Liquidity in Select Futures Markets*

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Abstract

Recently, a number of concerns about decreasing market liquidity in various financial markets have been expressed by market participants and academics. In order to better understand trends in liquidity within U.S. derivatives markets, we make use of trade and orderbook audit trail data for three active futures products (S&P E-mini, Ten Year Treasuries and WTI Crude Oil) from 2013 through mid-2016. We calculate multiple liquidity measures for each of these products, including bid-ask spreads, orderbook depth, and other metrics related to trading costs and execution quality. Trends for a few of these liquidity measures signal a potential increase in trading costs over the last few years such as reduced trade sizes and, in cases, lower orderbook depth, especially for the E-mini contract; often these reductions coincide with periods of increased market volatility. In contrast, trade volumes have increased for WTI Crude Oil and price impacts have decreased over the same time frame. Most common are trends that indicate little change in liquidity levels over the analyzed time period: the average number of participants, average number of market-makers, and the level of liquidity provision for the major trader groups has remained range bound across multiple years. The balance of our overall findings indicate that costs for market participants, and the prevalence and concentration of market-markets, has not changed significantly over recent years. More generally, this paper highlights a set of measures that can be utilized on an ongoing basis for futures liquidity monitoring.

1 Introduction

Although a debated concept, liquidity is often described as the ability to transact at a reasonable cost across a wide variety of market conditions. Often market participants make decisions about when and where to trade based on

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anticipated liquidity levels. When trading costs are low, participants can enter and exit positions without significant price impact. In contrast, if trading costs increase, fewer participants may be willing or able to trade, potentially leading to progressively lower levels of liquidity. Recent concerns have been expressed that market liquidity is on a secular decline, leading to increases in transaction costs, especially for large trades, and unexpected short-term spikes in volatility. Some have pointed to the possibility that changes in market structure, regulation and participation in recent years have led to this trend, raising costs for market makers and for end-users who trade with these market-makers. To investigate recent trends in liquidity for markets under the purview of the CFTC, in this paper we examine trade and order book data for a small set of futures markets: the E-mini (representing the S&P 500 equity index), the Ten Year U.S. Treasury, and WTI Crude Oil.[1] These futures contracts are three of the most active U.S. futures products and represent a range of asset classes (equities, fixed income, and physical commodities respectively). We find a few individual trends in liquidity, with a few decreases in liquidity-related metrics for the E-mini contract and a few increases for WTI Crude Oil, but these individual trends are paired with a high number of cases where liquidity ranges over the last few years have been fairly tight. On balance, measures do not often show significant shifts either postively or negatively. For a few measures, like the willingness to provide liquidity to the market, we examine in greater detail how certain participant groups have, perhaps idiosyncratically, responded to recent market evolutions. Included in this analysis will be a few comparisons between participation trends for traditional hedgers and traditional intermediaries, or longer versus shorter investment horizon intermediaries.

Several commonly used measures of liquidity are included in this paper and are calculated for all three futures contracts. This list includes:

- Orderbook Depth
- Bid-Ask Spreads
- Trade Sizes
- Liquidity Provision Levels
- Amihud's Liquidity Measure

Our liquidity analysis covers only a relatively short time period, the period from 2013 through the first half of 2016, in part due to data limitations. Note that, because our reference period does not include many extended periods of extremely high general market volatility, such as during the financial crisis in 2008-2009, the results are likely to better represent market conditions with low to medium volatility levels.

[1] The three products chosen for the paper are generally considered highly liquid, so they may not be fully representative of broader trends or less traded markets in the futures space.

2 Literature Review

A significant amount of research has been published on market liquidity trends over the last few years by academics, regulators and the private sector. The analysis in these studies spans a wide set of products and geographical regions and has focused on a similarly wide array of market trends. One focus has been on the potential effects of market structure or regulatory changes on the provision and resilience of liquidity within markets. Findings on these effects have been mixed and have often identified differing trends across individual products. For instance, (Trebbi and Xiao, 2016) examines the effects of regulatory change on market liquidity levels in corporate and Treasury bonds. Using a structural break approach, they do not find evidence that recent regulatory changes have resulted in reduced liquidity levels; they do find limited evidence of cases where liquidity may have increased due to regulatory updates. Two related papers, (Cheng Loon and Zhong, 2013 and Cheng Loon and Zhong, 2016) look specifically at two recent swap market changes, the introduction of central clearing and the introduction of real-time swap trade public disclosure. Both market changes resulted in improved liquidity levels, measured by reduced effective spreads and lower price dispersions. (Mizrach, 2015) looks specifically at corporate bond trades over more than a ten year span and finds mixed results based on common liquidity measures. Trade volumes for both highly liquid and less liquid bonds have grown, but average trade size dropped around 35 percent for the liquid set, perhaps indicative of increased difficulties of transferring larger risks. Similar findings are in (Bessembinder, 2016) which also looks at corporate bonds over a similar time frame. The authors find that execution costs have fallen over time, but that other measures, like the willingness of dealers to hold inventory or act on a principal basis, decreased during the Financial Crisis and have not returned to previous levels. Another recent study, (PWC, 2015), also found a reduced willingess of dealers to use balance sheet in the course of market-making.

Other studies have focused on the structural changes brought about by the introduction, and expanded use, of automation to financial markets. A study of equity markets, (Hendershott, 2011) found that the introduction of automation to the New York Stock Exchange resulted in reduced spreads and improves price informativeness. More general reviews of automated and high-frequency trading like (Jones, 2013) and (Menkveld, 2016) have found that academic evidence, though mixed, on balance points to a net benefit from the arrival of sophisticated, highly automated firms. However, often this benefit is dependent on automation strategies; where automated market-makers can tighten spreads and decrease average costs, a prevalence of highly aggressive participants can increase adverse selection costs and drive up the speed arms race with fewer offsetting benefits. Other studies, like the (IMF, 2015) and (Anderson, 2015) have raised concerns about whether increased automation has led to an increase in the frequency of flash market events like on May 6, 2010 in equities and Oct 15, 2014 in fixed income. Recent studies of these events, like (Joint Staff, 2010) and (Joint Staff, 2015) have taken detailed looks at market behavior in the face of extreme price volatility and found it difficult to determine whether, and how, automation may have exacerbated or mitigated the event. Both reports recommended further study on how market structure changes had affected liquidity provision and market responses to extreme price events. This paper takes a higher level view of liquidity in select futures contracts, and provides information on trends in liquidity measures over recent years; in addition, trends for some participant categories, like highly automated firms, are included for more a more detailed look at subsets of market participation.

3 Data Overview

This paper uses three regulatory data sets provided by the CME Group (CME) to generate liquidity-related metrics. The first is a transaction audit trail, a trade-by-trade record of all executions on CME's trading platform. This data set provides a number of details related to each trade, including product information, the customer accounts and traders on the buy and sell sides of the transaction, trade prices and quantities, characteristics of order generation and execution (algorithmic vs manual, aggressive vs passive), along with other relevant information. We focus on audit trail information for all U.S. business days from January 1, 2013 through mid-2016.

The other data sets are based on order messages submitted to the CME. One represents the data set provided, on a real-time basis, to market participants. This public data set includes the price and the visible posted quantity available at the ten best bid prices and the ten best ask prices (often known as the "ten deep" data feed)[2]. This data set is updated in real time as orders are placed, modified or canceled, or when orderbook depth adjusts after executions. Due to the public nature of this data set, it does not provide information about the trading entities behind the orderbook changes, but it does provide a real-time summary of the liquidity levels available to market participants through the trading day. The third and final data set is the regulatory order audit trail which tracks, at the level of individual messages, the actions of market participants. This data set does include information about the firm and account sending the message, the message type, and the price, quantity and timestamp associated to the message. Message types in this set include new messages, modifications of messages, message cancellations, and trades. Trades included in this audit trail match the trades in the first data set - we make use of the trades audit trail in charts below because the date range covered by it is larger than that in the orderbook data.

As noted, the analysis in this paper focuses on three products: Ten Year Treasury Futures, Crude Oil Futures, and the E-Mini S&P 500 Futures. Treasury Futures are listed on the Chicago Board of Trade (CBOT), crude oil futures on the New York Mercantile Exchange (NYMEX) and the E-mini on CME. All are exchanges under the CME Group umbrella. The analysis uses the complete trade audit trail for the selected futures products from 2013 through mid-2016 and a sample set of dates (the first Tuesday and Thursday of each month) for orderbook related metrics.[3]

[2]The number of visible levels is not always ten across all futures products, but this is by far the most common publically visible market depth.

[3]This period of time was chosen due to underlying data limitations. Though this time frame allows for some comparisons across time and across different market conditions, the time frame does not allow for comparisons to liquidity levels prior to the financial crisis or prior to implementation of some regulatory efforts, like Dodd-Frank.

4 Recent Market Conditions

In order to help contextualize changes in market liquidity, we begin with a brief overview of general market conditions for our three selected contracts. Figure 1 shows futures prices for the rolling most active contract in the E-mini S&P 500, 10 Year Treasury and WTI crude oil futures since January of 2013.[4] Each of the futures contracts has experienced periods of high and low market volatility in the focal years. As an example, large price movements occurred in equities and equity index markets on the morning of August 24th, 2015. Similar falls in equity valuations occurred early in 2016 as economic concerns in Europe came to the fore. Bond markets, here represented by the 10 Year Treasury contract, experienced price declines in the spring of 2013, as the market adjusted to statements on short-term monetary policy. Finally, higher than expected oil supply from a number of major producers and slack demand from around the world led oil prices to fall from over $100 a barrel to around $40 in the second half of 2014. Each of these market events are noticeable both in the price charts and in the ten day realized volatility series shown in Figure 2[5]. Later charts show that these events coincide with some of the largest changes in liquidity levels over the last few years and perhaps explain many of the shorter-term shifts in liquidity trends; for example, many of the declines in orderbook depth, seen in Figure 5, can be traced back to these, or similar, market events.

Figure 3 shows trade volumes over the same 2013 through mid-2016 time frame. Unlike the relationship between market liquidity and volatility, the relationship between market liquidity and trading volume is not always as direct. Markets where a significant amount of risk passes between participants on an ongoing basis are usually considered highly liquid. For these markets, trades represent a participant's ability to enter or exit positions within the normal course of business without significantly affecting prices. However, the relationship between volume and liquidity may change in cases where market volumes differ from expected or normal levels. As two examples, August 24th of 2015 for equities and October 15th of 2014 were days with historically high market volume; these two days stand out in Figure 3 - when these unanticipated volume spikes occur, market-makers who did not anticipate this level of market volume may back away, resulting in increases in price impact measures.[6] Charts of average price impact discussed in the next section show exactly this response. Taken together, this points to correlations between high volumes and greater liquidity during normal periods, but unexpectedly high volumes may often correlate with lower than normal liquidity. Figure 4 provides a visual summary of this volume/volatility relationship, though at a simplified level. There is a positive relationship between the two variables across all three contracts, with increases in volume being paired with increases in daily volatility. After normalizing by trade volumes, however, here represented by the regression line, price moves for a unit of volume do not seem to differ that significantly between low- and high-volume days for any of the three contracts.

[4] In these and most other charts (unless noted), only the activity of the most active futures contract is included. To simplify further, and to provide a cleaner comparison between contracts that have large spread activity and those that do not, only trades where an outright order matches with another outright order are included in volume charts. For clarity of reading and to smooth out unusual individual days, most of the charts show 10 day moving averages of the specified measure.

[5] The volatility levels depicted in the charts is defined as realized ten day volatility.

[6] For more information about these events please see the public report by the SEC on August 24th, and the Joint Report on October 15th, by five government agencies.

