CME Group

INTEREST RATES

The New Treasury Market Paradigm

TREASURY FUTURES

JUNE 2016

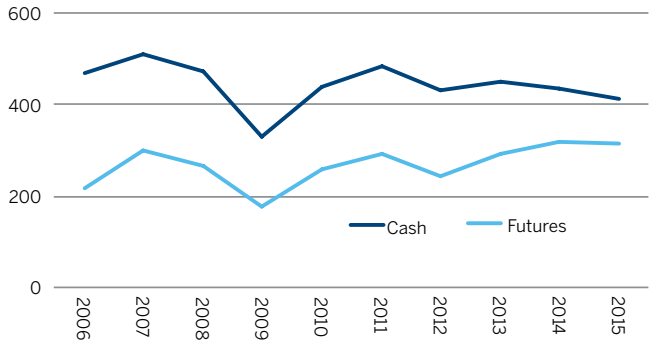
Changes in banking regulations have contributed to increased demand for off-balance sheet Treasury exposure, as evidenced by persistent negative swap spreads and continued growth of futures markets relative to cash Treasury securities. Market commentators observe that liquidity in Treasury futures has become comparable to, if not superior to, liquidity in the cash Treasury securities market. Additionally, Treasury futures are unlikely to expose customers to fails to deliver, which have become an increasingly relevant issue in securities markets.

The purpose of this note is to summarize the facts that attest to the increasing role of Treasury futures in the greater Treasury market (inclusive of both cash and futures) and the reasons for it.

TRENDS OF TREASURY FUTURES AND CASH VOLUMES

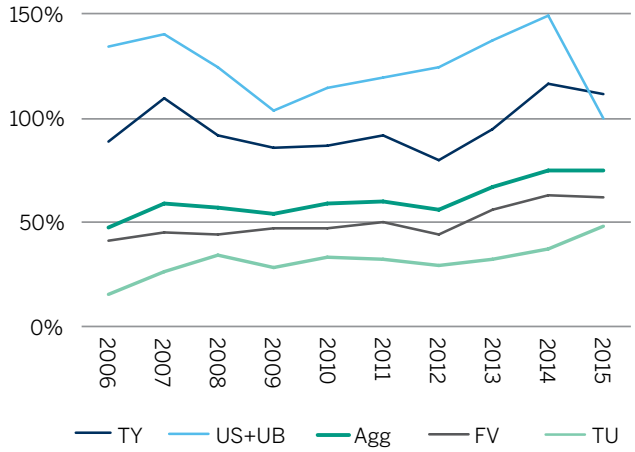
Aggregate Treasury futures transaction volumes – when expressed in terms of notional face value traded (rather than in number of contracts traded) — grew more than 22 percent over the last five years, from $257 bln per day in 2010 to $314 bln per day in 2015 (Exhibit 1). **This outcome runs counter to contemporaneous trends in the underlying cash market for US Treasury notes and bonds, where trading volumes reported by US government securities primary dealers to the Federal Reserve Bank of New York decreased by more than six percent, from $441 bln per day in 2010 to $413 bln per day in 2015.**

Exhibit 1: Annual average of daily trading volume Treasury Note and Bond futures (Futures) and primary dealer transactions in US Treasury fixed-principal coupon-bearing securities (Cash)



($ blns per day for Cash, $ blns per day of contract notional face value for Futures) Data sources: CME Group, Federal Reserve Bank of New York.

Exhibit 2: Notional trading volume in Treasury Note and Bond futures as percentage of notional primary dealer transactions in US Treasury fixed-principal coupon-bearing notes and bonds for corresponding tenors and in aggregate



Data sources: CME Group, Federal Reserve Bank of New York

1 U.S. Treasury Note and Bond Futures are listed for trading on and subject to the rules and regulations of the Board of Trade of the City of Chicago, Inc. (CBOT). CBOT lists futures on Treasury securities covering a broad set of maturities, including the benchmark 10-Year Treasury Note futures. CME Group is the parent of four U.S. based futures exchanges that are registered under the Commodity Exchange Act ("CEA") with the CFTC as designated contract markets ("DCMs"): Chicago Mercantile Exchange ("CME"), the Board of Trade of the City of Chicago, Inc. ("CBOT"), New York Mercantile Exchange, Inc. and Commodity Exchange, Inc. (collectively, the "CME Group Exchanges" or "Exchanges").

