEs and non-FTEs) for US Equities, Municipal and Corporate Bonds; 2. Displayed ranges represent averages for medium and large firms in each category, as there will be limited operational impact to small firms.

Table 2. Cost-benefit model outputs: Operational cost savings

Significant behavioral changes across the industry are a key prerequisite to a T+1 operating model, and these changes could lead to an additional upside of ~\$195M that is not reflected in the above table. Participants revealed widespread skepticism about whether or not “other” players across the industry will change behaviors in moving to T+1, as suggested by several quotations from our industry interviews and deep dives shown on the left side of Figure 14 below. A lack of behavioral change would offset other efficiencies generated by a T+1 operating model. However, systematic adoption of behavioral changes and adherence to a “trade date” environment would drive cost savings on several dimensions: by assuming a large reduction in manual processing at Custodians, reduction in fails, significant reductions in exceptions management and material reductions in reconciliation, client data management and trade processing for broker-dealers, industry-wide savings would increase to approximately \$370M from \$175M under T+1. This translates to an approximate doubling of savings (vis-à-vis T+1 without behavioral changes) for retail broker-dealers and custodians and a tripling of savings for institutional broker-dealers, as shown in the right side of Figure 14 below.

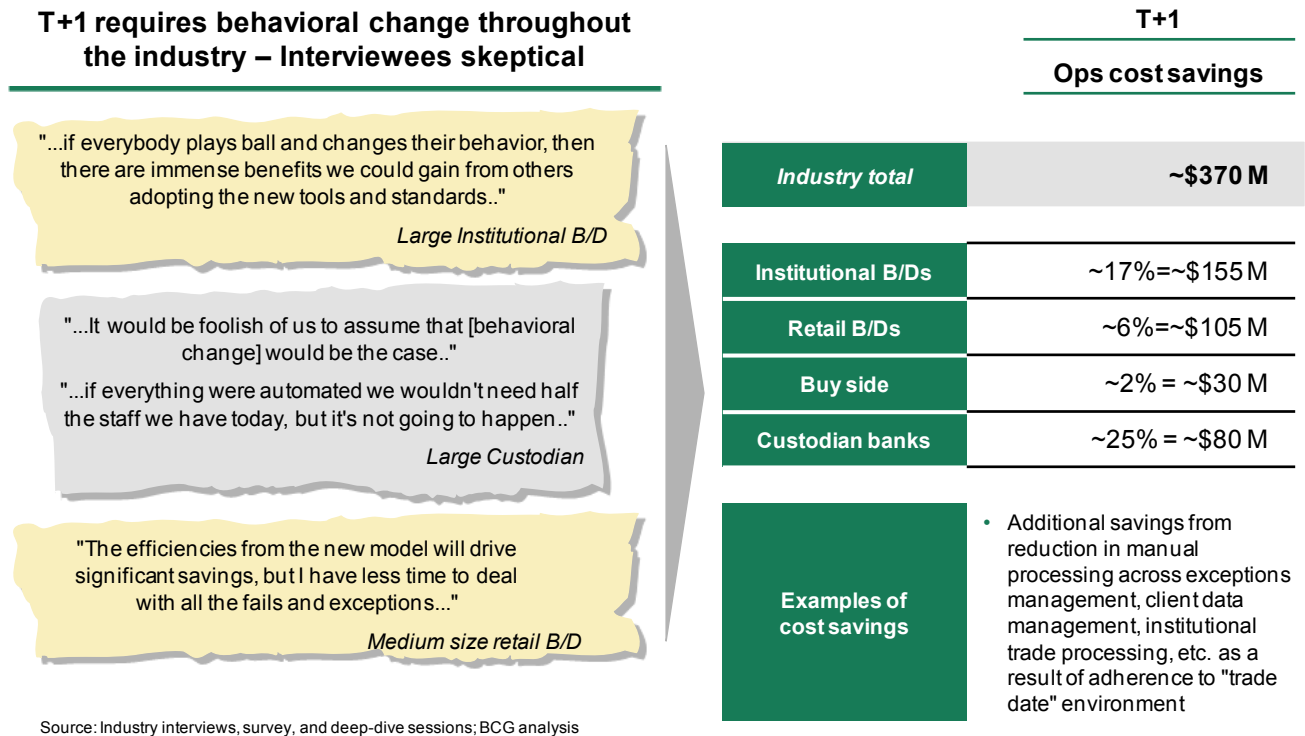


Figure 14. Evidence of skepticism across industry regarding behavior changes

The additional upside would require the industry to refute the beliefs of these skeptics by broadly changing behaviors and adopting best practices prior to transitioning to T+1. Examples of behavior changes that could drive this additional upside include:

- Increasing speed and efficiency through standardization and automation of communication for various processes (including institutional and street side clearing and settlement, stock loan processes, corporate actions, reconciliation and exception resolution),
- Increasing automated, streamlined processing of institutional trades through industry-wide, systematic usage of an enhanced SI solution, and
- Eliminating D/Ks and reducing fails and exception processing costs through adoption of match to settle.

Capital optimization through reduction in clearing firms' Clearing Funds requirements is the second key benefit that arises from a shortening of the settlement cycle. For each operating model, we considered the reduction in Clearing Fund requirements and multiplied by the average Federal Funds target rate for the 10-year period up until 2008 (3.5%) to convert this freed capital to an annual income statement impact. This results in annual savings for ~\$25M for T+2 and ~\$35M for T+1.

Risk reduction, specifically reduction in buy side exposure to the sell side, is the third key benefit arising from a SSC. A shorter settlement cycle also has the potential to materially reduce risks across the industry. Following the analytical framework discussed in detail in the full methodology (Section 6.1.2.5), the implied savings due to reduction in risk are material, at \$200M for T+2 and \$410M for T+1. However, we did not include these savings in our basic cost-benefit comparison of T+2 and T+1. Rather we will look at the impact to the overall payback period of each operating model should the risk reduction benefit be included, in the next section.

4.4.2 *Summary comparison of two models*

The inclusion of buy side risk reduction materially improves the industry wide payback, with all of this incremental benefit accruing to the buy side. As shown in Figure 15 below, the industry-wide payback periods including the benefits associated with buy side risk reduction are approximately one-half of the corresponding periods for T+2 or T+1 considering all benefits except risk reduction.

	T+2 payback period (years)	T+1 payback period (years)
Operational cost savings	3.3	10.1
Assuming adherence to trade date environment	N/A	4.8
Including Clearing Fund reductions	2.8	4.3
Also including buy side risk reduction	1.4	2.2

Source: Industry interviews, survey and deep-dive; BCG analysis

Figure 15. Payback period comparison including different benefit types

As shown above, the T+2 model has a faster payback period, with or without inclusion of the benefits from risk reduction. However, although this shorter payback period implies a stronger business case for near-term change with T+2, the absolute benefits of T+1 are superior (especially if we include risk reduction). Also, the long-term business case for T+1 may improve as firms independently transition to a “trade date” mentality and invest in technologies to support near real-time clearing and settlement. These factors should be taken into consideration as the industry plans for next steps; even if a move to T+2 is determined to be most appropriate in the near term, the overall benefits of a T+1 settlement cycle should be taken into consideration in setting a long-term aspiration for the industry.

Importantly, the payback period to individual constituent segments is also relatively short in each operating model, a potential indicator of the ability to build consensus around change. Figure 16 below provides this breakdown for each model, as well as segment-level payback periods based on all benefits and, more conservatively, direct operations cost reductions alone.

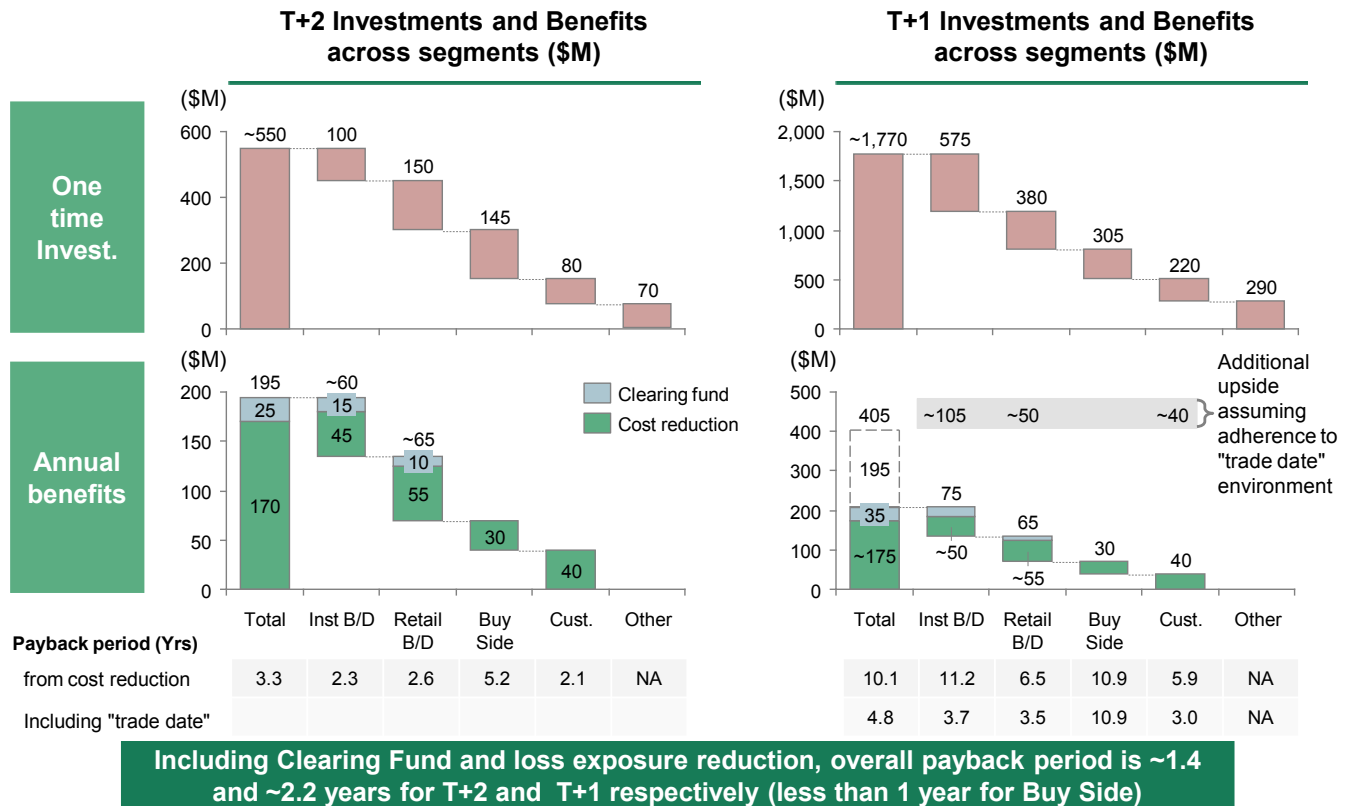


Figure 16. Investment and benefit breakdown by constituent type

The payback period range is still quite favorable for most segments, considering only operations cost savings for the T+2 model. The longest payback period is 5.2 years for the buy side and other constituent groups have comparatively short payback periods ranging from 2.1 to 2.6 years. The segment-level payback periods for the T+1 operating model have a somewhat higher range. Excluding the buy side, these payback periods range from 3.0 to 3.7 years, assuming adherence to a “trade date” environment. The buy side payback period is 10.9 years, but this is based on relatively low operations savings only and does not take into account the significant additional upside due to risk reduction, which would shorten the payback period for the buy side to less than one year for either operating model.