After filtering out days with idiosyncratic activity, market volumes in the E-mini and in the 10Y Treasury have been quite stable over the last few years. In contrast, volumes in the crude oil front-month contract have seen consistent increases, perhaps indicating both a more active risk transfer in the contract and a stronger ability of participants to act as market-makers. Given these trends, cross-year volumetric measures seem to indicate either roughly unchanged liquidity (the first two contracts), or perhaps even a slight improvement (crude oil). Note that in all three contracts volumes usually temporarily fall around holiday periods, most clearly at the end of the year when markets close for Christmas and the New Year.

5 Liquidity Measures

This section summarizes trends in a few liquidity measures over the last few years: average orderbook depth, bid-ask spreads, trade sizes and price impact as represented by the Amihud measure. The appropriateness of any individual measure is often dependent on the trades, or market conditions, of most interest. For very small trades (which may represent the trading interest of small firms or individual retail traders) trading costs may be best represented by average bid/ask spreads. A very small aggressive trade will likely be able to execute against an order at the top of the book and will cost the minimum spread. Trades of much larger sizes may need to walk through the book, removing liquidity not just from the best, but from the second, third, or even deeper price levels. In this case, bid/ask spreads may be less relevant to execution cost than the total quantity of orders within a given price range, otherwise known as orderbook depth. In a third case, where a participant may wish to execute orders throughout the day, total market volume may be a reasonable proxy for how easily the market will be able to absorb the aggregate trade demand, a measure discussed above.

Our first two measures, orderbook depth and the bid/ask spread, are based on the public data feed, which provides the five (E-mini) or ten (Treasuries/crude) best bids or offers for the product, along with the number of contracts available at that level; the measures can be tracked by all market participants in real-time. As noted above, bid/ask spreads provide rough estimates of trading costs for small trades, while orderbook depth is more tightly correlated with costs for large trades. Figure 5 shows average orderbook depth information for selected days across our 2013 through mid-2016 period. These measures restrict attention to the top three bid and ask levels for the most active contract on a given day, and are a daily average of the sum of ask and bid depth for the more active trading hours (8:00 to 4:00 CST). For example, for Figure 5c, a depth of 100 would indicate that a total of 100 futures contracts are available on either the buy or sell side of the market on that day for execution. Because these aggregates come from the public feed, they only include visible depth within the orderbook - any hidden liquidity, like that from iceberg orders, would need to be added for calculations of total available liquidity in the market.[7] We use this public feed as a liquidity proxy because these are levels that market participants could and might use to estimate

[7] In addition, these counts do not include potential liquidity arising from the individual legs of spread orders. In markets like crude oil, volumes associated with spread trading are often a high proportion of total trading volume

transaction costs.[8] Because orderbook depth is a static measure, it does not provide information about how fast liquidity gets replenished after an aggressive order - the refresh rates of the orderbook, hidden depth, and variance in depth related to changes in volatility would affect how quickly larger orders, divided up and executed in pieces, could be fully executed.

The depth charts appear to show both longer and shorter term trends. Periods of elevated market volatility often coincide with reductions in orderbook depth; liquidity providers may be less willing to post orders as the potential cost of those orders (due to adverse selection) goes up. Market shifts like that in the spring of 2013 for Treasuries and the end of 2014 for crude oil coincided with clear decreases in the average total quantity of orders posted for possible execution. Along with this, in the E-mini contract there has been a longer term reduction in the quantity of posted liquidity, both during periods of high and low market volatility. Reasons for this trend are less clear, though we will see below that other liquidity measures for the E-mini have remained robust through the years of interest. In contrast, orderbook depth for crude oil, like crude oil trading volumes, has been increasing since around mid-2015, like trade volumes.

Similar patterns to those in orderbook depth can be observed in average bid/ask spread levels (shown in Figure 6). Figure 6 shows daily averages of the difference between the best bid and best ask prices available for execution throughout the day, normalized for each product to dollars per contract. For both the E-mini and Ten Year Treasury contracts, the bid-ask spread is very close to the minimum tick size ($25 and $15.625 respectively) for the entire period, with a small increase in the average E-mini spread over time; for crude oil, average bid/ask spreads have been trending towards the minimum level ($10) over the period. In each product, spreads remain close to the market minimum. Like orderbook depth, spreads shift in rough sync with market volatility levels; for instance, bid/ask spreads for crude oil did see increases during the volatile late-2014 period. Even with these fluctuations, the level of change seen in bid/ask spreads is generally lower than in the orderbook depth measures. Because of the increased level of automation in markets over the last few years, quoting at the minimum tick levels may be possible in almost all market conditions - market-makers may more often adjust their risk appetite by increasing or decreasing the quantity of orders they place at the minimum tick. We have seen market-maker decisions like this in specific market events such as October 15th, 2014 in Treasuries where automated market-makers retained a one-tick bid/ask market through much of the move even in the face of extremely high volatility levels.

Futures contracts where there is a more active term structure allow for more extensive analysis of orderbook depth and bid/ask spreads. For the E-mini and Treasury contracts, very little activity (outside the roll period) occurs in contracts other than the front month. However, trading volume for the third product, WTI crude oil, is often non-negligible across a number of futures expirations. Figure 7 shows orderbook depth over time in the ten most active futures contracts for crude oil. Recent claims have stated that markets have experienced a liquidity consolidation, in part due to market automation - depth in deferred contracts has deteriorated as more participants shift to the

[8]Higher levels of market depth indicate lower transaction costs, which we associate with higher potential liquidity levels.

active contract where liquidity is most plentiful. This shift has then led to higher hedging costs for participants who wish to purchase futures contracts beyond the active front month. Orderbook depth charts do not seem to show a secular liquidity consolidation for the crude oil contract. Generally market depth in the most active contract has tracked price volatility–falling in late 2014, then stabilizing in early 2015, and increasing fairly consistently since then. Depth in deferred contracts (2-10) has been less volatile and does not show a clear pattern – depth in some contracts has slightly fallen, while others have seen increases.

One potential consequence of higher costs for immediate execution is a heightened need for breaking large orders up into smaller pieces to minimize aggregate execution costs. This strategy of order fragmentation, where a "parent" order is broken up into many "child" orders, can increase the uncertainty of the execution price, as the trade is averaged across a longer time period. To examine whether this behavior has become more prevalent, we consider trends in average trade sizes, assuming that the sizes of the parent order have not changed that much over time. Figure 8 presents the average size of an outright trade for our three products from 2013 through 2016. Trade sizes on an absolute level are highest in Treasury futures, perhaps due to the participant distribution. Large buy-side firms like asset managers are more active in Treasuries relative to other products, whereas the E-mini contract has historically seen a higher level of retail participation. On a relative level, for both the 10-Year Treasury and the E-mini contract, trading sizes have been relatively flat or slightly decreasing in the past few years; variations within this period again showed high correlations with market volatility. In contrast, trade sizes in crude oil are on average the lowest, but have been slowly increasing over the same time period, leading to no clear universal trade size pattern across futures products - and so no clear evidence that order fragmentation has increased significantly since 2013. Though in other charts we have omitted spread trades, we show them in Figure 9 as a contrast to outright trade trends. The average size of these trades is significantly higher than that seen in outright activity. Spread volumes are often highly cyclical, with average trade sizes strongly increasing during the periodic roll period (e.g. quarterly for the E-mini contract). Crude oil, because it has a more active term structure and spreads are used for much more than just the periodic roll, has less size variance on a day-to-day basis. For the E-mini, spread sizes have come down over recent years, though they still remain much larger than outrights.

Finally, we present one final measure used to represent market liquidity, the Amihud illiquidity measure. The Amihud measure calculates the average cost of a trade, scaled by the size of that trade. For example, an Amihud value of 0 would imply that a given trade has no market impact (i.e. was traded at the same price as the previous trade). Larger values of the measure are associated with higher trading costs for a given trade volume, indicative of lower market liquidity levels. The Amihud measue charts, Figure 10, show comparisons both across time (similar to above) and between trades executed by automated traders and those by manual traders; we see that, across all three contracts, trades done using manual means generally cost more, on average, than those done through automated means. This finding may provide one indication about why the use of automation has continued to increase in recent years. The spread between manual and automated traders has increased over time in the E-mini, pointing to increases in the relative value of the manual/automated switch. More generally, in none of the contracts does it seem clear that trade costs (and thus the underlying market liquidity) have dramatically increased. For automated traders specifically, trading costs have either remained roughly flat (E-mini, Treasuries), or have been on a general downtrend (crude oil). These findings match, both by contract, and across time, with trends in the prior measures. Changes in these costs look to be at least as much driven by day-to-day volatility changes as any secular trends.

6 Liquidity by Participant Category

This section investigates trends in liquidity provision and trading behaviors, broken down by participant category. We start with a binary breakdown between automated and manual traders, a field included in the transaction audit trail. Figure 11 provides a daily moving average of the number of accounts actively trading outrights in the given product, divided between those using automated methods (red) and those that trade manually (blue). [9] Note that if an account trades using both methods it will be included in both numbers[10]. In all three of the markets, the number of manual accounts is much higher than the number of automated accounts. However, as seen in an earlier white paper, aggregate trading volumes associated with automated orders often exceeds that of manual orders, sometimes reaching 80 percent of all trade volume for the most liquid products.[11] Because of this, the average trading volume of an automated account is commonly much higher than for an average manual account. For all three products, the number of active accounts has been relatively stable over the last few years, indicating no large exodus of firms due to rising costs. Interestingly, periods of high market volatility seem to be associated with higher numbers of active accounts - volatility may lead less active market participants to adjust, or close, positions that they had been holding. As previously noted, during holiday periods the number of active accounts experiences large drops. These temporary reductions in trading interest occur across all three products and, perhaps somewhat surprisingly, across both manual and automated accounts. Figure 12 shows the same breakdown for spread trades; the count exhibits much more cyclicality because many accounts only trade spreads during the roll period - the range of values, however, is generally lower than the average number of active outright accounts. Out of the three products, crude oil has the lowest variance in the number of active spread accounts both because it rolls on a monthly basis and because cross-expiration spread trading is much more common during non-roll periods.

Similar trends hold when we restrict to the number of active market makers in the three selected products, the accounts that provide liquidity and most directly affect trading costs. Figure 13 shows the count of active market-making accounts for the three contracts, where a "market-maker" is defined as an account which is at least 70 percent passive. Like the prior charts, accounts are divided up into those that trade manually and those that trade using automation. In all three products, the average number of market-making accounts is near (Ten Year Treasuries) or well above (Crude Oil/E-mini) one thousand, though not all of these accounts may have significant daily volume.

[9] We omit spread trading in this count because of its high seasonality.
[10] This account overlap is not significant.
[11] See, for instance, Automated Trading in Futures Markets

In no contract does there appear to be a sharp reduction in the accounts willing to provide day-to-day liquidity. The trend lines in all contracts match the trends of the other liquidity measures, with the count for automated firms especially stable over the years of focus. In fact, in cases like late 2014 for crude oil, as market volatility increased, possibly increasing the cost of providing liquidity, the number of market-makers also rose.

In addition to the breakdown between manual and automated traders, we constructed a classification schema which matches each trading account with a firm type. Firm types include Bank/Dealers, Asset Managers, Principal Trading Firms (PTFs) and Corporations [12]. In all cases, we attribute trading activity to the executing firm, whether the executing firm is trading on behalf of a house account or a customer account. Below, we include charts similar to those using the manual/automated breakdown, one examining general volume trends by category and one on liquidity provision by category. Like the rise in market automation over the last few years, highly automated PTFs, firms that trade using their own capital, are an increasingly active share of market volume. We see these trends in relative participation in Figure 14, which summarizes outright trade volume over the last few years for three of the largest trader groups: PTFs, Asset Managers, and Bank/Dealers. In all three products, PTFs are the most dominant participant category. For the E-mini and Treasury contract, mirroring the somewhat flat volume trends over the last few years, relative and absolute volumes have not been consistently increasing or decreasing over the time period. Crude oil has, as seen in other measures, increased in activity since the beginning of 2013, with much of this increase attributable to additional PTF volume. This along with Figures 11 and 13, provide evidence that the number of participants, even among those engaging in specific and important activities like market making, has not experienced significant reductions for our three focal products.