That is, aggregate (Agg) notional trading volume in Treasury futures, measured as a percentage of notional volume of trade mediated by primary dealers in the cash market for Treasury fixed-principal notes and bonds, rose from less than 59 percent in 2010 to 75 percent in 2015 (Exhibit 2). The general uptrend in relative proportions manifests itself in different ways, at different points along the term structure of maturity. 2-Year and 5-Year (TU and FV) Treasury Note futures, for instance, have enjoyed more or less steady gains. Between 2010 and 2015, TU trading volumes (sized relative to trading activity in fixed-principal coupon-bearing securities due in more than two years but no more than three years) soared from less than 33 percent to more than 48 percent, and FV trading activity (sized relative to transaction volume in fixed-principal coupon-bearing securities due in more than three years but no more than six years) shot from 47 percent to nearly 62 percent.

At the same time, 10-Year (TY) Treasury Note trading activity has oscillated around 100 percent of trade flows in the proximate sector of the cash market (ie, fixed-principal coupon-bearing Treasury securities due in more than six years but no more than 11 years). From less than 87 percent in 2010, it ascended to a historical high of nearly 117 percent in 2014, edging back to 111 percent in 2015.

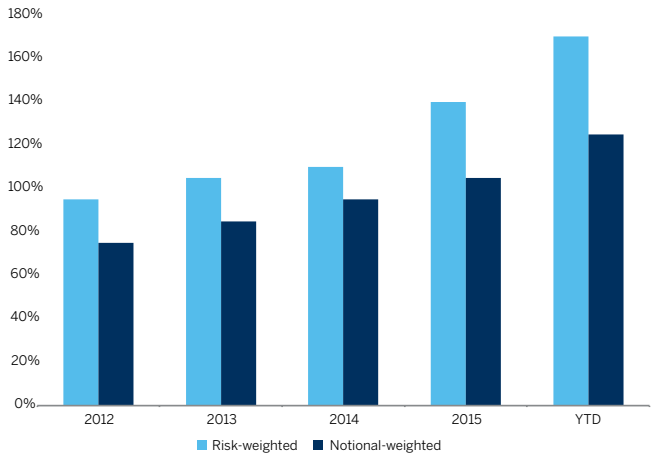
Meanwhile, combined volumes of Treasury Bond (US) and Ultra Treasury Bond (UB) futures (sized relative to transaction volume in fixed-principal coupon-bearing securities due in more than 11 years) steadily grew from 100 percent in 2009 to 150 percent in 2014. In 2015, their combined share abruptly declined back to 100 percent as Treasury Bond futures (US + UB) fell by 15 percent YoY. Recall, in 2015 US futures transitioned from tracking a bond with a term to maturity of 15 years to one with a term to maturity of 21 years. The change in the Treasury Bond (futures) cheapest to deliver due to the five-year absence of Treasury bond issuance enabled customers to trade and hold fewer contracts for the same risk exposure. As US +UB futures volumes fell by 15 percent in 2015, risk-weighted US+UB volume increased by 16 percent. The increase in risk-weighted US+UB volumes as contract volumes fell abruptly suggests the US contract has maintained its status as a key source of price discovery and hedging in spite of the significant increase in risk exposure.

The aforementioned percentages of Treasury futures volume are conservative due to the approach to the Treasury cash market volume. The prior comparisons depict notional volumes of all Treasury coupon securities within a range of remaining terms to maturity for the corresponding Treasury future. For example, TY notional volume is compared to notional volume of all Treasury securities (reported by the primary dealers) with terms to maturity of greater than six years and less than or equal to 11 years.

Another reasonable approach to Treasury cash volumes for the purpose of comparison to futures is to limit the scope of Treasury coupons to the on-the-run (OTR) security (the most recently auctioned). In a recent note, JP Morgan analysts took this approach by comparing on-the-run/ hot run Treasury cash and futures volume in terms of notional and duration-weighted basis. Based upon data for 2012-15, the JP Morgan authors determined that "global trading volumes in U.S. Treasury futures have increased meaningfully relative to cash. Last year they exceeded trading volume in hot-run Treasuries for the first time on a notional-weighted basis, and have increased even more dramatically on a duration-weighted basis (Exhibit 3). And with no significant changes to regulatory constraints on dealer activity, FX reserve outflows, or financing market structure on the immediate horizon, we expect this trend to continue and likely accelerate from here."