4.4.3 *Additional considerations*

The key additional considerations to take into account when assessing either model are the operational ease with which firms could transition to and function within either cycle, and the relevance of international markets and global harmonization to the direction the United States should take.

From an **operational ease** perspective, we have already discussed the broad feedback from participants regarding a T+2 model: it could be accomplished largely with minor systems changes and more significant behavioral changes. A critical part of this is the fact that, in most cases, batch processes could be maintained in a T+2 environment with minimal consequences. Shortening the settlement cycle to T+1, by contrast, could strain participants' ability to meet new deadlines given their current reliance on batch processes (either their own or at counterparties). For this reason, a key element of change for T+1, the industry would need to invest in more infrastructure to support near real-time processing. Considering broader processes and unintended consequences, a key challenge that arises is the impact on stock loan given a shorter settlement cycle. Due to the current reliance on batch processes between many custodians and 3rd party lending agents, securities lending processes would require significant transformation to enable T+1 settlement. Trade communications between investment managers and custodians may also require changes to be made more near real-time to avoid delays in notifying lending agents of a sale being made. Furthermore, a T+1 settlement cycle would require a significant reduction in recall timeframes, which could be problematic unless borrowers changed their processes and behavior to incorporate shorter (less than one day) recalls.

As noted previously, several prominent international markets are currently operating at T+2, and to improve **global harmonization**¹⁹, a group convened by the European Commission recently recommended a move to T+2 for the Euro-zone, which will likely be implemented in the next few years. Our research also revealed broad skepticism on the part of representatives regarding the feasibility of international markets harmonizing around T+1 in the near future. The key impediments to such a move would be the need for near real-time communications infrastructure internationally, as well as a way to resolve exceptions given differences in time zones without creating unwarranted burden for foreign players. Given these considerations, T+1 does not appear to be feasible on a global basis in the short-term.

¹⁹ Prior to the implementation of Target2Securities (T2S)

4.4.4 Tradeoffs to be balanced between various approaches to a SSC

In considering the current state of and potential paths forward for the industry, two fundamental tradeoffs emerge. Striking a balance between different perspectives on these trade-offs is essential to building consensus across the industry and implementing change.

The first concerns the **level of investment required versus degree of transformative value** of a new settlement model. On one hand, the industry could aim to create the most value, significantly transforming settlement for US equities, corporate and municipal bonds. On the other, a less aggressive (but less impactful) path could be chosen. Significant transformation would bring the greatest amount of benefit across the industry, but it would also require a much bigger effort in the short term and a higher level of coordination between different players. For example, migrating core-platforms to near-real time processing is a massive undertaking that would require significant investments. Also, near real-time communication of trade details could only be broadly effective if most or all firms invested in the required technology. A small minority of laggards could detract from the benefits that might otherwise accrue to all firms. For reasons such as these, the degree of transformation should be weighed against the ability and bandwidth firms have to currently undertake significant efforts incremental to their in-flight projects (often regulatory-driven, and as such, non-discretionary) as well as the range of outcomes if broad adoption is delayed.

In the event the industry decides to shorten the settlement cycle, it would need to decide how to proceed: **in one step or incrementally?** Proponents of a direct move point out that the costs of change itself (planning, designing, testing, etc.) are material and accrue additively if change occurs in multiple steps. Those that argue for a more incremental approach suggest that rapidly changing multiple systems is harder to coordinate across various players and can lead to unintended negative consequences, such as an increase in fails if some players adopt new processes slower than others. From this perspective, the expected costs of a phased approach might be slightly higher, but the unanticipated consequential costs (and risk) would be much lower.

These tradeoffs need to be balanced in charting a course for the industry regarding a shorter settlement cycle: degree of transformative value, whether to optimize by industry segment or across all segments, and how to structure the approach to change. Considering these tradeoffs, the required investments and benefits, and the considerations outlined above, the industry should evaluate the comparative merits of a move to either T+2 or T+1. In the following section, we will look at the key next steps that the industry should undertake in deciding on a path forward.

5 Next steps

The key next step for the industry is to socialize the findings of this research and decide upon the most appropriate path forward regarding a SSC. Should the industry deem it appropriate to implement a SSC, it should then clearly define a timeframe that accommodates current or planned regulatory initiatives, and involve regulators and rule-making bodies in the process of initiating change. The following sections describe the importance of socialization as a next step, the appropriate timeframe and roadmap for implementation, and the role of the regulators in this process.

5.1 Socialization of findings and determination of next steps

Given the far-reaching implications of a shorter settlement cycle on the industry overall, as well as the different end-state and implementation options, the next step for DTCC is to socialize the findings of this study across the industry in order to develop a recommendation for a path forward.

Effective socialization of the findings of this study is essential both to determine a recommendation and to build cross-industry consensus around it. As part of this effort, DTCC will engage with regulators, industry forums and a broad set of key participants and stakeholders. Next steps would include:

- **Through December 2012:** Initial socialization of study findings with industry participants and forums to understand the industry's position on accelerating settlement.

Should the industry agree to move forward with a SSC, additional steps might include:

- **Through January 2013:** Engagement of regulators to determine appetite for change and willingness to support.
- **February-March 2013:** Broad syndication of proposal across industry, with appropriate regulatory involvement, including publishing a calendar outlining the specific timeframes for transition to the proposed plan. This calendar should coordinate the elements of the transition with obligations arising from existing regulatory changes to minimize undue burden on industry participants.

5.2 Illustrative timeframe for implementation of a shorter settlement cycle

Should the industry decide to move forward with a SSC, the establishment of a calendar that defines the cadence for change and coordinates with other industry initiatives will have material value for various constituents. To this end, we have estimated timeframes for change based on industry feedback that should also be validated during the socialization process. Our research suggests that T+2 could be achievable within 3 years of a clear decision to pursue it, whereas T+1 is achievable within 4 to 6 years following a move to T+2.

Firms indicated mixed levels of complexity and required investment in order to move to T+2. For many, the move would largely be a non-event, with a subset of firms across all industry segments indicating readiness to move to T+2 today, or within the next few years given enhancements or integration with service bureaus that are already planned. Two factors were taken into consideration in developing a timeframe for firms that would have to invest to modify existing systems to transition to T+2:

- Bandwidth for change given pre-existing, mandatory regulatory initiatives
- Extent of requisite investments compared with budgetary limits

For firms of each segment, we estimated the number of years over which the investments in necessary changes would need to be spread given firms' respective "Change the Bank" budgets, discounting to account for other current and future mandatory regulatory initiatives. This analysis indicated that the feasible T+2 timeframe is constrained by the investments required of the institutional broker-dealer segment, which will take up to 3 years for some firms.

This analysis acknowledges that there will always be other regulatory initiatives demanding the attention of firms, and thus there is never a "right" time to implement a cross-industry change initiative. Nevertheless, this timeframe will reduce the degree of conflict with the large confluence of current regulatory changes associated with Dodd-Frank, FATCA, Basel-III, Legal Entity Identifier (LEI) proliferation, implementation of the SEC's consolidated audit trail, and other initiatives.

A number of firms across different categories also indicated readiness for a near-immediate move to T+1, although the degree of change required by less-prepared firms dictates a longer implementation timeframe. Following the same analysis as described above for the T+2 case, we developed timeframe ranges for firms within each segment, subject to the budgetary requirements of other current or anticipated mandatory regulatory changes. Again, the feasible timeframe for the industry

is constrained by the investments required by institutional broker-dealers and custodians, at 6 years. The results for all segments are shown in Table 3 below.

	T+2	T+1
Institutional B/Ds	up to 3 years	up to 6 years
Retail B/Ds	up to 2 years	up to 4 years
Buy side firms	up to 1 year	up to 3 years
Custodian banks	up to 2 years	up to 6 years

Table 3. High-end estimated implementation times for T+2 and T+1

5.3 Regulators and industry utilities will play a central role in move to SSC

Regulators and rule-making bodies, industry utilities and exchanges will play an important role in facilitating and supporting a move to a shortened settlement cycle. Throughout our interviews most broker-dealers and custodians agreed that a regulatory mandate would be required, a perspective that was validated in the industry survey as shown in Figure 17 below. RIAs and buy side firms tended not to agree that a mandate was necessary. However, most agreed that, at the very least, clear regulatory support of a SSC was a key prerequisite to shortening. This could include rule changes to enable a shorter cycle or clear indication from regulators that a shorter cycle would be supported.

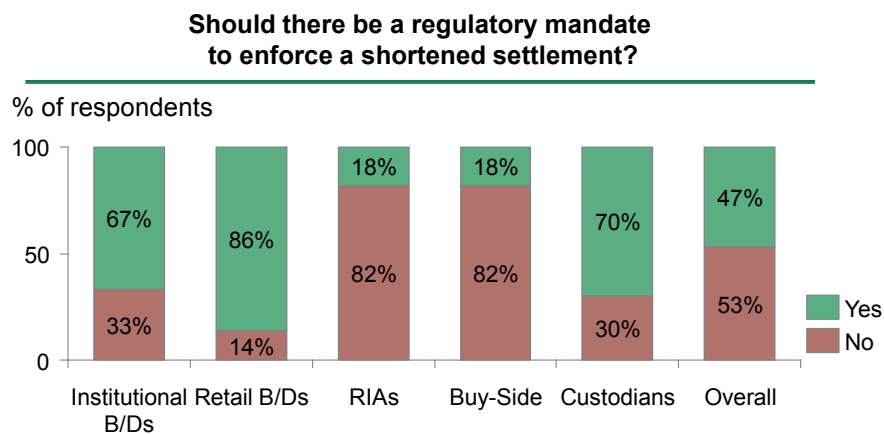


Figure 17. Industry perspectives on necessity of a regulatory mandate for a SSC

Corresponding to the shortening of the cycle itself and its accompanying enablers, we researched the existing regulations likely to be impacted. These include changes to rules and regulations by regulators and SROs. A summarized list of these potentially impacted regulations is presented in Figure 18 below.

Regulatory body or organization	Relevant rules and regulations
Securities and Exchange Commission (SEC)	<ul style="list-style-type: none"> • 15c6-1: setting standard settlement timeframe for most securities transactions • Rule 204 of Regulation SHO: requiring "close out" of all FTD positions by morning of T+4 (T+6 for market makers)
Financial Industry Regulatory Authority (FINRA)	<ul style="list-style-type: none"> • FINRA Rule 11320: Regarding "regular way" transaction delivery dates
Municipal Securities Rulemaking Board (MSRB)	<ul style="list-style-type: none"> • Rule G-12(b): settlement dates for regular way transactions
Securities Industry and Financial Markets Association (SIFMA)	<ul style="list-style-type: none"> • Master Securities Loan Agreement Sec. 6.1(a): regarding standard recall timeframe for non cash collateral
Depository Trust & Clearing Corporation (DTCC)	<ul style="list-style-type: none"> • Settlement timeframe rules and processes
Exchanges	<ul style="list-style-type: none"> • Corresponding rules regarding settlement timeframe for regular way transactions

Figure 18. Summary of rules and regulations potentially impacted by a SSC

In addition to these impacted changes, several new regulations and rules may need to be developed to support the operating models defined in Chapter 3. These include a DTC rule change to enforce match to settle, industry guidelines regarding the use of a cross-industry SI solution, and a regulatory mandate supporting the dematerialization of physicals. As a next step, it is important for DTCC to socialize the results of this analysis and to ensure alignment with regulators and key industry groups prior to initiating any change.

