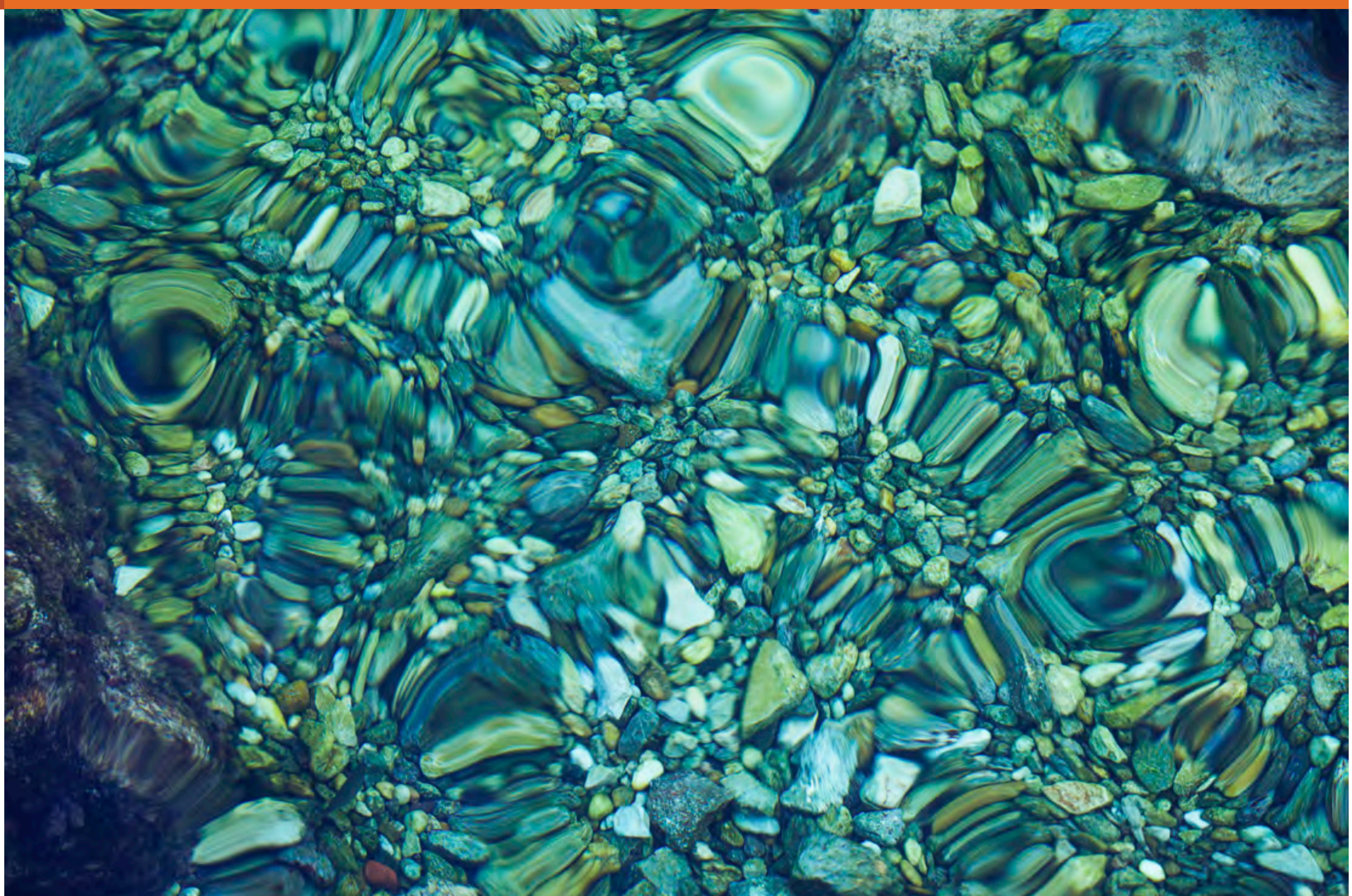
Q4 2015

U.S. Treasury Trading: The Intersection of Liquidity Makers and Takers



GREENWICH ASSOCIATES

CONTENTS

Kevin McPartland is the Head of Research for Market Structure and Technology at Greenwich Associates.

