Automated Trading in Treasury Markets White Paper

In recent years, electronic trading has taken on an increasingly prominent role in the U.S. Treasury market, beyond the Treasury futures market, where it has been well-established since the late 1990s. In the dealer-to-client market, electronic transmission of orders has largely displaced traditional voice brokerage, while trading in the inter-dealer market for on-the-run Treasury securities is already almost entirely electronic. Trading in the most liquid on-the-run Treasury securities in the inter-dealer market has witnessed an increasing presence of automated trading, and high-frequency trading (HFT) in particular. This paper describes the growth of automated trading in the secondary market for Treasury securities and the potential benefits and risks associated with this evolution.

Today, electronic trading in the Treasury securities market takes place using a variety of trading protocols across a diverse set of trading venues, most of which allow for some degree of automation by market makers but only a subset of which are amenable to the deployment of fully automated trading strategies. Electronic trading in the Treasury markets has arguably improved overall liquidity through enhanced order flow and competition, thus reducing trading costs and allowing market participants to more effectively manage risk. Some have also reasoned that automated trading has improved market efficiency by reducing valuation discrepancies across related markets. However, the increased adoption of automated trading has also led market participants and regulators to articulate concerns about the potential for greater operational risk, disruptive market practices and trading strategies, and the risk of sharp, short-term disruptions to the Treasury securities market of the kind experienced in the equities and futures markets, which have a significant automated trading presence. Given the growth of automated trading in the Treasury securities market and the increasing role that

automated trading firms play as providers of liquidity in the inter-dealer market, the Treasury Market Practices Group (TPMG) is releasing an updated set of best practices recommendations designed to promote and support the continued efficiency and integrity of the markets.

Background

Electronic trading, for the purposes of this paper, is trading conducted on platforms over which clients transact relative to price levels displayed on a screen and orders are transmitted via computer systems. Electronic trading is estimated to now represent more than half of the overall trading volume in the Treasury securities market.[1] The remaining activity still occurs over the telephone—partly in the dealer-to-client market (DtC) and otherwise in the inter-dealer off-the-run market. Most electronic DtC trades, however, still involve clients manually inputting individual orders into an electronic trading system while dealers typically utilize automated-quoting systems. According to broker-dealers, nearly all trading of on-the-run Treasury securities in the inter-dealer market occurs electronically, with much of that trading conducted in automated fashion. Trading in off-the-run Treasury securities takes place over voice channels and electronic RFQ platforms.

Automated trading, for the purposes of this paper, refers to a subset of electronic trading that relies on computer algorithms for decision-making and execution of order submissions. Automated trading represents a diverse set of strategies, differing both in complexity and the degree of reliance on speed, but tends to thrive in electronic markets with a central limit order book, robust IT infrastructure, and real-time data feeds. While execution algorithms—or those designed to carry out a given transaction—are typically considered to be low frequency, market-making algorithms are typically considered higher frequency. Indeed, *high-frequency trading* (HFT) is a subset of automated trading in which the trading opportunities are identified and acted upon algorithmically and often executed via low-latency technology and with high message rates (orders, modifications, and cancellations). Such HFT strategies generally rely on high-speed communications and robust trading systems, with the submission of orders often

[1] Source: Greenwich Associates 2014 North American Fixed Income Study.

accomplished through dedicated high-speed connections to trading platforms (see Table 1 for examples of traditional automated trading strategies). In order to minimize latency,[2] algorithmic trading firms often physically co-locate their algorithmic hosting servers with the trading platform's servers or nearby through proximity hosting by a third party.[3] Most of the transmission technology supporting algorithmic trading—microprocessors, microwaves, and fiber optics—has to some extent matured, and recent initiatives have focused on extending the reach of high-speed networks in response to the continued spread of automated trading across an increasing number of global trading venues. Meanwhile, much of the current focus of innovation centers on the development of more sophisticated quantitative models able to rapidly process ever-increasing amounts of real-time data.[4]

Table 1: Common Automated Trading Strategies in On-the-Run Treasury Securities[5]