Figure 15 displays the percentage of a participant category's outright trading where liquidity is provided rather than taken. Trends and levels differ by category, but a few overall relationships seem to remain consistent across the panel. First, no category is either highly aggressive or highly passive - each are fairly mixed in their activity and engage in non-negligible market making and taking. Bank-dealers as a category tend to be the most aggressive participants, with PTFs often the most passive; because we are aggregating across both customer and house trades, bank aggressiveness may be partly due to market orders where a bank is acting on an agency basis. Trends in asset managers, where business models and strategies may be more diverse across firms and across time, have a more volatile level of passivity over time, though even in the less stable cases they still traditionally stay within 40 and 50 percent (E-mini/Treasuries) or 50 to 60 percent (crude oil) passivity. Wtih this caveat, over the past three and a half years, there does not seem to be overwhelming evidence that the primary liquidity providers in these contracts are changing behavior, at least at the aggregate level shown here.

Finishing our classification analysis, figure 16 shows the average end-of-day net position of firms by firm type for our three products. Net positions are defined as the absolute value of buys minus sells for a given day for a given account. Market participants have cited a general reduction in the willingness of dealers to hold inventories in markets as a

[12] For more information on the classification, and futures activity broken down by this classification, see "The Futures Trading Landscape" white paper.

result of regulatory pressures. If true, this could increase the cost of accumulating larger positions as intermediaries scale back the inventory levels they are willing to carry. This trend could be matched an increasing shift to highly automated trading desks that focus on the provisioning of intra-day, rather than inter-day, liquidity. In contrast to these qualitative storylines, the charts below do not show average end-of-day net inventories significantly lower than in the past. For all three products, asset managers generally have the largest net daily position change (and likely have the longest holding periods), followed by banks and, finally, PTFs.[13] Though there do not appear to be cases where net positioning has fallen in recent years, though this is a limited sample, there are individual cases of an opposing trend. PTFs, often considered very short term traders with trading horizons on the order of a few hours or minutes, seem to have an, albeit small, increasing average net position in a few products. Recent news has noted the interest that a few PTFs have in expanding to areas more traditionally associated with longer trading horizons, which could lead to the trends in the charts.

7 Conclusion

This paper has focused on summarizing a few market measures related to liquidity in futures markets; these metrics include those related to transaction costs, trading choices, and the distribution of market activity by participant class. The granularity in the regulatory data we receive on futures products allows us to take a close look at liquidity trends within a few active contracts: the S&P E-mini, Ten Year Treasuries, and WTI Crude Oil. Generally, liquidity metrics do not show either a significant decrease or increase in liquidity across these three selected futures contracts. For many metrics, like the number of active accounts and the relative liquidity provision of different participant classes, liquidity levels over the last few years have been fairly stable; this is perhaps due in part to our truncated date range. For some contracts, during some periods, liquidity levels may have fallen - in many cases these moves (like in orderbook depth or in bid-ask spreads) have coincided with increases in market volatility. For other contracts and time periods, especially for crude oil, trends seem to point to liquidity improvement. Given these results, it is hard to point to an overarching storyline applicable to all the studied products. We plan on continuing this work by expanding on the number of covered products, and on broadening the set of liquidity measures used in the trend analysis

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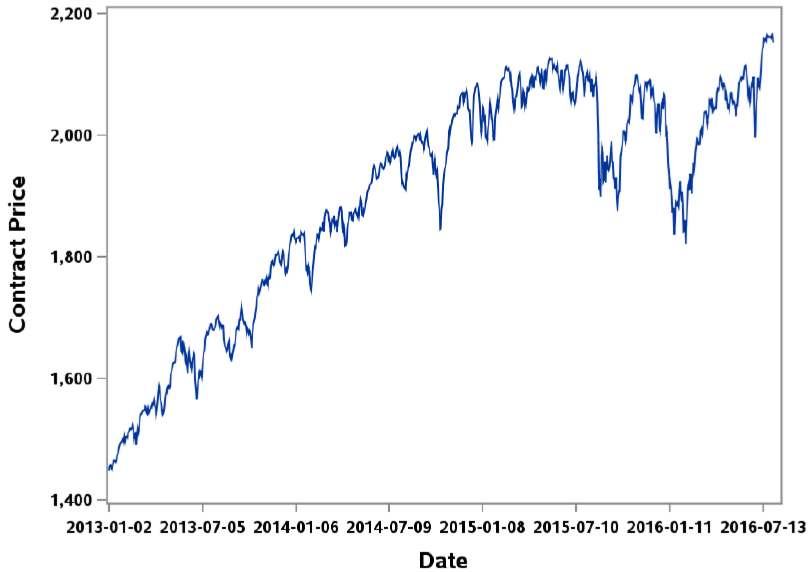
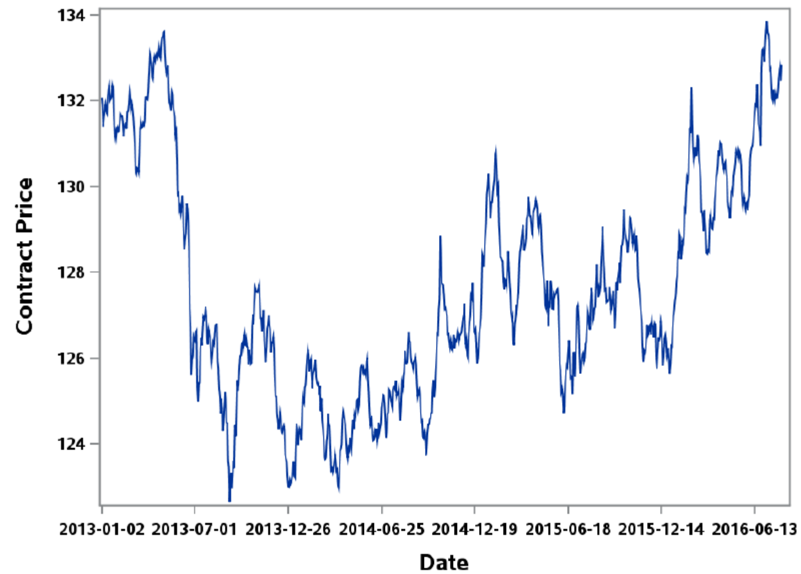
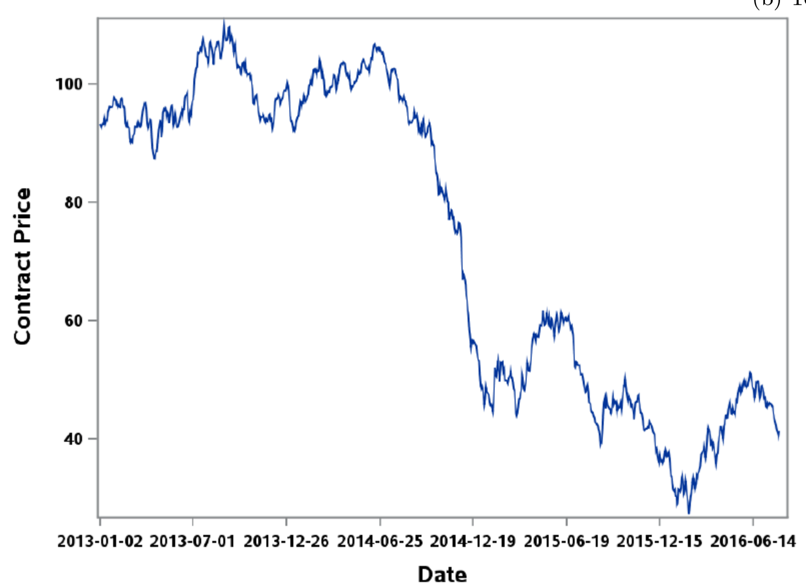
Figures