6 Appendices

6.1 Detailed data sources and methodology

6.1.1 Data sources

Our analysis draws on six main sources: Expand® benchmarks and additional proprietary BCG data sources; background research, including international best practices of markets settling in shorter cycles; 73 interviews across the industry; 70 survey respondents of various types, sizes and level of process sophistication; targeted deep dives with 10 firms representing the various industry segments; and internal interviews with DTCC and Steering Committee meetings. Interviews, surveys and deep dives collectively captured input from 94 institutions and 109 different entities (including different business groups within large financial institutions that were engaged separately).

Expand® benchmarks and additional proprietary BCG data: In the initial phase of this project, we developed a clearing and settlement cost baseline by segment across IT, operations costs and relevant DTCC and Omgeo fees. We leveraged prior BCG experience and proprietary data, BCG Global Asset Management benchmarks, proprietary Expand® benchmarks in capital markets and wealth management operations and IT, and DTCC and Omgeo fee to data develop this cost model.

<p>Company Overview</p>	<p>Expand is a London-based firm offering IT benchmarking services to capital markets clients</p> <ul style="list-style-type: none"> The company has 5 partners and 40+ employees with offices in London, New York, and Singapore
<p>Product offering</p>	<p>Expand's primary focus is IT benchmarking in capital markets</p> <ul style="list-style-type: none"> 20+ benchmarks provided to over 25+ clients Currently expanding its benchmark offering to include capital markets operations benchmarks Expand offers a Wealth IT and a Commodities IT benchmark <p>Expand also organizes and facilitates executive-level forums and round-table discussions for clients to share best practices</p>
<p>Clients</p>	<p>Expand's clients include many of the world's leading investment banks and investment banking divisions of universal banks</p> <ul style="list-style-type: none"> Expand's typical points of contact are CIOs and heads of tech in key product areas

Figure 19. Expand® overview and product offering

Background research and international interviews: We also developed a fact base of current initiatives relating to shorter settlement (domestically and internationally) and potential obstacles to a shorter cycle given where this industry is today. Interviews with representatives from foreign clearing agencies and regulators (covering the European Union, Hong Kong, Germany and Canada), and a review of published literature from 2000 onward contributed to this effort. This fact base provided a broad set of international perspectives and potential challenges and enabled the development of working hypotheses to test in industry interviews.

Industry interviews to understand perspectives and insights into challenges today, impediments and requirements: In this phase, we tested our initial hypothesis, gained insights into additional issues and potential challenges, and developed an initial understanding of perspectives on settlement inefficiencies, process simplification opportunities and shorter settlement initiatives held by various industry participants. We conducted interviews with 73 entities, including 19 institutional broker-dealers, correspondent clearers and prime brokers; 9 retail broker-dealers; 15 asset managers, hedge funds and other buy side firms; 12 registered investment advisors (RIAs); 9 custodians banks; and 9 other entities, including back and middle office technology providers and other service bureaus, transfer agents, alternative trading systems, and exchanges. We covered firms of different sizes, having various business models and operational setups (level of automation/ process sophistication).

Cross-industry survey to quantify key dimensions of change and test potential future

operating models: Following the industry-wide interviews, we distributed a survey to over 260 industry participants across all segments. In the survey we tested various scenarios for a SSC as well as the impact of different sets of accompanying changes that could enhance or help enable a shorter settlement cycle. Survey questions covered:

- Firms' current business model, operational setup, and level of readiness for a shorter cycle;
- Perspectives on settlement efficiencies, process simplification, and shorter settlement (overall as well as for specific scenarios);
- Perspectives on expected risk reduction and impact to fails, and necessity of regulation to achieve change; and
- Estimates of required investments and cost impacts of each of the four scenarios presented.

We received survey responses from 70 participants, including 20 institutional broker-dealers, prime brokers and correspondent clearers; 12 retail broker-dealers, 17 buy side firms; 14 registered

investment advisors (RIAs); and 7 custodian banks. When necessary, we followed up with the respondents to clarify and confirm their input.

Targeted deep-dives to confirm understanding of process-level impacts and provide further context for model development: We then conducted in-depth working sessions with a number of players to better understand: (i) the specific ways in which processes would be impacted by shortened settlement, (ii) the specific investments that firms would need to make for a shortened cycle, and (iii) the resulting cost impact these changes would have. Over a month and a half, we held detailed working sessions with three institutional broker-dealers, two retail broker-dealers, two buy-side firms, two custodian banks, and one service provider.

Steering Committee meetings and internal interviews with DTCC staff: Steering Committee meetings were held on a biweekly basis providing the team with the opportunity to share progress, analyses and findings and incorporate the Steering Committee's input, guidance, and feedback.

The Steering Committee was comprised of 16 members, representing 14 different institutions: Bank of America-Merrill Lynch, Blackrock, Broadridge, Goldman Sachs, JPMorgan Chase, Morgan Stanley, Nomura, Pershing, State Street, and UBS, in addition to one medium-sized retail broker-dealer, one large buy-side firm, DTCC and SIFMA. In addition, internal interviews with DTCC staff provided background to our research.

Whereas industry interviews enabled us to understand the key pre-requisites of various settlement models, more focused deep-dives and the cross-industry survey were key to quantifying the costs and benefits of various approaches. We incorporated data from both sources in developing operating models and industry cost-benefit analyses for a T+1 and T+2 settlement cycle.

6.1.2 *Methodology*

6.1.2.1 Overall industry baseline

To lay the groundwork for the analysis of these T+2 and T+1 scenarios, we first developed an overall post-trading cost baseline using multiple approaches and top-down and bottom-up calculations. For example, we estimated the sell side clearing and settlement costs baseline, comprising both institutional and retail broker-dealers, by comparing three independent analyses:

- **Based on cost per trade:** In this approach we multiplied DTCC sides per year by cost per side (per asset class), based on BCG experience and Expand® data for Operations and IT costs for Equities and Fixed Income.
- **Based on industry revenue estimates and profit/cost ratios:** For this method we multiplied 2010 revenues of in scope-assets by average profit margins and Ops/IT cost ratios, leveraging BCG experience and 2010 market report
- **Based on institutional and retail costs as reported in survey and deep dives:** We multiplied cost per trade estimations reported by each industry participants by their respective number of trades.

A second step in laying the groundwork for the investment and cost analysis was to develop an accurate count and categorization of types of players by segment and size. For purposes of this study, we split the industry into four major segments: self-clearing institutional broker-dealers (segment includes correspondent clearers and prime brokers), self-clearing retail broker-dealers, buy side firms, and custodian banks. Each segment was then sub-divided into three groups (large, medium and small), based on criteria appropriate to that group (e.g., settlement activity for broker-dealers, assets under management for buy side firms), as is shown in Table 4 below. DTCC data, industry research, BCG experience, and public data sources were leveraged to develop an accurate count of players in each size group and industry segment. In addition to these for segments, we included other constituents (registered investment advisors (RIAs), non-clearing broker-dealers, service bureaus as well as utilities such as DTCC and Omgeo) to ensure a complete picture of the industry participants.

	<i>Categorization metric</i>	Small	Medium	Large
Institutional B/Ds	<i>DTCC settlement fees</i>	< \$0.1 M	\$0.1-1.2 M	> \$1.2 M
Retail B/Ds	<i>DTCC settlement fees</i>	< \$0.1 M	\$0.1-0.45 M	> \$0.45 M
Buy side firms	<i>Assest under management</i>	\$1-50 B	\$50-500 B	> \$500 B
Custodian banks	<i>DTCC 2011 billings</i>	< \$0.5 M	\$0.5-10 M	> \$10 M

Table 4. Size categorization breakpoints for major market segments

6.1.2.2 Scenarios analyzed

Based on our interviews, we constructed four scenarios for a shorter settlement cycle that were tested in the industry-wide survey and deep-dive working sessions. These included basic and enhanced T+2 scenarios and an enhanced and transformative T+1 scenarios, differentiated by the type and degree of ancillary market changes that would accompany and facilitate the transition to a shorter cycle (shown in detail in Figure 20 below). The structure of these scenarios, combined with the sub-categories of investment and cost impact questions we asked, enabled us to identify the investments attributable to shortening per se as well as the components of change.

	Settlement cycle	Affirmation/ authorization/ reclaims	Matching method	Utility for some back & middle office functions	Rules on fails	Physicals	ACH rescission
Shorter cycle – Basic T+2 (scenario 1)	Same times / one day earlier	No change, higher DTCC fees if not affirmed	No change	None	No change	Keep T+3 process, higher fees on withdrawals	No change
Enhanced T+2 (scenario 2)		Required trade affirmation/ match to settle; Mandatory receiver authorization	Mandate central matching	Limited (e.g. reference data (SSI) central repository)	Higher DTCC fees for fails	Enable trade only after certificate delivery to TA	Shorter timeline (24 hours?)
Enhanced T+1 (scenario 3)	Settlement begins at 2am on T+1	Custodians authorization part of affirm	Mandate central matching & encourage pre-allocation	Significant (e.g. SSI repository +AML/KYC compliance)	Mandatory buy-in	Ban physicals for DTCC-eligible securities	No rescission
Transformed T+1 (scenario 4)							

Figure 20. Scenarios constructed and tested in survey and deep-dive working sessions

We leveraged input from the survey on scenario preferences as well as deep-dive discussions in deciding which scenarios to carry forward to the cost-benefit phase of the analysis. Among the two T+2 settlement scenarios tested in the survey, Enhanced T+2 emerged as the preferred option. Enhanced T+2 could be achieved by changing behaviors and instituting a relatively modest amount of systems changes. A batch model, for example, could be largely maintained without causing a problem for T+2 settlement (although multiple intraday batches or near real-time processes would still be a preferred alternative). Additional changes included in the Enhanced T+2 model reduce or eliminate the unintended consequences of schedule compression and further improve efficiencies by

reducing the number of upstream exceptions. We incorporated feedback from interviews and deep dives to develop a viable T+1 settlement scenario that combined the most favorable elements of Enhanced T+1 and Transformed T+1. Participants still anticipate a significant level of investments in process change and infrastructure in order to enable T+1 settlement.

The two operating models that emerged from this process, an enhanced version of each T+2 and T+1 scenarios, served as the basis of the detailed cost-benefit analysis, which leveraged quantitative data from the deep dives, survey, Expand® and other public and proprietary industry data sources. A full description of each model, including the package of changes that would precede or accompany the transition to a SSC in each case, is covered in Chapter 3.

The details of our cost-benefit analysis, including the methodology to develop investment, cost savings, capital optimization and risk reduction estimates, are described in the following sections.

6.1.2.3 Investments required and operational costs savings

Having developed a cross-industry cost baseline and categorized firm counts, our next step was to determine the level of investments and potential costs savings for the average player within each segment and size group, for both the T+2 and T+1 operating models. From our deep dive working sessions and survey we collected multiple data points on investments and cost impacts for each segment. These data points were grouped by constituent and segment size and the result was used as an input into the model for the corresponding category.

