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**Preliminary Findings Regarding  
the Market Events of May 6, 2010**

**Report of the Staffs of the CFTC and SEC to the Joint Advisory Committee on  
Emerging Regulatory Issues**

**May 18, 2010**

This is a report of preliminary findings by the staffs of the U.S. Commodity Futures Trading Commission and the U.S. Securities and Exchange Commission. The Commissions have expressed no view regarding the preliminary analysis or conclusions contained herein.

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## I. INTRODUCTION

The Commodity Futures Trading Commission (“CFTC”) and the Securities and Exchange Commission (“SEC” and collectively, the “Commissions”) have established a Joint CFTC-SEC Advisory Committee on Emerging Regulatory Issues (the “Committee”). The establishment of the Committee was one of 20 recommendations included in the agencies’ joint harmonization report issued last year.<sup>1</sup>

The first item on the agenda of the Committee will be to conduct a review of the market events of May 6 and to make recommendations related to market structure and liquidity issues that may have contributed to the volatility experienced on that day, as well as disparate trading conventions and rules across various markets.

This report to the Committee reflects the preliminary findings of the Commissions’ respective staffs resulting from their ongoing review of the events of May 6. The report is intended to brief the Committee regarding the May 6 events and to provide certain context regarding the current structure of the equity and futures markets and the regulatory framework for those markets.

This report includes: (a) an executive summary; (b) an overview providing general market context with respect to the events of May 6; (c) preliminary findings with respect to those events; and (d) areas for further analysis and initial next steps. In addition, this report contains several appendices providing relevant background regarding the market structure of the securities and futures markets.

It is important to emphasize that the review of the events of May 6 is in its preliminary stages and is ongoing. The reconstruction of even a few hours of trading during an extremely active trading day in markets as broad and complex as ours— involving thousands of products, millions of trades and hundreds of millions of data points—is an enormous undertaking. Although trading now occurs in microseconds, the framework and processes for creating, formatting, and collecting data across various types of market participants, products and trading venues is neither standardized nor fully automated. Once collected, this data must be carefully validated and analyzed. Such further data and analysis may substantially alter the preliminary findings presented in this report. The staffs of the Commissions therefore expect to supplement this report with further additional findings and analyses.

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<sup>1</sup> *Joint Report of the SEC and the CFTC on Harmonization of Regulation*, October 16, 2009.

## II. EXECUTIVE SUMMARY

On May 6, 2010, the financial markets experienced a brief but severe drop in prices, falling more than 5% in a matter of minutes, only to recover a short time later. Since that day, the staffs of the Securities and Exchange Commission and the Commodity Futures Trading Commission have been collecting and reviewing massive amounts of information in order to understand the events and to recommend appropriate measures.

### *SECURITIES MARKETS*

#### Preliminary Findings

May 6 started with unsettling political and economic news from overseas concerning the European debt crisis that led to growing uncertainty in the financial markets. Increased uncertainty during the day is corroborated by various market data: high volatility; a flight to quality among investors; and the increase in premiums for buying protection against default by the Greek government. This led to a significant, but not extraordinary, down day in early trading for the securities and futures markets.

Beginning shortly after 2:30 p.m.,<sup>2</sup> however, this overall decline in the financial markets suddenly accelerated. Within a matter of a few minutes, there was an additional decline of more than five percent in both the equity and futures markets. This rapid decline was followed by a similarly rapid recovery. This extreme volatility in the markets suggests the occurrence of a temporary breakdown in the supply of liquidity across the markets.

The decline and rebound of prices in major market indexes and individual securities on May 6 was unprecedented in its speed and scope. The whipsawing prices resulted in investors selling at losses during the decline and undermined confidence in the markets. Although evidence concerning the behavior of the financial markets on May 6, 2010 continues to be collected and reviewed, a preliminary picture is beginning to emerge.

At this point, we are focusing on the following working hypotheses and findings—

- (1) possible linkage between the precipitous decline in the prices of stock index products such as index ETFs and the E-mini S&P 500 futures, on the one hand, and simultaneous and subsequent waves of selling in individual securities, on the other, and the extent to which activity in one market may have led the others;
- (2) a generalized severe mismatch in liquidity, as evinced by sharply lower trading prices and possibly exacerbated by the withdrawal of liquidity by

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<sup>2</sup> All times in this report are EDT.

electronic market makers and the use of market orders, including automated stop-loss market orders designed to protect gains in recent market advances;

- (3) the extent to which the liquidity mismatch may have been exacerbated by disparate trading conventions among various exchanges, whereby trading was slowed in one venue, while continuing as normal in another;
- (4) the need to examine the use of “stub quotes”, which are designed to technically meet a requirement to provide a “two sided quote” but are at such low or high prices that they are not intended to be executed;
- (5) the use of market orders, stop loss market orders and stop loss limit orders that, when coupled with sharp declines in prices, for both equity and futures markets, might have contributed to market instability and a temporary breakdown in orderly trading; and
- (6) the impact on Exchange Traded Funds (ETFs), which suffered a disproportionate number of broken trades relative to other securities.

We have found no evidence that these events were triggered by “fat finger” errors, computer hacking, or terrorist activity, although we cannot completely rule out these possibilities.

#### Key Avenues for Further Investigation

Much work is needed to determine all of the causes of the market disruption on May 6. At this stage, however, there are a number of key themes that we are investigating.

***Futures and Cash Market Linkages.*** The first relates to the linkages between trading in equity index products, including stock index futures and the equity markets. About 250 executing firms processed transactions for thousands of accounts during the hour 2:00 p.m. – 3:00 p.m. in the E-Mini S&P 500 futures contract. Of these accounts, CFTC staff has more closely focused their examination to date on the top ten largest longs and top ten shorts. The vast majority of these traders traded on both sides of the market, meaning they both bought and sold during that period. One of these accounts was using the E-Mini S&P 500 contract to hedge and only entered orders to sell. That trader entered the market at around 2:32 and finished trading by around 2:51. The trader had a short futures position that represented on average nine percent of the volume traded during that period. The trader sold on the way down and continued to do so even as the price level recovered. This trader and others have executed hedging strategies of similar size previously.<sup>3</sup>

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<sup>3</sup> Statement of Gary Gensler, Chairman, Commodity Futures Trading Commission, Before the House of Representatives Committee on Financial Services, Subcommittee on Capital Markets, Insurance, and Government Sponsored Enterprises, May 11, 2010, at 8. Except as specifically

Data from the CME order book indicates that, although trading volume in E-mini S&P 500 futures was very high on May 6, there were many more sell orders than there were buy orders from 2:30 p.m. to 2:45 p.m. The data also indicate that the bid ask spread widened significantly at or about 2:45 p.m. and that certain active traders partially withdrew from the market. Considerable selling pressure at this vulnerable period in time may have contributed to declining prices in the E-Mini S&P 500 – and other equivalent products such as the SPY (an ETF that tracks the S&P 500).

All of these markets are closely linked by a complex web of traders and trading strategies. The precipitous decline in price in one market on May 6 may have influenced a sustained series of selling in other financial markets. The rapid rebound in price in one market could similarly have been linked to a rebound in price in another.

***Implications for the Equity Markets.*** The great majority of securities experienced declines that are generally consistent with the decline in value of the large indexes. Some were less than the approximately 5% decline in the E-mini S&P 500 during that period, and some were greater. Approximately 86% of securities, however, reached lows for the day that were less than 10% away from the 2:40 p.m. price.

The other 14% of securities suffered greater declines than the broader market, with some trading all the way down to one penny. The experience of these securities exposed potential weaknesses in the structure of the securities markets that must be addressed.

One hypothesis as to why the prices of some securities declined by abnormally large amounts on May 6 is that they were affected by disparate practices among securities exchanges. In the U.S. securities market structure, many different trading venues, including multiple exchanges, alternative trading systems and broker-dealers all trade the same stocks simultaneously. Disparate practices potentially could have hampered linkages among these trading venues and led to fragmented trading in some securities. Two types of disparate practices on May 6 relate to the NYSE’s liquidity replenishment points (“LRPs”) and the self-help remedy in Regulation NMS. These and other practices merit significant ongoing review:

- **LRPs and Similar Practices.** The NYSE’s trading system incorporates LRPs that are intended to dampen volatility. When an LRP is triggered, trading on the NYSE will “go slow” and pause for a time to allow additional liquidity to enter the market. Some have suggested that LRPs actually exacerbated, rather than dampened, price volatility on May 6 by causing a net loss of liquidity, as orders were routed to other trading venues for immediate execution rather than waiting on the LRP mechanism. If this occurred, it potentially could have caused some NYSE securities to decline further than the broad market decline. However, others believe that the LRP mechanism indeed dampened

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authorized, Section 8 of the Commodity Exchange Act generally forbids disclosure of additional information regarding such traders.

volatility by rebuilding additional buy side liquidity that soaked up some of the excess selling interest in these securities on May 6. LRPs and other types of exchange procedures for handling or executing orders will be closely examined to determine whether they inappropriately impede liquidity.

- Self-Help Remedy. Another disparate exchange practice potentially relevant to the thinning of liquidity is the self-help remedy. Two exchanges declared self-help against NYSE Arca in the minutes prior to 2:40 p.m. Exchanges are entitled to exercise the self-help remedy when another exchange repeatedly fails to provide a response to incoming orders within one second. A declaration of self-help frees the declaring exchanges from their obligation to route orders to the affected exchange. Some have suggested the exercise of self-help led to a net loss of liquidity as the declaring exchanges stopped routing orders to NYSE Arca.
- Stop Loss Market Orders. An additional hypothesis as to why some securities suffered more severe declines than the broader market on May 6 is that they were particularly affected by stop loss market orders. These orders have stop prices that, for sell orders, are lower than current prices. When the stop price is reached, such orders turn into market orders to sell. In fast-falling market conditions, stop loss market orders could potentially trigger a chain reaction of automated selling if they are in place in significant quantity for a particular stock. We are investigating whether such a chain reaction led to abnormally large declines for some stocks on May 6.
- Short Sales and Stub Quotes. We also are examining the use of short sales and stub quotes on May 6. Our analysis thus far of broken trades has found that short sales accounted for approximately 70 % of executions against stub quotes between 2:45 p.m. and 2:50 p.m., and approximately 90 % of executions against stub quotes between 2:50 p.m. and 2:55 p.m. Notably, short sale executions against stub quotes would be subject to the alternative uptick rule (Rule 201) adopted by the SEC in February 2010, with a compliance date in November 2010.

In addition, we will evaluate the use of stub quotes by market makers. As noted above, stub quotes are not intended to be executed and effectively indicate that the market maker has pulled out of the market. Their presence at the bottom and top of order books on May 6 may have led to a very large number of broken trades. We will examine the extent to which market makers used stub quotes to nominally meet their market making obligations on May 6.

***Exchange-Traded Funds.*** Of the U.S.-listed securities with declines of 60% or more away from the 2:40 p.m. transaction prices, which resulted in their trades being cancelled by the exchanges, approximately 70% were ETFs. This suggests that ETFs as a class were affected more than any other category of securities.

Based on our analysis to date, we are focused on a number of issues that may have contributed to the ETFs' experience, including:

- Because ETFs generally track securities market indices, the extraordinary price declines in certain individual securities likely contributed to the ETF price declines. For the most part, the severe ETF price declines followed, in time, the sharp decline in the broad markets. ETFs that track bond indices generally did not experience severe price declines. We therefore are considering the linkages between ETF price declines and the declines in the equity market.
- The role of market makers and authorized participants in ETFs, and whether an inability to hedge their ETF positions during periods of severe volatility may have contributed to a lack of liquidity in ETF shares.
- The use of ETFs by institutional investors as a way to quickly acquire (or eliminate) broad market exposures and whether this investment strategy led to substantial selling pressure on ETFs as the market began to decline significantly.
- The impact of ETF stop loss market orders, particularly from retail investors, on the overall ETF market price declines.
- Given that NYSE Arca is the primary listing exchange for almost all ETFs, whether the declaration of "self-help" against NYSE Arca by other exchanges may have impacted NYSE Arca-listed stocks generally and ETFs in particular. The loss of access to NYSE Arca's liquidity pool may have had a greater impact on market liquidity and trading for ETFs.

## ***FUTURES MARKETS***

### **Preliminary Findings**

Economic evidence from the futures markets is also consistent with the conclusion that a liquidity drain likely played a role in the dramatic and sudden movements in the price of stock index futures.

As noted above, preliminary data indicates that, although trading volume in E-mini S&P 500 futures was very high on May 6, there were many more sell orders than there were buy orders from 2:30 p.m. to 2:45 p.m. The data also indicate that the bid ask spread widened significantly at or about 2:45 p.m. and that certain active traders partially withdrew from the market.

Starting at 2:45:28 p.m., CME's Globex stop logic functionality initiated a brief pause in trading in the E-mini S&P 500 futures. This functionality is initiated when the



last transaction price would have triggered a series of stop loss orders that, if executed, would have resulted in a cascade in prices outside a predetermined ‘no bust’ range (6 points in either direction in the case of the E-mini). The purpose of this functionality is to prevent sudden, cascading declines (or increases) in price caused by order book imbalances.

The stop logic functionality has been activated previously for a variety of instruments. In the case of the E-mini S&P 500 futures, the stop logic functionality has been triggered a number of times in the past few years, including several times during the financial crisis in the Fall of 2008, when market data indicates similar conditions as those seen on May 6.

On May 6, activation of the stop logic functionality initiated a five second pause in trading on the E-mini S&P 500 futures contract. The price of the E-mini S&P 500 futures rebounded after the five second pause imposed by the stop logic functionality.

Staff analysis of market performance measures is consistent with the conclusion that a very temporary, but serious liquidity shortage occurred across the securities and futures markets.

## ***NEXT STEPS***

### **Securities Markets**

SEC staff will continue our ongoing investigation of the nature of the overall market liquidity dislocation and the impact on individual stocks. Where appropriate we are moving quickly to prevent a recurrence of the harm that investors suffered on May 6.

- We anticipate that the self-regulatory organizations (exchanges and FINRA) will propose circuit breakers for individual stocks that are designed to address temporary liquidity dislocation. Specifically, a pause in trading should provide an opportunity for all available sources of liquidity (both manual and automated) to be mobilized to meet sudden surges in demand for liquidity.
- The procedures for breaking trades that occur at off-market prices should be improved to provide investors greater consistency, transparency and predictability.
- We are also continuing to review a range of other policy options, including addressing the use of stub quotes, reviewing the obligations of professional liquidity providers and evaluating the use of various order types (market orders, stop loss orders).

## Futures Markets

CFTC staff will continue its analysis into the events of May 6. Specifically, CFTC staff is carefully reviewing the activity of the largest traders in stock index futures.

CFTC staff will also continue its analysis, already begun by our Office of Chief Economist, of liquidity provision in futures markets, with a particular focus on electronic trading. The subjects to be reviewed here include high frequency and algorithmic trading, automatic execution innovations on trading platforms, market access issues, and co-location.

CFTC staff is considering a proposed rulemaking with respect to exchange co-location and proximity hosting services. The purpose of the proposed rule would be to ensure that all otherwise qualified and eligible market participants that seek co-location or proximity hosting services offered by futures exchanges have equal access to such services without barriers that exclude access, or that bar otherwise qualified third-party vendors from providing co-location and/or proximity hosting services. Another purpose of the proposal would be to ensure that futures exchanges that offer co-location or proximity hosting services disclose publically the latencies for each available connectivity option, so that participants can make informed decisions.

CFTC staff will also be considering possible rules to enhance the CFTC's surveillance capabilities. These measures include automation of the statement of reporting traders in the large trader reporting system and obtaining account ownership and control information in the exchange trade registers.<sup>4</sup> These initiatives would increase the timeliness and efficiency of account identification, an essential step in data analysis.

## Joint Actions

- Staff also intends to pursue a joint study to examine the linkages between correlated assets in the equities (single stocks, mutual funds and ETFs), options and futures markets. The study could partly focus on examining cross-market linkages by analyzing trading in stock index products such as equity index futures, ETFs, equity index options, and equity index OTC derivatives using, to the extent practicable, market data, special call information, and order book data.
- Existing cross-market circuit breaker provisions should be re-examined to ensure they continue to be effective in today's fast paced electronic trading environment. Although the coordinated circuit breakers between futures and equities were not triggered, the events of May 6 reinforce the importance of having communication links between futures and equity markets so that there is meaningful and appropriate coordination of trading pauses and halts.

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<sup>4</sup> 17 CFR 18.04.

## ***PROCESS OF ANALYSIS***

Over the last ten days, the SEC and the CFTC have collected and analyzed a wide range of data from many different sources in order to prepare this preliminary report. Specifically:

- The SEC has sourced and analyzed price, time, and volume data on over 19 billion shares executed on May 6, and quote data representing the best bid and best offer for over 7,800 securities, for each exchange, for each millisecond during the trading day. Our goal is to gather data necessary to create a complete order book showing snap-shots of the full displayable depth on a particular market and audit trail data containing detailed information on all orders submitted.
  - Analysis of the complete order book is necessary to examine how changes in the provision of liquidity below the best bid, and above the best offer, led to rapid changes in execution prices, with some trades hitting high and low “stub quotes.”
  - Analysis of order audit trail data is necessary to examine what types of orders were driving these price swings (e.g., market, limit, etc).
  - The audit trail contains information on introducing brokers but does not include details regarding the trading activity of specific market participants. Currently, such data is only available directly from broker-dealers through “blue sheet” requests. Furthermore, even in this data participants are identified only in the way that they are known to the broker-dealer, as there are currently no uniform standards<sup>5</sup>
  - The order book and order audit trail are maintained at exchanges, FINRA, broker-dealers and other market centers. In some cases this information must be collected by the SROs, and then must be compiled and organized by the SEC. Every exchange has established its own requirements for what constitutes an audit trail, including what items are captured, how they are named, and the structure of the data file.
- The SEC has sourced and analyzed aggregate data on the volume and type of liquidity, provided and taken, by the largest liquidity providers and takers on various exchanges.
- The SEC has worked extensively with the relevant securities exchanges and FINRA to assess the circumstances of the market events on May 6. In addition, the SEC is analyzing detailed data for all *NYSE LRP*s occurring on May 6<sup>th</sup>, as well as over the last 5 months.
- CFTC staff has analyzed transaction and order book data on stock index futures, including the E-Mini S&P 500 futures contract.

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<sup>5</sup> For example, the same market participant may be known to different broker-dealers by different names making the aggregation of orders for a single participant very difficult. For further details, see the SEC’s recent proposal for the Large Trader Reporting System.

- CFTC staff has been reviewing information from a special call on over 40 large traders for their trading activity in the E-mini S&P 500 and Russell 2000 futures contracts on May 6, 2010. A special call is a CFTC directive to a trader holding a reportable position to furnish any pertinent information concerning the trader's positions, transactions, or activities.
- CFTC staff also has been reviewing information from a special call to swap dealers about their activity in over-the-counter broad-based security index derivatives markets on May 6, 2010. In addition, staff has been engaged in a detailed review of trader activity on May 6 through a comprehensive examination of trade-register data. To date, staff has received over 25 gigabytes of data in over 307,000 files, with more data expected.

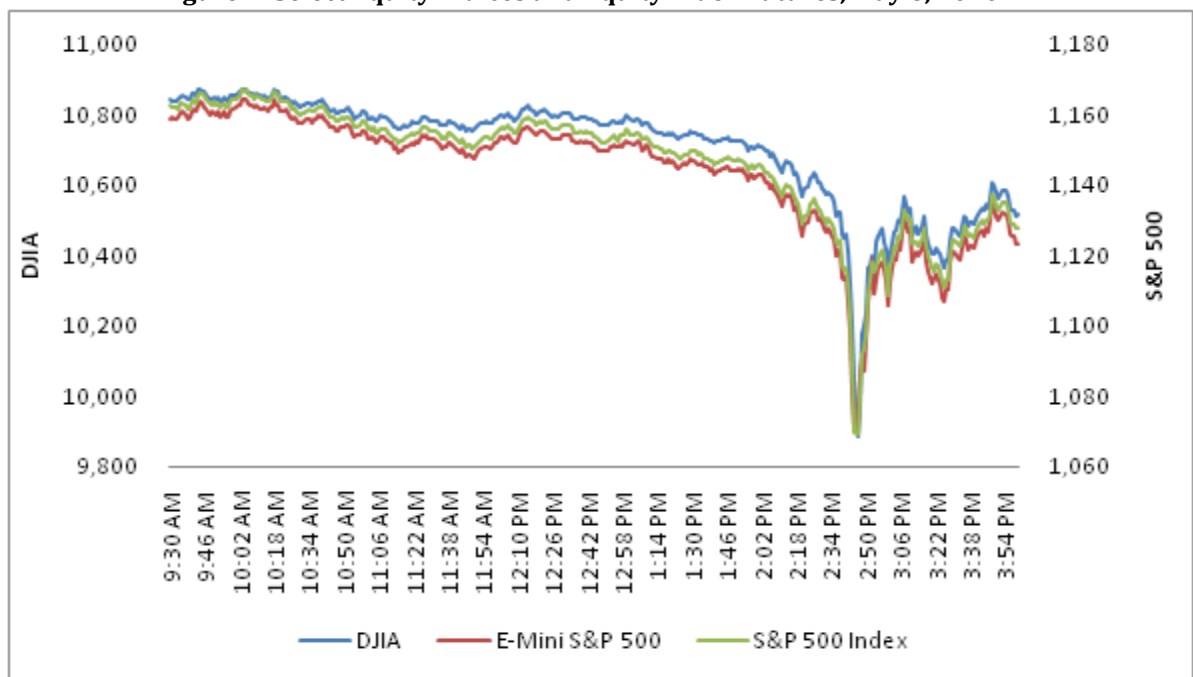
Both the CFTC and the SEC have had extensive conversations with a wide variety of market participants (investors, hedge funds, exchange traded funds, dealers, high frequency traders, etc.) to better understand their trading activities throughout May 6, and to gather *anecdotal evidence* from which common themes and/or trends can be identified to inform further areas of investigation.

### III. GENERAL MARKET CONTEXT

This section provides general market context for the trading activity on May 6.

Throughout the day on Thursday, May 6, many financial news outlets were reporting on political and economic events that were creating uncertainty in the financial markets. This increased uncertainty during that day is evidenced by patterns observable in financial market data. There is evidence of increasing volatility throughout the day, a “flight to quality”<sup>6</sup> (as seen in the rise in the price of gold and decline in U.S. Treasury yields), an increase in the price of premiums on credit default swaps to protect against the risk of default on European sovereign debt, and downward pressure on the Euro in global currency markets. All major broad-based equity indices and equity index futures spent much of the morning and early afternoon in negative territory (see chart below). For example, between 9:30 a.m. and 2:00 p.m., the Dow Jones Industrial Average (DJIA) declined 161 points to 10,712 (-1.5%), the S&P 500 Index declined 33 points to 1,145 (-2.9%), and the E-mini S&P 500 Index June futures declined 15 points to 1,143 (-1.3%).

**Figure 1: Select Equity Indices and Equity Index Futures, May 6, 2010**



Source: Bloomberg

<sup>6</sup> Flight to Quality is a term used to describe the movement of capital into asset classes that are perceived to be less risky during times of financial uncertainty.

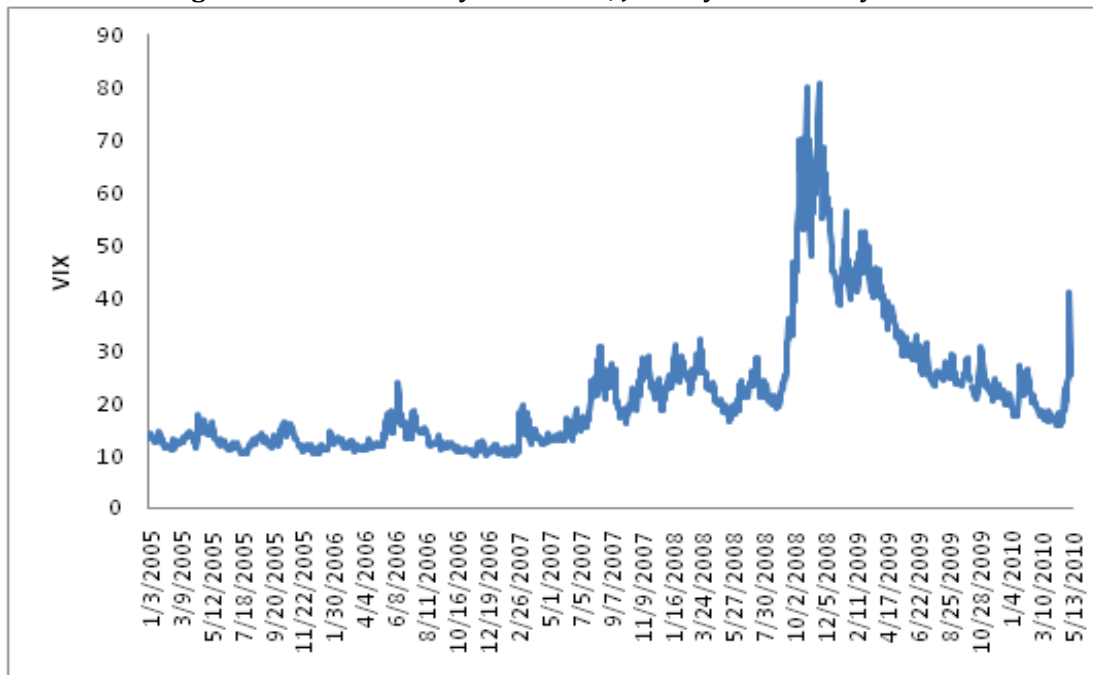
## Indicators of Market Uncertainty

### *Market Volatility*

A general indicator of market uncertainty is the Chicago Board Options Exchange SPX Volatility Index (“VIX”). The VIX is a measure of the expected volatility of the S&P 500 index, based on options prices, and is sometimes colloquially referred to as the “fear index.” The VIX provides a picture of the expected range of S&P 500 index returns in the next 30 days. Higher values of the VIX imply a greater range of returns, both positive and negative. Thus, increases in the VIX signal increased uncertainty about possible stock returns.