PRINCIPAL TRADING FIRMS HAVE BECOME SIGNIFICANT PLAYERS GLOBALLY INCLUDING IN U.S. TREASURIES, AND TAKE THEIR SYSTEMIC IMPORTANCE SERIOUSLY

12%

OF INVESTORS CURRENTLY OR PLAN TO INTERACT WITH NON-BANK LIQUIDITY PROVIDERS IN THE COMING YEAR

Executive Summary

The U.S. Treasury "flash crash" on October 15, 2014 acted as a catalyst for market structure change.

A market-wide feeling of content with existing relationships, protocols and platforms saw regulatory and product strategy teams focusing on other markets with more pressing issues, like corporate bonds and swaps.

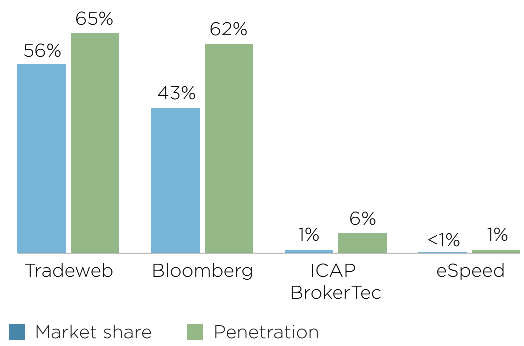
The past year has seen this attitude change, with new business models and trading mechanisms threatening to blur the lines between liquidity makers and liquidity takers. Through conversations with primary dealers, principal trading firms and major investors, this study examines how the market structure is changing at the hands of new technology, regulatory changes and market participants willing to interact with one another in ways they never have before.

Nearly all investors are trading U.S. Treasuries electronically. Interviews with 103 U.S. government bond investors for the Greenwich Associates 2015 U.S. Treasury Trading Study showed that nearly 85% were trading at least some of their U.S. Treasury volume electronically, up 38% from 2005. This is a rapid and significant change, particularly given the uptake was purely organic with no direct regulatory intervention.

What hasn't changed, however, is the dominant method of e-trading in the dealer-to-client market—request for quote (RFQ). Bloomberg and Tradeweb, which today dominate e-trading of U.S. Treasuries between investors and dealers, both see most of their volume executed this way. This is by no means a bad thing—trading bonds via RFQ has been around for more than a decade because it works and most of the buy and sell side like the name-disclosed interaction.

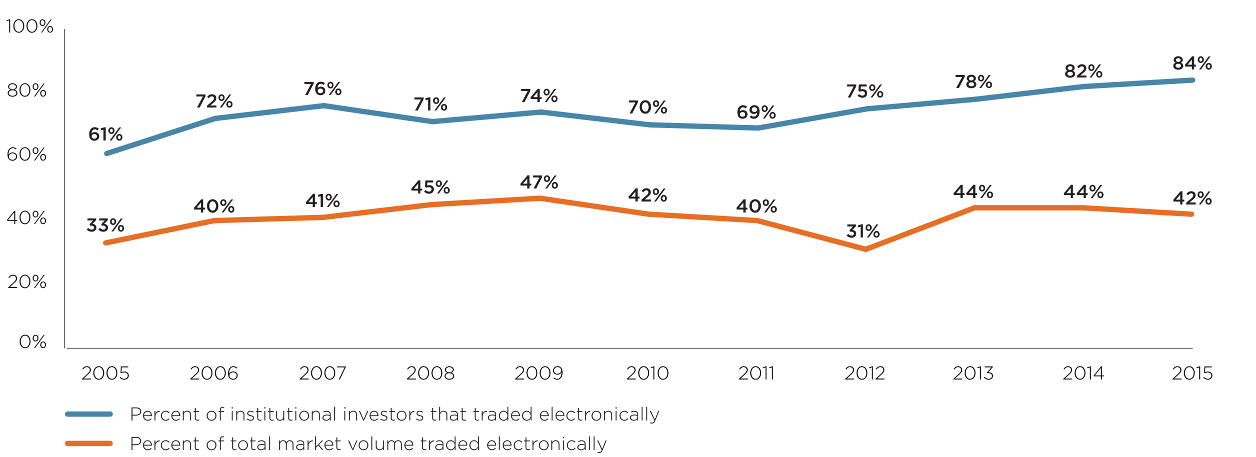
As such, we firmly believe that RFQ will remain an important method for investors trading U.S. Treasuries going forward, particularly for larger orders and less liquid off-the-runs. Nevertheless, investor concerns about bond market liquidity provided by traditional dealers, information leakage sensitivities, the growth of non-bank liquidity providers, and what some might call a renaissance in fixed-income technology is driving buy-side traders to open their minds to new execution mechanisms.