Two sets of costs were considered, IT costs and operations FTE and non-FTE costs. The interviews and deep-dives indicated that the shortening of the settlement cycle should have no material bearings on the ongoing IT expenses. Survey and deep dive responses broke down ongoing operations costs by 8 to 12 categories, depending on constituent segment, from which respondents supplied an estimated impact to on-going costs for each scenario under consideration. We estimated the percentage of total operations costs comprised by each of these 8-12 categories based on deep-dives. After reviewing the data and validating responses with follow-up interviews where needed, we calculated the average cost impact of each respondent leveraging the impact by category and the corresponding percentage of total operations costs. We then averaged out these cost impacts for each participant segment and size category to determine an overall cost savings percentage.

6.1.2.4 Clearing fund impact and capital optimization

In addition to the operations costs savings gained from a shortening of the cycle, a shorter settlement cycle will have capital optimization benefits for clearing firms due to decreases in Clearing Fund requirements. Numerous factors contribute to DTCC's calculation of Clearing Fund requirements, several of which depend on the length of the settlement cycle. In order to determine the impact to member firms' Clearing Fund requirements from a SSC, we leveraged a recent analytical study developed by DTCC that looks at the change in Clearing Fund requirements were a T+2 or T+1 hypothetically in place for two actual historic time periods: a "normal" volatility period from October 2010 through July 2011, and a "high" volatility period observed in August 2011.²⁰

6.1.2.5 Risk impact

A shorter settlement cycle also has the potential to materially reduce risks across the industry. Participants in interviews and deep dives identified attenuation of buy side exposure to sell side firms as a key risk-related outcome of a SSC. Market risk on outstanding, unguaranteed institutional trades translates into actual losses should a sell side counterparty default and fail to fulfill its obligations, and a SSC reduces the amount of this exposure and risk. To dimension the attributable benefit, we considered the volume of outstanding trades and overlaid market volatility and probability of default of broker-dealers.

We evaluated loss reduction potential considering two distinct scenarios: a *stress scenario*, which could involve the default of a second- or third-tier institutional broker-dealer, and a *major failure scenario*, which captures the loss from a very high volume / very high volatility event, which occurs much less frequently but could be up to once every ~10 years. For each scenario, we looked at typical volumes and average market volatility during similar historical periods. We combined this data with publicly available default probabilities of each broker-dealer, and determined an annual expected loss to the buy side, assuming the major failure scenario is likely to occur approximately once per decade. A summary of the elements of this risk model is shown in Figure 21 below.

²⁰ This 'point in time' analysis is meant to be directional, considering the fact that DTCC modifies the way in which it calculates Clearing Fund requirements from time to time.

	Exposure	Market volatility	Default probabilities
Stress Scenario	<p>Average volumes for 'high-volatility' dates</p> <ul style="list-style-type: none"> • \$150 to 200B / day – August 2011 • Estimated by Omgeo 	<p>Average market volatility across settlement cycle for 'high-volatility' dates</p> <ul style="list-style-type: none"> • Using S&P 500 volatility for August 2011 <ul style="list-style-type: none"> – 2% to 5% volatility 	<p>Default probabilities for each broker-dealer</p> <ul style="list-style-type: none"> • Leveraging public credit ratings¹ and implied likelihood of default
Major Failure Scenario	<p>Typical volume in a crisis situation / major failure</p> <ul style="list-style-type: none"> • 3x average to high volatility volumes • Based on October 1987 and Lehman failure period 	<p>Typical volatility in a crisis situation / major failure</p> <ul style="list-style-type: none"> • 3x 'high-volatility' periods • Based on Lehman failure period <ul style="list-style-type: none"> – 6% to 14% volatility • October 1987 witnessed over 20% one-day volatility 	<p>No domino effect assumed</p>

1. Credit ratings for subordinate debt from S&P, Moody's and Fitch, matched to historical probabilities of default. Bloomberg default risk also incorporated when available. Source: Yahoo! Finance (historical index data), Bloomberg (credit ratings), BCG analysis

Figure 21. Buy side exposure and potential loss model assumptions

6.1.2.6 Scaling up investments and cost, capital and risk impacts to industry

After developing average investment and cost, capital and risk impacts for each participant segment and size category, these values were scaled up to the industry by using the total count of players for each segment and size group. Survey and deep dive responses also enabled us to determine the extent to which investments would be shared with service providers. This information is critical as it allows us to avoid double-counting since we had independently captured the investments required for service providers. Our analysis showed that total industry investments did not change materially when this assumption was changed for the various constituent groups. The results of the above-described analyses are covered in detail in Chapter 4.

Having described the background, approach and methodology of our research, we now present the findings from our industry outreach, including the degree of industry receptivity toward a shorter cycle and the elements of a business case (investments and corresponding benefits) from a SSC.

6.2 Detailed recap of interview and survey results

6.2.1 Challenges with current settlement processes

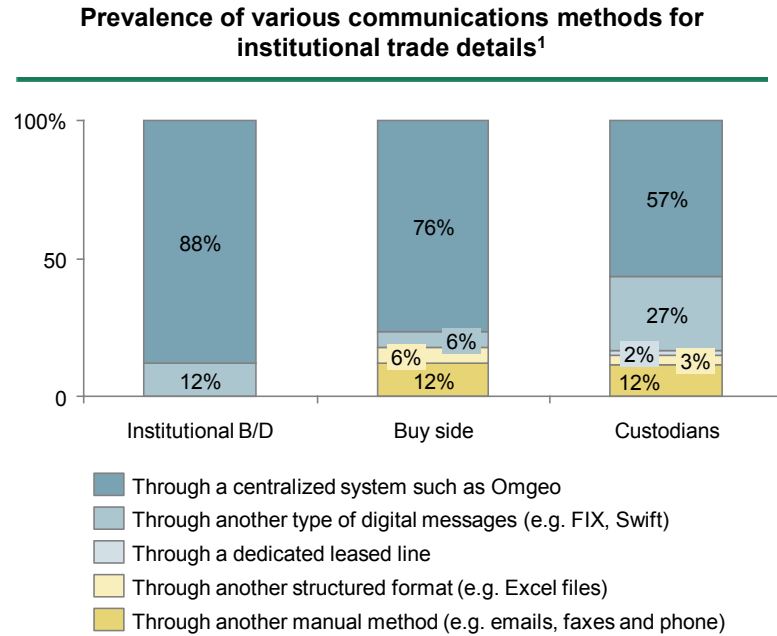
Despite improvements to processes and technology, several unresolved issues continue to add cost, complexity and uncertainty to settlement processes. These issues include inefficiencies and risk exposure in client side transactions, unnecessary cost and complexity related to physical certificate processing, and specific issues related to settlement of trades with foreign buyers.

This section describes the current barriers and challenges associated with the current clearing and settlement (C&S) process. We later describe the set of initiatives that will address these pain points and together will enable considerable industry efficiency enhancements, process simplification, risk mitigation and shorter C&S cycles.

6.2.1.1 Street side processes are highly automated, but inefficiencies in institutional matching remain

Improvements in technology and automation have substantially reduced errors, complexity and cost in the clearing and settlement of street side transactions over the last decade. Client side transactions, by contrast, continue to be a significant source of errors and miscommunications, often relying on non-standardized and manual processes. Two areas should be addressed to improve upon client side processes:

Outmoded technologies and inefficient processes include the persistence of some manual processes where transaction volumes would suggest , automation, and the predominance of daily batch processing, limiting available information and ability to act in near-real time. A number of firms rely on phone, fax or email for allocation and affirmation of trade details, as well as communication and maintenance of standing settlement instructions (between buy side firms, broker-dealers and custodians). The below graph shows that only a minority of firms with whom we spoke rely on non-automated messages for communication of institutional settlement information:



1. Specific question varied by constituent group: (Institutional B/D) What is your most common means of receiving allocations from buy-side clients in the U.S.? (Buy side) What is your most common means of communicating allocations to brokers in the U.S.? (Custodians) Identify the average proportion of settlement instructions received by these common means from your buy side clients.
Source: Industry survey; BCG analysis

Figure 22. Institutional trade detail communication method comparison

Nonetheless, these manual interactions create a significant operational and cost burden as the cost of processing a manual interaction is orders of magnitude higher than an automated one. Implementing straight-through processing (STP), either for its own benefits or to enable the shortening of the settlement cycle, implies automating the interactions between participants as well as their internal processes. Therefore, widespread implementation of more automated processes is essential to resolving this root cause of inefficient institutional matching.

Even for those firms that have implemented more-automated processes, **a lack of standardization across the industry** increases complexity and uncertainty in clearing and settlement of client side trades. For example, despite the availability of sophisticated services facilitating institutional trade matching, many firms (including the most automated) either: (i) do not utilize available services, arguing that options are too limited and/or costs are too high, or (ii) utilize existing services but leverage them in different ways to communicate trade details. For example, buy side firms have reported at least three methods of sending settlement details to their custodian banks following successful trade agreement-stage matching:

- Sending automated messages via an institutional trade matching systems,

- Sending, in addition to the above, an independent message sent to a custodian bank, with the expectation that the bank reconcile the two, or
- Sending only an independent message (electronic or not, automated or manual) to their custodian banks.

Many industry participants underscore the burden of **financing and processing costs to manage reclaimed institutional transactions** arising from outmoded technologies/ processes and a lack of standardization. Unlike many international markets, the United States does not require that trades be matched at the depository prior to settling. Related to this, problems with reconciliation of trade details can cause institutional trades to be reclaimed on settlement day. Although only a small minority of institutional transactions settle without matching, these transactions are more likely to lead to a reclaim than matched transactions, and consequently increase the costs associated with financing and re-processing.

Other things equal, a lack of standardization will tend to increase complexity and costs to industry participants. As noted by European Commission group charged with the investigation of settlement cycle harmonization in Europe, “a key principle in securities processing is simplicity... any unnecessary increase in complexity ... does generate the potential for problems (cost, risk, etc.)” (European Commission, 2009). Trade breaks that result from, among other things, the lack of standardized communication methods across the industry, lead to a greater number of reclaims, unnecessary exceptions, incremental participant cycle time, inefficiencies and additional cost burden on the industry. Although the current state of technology implies that the industry has come much closer to addressing these challenges since 2000, significant work remains to be done.

6.2.1.2 Counterparty risk leads to a material amount of uncollateralized client side exposure

Counterparty risk is a second aspect of client side transactions that is problematic in the current environment. Unlike street side trades (which are guaranteed by NSCC), institutional trades expose counterparties to a material amount of risk. As the amount of risk is partly a function of the time between when parties commit to a transaction and when it settles, the current T+3 settlement cycle exposes firms to a greater degree of counterparty and market risk than a shorter settlement cycle would.

Additionally, since there is no central counter-party for client side transactions (a role played by NSCC for street side trades), there is little or no opportunity to “net” obligations to reduce counterparty exposure/ risk.

6.2.1.3 Physical certificates continue to represent a material amount of post-trade costs

Although the first two issues primarily impact parties to institutional transactions, physical certificates continue to be a significant issue for retail broker-dealers and, to a lesser extent, institutional broker-dealers. Some retail-focused firms continue to process as many as 300 physical certificates per day at significantly higher costs than securities in book-entry form. Other costs associated with physicals include vault maintenance, lost certificate surety, and shipping and insurance costs (SIA, 2004). Use of physicals has decreased significantly over time. Daily average withdrawals at DTCC are now below 500 certificates, representing a 94% reduction in withdrawal activity, respectively, since 2000 (DTCC, 2012). At the same time, the persistence of physical certificate activity at several broker-dealers ties significant infrastructure and resources for processing and settlement.