2 *Joshua Younger, Alberto Iglesias, Devdeep Sarkar, "24 hour party people redux", North America Fixed Income Strategy, J.P. Morgan Securities LLC, 27 January 2016, 2-58*

Exhibit 3 – Comparison of annual average daily volume in Treasury futures* and hot-run Treasury issues+, risk- and notional-weighted; %



* *Includes TU, FV, TY, TN, US and UB. Risk-weighted from front futures DV01. Three weeks around first delivery date excluded to avoid distortions owing to the quarterly roll.*

\+ *Includes hot-run 2s, 3s, 5s, 7s, 10s, and 30s from two electronic interdealer markets (e-Speed and BrokerTec). Same dates excluded as above for consistency.*

Note: YTD data through 1/21/16.

Sources: J.P. Morgan, CME, Reuters, e-Speed, BrokerTec

TREASURY FUTURES: A DEEP POOL OF LIQUIDITY

The greater Treasury market is increasingly global. Comparing cash and futures liquidity by region reveals the pattern by which liquidity develops during a typical trading day. As Exhibit 4 shows, a significant percentage of Treasury futures volume is executed outside of U.S. market hours (7am until 4pm, Central Time), particularly in FV and TY futures, which produced more than 20% of their average daily volumes during non-U.S. hours over the last three years (April 2013 through March 2016).

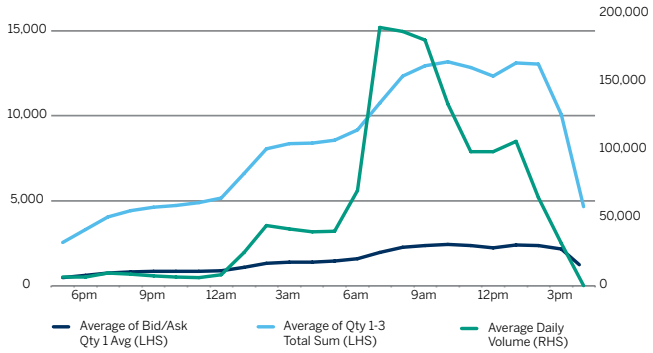
Exhibit 4 – Percentage of daily volume in Treasury Note and Bond futures during Non-U.S. Hours* - April 2013 – March 2016

Data source: CME Group

* *Asian Trading Hours (5p.m.-1a.m., Central Time), European Trading Hours (1a.m.-7a.m., Central Time)*

As demonstrated in Exhibit 5 below, the chart of hourly market depth and volume of TY futures shows how liquidity develops on a typical trading day. The market depth and volume data reflects hourly averages of the last three years (April 2013 through March 2016).

Exhibit 5 – Three-Year Average Market Depth* (Best and 3 Best Prices) and Hourly Volume, TY futures – April 2013 – March 2016



Data source: CME Group

Chart and data reflects Central Time

Market depth is quantity available at best and three best prices for front month contract

As Treasury futures play an expanding role in the broader Treasury marketplace, liquidity metrics are worth closer examination. Liquidity means many things to many people. For the purpose of this comparison, market depth, bid/ask spreads, and open interest are the focal points.

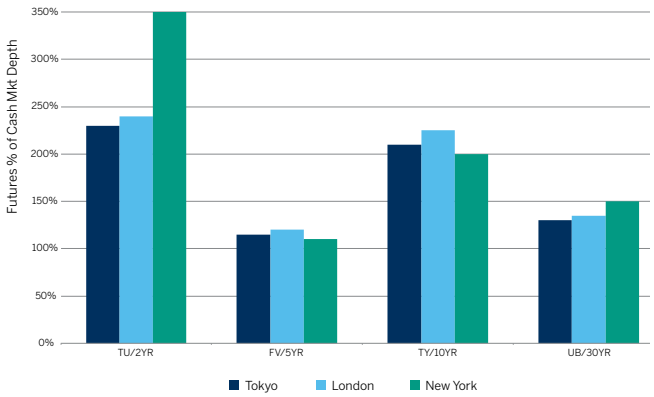
Market Depth

On any automated trading platform such as CME Globex, market depth is gauged by the number of contracts bid for purchase or offered for sale at a given number of bid or offered price levels at any given time. Comparison of cash and futures market depth requires expressing resting bid and offered amounts in terms of a common metric, such as the dollar value of a 1-basis-point change in market yields ("DV01").