MARKET SHARE AND PENETRATION IN ELECTRONIC TRADING OF GOVERNMENT BONDS SECURITIES—MULTI-DEALER SYSTEMS



Note: Based on 79 responses in 2015.
Source: Greenwich Associates 2015 North American Fixed-Income Investors Study

ELECTRONIC TRADING ACTIVITY IN GOVERNMENT BONDS



Note: Based on 129 responses in 2005, 114 in 2006, 130 in 2007, 130 in 2008, 85 in 2009, 90 in 2010, 115 in 2011, 111 in 2012, 101 in 2013, 93 in 2014, and 100 in 2015.
Source: Greenwich Associates 2015 North American Fixed-Income Investors Study

Trading U.S. Treasuries: Changes Afoot

Greenwich Associates research is already showing some signs of this willingness to try new things. The presence of ICAP's BTEC and Nasdaq's eSpeed in our study results, for instance, shows the traditionally dealer-only platform has attracted some buy-side flow.

While these new participants do not contribute meaningful volume to those platforms nor are they among the largest real-money asset managers (most are hedge funds and so-called "buy-side banks"), the presence of any buy-side flow signals a change that would have seemed impossible 10 years ago. This trend toward investors trading on anonymous all-to-all platforms appears set to continue, with 1 in 5 investors telling us they either have or plan to gain access in the coming years.

Driving the market toward more all-to-all trading, where investors can trade directly with one another, has certainly come into vogue in recent years. Regulators believe it will limit reliance on the big banks, and investors are perpetually in search of better execution. To date, the model's success across the fixed-income product spectrum has been limited, save traditional exchange-traded markets such as futures.

For the U.S. Treasury market, where anonymous order-book trading has been common among dealers for years, the likelihood of success is higher than most. The market is one of the most liquid in the world, the product is standard, and the community of "users" is amazingly diverse. However, we do not believe that all U.S. Treasuries will eventually be traded in an exchange-like order book. The needs and wants of investors and liquidity providers tell us that such an approach is overly simplistic and not ideal for many, even if technically possible. The U.S. Treasury market will, however, undergo a more evolutionary and nuanced change.

Part of that change will include a blurring of the line between liquidity takers and makers. To understand how and why, it is important to examine in more detail the current market structure and how it came to be.

ANTICIPATED USE OF ANONYMOUS ALL-TO-ALL ELECTRONIC PLATFORMS

Note: *Traditional interdealer platforms (e.g., eSpeed, BrokerTec)
Based on 58 responses from U.S. treasury securities investors in the U.S. in 2015.
Source: Greenwich Associates 2015 North American Fixed-Income Investors Study