As seen in Figure 2, in 2010 the VIX prior to May 6 has averaged 19.58, a level that indicates much lower expected market volatility when compared to the VIX averages of 2008 (32.69) and 2009 (31.48). The elevated VIX levels from 2008 and 2009 were associated with a broader financial market crisis. Since then, the average level of the VIX has returned to levels that are consistent with the pre-2008 period. For example, in April the VIX averaged 17.42. For the month of May through May 14 the VIX has averaged 28.33.

**Figure 2: Historical Daily VIX Values, January 2005 to May 2010**

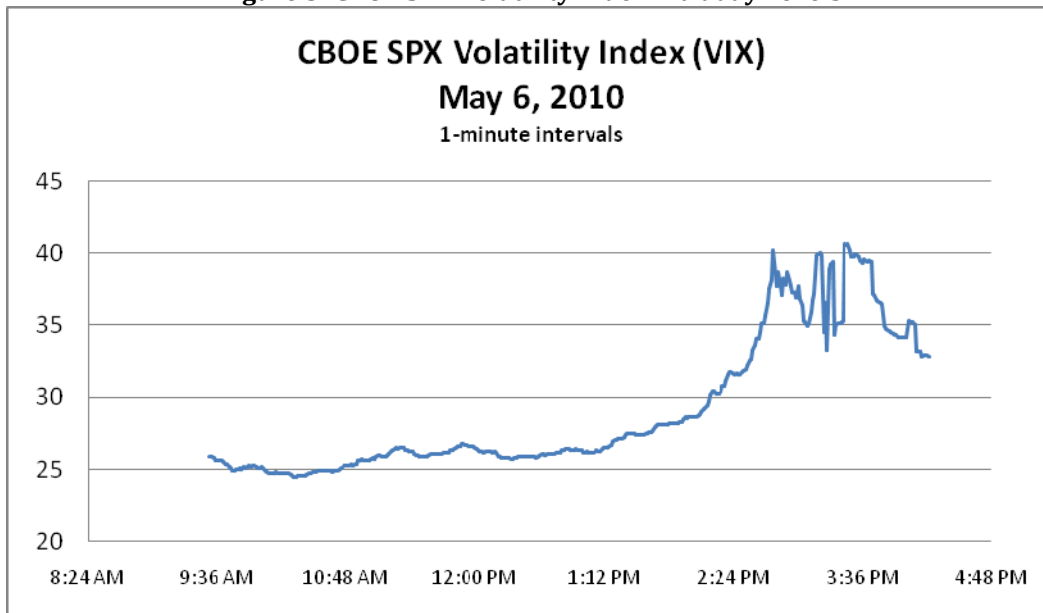


*Source: Bloomberg*

On May 6, the VIX opened at 25.88. This represents a 15.5% increase from when the trading week began on Monday, May 3 at 22.41. After staying level for most of the day, the VIX began to rise around 1:30 p.m. At 2:00 p.m. the VIX had increased 2.72 points or 10.5% from its opening level, signaling increasing expected volatility in the

S&P 500 Index. Over the next half-hour, the VIX steadily increased an additional 3.11 points to 31.71, up 22.5% from the open. A nearly continuous rise in the VIX signals higher levels of expected market risk and uncertainty going forward. The increase in the VIX then accelerated and the index reached 40.26 by 2:46 p.m. Had markets closed at the 2:46 p.m. level of 40.26, it would have represented a 61.6% increase from the previous day's close and would represent the fourth largest single-day increase in market volatility. Ultimately, the VIX closed at 32.80, a 31.7% increase from the previous day's close.<sup>7</sup>

**Figure 3: CBOE SPX Volatility Index Intraday Levels**



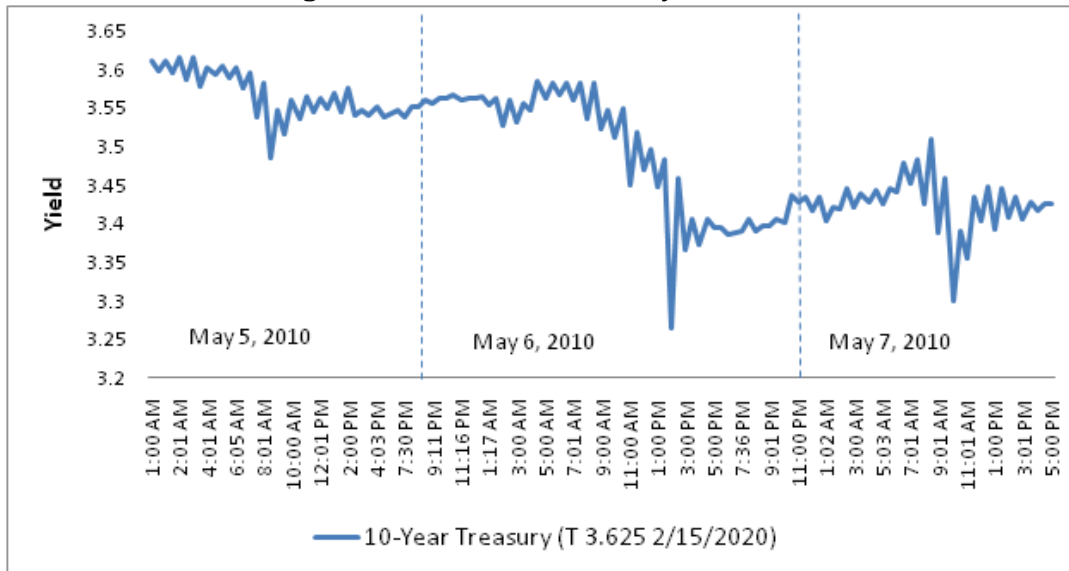
Source: Bloomberg

### *Flight to Quality*

Gold and U.S. Treasuries are assets that have historically been in high demand during periods of market uncertainty. On May 6, the COMEX nearby gold futures contract rose steadily from approximately \$1,180 to \$1,210 per troy ounce from the market open to its close at 1:30 p.m. Additionally, the ten-year Treasury yield fell from 3.58% on May 5 to an intraday low of 3.26% before settling at 3.41% (see Figure 4).

<sup>7</sup> The three highest single-day increases in the VIX are 10/19/87 (312.95%), 10/13/89 (68.30%), and 2/27/07 (64.22%).

**Figure 4: Ten-Year U.S. Treasury Note Yield**



Source: Bloomberg

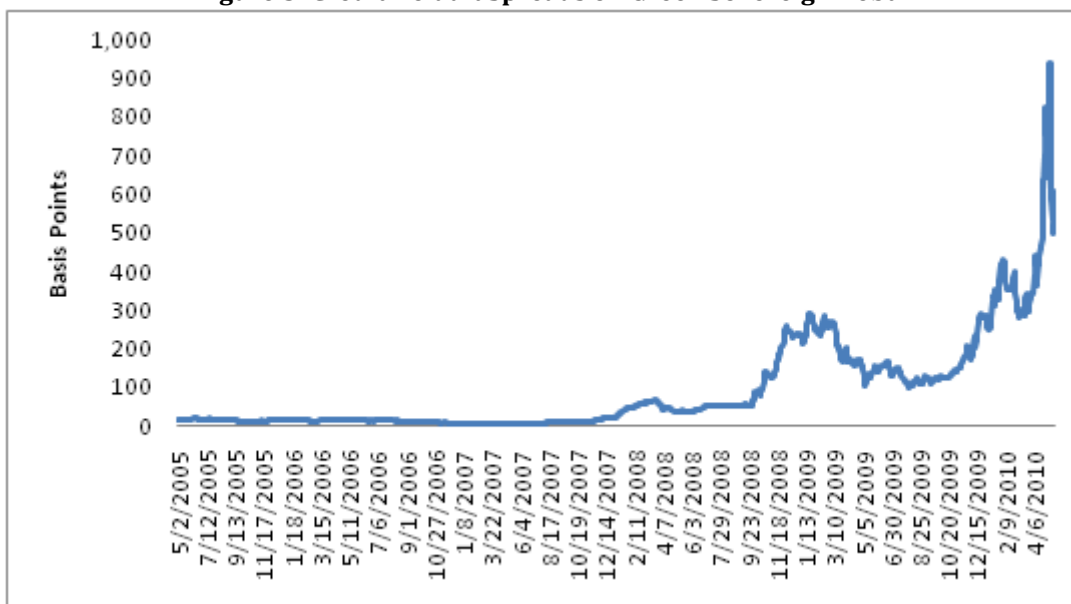
### *Credit Default Swaps*

The credit derivatives markets indicated increased uncertainty over the ability of the government of Greece to service its debt. Spreads on CDS protecting against the default of debt securities issued by Greece widened on May 6 to 937.9 basis points, up from 844.2 basis points the previous day.<sup>8</sup> This essentially meant that the price of premiums to protect against a default by Greece had increased. This widening coincided with the European Central Bank's press conference, beginning at 8:30a.m., in which the Bank did not address the possibility of purchasing Greek government bonds. Figure 5 shows CDS spreads on Greek sovereign debt over the past five years.

<sup>8</sup> A CDS spread widening means that it will cost more for a company to insure against default, because the market sees default as more likely than it previously did. In other words, someone who wants to buy protection on a risk of default of a debt has to pay a higher premium.



**Figure 5: Credit Default Spreads on Greek Sovereign Debt**

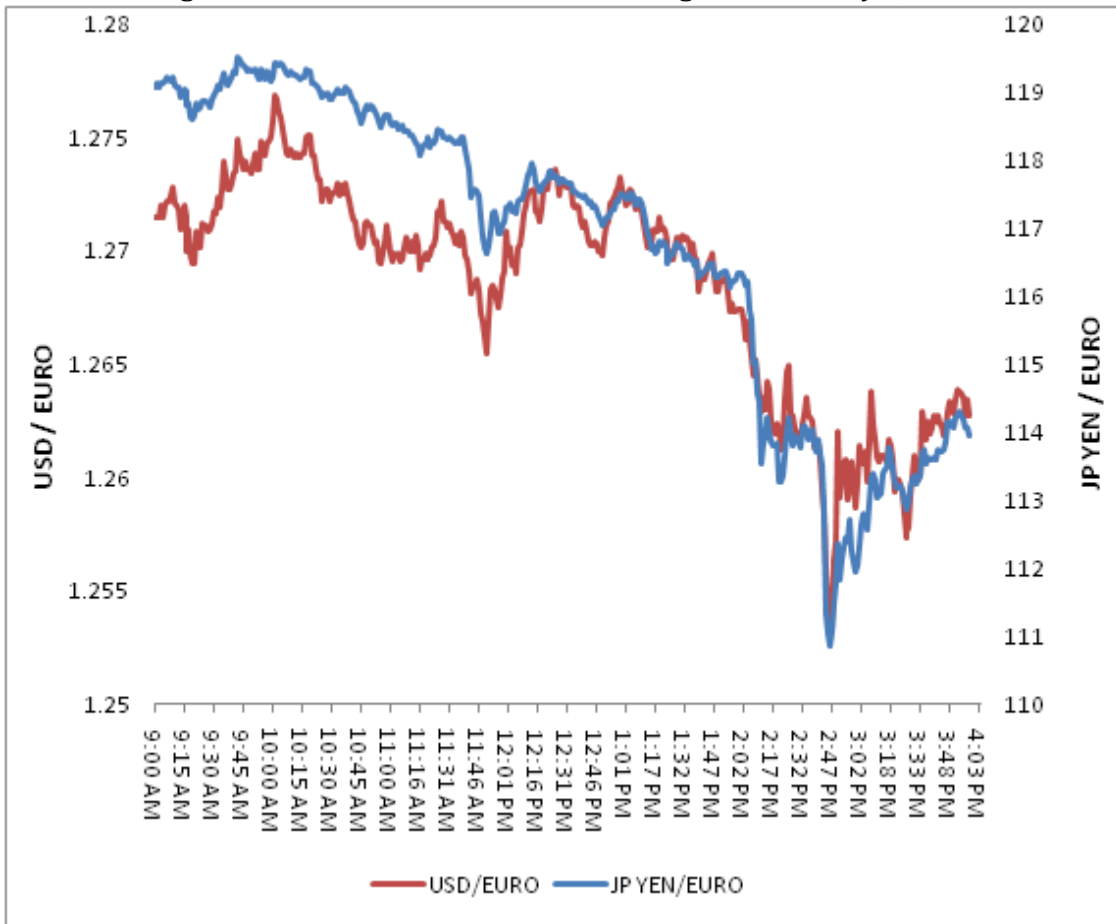


*Source: Bloomberg*

### *Euro Declines Against the Dollar and Yen*

In addition, global currency markets were indicating concern over the financial stability of the European Union. Shortly after 1:00 p.m., the Euro began a sharp decline against both the U.S. Dollar and the Japanese Yen (see Figure 6).

**Figure 6: Euro-Dollar and Euro Yen Exchange Rates on May 6, 2010**



Source: Bloomberg

*Events During the Afternoon of May 6*

By approximately 2:45 p.m. over 200 securities had fallen 50% or more from their 2:00 p.m. levels. Between 2:45 p.m. and 2:47p.m., the DJIA, S&P 500, and NASDAQ100 all reached daily lows. During this same period, all 30 DJIA components reached their intraday minima, representing a range from -4% to -36% from their opening levels. The DJIA bottomed at 9,872.57, the S&P 500 at 1,065.79, and the NASDAQ100 at 1,752.31. The E-mini S&P 500 index futures contract bottomed at 1,056.

After bottoming, equity and equity index futures markets began to rebound. At 2:50 p.m. the DJIA was trading at 10,232 and the E-mini S&P 500 was trading at 1,096. The E-mini S&P 500 climbed further to 1,118 by 2:53 p.m. The DJIA closed at 10,520.32, down 347.68 points, or 3.2%, from the prior day's close. The E-mini S&P 500 settled at 1,122.5, down 41.5 points, or 3.6%, from the prior day's settlement.

## IV. PRELIMINARY FINDINGS

### A. Securities Markets

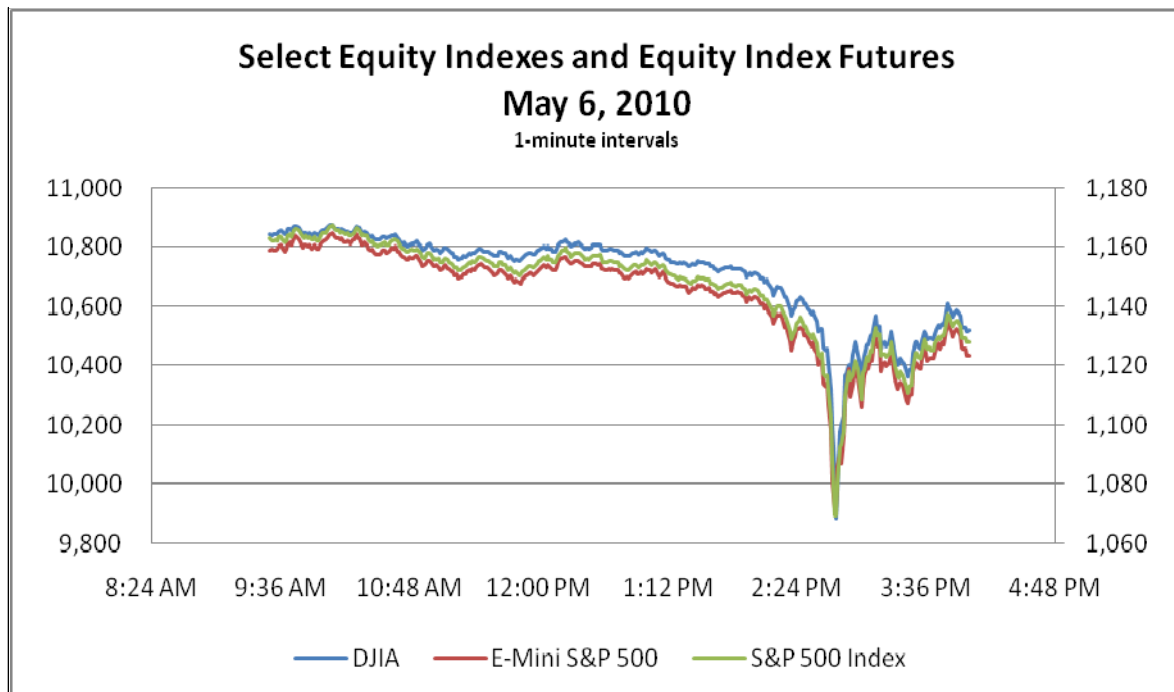
The market events of May 6, 2010 included a surge in trading in the stock markets, with total trading volume on that day of 19.4 billion shares, approximately 2.2 times the average daily trading volume in the 4<sup>th</sup> quarter of 2009. The trading volume in NYSE-listed stocks across all trading venues on May 6 represented the second highest daily volume on record, while May 6 volume in NASDAQ-listed stocks across all trading venues was the highest on record.

The severe price decline and recovery that occurred during a period of approximately 20 minutes on the afternoon of May 6 can usefully be described in terms of two broad but related themes: (1) a precipitous drop in value of more than 5% followed immediately by a rapid recovery, both of which occurred consistently across various broad market indices and products; and (2) extreme price fluctuations – mostly losses – that occurred for certain individual securities, followed relatively promptly by reversions to price levels consistent with the broader market. These two themes are discussed below.

#### 1. Broader Market Drop and Recovery

On May 6, a wide variety of broad market indices and products displayed similar behavior – a severe price decline immediately followed by a rapid recovery during a 20-minute period. This phenomenon is illustrated by the following price chart of the DJIA, the S&P 500 Index, and the E-mini S&P 500 futures (Figure 7).

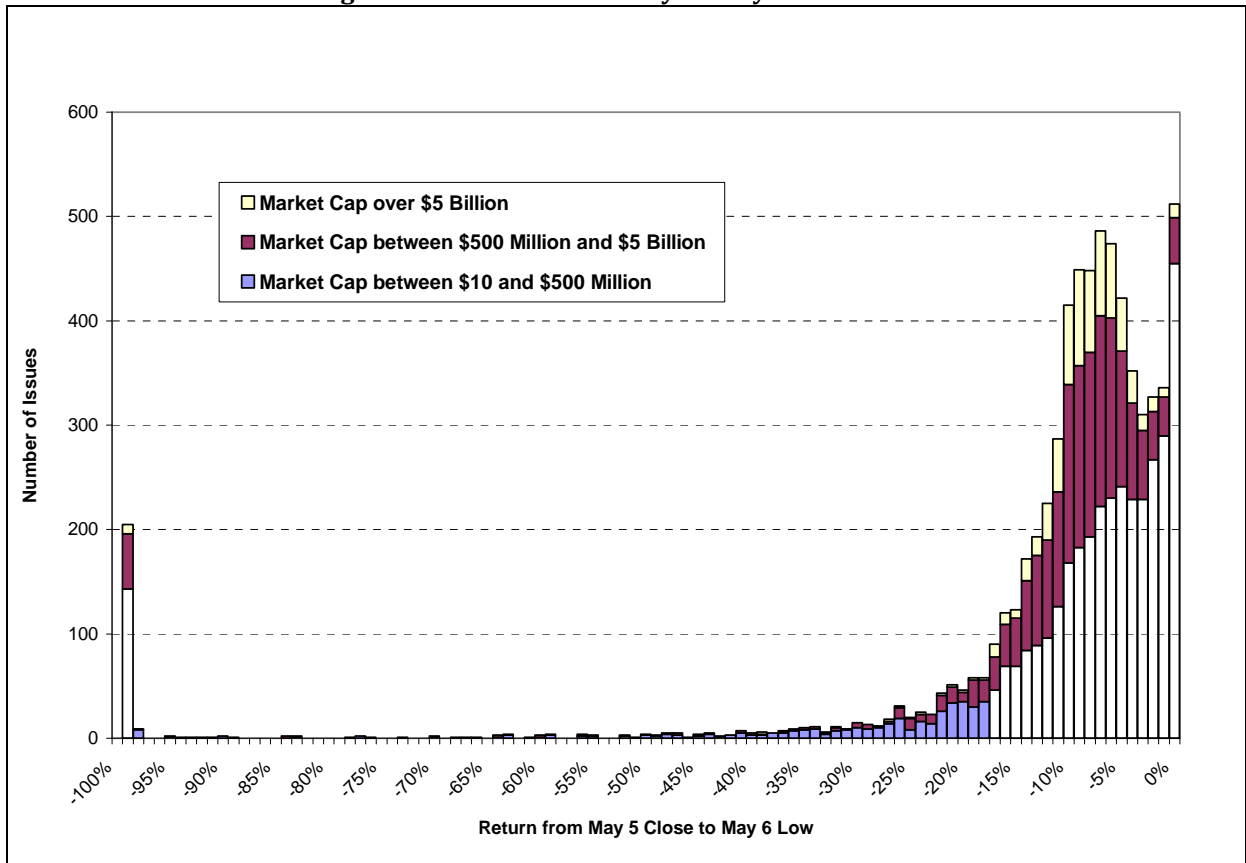
Figure 7: Equity Indices and Equity Index Futures



Until approximately 2:40 p.m., the figure reflects a significant, but not extraordinary, down day that was influenced by multiple negative economic factors, as noted in the previous section. At approximately 2:40 p.m., however, prices declined with extraordinary velocity. Each of the indices fell in excess of 5% within 5 minutes, and then immediately began a recovery that exceeded 5% within 10 minutes.

Most individual stocks declined by amounts that were generally consistent with the broader market decline. Approximately 86% of U.S.-listed securities reached lows for the day that were less than 10% away from the 2:40 p.m. price (a useful benchmark for the market price before the rapid market decline and recovery). The remaining 14% of U.S.-listed securities reached lows that exceeded 10% (these securities are discussed in greater detail in section IV.A.2 below).

**Figure 8: Distribution of May 6 Daily Lows<sup>9</sup>**



Sources: Thomson Financial Datastream and NYSE Trades and Quotes.

<sup>9</sup> This figure depicts the distribution of returns from the close on May 5 to the lowest transaction price on May 6. The securities included are equity securities (common and preferred) of corporate issuers, exchange-traded products, closed-end funds, and ADRs, traded on major U.S. exchanges, and having in each case, as of the May 5 close, a share price of more than \$3.00 and a market capitalization of at least \$10 million.

Figure 8 illustrates in more detail the behavior of these two groups of individual securities. It shows that, for the day, there is a concentration of daily lows at a point near 7% below the May 5 close, on the right-hand side of the graph. The distribution of lows for individual securities around this point is consistent with a day where the ETF that tracks the S&P 500 Index transacted 8.5% below the previous day's close. The figure notably also shows that some securities exhibited substantially more pronounced daily lows than the decline in the broad market would imply. In particular, approximately 200 securities traded, at their lows, almost 100% below their previous day's values, as represented by the spike at the left-hand side of the graph. The incidence of extreme daily lows for large capitalization stocks (depicted on the graph in yellow) appears to be lower than for smaller capitalization stocks (depicted in the graph in purple).

An examination of individual trades during the 2:40 p.m. - 3:00 p.m. period reveals a similar pattern. Table 1 and Table 2 below report the total number of trades, the total share volume and total dollar volume for trades executed between 2:40 p.m. and 3:00 p.m., for losses and gains, respectively. The losses/gains are computed as the difference between the trade price and the 2:40 p.m. price, divided by the 2:40 p.m. price, for each stock. The data do not include out-of-sequence trades.<sup>10</sup> Table 1 indicates that most investors that sold during this period transacted at prices that were within -10% away from the 2:40 p.m. price. Approximately 4.9 million, or 98%, of the trades that were executed during this period at prices less than the 2:40 p.m. price were within -10% of the 2:40 p.m. price. Approximately 102,000 trades were executed during the decline and recovery at prices that were -10% or more away from the 2:40 p.m. price; these trades are discussed in section IV.A.2 below. We see a similar pattern in Dow stocks. Four out of 30 (about 13%) had returns that were less (more negative) than -10%. Table 3 indicates the lowest trade price executed for each of the Dow Jones Industrial Average component stocks and the return computed against the stock's 2:40 p.m. trade price. Of these stocks, four, Proctor & Gamble (PG), 3M (MMM), Hewlett-Packard (HPQ), and General Electric (GE), traded at a loss of over 10%, relative to the 2:40 p.m. price.

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<sup>10</sup> An "out-of-sequence" trade occurs when the TAQ data identifies the posted trade time as incorrect. In this case, the actual time at which the trade was placed is unknown.