(a) E-Mini

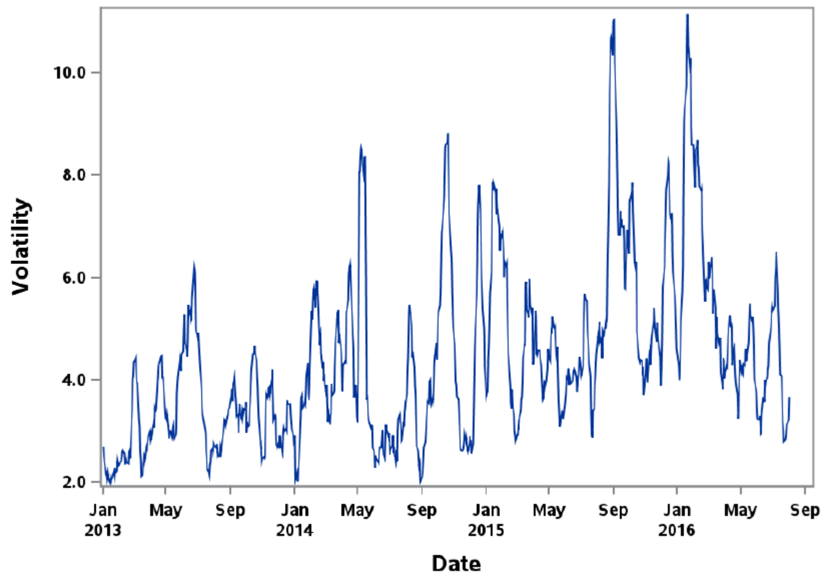


(b) Ten Year Treasury

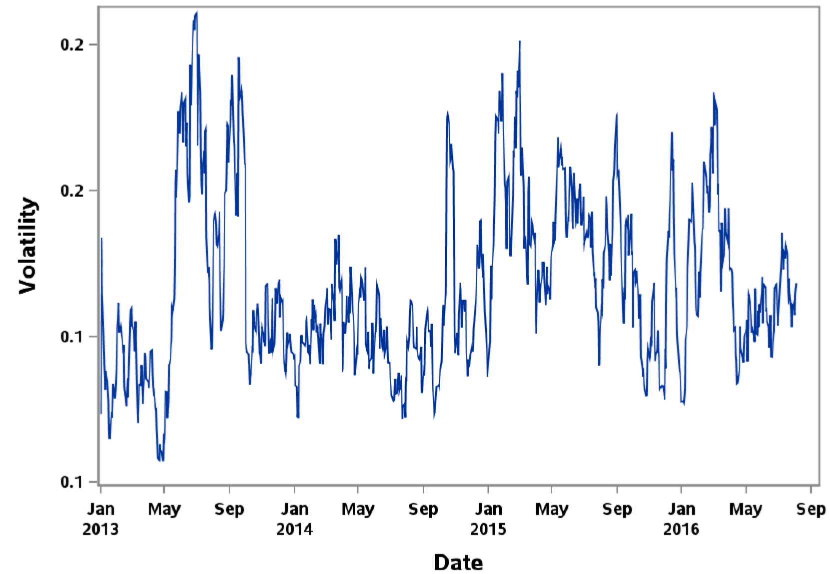


(c) WTI Crude Oil

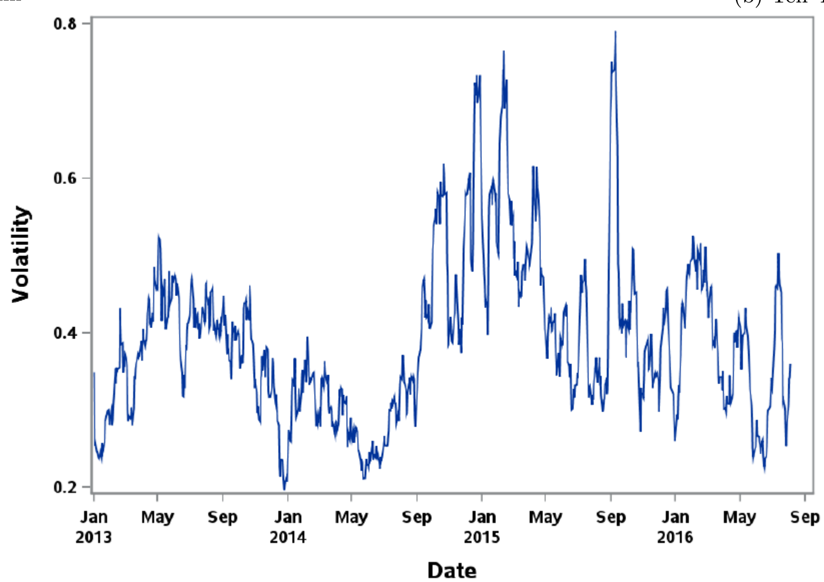
Figure 1: Historical Prices by Product



(a) E-Mini

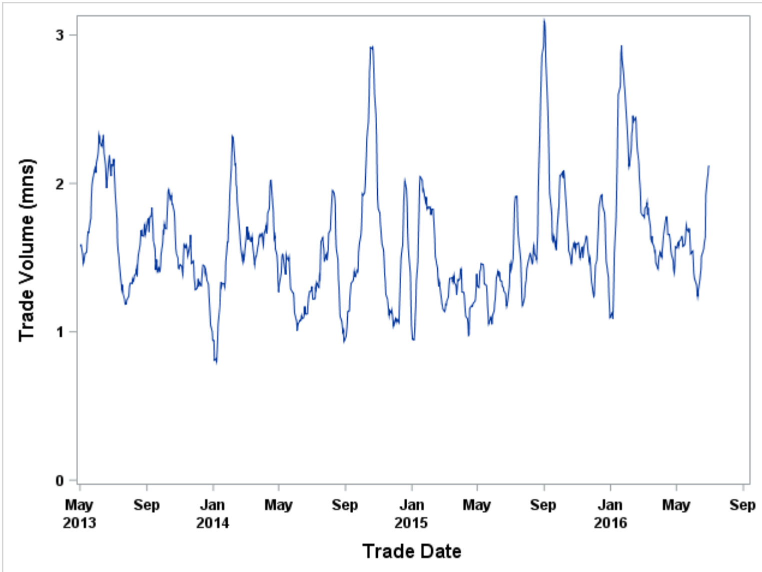


(b) Ten Year Treasury

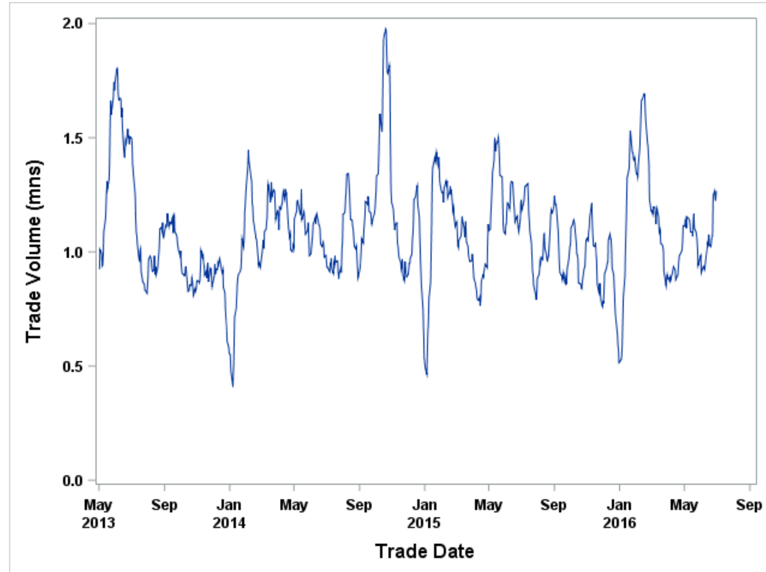


(c) WTI Crude Oil

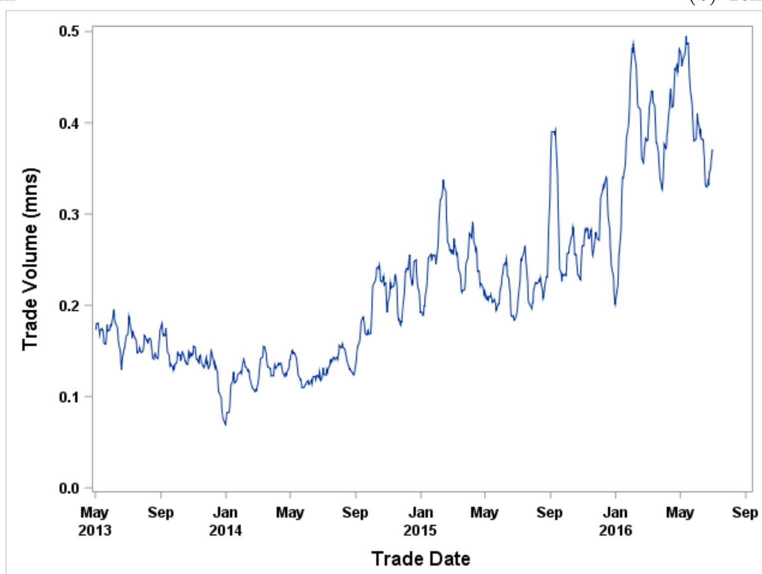
Figure 2: Historical Volatility by Product