6.2.1.4 Foreign buyers/ cross-border transactions add complexity to institutional settlement

Transactions with foreign buyer of U.S. securities, specifically institutional trades, are another source of added complexity in settlement for many market participants. Lack of harmonization across markets, delays due to time zone issues or intermediaries, and a lack of compliance with institutional matching best practices all contribute to the complexity of settling transactions with foreign counterparties.

Lack of harmonization across markets: International markets settle trades following a variety of timeframes, which creates complexity for investors and broker-dealers operating in multiple geographies. Moving toward a synchronized settlement cycle across geographies could reduce this complexity significantly. Although such a move will ultimately require international consensus to achieve, and beyond the scope of our analysis, we point out the fact that several prominent markets (for example, Germany and Hong Kong) operate at a T+2 cycle today, and the European Commission has decided to move to T+2, citing the benefits of harmonization. This topic is discussed further in the description of changes needed and lessons learned from international markets below.

Delays due to time zone issues: Time zone differences between foreign buyers and domestic broker-dealers can cause normal settlement processes to be delayed in the current environment. Several

broker-dealers stated that they do not receive allocations from foreign buyers until T+1, likely because notices of execution (“NOEs”) are sent to buyers during their off-hours. Although this time lag is manageable in the current environment, it causes greater complexity for broker-dealers and limits their ability to improve SDA rates.

Delays due to intermediaries: In cases where foreign buyers of U.S. securities have a direct relationship with a foreign custodian that is not a member of DTC, another bank will serve as sub-custodian to the foreign custodian. The presence of intermediaries (e.g., foreign custodians) slows down the transfer of information between those making buy or sell decisions (investors) and those responsible for depositing cash or securities (U.S. custodians serving as sub-custodians).

Lack of compliance with institutional matching best practices: With respect to institutional matching practices, multiple broker-dealers have suggested that foreign buyers are also less likely to affirm institutional trades than domestic buyers. The end result of this behavior is a greater number of institutional transactions that are not affirmed in the trade agreement stage and are therefore more likely to encounter an issue in settlement.

6.2.2 *Physical prospectus delivery requirements add unnecessary cost*

Physical prospectuses delivery requirements continue to add processing cost for some products, including ETFs, mutual funds and certain other securities²¹. In 2005, the SEC changed the rules around prospectus delivery requirement for registered offerings (including equities and corporate bonds). Citing a high level of internet accessibility by investors across the market, the SEC instituted “access equals delivery” rules whereby prospectus were considered delivered so long as they were uploaded onto the SEC’s website, and hence accessible to investors (SEC, 2005).

Although “access equals delivery” significantly reduced processing cost related to registered offerings, several other asset classes, including ETFs and mutual funds, are not covered by these provisions (FINRA, Disciplinary and Other FINRA Actions, 2009). Multiple firms interviewed mentioned the complexity associated with these transactions, as well as how this arrangement could potentially impede a shorter cycle.

²¹ According to a disciplinary comment by FINRA following its fining of Wachovia for prospectus delivery failures, “the new access equals delivery rules [adopted by the SEC on Dec. 1, 2005] do not apply to mutual funds, ETFs and certain other securities issued by investment companies.” (FINRA, Disciplinary and Other FINRA Actions, 2009)

6.3 Detailed description of enablers for T+2 and T+1 operating models

6.3.1 Core enablers and enhancements for a T+2 settlement cycle and implementation considerations

In order to transition from T+3 to a T+2 operating model, the industry would need to implement a package of operational, technological and market infrastructure changes. In so doing, participants would enhance the operational processes associated with clearing and settlement. The activities associated with each type of change are described below.

Enabler 1: Migration to trade date matching

Migration to trade date matching would lead to significant improvement in early, straight through affirmation rates, and reductions in the cost and complexity of managing institutional trade exceptions and reclaims. Currently there are two standard methods for matching institutional trade details between investment managers and broker-dealers before settlement instructions are sent to DTC and custodians. A majority of firms continue to utilize sequential matching processes, whereby, following a notice of execution from the broker-dealer, an investment manager sends allocations, awaits a confirmation from the broker-dealer and then sends an affirmation, at which point the trade is “matched.” Streamlined matching processes, by contrast, eliminates the affirmation step, by making it implicit in the allocation. The investment manager still sends the account-level allocations, but once the confirmation is received and successfully matched with the allocation, the matching system can automatically generate the affirmation and send the matched trade details to all involved parties, including custodians. Currently available institutional matching systems can support streamlined matching processes, eliminating the need for a redundant affirmation step.

A key component to driving efficiencies in institutional matching is the standardization of formats and elimination of unnecessary manual processing. For example, investment managers use various methods to communicate settlement details to their custodians, and custodians have various methods of reconciling this information before committing to receive a trade on behalf of their clients.

To address this lack of standardization, the industry should adopt common formats and methods of communication that also reduce manual processes. Smaller buy side firms for whom it is not feasible to invest in automated systems to handle these communications could have several options:

- leveraging a third-party vendor or distributed platform to automate communications,

- utilizing web front-ends developed by matching systems or custodians to manually enter trade and allocation details, or
- uploading a file (e.g. Excel or CSV) in a standardized format to eliminate further manual processing on the receiving end.

Medium and large buy side firms and custodians should be able to leverage existing matching systems as well as FIX connectivity for the sending and receiving of allocations and instructions.

Implementing the above changes to streamline institutional matching and related communications will drive reductions in institutional trade processing costs, improvements in information accuracy, and reductions in trade breaks and reclaims across the industry.

Implementation plan/ timeframe considerations: Proliferation of streamlined matching processes and same day affirmation will take time to achieve, but near-term steps can be taken to accelerate this process. Existing matching utilities can compare the relative merits of sequential versus central matching processes to ensure that fee structures incentivize use of the most efficient methods. Custodians can be engaged to determine how to improve the success of fax elimination efforts across the industry.

Enabler 2: Mandated match to settle

“There is no reclaim in international markets; we would want the confirmation on T+0 to trigger sending of settlement instructions, and have the agreement complete by end of day T+1. This should get rid of DK functionality”
– Large Custodian

“DTC is the only CSD in the world that allows trades to settle without being matched”
– Large institutional Broker / Dealer

In order to further facilitate efficient and effective institutional matching and settlement finality, DTCC has recently outlined a proposal to mandate matching before settlement can occur. While migration to trade date institutional matching is a priority front-end driver of improvement institutional trade processing, match to settle is a priority back-end driver. Together, these two enablers will significantly improve institutional matching, instruction and exception management processes, thereby driving down processing and reclaim-related costs. DTCC’s proposal for match to settle is broadly in line with the requirements of a SSC, and for this reason it should be pursued as an enabler.

Through our research and industry engagement, we have identified several elements that should be considered. Specific specifications should include:

- Providing firms receiving institutional deliveries (e.g. custodian banks) with a time window during which they can “disaffirm” matched trades submitted to DTC prior to final settlement,
- Notifying firms making institutional deliveries (e.g. institutional broker-dealers), as soon as possible, of any issues in trade details or instructions, and
- Enhancing settlement finality in line with Recommendation 8 of the International Organization of Securities Commissions’ *Recommendations for securities settlement systems* (IOSCO, 2001)

A key element of the above arrangement is that it gives delivering parties advance notice if their pending delivery gives rise to an instruction-related exception, allowing more time to resolve any discrepancy before the deadline for settlement.

Implementation plan/ timeframe considerations: DTCC is currently engaged in a proposal for match to settle, and its objectives sufficiently overlap the requirements of this enabler for a shortened settlement cycle. Therefore, the current DTCC proposal should serve as a reference with respect to timeframe and implementation considerations.

Enabler 3: Cross-industry standing settlement instruction solution

*“An industry-based 'Golden Copy' of SIs would take us a long way in reducing fails, shortening the cycle and savings costs”
– Large Institutional Broker/ Dealer*

A cross-industry settlement instruction (SI) solution could significantly improve Straight-Through Processing (STP) for institutional transactions by improving SI data quality, and expanding data coverage and the proportion of transaction activity covered by a centralized system. Inaccurate information is often the cause of trade breaks and can lead to reclaims and add cost and complexity to settlement of client side trades. Aside from adding cost and complexity, resubmission of information or reconciliation of trade breaks puts a lower bound on the speed at which most exceptions can be resolved. For this reason, a cross-industry SI solution is considered a key enhancement to a T+2 model.

Implementation plan/ timeframe considerations: Although this solution could be accomplished in various ways leveraging existing technology, and/or building complementary functionality, the bar

for success should be a system that is used by >99% of participants and maintains/communicates accurate SIs ~100% of the time. Furthermore, it should include:

- Built-in functionality to identify and copy new SIs not already captured in a centralized repository,
- Differentiated permissions to allow 3rd parties to access and/ or manage SIs,
- Standardized naming conventions incorporating an appropriate degree of granularity,
- Enhanced validation rules and data input controls to ensure information quality, and
- Automated interfaces for input from broker-dealers, buy side firms or custodian banks.

Similar to migrating to trade date matching, the key to achieving the industry objective of a cross-industry SI solution is degree of utilization across the industry. For this reason, the functionality and utilization of current systems should be analyzed to determine what would require broad utilization of a central platform.

Enabler 4: Dematerialization of physicals

*“Reducing physicals would be an important step and have material benefits; physicals are very expensive to process”
– Medium-sized buy side firm*

As physical securities continue to add cost, complexity and risk to clearing and settlement, dematerialization of physicals is a key enhancement to a shortened cycle. Increasing dematerialization efforts would further reduce the cost/complexity involved in the settlement of physical securities and is an essential element to shortening the settlement cycle. This building block is broader than DTCC’s recently published proposal outlining steps that could be taken to dematerialize physicals settling at DTC.

Implementation plan/ timeframe considerations: The industry has attempted for a long time to dematerialize physicals, and significant progress has been achieved over the last decade. To accelerate the completion of this, DTCC and regulators should consider the feasibility of taking regulatory steps to eliminate physicals. Alternatively, increases in fees on withdrawals of physicals could be considered to disincent the propagation of physicals in the system. Both of these steps could be undertaken in the near-term, beginning with the socialization plan discussed in this white paper.

Enabler 5: Extending “access equals delivery” to all products settling at NSCC and DTC

In 2005, the SEC revised the “final prospectus” requirement of the Securities Act of 1933, eliminating the need for a broker to deliver a physical hard copy of a prospectus accompanying or preceding a written confirmation of a sale. The SEC states that “at this time, we believe that Internet usage has increased sufficiently to allow us to adopt a final prospectus delivery model ... [whereby] the obligation to have a final prospectus precede or accompany a security for sale can be satisfied by filing the final prospectus with [the SEC].” (SEC, 2005)

The SEC rule change impacted all SEC-registered offerings (such as equity and corporate bonds) and materially improved settlement efficiencies for brokers to the sale of these asset classes. However, some products, including certain classes of exchange traded funds (ETFs), mutual funds, collateral mortgage obligations (CMOs), and various other securities, were not covered by the SEC rule change (FINRA, 2009). To avoid additional burden to firms that would be required to make physical delivery of prospectus within the timeframes of a SSC, this building block calls for the “access equals delivery” rules to be extended to all products.

Implementation plan/ timeframe considerations: Extending “access equals delivery” would likely require an SEC rule change and approximately three years to complete, as described in the implementation portion of Enabler 6 below.

