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April 22, 2016
By Electronic submission

David R. Pearl
Office of the Under Secretary for Domestic Finance
Department of the Treasury

Re: Notice Seeking Public Comment on the Evolution of the U.S. Treasury Market Structure
Docket ID: TRES-DO-2015-0013

Dear Mr. Pearl,

Citigroup Global Markets Inc. ("Citi" or "Firm") appreciates the opportunity to provide its views on structural changes in the U.S. Treasury market and their implications for market functioning. Citi is a Federal Reserve Primary Dealer and a SEC registered Broker Dealer, and is a major participant in the Treasury market on behalf of clients and for its own hedging and market making activity. Citi recognizes the challenge the U.S. Department of Treasury ("Treasury") faces to create a regulatory framework that promotes the best liquidity conditions in the U.S. Treasury market.

Given the intricate nature of today's financial markets, and the emergence of electronic methods of access, we also recognize the need to be cautious when designing market structure. In particular, we will discuss the relationship between liquidity and post-trade reporting, which we believe has been relevant in related interest rate markets.

An outline of the issues addressed in this document is set forth below:

- I. Oversight and Controls for Trading Venues and Market Participants
 - Venues
 - Participants
- II. Liquidity in the U.S. Treasury Market
 - An Index of On-the-Run Liquidity
 - Off-the-Run Liquidity
- III. Reporting and Transparency
 - Pre-Trade Transparency
 - During-Trade Reporting
 - Post-Trade Reporting
 - Recommended Structure of Post-Trade Reporting
 - Phase-In of Post-Trade Reporting
 - Volume of Trades
- IV. Conclusion: Recommendations

I Oversight and Controls for Trading Venues and Market Participants

It is Citi's observation that the U.S. Treasury market has seen a proliferation of new trading venues and participants in recent years. Citi recognizes the many benefits for the market of multiple trading venues and participants. Citi further thinks that the market overall would benefit from a more standardized governance framework for both trading venues and participants.

Of particular note is the evolution in the speed of market access that has occurred over the last number of years. While Citi recognizes the value of many types of market participants, the Firm feels that the evolution of the speed race, alongside the changing landscape of participants, in and of itself has been harmful for liquidity with no overall market benefit. Section 6.5 of "The High-Frequency Trading Arms Race: Frequent Batch Auctions as a Market Design Response"¹ provides support for this observation:

"In equilibrium of our model fast trading firms endogenously serve two roles: liquidity provision and stale-quote sniping. The liquidity provision role is useful to investors; the stale-quote sniping role is detrimental to investors because it increases the cost of liquidity provisions... Our results say that sniping is negative for liquidity and that the speed race is socially wasteful."

Mary Jo White, Chairwoman of the Securities and Exchange Commission, articulated a similar view of the race for speed in the equity markets, in her June 5, 2014 speech:²

"We must consider, for example, whether the increasingly expensive search for speed has passed the point of diminishing returns. I am personally wary of prescriptive regulation that attempts to identify an optimal trading speed, but I am receptive to more flexible, competitive solutions that could be adopted by trading venues. These could include frequent batch auctions or other mechanisms designed to minimize speed advantages. They could also include affirmative or negative trading obligations for high-frequency trading firms that employ the fastest, most sophisticated trading tools."

While the arms race for speed is in the best interest of any individual trading firm, Citi agrees that it is not in the best interest of the overall market. Arguably, it worsens liquidity and social welfare with no benefit to the investor or end user, while potentially advantaging firms with larger technology budgets. Citi would recommend that this phenomenon be an integral consideration for Treasury in designing regulation for venues and participants.

Venues

There are many benefits to having a number of venues offering U.S. Treasury trading. It benefits the market to not be dependent on any one venue or technology for liquidity. It also provides price discovery and more competition around execution costs, potentially enabling new entrants and a broader base of direct participation in the U.S. Treasury market.

¹ Available at <http://home.uchicago.edu/~shim/Papers/HFT-FrequentBatchAuctions.pdf>

² Available at <https://www.sec.gov/News/Speech/Detail/Speech/1370542004312>

Citi's standard risk management controls include notional limits, per-trade limits, Value at Risk ("VaR") and more general risk limits, Profit-and-Loss ("P&L") tolerances, and metrics commonly found with other market participants. When automated systems are used, there are additional checks and controls that would not be applicable to human traders, such as maximum orders sent in a second, ACK/NAK³ rules before something shuts down, various checklists before turning on or modifying a system, price and P&L checks before showing a price to a client on a dealer to client ("D2C") platform, and so forth.

Increased complexity runs the risk of not benefitting the market, and instead creating an advantage for firms with greater technical and/or financial resources. Therefore best practices for trading venues probably means the fewest, simplest order types to ensure a functioning market, uniform requirements to access dealer to dealer ("D2D") markets, and uniform rules and limits on marks access by participants (e.g., only send this many orders per second, order must be good for a certain period of time, rules on sizes per order, cancellation ratios, etc.). Order types and details (Pro-rata vs. FIFO; FAK, FAS, FOK, blocks, icebergs, etc.), time requirements, cancellation details, and other issues should be standardized first before "tail end" events like circuit breakers.