(a) E-Mini

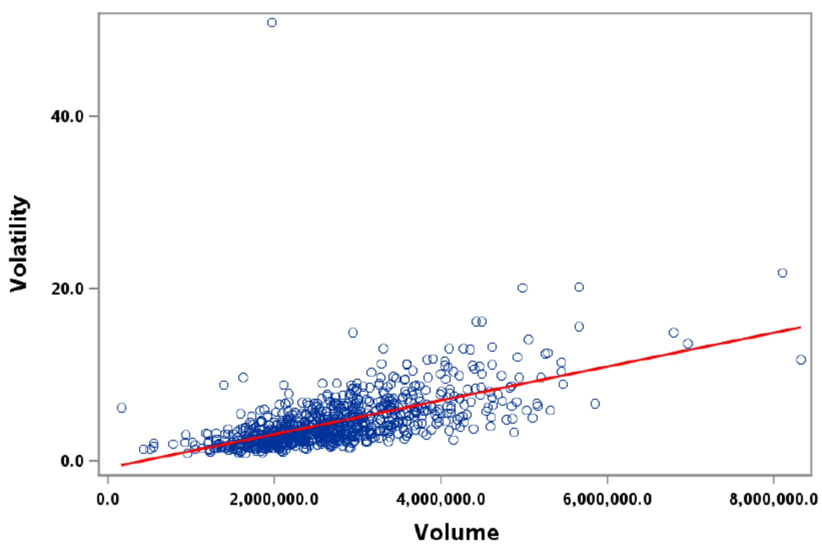


(b) Ten Year Treasury

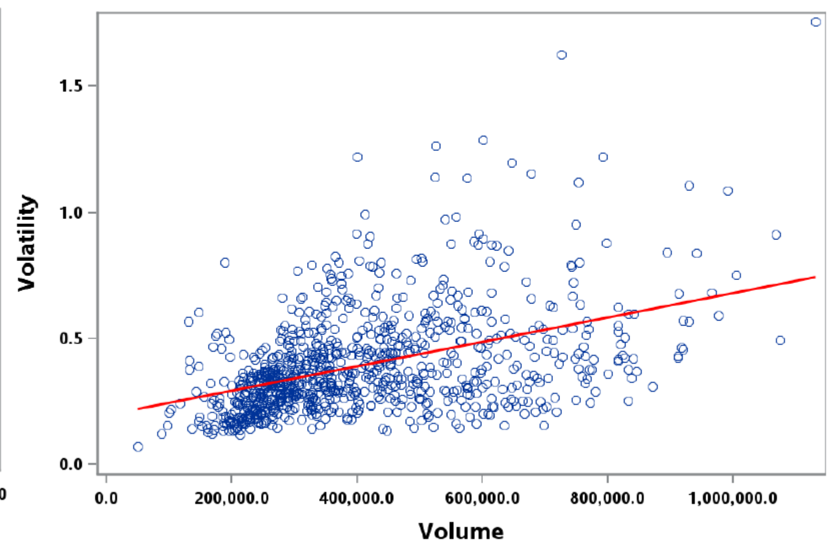


(c) WTI Crude Oil

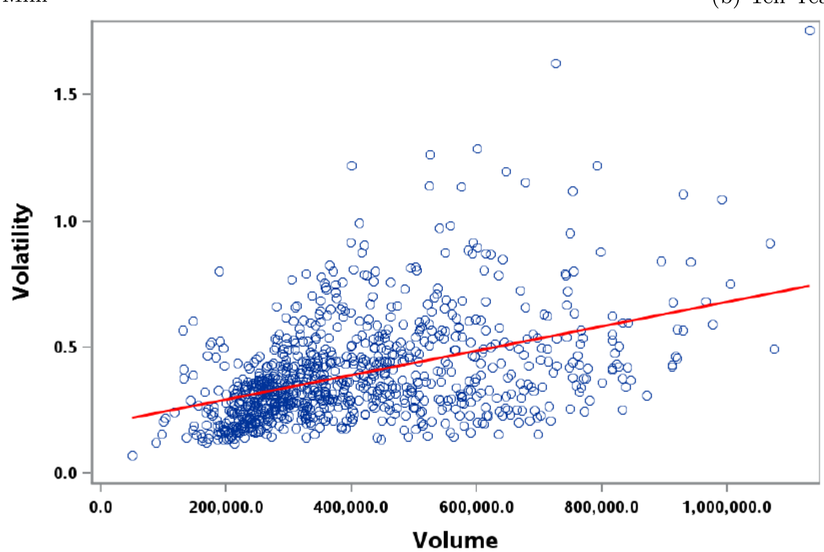
Figure 3: Historical Volume by Product



(a) E-Mini

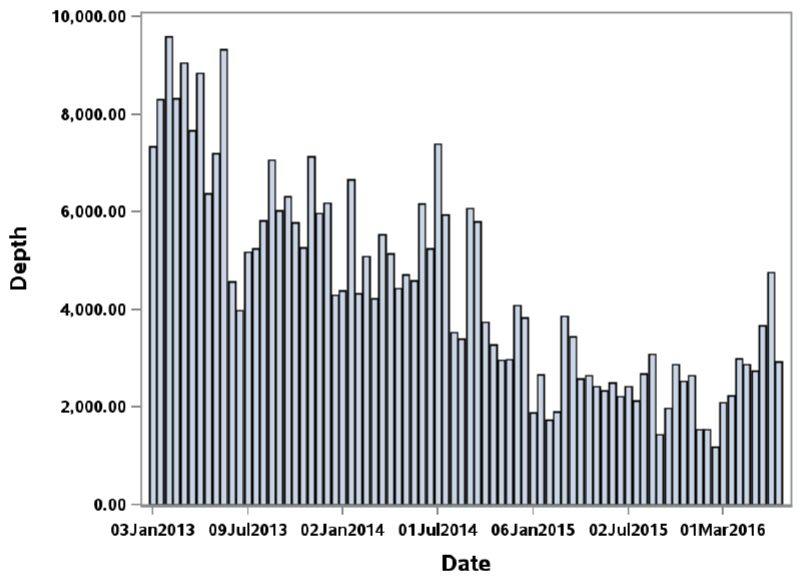


(b) Ten Year Treasury

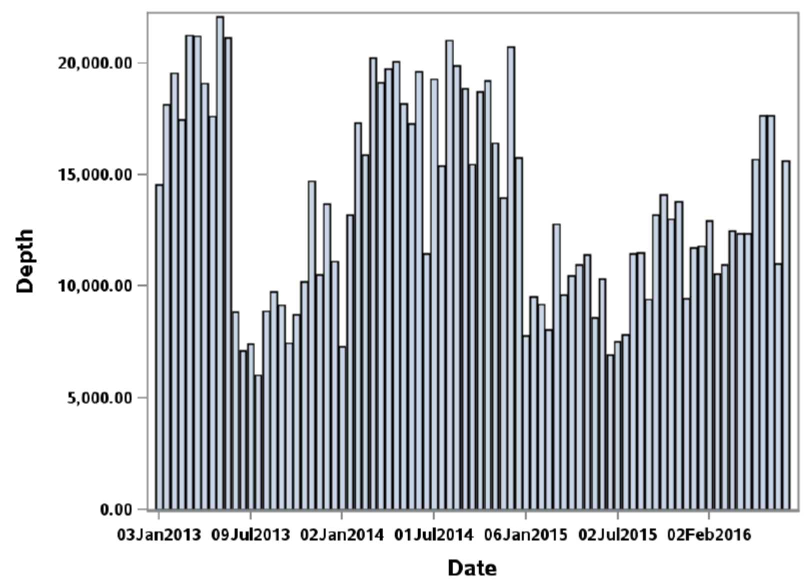


(c) WTI Crude Oil

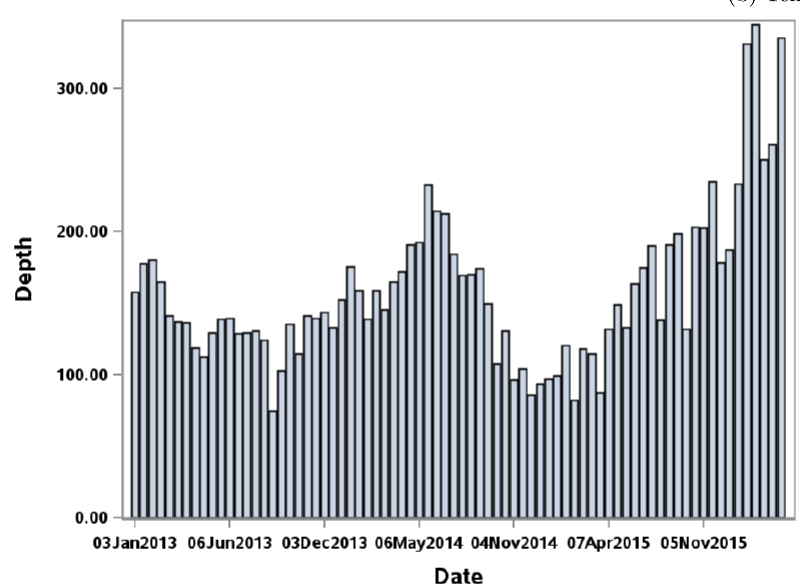
Figure 4: Volume/Volatility Relationships



(a) E-Mini

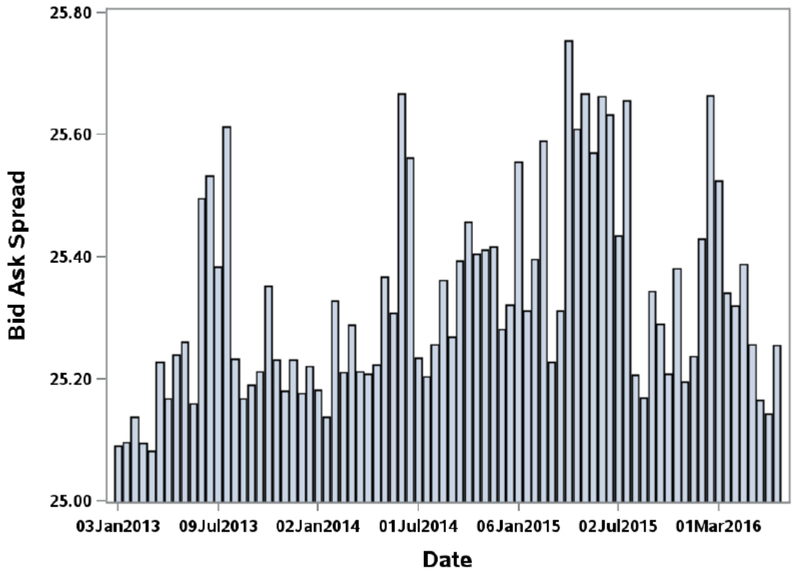


(b) Ten Year Treasury

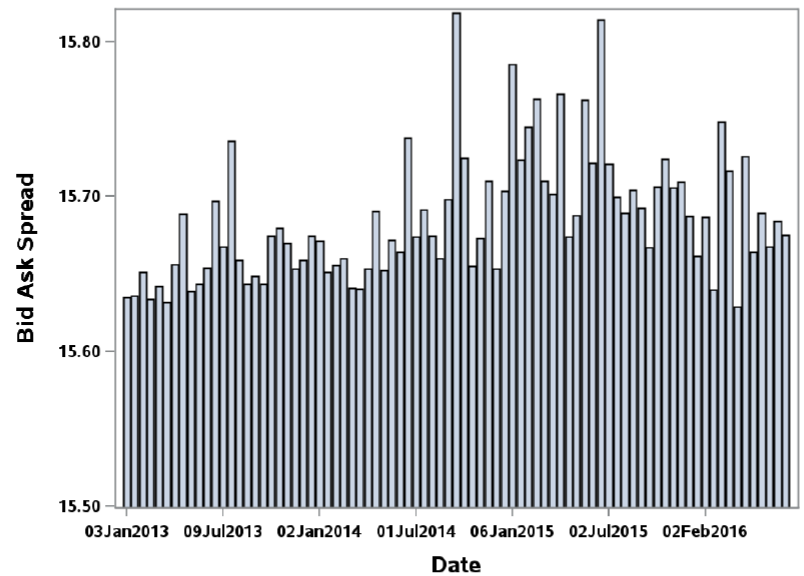


(c) WTI Crude Oil

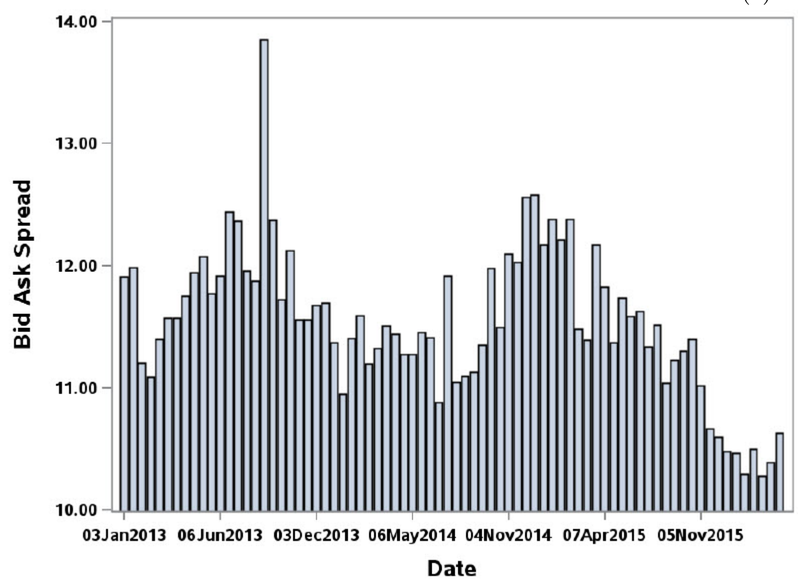
Figure 5: Orderbook Depth (Top Three Levels) by Product