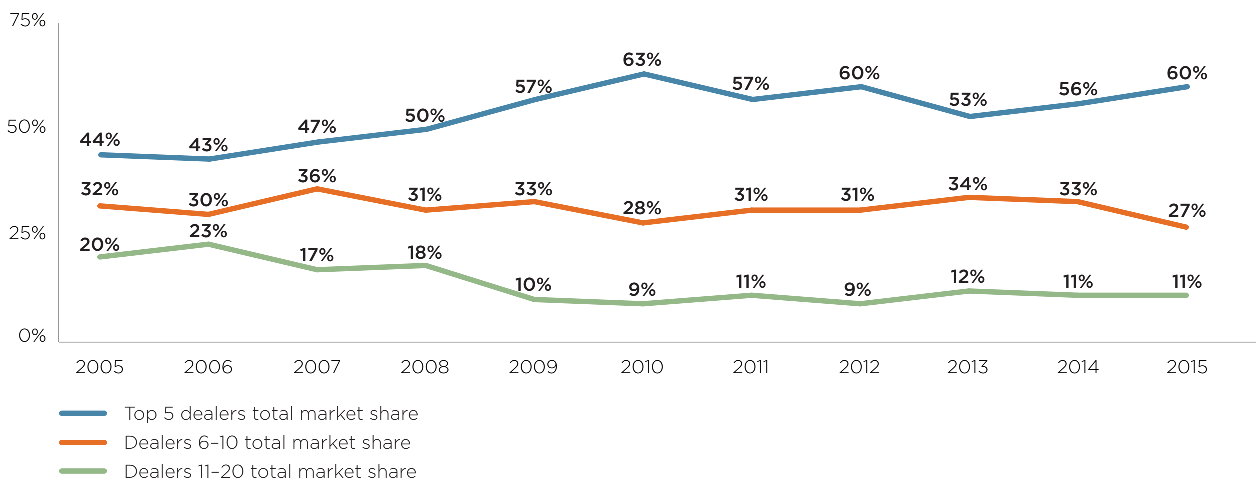
The Liquidity Provider Landscape

At last count, the Federal Reserve has designated 22 firms as primary dealers of U.S. government securities. By and large, these firms are the primary interface investors have to the U.S. Treasury market, which is mostly by design. This was true in 2005, and it remains true today. While the exact makeup of the list has changed, it is the distribution of client flow among the top 20 firms that tells the interesting story.

In 2005, the top five dealers handled 44% of trading done by U.S.-based Treasury investors; today the top five handle 60% of that volume. So while clients are expanding their counterparty lists in an effort to increase the liquidity available to them, they are in tandem sending a higher percentage of their flow to a smaller list of dealers. This ensures they remain on the platinum list and are provided the needed services that come with that distinction.

Dealer balance sheets have shrunk as the cost of capital has increased, which means dealers cannot provide high-touch service to as many clients as they once could—hence the hard work of clients to remain top-tier. But it is not just balance sheet that is slowing the top-tier dealers down. Their ability to use the interdealer market to offload risk obtained via client interactions and create supplemental revenue via market making has been increasingly crippled.

MARKET SHARE CONCENTRATION—U.S. TREASURY



Note: Based on 226 responses in 2005, 206 in 2006, 177 in 2007, 184 in 2008, 161 in 2009, 90 in 2010, 115 in 2011, 111 in 2012, 101 in 2013, 105 in 2014, and 103 in 2015.
Source: Greenwich Associates 2015 North American Fixed-Income Investors Study

Interdealer Markets Today

The platform and participant makeup of the electronic interdealer broker market looks quite different than it did 10 years ago. On the platform side, where BrokerTec and what is now eSpeed once split the market down the middle, BrokerTec has steadily gained share and now is the market leader. Tradeweb in 2014 also launched Dealerweb for Active Treasuries, which has seen respectable growth, given the offering is still relatively new to the market.

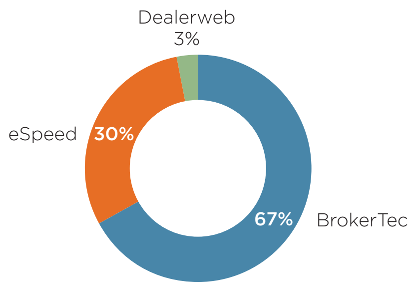
The more dramatic story, however, is the changes in market participant makeup. A good case in point—of the top 10 firms by volume on the platforms just mentioned, only two are primary dealers. The balance is made of non-bank liquidity providers, primarily principal trading firms (PTF). This does not mean the rest of the traditional dealer community isn't using these platforms. In fact, all of the dealers we interviewed are using at least one, and in most cases all three. But while the PTF community has upped its presence here, the primary dealers have backed away.

Our study participants confirmed that all major dealers now use interdealer markets primarily to offload risk obtain via trading with clients. While nearly all primary dealers once made good money market making and taking directional bets on the IDB platforms, the Volcker Rule changed that. Our research shows that today less than half of top dealers are still actively making markets; a huge market structure change from the pre-financial crisis era. Despite the fact that government securities are exempt from the Volcker rule, futures and swaps are not, removing a critical risk-management tool from the market makers' toolbox and, as such, making the proposition much less attractive.