Enabler 6: Compressing timeframes / rule changes

The implementation of rule and timeframe changes will impact a broad range of activities part of and related to settlement. Four sets of changes relate to this initiative:

- *Timeframe and rule changes at DTCC* itself comprise the first component of these changes. All deadlines related to clearing and settlement, and its associated processes, would have to occur one day in advance of the current schedule in order to enable T+2.
- *Clearing and settlement-related rules changes by regulators* make up the second component of timeframe compression changes. Changes to some rules and regulations are essential or appropriate given the current rule intent, including SEC rule 15c6-1 (specifying the standard settlement timeframe for covered securities), FINRA rule 11320 (specifying the standard settlement timeframe for “regular way” transactions), Rule 204 of Regulation SHO (specifying timeframes a close out requirement for all FTD positions – currently the morning of T+4 for standard activity, and T+6 for legitimate market making activity), and Municipal Securities

Rulemaking Board (“MSRB”) rule G-12(b) (specifying settlement day for “regular way” municipal bond transactions). Although not absolutely necessary, changes to other rules and regulations could support the move to a shorter settlement cycle by promoting best practices. These include SEC rule 15c3-3 (regarding completion of sell orders on behalf of customers – currently a 10-day timeframe), FINRA rule 11810 and NYSE 282, 284, 289 and 290 (collectively governing buy-in timeframes), and MSRB rule G-12(h) (buy-in timeframe for municipal bonds, currently 5 days following settlement).

- *Industry best practices regarding standard timeframes* comprise a third set of changes that would need to occur for T+2. An example of this type of change is the default recall period for non cash collateral associated with stock loans outlined by SIFMA’s Master Security Lending Agreement (“MSLA”) template.
- Following from all of the above, *compressed timeframes will also have an impact on the systems and processes in place within constituent firms*. The majority of firms will be able to transition to T+2 merely by adapting current systems to a shorter timeframe. In these cases, a comparatively small amount of investment is required to transition to T+2. A key factor that enables most firms to leverage current technology is the fact that most batch processes can be maintained (possibly with some daily batch processes converted to multiple intraday batches) in T+2 settlement. Nevertheless, we do believe that system improvements to enable T+2 would require some level of investment, including the expense of testing systems once changes are made – these investment drivers are incorporated into our economic analysis.

Enabler 10: Increased penalties for fails

*“Industry should have a penalty structure that motivates getting affirmations in on time, etc.”
– Large Retail Broker / Dealer*

*“Stiffer penalties / fees are necessary. The 3% charge in Treasuries space [following TMPG] has significantly reduced fails”
– Small institutional Broker / Dealer*

Once the processes and means are in place to enable participants to successfully clear and settle transactions on a T+2 schedule, incentives should be put in place to encourage compliance and drive cost and risk out of the clearing and settlement processes. Increased penalties for failed transactions (both on the street side and client side) are a critical element of such an incentive program. Penalties would serve as backend disincentive to fails and have the effect of improving communications and decreasing exceptions and cost upstream. Benefits will accrue to all market participants as processes

become more streamlined and firms put in place mechanisms to manage exceptions in a timely manner. Although specification of the precise nature of penalties is beyond the scope of this analysis, we recommend industry utilities and regulators consider the following guiding principles in making changes to fee/ penalty schemes to incentivize best practices across the industry:

- Ensure that incentives and penalties are structured in a way to encourage adoption of best practices (for example, trade date matching)
- Structure rules (or guidelines) and penalties in a manner that reduces the ambiguity of responsibility among multiple parties involved in a joint process (for example, create guidelines for when investment managers and broker-dealers individual responsibilities in institutional matching should be complete)
- Set rates for penalties in a manner that does not increase total fees to participants, rather shifts the burden of these fees to those firms whose behavior increases processing costs for others (over time, the goal should be for no firms to pay penalties and cost reductions for firm-to-firm clearing and settlement interactions are maximized)
- Minimize the burden and cost of compliance on firms.

For additional details on potential fails penalty models, please refer to Section 6.5.

Implementation plan/ timeframe considerations: Following the example set by the Treasury Market Practice Group (TMPG), a proposed rule change to increase penalties on fails could be drafted and put forward in 3-6 months, or as time allows.

6.3.2 *Core enablers and enhancements for a T+1 settlement cycle*

Although we already described a majority of the *number* of operational, technology and market infrastructure changes in our description of the T+2 operating model above, one should not underestimate the *extent* of additional transformative change to achieve T+1. The T+1 model requires all the above listed changes required for the T+2 model and a few significant additional changes described below.

Enabler 7: Infrastructure for near real-time processing

Shortening the settlement cycle to T+1 would raise the bar for a minimum level of technological capability across the industry. Specifically, firms would need to invest in near real-time capabilities for settlement related processes (institutional matching, trade reconciliation, segregation calculations, etc.). These investments will support a move to near real-time straight-through processing, across all settlement related activities for buy side firms, broker-dealers, custodian banks,

service bureaus, institutional matching systems, DTCC and other parties involved in transaction settlement.

Enabler 8: Transformed securities lending processes

A T+1 operating model will require broad transformation of current securities borrowing and lending (stock loan) processes. Current stock loan practices are functional in a T+3 environment and could be accommodated in a T+2 environment with changes to rules and standards (such as the MSLA-specified default recall period). By contrast, we anticipate that significant transformation and process streamlining would need to precede a transition to T+1.

Current securities lending communication practices could lead to challenges if maintained in a T+1 environment, especially when there are intermediaries in the chain of communication. For example, in cases where a lender's securities are held at one custodian bank that in turn leverages the stock loan platform of another firm, a recall notice may take too long to transfer from lender to borrower. Such an arrangement could make the possibility of recalling a loan infeasible given the timeframe in which it would have to occur for T+1 settlement.

Lending agents can often (up to 95% of the time as indicated by our interviews) reallocate inventory based on their pools of securities available for loan, obviating the need for a recall and mitigating some of the negative impact of the above-described scenario. A shorter cycle would likely impact the proportion of time that lending agents are able to reallocate inventory, increasing the importance of getting information in time to issue a recall. Processes at broker-dealers would also have to adapt to deal with a shorter recall timeframe.

An additional challenge with securities lending that could become problematic in a T+1 environment is the fact that most lending agents do not update their advertised availability of stocks for loan as prospective borrowers locate shares for future loans. Such "soft" locate practices enable multiple firms to locate the same securities, which could mean that there are not shares available for one or more of those firms when the time to execute the loan arrives. As a shorter cycle would decrease the typical timeframe between locates and borrows, this gap in information could present a challenge for short brokers aiming to borrow securities and lending agents aiming to effectively manage inventories. Consequently, a "hard" locate may become necessary.

Enabler 9: Transformed foreign buyer processes

Stemming from communication issues similar to those with stock loan, changes to foreign buyer processes would be required to enable T+1 settlement. Two fundamental challenges impact processing institutional transactions for foreign clients: time zone and intermediaries. Both of these issues would become even more problematic in a T+1 settlement model, and the following changes would need to be put in place to deal with them.

Given a T+1 environment, challenges with time zone differences and intermediaries would manifest themselves in the same failure mode if not addressed: incomplete matching / authorization of institutional transactions in time for T+1 settlement. Correspondingly, the solution would involve developing systems to enable near real-time communication of trade details and exception management, while also addressing the issue of time-zones that do not overlap through increases in automation or selective extensions of processing timeframes for foreign counterparties. Achieving this would require compliance with best practices and investment in infrastructure to support near real-time processing across the globe, and include intermediaries such as global sub-custodians and foreign custodians. Thus we consider this to be a very challenging goal to implement, especially considering the fact that creating a “dual track” for international counterparties (settling, for example at T+2), would increase complexity in C&S processes, working against the aim of reducing cost, complexity and risk.

Enabler 11: Retail funding acceleration

Client funding of retail trades could potentially impact broker-dealers for whom settlement process and account funding processes are linked in time. Broker-dealers that allow clients to trade before making payment, or to make simultaneous payment that has inherent delays (e.g. physical checks) may need to adapt processes in a T+1 environment. Several options are open to these broker-dealers:

- Continue to accept physical checks, reducing clearing time to the extent possible through digitization (Check21 Act),
- Encourage retail clients to transition to ACH debits for transaction funding, or
- Migrate customer base to pre-funded trading accounts.

Broker-dealers should independently balance the tradeoffs between these options: check clearing time could imply negative float, even accounting for digitization; ACH debits are subject to rescission for 60 days, based on FDIC consumer protection rules; migrating to trading accounts may require a

change in customer behavior. Although the choice is for broker-dealers themselves, migration to trading accounts appears to be a best practice for funding of retail transactions. The key benefits of trading accounts include decoupling of the funding process/ timeframe from the clearing and settlement process/ timeframe (reducing time lag and removing the possibility of negative float) and elimination of the possibility that retail client funds are unavailable or insufficient to cover a transaction (reducing risk and exposure to retail clients).

6.4 Additional industry outreach and model details

Industry cost baseline and comparison with 2000 SIA study

As discussed in 6.1.2 above, an initial step in our analysis was to develop the cost baseline for post-trade processes. A description of the various calculations that were used to triangulate this cost baseline is described in Figure 23 below. The summarized results of this analysis are shown in Figure 24 following, which shows how total industry costs are broken down between fees, operations and IT, and also by major industry segments (institutional broker-dealers, retail broker-dealers, buy side firms and custodian banks). These broad industry costs include utilities and service providers.

	Top-down calculations	Bottom up calculation
Broker / Dealers	<ul style="list-style-type: none"> • ~\$6.06B using cost per trade <ul style="list-style-type: none"> – Multiplied DTCC number of sides per year by cost per side (per asset class) – BCG experience – Confirmed IT cost per trade with Expand benchmarks for US Equities and Fixed Income • \$6.12B using profit margin and typical Ops / IT cost ratios <ul style="list-style-type: none"> – Multiplied 2010 revenues of assets in scope by average profit margins and typical Ops / IT cost ratios – Based on BCG experience and BCG 2010 market report 	<ul style="list-style-type: none"> • ~\$5.7B using cost per trade per player from survey data <ul style="list-style-type: none"> – Cost per trade estimations from survey and deep dive multiplied by number of trades
Buy-Side	<ul style="list-style-type: none"> • ~\$3.3B using cost per trade per AuM from BCG 2012 survey <ul style="list-style-type: none"> – Used BCG's 2012 Global Asset Management benchmark to map AuM assets in scope and estimate post-trade costs per AuM • ~\$3.9B using cost per trade per AuM from 2008 market data <ul style="list-style-type: none"> – Used 2008 market data recapping cost per trade per AuM in bps 	<ul style="list-style-type: none"> • ~\$4B using cost per trade in \$ from 2000 study <ul style="list-style-type: none"> – Leveraged reported cost per trade in 2000 study from Buy-Side – Multiplied by number of 2012 trades per Omgeo data
Custodians	<ul style="list-style-type: none"> • ~1.1B leveraging BCG experience of cost breakdown and survey <ul style="list-style-type: none"> – Mapped detailed Custodian cost for key players leveraging BCG experience – Identified cost per trade per AuC leveraging survey data – Extrapolated leveraging market share and scale 	<ul style="list-style-type: none"> • ~\$0.9B using reported clearance and settlement cost per trade <ul style="list-style-type: none"> – Based on survey and deep-dives