JP Morgan analysts took this approach in a recent comparison of cash and futures market depth during the first two hours of the trading day in each of Tokyo, London, and New York.[3] Based upon data for 2013-15, the JP Morgan authors concluded that "futures markets are generally deeper and more liquid than cash, particularly in TU and TY. (Exhibit 6) Further, with the exception of the front end, the relative liquidity roughly constant on average through the overnight session—depth in TY versus 10s is around 200-250% in Tokyo, London, and New York trading. Going forward, we expect this will continue to be the case."

Market depth typically moves inversely to price volatility: Market depth decreases as price volatility increases, and vice versa. In an earlier note, the JP Morgan team examined this phenomenon, concluding that it imposes no handicaps on the usefulness of market depth as a gauge of market liquidity: "...market depth is in fact the best metric that is most highly correlated with delivered volatility over the same time period."[4]

Exhibit 6 – Three-Year Average % of Three Best-Bid/Best-Offered during Tokyo, London, New York Open - January 2013 – January 2016



**On a duration-adjusted basis using front futures DV01*

Sources: J.P. Morgan, BrokerTec, CME Group

3-year average market depth in the top three order book positions of futures versus OTR cash by trading session and contract; % of cash market depth*

Transaction Cost (Bid/Ask Spread)

The majority of the transaction cost incurred executing a trade in a central limit order book market is ascribable to the width of the bid/ask spread, ie, the difference between the highest available bid (buy) price and the lowest available offer (sell) price. The Exchange defines the minimum price increments for each Treasury futures product. Not surprisingly, bid/ask spreads in these products gravitate to the respective minimum price increments during the course of a typical trading day. For Treasury Note (TU, FV, and TY) futures, bid/ask spreads tend to be at the minimum price increment regardless of time of day. In each case, the prevailing width of the futures bid/ask spread is consistent with the characteristic bid/ask spread for the corresponding on-the-run cash Treasury note.[5] In the case of TU, the bid/ask spread is tighter than its cash counterpart.

3 Joshua Younger et al., "24 hour party people redux", North America Fixed Income Strategy, J.P. Morgan Securities LLC, 27 January 2016, 4

4 Joshua Younger et al., "24 hour party people" ", North America Fixed Income Strategy, J.P. Morgan Securities LLC, 23 October 2015, 3

5 For comparison purposes, the Treasury cash market data represents on-the-run (most recently auctioned) issues (duration-adjusted) using BrokerTec data from J.P. Morgan's note, "24 hour party people redux."

Please refer to Exhibit 7 below for charts of medians and interquartile (IQR) ranges of Treasury cash and futures bid/ask spreads during initial Tokyo, London and New York hours over the last three years. The IQR quantifies the stability of the bid/ask spread during the three year period assessed in the recent J.P. Morgan note. The IQR of median bid/ask spreads suggests futures spreads are as stable as cash spreads, if not more so. In each chart, New York hours represent the baseline. The stacked bars for London and Tokyo hours are the incremental change in value from prior time period because bid/ask spreads tighten and become more stable as the trading evolves from Tokyo hours to London hours, and from London hours to New York hours. For example, the 30 year cash bond has a median bid/ask spreads of 1.66 (32nds) during Tokyo hours, 1.37 during London hours, and 0.97 during New York hours.

Exhibit 7 – Treasury Cash and Futures Bid/Ask Spreads by Local Trading Hours – January 2013 – January 2016

Median and inter-quartile range for bid/ask spreads at the top of the order book for various futures contracts and cash securities* in the first two hours after each local open in Tokyo, London and New York; 32nds