**Table 1: Trades Executed at a Loss**

	<b>Total # trades</b>	<b>Total volume</b>	<b>Total volume (\$)</b>
All trades	7,135,104	1,995,000,637	56,651,582,692
Losses	5,013,724	1,358,709,226	38,047,617,508
0% to -10%	4,912,125	1,324,448,213	37,383,122,363
-10% to -20%	63,890	22,171,745	522,444,343
-20% to 30%	12,923	4,077,881	85,328,519
-30% to -40%	6,112	2,317,245	30,461,333
-40% to -50%	2,519	767,393	9,641,261
-50% to -60%	1,682	472,624	8,334,944
-60% to -70%	1,056	370,920	4,328,898
-70% to -80%	798	292,061	2,245,851
-80% to -90%	1,109	237,259	1,152,480
-90% to -100%	11,510	3,553,885	557,516

**Table 2: Trades Executed at a Gain**

	<b>Total # trades</b>	<b>Total volume</b>	<b>Total volume (\$)</b>
All trades	7,135,104	1,995,000,637	56,651,582,692
Gains	2,121,380	636,291,411	18,603,965,183
0% to 10%	2,108,076	632,378,310	18,079,956,948
10% to 20%	10,075	3,039,456	53,123,704
20% to 30%	927	281,383	8,589,789
30% to 40%	517	167,439	1,827,449
40% to 50%	106	32,866	536,641
50% to 60%	45	19,188	358,048
60% to 70%	67	14,466	387,321
70% to 80%	184	46,456	1,147,215
80% to 90%	178	44,075	1,143,755
> 90%	1,205	267,772	456,894,313

**Table 3: Maximum Trade Loss for Dow 30 Stocks**

<b>Company</b>	<b>Return</b>	<b>Low Price</b>	<b>Time</b>
The Proctor& Gamble Company	-36.14%	\$39.37	2:47:15 PM
3M Company	-18.39%	\$67.98	2:46:06 PM
Hewlett-Packard Company	-11.81%	\$41.94	2:46:13 PM
General Electric Company	-10.23%	\$15.00	2:46:11 PM
Merck & Company Incorporated	-9.23%	\$30.70	2:46:11 PM
Exxon Mobil Corporation	-8.74%	\$58.46	2:46:52 PM
E.I. Du Pont De Nemours	-8.13%	\$33.66	2:46:29 PM
Cisco Systems Incorporated	-7.52%	\$23.23	2:45:33 PM
The Walt Disney Company	-7.49%	\$31.00	2:45:45 PM
United Technologies Corporation	-7.42%	\$65.17	2:46:38 PM
International Business Machines Corporation	-7.20%	\$116.00	2:46:33 PM
Chevron Corporation	-7.18%	\$71.50	2:47:03 PM
Intel Corporation	-6.09%	\$19.90	2:47:30 PM
The Boeing Company	-5.89%	\$62.00	2:45:42 PM
Verizon Communications	-5.73%	\$26.49	2:45:48 PM
Johnson & Johnson	-5.70%	\$60.03	2:46:10 PM
Kraft Foods Incorporated	-5.21%	\$27.49	2:47:59 PM
Home Depot Incorporated	-5.06%	\$32.07	2:45:57 PM
Pfizer Incorporated	-4.64%	\$15.85	2:46:06 PM
Caterpillar Incorporated	-4.50%	\$58.00	2:45:33 PM
American Express Company	-4.47%	\$40.16	2:45:52 PM
Alcoa Incorporated	-4.34%	\$11.25	2:47:35 PM
Microsoft Corporation	-4.16%	\$27.91	2:46:39 PM
AT&T Incorporated	-3.88%	\$24.04	2:46:04 PM
Wal-Mart Stores Incorporated	-3.74%	\$51.53	2:45:29 PM
Bank of America Corporation	-3.55%	\$15.50	2:46:36 PM
The Coca Cola Company	-3.47%	\$51.21	2:47:23 PM
McDonalds Corporation	-3.43%	\$67.49	2:47:53 PM
JP Morgan Chase & Company	-2.51%	\$39.29	2:45:45 PM
The Travelers Companies Incorporated	-2.31%	\$48.53	2:45:46 PM

Both aspects of the 20-minute phenomenon—the effects on the broad market and the even more extreme effects on a minority of securities—warrant serious analysis, given the potential harm to investor confidence and the realized losses of investors. Although the state of our fact-gathering makes any analysis at this time too preliminary to draw firm conclusions—or even many tentative ones—about how and why the events of May 6 occurred, the facts we have and the analysis we have completed thus far do offer a few clues to the origins of the May 6 event.

We are in the process of obtaining and reviewing the order book and the data necessary to reconstruct the order audit trail for the various equity exchanges and electronic communications networks (“ECNs”) in the hope of being able to determine whether order book liquidity substantially thinned immediately prior to 2:40 p.m. For example, based on some preliminary data, there may be reason to believe that there may have been a thinning of order book liquidity at one significant exchange at around 2:00 p.m.

The temporary nature of the decline in prices in the broader market may be indicative of a failure in liquidity. As we will show, many individual securities exhibited more extreme temporary price movements than the broad market, consistent with a broader set of liquidity failures. The discussion that follows focuses on a key issue on May 6 – the interaction between liquidity demand and supply. A temporary price dislocation could be caused by an unusually high demand for liquidity, by an unusually weak supply of liquidity, or by some combination of these factors. Our preliminary analysis indicates that both of these factors may be at play. In this section, we focus on questions that bear on this central issue.

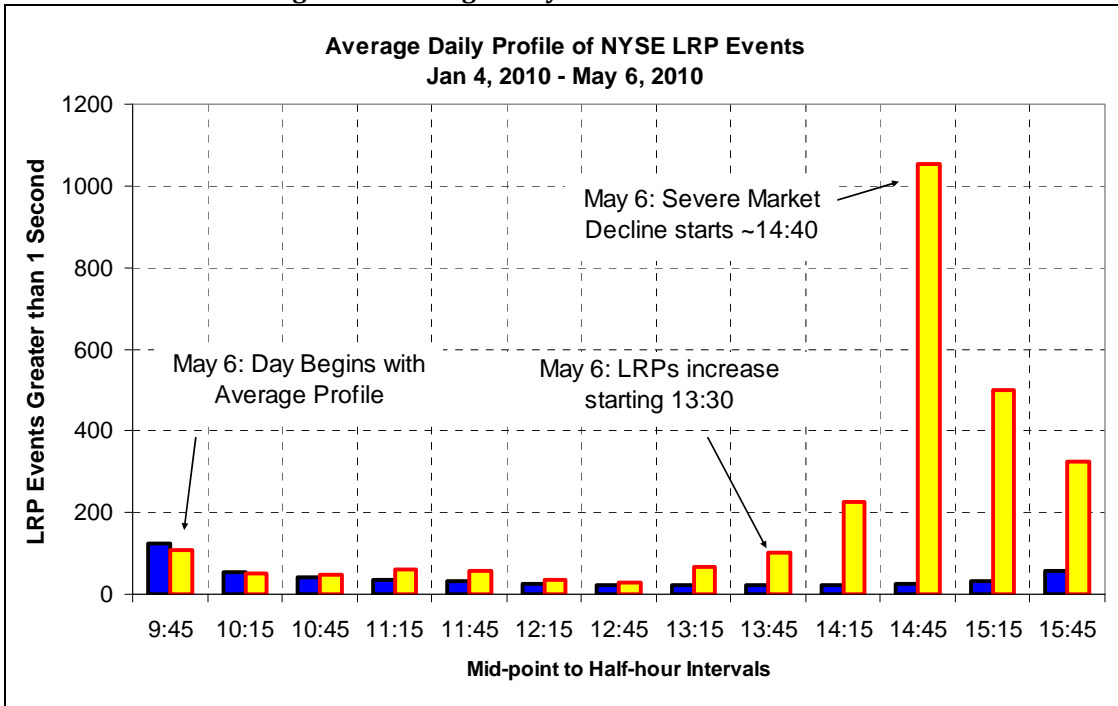
NYSE’s trading system incorporates LRPs that are intended to dampen volatility in a given stock by temporarily converting from an automated market to a manual auction market when a price movement of a sufficient size is reached. In such case, trading on the NYSE will “go slow” and pause for a time period to allow an opportunity for additional liquidity to enter the market. During an LRP, the NYSE will display a quotation that is not immediately accessible and can be bypassed, but is not required to be bypassed, by other trading venues and order routers.

Figure 9 compares the May 6 LRP profile on the NYSE with the average profile of such events during 2010. The figure indicates the number of securities that triggered an LRP event lasting more than 1 second during any given 30-minute period. The blue blocks, reported first in the series, represent the average number of securities meeting this criterion from January 4, 2010 through May 6, 2010. The yellow blocks, reported second in the series, represent the LRP events on May 6, 2010 itself.

Figure 9 shows a substantial increase in the number of securities with LRPs on the NYSE starting in the period from 1:00 p.m. to 1:30 p.m. and rising to more than 200 in the period from 2:00 p.m. to 2:30 p.m. Between 2:30 and 3:00 pm, the level rose to approximately 1,000. This significant rise in LRPs could be indicative of a thinning of order book liquidity at the NYSE.



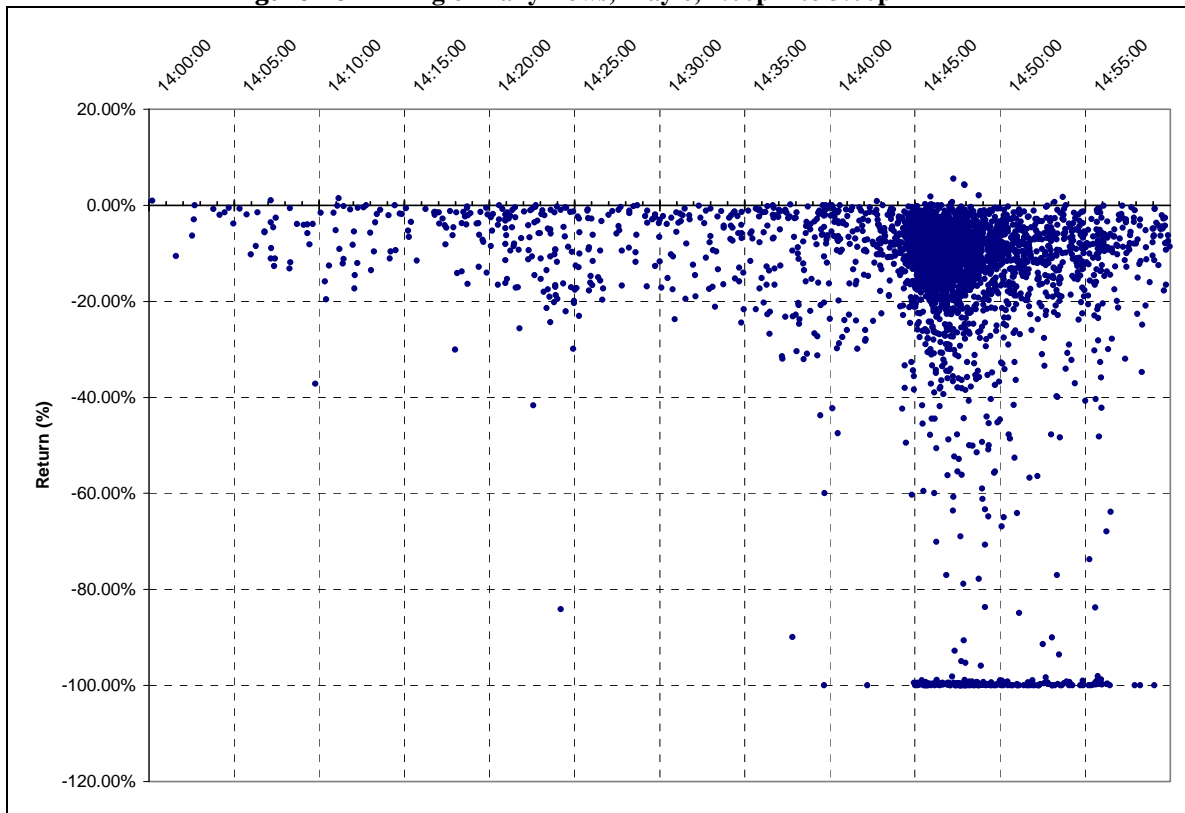
**Figure 9: Average Daily Profile of NYSE LRP Events**



Source: NYSE

Finally, Figure 10 shows a scatter plot of the time and percentage decline for all securities that realized their daily low measured from May 5 close to their May 6 low during the period between 2:00 p.m. and 3:00 p.m. Each point on the plot represents one stock, the time of day it executed a trade at its lowest trade price of the day, and the return from the previous night's close to that trade price. It shows a steady increase in the number of securities with daily lows throughout the hour.

**Figure 10: Timing of Daily Lows, May 6, 2:00pm to 3:00pm<sup>11</sup>**

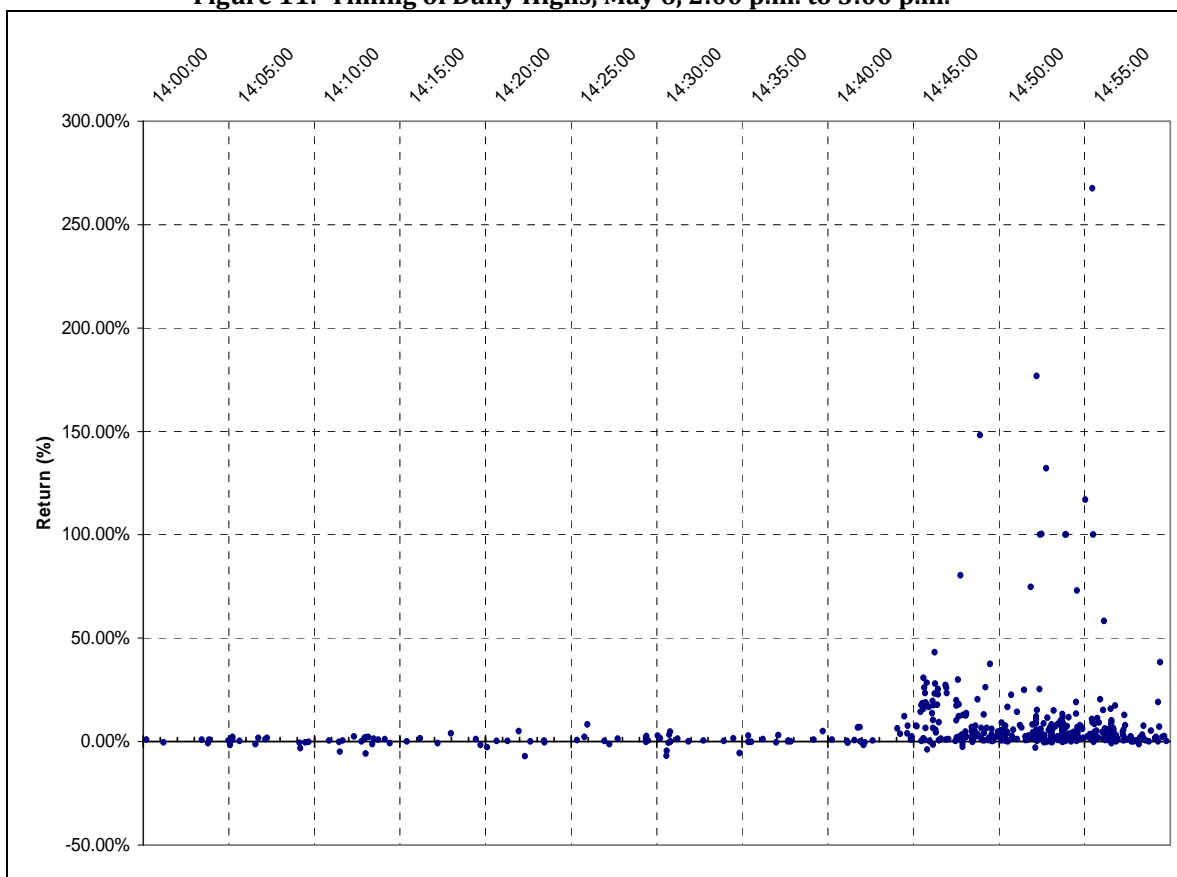


*Source: Thomson Financial Datastream and NYSE Trades and Quote*

<sup>11</sup>

Figure 10 depicts the timing of daily lows during the one-hour period from 2:00 p.m. to 3:00 p.m. on May 6. Each point represents the return from the May 5 close to the lowest transaction price on May 6, plotted against the time at which the transaction occurred. Daily lows not occurring during this one-hour interval are not depicted. The figure includes all equity securities (common and preferred) of corporate issuers, exchange-traded products, closed-end funds, and ADRs, traded on major U.S. exchanges, with a share price of more than \$3.00 and a market capitalization of at least \$10 million as of the May 5 close.

**Figure 11: Timing of Daily Highs, May 6, 2:00 p.m. to 3:00 p.m.<sup>12</sup>**



*Sources: Thomson Financial Datastream and NYSE Trades and Quote.*

While a large number of securities experienced extreme low trades during the 2:00 p.m. to 3:00 p.m. interval, a smaller but still significant number of securities experienced extreme highs. Figure 11 indicates positive returns on May 6, excluding a few stocks for scaling reasons. The figure shows that a significant number of securities experienced daily highs more than 25% higher than their close on May 5. These extreme highs were concentrated after 2:44 p.m. Unlike the lows depicted in Figure 10, which began to occur in the early part of the hour, there appear to be no extreme highs occurring prior to 2:44 p.m.

Another factor potentially relevant to the thinning of liquidity is the declaration of self-help by NASDAQ against NYSE Arca at 2:37 p.m., and by NASDAQ OMX BX against NYSE Arca at 2:38 p.m. We have not yet evaluated the basis for the exercise of

<sup>12</sup> Figure 11 depicts the timing of daily highs during the one-hour period from 2:00 p.m. to 3:00 p.m. on May 6. Each point represents the return from the May 5 close to the highest transaction price on May 6, plotted against the time at which the transaction occurred. Daily highs not occurring during this one-hour interval are not depicted. The figure includes all equity securities (common and preferred) of corporate issuers, exchange-traded products, closed-end funds, and ADRs, traded on major U.S. exchanges, with a share price of more than \$3.00 and a market capitalization of at least \$10 million as of the May 5 close. For scaling purposes, Figure 11 excludes returns to daily highs on a few equity securities of corporate issuers.

self-help against NYSE Arca. Under Regulation NMS, exchanges are entitled to exercise self-help when another exchange repeatedly fails to provide a response to incoming orders within one second. The direct effect of a declaration of self-help is that the declaring exchanges will no longer route orders to the affected exchange. We are not aware, however, that any broker-dealer or any other exchange declared self-help against NYSE Arca prior to the time the broad market indexes reached their daily lows.<sup>13</sup> Consequently, the broker-dealers and other exchanges that wished to access NYSE Arca quotes would have been likely to route orders directly to NYSE Arca (and therefore would not have been affected by a self-help declaration), rather than trying to access those quotes indirectly through NASDAQ or NASDAQ OMX BX. Accordingly, we are evaluating the extent to which the declaration of self-help by the two exchanges against NYSE Arca prior to 2:40 p.m. could have caused a significant thinning of available liquidity.

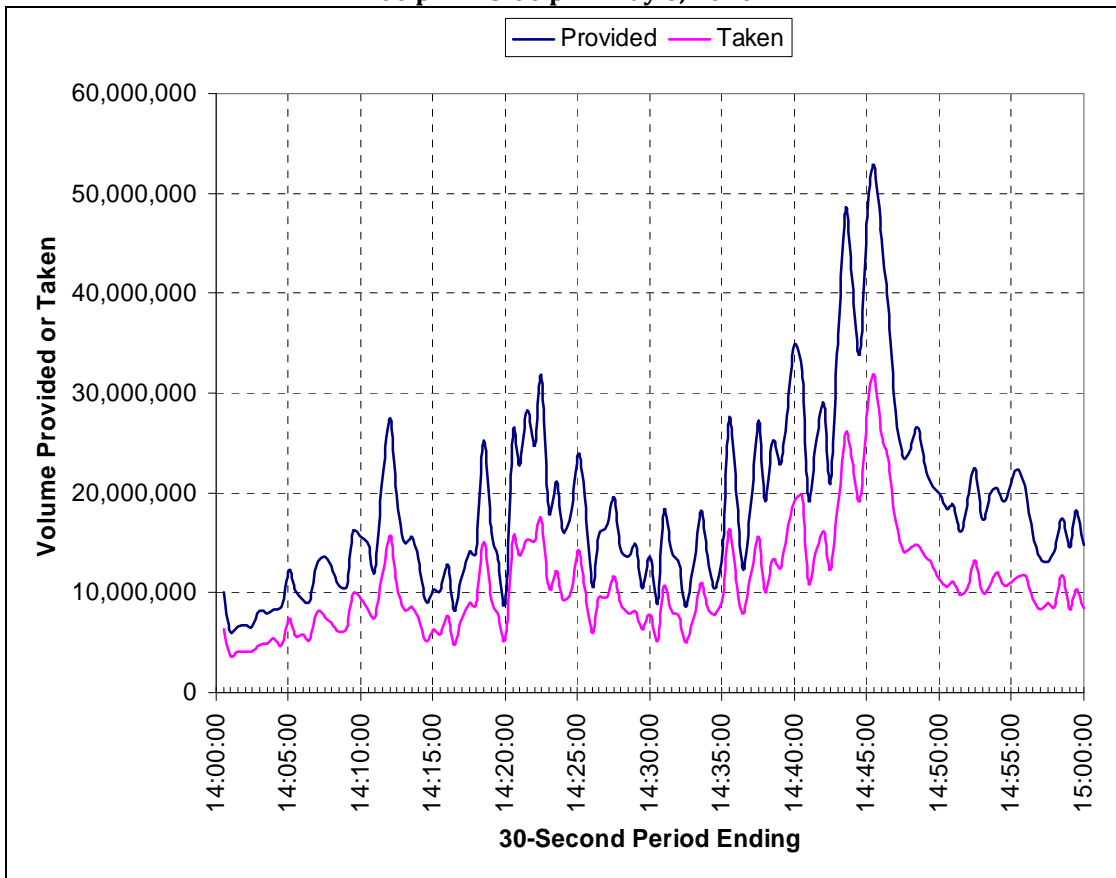
Another interesting question remains as to whether electronic liquidity providers pulled back during the relevant timeframe. At approximately 2:40 p.m. on May 6, prices declined rapidly across many trading venues and products. The activities of electronic liquidity providers are important subjects for analysis. These proprietary trading firms have come to be the dominant type of liquidity provider in the U.S. equity markets. Consequently, we are analyzing their activities on May 6. As noted above, we are in the process of obtaining and reviewing the order book data of exchanges and ECNs. We have, in the meantime, obtained other data from the exchanges concerning the activity of their top ten liquidity providing firms from 2:00 p.m. to 3:00 p.m. We continue to analyze these data to assess the activity of these liquidity providing firms. Some initial findings based on these data are set forth in Figure 12 and Figure 13 below.<sup>14</sup>

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<sup>13</sup> Two other exchanges – BATS and NSX – exercised self-help against NYSE Arca after this time.

<sup>14</sup> All of the equity exchanges provided data on their liquidity providers. Each exchange was requested to identify and provide data on the top ten overall liquidity providers (“Top Ten Providers”) on the exchange on May 6. For each of the Top Ten Providers, the exchange was requested to provide (1) the number of trades and share volume of liquidity provided on the exchange from 2:00 p.m. to 3:00 p.m., broken down in 30 second intervals, for all securities traded on the exchange in the aggregate; and (2) the number of trades and share volume of liquidity removed on the exchange from 2:00 p.m. to 3:00 p.m., broken down in 30 second intervals, for all securities traded on the exchange in the aggregate.

**Figure 12: Liquidity Provided/Taken by Top 10 Liquidity Providers Across All Equity Markets  
2:00 p.m. - 3:00 p.m. May 6, 2010<sup>15</sup>**

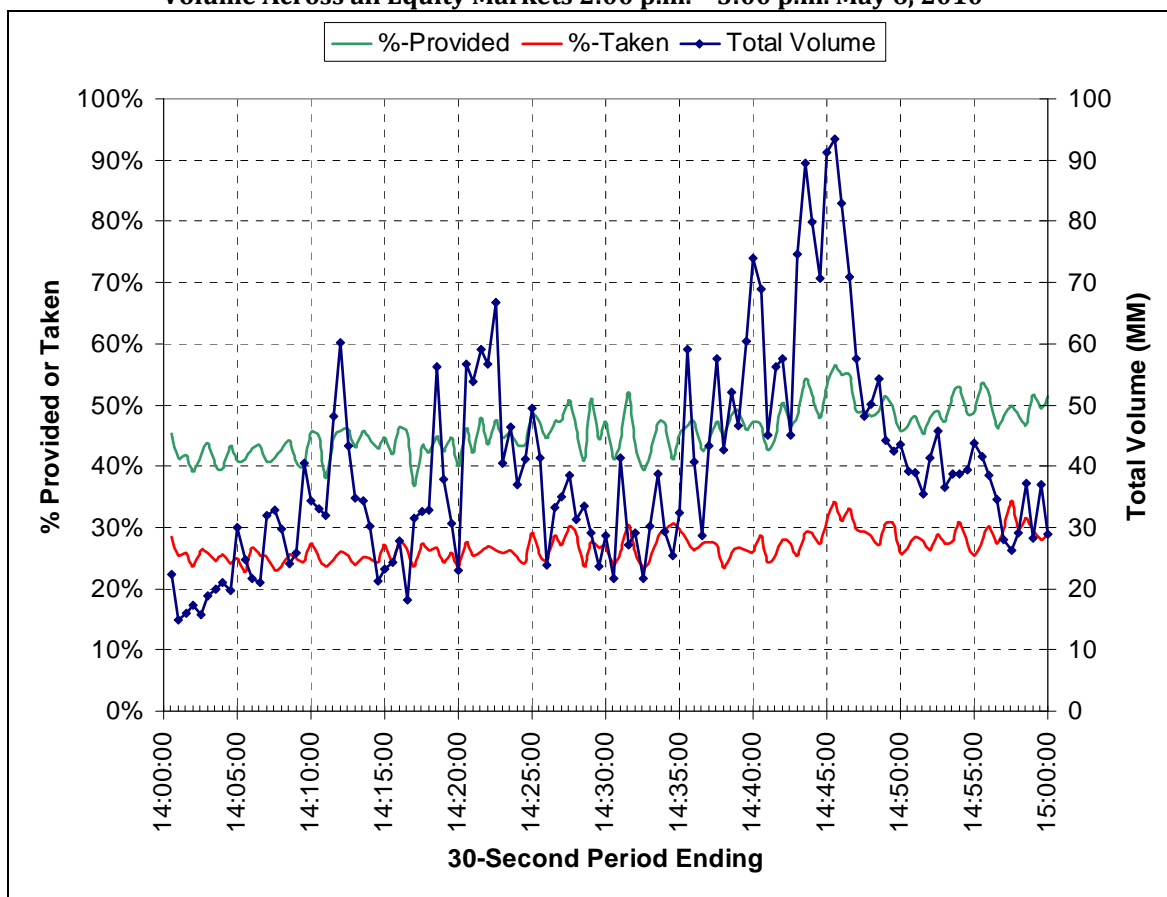


*Source: All data was provided by the exchanges*

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The aggregate number of shares taken and provided by each of the top ten liquidity providers for each exchange reported in 30-second intervals.

**Figure 13: Percent of Liquidity Provided/Taken by Top 10 Liquidity Providers against Total Volume Across all Equity Markets 2:00 p.m. – 3:00 p.m. May 6, 2010<sup>16</sup>**



Sources: Liquidity data provided by the exchanges; total volume from NYSE Trades and Quotes.

Figure 12 shows the share volume of aggregate liquidity provided and removed for all stocks by the top 10 firms for all of the exchanges between 2:00 p.m. and 2:59 p.m. Figure 13 shows the percentage of liquidity provided and removed against the total volume across all equity markets. Figure 12 and Figure 13 could indicate that, collectively, these particular firms appear to have remained net liquidity providers throughout this period and that they increased their liquidity provision, both in terms of share volume and percentage of total volume, when total volume increased at approximately 2:40 p.m. We note, however, that the underlying data provided by the exchanges as the source for these figures are also consistent with significant variations in the activities of different liquidity providers during this period. In addition, it should be noted that Figure 12 and Figure 13 represent only the number and percentage of shares of liquidity, and not the prices of the transactions which, of course, are important to a complete understanding of liquidity provider behavior. Anecdotal evidence, moreover, indicates that at least some large electronic liquidity providers and other liquidity providers did withdraw from the market during this time. We continue to analyze the conduct of these and other primary liquidity providing firms.