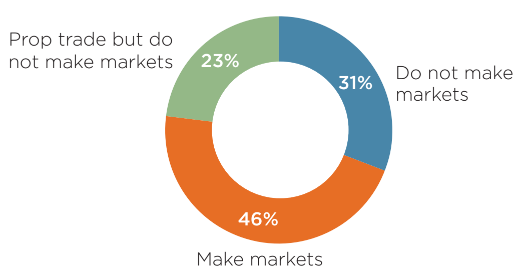
"It's not that dealers have backed away, but [principal trading firms] have come in harder, and dealers are more efficient in hedging."

– Top-tier investment bank

ELECTRONIC IDB MARKET SHARE



DEALER USE OF IDB PLATFORMS



Note: Based on 13 responses from dealers active in U.S. treasury securities in 2015. Source: Greenwich Associates 2015 North American Fixed-Income Investors Study

MARKET MAKING DEFINED

True market making can be defined as continuously providing the market with two-sided prices for the given product, representing a willingness to buy and sell on demand. Some dealers suggested they "make markets" when their hedging needs can benefit from this approach, but given the short-term nature of this trading, most would not consider it bona fide market making. Furthermore, nearly all top-tier dealers and some clients do place limit orders into the market, which is at its heart "making" a market. However, this should not be confused with market making.

Lastly, some proprietary trading does still exist within the top-tier banks and is focused on expressing a view on the market, as opposed to consistently providing liquidity via two-sided quotes as a market maker. Most of the bona fide market making on the electronic interdealer broker platforms today is carried out by PTFs, with a smaller few major dealers also providing continuous two-sided quotes.

Low interest rates and the high cost of capital have killed profit margins in the client-facing business. This means dealers are working harder than ever to minimize costs, with reducing the cost of hedging front and center. IDB fees and the complexity of those markets have driven the use of internalization up considerably. Internalization, put simply, is matching client orders within the given bank—either with other client orders or with those from another part of the bank. Roughly half the dealers we spoke with brought up internalization as a key element to their client business and one they expect to grow.

NUMBER OF DEALERS PROVIDING DIRECT STREAMS TO CLIENTS

Note: Based on 13 responses from dealers active in U.S. treasury securities in 2015. Source: Greenwich Associates 2015 North American Fixed-Income Investors Study

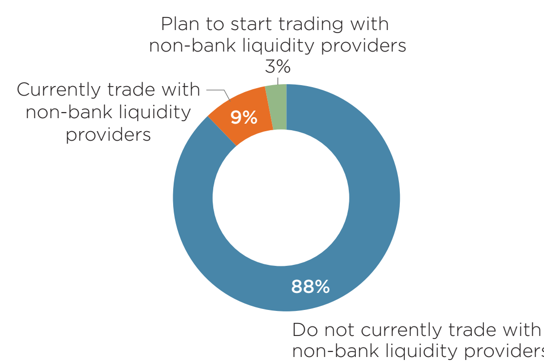
Is PTF Liquidity an Oxymoron?

In the midst of this change, clients and dealers alike continue to look for new sources of liquidity. Clients just want to get a good fill, while dealers need to tightly risk-manage their books. The role of PTFs in the U.S. Treasury liquidity debate is a polarizing one. Some of our study participants criticized PTFs for making the market harder to use, but others see them as part of the solution.

Twelve percent of investors told us that they are either already trading with non-bank liquidity providers or plan to in the coming months. Given that a considerable portion of PTF trading in the U.S. Treasury market is done on anonymous platforms, the number of investors interacting with their liquidity is likely even higher than that.

Some dealers are also starting to work with, rather than against, PTFs. Greenwich Associates research found that 35% of the top 20 dealers now consume at least one PTF direct-pricing stream and execute roughly 25% of their traditionally interdealer flow through those channels.

USE AND EXPECTED USE OF NON-BANK LIQUIDITY PROVIDERS



Note: Such as hedge funds or non-bank broker/dealers. Based on 103 responses from U.S. treasury securities investors in 2015. Source: Greenwich Associates 2015 North American Fixed-Income Investors Study