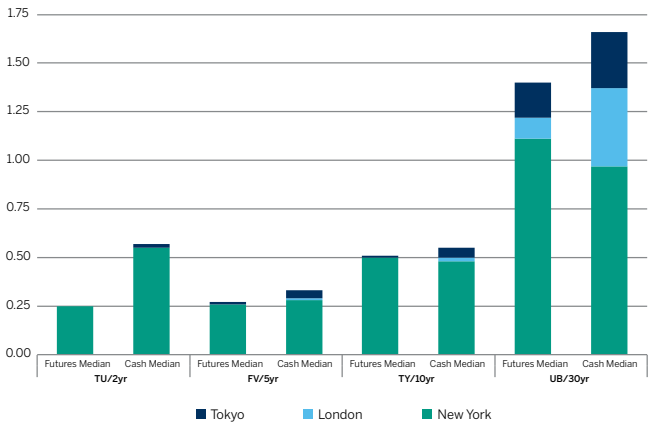
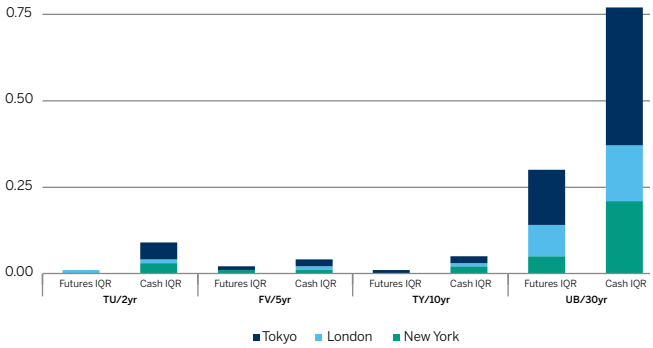


Exhibit 7 – Treasury Cash and Futures IQRs of Bid/Ask Spreads



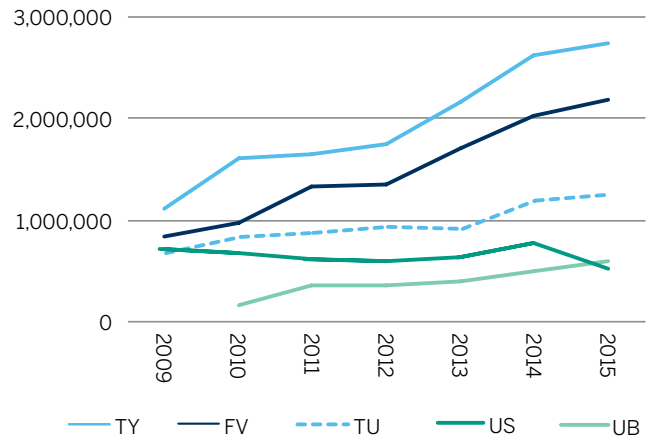
* *Cash bid/offer spread is scaled to match the futures DV01.Note: J.P. Morgan excludes three weeks around the first delivery date due to distortions owing to the quarterly roll. Data current to 1/25/16.*

Sources: J.P. Morgan, BrokerTec, CME Group

Open Interest

Given the standardization that characterizes listed futures contracts, futures open interest makes a useful, familiar, and informative adjunct to the measures described above. It affirms that the Treasury futures liquidity pool has deepened and grown more resilient in recent years. Annual average daily open interest (ADOI) in Treasury futures doubled from 3.36 million in 2009 to 6.7 million contracts in 2015. The increase has been led by FV futures. Exhibit 8 on the following page depicts annual ADOI by tenor from 2009 through 2015.

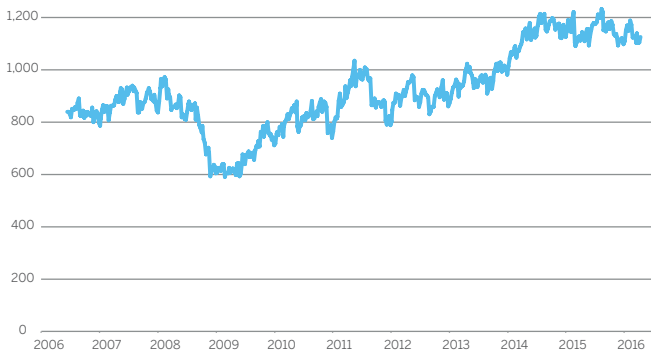
Exhibit 8 – Annual average level of daily open interest in Treasury Note and Bond futures (contracts)



Source: CME Group

Among the contract terms and conditions of any Treasury futures contract is the reportable level of open interest held by any futures account. Positions at or above the reportable levels are reported daily by CME clearing member firms to the CFTC. The CFTC's weekly Large Open Interest Holder (LOIH) report tallies the number of open positions in any given contract that are at or above the corresponding reportable level. As Exhibit 9 demonstrates, the number of LOIHs in Treasury futures similarly increased by more than 100% from 600 in 2009 to a peak of more than 1200 in August 2015 as Treasury futures open interest doubled.