<sup>16</sup> The percent provided and taken and provided by each of the top ten liquidity providers for each exchange reported in 30-second intervals.

## 2. Securities that Suffered Declines Disproportionate to the Broader Market

As noted above, the great majority of individual securities traded at prices that were consistent with the broader market decline during the day, while approximately 14% of U.S.-listed securities reached lows for the day that were more than 10% away from the 2:40 p.m. price. Table 1 and Figure 8 above show that a similar proportion of trades in securities hit lows for the day that were more than 10% from the previous day's close.<sup>17</sup> This section discusses the individual securities that suffered declines that are out of proportion to the broader market. We first focus on broken trades, including ETFs in particular. The actual dollar volume of these broken trades was of course small, due to artificially low share prices involved, but the shares involved in those trades would have been valued at \$212.4 million, at their 2:40 p.m. benchmark price. (See Table 7 below). We then address securities that otherwise experienced unusually severe declines without reaching the threshold for broken trades.

### a) Securities with Broken Trades

The securities exchanges and FINRA have adopted “clearly erroneous execution rules” that are designed to permit them to cancel trades that in their determination were clearly entered into in error.<sup>18</sup> On May 6, under these rules, the SROs broke trades that were effected from 2:40 p.m. to 3:00 p.m. at prices 60%<sup>19</sup> away from the last trade at or before 2:40 p.m. Table 4 below provides certain information regarding the securities in which trades were broken.<sup>20</sup>

A total of 7,878 securities were traded during this period. Trades were broken in 326 individual securities, consisting of those that experienced a very severe price move of 60% or greater from the 2:40 p.m.<sup>21</sup> No trades were broken in any of the stocks that comprise the DJIA. Trades were broken in only 12 stocks that are included in the S&P 500 Index and in only 30 stocks included in the smaller capitalization Russell 2000

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<sup>17</sup> We use 10% as an estimated cutoff for stocks that declined by amounts consistent with the overall market decline because, on any given day with a significant decline in prices, some stocks will decline less and some will decline more. On May 6, for example, 11 DJIA stocks declined by less than 5% from the 2:40 p.m. price, and 26 DJIA stocks declined by less than 10% from the 2:40 p.m. price. (Table 3)

<sup>18</sup> See description of clearly erroneous rules in Appendix A.

<sup>19</sup> Following the wide-scale disruption of May 6, 2010, the exchanges and FINRA settled on the relatively high 60% standard for breaking trades. We understand a substantially lower standard – 10%-20% – typically is selected for the more common discrete erroneous trade events involving one or a few securities. The SEC is working with the exchanges and FINRA to establish more transparent and objective standards for breaking erroneous trades.

<sup>20</sup> The term “broken trades” for these purposes means all trades identified as broken trades by the exchanges and FINRA for May 6, 2010.

<sup>21</sup> From April 1, 2010 to May 5, 2010, the average number of broken trades (excluding FINRA trades) was 118.25.

Index. Trades were broken in 227 of the 838 ETFs, however. These ETFs represent 69.6% of all securities with broken trades.

**Table 4: Distribution of Securities and Securities with Broken Trades**

	Market		Broken	
	Total	%	Total	%
<b>Securities</b>	7,878	100.0%	326	100.0%
<b>Primary Listing on NYSE</b>	3,277	41.6%	56	17.2%
<b>Primary Listing on NASDAQ</b>	2,946	37.4%	42	12.9%
<b>Primary Listing on ARCA</b>	1,088	13.8%	225	69.0%
<b>Primary Listing on Amex</b>	567	7.2%	3	0.9%
<b>Component of DJIA</b>	30	0.4%	0	0.0%
<b>Component of S&amp;P 500</b>	500	6.3%	12	3.7%
<b>Component of Russell 2000</b>	2,000	25.4%	30	9.2%
<b>Exchange-Traded Fund</b>	838	10.6%	227	69.6

The distribution of all stocks and stocks that had broken trades on May 6, 2010 by primary listing exchange, inclusion in key stock indices and the number of Exchange Traded Funds

*Sources: NYSE, NYSEAmex, NYSE Arca, NASDAQ, BATS, CBOE Stock Exchange, ISE, NASDAQ-BX, National Stock Exchange, Chicago Stock Exchange and FINRA.*

The 99 securities<sup>22</sup> with broken trades that are not ETFs include securities of a wide variety of issuers, both large and small (including 10 exchange-traded products, or ETPs, that are not ETFs) and there may be a variety of explanations for their aberrant behavior. We continue to investigate the trading in these securities on May 6 to determine whether there is a common cause or causes for the trading anomalies, such as a particular susceptibility to liquidity withdrawal or an unusually large number of stop loss market orders.

Tables 5 and 6 below provide certain information regarding the distribution of trades that were broken, both by trading venue and by time period. These tables show that 20,761 trades were broken on May 6, with 12,306 (59.3%) broken by NASDAQ, 4,903 (23.6%) broken by NYSE Arca, 1,816 (8.7%) broken in the OTC market, and 1,094 (5.3%) broken by BATS. No trades were broken by NYSE.

Table 5 and Table 6 show the distribution of securities in which broken trades occurred by markets.<sup>23</sup>

<sup>22</sup> The total of 326 securities with broken trades is comprised of 227 ETFs, 10 ETPs that are not ETFs and 89 stocks.

<sup>23</sup> The number of broken ADF/TRF trades counts only trades that were not rejected by ACT and that were reported to the tape.



**Table 5: Number of Trades Executing on Each Market**

	<b>2:20- 2:40p.m.</b>	<b>2:40- 3:00p.m.</b>	<b>Number of Broken Trades</b>
<b>Total Trades</b>	5,721,383	7,318,675	20,761
<b>Average Trade Size</b>	286.68	282.03	270.33
On NYSE	667,368	1,039,233	0
On Amex	4,154	6,965	4
On ARCA	886,899	1,110,765	4,903
On NASDAQ	1,482,761	2,052,647	12,306
On BATS	988,252	1,177,318	1,094
On CBOE	2,902	4,743	138
On ISE	87,313	171,978	403
On NASDAQ-BX	271,119	401,549	63
On National	35,386	58,085	27
On Chicago	5,845	10,748	7
On ADF/TRF	1,287,489	1,101,252	1,816

*Sources: NYSE, NYSEAmex, NYSEARCA, NASDAQ, BATS, CBOE Stock Exchange, ISE, NASDAQ-BX, National Stock Exchange, Chicago Stock Exchange and FINRA*

**Table 6: Percentage of Trades Executing on Each Market**

	<b>2:20- 2:40p.m.</b>	<b>2:40- 3:00p.m.</b>	<b>Percentage of Broken Trades</b>
<b>Total Trades</b>	5,721,383	7,318,675	20,761
<b>Average Trade Size</b>	286.68	282.03	270.33
On NYSE	11.70%	14.60%	0.00%
On Amex	0.10%	0.10%	0.00%
On ARCA	15.50%	15.60%	23.60%
On NASDAQ	25.90%	28.80%	59.30%
On BATS	17.30%	16.50%	5.30%
On CBOE	0.10%	0.10%	0.70%
On ISE	1.50%	2.40%	1.90%
On NASDAQ-BX	4.70%	5.60%	0.30%
On National	0.60%	0.80%	0.10%
On Chicago	0.10%	0.20%	0.00%
On ADF/TRF	22.50%	15.40%	8.70%

*Sources: NYSE, NSYEAmer, NYSEARCA, NASDAQ, BATS, CBOE Stock Exchange, ISE, NASDAQ-BX, National Stock Exchange, Chicago Stock Exchange and FINRA*

We continue to analyze the distribution of broken trades across markets to determine whether differences in market structure may have had an impact. Because NYSE pauses or slows trading in volatile periods when a LRP is triggered, this likely explains why NYSE had no broken trades on May 6. Some have suggested that LRPs exacerbated price volatility on May 6 by causing a net loss of liquidity as orders were routed to other trading venues for immediate execution rather than wait on the LRP mechanism. If accurate, this potentially could cause some NYSE securities to decline further than the broad market decline. Others believe that the LRP mechanism served to attract additional liquidity that helped soak up some the excess selling interest in these securities on May 6. In any event, nearly 83% of the securities with broken trades do not trade on NYSE, as NYSE trades only NYSE-listed stocks, and thus could not have been directly affected by NYSE LRPs. A determination of the extent to which the use of LRPs by NYSE contributed to the volatility on May 6 requires further study.

Also worth noting is the relatively low number of broken trades on BATS, relative to its share of trading volume. Although more study is required, one explanation for this could be that BATS does not refresh “stub quotes.” The SEC staff is reviewing the extent to which the use of stub quotes contributed to the volatility on May 6, and is considering possible policy responses.

**Table 7: Broken Trades by Time Period - May 6, 2010**

Description	Before 2:40	2:40 - 2:45	2:45 - 2:50	2:50 - 2:55	2:55 - 3:00	After 3:00	Total
<b>Panel A: All Broken Trades</b>							
# of Broken Trades	209	91	11,446	4,703	2,011	2,301	20,761
> 14:40 price	20	1	156	1,130	95	2,158	3,560
< 14:40 price	189	90	11,290	3,573	1,914	143	17,201
> 160% of 14:40 price	13	0	156	1,130	93	1,011	2,403
< 40% of 14:40 price	186	90	11,290	3,572	1,914	143	17,195
< 5¢	148	6	5,158	1,928	175	1	7,416
Share Volume (x000)	37	57	3,165	1,136	636	582	5,612
\$ Volume (by 14:40 pm price in \$MM)	1.3	2.1	132.4	29.3	17.6	29.7	212.4
Return from 14:40 price (weighted)	245%	-97%	-93%	-41%	119%	2976%	262%
<b>Panel B: Broken Trades that are Short Sales</b>							
% of Broken Trades	16.3%	4.4%	42.0%	52.6%	12.1%	54.2%	42.4%
> 14:40 price	20.0%	0.0%	4.5%	45.1%	2.1%	57.7%	49.7%
< 14:40 price	15.9%	4.4%	42.5%	55.0%	12.6%	1.4%	40.9%
> 160% of 14:40 price	15.4%	0.0%	4.5%	45.1%	2.2%	50.0%	42.7%
< 40% of 14:40 price	16.1%	4.4%	42.4%	54.7%	12.6%	1.4%	40.8%
< 5¢	20.3%	0.0%	70.9%	90.1%	39.4%	0.0%	74.0%
Share Volume (% of Broken Trades)	9.8%	3.0%	19.0%	36.7%	12.2%	50.4%	24.9%
\$ Volume (% of Broken Trades)	6.0%	1.8%	14.5%	30.3%	9.5%	54.8%	21.7%
Return from 14:40 price (weighted)	-76%	-97%	-92%	-21%	-95%	81%	-35%

Source: All trade data from SROs. Price data from NYSE Trades and Quotes.

Table 7 shows that, during the core 2:40 p.m. to 3:00 p.m. period, broken trades peaked between 2:45 p.m. and 2:55 p.m., with 11,446 broken trades executed from 2:45 p.m. to 2:50 p.m. and 4,703 broken trades executed between 2:50 p.m. and 2:55 p.m. As expected, this corresponds with the period of peak volatility and trading volume in the securities markets.

Table 7 also shows the number of trades that occurred at extraordinarily low prices – five cents or less – which indicates an execution against a “stub” quote of a market maker. A total of 7,416 of these trades took place during the core 2:40 p.m. to 3:00 p.m. period, with the highest levels occurring, as expected, between 2:45 p.m. and 2:50 p.m. (5,158) and 2:50 p.m. and 2:55 p.m. (1,928).

Table 7 further shows the number of broken trades identified as short sales. During the period of peak market volatility, 2:45 p.m. to 2:55 p.m., the broken trades executed at five cents or less were primarily short sales. Short sales account for approximately 70.1% of executions against “stub” quotes between 2:45 p.m. and 2:50 p.m., and approximately 90.1% of executions against “stub” quotes between 2:50 p.m.

and 2:55 p.m. It is worth noting that short sale executions against stub quotes at or below the prevailing national best bid would be subject to the alternative uptick rule (Rule 201) adopted by the SEC on February 24, 2010, with a compliance date of November 10, 2010.<sup>24</sup> The SEC staff is continuing to review short selling activity on May 6, including the apparent high level of short selling against “stub” quotes during the period of peak market volatility.

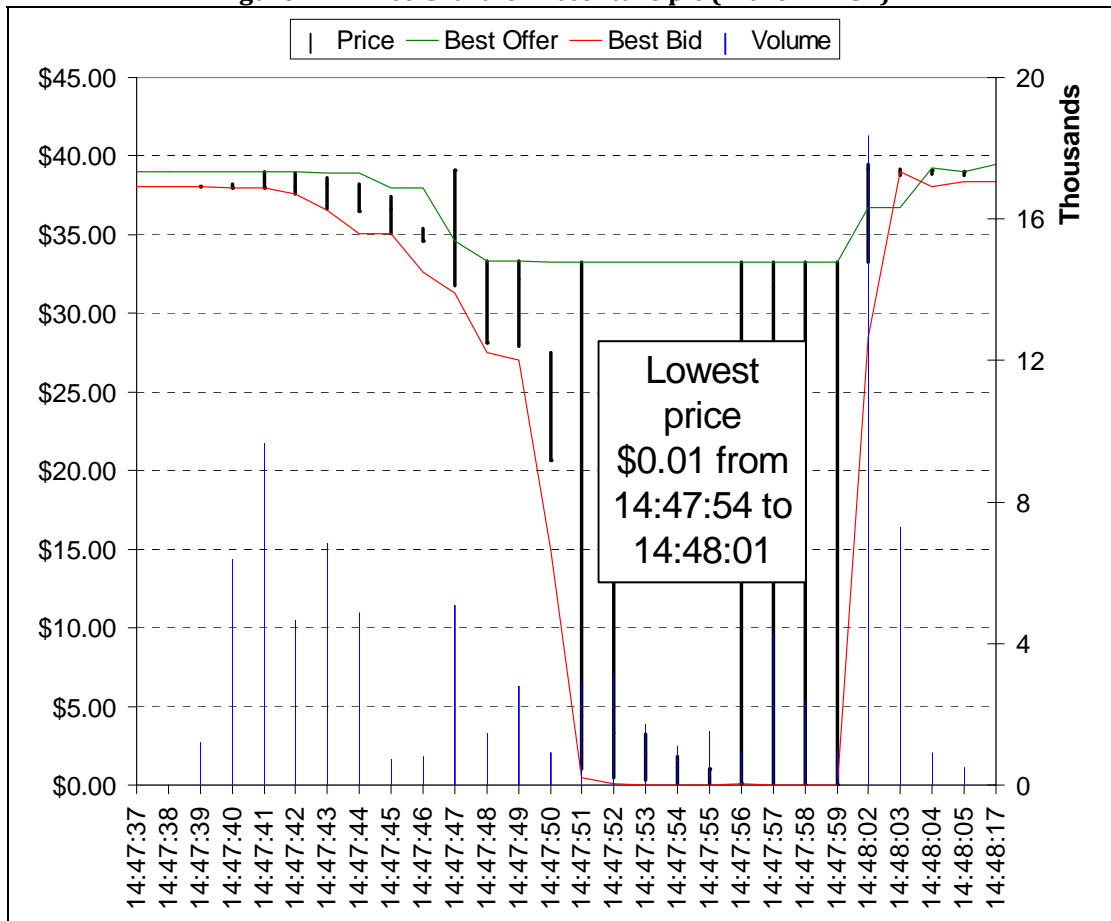
Figure 8 shows that these stub quote executions occurred in more than 200 securities, across large, medium and small capitalization stocks, but with a concentration in small capitalization securities. Although more study is required, the higher level of stub quote executions in smaller capitalization securities is consistent with their tendency to have less liquidity, and thus a greater likelihood that selling interest could overwhelm order books in times of heightened volatility. As noted above, the SEC is reviewing the extent to which the use of stub quotes contributed to the volatility on May 6, and is considering possible policy responses.

One example of a security where there were executions against stub quotes is Accenture (ACN). The data set forth below indicates that share prices of Accenture fell from nearly \$40 to a penny and recovered all of their value within a matter of seconds. We are investigating this dramatic spike to determine possible causes and explanations, including its relation to the broader market disruption.

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<sup>24</sup> Under Rule 201, trading centers will be required to have and enforce policies and procedures reasonably designed to prevent executions of short sales at or below the national best bid once the stock price has experienced a ten percent decline relative to the prior day’s closing price.

Figure 14: Price Chart for Accenture plc (Ticker = ACN)<sup>25</sup>



Source: All data from NYSE Trades and Quotes

The figure above shows that bids for Accenture plc (ACN) rapidly declined in 7 seconds from about \$30 at 2:47:47 p.m., to \$0.01 by 2:47:54 p.m.. The black bars show that trades were being made at both the stub quote of \$0.01 and the ask price of over \$30 within the same second.

**ETFs:** As previously discussed, the data suggests that ETFs as a class were affected more than any other category of securities. Trades in securities issued by ETFs appear to have accounted for nearly 70% of the securities in which trades were broken on May 6. Figure 15 shows the distribution of ETF daily lows during May 6. A relatively large number of ETFs, approximately 160, experienced lows during the day approximately 100% lower than the May 5 close, represented by the spike on the left-

<sup>25</sup>

This chart and the others below depicting single security price charts plot the second-by-second activity of trades, quotes, and volume for the security indicated. Each thick vertical bar (in black) shows the high/low range of all prices executed for all trades within a given second (scale on left axis). The red line shows the lowest National Best Bid quoted across all exchanges during that second. The green line shows the highest National Best Offer quoted across all exchanges during that second. The thick blue vertical lines indicate the total volume of shares traded each second (scale on right axis).

hand side of the figure. A significant number of ETFs also experienced less extreme, but still notable lows of between 35% and 100% relative to their corresponding May 5 close.

A larger cluster of ETFs experienced lows approximately 8% below May 5 close. This clustering of daily lows around -8% is consistent with the daily low in the broader market, which was approximately 8.5% for the S&P 500. However, relative to the distribution of losses of all securities, (depicted above in Figure 8), extreme daily lows appear to have been more common in the ETFs (as depicted in Figure 15). Figure 15 does not reveal an obvious relation between ETF market capitalization and daily lows.

Tables 8 and 9 report the total number of trades, the total volume and total dollar volume for ETF trades executed between 2:40 p.m. and 3:00 p.m., for losses and gains, respectively. The tables are based on 838 registered ETFs as derived from Morningstar. The losses/gains are computed as the difference between the trade price and the 2:40 p.m. price, divided by the 2:40 p.m. price, for each stock. The data do not include out-of-sequence trades.

**Table 8: Trades Executed at a Loss**

	<b>Total # trades</b>	<b>Total volume</b>	<b>Total volume (\$)</b>
All trades	1,265,637	456,335,890	22,381,572,444
Losses	794,607	279,836,213	14,135,649,267
0% to -10%	761,866	269,307,656	13,909,304,917
-10% to -20%	13,607	3,988,959	145,247,171
-20% to 30%	3,714	1,144,431	40,234,001
-30% to -40%	2,041	753,856	18,934,582
-40% to -50%	1,151	320,661	6,612,612
-50% to -60%	1,148	344,774	7,657,548
-60% to -70%	758	314,030	4,111,592
-70% to -80%	505	233,617	2,021,741
-80% to -90%	775	176,632	1,025,499
-90% to -100%	9,042	3,251,597	499,604

Source: NYSE's Trades and Quotes

**Table 9: Trades Executed at a Gain**

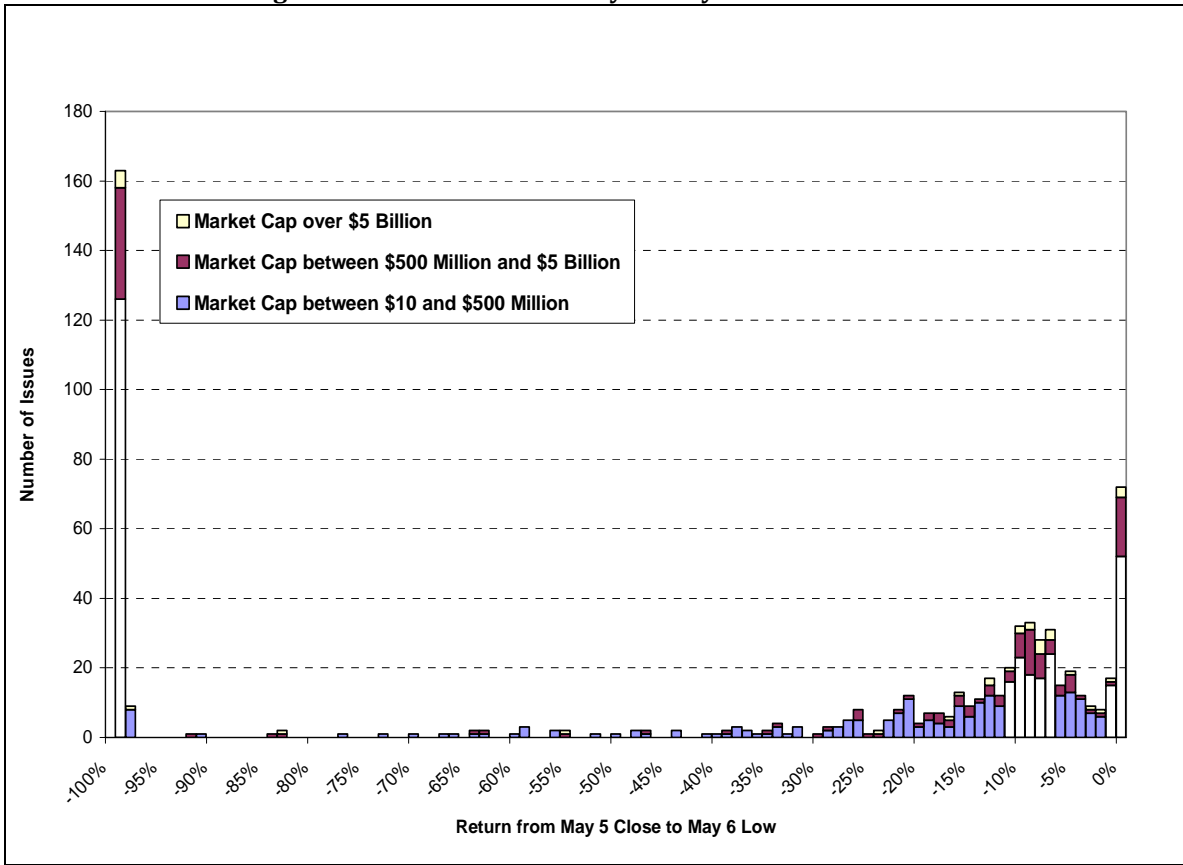
	<b>Total # trades</b>	<b>Total volume</b>	<b>Total volume (\$)</b>
All trades	1,265,637	456,335,890	22,381,572,444
Gains	471,030	176,499,677	8,245,923,177
0% to 10%	468,197	175,697,855	8,221,468,066
10% to 20%	2,392	712,398	18,350,149
20% to 30%	99	30,162	1,330,565
30% to 40%	28	6,668	240,300
40% to 50%	35	4,300	184,047
50% to 60%	12	1,600	77,897
60% to 70%	19	5,996	266,038
70% to 80%	30	5,166	511,016
80% to 90%	41	4,500	450,227
> 90%	177	31,032	3,044,872

Source: NYSE Trades and Quotes

Table 8 indicates that, out of the 280 million ETF shares that traded below the 2:40 p.m. price, approximately 269 million, or 96%, traded at prices above or within 10% of the 2:40 p.m. price. A significant number of shares, approximately 3 million, traded at 90-100% losses. Dollar volume for trades at 90-100% losses is low, at \$499,600, but purely as a mechanical consequence of low share prices. Significantly fewer shares of ETFs traded at large gains than traded at large losses. Table 9 indicates that only 712,398 shares traded at gains of 10% to 20%. In the aggregate, approximately 800,000 shares, with a dollar volume of \$24.5 million, traded at a more than 10% gain.

Figure 15 indicates the distribution of ETF daily lows during May 6. A relatively large number of ETFs, approximately 160, experienced lows during the day approximately 100% lower than the May 5 close, represented by the spike on the left-hand side of the figure, and a number of ETFs also experienced less extreme, but still notable, lows between, 35% and 100% below the May 5 close. A larger cluster of ETFs experienced lows approximately 7% below the May 5 close, a concentration that may be a byproduct of the temporary dislocation in the broad market. In some ETFs, daily lows were approximately the same as the May 5 close, represented by the modest spike on the right-hand side of the chart. Relative to the distribution of all securities, depicted above in Figure 8, extreme daily lows appear to have been more common in the ETFs.