Alternative markets could offer some insight into best practices. Mary Jo White, current Chairwoman of the SEC, has proposed more detailed plans with rule amendments in the equity markets following the Knight Capital Market-Making software glitch of August 1, 2012 and the NASDAQ trade halt of August 22, 2012⁴. In international capital markets, regulations such as the Markets in Financial Instruments Directive (MiFID II) in the EU are likely to include mechanisms to promote trading venue stability. Standard rule books for venues offering U.S. Treasury trading could be a viable option to promote best practices in electronic trading.

Citi is supportive of various methodologies for market access. However, Citi thinks it is critical for there to be certain appropriately standardized controls across participant firms and venues. **Only when there is a standardized system with synchronized clocks can a consolidated audit trail exist across multiple venues.**

Participants

Citi also believes there are benefits to having a broad base of market participants. While the number of participants is not a direct correlation to liquidity, participants motivated by different factors help to increase liquidity by driving a more orderly price discovery process.

Similarly, best practices for participants could include a simple and uniform registration. Firms that conduct a certain risk-based threshold of trading, within appropriate jurisdictional bounds, should be subject to certain capital requirements and margins, supervision, and conduct rules with appropriate justification. Automated trading would simply be an addendum to those requirements given the potential speed at which a participant could trade, and associated market risk that could be aggregated at a significant impact to the market. Requiring minimum standards would most likely have little impact

³ "ACK" and "NAK" are defined as the acknowledgement or the negative acknowledgement from the exchanges.

⁴ Available at <https://www.sec.gov/News/Speech/Detail/Speech/1370542004312>

on the market, and these requirements may in fact strengthen the faith in the U.S. Treasury market (rules and registration “legitimizes” the participants and their strategies, and potentially implements some threshold of capital requirements per unit of risk). **To achieve this there must be common audit trail, time stamping and audit trail retention requirements across all trading venues. More governance is required to ensure best practices are clearly defined and observed by all trading venues and market participants.**

II. Liquidity in the U.S. Treasury Market

An Index of On-the-Run U.S. Treasury Liquidity

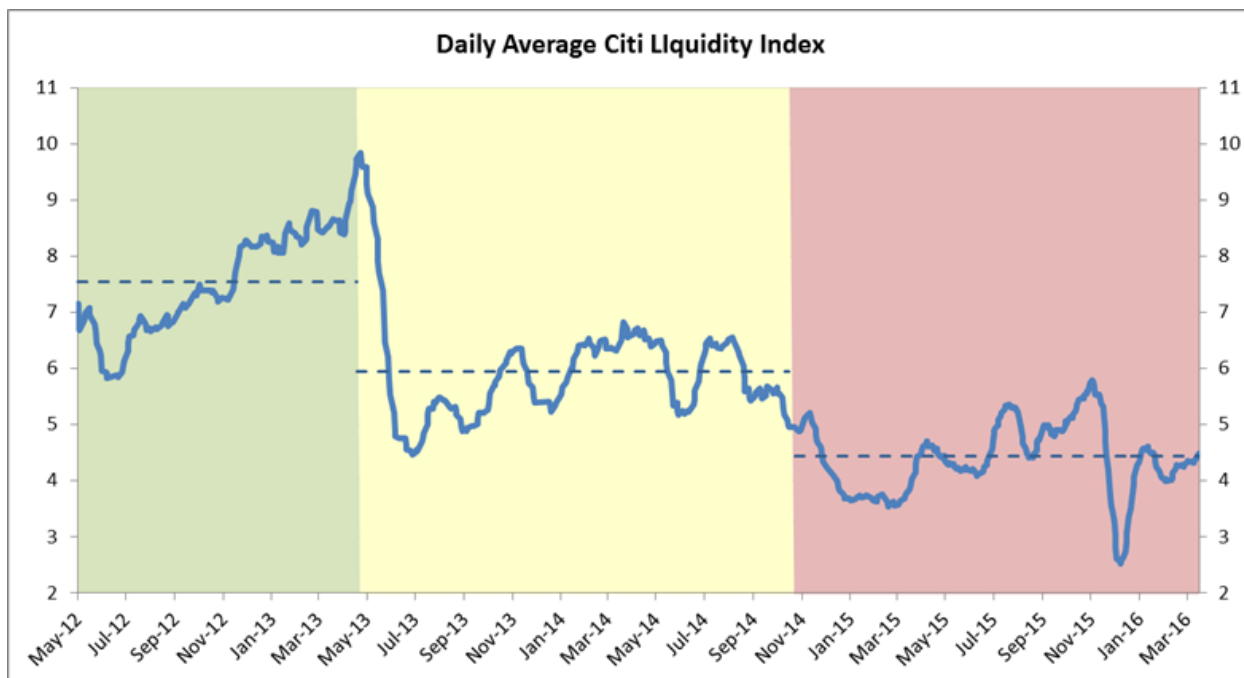
Based on Citi’s experience as a Primary Dealer and feedback from our clients, the Firm measures “liquidity” in terms of several components

- 1) Width of bid-offer spread
- 2) Market Depth
- 3) Imbalance of the market (either of visible order books, or of volumes traded)
- 4) Resilience (scale of market impact for a given trade)