Source: Industry survey; Expand benchmarks; BCG analysis

Figure 233. Cost baseline methodology details

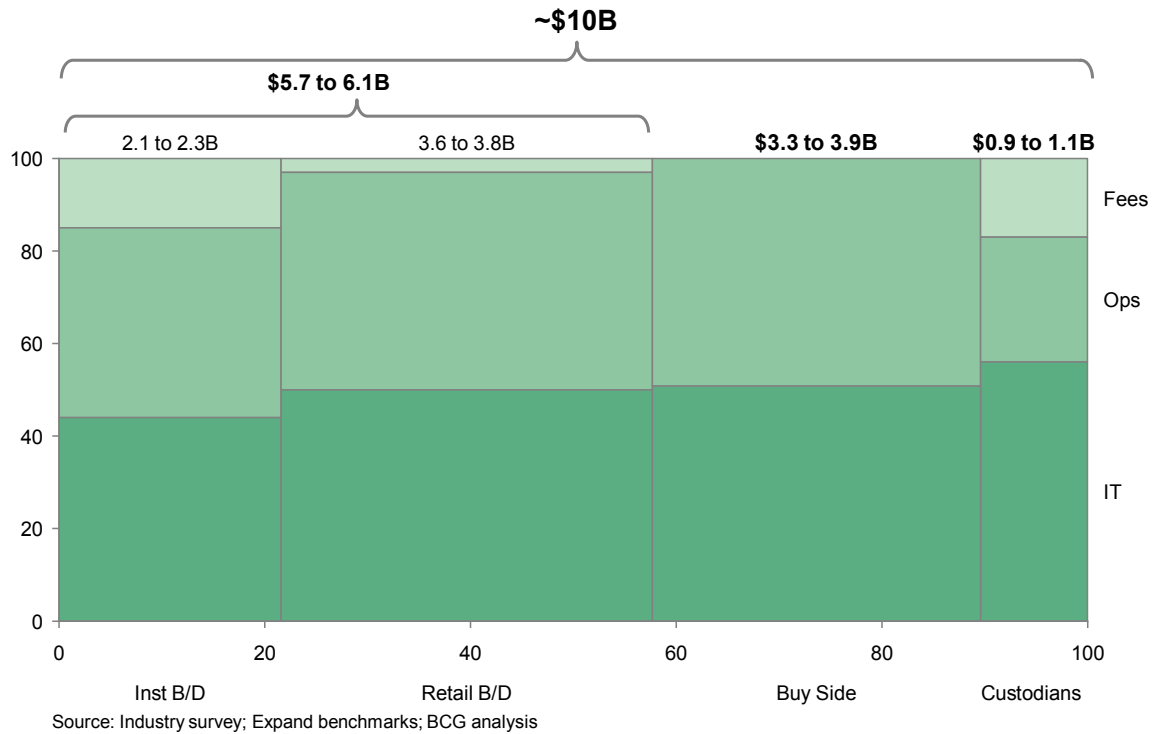
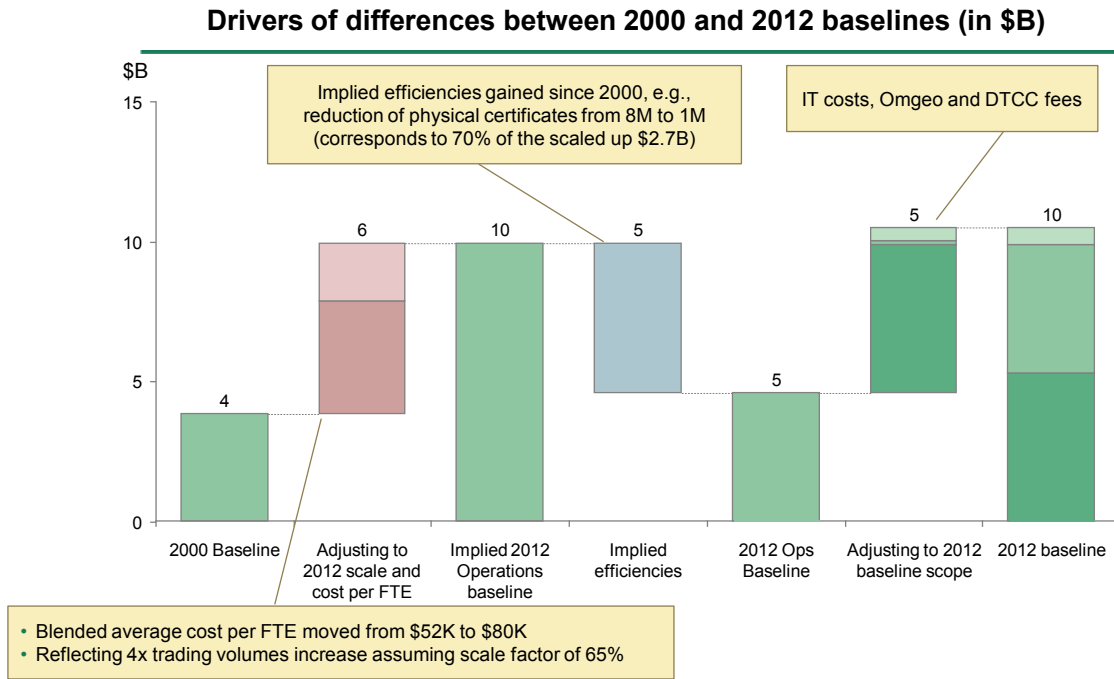


Figure 24. Baseline post-trade costs across the industry

We then considered how this cost baseline compared to the \$4B baseline presented in the SIA’s 2000 study. As shown in Figure 25 below, the overall operations baseline scaled to today’s volumes (and inflated appropriately given increases in cost per FTE), would roughly increase be \$6B to a total of \$10B in operations cost in 2012. Since the SIA baseline only represented operations cost and our present-day baseline suggests approximately \$5B in operations costs, there is an implied efficiency gain of approximately \$5B across the industry since 2000. This is likely a result of a number of changes that have occurred since 2000, including increases in automation and STP as well as reductions in physical certificate volumes across the industry and scale economies.



Source: 2000 Study; BCG analysis

Figure 255. Post-trade baseline comparison with 2000 SIA Study

Initial perspectives on a shorter settlement cycle

Responses to the survey provided an initial set of perspectives on various scenarios for a shorter settlement cycle. As discussed in the methodology description above (Section 6.1.2), the survey respondents were presented with four scenarios initially: basic T+2, enhanced T+2, enhanced T+1 and transformative T+1. As is shown in Figure 26 below, there was a strong net preference for enhanced T+2. This information, and the mix of preferences between the two T+1 options, guided the definition of the two models considered in the cost benefit analysis.

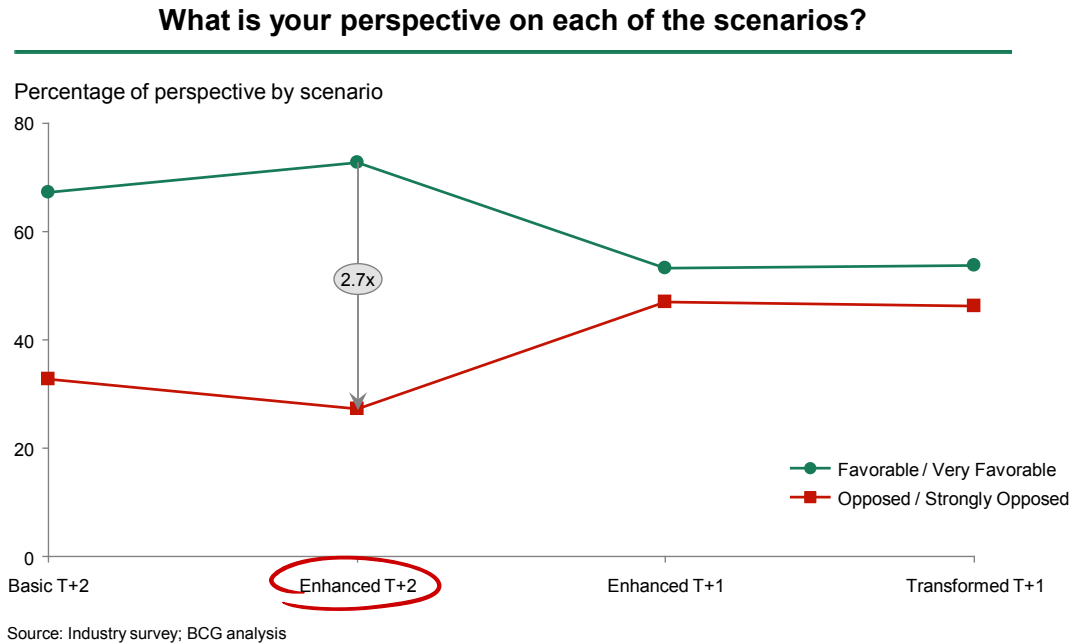


Figure 266. Preferences for settlement scenarios considered in industry survey

Survey results also provided a clearer view of participants perspectives on the risk reduction benefits of a shorter settlement cycle. As is shown in Figure 27 below, a majority of participants believed that a SSC would lead to risk reductions for their firms, and most agreed that it would reduce risks across the industry. Vis-à-vis other segments, a less significant proportion of small firms anticipated benefits to themselves or the industry from risk reduction.

Do you consider that accelerated settlement would lead to risk reduction?

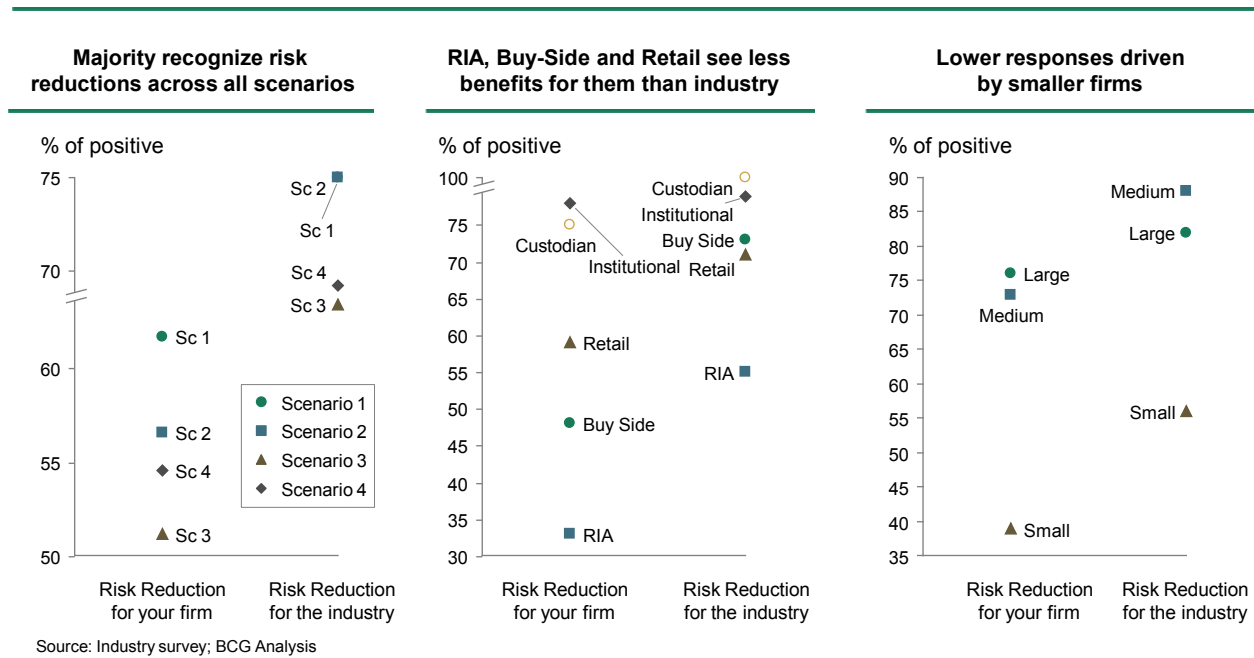


Figure 27. Industry perspectives on risk reduction potential of a shorter settlement cycle

Cost-benefit model detailed outputs

The following two tables summarize the outputs of our cost-benefit model, as discussed elsewhere in this report. Table 5 shows the investments and operations cost reductions for each major industry and operating model under consideration. Table 6 shows the same information for all groups or entities that did not fall into one of the four major segments in our analysis, including DTCC, Omgeo, service bureaus, RIAs and non-clearing broker-dealers.