**Figure 15: Distribution of May 6 Daily Lows for ETFs<sup>26</sup>**



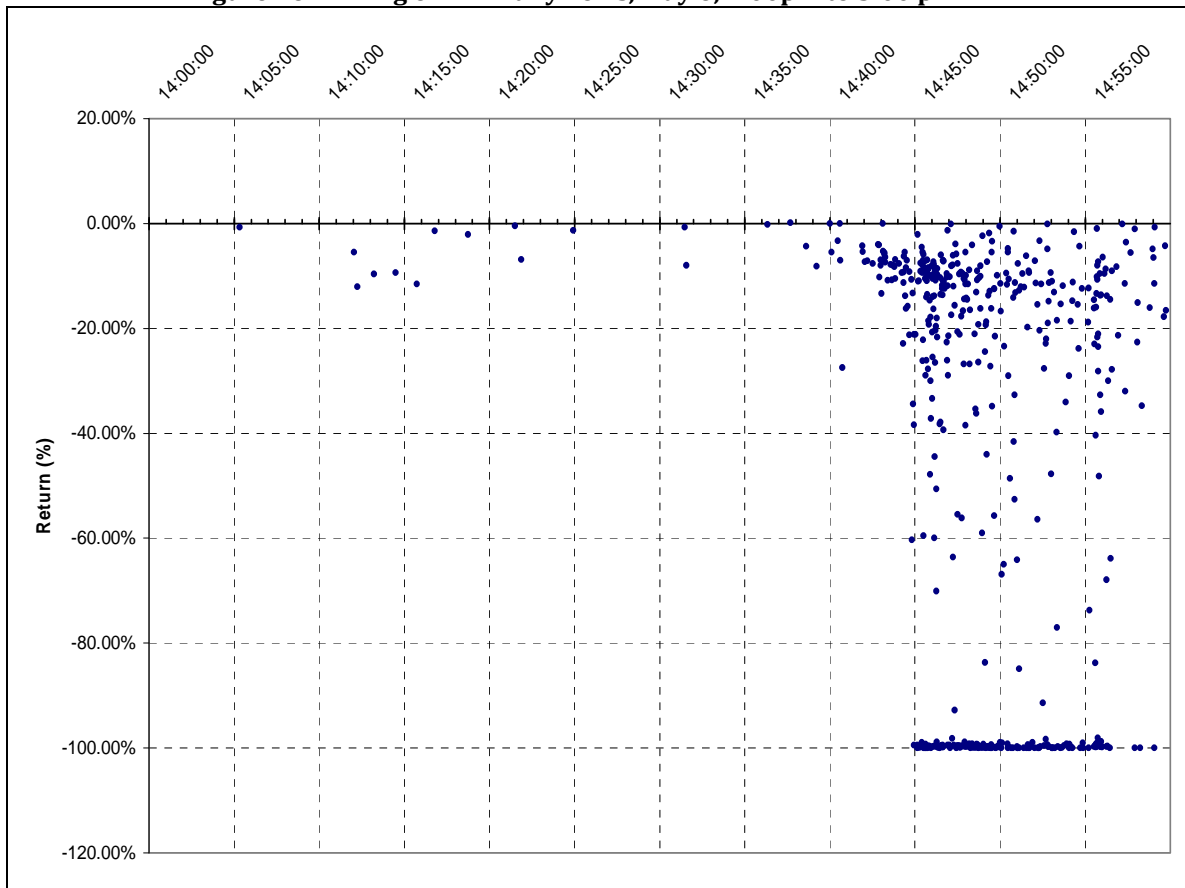
Sources: Thomson Financial Datastream and NYSE Trades and Quotes.

<sup>26</sup>

Figure 15 depicts the distribution of returns from close on May 5 to the lowest transaction price on May 6. The securities included are ETFs trading on major U.S. exchanges, with a share price of more than \$3.00 and a market capitalization of at least \$10 million as of the May 5 close.



**Figure 16: Timing of ETF Daily Lows, May 6, 2:00pm to 3:00 pm<sup>27</sup>**



*Sources: Thomson Financial Datastream and NYSE Trades and Quotes*

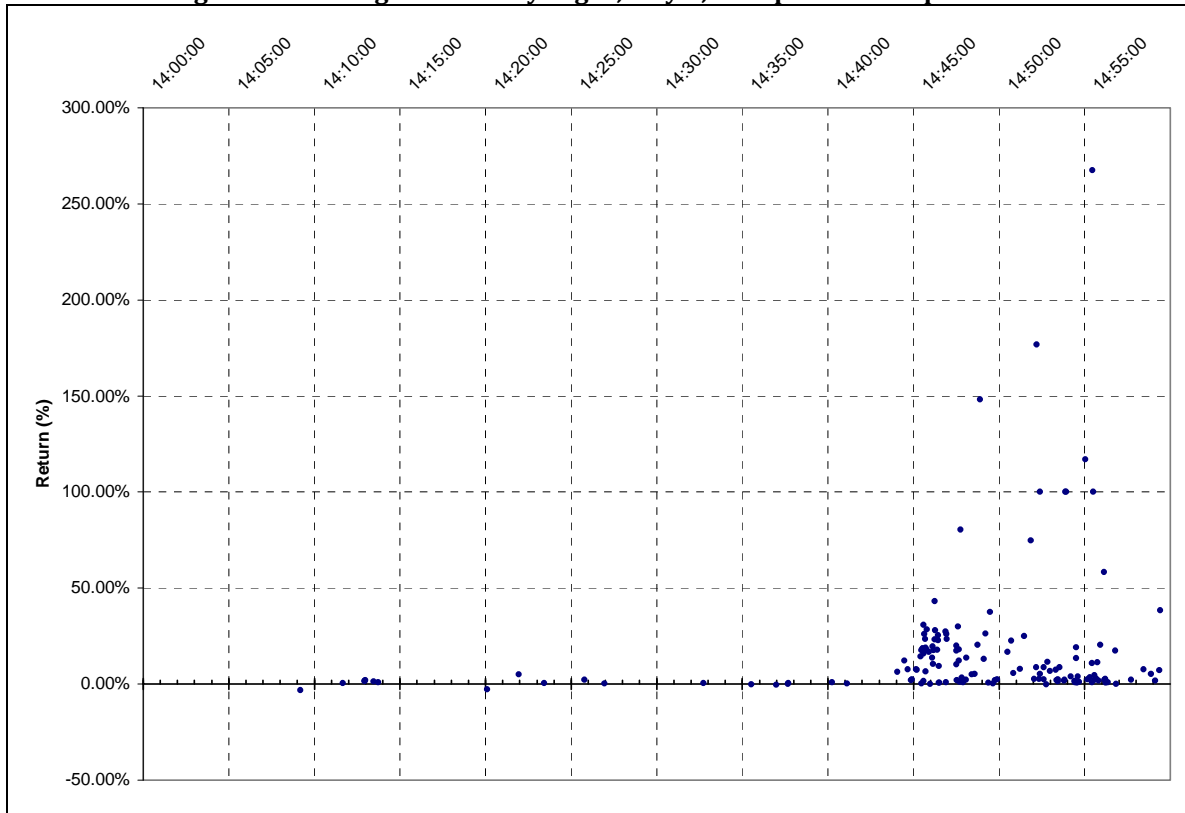
Over the one-hour interval between 2:00 p.m. and 3:00 p.m., as shown in Figure 16, many of the daily lows in ETFs occurred after 2:45 p.m. A few ETFs began experiencing relatively modest daily lows of approximately 10% below the May 5 close shortly after 2:10p.m. These lows continued sporadically until around 2:40p.m., when their frequency increased, represented on the graph by the concentration of points on the lower right. Many of these daily lows, beginning near 2:45p.m., were approximately 100% below the May 5 close, represented by the dense line near -100% on the right-hand side of the graph. Comparing this figure with Figure 10, which presents the same analysis for all securities, ETFs appear relatively less likely than other securities to have experienced extreme daily lows during the early part of the hour.

While many ETFs experienced extreme daily lows during the day, as evidenced by the daily lows presented in Figure 16, a significant number of ETFs experienced

<sup>27</sup> Figure 16 depicts the timing of ETF daily lows during the one-hour period from 2:00 p.m. to 3:00 p.m. on May 6. Each point represents the return from the May 5 close to the lowest transaction price on May 6, plotted against the time at which the transaction occurred. Daily lows not occurring during this one-hour interval are not depicted. The figure includes ETFs trading on major U.S. exchanges with a share price of more than \$3.00 and a market capitalization of at least \$10 million as of the May 5 close.

extreme daily highs. Figure 17 presents these daily highs, plotted against the time at which they occurred. One ETF experienced a daily high approximately 275% higher than the May 5 close. Consistent with the pattern for extreme daily lows, the extreme daily highs appear to begin near 2:45 p.m. and are notably absent from the early part of the hour.

**Figure 17: Timing of ETF Daily Highs, May 6, 2:00 p.m. to 3:00 p.m.**<sup>28</sup>

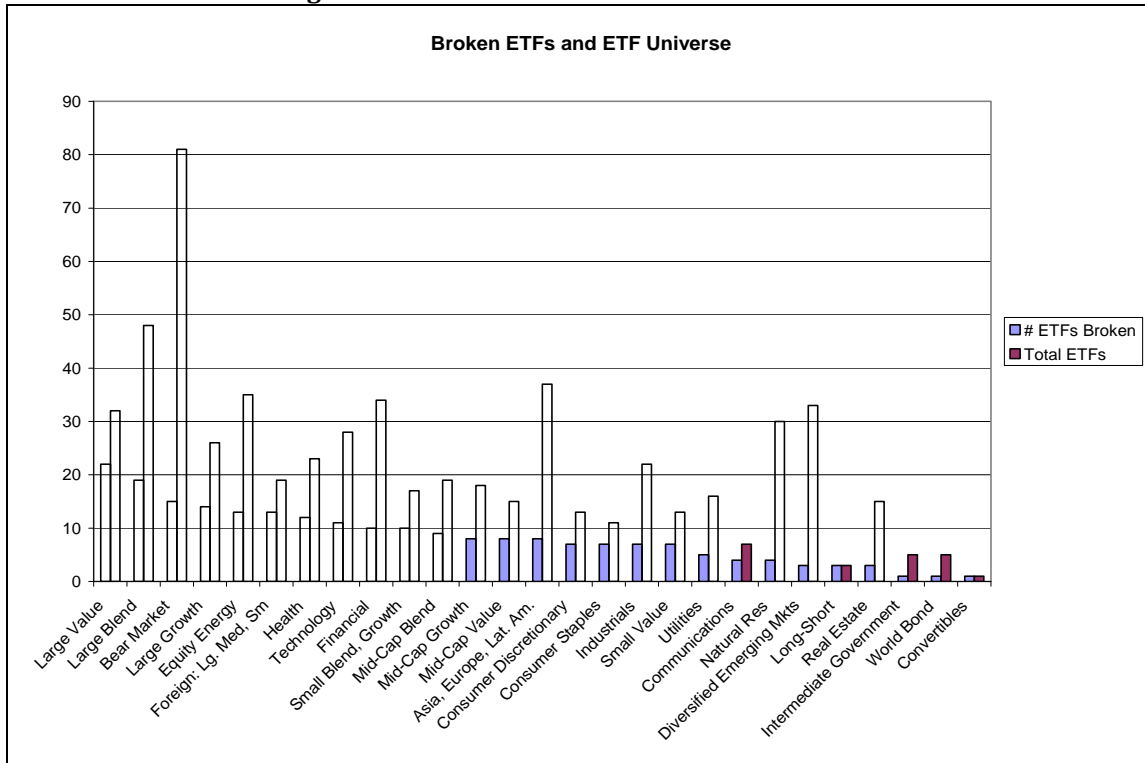


*Sources: Thomson Financial Datastream and NYSE Trades and Quotes*

Figure 18 depicts the number of broken-trade ETFs and the total number of ETFs, broken out by asset category. This behavior is very similar to that previously depicted for individual companies.

<sup>28</sup> Figure 17 depicts the timing of ETF daily highs during the one-hour period from 2:00 p.m. to 3:00 p.m. on May 6. Each point represents the return from the May 5 close to the highest transaction price on May 6, plotted against the time at which the transaction occurred. Daily highs not occurring during this one-hour interval are not depicted. The Figure includes ETFs trading on major U.S. exchanges with a share price of more than \$3.00 and a market capitalization of at least \$10 million.

**Figure 18: Broken-Trade ETFs and ETF Universe**



Source: NYSE, NYSEAmex, NYSE Arca, NASDAQ, BATS, CBOE Stock Exchange, ISE, NASDAQ-BX, NSX, Chicago Stock Exchange and FINRA

Tables 10, 11 and Figure 18 present summary statistics on broken trades by fund company, by net assets, and by asset class. Figure 18 illustrates the relation between fund investment objective and the existence of broken trades. It depicts the distribution of total ETFs and ETFs with broken trades by asset category. The broken trades are skewed toward large- and mid-cap equity ETFs, with fewer broken trades occurring in bond, real-estate and ETFs with objectives that do not track the overall market.

Table 10 classifies broken-trade exchange-traded funds by fund family. All but ten of the exchange-traded products with subsequently broken trades were also ETFs, and five of those ten appear to be stock-related ETPs. Table 10 indicates that, on average, 27.1% of all fund companies experienced broken trades. There is, however, considerable cross-sectional variation among fund families. For example, First Trust experienced broken trades in approximately 50% of its ETFs, while PIMCO had no ETFs with broken trades.<sup>29</sup>

One explanation for this variation may be the degree to which families specialize in asset classes that had fewer breaks, such as debt-oriented fund families like PIMCO. It is clear that the breaks occurred in many trades of ETFs in fund families (16 of 26 fund

<sup>29</sup> Additionally, one fund family appears to account for all five of the commodity-index-related non-ETF ETPs that experienced broken trades

families) and that, conditional on a break occurring within a particular fund family, not all of the ETFs were affected.

Table 11 examines the relation between ETF size and broken trades by net asset quartile. The data suggests that the proportion of broken trades in the smallest net asset quartile of ETFs is lower than the others (16.3% versus 30.7%).<sup>30</sup> Table 11 also indicates that while there are differences across quartiles, the relative volume of broken trades to non-broken trades within each quartile did not change very much between May 5 and May 6. For example, the May 5 ratio of daily volume of funds that had broken trades on May 6 to those without broken trades was 63.8% ( $46,115/(46,115+26,138)$ ). The analogous ratio computed using May 6 volume levels is very similar at 61.7% ( $28,034/(28,034+17,385)$ ).

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<sup>30</sup> The rate of broken trades for Average Current Net Asset Quartile 1 of 16.3% is computed as  $34/(34+175)$ . An analogous calculation is used to compute the average across the other three quartiles.

**Table 10: Fund Companies<sup>31</sup>**

<b>ETF Firm Name</b>	<b>Broken</b>	<b>Not Broken</b>	<b>Total</b>
ALPS ETF	0	6	6
AdvisorShares	0	1	1
Claymore Securities	9	25	34
Direxion Funds	3	31	34
Emerging Global	0	6	6
FaithShares	1	4	5
Fidelity Investments	1	0	1
First Trust	21	22	43
Global X Funds	0	10	10
Grail Advisors	0	7	7
IndexIQ	2	6	8
JETS	0	2	2
OOK Advisors	0	2	2
Old Mutual	0	4	4
PIMCO	0	10	10
PowerShares	43	73	116
ProShares	22	77	99
Rydex/SGI	17	14	31
Schwab Funds	5	3	8
State Street Global	14	76	90
VTL Associates, LLC	2	4	6
Van Eck	2	23	25
Vanguard	15	31	46
WisdomTree	9	33	42
XShares	0	5	5
iShares	61	136	197
<b>Total</b>	<b>227</b>	<b>611</b>	<b>838</b>
<b>Percent of Total</b>	<b>27.1</b>	<b>72.9</b>	<b>100.0</b>

Source: NYSE, NYSEAmex, NASDAQ, BATS, CBOE Stock Exchange, ISE, NASDAQ-BX, NSX, Chicago Stock Exchange and FINRA

<sup>31</sup> Table 10 presents the number of ETPs with broken trades on May 6, 2010 by fund family (sponsor).

**Table 11: ETFs with Broken Trades<sup>32</sup>**

	<b>Quartile Average Current Net Assets<sup>33</sup></b>	<b>Number of ETFs</b>	<b>Average Daily Volume May 6</b>	<b>Average Daily Volume May 5</b>	<b>Average Current Net Asset</b>
Broken	1	34	46,115	28,034	\$8,321,632
Not Broken	1	175	26,138	17,385	\$7,690,493
Broken	2	60	150,390	76,880	\$42,167,498
Not Broken	2	150	99,232	60,952	\$37,411,891
Broken	3	76	265,000	192,501	\$188,958,576
Not Broken	3	133	1,316,488	856,819	\$177,878,106
Broken	4	57	5,962,890	3,355,924	\$2,586,658,099
Not Broken	4	153	20,746,803	11,972,562	\$3,463,601,150

*Sources: Morningstar is the source of current net asset data and Datastream is the source of the average daily volume data*

The next three charts show the experience of broken trades in three different ETFs.

<sup>32</sup> This presents the number of ETFs by quartile of average current net assets, with broken trades on May 6, 2010 out of all ETFs, the average daily volume for ETFs for May 5, 2010 and May 6, 2010, and the average net assets of registered ETFs.

<sup>33</sup> ETFs in quartile 1 have current net assets less than \$16,312,382. Quartile 2 has ETFs with current net assets between \$16,312,382 and \$75,170,606. Quartile 3 has ETFs with current net assets between \$75,170,606 and \$351,622,059. Quartile 4 consists of ETFs with current net assets greater than \$351,622,059.

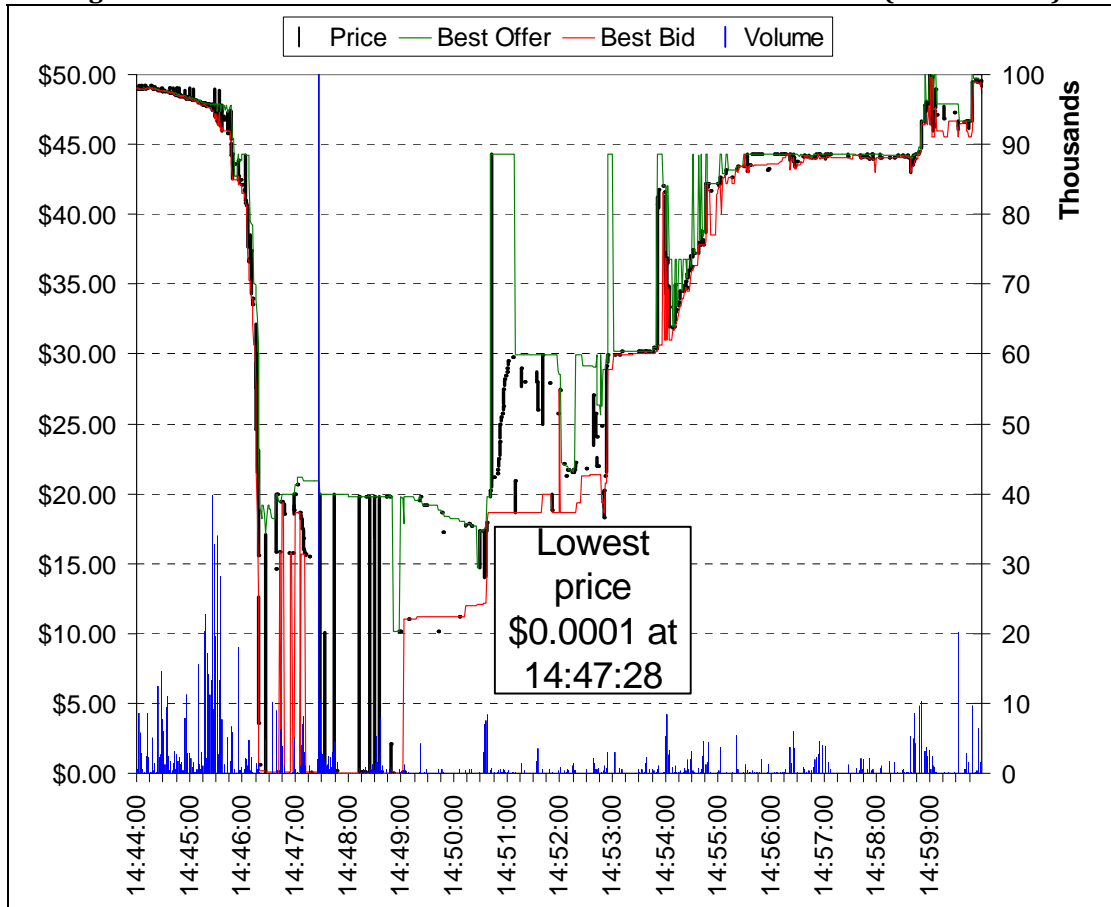
**Figure 19: Price Chart for iShares MSCI EAFE Growth Index Fund (Ticker = EFG)**



Source: NYSE Trades and Quotes

Figure 19 shows that iShares MSCI EAFE Growth Index Fund (EFG) was thinly traded but within a relatively narrow bid-ask spread. However, a number of trades are executed below the lowest national best bid, and at 2:58:14 p.m. transactions are executed at prices of less than \$0.01.

Figure 20: Price Chart for iShares Russell 1000 Growth Index Fund (Ticker = IWF)

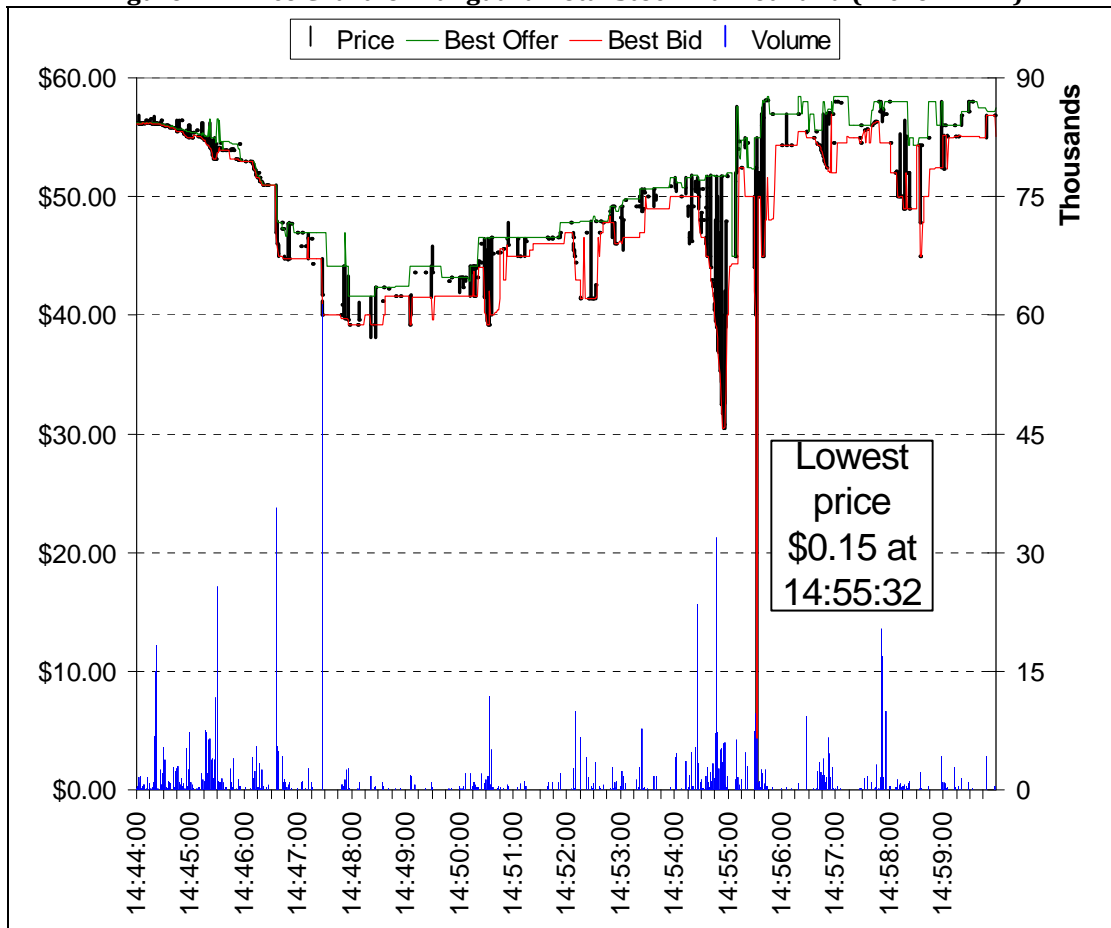


Source: NYSE Trades and Quotes

In Figure 20, bids for iShares Russell 1000 Growth Index Fund (IWF) rapidly declined just before 2:46 p.m. A number of trades were executed at stub-quotes of less than \$0.01 and at the highest offer-quote of \$20.00 within a 3-minute period, which was followed by a two-minute period with almost no trade activity. IWF then slowly recovered with widely varying bid and offer quotes. By 2:56 p.m. the bid-ask spread narrows and the price increased to approximately 90% of its decline.



Figure 21: Price Chart for Vanguard Total Stock Market Fund (Ticker = VTI)



Source: NYSE Trades and Quotes

Figure 21 indicates that Vanguard Total Stock Market Fund (VTI) maintained relatively narrow bid-ask spreads while following the broad market through decline and recovery beginning 2:44 p.m. Just prior to 2:55 p.m., bids suddenly collapsed on increased volume well after the recovery is underway. And at 2:55:32 p.m. bids drop to stub quotes and trades are executed at \$0.15 before the price resumes its recovery.

For reference, the tables below rank the top 10 ETFs with broken trade and stocks (by volume, both for the full day and between 2:00 p.m. and 3:00 p.m. on May 6).