The last two components are difficult to quantify, and of course every observer would assign different weights to the four, and some may add other components. Importantly, however, Citi believes liquidity is much more than component (1) (i.e, width of bid-offer spread). Citi has many clients who are predominantly institutional in nature. **When those clients give us feedback about the quality of Citi’s “liquidity provision”, they are referring to our ability to make good prices “in size” – tight markets for tiny size does not count as liquidity provision with that client base.**

To aid in the Firm’s own risk management, Citi has developed a “Liquidity Index”, which monitors visible market depth (see more details in Appendix A). The goal of the index is to capture Citi’s assessment of how much risk is available in the marketplace, at a constant distance from “mid”⁵, across the entire U.S. Treasury (“UST”) complex. While this does not explicitly incorporate metric #(4) above, Resilience, it does effectively operate as a depth score over time.

⁵ For the purpose of this comment letter, “Mid” is defined as the average of the bid and offer for a financial instrument.



As measured by the Liquidity Index, it appears that market depth has gradually diminished with marked steps down around large moves up or down in rates accompanied with high volatility, such as in late spring 2013 or the pronounced fall in UST yields in the fall of 2014. **Following each event the liquidity index has failed to recover to previous levels.**

Liquidity in Off-the-Run Treasuries

Of the 782 different CUSIPs that comprise the U.S. Treasury market⁶, only six are “On-the-Run” (“OTR”). Given their very visible price performance, they are frequently cited by market participants in examination of market developments.

Liquidity, and daily traded volume, of the other 776 securities varies materially and is lower than that of the On-the-Runs.

For context, please find some of Citi’s own turnover data.⁷ Citi splits volumes into eight categories:

- 1) “OTR” (On-the-Runs)
- 2) “Olds” (first Off-the-Run)
- 3) “2x Old” and “3x Old” (second and third Off-the-Run)
- 4) “Off” (Off-the-Runs, excluding buckets 2 and 3 above)
- 5) “STRIPS” (includes both Principal and Coupon STRIPS)

⁶ 396 STRIPS CUSIPs are calculated as the principal and individual coupons of all stripped bonds and the principal and coupon stream of all stripped notes and TIPs as reported by the U.S. Treasury for the month of March.

⁷ “Turnover” is defined as the amount of bonds bought or sold by Citi over a given period. “Theoretical days to full turnover” is defined as the sum of the notional outstanding for a group of CUSIPs divided by the sum of the traded notional amount of those CUSIPs per day.

6) "Bills" (U.S. Treasury Bills)

7) "FRNs" (U.S. Treasury issued Floating Rate Notes)

8) "TIPS" (U.S. Treasury issued Inflation Linked Bonds)

Citi's volumes for the (representative) week of April 4th, 2016 are shown below.⁸

	Average Daily volume							
	OTR	Old	2x&3x Old	4+x Old	STRIP	BILL	TIPS	FRN
10 Year Equivalents (mm)	11,174	1,097	212	2,092	162	178	115	0
Notional (mm)	15,310	1,137	371	2,607	125	7,743	236	109
% of Issued Notional	7.4%	0.41%	0.17%	0.03%	0.03%	0.56%	0.02%	0.03%
Number of Cusips	6	6	12	281	387	30	40	8
Theoretical Days to Full Turnover at the Firm	13	244	606	3,576	3,086	177	4,667	3,023
Theoretical Days to Full Turnover in the Market*	1	22	55	322	278	16	420	272

* assumes 9% market share, cusips in aggregate; however turnover is not proportionate in reality

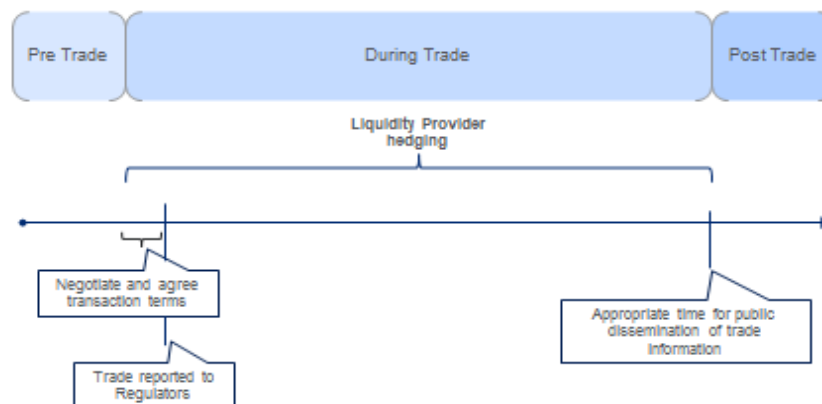
Source: U.S. Treasury, Citi

The lower turnover of Off-the-Runs inventories implies that liquidity providers often need to warehouse risk for several days, effectively lengthening the duration of the transaction.

III Reporting and Transparency

The following diagram illustrates the sequence of events in a typical principal-style client-vs.-dealer trade, which makes up the bulk of Citi's secondary U.S. Treasury business.

Sample principal price timeline



⁸ "10y equivalent" is defined as the notional equivalent of any bond to make it duration neutral to the OTR 10y bond.