	Market Making	Liquidity Seeking	Price Predictive	Relative Value / Spread Trading
Description	Provides liquidity via limit orders based on models of price dynamics and order flows.	Bridges differences in liquidity across trading venues by providing liquidity in illiquid venues and taking liquidity in liquid venues.	Profits from ability to predict short-run price trends such as momentum or reversal.	Seeks to profit from price discrepancy between closely linked markets such as cash/futures basis trading.
Market effect	Increases liquidity	Links liquidity across venues	Incorporates information flows into market prices	Brings prices in line across markets
HFT prevalence	High	High	Moderate	High

The Treasury securities market includes a number of distinct electronic trading platforms, each catering to the needs of a specific set of market participants and employing one of three distinct quoting methods, or "protocols." The first type is a *request for quote* (RFQ). This is the most commonly used trading protocol between dealers and customers. An RFQ allows an

[2] In automated trading, latency refers to the time between order submission, execution, and confirmation.
[3] Co-location services are typically offered by individual trading platforms on an equal access basis for a fee. The aim of co-location is to reduce the latency between order submission by the trading firm and its acknowledgement by the trading platform.
[4] While the distinction between "high-frequency trading" and other automated trading strategies is not clearly defined, certain trading strategies, such as market making, tend to benefit more from low-latency implementation.
[5] Many of these strategies have common elements and should not be thought of as mutually exclusive.

investor (e.g., asset manager or hedge fund) to request a quote for a bid or offer from several competing market makers. While the RFQ process requires investors to manually input or upload their request into an electronic trading system, market makers often use automated systems to respond to requests. Some market makers also use the same automated systems to execute and book accepted trades initiated through the RFQ process, as well as hedge the trade in the inter-dealer market following confirmation. Owing to the structure of the RFQ process, dealers typically provide "indicative" quotes—reflective of where they are willing but not obligated to trade—to electronic platforms and thus investors. When a client sends an RFQ, a dealer then responds with a transaction price.

The second protocol, *streaming quotes*, is used on single-dealer platforms, and involves dealer market makers continuously streaming bid and offer quotes to investors. These two-sided quotes are typically "executable," meaning that they are supported by an infrastructure whereby a market maker provides both a price and quantity to investors at which it is willing to execute a transaction.[6] Dealers sponsoring such platforms generally rely on market-making algorithms to automatically generate quotes and may enable clients to source liquidity using execution algorithms. However, specialized high frequency trading firms tend not to be active liquidity takers on single-dealer platforms given the prevailing spreads and limited trade quantities. Moreover, single-dealer platforms have generally not allowed clients to act as liquidity providers on such platforms, though this is reportedly changing.

The third protocol, a *central limit order book*, is the prominent feature of the inter-dealer market, allowing for anonymous trading with complete price transparency between market makers connected to a trading platform.[7] Trades are conducted through an application programing interface (API), a graphical user interface (GUI), or an "aggregator"—software that aggregates quotes from multiple platforms. According to inter-dealer broker platforms, trading of benchmark Treasury securities in the inter-dealer market is almost fully electronic, and in recent years a significant share of trading has been conducted through fully automated

[6] Some single-dealer platforms distinguish between firm and non-firm pricing.
[7] Typically at least five levels of the order book are visible and a (near) real-time feed of executed trades is available.

strategies, many of which focus on high-volume, low-latency specific strategies. This evolution reflects a notable shift in the infrastructure of the inter-dealer market. Participants on these platforms both provide and source liquidity within the community, either to hedge positions initiated elsewhere or to execute proprietary trades. Historically, these platforms were limited to dealers only, but more recently they have opened to a broader set of participants with automated and high-speed trading capabilities. The advances in automated trading technology and the expansion of the number and type of participants on these platforms have increased volumes traded on these platforms in on-the-run securities.[8]