Exhibit 9: Treasury Futures Large Open Interest Holders, June 2006-April 2016



Source: CFTC COT Reports

On average during 2015, Asset Managers accounted for 40% of the number of LOIHs in the Treasury futures complex. As Exhibit 10 demonstrates, the LOIHs in the Treasury futures liquidity pool represent a broad mix of customer types with varying perspectives, needs, and time horizons shaping their applications of Treasury futures.

Exhibit 10: 2015, Weekly Average Open Interest Holdings of Treasury Futures, by Segment

	Long Open Interest	Short Open Interest	Long LOIHs	Short LOIHs	Spread LOIHs
Asset Managers	3,517,909	2,784,046	204	209	217
Dealers	334,465	698,805	48	110	33
Leveraged Money	1,741,386	1,970,796	178	192	140
Other Reportable	951,122	1,175,802	68	135	36
Non-Reportable	759,562	674,996	n/a	n/a	n/a
Total	**7,304,444**	**7,304,444**	**498**	**646**	**426**

Source: CFTC COT Reports, 2015

Treasury Fails

The implementation of the Supplemental Leverage Ratio (SLR) for Basel III has prompted applicable banks to more carefully manage their balance sheets. As a result, these banks may be less apt to maintain or repo positions in certain off-the-run Treasury securities. Nevertheless, many of these off-the-run Treasury securities are also available in the System Open Market Account (SOMA) managed by the Federal Reserve Bank of New York.[6]

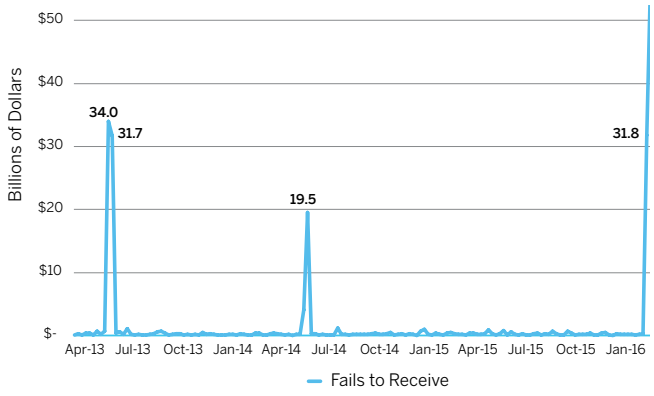
In recent months, the rising incidence of settlement fails in Treasury securities, particularly off-the-run issues, has become a topic of concern for the market practitioners. A settlement fail occurs when a market participant is unable to make delivery of a security to complete a transaction. Such a "failure to deliver" can result from the outright sale of a security, or the initiation or termination of a repurchase transaction to borrow or lend a security. The party to whom the delivery was due will also record a fail, in the form of a "failure to receive." "Gross fails" refers to the sum of fails to deliver and fails to receive. Settlement fails can occur for various reasons, with operational error and, on occasion, strategic intent being among them.

Settlement fails do not apply to Treasury futures, neither when entering nor when exiting a futures position. A market participant entering a long Treasury exposure is not subject to settlement risk exposure prior to the delivery month of the contract. He simply holds long open interest versus short open interest held on the other side of the market.

More importantly, futures users seeking to make or take delivery of Treasury notes or bonds by way of Treasury futures delivery know (or should know) that Exchange rules expressly prohibit failure to fulfill any contract delivery obligation. Unlike settlement practices in the cash government securities market, the Treasury futures delivery process does not support any failure-to-deliver capability. Failure to make or take delivery on Treasury futures, in complete accord with contract terms and Exchange procedures, can result in significant economic and regulatory penalties, both to the failing party and to the failing party's clearing firm.

During the two weeks prior to 9 March 2016, primary dealers reported cumulative fails of $32 billion and $56 billion of the OTR 10-Year Treasury Note (Exhibit 11), the two highest consecutive weeks since at least April 2013. Customers establishing long positions in the new TN futures were able to establish similar OTR 10-Year exposure without risk of being unable to establish exposure due to fails to receive.