In the principal model of client-vs.-dealer trading, clients typically ask one or more dealers for a bid and/or offer on a particular security. They may then execute the trade with one or more of these dealers based on their own criteria. If the trade is executed, the dealer may then hedge the risk incurred by the trade, in the context of its overall portfolio. Broadly speaking, this trade could be split into three phases: pre-, during- and post- trade.

Pre Trade

Citi notes that the level of pre-trade transparency in the U.S. Treasury market surpasses most other markets. For example, Citi continuously streams prices for 381 out of 782 securities to both Bloomberg and Tradeweb. Citi also provide Request-for-Quote (“RFQ”) pricing on all UST securities on both platforms simultaneously. Bloomberg displays Citi’s bids and offers, along with those of many of its peers’ on pages such as “ALLQ”, while Tradeweb displays a composite mid-price compiled using all the liquidity providers’ price feeds. Both platforms provide closing prices to market participants who subscribe. Citi also publishes daily, at 3p.m. Eastern Standard Time, closing prices of all U.S. Treasury instruments on Citi Velocity, which was accessed by over 73,500 unique client users in 2015. Citi’s clients accessed the site over 8 million times during that same timeframe.

During and Post Trade

The “bid-offer” that a dealer applies to a client request in the principal model is a function of many variables, including perceived overall wholesale liquidity, the liquidity of the particular security, the size of the transaction, the dealer’s inventory in that security, and the dealer’s perception of its ability to redistribute the potential risk exposure.

It stands to reason, and is consistent with Citi’s experience, that if the details of the trade requested or executed are instantly disseminated to the entire market, the task of managing or redistributing that risk will be more difficult, and a wider bid-offer will be charged ex-ante, all else being equal. This effect is particularly significant for larger trades, which are typically executed in the client-vs.-dealer model.

It is this fundamental issue that brings about the tradeoff between transparency and reporting goals, on the one hand, and liquidity, on the other.

The Firm has yet to see any evidence that broad market dissemination of a traded price between two principals accomplishes much, but if dissemination is deemed necessary, Citi would suggest that an interval of time (denoted “During Trade” in the diagram above) be carved out for the liquidity provider to distribute or mitigate the risk, and therefore ex-ante allow the principal client model to function. **As denoted in Section II, this interval of time varies materially across the eight buckets of U.S. Treasury issued securities.**

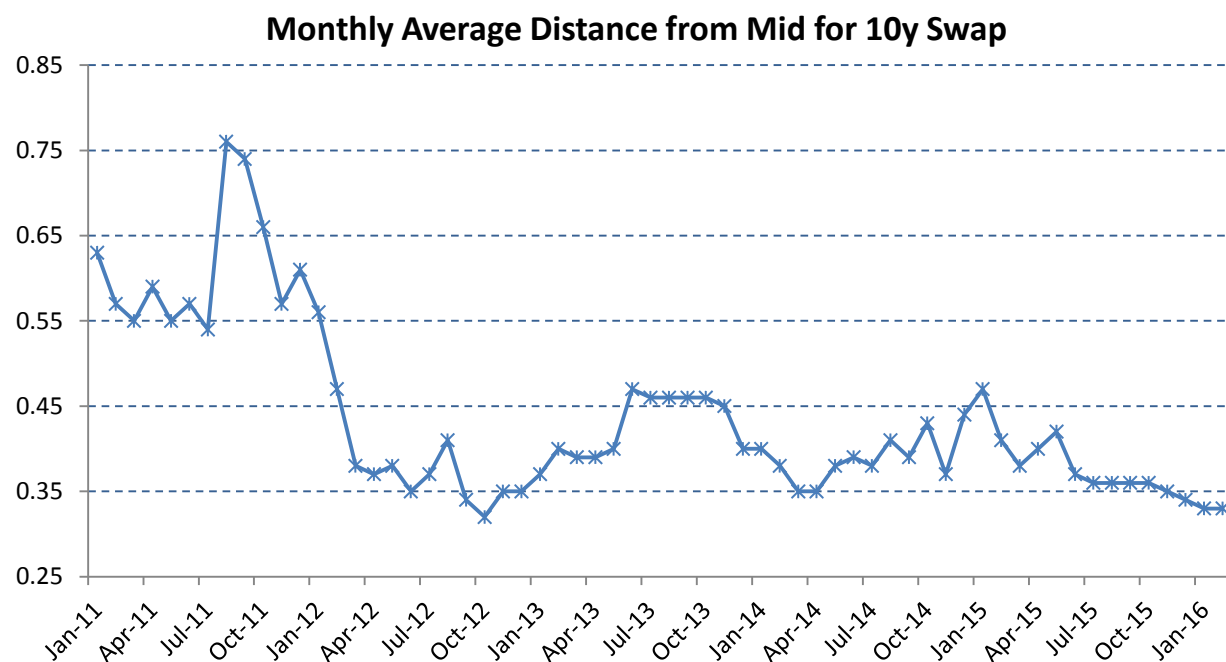
Further criteria are discussed below.