Table 2: Protocols

	Request for Quote	Streaming Quotes	Central Limit Order Book
Trading venues	Execution platforms	Single-dealer platforms	Inter-dealer platforms
Participation	Dealer-to-client	Dealer-to-client	Principals
Interaction type	One-to-one, one-to-many	One-to-one, one-to-many	Any-to-any
Trade anonymity	No	No	Yes
Trading system interface	Voice, GUI	GUI, API	GUI, API
Automation possible	Automated quoting	Automated quoting, some automated trading	Automated quoting, automated trading
Principal non-dealer participants	Asset managers, pension funds, hedge funds	Asset managers, hedge funds, regional dealers	Regional dealers, automated trading firms

Evolution of Automated Trading in the Treasury Market

Automated trading in the cash Treasury market has grown rapidly over the past decade, following developments in equities, futures, and over-the-counter foreign exchange markets. The initial move toward automated trading in fixed income markets occurred in the early 2000s, when inter-dealer brokers first launched their electronic platforms for Treasuries and allowed trading instructions to be entered by algorithms, instead of manually. The next

[8] In contrast, off-the-run securities, which are significantly less liquid than on-the-run securities, continue to trade via traditional "voice" transactions and electronic RFQ protocols. To date, there has not been a demand for active automated trading in off-the-run Treasury securities.

important change occurred in the mid-2000s, when sophisticated automated trading firms began to have a significant presence on the electronic platforms. Estimates from the major inter-dealer platforms show that automated trading strategies now typically account for more than half of trading activity in on-the-run Treasury securities that occurs on such platforms. Of this automated activity, a significant percentage is generated from firms specializing in an HFT model, with the balance coming from banks and non-banks that employ a number of sophisticated trading methodologies.

One of the main drivers behind the trend toward electronic trading and automation has been the desire by dealers to lower costs. Traditional cost factors relate to trade execution and processing as well as front- and back-office headcount, with a more recent consideration being the increased cost of balance sheet for some participants as a result of post-financial crisis regulation. Electronic trading can significantly lower execution costs, reduce or eliminate the need for human intervention, and increase the efficiency of trade processing. The drive to lower costs has also led to increased internalization of dealer flows, in which dealers seek to match buyers and sellers across various internal desks before accessing liquidity in inter-dealer markets.[9] In some cases, these internal markets are being opened to external clients via single-dealer platforms, thus allowing dealers to deploy automatic quoting and hedging algorithms, requiring fewer traders on the desks. At the same time, some sophisticated asset managers and hedge funds are increasingly relying on dealer-provided algorithmic execution and smart order routing, processes used to spread out large trades and target specific liquidity pools with the aim of seeking best execution and reducing execution costs.[10]

Narrow bid-ask spreads have also continued to drive the electronification of Treasury trading, affecting the DtC business model for many dealers, with some choosing to reduce their capital-intensive market-making activities, and incentivizing others to reduce costs via increased

[9] Dealers also attempt to internalize flows to offset risk across trading business lines. For example, a corporate desk looking to hedge new corporate debt issuance can sell Treasuries to the Treasury desk, which in turn may be looking for inventory to fulfill an investor request.

[10] Execution costs addressed by these algorithms include explicit costs like bid-ask spreads as well as implicit costs such as price impact and opportunity costs of non-execution.

volumes and internalization of flows to achieve target returns on equity.[11] These trends support the high concentration of trading activity among large market makers, with the top five dealers now accounting for more than 55 percent of DtC volume.[12] These dealers play the role of both market makers and providers of algorithmic trading solutions to investors. As a result, cutting-edge trading technology increasingly resides not only with dealers but also with their clients who deploy algorithmic trading strategies to minimize trading cost. In the inter-dealer market, market making in on-the-run Treasuries now appears to be dominated by dedicated trading firms and dealers with the know-how to develop the cutting-edge algorithms required to compete.

Several important initiatives to accelerate the automation of trading in Treasury markets mirror key innovations from the foreign exchange (FX) market.[13] Recent trends with FX antecedents include the creation of new liquidity pools in the form of single-dealer platforms streaming executable quotes, the emergence of aggregators that provide a single interface with streaming quotes from multiple underlying markets, and the increased "internalization" of orders by banks.