Exhibit 11 – OTR 10-Year Treasury Note, Dealer Weekly Cumulative Fails to Receive ($blns)

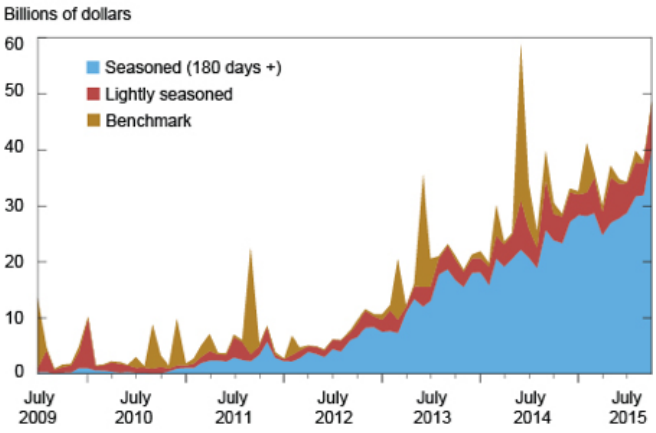


Data source: Federal Reserve Bank of New York

6 *System Open Market Account Holdings (as of 6 April 2016), Federal Reserve Bank of New York, retrieved 12 April 2016 from: http://nyapps.newyorkfed.org/markets/soma/sysopen_accholdings.html*

The latest bout of settlement fails in the OTR 10-Year Treasury Note may prove ephemeral. The trend toward increasing incidence of settlement fails for "seasoned Treasury issues," however, is indisputable. A recent report published by the Federal Reserve Bank of New York confirms as much.[7] The following graphic, which appears in that report, dramatizes the trend and relative size of settlement fails for seasoned Treasury securities (which the FRBNY analysts define to comprise any Treasury security that is more than 180 days beyond its issue date).

Seasoned Fails Continue to Rise



Source: Authors' calculations, based on data from the Depository Trust and Clearing Corporation.

Note: The chart shows average daily gross fails by month for the most recently issued (benchmark) Treasury securities of a given original maturity, for Treasury securities issued more than 180 days prior (seasoned), and for all other Treasury securities (lightly seasoned).

At its January meeting, the Treasury Market Practices Group (TMPG), which is convened under the aegis of the Federal Reserve Bank of New York, addressed rising settlement fails of seasoned securities. According to the minutes of that meeting, TMPG members "attributed the increase to several factors, including heightened demand to transact in Treasury securities relative to substitutable derivative products such as swaps, and the shortage of aged securities in dealer inventory due to increased balance sheet costs. It was noted that the duration of the fails, typically very brief, mitigated associated credit risks as described in a recent New York Fed blog."[8] The combination of the SLR and the increasing fails of off-the-run issues have led to conclusions similar to TMPG's that the fails are a symptom of the SLR. However, the timing of the increasing number of fails for seasoned issues suggests it preceded the SLR.

CONCLUSION

Treasury market participants have concluded that the reduction of bank balance sheets due to increased costs have contributed to increasing Treasury futures liquidity and Treasury securities settlement fails. Treasury futures provide a unique solution for customers seeking off-balance sheet Treasury positions without direct exposure to settlement fails and liquidity comparable, if not superior to, cash markets.

A multitude of factors contribute to the broad participation as well as the deep and consistent liquidity in Treasury futures. Standardization, neutrality, and safety of CME Clearing afford lower margin requirements in futures. Initial margin requirements in futures are established by prudent risk management and the self-funding nature of futures. This capital efficiency coupled with the off balance sheet nature of Treasury futures ensures broad participation in these markets. In addition, CME Group has the world's largest interest rate product distribution through our network of clearing members and CME Globex distribution. CME Globex promotes orderly markets through its multitude of credit and market risk control measures.[9]

7 *Michael Fleming and Frank Keane, "Characterizing the Rising Settlement Fails in Seasoned Treasury Securities", Liberty Street Economics website of Federal Reserve Bank of New York, 4 January 2016, retrieved 30 March 2016 from: http://libertystreeteconomics.newyorkfed.org/2016/01/characterizing-the-rising-settlement-fails-in-seasoned-treasury-securities.html#.VvwmhlUrKUk*

8 *TMPG Meeting Minutes, 14 January 2016, retrieved 30 March 2016 from: https://www.newyorkfed.org/medialibrary/Microsites/tmpg/files/january_minutes_2016.pdf*

9 *Risk Management Tools, CME Group website, retrieved 11 April 2016 from: http://www.cmegroup.com/globex/trading-cme-group-products/risk-management-tools.html*

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