		T+2			T+1	
		#	Investments	Ops cost reduction	Investments	Ops cost reduction
Institutional broker-dealers	Large	12	\$4.5	5%	\$20 M	6%
	Medium	28	\$1	5%	\$12 M	5%
	Small	66	\$1	Limited	\$4.5 M	Limited
	<i>Leverage from service providers¹</i>		(\$50 M)		(\$300 M)	
	Total	106 ²	~\$100 M	~5%= ~\$45M	~\$575 M	~5%=~\$50M
Retail broker-dealers	Large	10	\$4 M	4%	\$15 M	4%
	Medium	18	\$3 M	2%	\$7 M	2%
	Small	73	\$1.5 M	Limited	\$3 M	Limited
	<i>Leverage from service providers¹</i>		(\$54 M)		(\$115 M)	
	Total	101 ³	~\$150 M	~3%= ~\$55M	~\$380 M	~3%=~\$55 M
Buy side	Large	11	\$1 M	2%	\$2 M	2%
	Medium	62	\$0.6 M	2%	\$1.5 M	2%
	Small	473	\$0.3 M	Limited	\$0.6 M	Limited
	<i>Leverage from service providers¹</i>		(\$45 M)		(\$100 M)	
	Total	546	~\$145 M	~2%=~\$30M	~\$305 M	~2%=~\$30 M
Custodian banks	Large	3	\$4 M	15%	\$16.5 M	15%
	Medium	13	\$4 M	10%	\$12 M	10%
	Small	121	\$0.5 M	Limited	\$1 M	Limited
	<i>Leverage from service providers¹</i>		(\$45 M)		(\$105M)	
	Total	137	~\$80 M	~12%=~\$40M	~\$220 M	~12%=~\$40 M

1. Assumes service provider investments replicable across firms; 2. Represents self-clearing institutional broker-dealers and correspondent clearers (capturing activity of institutional broker-dealers that do not clear their own trades); 3. Represents self-clearing retail broker-dealers. Non-self clearing firms investments included in "other" category

Table 5. Cost-benefit model detailed outputs: major segments

	#	T+2		T+1	
		Investments	Cost reduction	Investments	Cost reduction
DTCC	1	\$10M	NA	\$20M	NA
Omgeo	1	\$10M	NA	\$20M	NA
Service Bureaus	4	\$2.5M	NA	\$12M	NA
RIAs	11K	-	NA	-	NA
Non-Clearing B/Ds	4K	~\$10K	NA	\$50K	NA
Total		\$70M		~\$290M	

Table 6. Cost-benefit model detailed outputs: other constituents

6.5 Benchmark of international markets and fail penalty models for other U.S. securities

The following sections outline the key lessons learned from international markets with respect to a move to a shorter settlement cycle, and serve as a useful benchmark against which we can test our own assumptions about the prerequisites for and impact of a shorter settlement cycle.

Key enablers of shorter settlement in Germany and Hong Kong

Germany and Hong Kong are two examples of markets that operate successfully with a T+2 settlement cycle today. Similarities between these markets that help enable a shorter settlement cycle include:

Matching of all institutional transactions: Both Hong Kong and Germany match all institutional transactions prior to settlement. While the trade agreement-level matching between the buy side and broker-dealers is typically transparent to the CSD, both countries' CSDs require matching delivery and receive instructions from each side of an institutional transaction before it will settle (via CCASS in Hong Kong and CBF in Germany), an arrangement similar to what DTCC plans to propose with match to settle.

High same day affirmation rates: for institutional transactions where data is available (those matched using Omgeo), Hong Kong and Germany have same day affirmation ("SDA") rates of 94.2% and 84.0%, respectively. These are dramatically higher than the SDA rate for U.S. institutional transactions (approximately 45%). Although a high SDA rate is not an absolute pre-requisite to T+2 settlement, it would help streamline the process by reducing the amount of unmatched trades that could potentially give rise to exceptions later in the process. A migration to central matching would also help improve SDA rates in the U.S.

Significant disincentives to street side FTDs: Both Germany and Hong Kong have mandatory buy-in programs that create a strong disincentive to street side FTDs. Hong Kong's mandatory buy-in program is initiated at 10am on T+3 (morning after S), and charges and penalties include differences in security price (up to +100%), incidental expenses and 0.5% of the value of the transaction (up to ~\$13k) (RBCIS, 2012). In Germany, several mandatory buy-in attempts begin on T+5 (3 days after S), and charges and penalties include the difference in security price (up to +100%) and 10% of the value of the transaction (up to ~\$7k) (RBCIS, 2012). These significant buy-in penalties create a strong backend disincentive for firms to fail to deliver securities and likely create greater process discipline upstream. Although we do not consider these disincentives to be a pre-requisite to a shorter

settlement cycle and recognize the potential cost to administer them, we agree that they could significantly enhance the effectiveness of a shorter cycle for street side activity.

Key enablers of a move to T+2 for the Euro-zone

Whereas the above section outlines several findings from markets already effectively operating at T+2, it is also helpful to consider the enablers identified by another market considering a move to T+2, the European Union. A group convened by the European Commission to assess the benefits of a shorter settlement cycle for the Euro-zone highlighted a number of key enablers of a successful transition to T+2, which can be grouped into three categories: early matching of institutional trades, high settlement efficiency of street side and institutional trades, and strict buy-in rules affecting CCP-guaranteed street side trades.

Early matching of institutional trades would allow for trade details to be confirmed early in the settlement process, thereby reducing the chances of failed trades and mitigate the cost impacts of failed trades. Critical components of a successful early matching program include automated matching instructions, near real-time exceptions reporting and management and the implementation of incentives to encourage compliance with matching standards (European Commission, 2009).

High settlement efficiency of street side and institutional trades would improve overall functioning of the market and has the potential to reduce transaction costs for various industry participants. Key components to increasing efficiency include continuous settlement cycles throughout the day, provisions for automated borrows/credit extension to accommodate cash shortfalls, and recycling of fails and new trades in a technical netting mechanism (all for street side trades), and monitoring and publicizing settlement rates to help change industry behavior and mindset (for street side and client side activity) (European Commission, 2009).

Strict buy-in rules for CCPs guaranteeing street side trades would mitigate potential losses for investors in the event of counterparty FTDs. Buy in rules would also improve settlement efficiency, especially when there are a series of transactions that are linked and the failure of one transaction could potentially cause cascading transaction failures for numerous participants. Critical components of a successful buy-in program include economic incentives to encourage compliance with standards / penalties to discourage poor performance against set standards, and monitoring and publication of fail rates to help change industry behavior and mindset (European Commission, 2009).

Improving same day affirmation rates in Canada

Building off of the first key enabler identified by the European Commission group, several useful lessons come from Canada's achievement of earlier matching of institutional trades.

Canada is likely to adopt a settlement cycle that falls in line with the United States. Responding to the industry momentum towards a shorter settlement cycle in the U.S. in 2000, the Canadian authorities decided to take proactive steps to prepare for a potential move to a shorter settlement cycle. Since the Canadian securities markets are very tightly linked to the U.S. markets, it was generally anticipated that Canada would adopt the same settlement cycle as the U.S.

Although regulators should aim for bold change, building consensus around pragmatic, achievable goals is critical to success. Keeping in mind the possibility of an eventual move to either T+1 or T+2, the Canadian authorities determined in 2004 that improving SDA rates for institutional transactions would be a key building block to enabling a shorter settlement cycle. In order to ensure market compliance with SDA, a regulatory mandate, National Instrument 24-101 ("NI 24-101"), was issued in 2007. This originally called for the matching of 95% of institutional trades on T, which was subsequently amended to 90% of trades by noon of T+1.

Regulation of the sell side may incentivize better behaviors on the buy side, but it may be difficult to enforce. An additional key element of NI 24-101 was that it prohibited regulated broker-dealers from executing trades on behalf of "an institutional investor unless the [broker-dealer] has established, maintains and enforces policies and procedures designed to achieve matching as soon as possible after such a trade is executed." In this way, NI 24-101 effectively requires broker-dealers to ensure that their buy side clients are adequately prepared for STP.

A key outcome of NI 24-101 was the move, across the industry, toward electronic matching of trades. As the final deadline for the 90% T+1 matching requirement is December 2012, Canada appears to be on track to meet this goal. Much of this progress has been achieved in the last two years, as shown in the figure below.

	2012	2010
Equities	93%	66%
Fixed Income	80%	54%

Table 7. Adoption of electronic matching methods by Canadian investment managers

Several common themes emerge from the above-outlined experiences of foreign markets operating at or building toward a shorter settlement cycle. Confirming our own view, improvements to client side processes for a shorter cycle is a key priority as street side transactions are already more streamlined. However, creating the right incentives to change behaviors of street side players is also an important element of change. Continued dematerialization is another box to check that will positively impact both client side and street side processes. Finally, although a plan should bold aim to improve outcomes through changes to behaviors and processes, it is also essential to put forth and build consensus around reasonable goals for the industry, to avoid regulatory back-pedaling as Canada experienced in the late 2000s.

Fail penalty models for U.S. Treasuries and mortgage-backed securities pools

Implementation of an explicit fails charge significantly reduced the prevalence of U.S. Treasuries fails, especially in low interest rate environments. On May 1, 2009, following the recommendation of the Treasury Markets Practice Group (TMPG), a fails charges went into effect covering FTD on U.S. Treasuries. Prior to this time, sellers of U.S. Treasury’s had been able to postpone delivery of securities without any explicit penalty in low interest rate environments, as the implicit penalty of such a postponement was directly related to the current market interest rates²². Low interest rates, large demand to borrow securities, or strategic fails (in which a firm deliberately fails, speculating on an increased future interest rate) all could lead to an increase in FTDs of U.S. securities prior to the implementation of an explicit fails charge (Garbade, 2010).

Similarly, the TMPG has also shown that, in the absence of an explicit fails charge, FTDs of mortgage-backed securities (MBS) pools occur at higher rates during periods of low interest rates: “When the cost of borrowing roughly equals the relevant interest rate, many market participants are essentially indifferent between failing and borrowing securities to avoid failing” (TMPG, 2011). On February 1, 2012, the Fails Charge Trading Practices recommended by the TMPG for agency MBS

²² More precisely, the implicit penalty was directly related the special collateral repo rate, as explained in Garbade, et al.

and debt securities came into effect and was supported by the Federal Reserve Bank of New York (FRBNY, 2012).

Considering the impact of the above TMPG recommendations on reducing fails in the U.S. Treasury, Agency debt and MBS markets, numerous market participants suggested that a similar explicit fails charge be considered for U.S. equities, corporate bonds and municipal bonds. The TMPG recommendations therefore serve as a model for how similar approaches to reducing FTDs on these classes of securities might be approached.

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