The evolution of automated trading in the Treasury securities market is also likely to be influenced by innovation in the Treasury futures market and the interest rate swaps market, in which execution is becoming increasingly automated. The Treasury futures and interest rate

[11] For example, while Treasury securities are exempted from important aspects of the Volker Rule, leverage ratios make holding Treasuries as expensive as corporate bonds. As a result, dealers are incentivized to shift balance sheet to assets with higher yield and/or wider bid-ask spreads.

[12] Source: Greenwich Associates 2014 North American Fixed Income Study.

[13] The over-the-counter spot FX market is in many ways similar to the cash Treasury market. Liquidity in both markets is concentrated in a few venues, with trading in the Treasury market focused in a few on-the-run securities, and trading in the spot FX market concentrated in a few major currency pairs (though arguably across more trading venues). In both markets, the vast majority of trading occurs with or between market makers, with end-investors almost never trading bilaterally and intermediation facilitating flows between buyers and sellers. Historically, the natural market makers in both FX and Treasuries were large banks with significant internal flows, giving them an advantage in liquidity provision. As with Treasury markets, the drive to reduce FX trading costs through electronic trading and the decision to allow automated trading on the inter-dealer FX platforms has led to an increase in automated trading and a growing presence of HFT firms. Automated and HFT trading now account for an estimated 70 percent and 40 percent, respectively, of trading volume in the three major currency pairs.

swap markets are closely linked to cash Treasury securities markets by active spread trading between the markets.[14]

BOX 1: TMPG Review of October 15, 2014

On October 15, 2014, U.S. Treasury securities experienced record-high trading volumes and significant intraday volatility. The yield on the 10-year Treasury note traded in the fourth-largest intraday range since the 2008 financial crisis, and saw a 15-basis-point round trip during a short 15-minute window. This price action was outsized relative to the fundamental economic news of that day and, given available data, market participants have generally been unable to attribute the price action to any single factor. Many factors have been suggested, such as bearish sentiment related to the global macroeconomic outlook, a significant capitulation in crowded short interest rate and volatility positions, and the evolving structure of the Treasury cash and futures market. The evolving market structure is reflected in broad changes in market participation and the risk-taking capacity of liquidity providers, changing regulation, increased use of electronic and automated trading, and other factors. Prices remained highly correlated across related products despite the substantial volatility witnessed, and the continuous and rapid price adjustments amid record volumes, especially in the 15-minute window, were only possible with automated trading. The speed and size of price movements may have led some proprietary trading firms to limit participation and some broker-dealers to reduce their market-making activity to customers. The events of October 15 suggest that it is worthwhile to continue to evaluate issues related to the evolving structure and liquidity characteristics of the Treasury market, including with respect to the role of automated trading.

[14] A key difference between Treasury futures, Treasury securities, and interest rate swaps is their individual market infrastructures. Trading in Treasury futures is limited to the Chicago Mercantile Exchange (CME), with all trading activity subject to the rules of the CME and the Commodity Futures Trading Commission (CFTC). Over-the-counter trading in the Treasury securities market is not centralized in one execution venue, and each electronic trading platform has a different set of rules. However, since each major electronic trading platform is operated by a broker-dealer registered with and subject to the rules and regulations of the Securities and Exchange Commission (SEC) and the Financial Industry Regulatory Authority (FINRA), there are currently certain risk management standards and supervisory procedures applicable to all platforms (see Box 2).
As a result of recent regulatory reforms, more interest rate swap trading has shifted onto electronic trading venues. Similar to the Treasury securities market, there are multiple execution venues in the interest rate swaps markets. While most DtC swap execution facilities (SEFs) employ an RFQ protocol, inter-dealer SEFs are more likely to use central limit order books. Compared to the maturity of automated trading in Treasury futures, automated trading in the inter-dealer SEF market remains nascent. As data feeds improve and more activity migrates to SEFs using central limit order books, automated trading will likely gain traction in the interest rate swap market as well. Given the size of the futures and interest rate swap markets and the active market for spread trading between them, changes in liquidity in the futures and interest rate swap markets have the potential to also meaningfully impact liquidity in the Treasury securities market.