**Table 12: Top 10 ETFs with Broken Trades by Trading Volume – Full Day, May 6**

ETF	Ticker	Volume
iShares Russell 2000 Index	IWM	195,387,906
ProShares UltraShort QQQ	QID	53,291,398
iShares Russell 1000 Growth Index	IWF	9,002,900
ProShares Ultra Real Estate	URE	6,983,600
iShares Russell 2000 Value Index	IWN	6,823,200
iShares Russell 1000 Value Index	IWD	6,258,200
Vanguard Total Stock Market ETF	VTI	6,160,500
iShares S&P MidCap 400 Index	IJH	5,416,800
iShares Russell 1000 Index	IWB	5,194,400
Rydex S&P Equal Weight	RSP	4,511,600

*Sources: NYSE, NSYEAmax, NYSEARCA, NASDAQ, BATS, CBOE Stock Exchange, ISE, NASDAQ-BX, National Stock Exchange, Chicago Stock Exchange and FINRA.*

**Table 13: Top 10 ETFs with Broken Trades by Trading Volume – May 6 from 2 p.m. to 3 p.m.**

ETF	Ticker	Volume
iShares Russell 2000 Index	IWM	58,392,711
ProShares UltraShort QQQ	QID	21,771,521
iShares Russell 1000 Growth Index	IWF	3,161,501
iShares Russell 2000 Value Index	IWN	2,671,281
Vanguard Total Stock Market ETF	VTI	2,472,422
Rydex S&P Equal Weight	RSP	2,305,135
ProShares Ultra Real Estate	URE	2,193,949
iShares Russell 1000 Value Index	IWD	1,707,294
iShares Russell 1000 Index	IWB	1,677,658
iShares S&P MidCap 400 Index	IJH	1,407,322

*Sources: NYSE, NSYEAmax, NYSEARCA, NASDAQ, BATS, CBOE Stock Exchange, ISE, NASDAQ-BX, National Stock Exchange, Chicago Stock Exchange and FINRA.*

**Table 14: Top 10 Broken Stocks by Trading Volume – Full Day May 6**

Stock	Ticker	Volume
Radian Group	RDN	70,612,297
Apple Inc.	AAPL	45,923,602
Philip Morris International	PM	16,460,300
Exelon Corp	EXC	12,426,400
Amylin Pharmaceuticals	AMLN	11,626,099
Costco Warehouse	COST	11,175,900
International Group of Companies	IPG	11,073,400
Accenture, PLC	ACN	10,311,600
Amazon	AMZN	10,195,600
CenterPoint Energy	CNP	9,322,800

*Sources: NYSE, NSYEAmax, NYSEARCA, NASDAQ, BATS, CBOE Stock Exchange, ISE, NASDAQ-BX, National Stock Exchange, Chicago Stock Exchange and FINRA.*

**Table 15: Top 10 Broken Stocks by Trading Volume – May 6 from 2 p.m. to 3 p.m.**

Stock	Ticker	Volume
Apple Inc.	AAPL	7,506,380
Radian Group	RDN	5,298,708
Philip Morris International	PM	4,140,829
International Group of Companies	IPG	3,235,083
Provident Energy Trust	PVX	2,622,676
Exelon Corp	EXC	2,509,121
CenturyTel, Inc	CTL	2,248,034
Accenture, PLC	ACN	2,059,138
Center Point Energy	CNP	2,018,251
Southwestern Energy Company	SWN	1,618,107

*Sources: NYSE, NSYEAmax, NYSEARCA, NASDAQ, BATS, CBOE Stock Exchange, ISE, NASDAQ-BX, National Stock Exchange, Chicago Stock Exchange and FINRA.*

SEC staff also evaluated whether creation and redemption behavior by authorized participants was significantly different on May 5, 6 and 7 between ETFs with broken trades and ETFs without broken trades. The staff was provided creation and redemption data by four ETF advisors. The data contained daily creation and redemption units or shares for all ETFs advised by those firms from approximately April 1 to May 11. Two ETF advisors provided their information in number of shares, while two provided theirs in number of units. Since shares and units are not directly comparable, the two data sets were combined separately in order to run the analysis. Statistical tests were run to determine whether the amount of net creations (creations minus redemptions) differed between ETFs that experienced broken trades and those that did not. The tests were run on creation and redemption data separately for May 5, May 6, and May 7.

The results of the tests do not provide evidence that there was a significant difference in the creation and redemption behavior of authorized participants between ETFs with broken trades and ETFs without broken trades. There are some statistically significant results indicating that ETFs with broken trades had higher creations on May 7 than ETFs without broken trades, although the level of significance is weak. As a robustness check, the same tests were run on all days not including May 5, May 6 and May 7. The results showed that there is no statistical difference in creation and redemption behavior of authorized participants between ETFs with broken trades and ETFs without broken trades during the trading window not including May 5, May 6 or May 7. It is noted that the tests were completed with very small sample size, limiting their power.

The SEC staff continues to investigate precisely why ETFs as a class were affected so dramatically. ETFs are primarily highly transparent pools of securities that seek to track market indices. Thus, unlike other listed securities, the value of an ETF is dependent on the value of the individual securities it owns as well as the transactions in ETF shares by market participants. ETFs are often used by investors and other market participants as an efficient means of gaining (or reducing) exposure to market segments in connection with their implementation of investment or hedging strategies.

As discussed in Appendix A, ETF shares have typically traded at market prices that are closely related to the net asset value of their shares. This pricing discipline principally hinges on the ability of market makers: (a) to effectively hedge their market exposure to ETF shares; and (b) to engage in arbitrage transactions with the ETFs if the market prices of the ETF shares deviate significantly from their net asset values.

As noted above, certain non-ETF securities experienced extreme daily lows earlier than certain ETFs during the one hour interval from 2:00 p.m. to 3:00 p.m. We are currently gathering and reviewing data to ascertain the causes of these collapses and the possible implications for the broader market.

We are also studying the extent to which the use of ETFs may have contributed to the abrupt price declines. For example, institutional investors often utilize index-based ETFs in hedging strategies, which may have prompted unusual liquidity demands during this period of market turmoil. The use of stop loss orders by other investors may have created additional sell pressure on ETF shares in a rapidly declining market.

In addition, we are exploring the impact of “self-help” being invoked by NASDAQ and BATS against NYSE Arca. As NYSE Arca is the primary listing exchange for almost all ETFs, the loss of access to NYSE Arca’s liquidity pool may have had a disproportionate impact on market liquidity and trading for ETFs.

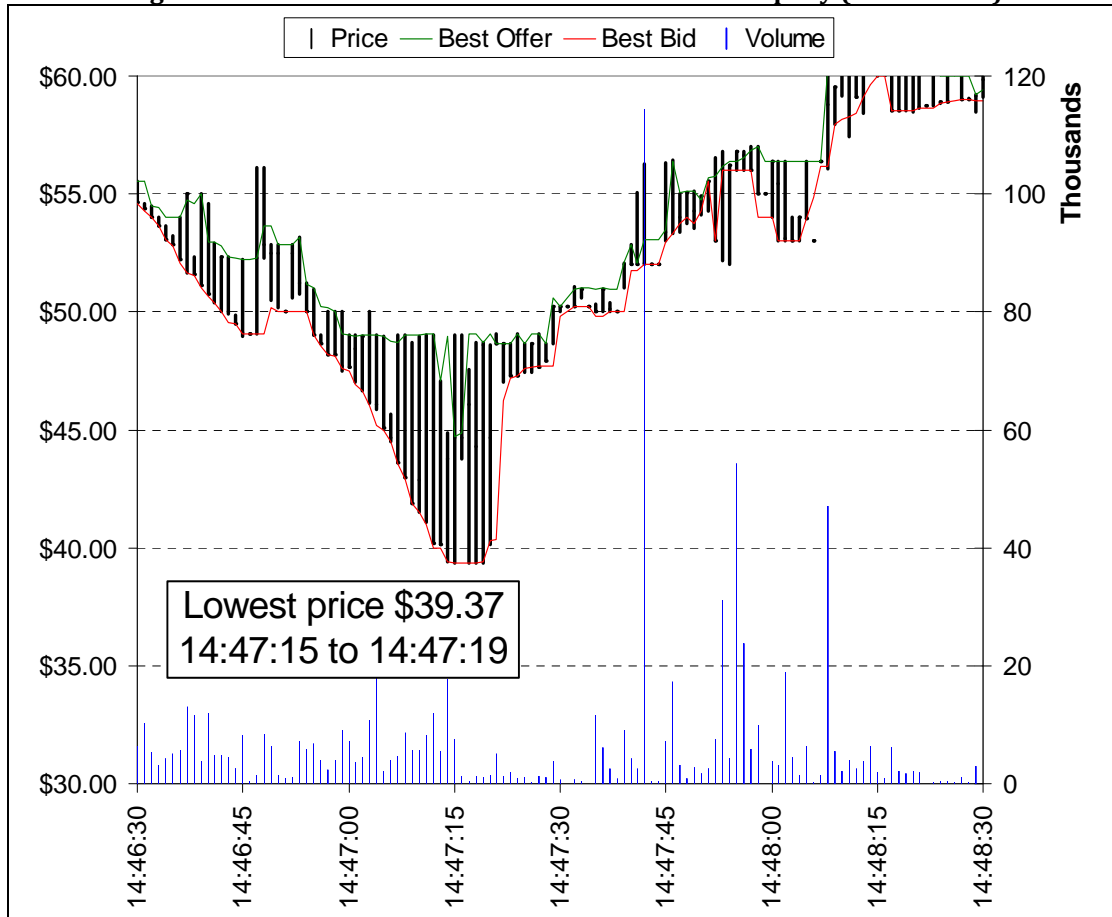
#### **b) Market Activity in Other Selected Securities**

Significant numbers of securities experienced declines in excess of the broad market (meaning, for these purposes, declines of more than 10% from their prices at 2:40

p.m.), but did not cross the 60% broken trade threshold. In addition, a significant number of securities experienced extreme daily highs after approximately 2:44 p.m.<sup>34</sup> In this section, we provide examples of specific selected securities to illustrate how representative securities behaved during the critical minutes of May 6.

For example, some large capitalization securities declined quite substantially. One was Proctor & Gamble (PG), whose price chart for May 6 is set forth in Figure 22.

**Figure 22: Price Chart for The Proctor & Gamble Company (Ticker = PG)**



Sources: NYSE Trades and Quotes

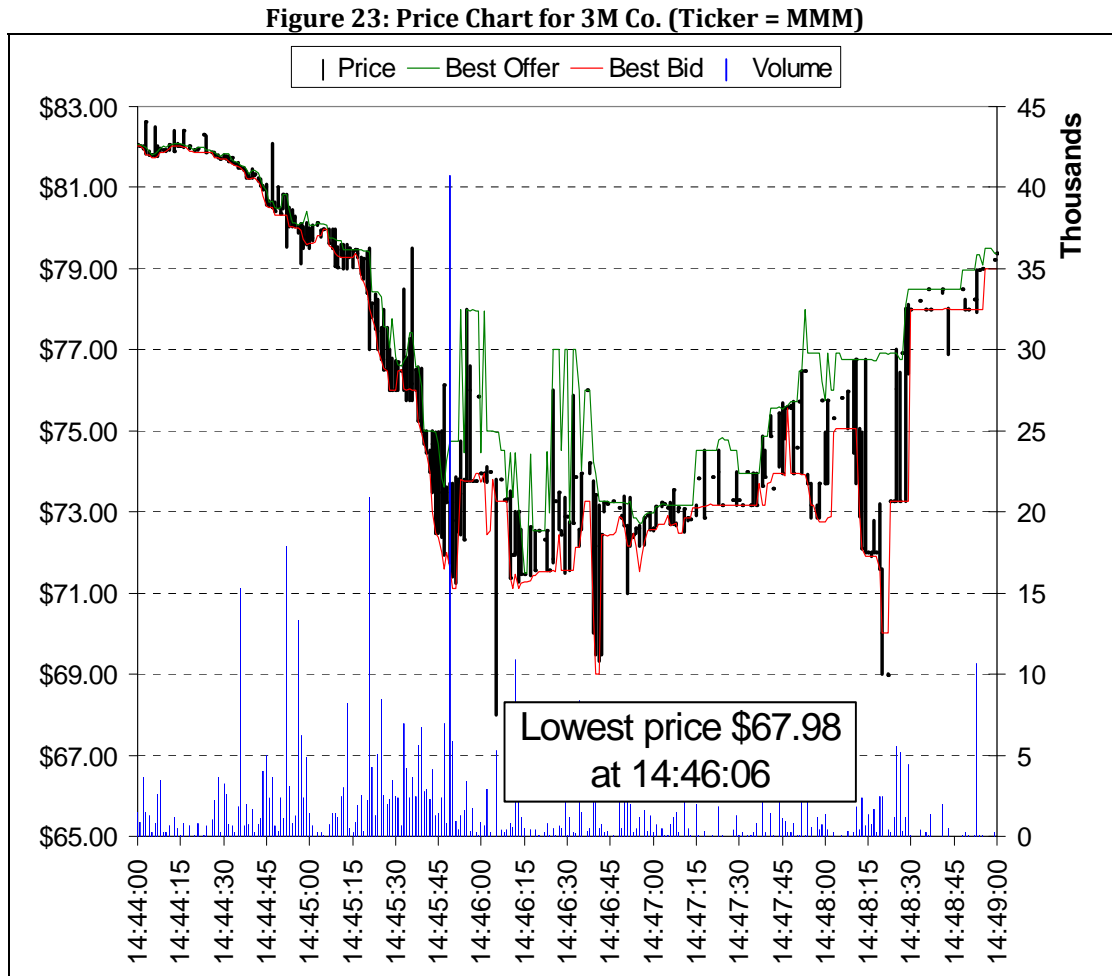
It can be seen that bids for PG decline rapidly over a one-minute period before rapidly ascending and then recovering. Trades occur in a wide range from the lowest national best bid in a given second to the highest national best offer in that same second.

PG declined from more than \$60 to a low of \$39.37 in approximately 3.5 minutes (a 36.14% decline from the 2:40 p.m. price), then recovered above \$60 in approximately one minute. Notably, the decline in PG did not begin until 2:44 p.m., well after the

<sup>34</sup> In contrast to the stocks that suffered on the downside, the stock of Sotheby's (BID) is notable for displaying aberrant behavior on the upside on May 6 (see Figure 25 and Figure 26).

broader market indices, which began their precipitous drop at approximately 2:40 p.m. Accordingly, early reports that an inordinately large trade in PG may have triggered the broad market decline do not appear well founded. Our analysis of the order book data should help shed light on why PG declined and recovered so much more significantly than other large capitalization stocks.

Another large capitalization stock that declined substantially was 3M Co. (MMM), whose price chart is shown in Figure 23.



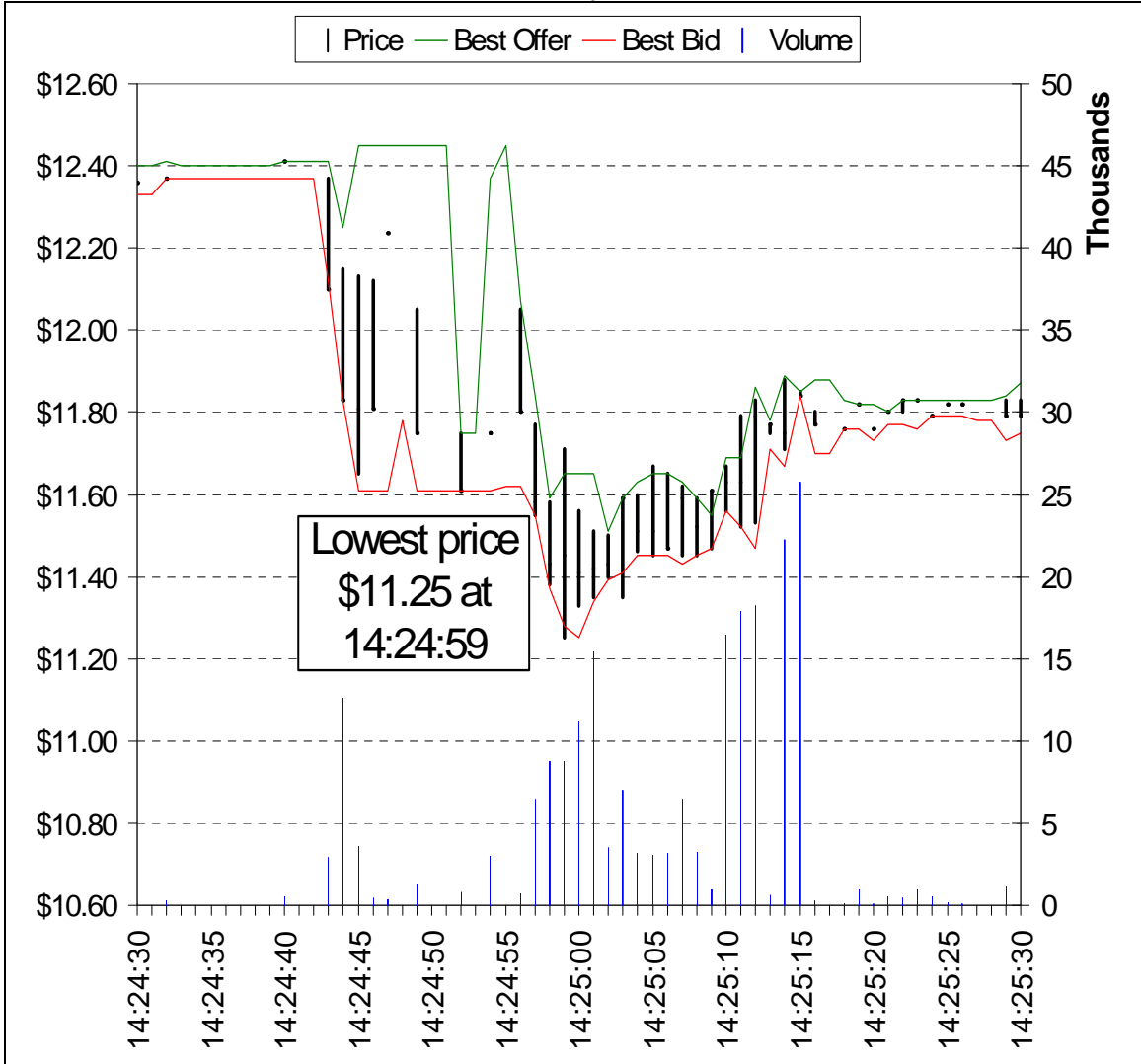
*Sources: NYSE Trades and Quotes*

The bid-ask spread for MMM stays quite narrow, and volume remains significant, even as the price declines from about \$82 at 2:44 p.m. to a low of approximately \$68 at 2:46 p.m. Prior to reaching this low, the bid-ask spread over any given second dramatically widens and remains erratic before beginning a slow and choppy recovery.

MMM first declines from approximately \$82.50 at 2:44 p.m. to approximately \$71.00, then slowly begins to recover. Though this 14% decline was substantial, at approximately 2:48 p.m., the price declines sharply for a second time and hits a daily low

of \$67.98, resulting in a total decline from its 2:40 p.m. price of 18.39%, second only to PG among DJIA stocks. The price then suddenly climbs within a few seconds to approximately \$77. As with PG, our analysis of the order book data should shed greater light on why MMM could appear to have recovered from the initial decline, then suffered such a sharp additional decline and rise.

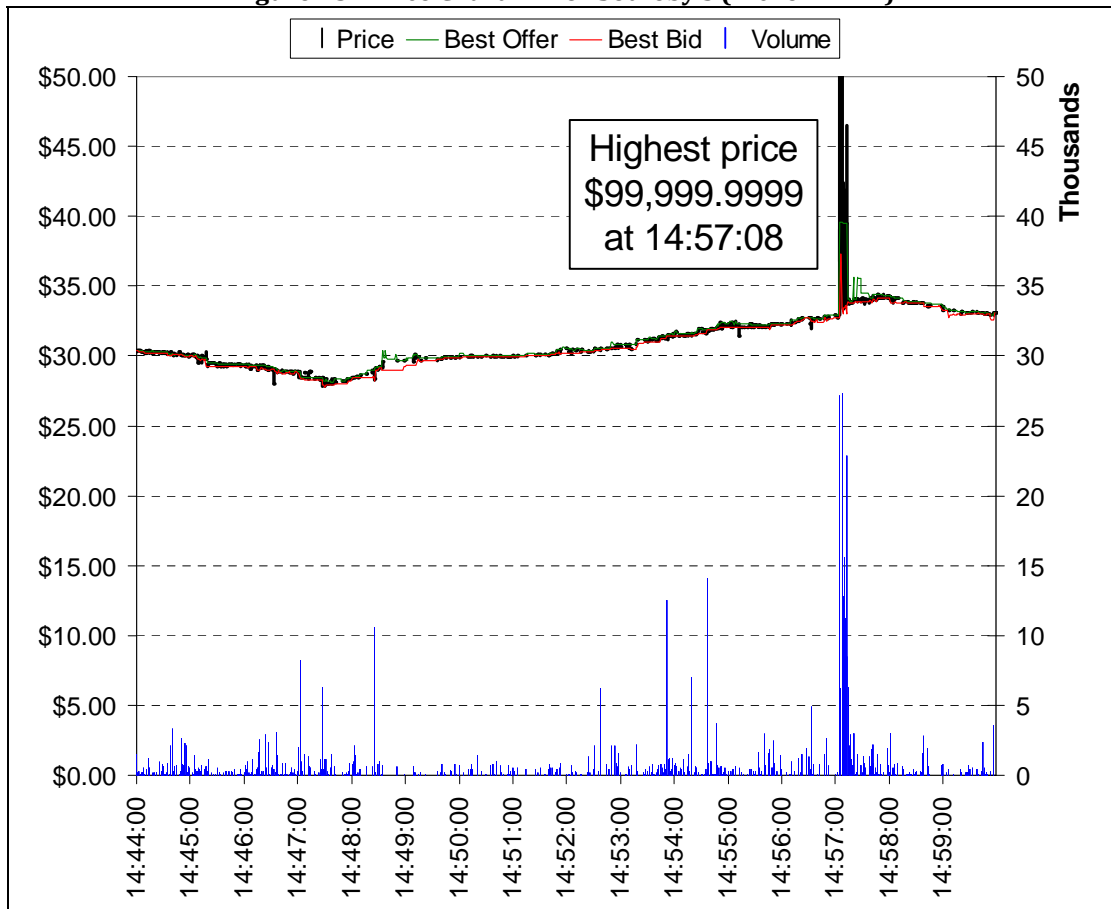
**Figure 24: Price Chart for Eaton Vance Tax-Managed Buy-Write Opportunities Fund (Ticker = ETV)**



Sources: NYSE Trades and Quotes

Figure 24 indicates that there is no activity in Eaton Vance Tax-Managed Buy-Write Opportunities Fund (ETV) from 2:24:30 p.m. through 2:24:43 p.m. at which time the bid drops by 6% rather quickly. Activity picks up again at about 2:24:57 p.m. as ETV partially recovers. This event occurred approximately 20 minutes prior to the main drop in broad markets.

Figure 25: Price Chart # 1 for Sotheby's (Ticker = BID)

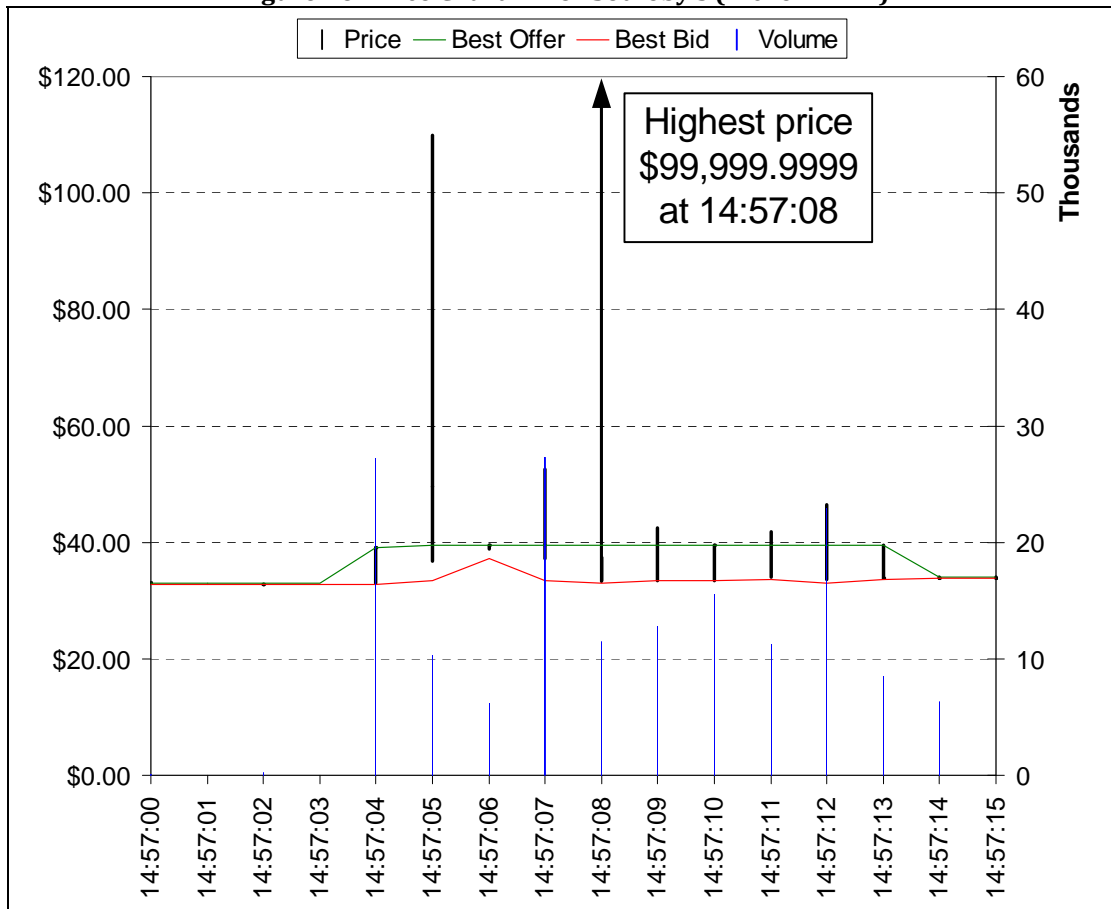


Sources: NYSE Trades and Quotes

In Figure 25, it can be seen that Sotheby's (BID) is actively traded and has a narrow bid-ask spread from 2:44 p.m. through 2:49 p.m. after which volume is low but bid and ask quotes remain stable. However, after about 2:57 p.m. volume spikes dramatically and trades are executed at a high (presumably stub) quote of approximately \$100,000. This event is plotted in more detail below.