Swap Market Liquidity since the Introduction of Post-Trade Reporting

To assess the likely effects of broad based during-trade reporting requirements on U.S. Treasury market liquidity, it is helpful to consider what has happened to other closely related markets where this change has been made, in particular the credit, municipal, mortgage, and swaps markets. Present below are data from the U.S. dollar swaps market, which shows that following post-trade reporting there were:

- 1) Tighter headline bid-offer (Component 1)
- 2) Lower depth and resilience (Component 2 and 4)
- 3) Lower overall liquidity

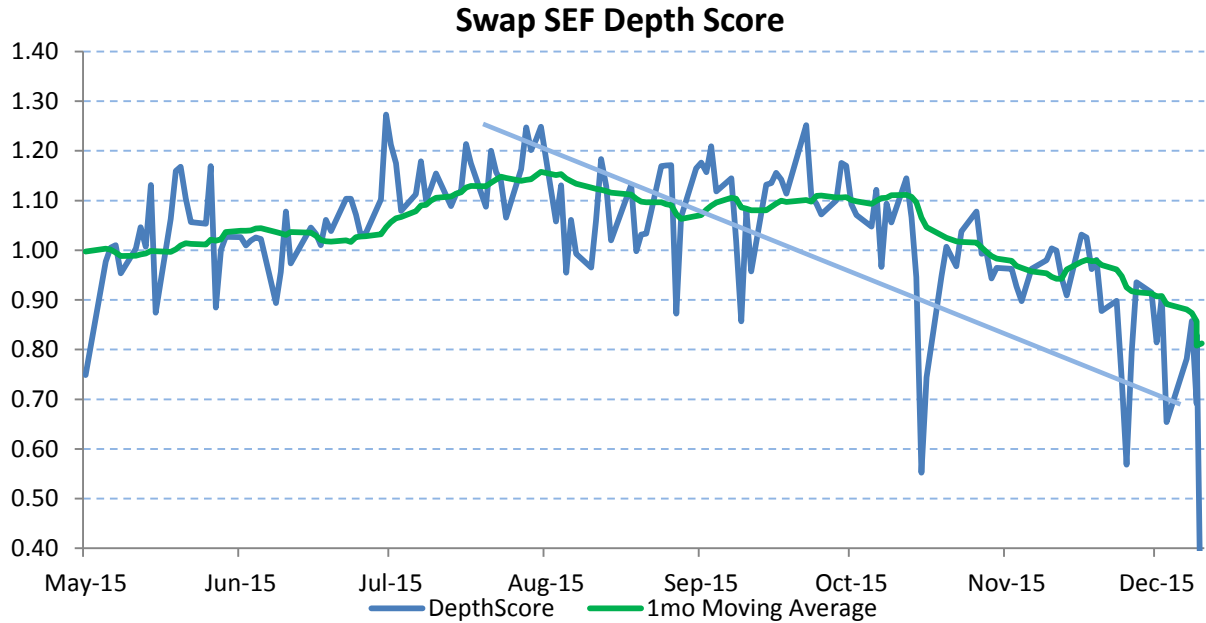
Below is a graph of average bid-offer spreads on 10-year swap rates from Bloomberg's composite price screens (data included with permission from Bloomberg).



Note: Distance between Bid and Offer on 10y swap as provided by Bloomberg

Source: Bloomberg

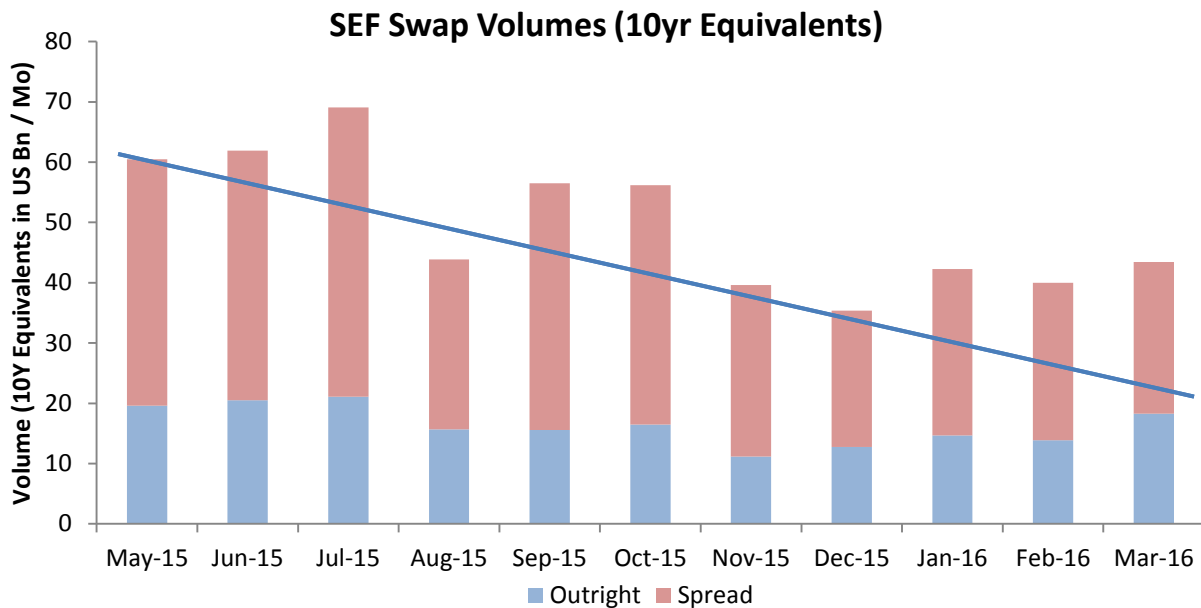
To illustrate how average market depth has changed, Citi used U.S. swap spreads to better isolate the impact on swaps rather than the broader duration markets.