Potential Risks of Automated Trading in the Treasury Market

Automated trading has come to play a crucial role in fostering liquidity and the efficiency of the price discovery process in inter-dealer U.S. Treasury markets. The evolution of automated trading has required participants, trading platforms, and clearing firms to build up their internal risk controls and processes as they manage the potential for rapidly changing market and counterparty risk exposures. These risks have in recent years manifested themselves in equity, futures, and FX markets where automated trading is more mature. While many risk events in these other markets have been attributed to automated trading, not all of them involve truly "new" risks or even risks specific to automated trading. Risk scenarios that develop with limited scope for human oversight by firms and/or counterparties are a common thread, often because automated trading can occur at speeds that exceed the capacity of manual detection and intervention and therefore pose a challenge to traditional risk management protocols. The risks associated with automated trading in the Treasury securities market include operational risk, potential systemic counterparty risk, market manipulation risks, transmission risks, and risks to market liquidity.

An element of operational risk is inherently present in all financial transactions regardless of the degree of automation, but this has been an area of particular concern in the case of fully automated trading systems where increased speed necessitates different controls. In fact, recent market events attributed to automated trading have been directly linked to operational risks ranging from malfunctioning and incorrectly deployed algorithms to algorithms reacting to inaccurate or unexpected data. In these cases, internal controls at the trading firm and credit controls at trading venues and/or counterparties seemed insufficient to prevent erroneous orders from reaching the market. In some instances, malfunctioning algorithms have interfered with market functioning, inundating trading venues with message traffic or creating sharp, short-lived spikes in prices as a result of other algorithms responding to the initial erroneous order flow.

Counterparty risks can also be created or magnified as a result of electronic and automated trading. For example, automated systems could erroneously generate trades that create both

operational risks as well as counterparty risks to firms on the other side of the trades. Even when trading venues have transparent error-trade policies in place, counterparties to erroneous trades may be at risk due to trades being cancelled or unfulfilled ex-post, leaving the counterparties with unwanted exposures.[15] In previous instances where a trading firm accumulated trading losses that exceeded its capital, losses were ultimately shared by counterparties who found themselves exposed through a central counterparty's default fund. This highlights a notable difference between the cash and futures market, since a significant volume of trades in the cash market involve non-FICC members and are settled bilaterally, which can lead to non-trivial overnight settlement risk.

Market manipulation is not a new phenomenon either, but automated trading systems can provide rogue traders with a faster set of tools for creating false impressions of market depth, trading volume, and prices through "spoofing," "layering," and "wash trading," among others. "Spoofing" and "layering" involve non-bona fide bidding and offering with the intent to cancel the bids or offers before execution. "Wash trades" are generally intentionally manipulative non-bona fide transactions that do not result in a change in beneficial ownership of the security. Manipulative strategies all distort the impression of true market liquidity in the Treasury market. Even in cases where trading is bona fide and not designed to be disruptive, certain automated trading strategies could nevertheless create a false or misleading impression of market liquidity.

Automated trading also has the potential to increase short-term volatility in financial markets by transmitting idiosyncratic shocks from one market to other markets. The evolution of automated trading has made the relationships between certain markets stronger as some market participants take cues from one market to make investment decisions in another and pursue a broader range of cross-asset, global investing and hedging strategies. As a result of these correlations, idiosyncratic shocks initially occurring in one market could be transmitted to others based on little fundamental news. For example, the erroneous order that precipitated the 2010 equity market "flash crash" prompted moves in a range of markets.

[15] Differences in error policies across venues may increase this risk.

The significant presence of automated trading introduces a final potential risk related to abrupt changes in trading strategies that may adversely affect market liquidity. Market participants representing a material share of the daily trading volume could impact market liquidity with a sudden change in their traded volume by altering automated trading or execution strategies. The effect could be amplified if multiple market participants react independently, but in a similar fashion, based on an event. Although these actions may be the result of independent prudent decision-making at the individual firm level, the combined effect may have unintended detrimental consequences for market function and liquidity.