**Figure 26: Price Chart #2 for Sotheby's (Ticker = BID)**

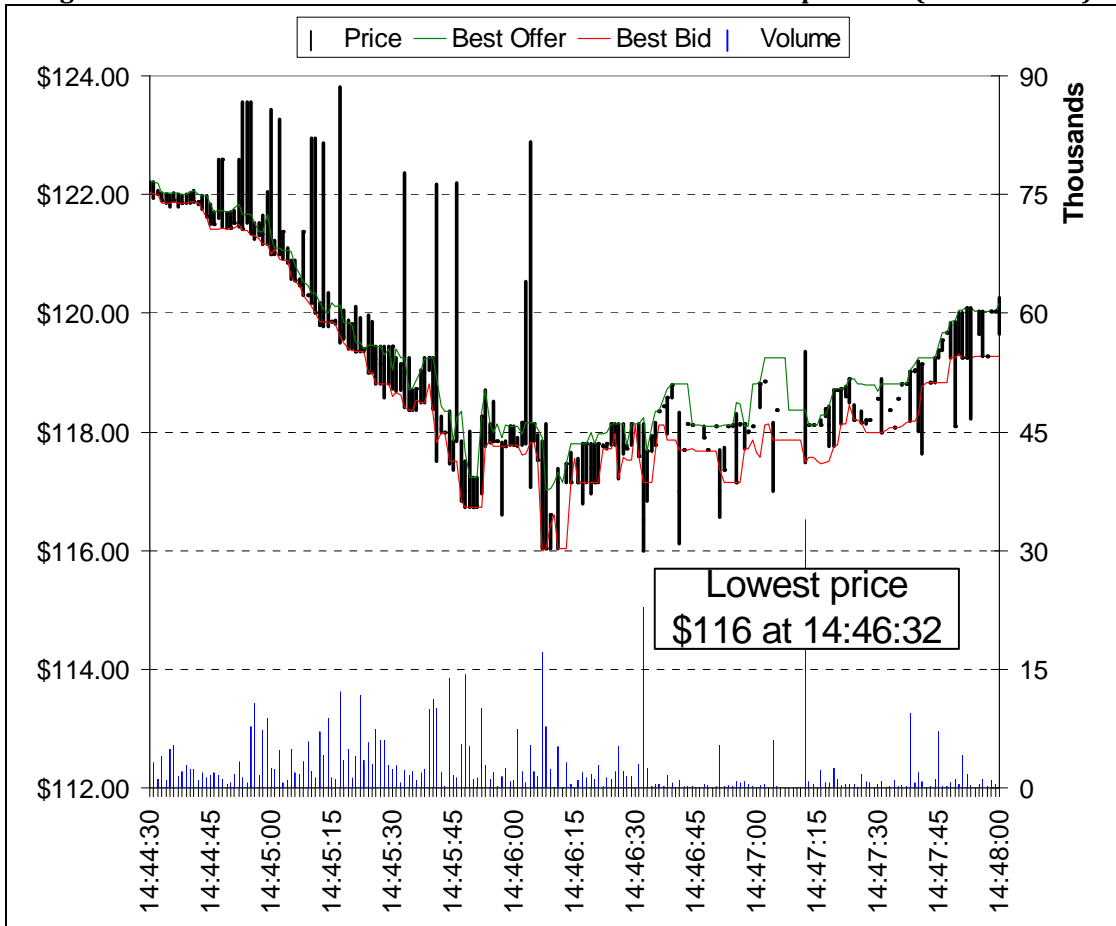


Sources: NYSE Trades and Quotes

As Figure 26 shows, BID trades through the national best offer multiple times between 2:57:05 p.m. and 2:57:12 p.m. This includes trades at approximately \$100,000 which is presumably a top-end stub quote. In contrast to the process in which bid-quotes for other stocks were shown to rapidly decline (which led to lower execution prices) here the highest offer price remained reasonable during a widening of the bid-ask spread, suggesting that the \$100,000 trade occurred deeper into the order book.

In contrast, many other stocks did not experience such substantial declines. Two such examples, IBM and Intel (INTC), are respectively shown below in Figures 27 and 28.

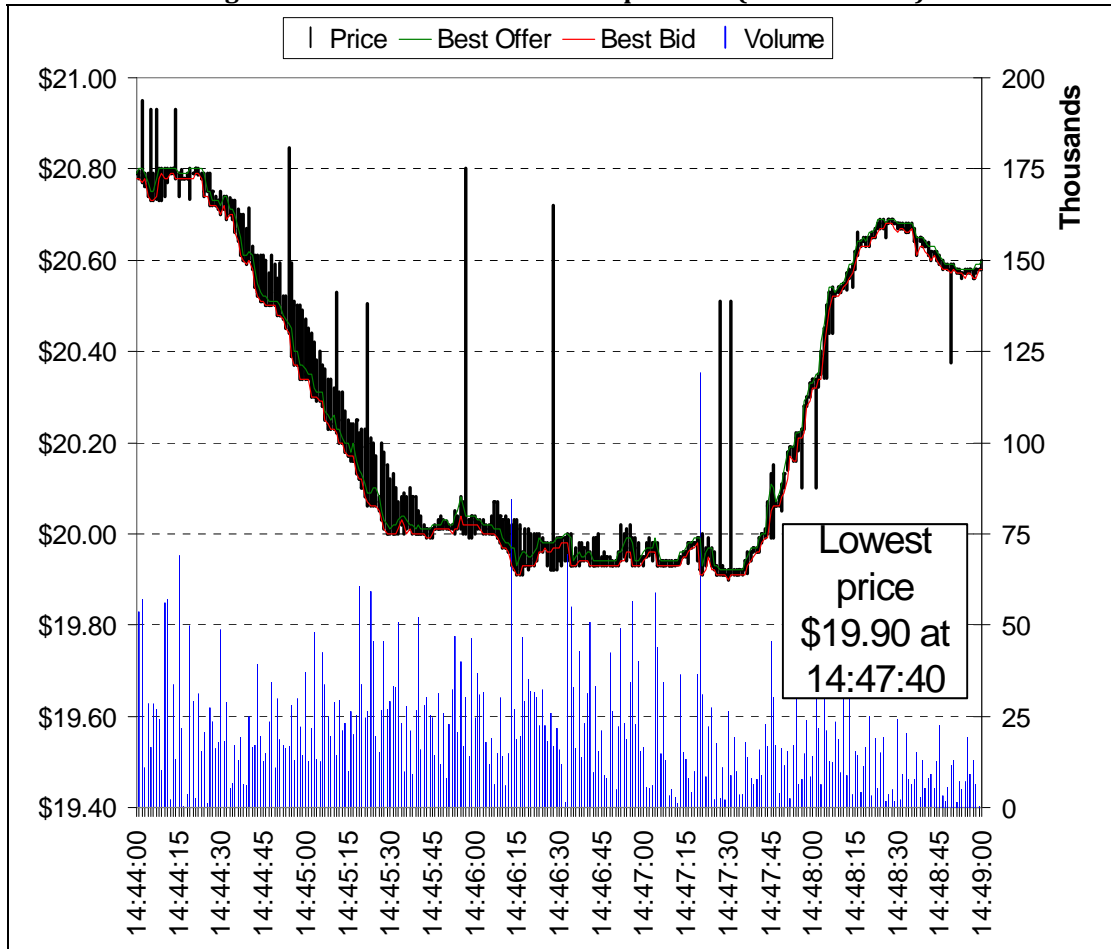
Figure 27: Price Chart for International Business Machines Corporation (Ticker = IBM)



Sources: NYSE Trades and Quotes

It can be seen that IBM trades down from \$122 at 2:44:30 p.m. to a low of \$116 (an approximate 5% loss) at 2:46:32 p.m. before rebounding to \$120 by 2:48:00 p.m. The upward spikes in trade execution represent prices that were above the highest national best offer suggesting that these trades occurred deeper in the order book. Note that activity during the recovery period shows trade prices below the national best bid, but with very low volume.

**Figure 28: Price Chart for Intel Corporation (Ticker = INTC)**



*Sources: NYSE Trades and Quotes*

As indicated above, INTC has constant volume and narrow bid-ask spreads throughout its moderate 4% decline, though the highest offer quote was sometimes breached on the up-side suggesting trades being executed deeper into the order book.

Table 16 presents summary information for each of the securities illustrated in the examples. The Historical Short Sale Ratio represents data from August 3, 2009 through April 23, 2010.<sup>35</sup> None of the May 6 Short Sale Ratios are more than 1.5 standard deviations away from their Historical Average.

<sup>35</sup> The “short sale ratio” is defined as the volume of short selling divided by total volume.

**Table 16: Summary Data for Single-Security Plots**

Stock Symbol	Listing Exchange	Event Type	Price (\$)	Time	Price at 2:00 p.m.	May 6 Short Sale Ratio	Historical Short Sale Ratio
ACN	NYSE	Low	0.01	14:47:54	41.78	33%	37%
BID	NYSE	High	100K	14:57:08	32.15	51%	49%
EFG	ARCA	Low	< 0.01	14:58:14	51.10	39%	39%
ETV	NYSE	Low	11.25	14:24:59	13.68	23%	32%
IBM	NYSE	Low	116.00	14:46:32	127.00	44%	41%
INTC	NASDAQ	Low	19.90	14:47:40	21.87	45%	48%
IWF	ARCA	Low	< 0.01	14:47:28	49.65	62%	45%
MMM	NYSE	Low	67.98	14:46:06	85.64	41%	41%
PG	NYSE	Low	39.37	14:47:15	62.52	45%	39%
VTI	ARCA	Low	0.15	14:55:32	56.88	43%	53%

We continue to evaluate any common drivers that might explain why trading for different securities exhibited different behaviors. Among a variety of factors, we are considering the effects of:

**Stop Loss Market Orders.** As described further below, stop loss orders have stop prices that, for sell orders, are lower than current prices. If prices fall, these orders are intended to prevent losses from exceeding a certain amount (beyond the stop price) by liquidating a long position in the stock. When the stop price is reached, such orders turn into market orders to sell. In fast market conditions, stop loss market orders may cause trades at prices that are much lower than the “stop” price anticipated by an investor, because the market may have moved by a significant amount before the order is executed. They also could potentially, under certain circumstances, trigger a chain reaction of automated selling if they are used in significant numbers for a particular stock. For example, the triggering of one stop loss market order can trigger an automated sell market order that causes a price decline that, in turn, in the absence of liquidity provision, may trigger another stop loss market order at a lower level, and so on.

**NYSE’s LRP Mechanism.** Another factor that we will examine closely is the effect of the NYSE’s LRP mechanism. As described further below, the NYSE’s trading system incorporates LRPs that are intended to dampen volatility in a given stock by temporarily converting from an automated market to a manual auction market when a price movement of a sufficient size is reached. In such a case, trading on the NYSE will “go slow” and pause for a time period to allow an opportunity for additional liquidity to enter the market. During an LRP, the NYSE will display a quotation that is not immediately accessible and can be bypassed, but is not required to be bypassed, by other trading venues and order routers. Some have suggested that LRPs exacerbated price volatility on May 6 by causing a net loss of liquidity as orders were routed to other trading venues. If accurate, this potentially could cause some NYSE securities to decline further than the broad market decline. Others believe that the LRP mechanism served to

attract additional liquidity that helped soak up some of the excess selling interest in these securities on May 6. We are analyzing the effect of LRPs closely.

## **B. Futures Markets**

The CFTC staff has conducted a preliminary review of activity in the futures markets to better understand the events that took place on May 6, 2010. The objective was to collect and analyze preliminary evidence that might be associated with possible causes of the events that occurred in futures markets on May 6, 2010, including, but not limited to erroneous activities (*e.g.*, “fat finger” errors), cyber attacks, and significant system malfunctions. CFTC staff’s preliminary review has not, at this time, found evidence of erroneous activities, cyber attacks, or significant system malfunctions.

Preliminary findings suggest that a confluence of economic events, signals from various other markets, and a marked increase in sell orders (in comparison to buy orders) culminated in a significant dislocation of liquidity in the E-mini S&P 500 futures contracts.<sup>36</sup> This liquidity dislocation was also preceded by some reduction in activity of certain liquidity providers.

The analysis focuses on trading and liquidity provision in the June 2010 E-mini S&P 500 futures contract. That single contract month in the E-mini S&P 500 comprised 78.2 percent of the total volume of trading in the 12 most actively traded broad-based stock index futures contracts on May 6, 2010.

### **1. Background**

Consistent with broad market trends on May 6, 2010, trading volume in the E-mini S&P 500 futures was about 2.6 times greater than the average daily trading volume over the prior 30 days. On May 6, trading volume in the E-mini S&P 500 was the fifth highest daily volume over the past five years.<sup>37</sup>

Furthermore, the contract experienced a significantly higher level of trading during certain periods of the day. According to Figure 30, on May 6, the intraday-period-by-period trading volumes significantly exceeded the average trading volume for the same intra-day periods observed over the previous 30 days, especially between 2:00 p.m. and 3:30 p.m.

The daily trading activity did not result in a significant increase in the number of futures contracts held by market participants at the end of May 6, 2010. This implies many investors participated in the market intraday, but on balance few investors

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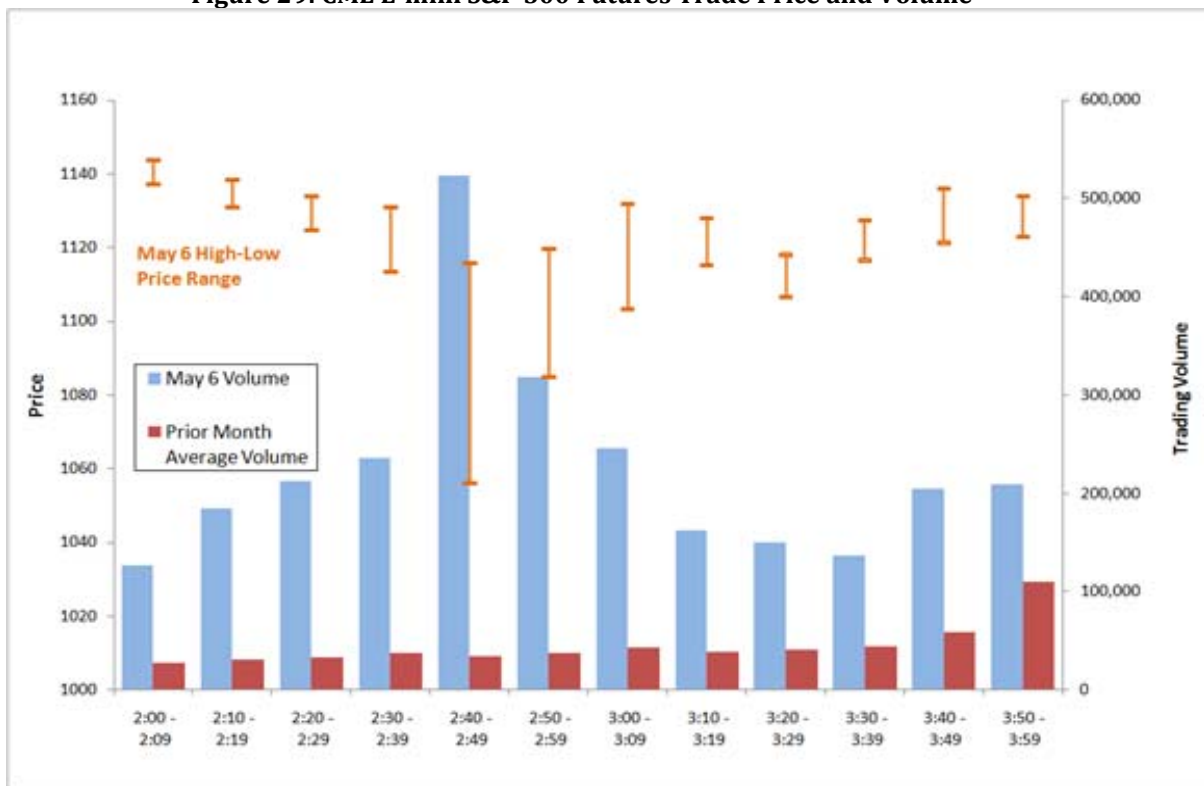
<sup>36</sup> For more information on broad-based stock index futures, see Appendix B.

<sup>37</sup> Each of the four dates on which trading volume was greater occurred in September or October 2008, during the financial crisis. During the week of the Lehman bankruptcy filing on September 16, 17 and 18, 2008 trading volumes were 6.1 million contracts, 5.9 million contracts and 6.9 million contracts, respectively. On October 10, 2008 trading volume was 5.9 million contracts.

increased their position by the close of trading. Specifically, open interest in the June 2010 E-mini S&P 500 futures contract increased by only 3.74%, to 2,688,328 contracts; at this level, daily open interest on May 6, 2010 did not rank among the highest five days over the previous 5 years.<sup>38</sup> An increase in open interest means there is a cumulative increase in the size of the market participants' positions that remained open at the close of trading.

In line with broad market trends, high trading volume in the June 2010 E-mini S&P 500 contract on May 6, 2010 coincided with significant changes in prices (price volatility). The daily price range in the E-mini S&P 500 was 112.75 points. This represents the second widest daily price range over the past five years. The other four of the top five widest price ranges over the past five years occurred during the financial crisis in the autumn of 2008, including the single largest daily price range of 115.5 points on October 28, 2008. Within the trading day, the widest range between high and low prices (calculated over 10 minute intervals) in the E-mini S&P 500—59.75 points—occurred during the period 2:40 p.m. to 2:49 p.m. (Figure 29).

**Figure 29: CME E-mini S&P 500 Futures Trade Price and Volume**



Source: CME Group

According to the CME, over 250 Globex executing firms were active in routing E-mini S&P 500 futures contract orders into Globex during the hour beginning at 2 p.m.,

<sup>38</sup> Open interest means the total number of futures contracts that are not yet liquidated by offsetting transactions or cash settlement.

including the period from 2:40 p.m. to 3:00 p.m. A Globex executing firm is an entity that is directly connected into Globex. Non-Globex executing firms access that trading platform through a Globex executing firm.

Also during the hour of 2 p.m., Globex transactions in the E-mini S&P 500 futures were recorded for 6,939 buy accounts, 6,873 sell accounts, 7,669 buy user IDs, and 7,564 sell user IDs. A buy (sell) account is a unique Globex account that executed one or more buy (sell) orders. A buy (sell) user ID is a unique operator ID (also referred to as a “Tag 50 ID”), identifying the party who entered the order on behalf of the account. A Tag 50 ID may be authorized to enter orders on behalf of multiple accounts. As well, a single account may have multiple authorized Tag 50 IDs.

May 6, 2010 was also the first day in 2010 on which the Globex system activated the Stop Logic functionality in any equity index futures market.<sup>39</sup> Under CME rules, this functionality is initiated when the last transaction price would have triggered a series of stop loss orders that, if executed, would have resulted in a cascade in prices outside a predetermined ‘no bust’ range (6 points in either direction in the case of the E-mini S&P 500 futures contract). The purpose of this functionality is to prevent sudden, cascading declines (or increases) in price caused by order book imbalances.<sup>40</sup>

At 2:40 p.m. the E-mini S&P 500 was trading at 1,113. Five minutes later at 2:45 p.m. the E-mini S&P 500 had fallen another 57 points to 1,056. At 2:45:27 p.m., the E-mini S&P 500 dropped 12.75 points over a period of 500 milliseconds on the sale of 1,100 contracts by multiple market participants. This sequence of trades caused the market to trade down to an intraday low of 1,056. Further, at 2:45:27 p.m., the bid/ask spread in the E-mini S&P 500 market widened 6.5 points, or 26 ticks. This triggered the Globex ‘Stop-Logic,’ sending the E-mini S&P 500 into a reserve state at 2:45:28 p.m. The reserve state held execution of any transactions for five seconds. This hold allowed enough orders to flow into the market so that the next executed trade would be within six points of the last trade.<sup>41</sup> At 2:45:33 p.m. the E-mini S&P 500 exited its Stop-Logic reserve state.<sup>42</sup>

Stop Logic functionality was also triggered on May 6 in two currency futures contracts, the Japanese Yen and British Pound contracts. Across all CME Group equity index futures markets, the Stop Logic functionality was activated on seven occasions in 2009, on 18 occasions during 2008 (a year with greater market volatility due to the economic crisis), and on three occasions in 2007. Fourteen of these 29 activations in equity index futures, including the one on May 6, occurred in the E-mini S&P 500

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<sup>39</sup> For more information on electronic trading, order display and order entry, see Appendix B.4, B.5 and B.8.

<sup>40</sup> For more information, see Appendix B.10 and B.11.

<sup>41</sup> If at the end of those five seconds there were no orders that would result in such a transaction, the market would have been held an additional five seconds.

<sup>42</sup> Upon exiting the reserve state, 1,753 contracts were traded at a price of 1056.75. The E-mini S&P 500 began to recover at that point.

contract. Save for the unusual circumstances of the Fall of 2008, Globex activates Stop Logic an average of five times per year across all equity index futures products, and an average of approximately three times per year in the E-mini contract. All Stop Logic functionality activations in CME equity index futures markets from 2007 through the present are listed in

Table 17.

Table 17: CME Equity Index Futures Stop Logic Events by Date: 2007-2010

Year	Date	Contract	Contract Name	Time (Central Time)	Total	
2007	9/18/2007	ESU7	E MINI S&P 500	1:15 PM	1	
	10/31/2007	EMDZ7	E-MINI MID CAP	1:14 PM	1	
	12/24/2007	SPH8	BIG S&P 500	6:52 AM	1	
<b>2007 Total</b>					<b>3</b>	
2008	1/14/2008	ESH8	E MINI S&P 500	1:01 AM	1	
	1/21/2008	SPH8	BIG S&P 500	2:12 AM	1	
		ESH8	E MINI S&P 500	2:12 AM	1	
	3/16/2008	ESH8	E MINI S&P 500	6:14 PM	1	
				6:17 PM	1	
				7:06 PM	1	
	3/17/2008	ESH8	E MINI S&P 500	2:50 AM	1	
	7/10/2008	NQU8	E MINI NASDAQ 100	11:01 PM	1	
	9/14/2008	NQZ8	E MINI NASDAQ 100	5:00 PM	1	
	9/16/2008	ESU8	E MINI S&P 500	1:14 PM	1	
	9/25/2008	SPZ8	BIG S&P 500	10:45 PM	1	
	10/6/2008	SPZ8	BIG S&P 500	3:30 PM	1	
	10/9/2008	ESZ8	E MINI S&P 500	7:21 PM	1	
	10/17/2008	ESZ8	E MINI S&P 500	3:01 AM	1	
	10/29/2008	ESZ8	E MINI S&P 500	3:43 PM	1	
	11/3/2008	SPZ8	BIG S&P 500	7:22 AM	1	
	11/13/2008	ESH9	E MINI S&P 500	11:59 AM	1	
	11/25/2008	SPZ8	BIG S&P 500	5:45 AM	1	
	<b>2008 Total</b>					<b>18</b>
	2009	1/9/2009	SPH9	BIG S&P 500	7:30 AM	1
2/27/2009		SPH9	BIG S&P 500	7:20 AM	1	
2/28/2009		ESZ9	E MINI S&P 500	10:32 AM	1	
3/6/2009		ZDH9	BIG DOW (\$10)	7:30 AM	1	
3/17/2009		NQM9	E MINI NASDAQ 100	1:17 PM	1	



	4/23/2009	YMM9	E MINI DOW (\$5)	2:53 PM	1
	12/17/2009	NQH0	E MINI NASDAQ 100	8:57 AM	1
<b>2009 Total</b>					<b>7</b>
2010	5/6/2010	ESM0	E MINI S&P 500	1:45 PM	1
<b>2010 Total</b>					<b>1</b>
<b>Total: 2007-2010</b>					<b>29</b>

Source: CME Group

Although the triggering of the Stop Logic functionality in the E-mini S&P 500 futures contract is not unprecedented, the events of May 6 caused significant public concern about the functioning of financial markets. Previous Stop Logic events occurred, including during the financial crisis of 2008, when liquidity concerns played a key role. Consequently, CFTC staff has conducted an analysis of trading activity and liquidity provision in the June 2010 E-mini S&P 500 futures contract during 2:30 p.m. to 3:00 p.m. – the period of the day when trading volume and transaction prices were particularly volatile.

## 2. Role of Liquidity in Markets

Liquidity reflects the ease with which certain amounts of an asset can be bought or sold without exerting a significant effect on its price. Higher market liquidity can be interpreted as a greater collective willingness to execute orders at given prices.

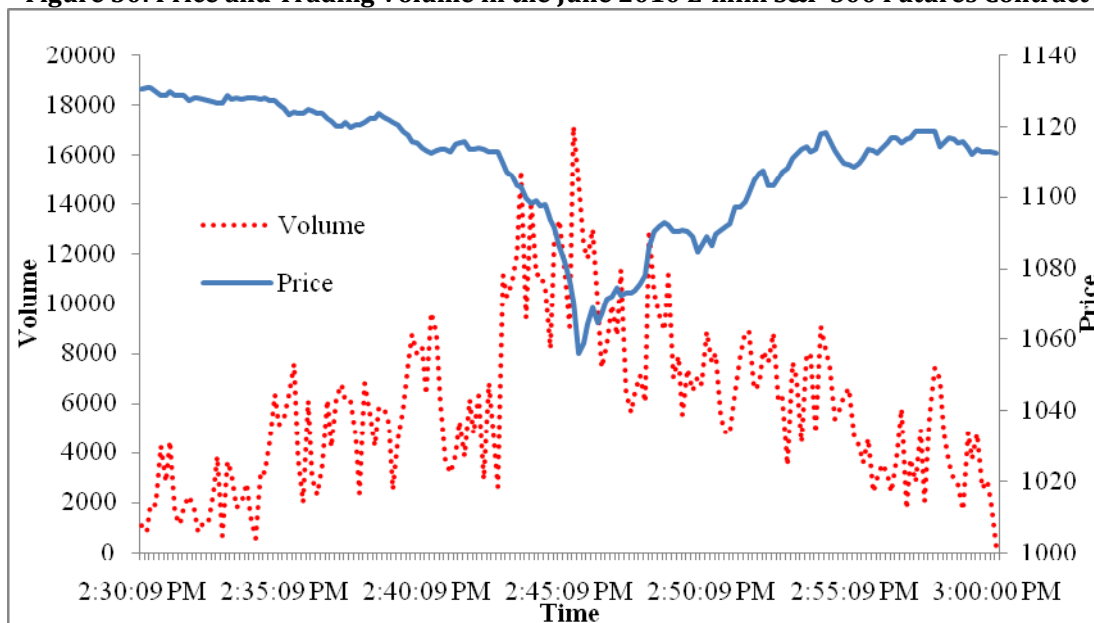
Market liquidity is not directly observable. In addition, market liquidity has multiple dimensions that are hard to capture by a single indicator. CFTC staff reviewed multiple indicators of liquidity, including, but not limited to, trading volume, bid/offer spread, and depth. High liquidity may manifest itself as high trading volume, narrow bid/offer spreads, and/or high depth of the order book at successive quotes.

As discussed below, preliminary analysis shows that between 2:30 p.m. and 3:00 p.m., trading volume spiked, bid/offer spreads widened, and depth declined. The latter two observations are consistent with a significant decline in liquidity with the bulk of that decline occurring between 2:42 p.m. and 2:45 p.m.

### a) Trading Volume

CFTC staff has analyzed trading volume and transaction prices for the June 2010 E-mini S&P 500 futures contract during the period 2:30 p.m. to 3:00 p.m. on May 6, 2010. Figure 30 presents transaction prices and trading volume for 10 second intervals from 2:30 p.m. to 3:00 p.m. for the June E-mini S&P 500 contract on May 6, 2010. According to Figure 1, between 2:30 p.m. and approximately 2:45 p.m., volume rose significantly while prices fell. Between 2:45 p.m. and 3:00 p.m. volume fell and prices rose.