(a) E-Mini



(b) Ten year Treasury



(c) WTI Crude Oil

Figure 6: Bid-Ask Spreads by Product

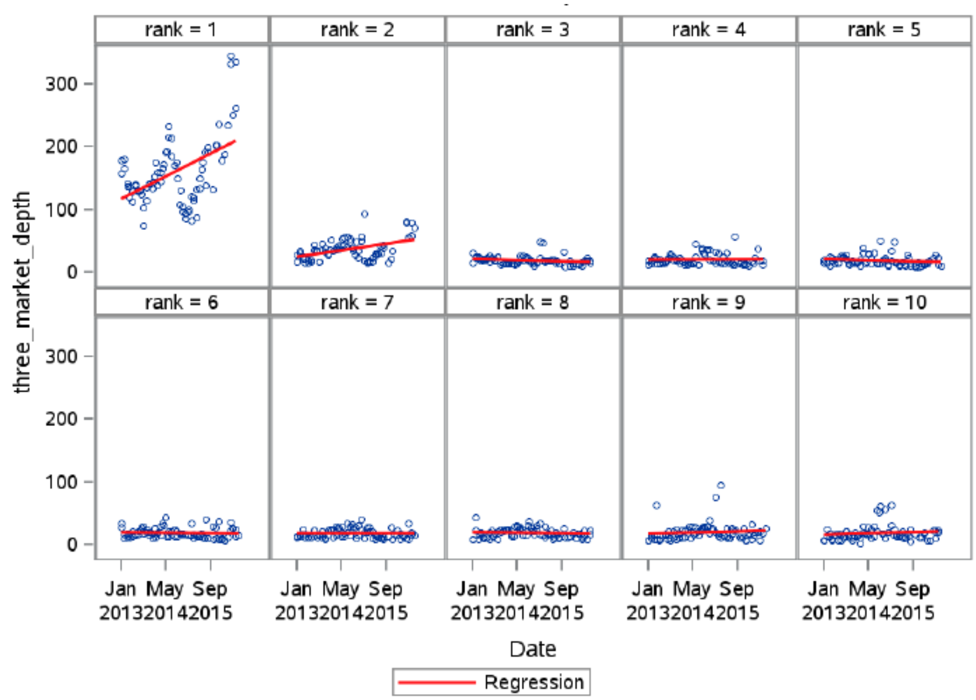


Figure 7: WTI Crude Oil Activity by Contract Date

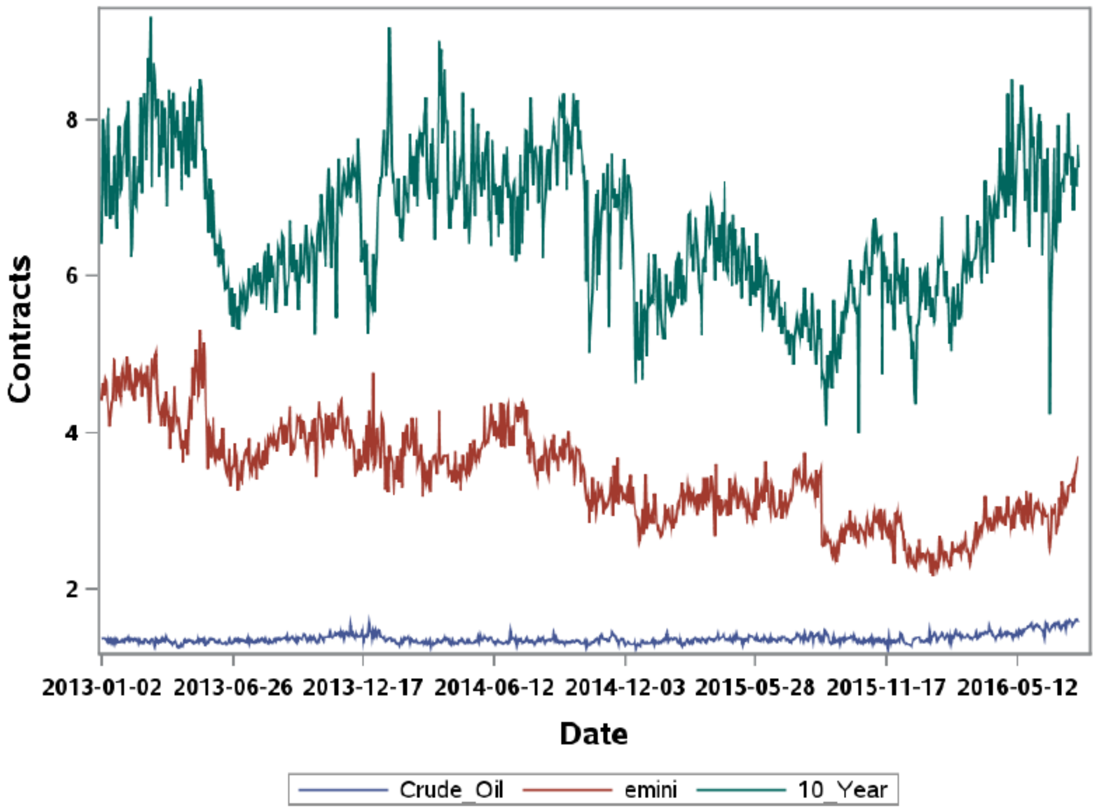


Figure 8: Outright Size by Product

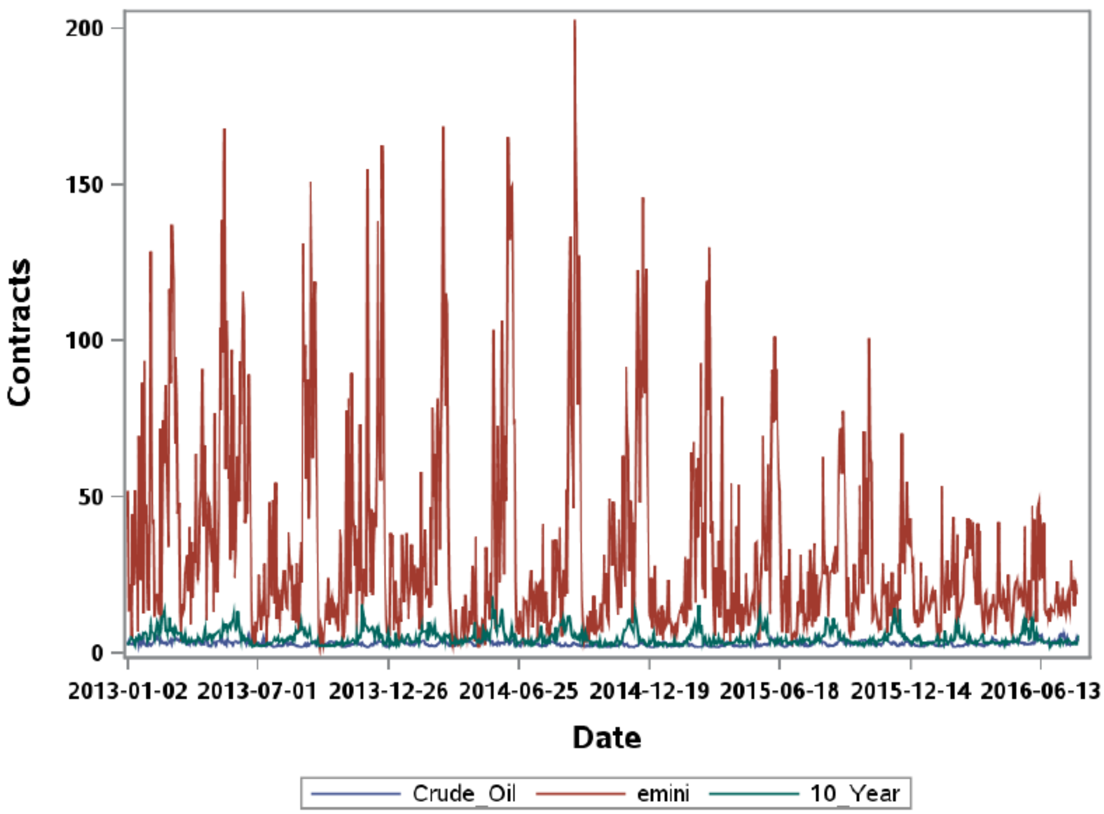
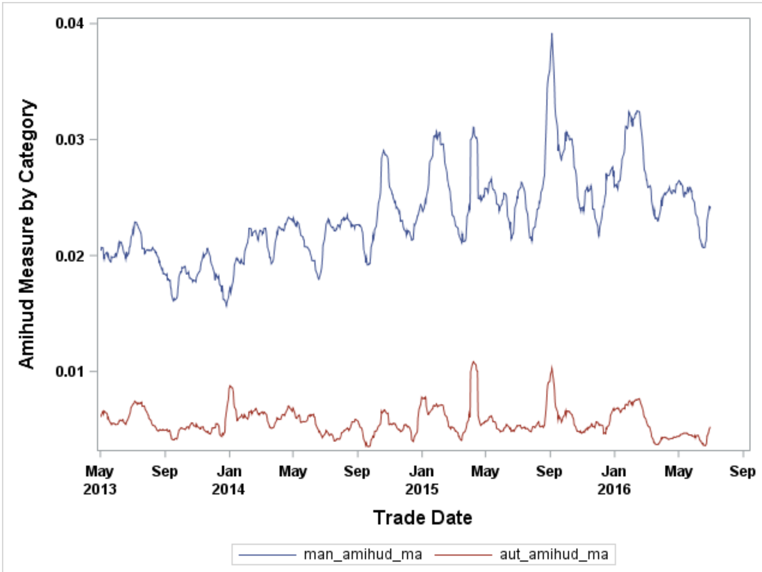
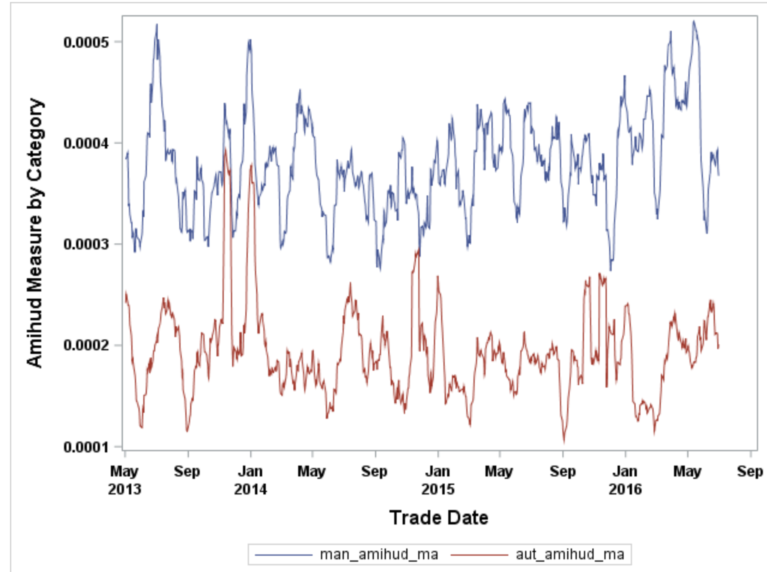


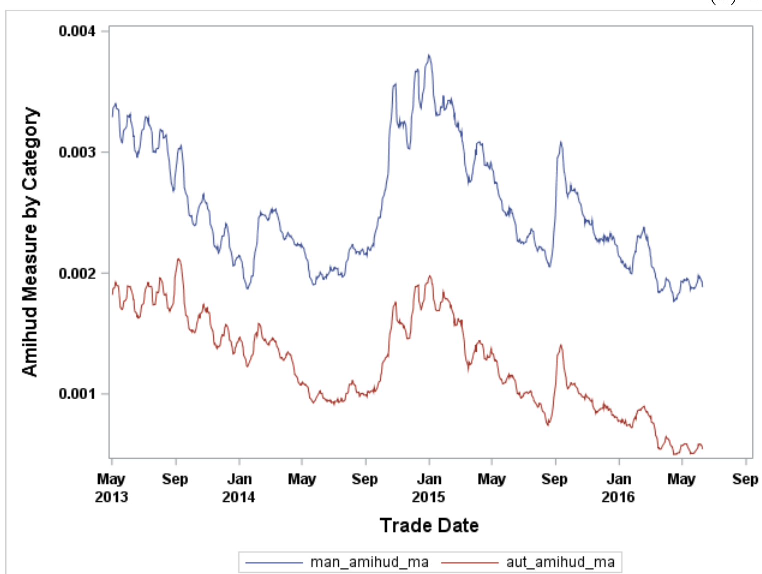
Figure 9: Average Spread Size by Product



(a) E-Mini

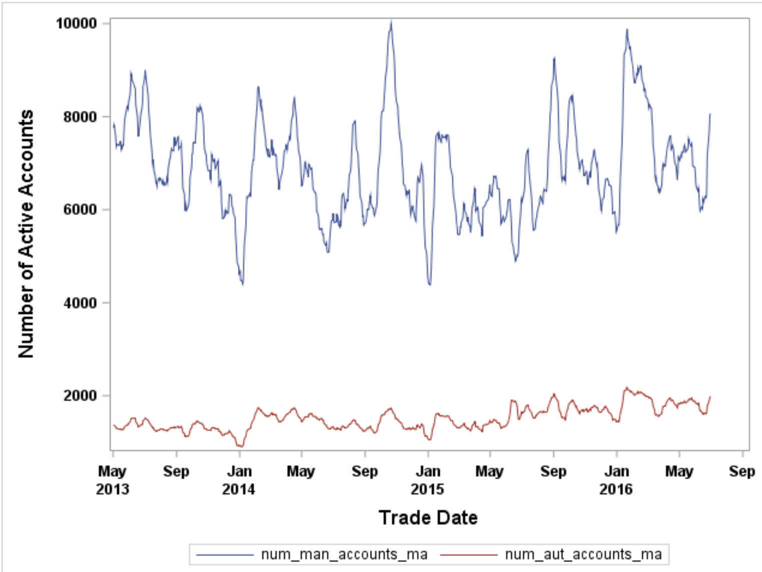


(b) Ten Year Treasury

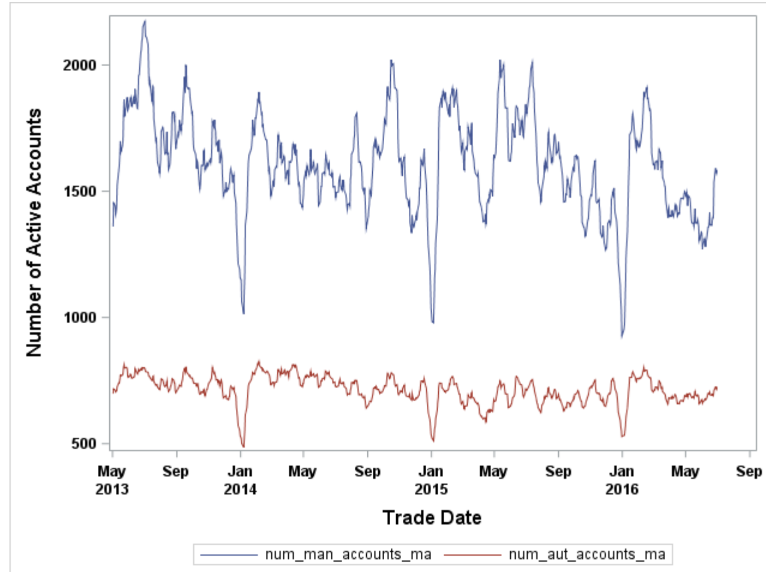


(c) WTI Crude Oil

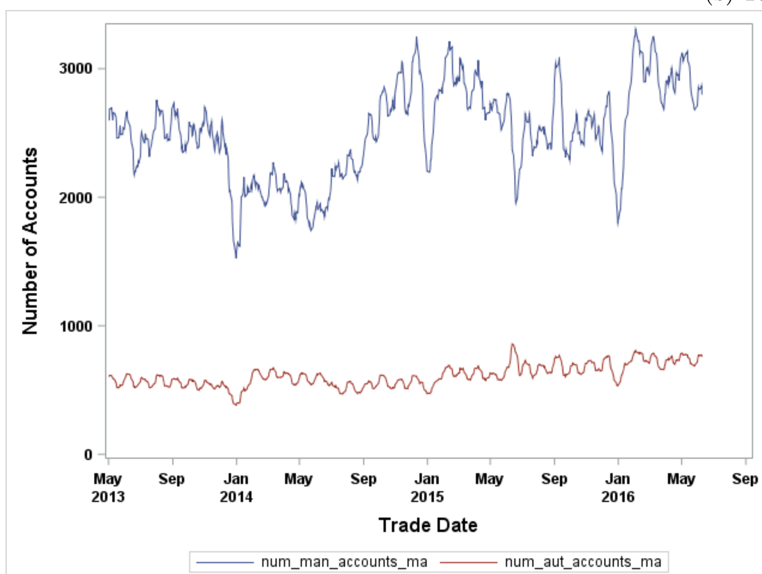
Figure 10: Amihud Measure by Automation Category (Red - Automated, Blue - Manual)