Note: Calculated as the inverse of the number of level of market depth needed to move \$750k DV01 worth of headline swap spreads on SEF. Data is computed every minute with the daily average being graphed. The index aggregates across all maturities, converting them based on DV01 into 10yr equivalents.

Source: Citi, Tradition, ICAP

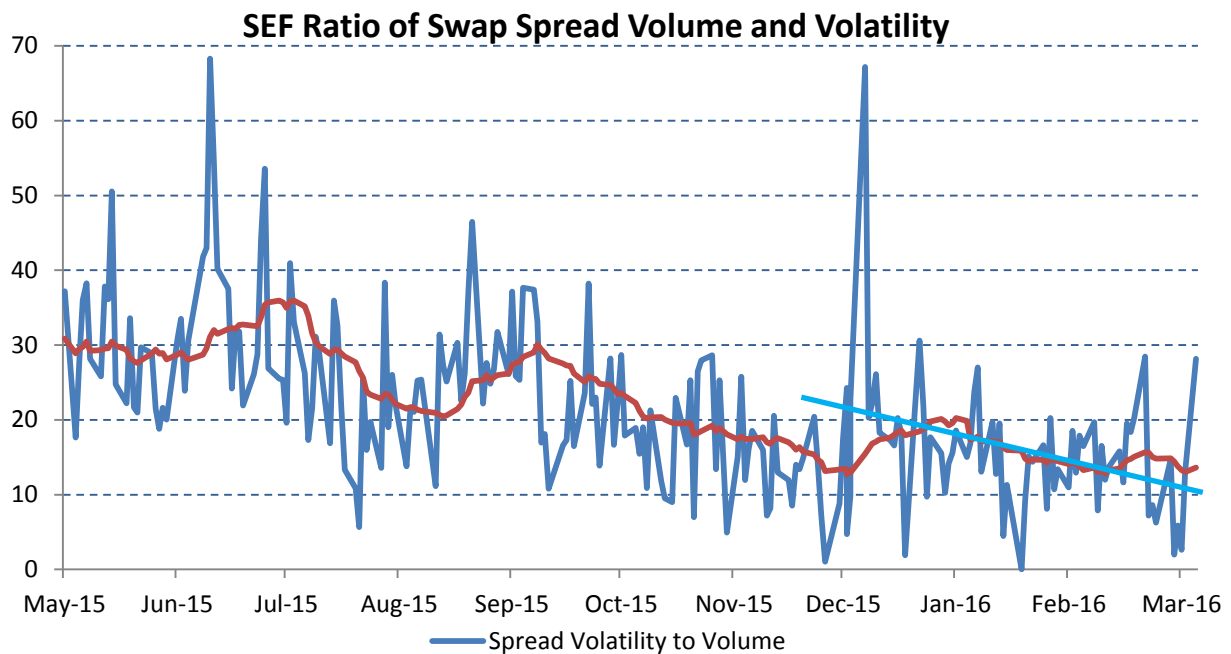
Volumes have also declined:



Note: Monthly aggregated swap spread and outright duration done electronically over i-Swap, TradeX and Dealerweb expressed in 10yr equivalents.

Source: Citi, Tradition, ICAP, Dealerweb

Simultaneously, the ratio of Swap Volume to Volatility had dropped notably. Citi views this as a strong indicator of declining market resiliency.



Note: Volatility is computed on 10y headline swap spreads using 2 minute interval data and averaged across 3 SEF platforms. Volume is computed as the sum of 10y swap spread volumes done across all platforms.

Sources: Citi, Tradition, ICAP, Dealerweb

Certainly other factors could be at work here, but the pattern seems fairly clear to Citi and is consistent with the observation that increasing during and post-trade transparency has led to an increased number of market makers. Possibly would-be market participants who had not developed the client or technological infrastructure to have a close enough grasp on where ‘mid’ is on a given instrument could use the new reporting features to leverage off of others who had, and thus gain a foothold in the market.

Citi believes that the data suggest that if post-trade reporting were introduced in U.S. Treasuries, similar patterns would be observed, except that OTR bid-offer spreads would be unlikely to compress without a move to decimalized prices. Therefore, in OTR securities, we would expect the main impact to be lower levels of depth and resilience and therefore lower liquidity.

Citi therefore does not support a move to broad based market dissemination of traded prices in the U.S. Treasury market, since it is likely to degrade liquidity further for limited overall benefit to the market. The Firm thinks this move would be damaging if the reporting window were narrow enough to cause “During the Trade” reporting.

Of course Citi has no reservations regarding reporting its activity during any time interval to any regulator.