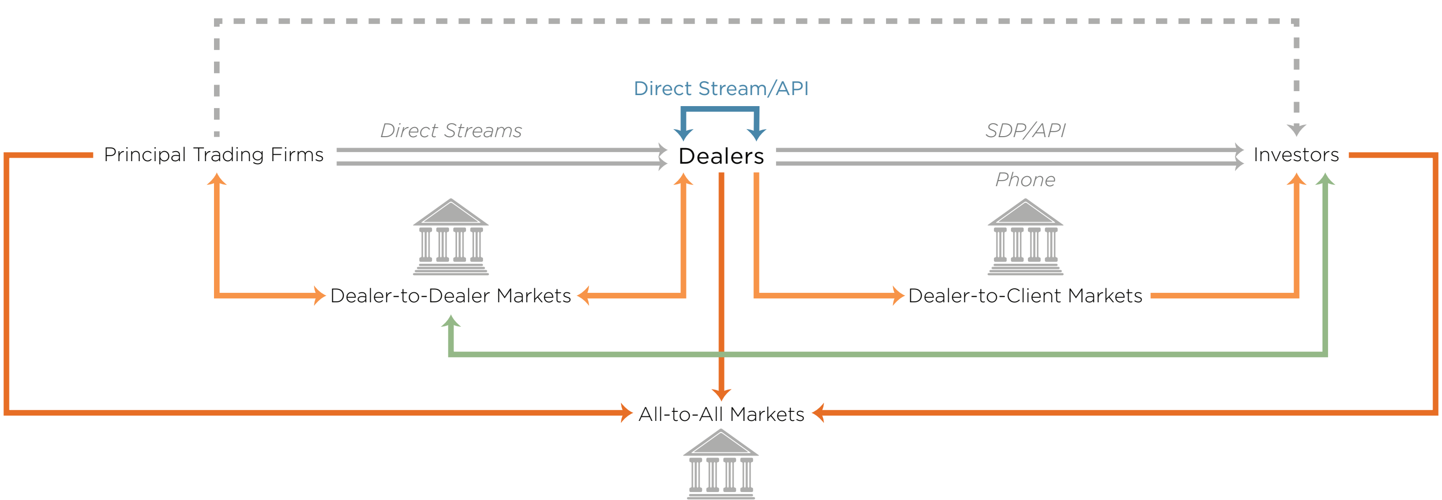
Direct pricing streams from PTFs, and direct pricing for U.S. Treasuries in general, are starting to raise a lot of eyebrows and have spawned a few new businesses. In fact, 19% of the liquidity providers we spoke with, including four top 20 banks, provide direct streams not only to customers, but to other dealers.

In order to understand what they are and what their existence could mean to the market, it is important to realize that not all PTFs are created equal. Lumping them all into one bucket (as we have done in this report thus far) oversimplifies their role in the Treasury market.

Understanding Non-Bank Liquidity

PTFs (often previously misunderstood to be generically all "high-frequency traders") have come a long way in the past 20 years. Many believe their presence in the U.S. Treasury market is a recent phenomenon and that PTF is synonymous with electronic trading. However, proprietary trading firms have played a large role in the market since they began trading U.S. Treasury futures via paper tickets and hand signals at the CBOT in the mid-1970s. As the markets transitioned from the floor to the screen, so did many of these principal trading firms. eSpeed launched in the late 1990s, giving non-banks electronic access to what was previously a market only for dealers, with BrokerTec following suite several years later. These changes paved the way for PTFs to expand and mature.

MARKET STRUCTURE OF U.S. TREASURY TRADING



Source: Greenwich Associates 2015

Today, the largest PTFs have grown from startups to heavily regulated entities, and in some cases public companies. KCG (formed by the merger of GETCO and Knight Capital) and Virtu fit both of those buckets, for example. These firms and the many others like them have become significant players in many markets around the world, including U.S. Treasuries, and take their systemic importance seriously.

Clearly, the individual firms that make up the PTF category are not created equal. Some act as bona fide market makers, sitting on the bid and ask continuously throughout the day. Others are more opportunistic, taking a view on the direction of prices or trading to correct misaligned prices and, consequently, take more liquidity from the market than they provide. Many remain relatively risk-neutral throughout the trading day, ending almost if not completely flat. Others, particularly the larger names and hedge funds that fit into the category, are increasingly willing and able to hold inventory both during the day and overnight.

A small few have decided to interact with the market on a name-disclosed basis—something else we never could have imagined 10 years ago. Since 2012 KCG has offered direct bilateral liquidity and pricing (most recently under the brand "KCG Acknowledge") to dealers, while Citadel is going head-to-head with traditional dealers operating in the RFQ market. In both cases, they act as principal on the trade.