(a) E-Mini

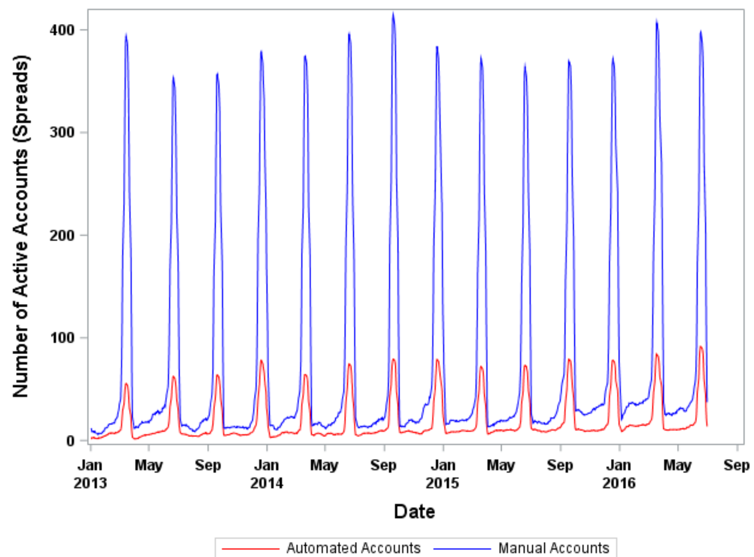


(b) Ten Year Treasury

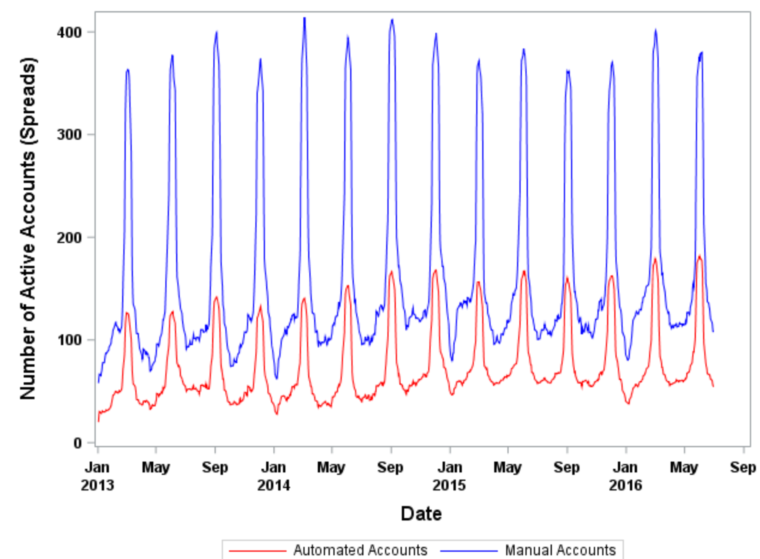


(c) WTI Crude Oil

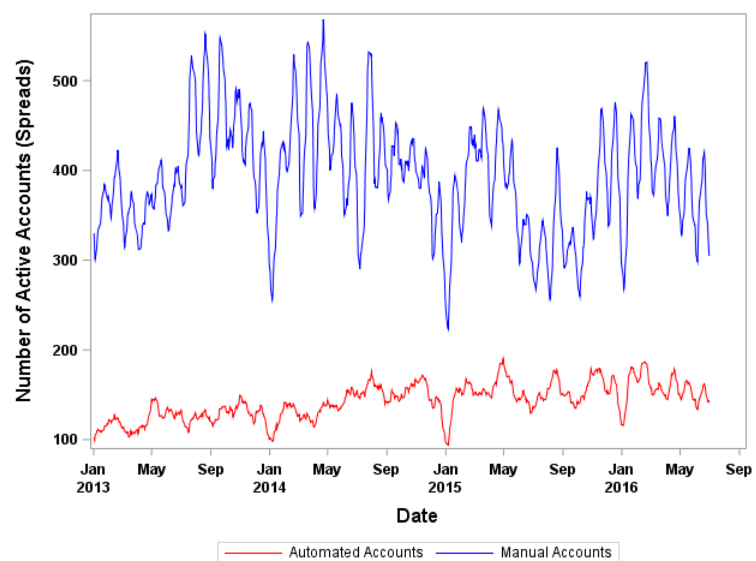
Figure 11: Number of Active Accounts, Outrights (Red - Automated, Blue - Manual)



(a) E-Mini

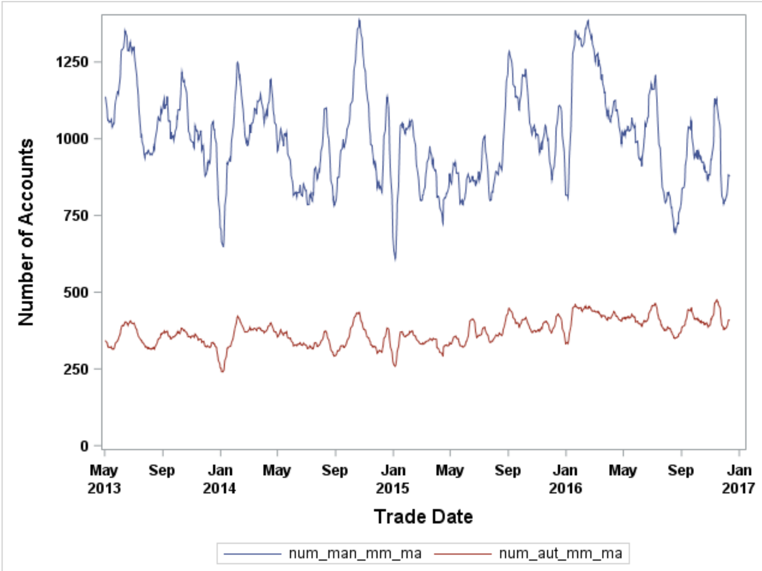


(b) Ten Year Treasury

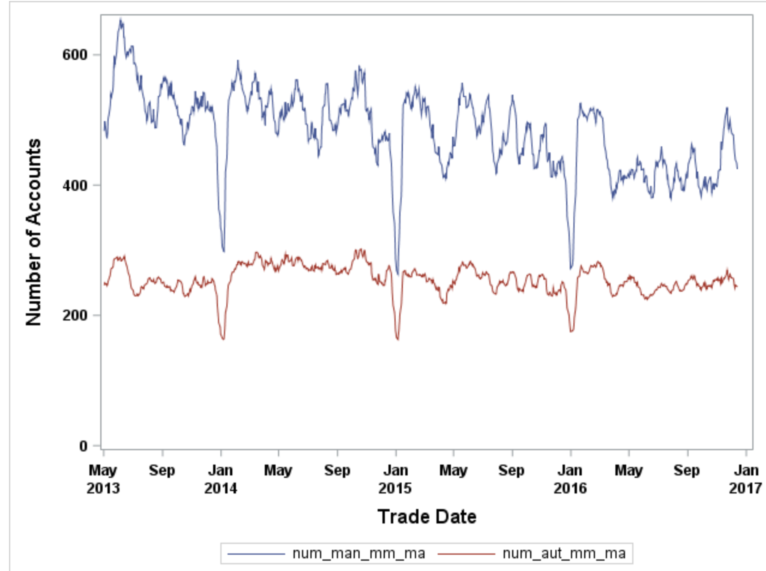


(c) WTI Crude Oil

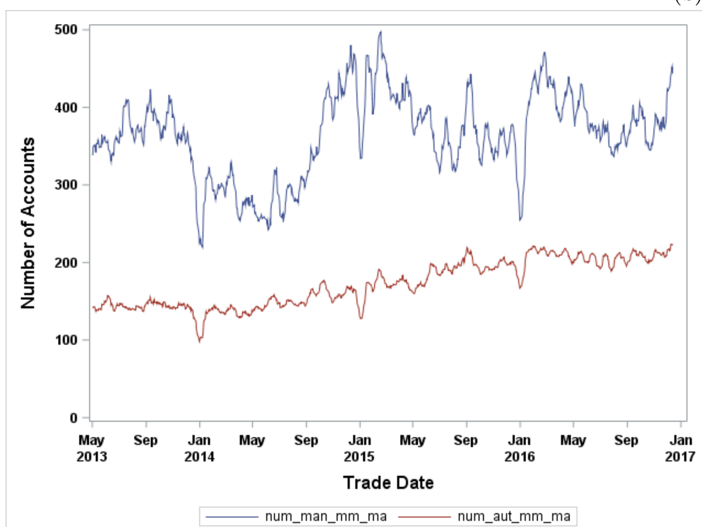
Figure 12: Number of Active Accounts, Spreads (Red - Automated, Blue - Manual)