Recommended Structure of Trade Reporting if Deployed

Nonetheless, if post-trade reporting were implemented, Citi believes that a number of factors should be considered to minimize any adverse impacts. For example, Citi highlights the need for flexible standards given the immense scope and variability of product within the U.S. Treasury universe, referring back to the eight categories of product in Section I. Citi views it as critical to structure reporting in a manner to prevent adverse effects to liquidity providers' incentive to take risk and provide price improvement, and this would vary by instrument. The Firm also highlights that the sheer number of daily U.S. Treasury trades could render full reporting potentially dilutive in terms of informational value.

Specifically, Citi would highly recommend a tiered approach for reporting time and trading size disclosure with a cap for block size, which is based on the market turn-over observed. Moving through the seven groups of securities in order:

1) OTR:

For the six securities defined as "On-the-Runs", additional public reporting seems sensible, with some accommodation for block trades. Citi looks at the To Be Announced ("TBA") mortgage market as the most similar to the U.S. Treasury market, and therefore mirroring the \$25 million threshold for block size and the within 15 minutes of execution would be reasonable, in the Firm's view.

2) Olds and When Issued ("WIs"):

Market volumes in Olds and WIs are markedly lower than in OTRs. Citi believes that the timeliness of reporting for these instruments is more valuable in creating transparency than the size. Therefore we would recommend a 15 minute window, but a reduced block size of \$10 million and greater.

3&4) 2x and 3x Olds and Off-the-Runs:

Market volumes drops off precipitously with the move beyond Olds. Citi believes that the ability to warehouse risk for some period of time is critical to smooth market functioning. The Firm views these as more akin to specified pools in the mortgage market. Therefore Citi would recommend a 60 minute window, and the similar block size of \$10 million and greater.

5) STRIPS:

Market volumes in STRIPS are very light, while VaR per unit of notional is very high. As such, Citi believes reporting here could be most disruptive. Citi would urge roll out of any reporting in STRIPS to be delayed, offering the Treasury time to assess the impact of reporting on U.S. Treasury securities more broadly first.

6) Bills:

Bills are, at maximum, 52-week issues, Citi would propose excluding U.S. Treasury Bills from post trade reporting.

7) FRNs:

Citi would propose block size of \$25 million and greater reporting within 15 minutes for FRNs.

8) TIPS:

Market Volumes in TIPS are also materially lighter, with valuations very volatile already. Citi would recommend a block size of \$10 million and greater with reporting within 60 minutes of execution.

In aggregate, Citi's recommendations are:

Type of Security	Reporting Times	Notional Block Size
OTR	Within 15 minutes of time of execution	25+mm
Olds & Ws	Within 15 minutes of time of execution	10+mm
2x,3x Olds and Off the Runs	Within 60 minutes of time of execution	10+mm
Strips	N/A	N/A
TIPS	Within 60 minutes of time of execution	10+mm

Citi would recommend a periodic review, perhaps annually, of these reporting times and block size thresholds. While overly frequent changes in rules could be disruptive, a periodic review would help to ensure that could be adjusted to be accommodative and remain appropriate throughout market evolution.

Phase-In of Post-Trade Reporting

With respect to phase-in of reporting, Citi would recommend a similar approach that has been taken with TRACE reporting in other markets, to ensure adequate data processing and systems testing on both the side of submissions and reporting.

Volume of Trades

The sheer volume of trades in the U.S. Treasury market should also be considered when designing reporting. Citi would estimate the average number of monthly trade tickets across venues to be in the millions. Citi recommends the consideration of the operational feasibility of full trade reporting also be considered when evaluating the possible benefits. **During general U.S. market hours, full trade reporting could mean posting of multiple trades a second. Processing of such information could be onerous, and inadvertently create an edge for firms with more significant technological resources, which Citi views as counter to the intent of creating transparency.**

IV Conclusion: Recommendations

In conclusion, Citi appreciates the Treasury's consideration of its views regarding the liquidity, market-structure, and evolution of the U.S. Treasury market.

The Firm's main recommendations are summarized below:

- Address the individual participant's incentive to participate in the arms race to speed, perhaps by limiting how participants can access markets (only send this many orders per second, order must be good for a certain period of time, rules on sizes per order, cancellation ratios, etc.).
- Maintain the landscape of many public trading venues, but create uniform requirements for accessing them, as well as uniform governance rules. Similarly, standardize order types and details across venues.
- Create a uniform registration process for market participants. Firms that conduct a certain risk-based threshold of trading should be subject to certain capital requirements and margins, supervision, and conduct rules, as well as the same reporting requirements.
- Require more complete trade reporting from material market participants (venue/participants)
- Synchronize clocks across venues and market participants to create a robust audit trail.
- Citi believes the benefit of post trade transparency would be more than offset by a corresponding decrease in liquidity, and therefore does not recommend post trade reporting. However, if Treasury views the benefits of post trade reporting as exceeding the risks to participants, Citi strongly recommends reporting post, and not during, the trade, with block size constraints. Specifically, the Firm views the following reporting as likely to be less damaging to the critical risk warehousing function of many market participants:

Type of Security	Reporting Times	Notional Block Size
OTR	Within 15 minutes of time of execution	25+mm
Olds & Wls	Within 15 minutes of time of execution	10+mm
2x,3x Olds and Off the Runs	Within 60 minutes of time of execution	10+mm
Strips	N/A	N/A
TIPS	Within 60 minutes of time of execution	10+mm

Also, the Firm recommends structuring trade dissemination to avoid disadvantaging players with smaller technological resources, given the likely volume of trades.