TMPG Best Practices Recommendations

As an industry group dedicated to promoting best practices, the Treasury Market Practices Group (TMPG) believes it is appropriate to proactively support trading, settlement, and risk management practices that advance the integrity and efficiency of the Treasury, agency debt, and agency MBS markets. The TMPG recognizes that growing adoption of automated trading in TMPG-covered markets has raised the potential for greater operational risk, magnified counterparty risk, growth of disruptive practices and trading strategies, and faster transmission of idiosyncratic shocks across related markets, all of which can impact efficient market functioning. In response to these issues, the TMPG is releasing a set of recommendations for market participants—including a few aimed specifically at trading venues—that supplement previously issued best practices. An updated list of best practices that address concerns related to automated trading is appended below.[16] Given the growth and evolving nature of automated trading, the TMPG will continue to review these practices and update them as needed over time.

Promoting Liquidity and Transparency

- **All market participants should behave in a manner that supports market liquidity *and integrity*.** Market participants should avoid trading strategies that hinder market clearance *or compromise market integrity*. Examples of strategies to avoid include those

[16] Updated text is indicated in *blue italicized* font.

that cause or exacerbate settlement fails, those that inhibit the provision of liquidity by others, those that restrict the floating supply of a particular issue in order to generate price movements in that security or related markets, *and those that give a false impression of market price, depth, or liquidity*.

- *Such strategies include those that may cause undue latency, artificial price movements, or delays in other participants' executions and result in a false impression of market price, depth, or liquidity. Manipulative practices, including those in which a trader enters a bid or offer with the intent to cancel the bid or offer before execution (such as "spoofing" or "layering"), "painting the tape," and improper self-trading, may also create a false sense of market price, depth, or liquidity and should be avoided.*

Maintaining a Robust Control Environment

- **Each market participant should maintain a strong internal control environment sufficient to ensure that each of its business areas (front, middle, and back offices) acts in accordance with applicable laws, regulations, self-regulatory organization rules, and best market practices.** *Market participants should adopt and adhere to policies and procedures designed to eliminate trading strategies that are manipulative or that result in a false impression of market depth to others.*

- ***Trading venues should develop processes and procedures to adhere to best practices.*** *Items of coverage include clear rules for all participants, information on available services and functionality to all participants, and authority to monitor quoting and trading behavior and take responsive action. Trading venues should make available to all existing and prospective users guidelines covering the various levels of services available to different users, rules on error trade policies with examples of situations that would lead to canceled trades, clear policies on price time priority of order entry, and descriptions of available market depth and transaction level data. Additionally, trading venues should actively manage any risks to the platform associated with the offering of*

automated trading, including through the implementation of risk limits, "fat finger" controls, and monitoring and surveillance capabilities to detect potentially problematic activity.

- ***Market participants and trading venues should ensure that they employ a robust change control process for designing, testing, and introducing new trading technologies, algorithms, order types, or other potentially impactful system features or capabilities.*** *Market participants and trading venues should adopt written policies and procedures identifying the types of changes that must be vetted and ensuring that such changes are vetted with appropriate representatives from key support areas such as compliance, risk, and operations. Such processes should be reviewed on a regular basis for ongoing compliance.*

- ***Market participants should ensure that risk management processes, clearing and settlement procedures, and other front- and back-office activities are documented and commensurate with the speed and sophistication of execution technology****. Market participants employing automated trading strategies should have safeguards and controls in place to manage the risk of large or unanticipated positions. Such controls should be reviewed routinely and modified in light of any changes in automated trading strategies or in execution speeds on trading venues.*

- **Internal control policies should further the firm's ability to detect and prevent potentially disruptive trading activity by identifying the specific trading trends, positions, strategies, or behaviors within the trading operation that constitute triggers for mandatory business and compliance review.** However, market participants, *including trading venues where appropriate,* should consider including the following non-exhaustive list of indicators in their compliance plan to prompt further review:

  - *unusual quoting activity submitted to the market through electronic trading platforms over time or throughout a trading day, such as:*
    - *unusual volumes of quotes,*

- *unusual number of modifications or cancelations, and*
- *unusual number of quotes submitted without a resulting transaction;*

❖ *unusual number of transactions and potential accumulation of positions;*

❖ *breaches of, or frequent changes to, risk limits; and*

❖ *changes to trading systems or algorithms released outside of a defined release management protocol.*

Managing *Sizable Positions and Activity* with Care

Sizable long or short positions *or trading activity are* not necessarily problematic, *but* should be managed responsibly to avoid market disruptions. From time to time, a market participant may amass a particularly large long or short position in a specific Treasury, agency debt, or agency MBS issue or product. **A market participant should manage that large position with heightened vigilance, mindful of the need to support market liquidity.** Particularly, large short or long positions in the floating supply of an issue should be given close scrutiny because of the uncertainty of the tradeable float. Market participants with large short positions or active shorting strategies have similar responsibilities to support the liquidity and smooth functioning of the market to those with large long positions. *Additionally, market participants who account for a material share of daily trading activity should manage changes to their trading strategies carefully, mindful of the impact such changes may have on market liquidity.*

❖ **When evaluating trading strategies for *sizable positions and trading activity*, market participants should take care that sudden changes in those strategies do not adversely affect the liquidity or settlement of the Treasury, agency, or agency MBS issue in the marketplace.** Market participants should not refrain from trading when they hold a large position. However, when market participants consider implementing a new trading strategy for a large position, they should evaluate whether it may affect market liquidity. For example, although open interest in MBS TBAs in a given issue often well exceeds the deliverable supply in the coupon, delivery decisions should not be made with the intention of distorting prices of either the cash security or the dollar roll. *Market participants representing a material share of trading volume should similarly evaluate*

the impact of abruptly changing their traded volume on market liquidity. Senior management, credit and market risk, operations, legal, and compliance functions should be made aware of any significant changes to trading strategies that may have adverse implications for market liquidity.

Promoting Efficient Market Clearing

- ***Market participants should review their clearing and settlement practices in light of the speed with which execution and/or position accumulation may occur.*** *Firms with clearing and settlement exposure to automated trading should be able to review the gross trading flows and net positions to assess potential risks under stress or error scenarios.*

BOX 2: Certain Regulations Relevant to Risk Management of Automated Trading of Treasury Securities

Broker-dealer subscribers and operators of inter-dealer platforms have adopted the standards of SEC Rule 15c3-5 regarding market access and risk controls and procedures as to their non-broker-dealer customers who are provided access. These controls and procedures must be reasonably designed to eliminate orders flowing to an exchange or automated trading system (ATS) that are above a customer's predetermined thresholds and to eliminate erroneous orders. Certain generally applicable broker-dealer regulations also address responsibilities relating to high-frequency trading that would apply to operators of a U.S. Treasury ATS and those providing market access. Under the anti-money laundering responsibilities applicable to broker-dealers through the Bank Secrecy Act, and through the implementation of self-regulatory organization regulations, such firms are required to establish and implement policies, procedures, and internal controls that can reasonably be expected to detect, and cause the reporting of, suspicious transactions, including suspicious securities transactions. For example, though not in the U.S. Treasury context, the SEC and FINRA have found firms providing market access liable for failures in this area for not properly detecting and reporting conduct such as "spoofing" and "layering." Additionally, FINRA rules set forth a number of content standards applicable to communications by broker-dealers that could apply to communications made by a U.S. Treasury trading platform or a broker-dealer providing market access. These standards include, among other things, a requirement that communications with the public be based on principles of fair dealing and good faith, be fair and balanced, and provide a sound basis for evaluating the facts in regard to any particular security or type of security, industry, or service. SEC regulations similarly prohibit materially misleading communications when made in connection with the purchase or sale of a security. Those providing market access should at a minimum communicate fairly and truthfully when making affirmative statements about the nature of the access provided and any associated controls that are utilized.