This evolution, coupled with the new normal for the primary dealers, is threatening to change the market's dynamic going forward. A straight line between investors and the primary dealers once defined the market. If we now include multiple e-trading platforms, direct streams from both dealers and PTFs, and the PTFs themselves to the diagram, the flow of liquidity gets more complex.

While complexity isn't always good, more competition on the liquidity provision side along with a more educated consumer should ultimately lead to a more efficient market.

NEW OPTIONS FOR E-TRADING USTs

- **BrokerTec Direct**
  Aggregating direct streams
- **Crossrate**
  Interdealer platform bullet
- **Dealerweb for Active Treasuries**
  Aggregating direct streams for dealers
- **DirectMatch**
  Anonymous CLOB
- **LiquidityEdge**
  Aggregating direct streams for all
- **OpenDoor**
  Focused on off-the-run U.S. Treasuries
- **Tradeweb PLUS**
  Aggregating direct streams for clients

Conclusion

After years of focus on electronic swaps trading and new corporate bond platforms, the U.S. Treasury market is finally getting long-needed attention from the largest institutional players. While the market has grown to trade in a heavily electronic way with very little regulatory intervention, the level of opacity that still exists in the market for the debt issued by the largest economy in the world is stunning. There is no required trade reporting, no required participant registrations, an exemption from the Volcker Rule, and no single body that is responsible for ensuring the market remains controlled and orderly.

Greenwich Associates does not believe all of those things need to change. In fact, allowing natural market forces to drive appropriate change is often preferable to regulatory intervention. The year that has passed since the U.S. Treasury "flash crash" on October 15, 2014 now has seen an industry interested in taking the former approach.

Currently, there are seven new offerings available for trading U.S. Treasuries electronically. While their business models vary, each is looking to embrace the changing nature of the market and its participants by encouraging liquidity makers and takers to find each other in the most seamless way—regardless of participant type. While none have seen much traction to date (in fact most have yet to fully launch), the nearly 20 liquidity providers we spoke with for this research confirmed they have had dialog with some if not all of the providers. The market is paying attention.

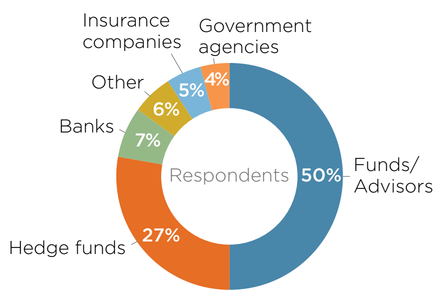
A big part of many of these new offerings is their use of direct pricing streams from liquidity providers. The idea at a high level is that liquidity takers can see an aggregate view of customized, two-sided prices from their top trading counterparties. The result is a virtual central-limit order book, albeit one where counterparty names are disclosed and the prices represent the takers' relationships with the liquidity makers. This model is prevalent in FX. In fact, both BrokerTec Direct and LiquidityEdge leverage technology originally developed for the FX market.

We spoke with six of the largest principal trading firms in the U.S. Treasury market for this study. While only two are actively providing direct streams, the other four were all in various stages of development or strategic review. It is important to note that the evolving direct-stream market structure requires pre-trade name give-up, something traditional high frequency trading firms once would never do. They have reacted to new demand from market participants and have adopted their business models to reflect the new reality.

We've said this before and we'll say it again; the largest dealers aren't going anywhere. Investors need their expertise and balance sheet, and it is important to note that they, too, measure U.S. Treasury trading latency in microseconds. However, their role has changed along with the market, further blurring the line between competitors, partners and customers.

METHODOLOGY

In the spring and summer of 2015, Greenwich Associates interviewed 103 U.S. institutional investors active in U.S. Treasuries, 13 dealers that collectively handle nearly 80% of all client trading in U.S. Treasuries, and six of the highest volume principal trading firms in the U.S. Treasury market. Buy-side participants included traders and portfolio managers, while sell-side participants included heads of electronic sales, heads of trading and heads of trading technology. Interview topics included trading strategies, product and dealer use, trading platform evaluations, and various related market structure topics.



GREENWICH ASSOCIATES

greenwich.com ContactUs@greenwich.com Ph +1 203.625.5038

Doc ID 15-2045