(a) E-Mini

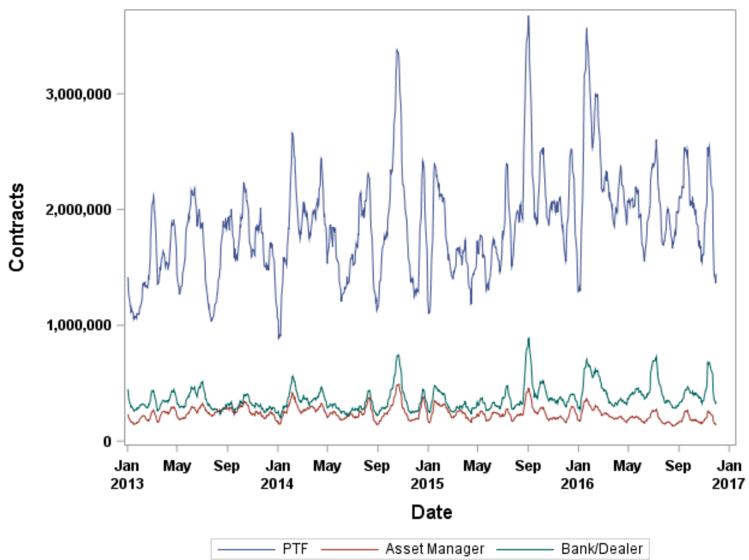


(b) Ten Year Treasury

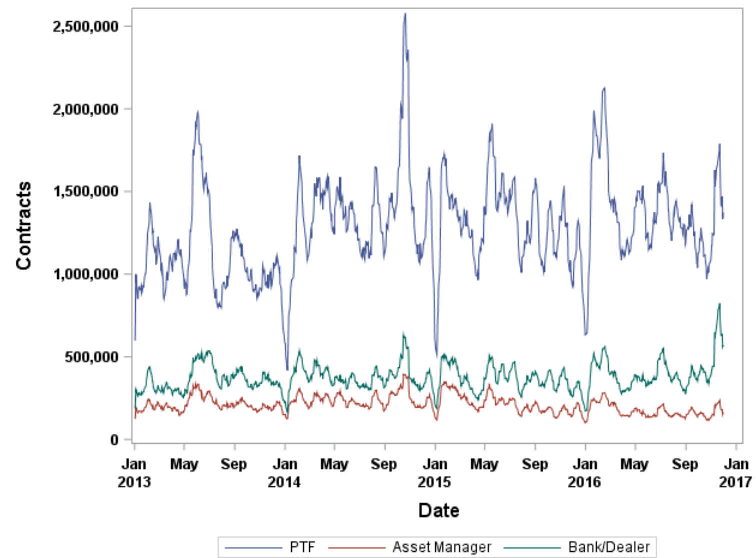


(c) WTI Crude Oil

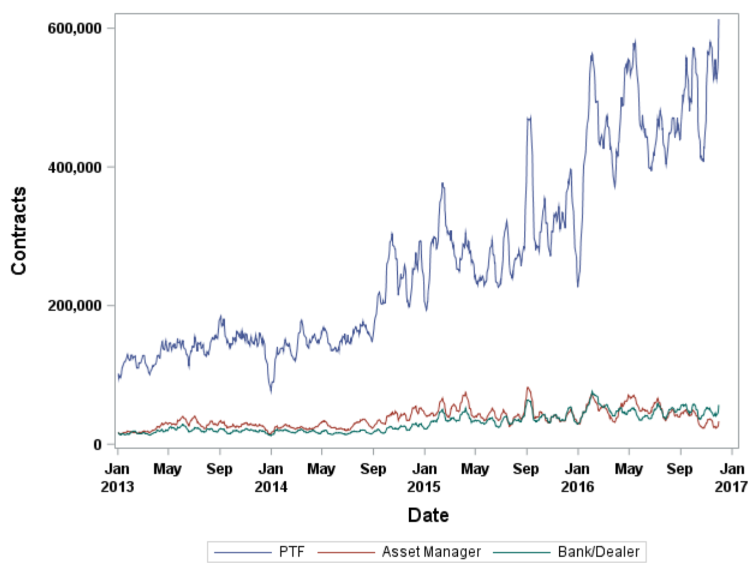
Figure 13: Market Makers (> 70 percent passive) by Product (Red - Automated, Blue - Manual)



(a) E-Mini

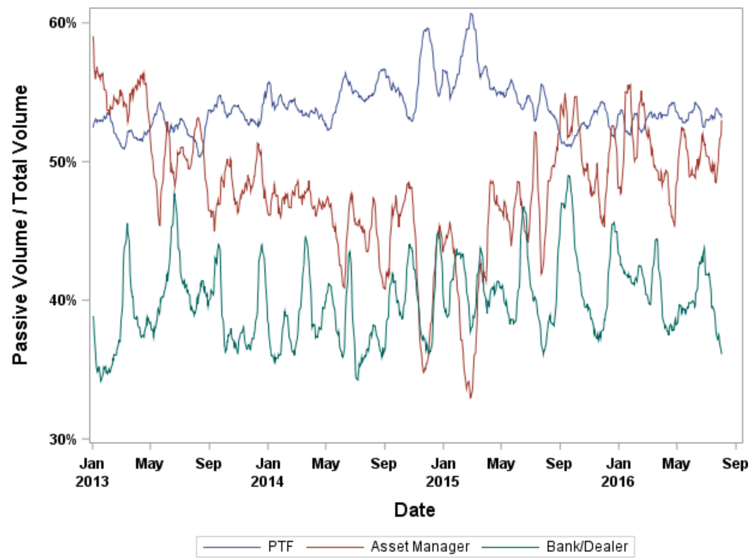


(b) Ten Year Treasury

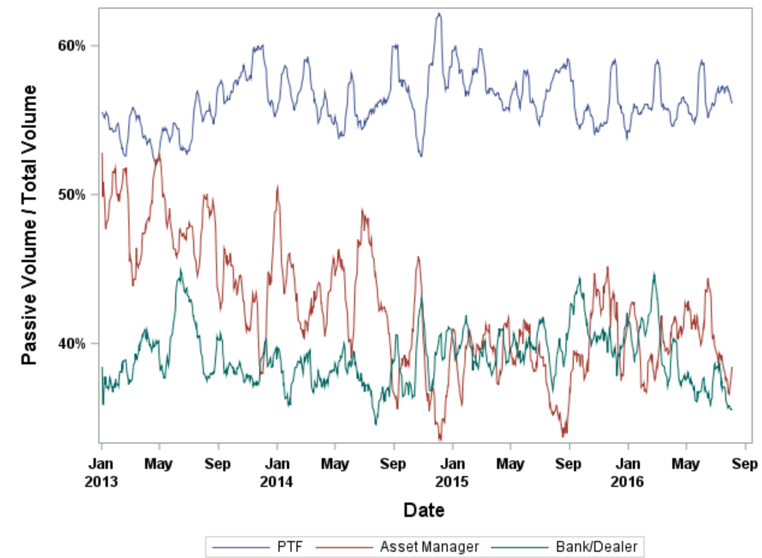


(c) WTI Crude Oil

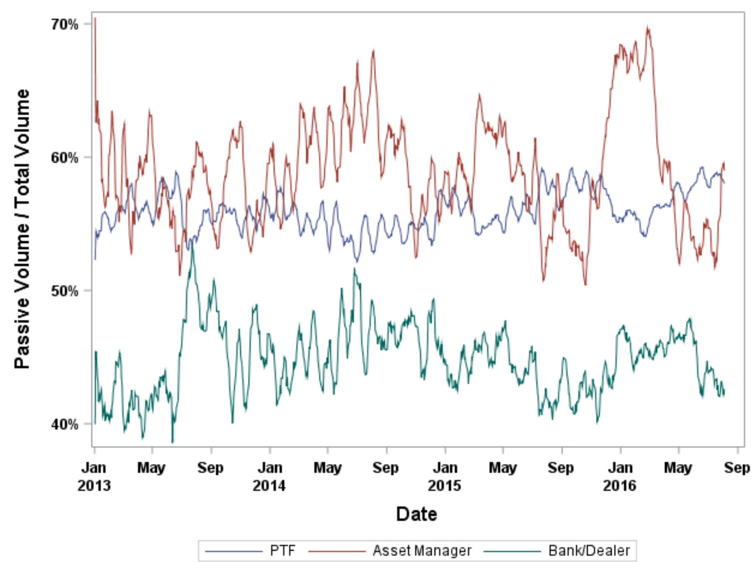
Figure 14: Outright Volume by Firm Type (Blue - PTF, Green - Banks, Red - Asset Managers)



(a) E-Mini

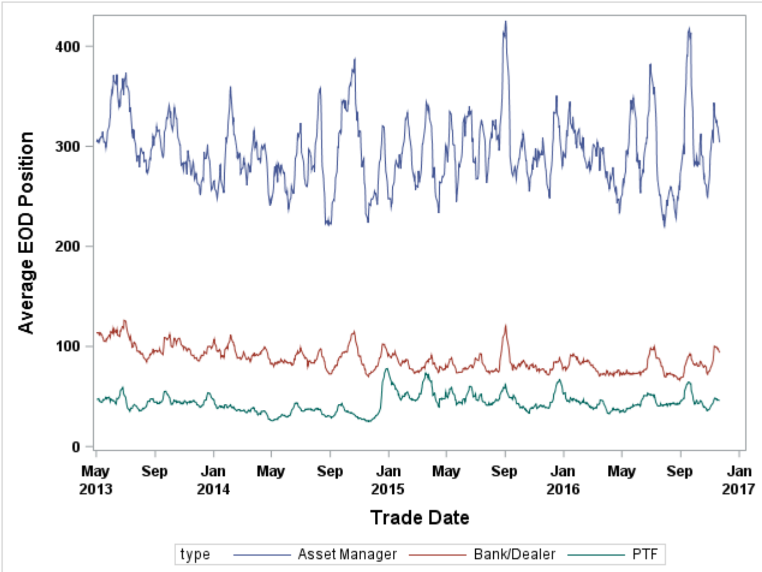


(b) Ten Year Treasury

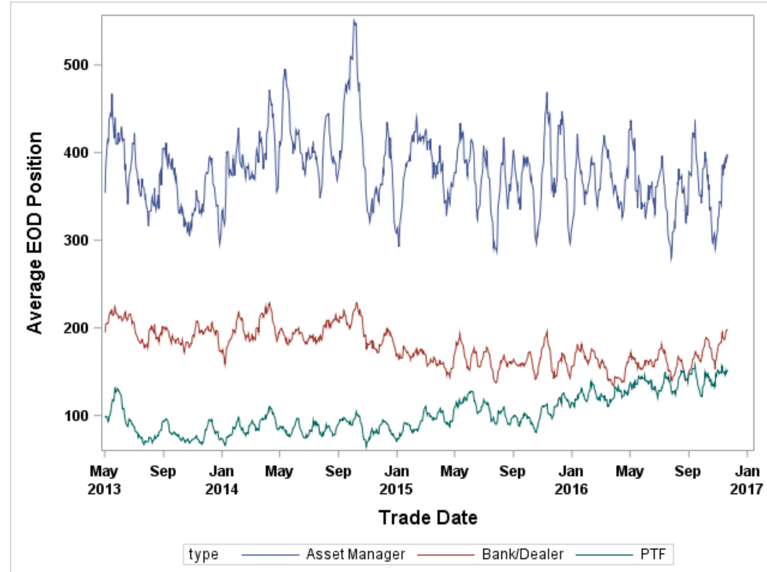


(c) WTI Crude Oil

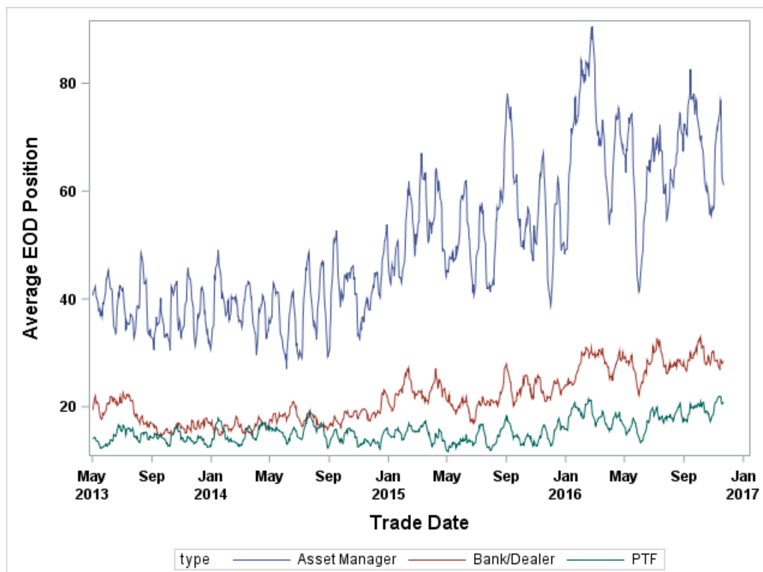
Figure 15: Passivity by Firm Type (Blue - PTF, Green - Banks, Red - Asset Managers)



(a) E-Mini



(b) Ten Year Treasury



(c) WTI Crude Oil

Figure 16: Average Takehome Quantity (Blue - PTF, Green - Banks, Red - Asset Managers)