We would be pleased to discuss any part of this comment in person.

Sincerely,

A handwritten signature in dark ink, appearing to read "Deirdre K. Dunn", with a long horizontal flourish extending to the right.

Deirdre K. Dunn
Managing Director – Head of NA G10 Rates
Citi Global Markets

APPENDIX A

Rates Quantitative Analysis, Fixed Income

Date: 30 November 2015

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Depth Score for the U.S. Treasury Market

1 Introduction

In this document we introduce a methodology to analyze liquidity conditions in the U.S. Treasury market.

2 Motivation

In [1], the authors proposed a methodology to quantify liquidity conditions. It is a relative metric, in the sense that the index is calibrated to a reference period and presented probabilistically. As a result, the index ranges between zero and one hundred, with zero indicating the worst liquidity condition, one hundred the best and fifty (arguably) normal. This is useful for intra-day analysis because it removes dependency on regimes, e.g. what is normal for the market today surely differs from what was normal for the market in the 1980s, and because intra-day analysis focuses mainly on short-term trends. Precisely for this reason, liquidity index has limited application for historical analysis over an extended period of time – the index value will, by definition, oscillate around fifty.

In this paper, we propose a different methodology suitable for long-term liquidity analysis. We begin with a simple question: How many levels of visible depth would it take to trade X amount of DV01? The answer to this question is obviously security dependent as different securities are traded differently. To this end, we select a different X for each security. We then calculated the weighted sum of the required depth levels for each security. It should be noted that a greater number in required depth indicates poorer liquidity conditions, so to make our metric more intuitive (greater value means better liquidity), we take a final step to invert the weighted sum. This metric is referred to as the *depth score* and is rigorously defined in the next section.

Security	X	ω
T2	750	0.50
T3	200	0.50
T5	150	1.00
T7	75	0.80
T10	75	1.00
T30	10	0.80
TU	3,750	0.50
FV	1,500	0.50
TY	750	1.00
US	100	0.80

3 Methodology

We consider on-the-run treasuries (T2, T3, T5, T7, T10, T30) and treasury futures (TU, FV, TY, US). For the i^{th} security, let X_i be the notional we are required to trade, ω_i the weight assigned to this security, $N_i^{\text{bid}}(X_i)$ the number of levels required to sell X_i amount of the security and $N_i^{\text{offer}}(X_i)$ the number of levels required to buy X_i amount of the security. The values of X_i and ω_i are given in Table 3. The notional amount for on-the-run treasuries is specified in millions. For treasury futures, the notional indicates the number of contracts.

Finally, the *depth score* D is defined as:

$$D := \frac{100}{\sum \omega_i (N_i^{\text{bid}}(X_i) + N_i^{\text{offer}}(X_i))}.$$

4 Data analysis

Figure 1 presents the time series of depth score values from April 2012 to November 2015.

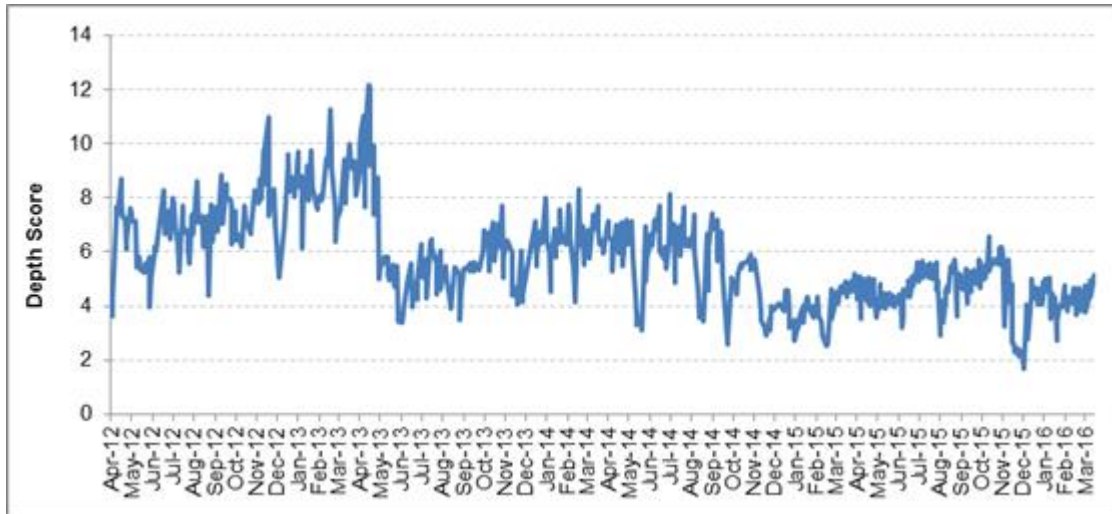


Figure 1: Daily average depth score values

References

- [1] LI, D., WADHAWAN, V., AND ZHOU, W. Liquidity index. *Citi Internal Document* (2015).