**Figure 30: Price and Trading Volume in the June 2010 E-mini S&P 500 Futures Contract**



Source: CME Group

During the 30-minute period from 2:30 p.m. to 3:00 p.m., trading volume was about 10 times the average daily trading volume for the same intraday time period calculated over the prior 30 days. High trading volume by itself can be interpreted as an indicator of improved liquidity. However, Figure 30 shows that high trading volume was accompanied by significant volatility of trading volume. This suggests a dislocation of market liquidity, with high volume fluctuations at the same time that orders are executed deep into the limit order book. Consequently, liquidity indicators based on the characteristics of the limit order book may provide additional information about the liquidity dynamics during 2:30 p.m. to 3:00 p.m. on May 6, 2010.

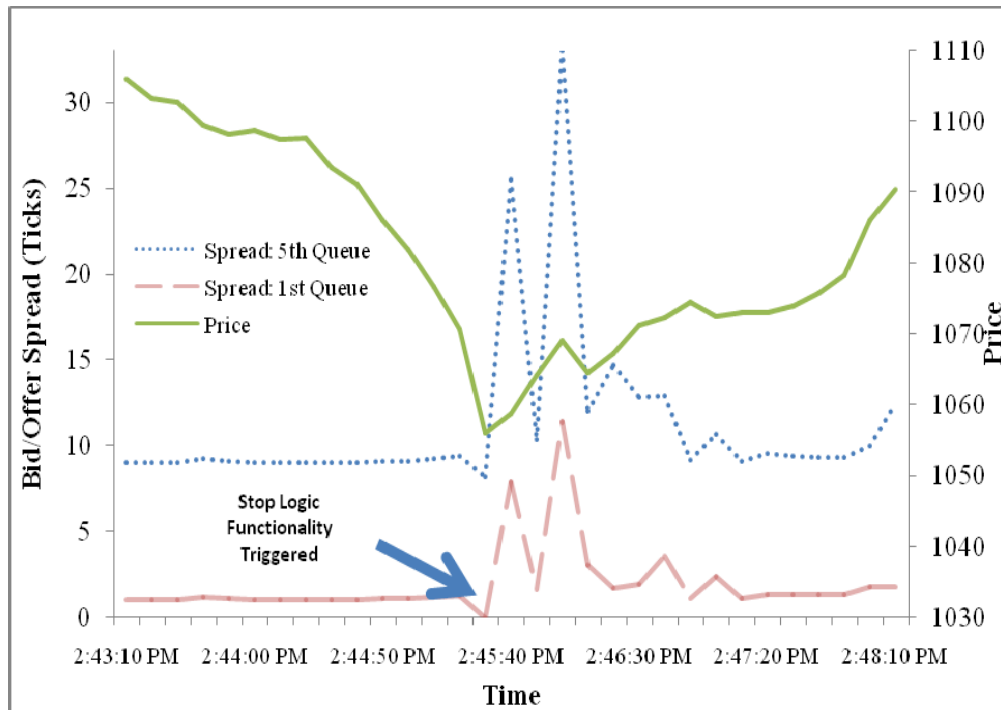
### **b) Bid/Offer Spread**

The bid/offer spread is a liquidity indicator based on the characteristics of the limit order book. Specifically, the bid/offer spread is calculated as the difference between the highest quoted price to buy (bid) and the lowest quoted price to sell (offer or ask) one or several contracts or securities. This price difference is a measure of the cost paid by a buyer or a seller who wishes to transact immediately. Similarly, the second, third, fourth, fifth best bid and offer prices represent transaction costs to the buyer and seller willing to buy at increasingly lower prices and sell at increasingly higher prices.

Figure 31 presents the bid/offer spreads for the first best and fifth best quotes of the June 2010 E-mini S&P 500 specifically focusing on the period of 2:43 p.m. to 2:48 p.m. along with transaction prices. The spread is measured in ticks—minimum price increments; for the E-mini S&P 500 contract the tick is equal to 0.25 point. The smallest bid/offer spread is one tick (0.25 point) and the smallest spread between the fifth best

quotes is 9 ticks (2.25 points).<sup>43</sup> Until approximately 2:45 p.m., both spreads were at their minimums, as is most often observed in this market. At 2:45:28 p.m., the best bid/offer spread widened to 26 ticks (6.5 points). At this time, Globex Stop Logic triggered a 5-second reserve state in the E-mini S&P 500 contract. Following the reserve state, the first and fifth best quote spreads increased to the period maxima of approximately 11 ticks (2.85 points) and 33 ticks (8.25 points), respectively.<sup>44</sup> By 2:50:40 p.m., both spreads declined to about 1 and 9 ticks (0.25 and 2.25 points), respectively.

**Figure 31: Bid/Offer Spread (in Ticks) and Price in the June 2010 E-mini S&P 500 Futures Contract**



Source: CME Group

### c) Depth

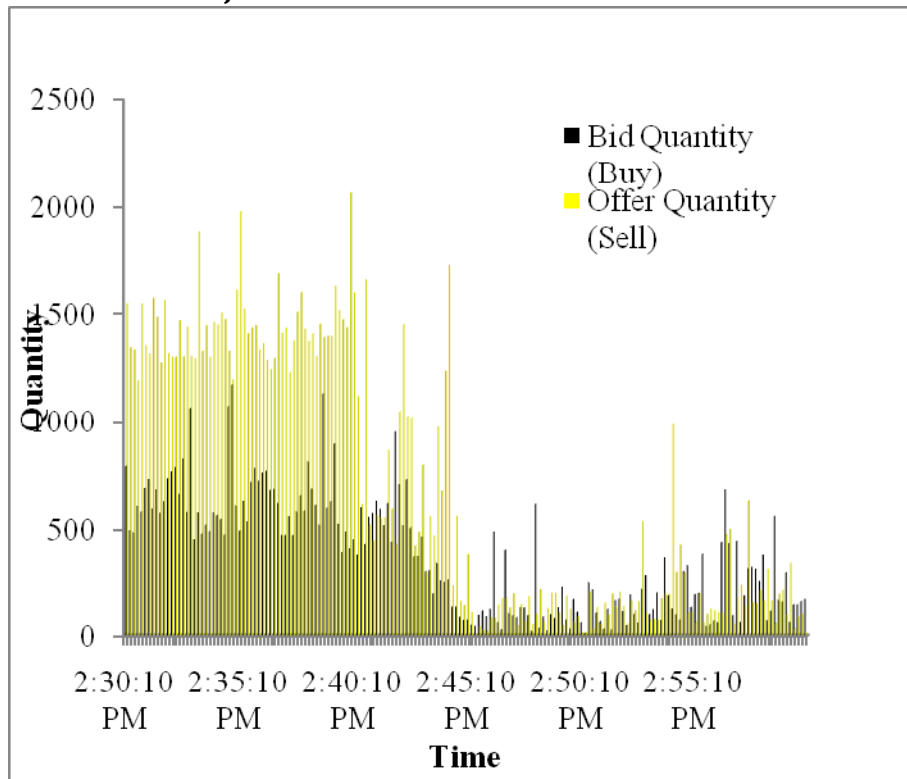
Depth is another liquidity indicator based on the size of orders in the limit order book. Depth is calculated as the sum of quantities of the orders resting at a particular price point—e.g., best bid or offer, second, third, fourth or fifth best bid or offer—in the limit order book. High depth (resting orders) on both sides of the limit order book may (but need not) result in higher trading volume (executed orders).

<sup>43</sup> Bid/offer spread between 2:30 p.m. and 2:43:10 p.m. and 2:48:10 p.m. and 3:00 p.m. are at their minimums.

<sup>44</sup> These spread measurements are graphed at 10 second intervals, with each data point representing the average of all quotes within a 1 second period.

Figure 32 illustrates the depth at the fifth best bid and offer quotes between 2:30 p.m. and 3:00 p.m. According to Figure 32, significant order imbalances existed between orders to buy and orders to sell. In addition, around 2:45 p.m., depth declined dramatically, but the limit order book became approximately balanced (orders to sell became approximately equal to orders to buy), which is its typical state.

**Figure 32: Bid/Offer Quantities: 5th Best in the June 2010 E-mini S&P 500 Futures Contract**



Source: CME Group

### 3. Analysis of Large Traders

In order to further analyze the liquidity dynamics between 2:30 p.m. and 3:00 p.m., CFTC staff examined the activities of large traders. In the preliminary analysis below, we report (1) the role of liquidity providers (six accounts, as defined below) and (2) activity of the ten largest traders by volume.

First, Figure 33 presents the total transaction sides<sup>45</sup> of two groups of market participants: liquidity providers and liquidity takers.

<sup>45</sup> A side of a transaction means the account was either the buyer or the seller in a transaction. Total volume is equal to half of all transaction sides. To convert transaction sides to volume for a group of accounts, one must also eliminate half of the sides of trades transacted within the group of accounts (that is, not with accounts outside of the group).

Liquidity providers are traders that are routinely present in the market to both buy and sell futures contracts, facilitating rapid execution of transactions. In electronic limit order markets such as Globex, where the E-mini S&P 500 futures contract is traded, there are no designated liquidity providers (that is, no trader has an obligation to provide bid and ask quotations on demand). Thus, for the purpose of this preliminary analysis, CFTC staff classified liquidity providers by their activity in the markets.<sup>46</sup>

CFTC staff classified six accounts as liquidity providers. These six accounts participated in about 50 percent of all transaction sides between 2:30 p.m. and 2:34 p.m. The remaining 4,573 accounts (of the total 4,579 accounts transacting between 2:30 p.m. and 3:00 p.m.) are defined as liquidity takers.

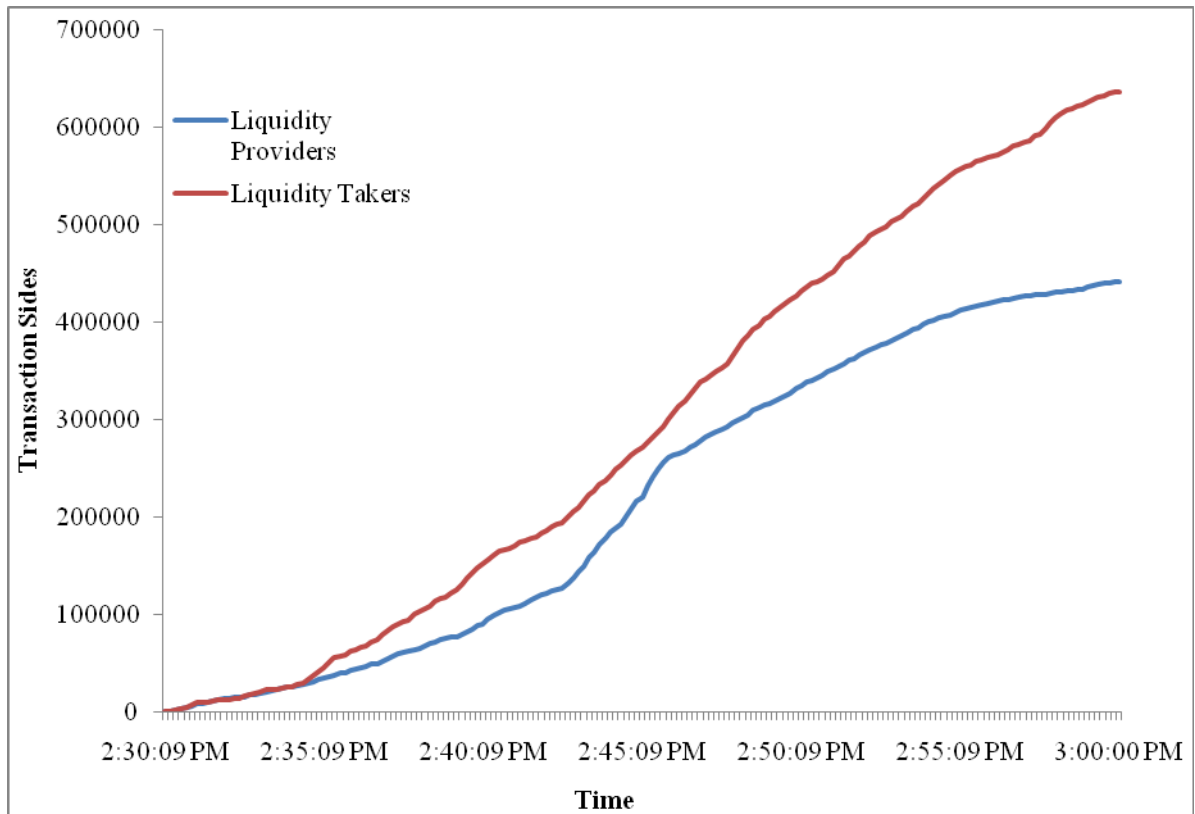
CFTC staff examined the behavior of liquidity providers during the time period 2:30 p.m. to 3:00 p.m. and observed that starting at approximately 2:35 p.m. liquidity providers began limiting their trading activity as measured by transaction sides in comparison to liquidity takers (Figure 33).<sup>47</sup> By 2:45:28 p.m., liquidity providers accounted for 46 percent of all transaction sides, lower than their participation percentage between 2:30 p.m. and 2:34 p.m. By 3:00 p.m. the liquidity providers accounted for 41 percent of transaction sides. The decline in the participation of liquidity providers in executed transactions can be interpreted as a partial withdrawal of liquidity by these six providers during a period of significant price movement.

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<sup>46</sup> For the purposes of this analysis, liquidity providers are defined as follows: from the accounts that were both one of the 10 largest long gross volume accounts and 10 largest short gross volume accounts, CFTC staff selected the accounts that had a net position change of no more than 150 contracts (long or short) during the time period 2:30 p.m. to 2:45 p.m.

<sup>47</sup> CFTC staff confirmed that between 2:42 p.m. and 2:45 p.m. that several additional accounts (belonging to some of the most active traders) ceased trading. Furthermore, CFTC staff confirmed through trader interviews that several accounts belonging to some of the most active traders ceased trading within seconds after the Stop Logic functionality was triggered and did not return to the market until later. A trader may transact through multiple accounts in Globex.

**Figure 33: Cumulative Number of Transaction Sides of Liquidity Providers and Liquidity Takers in the June 2010 E-mini S&P 500 Futures Contract**



Source: CME Group and CFTC Staff Calculation

Second, CFTC staff reviewed the activity of the ten largest traders by net volume and by gross volume, in order to ascertain whether there were significant imbalances between large buyers and sellers in the market. For two intraday time periods—2:30 to 2:45 p.m. and 2:46 to 3:00 p.m.—the net volume was computed for each account in the E-mini S&P 500 June 2010 futures contract.<sup>48</sup> During the period from 2:30 to 2:45 p.m., the top 10 net buying accounts bought 51,526 contracts more than they sold. The top 10 net selling accounts sold 72,186 contracts more than they bought. During the period from 2:46 to 3:00 p.m., the top 10 net buying accounts bought 49,180 contracts more than they sold. The top 10 net selling accounts sold 67,544 contracts more than they bought.

In addition, CFTC staff identified the top ten most active accounts by gross volume between 2:00 p.m. and 3:00 p.m. Of those ten, nine trading accounts executed trades on both the long and short side of the market. For these trading accounts, there was a relative balance of activity between the long and short sides of the market.

<sup>48</sup> The numbers reported are the total net volume for accounts with the 10 largest net buy volumes (“top 10 net buying accounts”) and, separately, the total net volume for accounts with the 10 largest net sell volumes (“top 10 net selling accounts”). Net volume for an account was calculated as the total buy volume minus the total sell volume in the time period.

One out of the top ten trading accounts only entered orders to sell. That trader entered the market at around 2:32 p.m. and finished trading by around 2:51 p.m. The trader's short futures position represented on average, nine percent on the volume traded during that period. The trader sold on the way down and continued to do so even as the price level rose.

We are continuing to analyze trading activity, including conducting interviews with market participants to collect further data.

#### **4. Preliminary Findings**

The quantitative evidence presented above suggest that a confluence of economic events, market forces, and trading system functionality led to a significant dislocation of liquidity in the June 2010 E-mini S&P 500 futures contract sometime between 2:30 p.m. and 3:00 p.m. on May 6, 2010.

Prior to that time, a number of economic events and market developments led to a broad-based market desire to lessen risk exposures. This translated into a downward movement in prices across financial markets in conjunction with significant trading volume. At or about 2:30 p.m., the electronic limit order book in the E-mini S&P 500 futures market exhibited a significant imbalance of sell orders and buy orders. In the backdrop of declining prices, this imbalance appears to have contributed to a sudden liquidity dislocation despite increased trading volume. At approximately 2:45 p.m., several sell orders executed deep into the limit order book, which coincided with a significant loss of depth, triggering the Stop Logic functionality. The Stop Logic functionality in the E-mini S&P 500 contract has been triggered a number of times in the past few years, including several times during the financial crisis in the fall of 2008, when market conditions may have resembled those seen on May 6, 2010. Activation of the Stop Logic functionality on May 6, 2010, initiated a five second pause in trading in the E-mini S&P 500 futures contract. After the five second pause, the limit order book became more balanced, which is its typical state, and the price of the E-mini S&P 500 futures contract recovered.

### **C. Clearance and Settlement**

#### **1. Securities Markets**

Securities clearing agencies are self-regulatory organizations that are required to register with the SEC under Section 17A of the Securities Exchange Act. There are two types of securities clearing agencies – clearing corporations and depositories.

Clearing corporations compare member transactions (or report to members the results of exchange comparison operations), clear those trades and prepare instructions for automated settlement of those trades, and often act as intermediaries in making those settlements. Clearing corporations include the National Securities Clearing Corporation (“NSCC”), a subsidiary of the Depository Trust & Clearing Corporation (“DTCC”), and

the Options Clearing Corporation (“OCC”). Depositories hold securities in bulk form for their participants and maintain ownership records of the securities on their own books. Currently, the Depository Trust Company, a subsidiary of DTCC, is the primary U.S. securities depository.

There were no significant processing issues at DTCC or OCC as a result of the market events on Thursday, May 6. The clearing agencies’ systems operated in an orderly manner both during and subsequent to those market events.

Collection of funds due to the clearing agencies on the morning of Friday, May 7, occurred without incident as all clearing fund participants met their payment obligations on time.

To accommodate the late submission of trade data by exchanges, clearing agencies, where necessary, delayed end-of-day processing on Thursday, May 6. This was particularly the case at the DTCC subsidiary NSCC because of the large number of cancelled trades in the equities markets. Processing was completed at OCC only slightly later than usual.

The market volatility and price decreases on Thursday, May 6, also resulted in substantially higher margin and clearing fund requirements at the clearing agencies on Friday, May 7. The requirements were calculated pursuant to the risk-based margin methodologies in place at the clearing agencies and in accordance with clearing agency rules and procedures. All margin and clearing fund requirements were met by clearing participants Friday morning on time.

## **2. Futures Markets**

The Commodity Exchange Act (“CEA”) requires all CFTC regulated designated contract markets (“DCM”) to have all contracts that trade on the DCM to be cleared and settled by a CFTC registered derivatives clearing organization (“DCO”). The DCO functions as the central counterparty and guarantor for the positions that result from all contracts traded on the DCM. This means that the DCO is the long to each short position and the short to each long position in all contracts that it clears. DCOs deal exclusively with their clearing participants. Any market participant that is not a clearing member of a particular DCM must have its positions carried by a clearing member. The DCO for CME is the CME Clearing House while the DCO for ICE Futures US is ICE CLEAR US.

One of the critical functions that each CFTC registered DCO performs is the removal of debt obligations among its clearing members at least at the end of the trading session for a given trade date. This is accomplished by independently determining a settlement (or marking) price for each contract that is cleared and marking all open positions to that price. The DCO collects cash from clearing members that have lost money on their positions and pays it to clearing members that have gained money on their positions.



With respect to the trading that took place on May 6 at CME and ICE Futures U.S., the clearing and settlement processes worked effectively and without incident.

The amount that the CME collected and paid to its clearing members as a result of the end-of-day mark-to-market calculation for all contracts cleared by CME was \$4,073,195,863. Of this sum, \$2,902,837,844 was collected and paid in the customer origin while \$1,170,358,019 was collected and paid in the house origin.

The amount collected and paid by ICE CLEAR US to its clearing members as a result of the end-of-day mark-to-market calculation was \$749,680,556. Of this sum, \$120,701,044 was collected and paid in the customer origin while \$628,979,512 was collected and paid in the house origin.

All payments to and from each DCO were met on time.

## V. NEXT STEPS

### A. Areas for Further Analysis

#### 1. Securities Markets

A crucial area for further analysis is how sudden demands for liquidity (particularly by sellers in a rapidly declining market) are transmitted among the various securities, options, and futures markets and products. In today's highly automated and low-latency markets, the links between the various related markets and products are extremely tight.

To conduct this analysis, we are undertaking a detailed market reconstruction, so that cross-market patterns can be detected and the behavior of stocks or traders can be analyzed in detail. Reconstructing the market on May 6 from dozens of different sources and calibrating the time stamps from each source to ensure consistency across all the data is consuming a significant amount of SEC staff resources.<sup>49</sup> The data are voluminous, and include hundreds of millions of records comprising an estimated five to ten terabytes of information. On May 6, there were over 17 million trades between 2:00 p.m. and 3:00 p.m. alone. Overall, the markets processed 10.3 billion shares in NYSE stocks alone that day. By contrast, the key day in the 1987 Market Break Study involved a trading session processing a little over 600 million shares in NYSE stocks.

SEC staff is investigating plausible explanations of events, forming testable hypotheses and using the data available to us to assess them. There are many challenges to completing this analyses. The size and complexity of our markets and those of related markets, the effects of computerized trading, the diversity and opacity of trading strategies and linkages among financial instruments make this a complicated task.

A theory of the May 6 events should attempt to explain a number of the preliminary findings outlined in this report, to the extent they are confirmed by a more

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<sup>49</sup> The SEC has obtained quotation and last-sale information produced by the Consolidated Tape plans, which cover all executions in NMS stocks, regardless of whether they occurred on an exchange or over-the-counter. The plans information also contains all top-of-book quotations (*i.e.*, the best orders or quotations in each listed equity security at each market at each point in time). However, the Consolidated Tape plans does not include orders that were outside the top of book, which constitute the vast majority of orders placed on any trading day. Most of these orders never execute and are canceled. Under current rules, there is no single record of such orders across the different markets. The relevant sources for this information include:

- *OATS*. The Order Audit Trail System (OATS) was established by NASD in 1996 and captures information on orders in Nasdaq-listed securities.
- *OTS*. The Order Tracking System (OTS) was established by the NYSE in 1999 and captures information on orders in equity securities listed on NYSE and NYSE Amex. The OTS is a system for gathering information by a request that can take ten days to fill.
- *Individual exchanges*. Each exchange has its own systems to record information about orders placed and executed on its market, regardless of which exchange lists the security.

exhaustive analysis, as well as any other facts uncovered. Among other things, a theory should explain:

- the sudden decline and sudden rebound in stocks generally;
- significant intraday negative returns of certain issues;
- the intraday lows of nearly zero in approximately 200 issues (shown in Figure 8), and the heightened levels of short selling that occurred at or near the intraday low;
- the extreme intraday highs of a significant number of issues, particularly among ETFs; and
- the disproportionate representation of ETFs among extreme returns.

A central component of this research is to understand the basic facts surrounding the event period and examine data from key additional sources. This exploratory work will guide the staff in forming causal hypotheses. For example, we will likely examine in more detail options data, including data on options transactions and quotes to better understand the role that participants in this market may have played.<sup>50</sup> We also will likely examine existing data on institutional and mutual fund holdings, as well as data from broker-dealers that will help attribute trades to specific brokerage accounts. In addition, we will examine trade and order characteristics to determine whether specific order types played a role in the breakdown of the price discovery mechanism.

Another key component of our analysis is to deepen our understanding of the behavior of groups of market participants. We, for example, will continue to examine the role of providers of liquidity, including market participants who have formal obligations under the federal securities laws or SRO rules. To the extent that data is available, we will seek to understand the impact of traders following high-frequency or algorithmic trading strategies. Many proprietary trading firms engage in automated strategies that continually monitor the various markets and products for disparities in prices. When the trading systems for these firms spot such disparities, they can generate in microseconds an enormous volume of orders that are intended to capitalize on these disparities. We would also consider examining the activities of ETF Authorized Participants in order to understand what, if any role, they played, in the markets of May 6. Additionally, our analysis to date has encompassed information about both ETF and non-ETF ETPs, but has not yet ascertained whether or not there are significant differences between the trading experiences of the two.

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<sup>50</sup> Our initial options analysis suggests that there were not triggers originating from the options markets.

## **2. Futures Markets**

### **a) Additional Analysis of Large Traders and Review of OTC Swaps**

CFTC staff will continue reviewing information from a special call on over 40 large traders for their trading activity in the E-mini S&P 500 and Russell 2000 futures contracts on May 6, 2010. A special call is a CFTC directive to a trader holding a reportable position to furnish any pertinent information concerning the trader's positions, transactions, or activities.<sup>51</sup> A reportable position in the E-mini S&P 500 futures contract is 1,000 contracts.<sup>52</sup> Staff also will continue reviewing information from a special call to swap dealers about their activity in over-the-counter broad-based security index derivatives markets on May 6, 2010. Staff also will continue its detailed review of trader activity on May 6 through a comprehensive examination of trade-register data. To date, staff has received over 25 gigabytes of data in over 307,000 files, with more data expected.

### **b) Additional Analysis of May 6 Activity**

CFTC staff will continue to scrutinize a broad range of existing evidence, collect new evidence, and update its analysis of the events of May 6, 2010.

CFTC staff will also continue our analysis of high frequency traders active in the E-mini S&P 500 futures on May 6, 2010.

## **3. Coordinated Analysis**

As reported above, related financial instruments appeared to experience significant volatility, including the sharp decline and recovery in close proximity. This suggests the need to study the linkages between correlated assets in the equities (single stocks, mutual funds and ETFs), options and futures markets. The study could partly focus on examining cross-market linkages by analyzing trading in stock index products such as equity index futures, ETFs, equity index options, and equity index OTC derivatives using, to the extent practicable, market data, special call information, and order book data. The growth, depth, and use of instruments in each of these markets to serve as intra- and cross-market hedges suggest that regulators need to better understand the linkages between these markets.

Given the role that the two agencies play in overseeing key related markets, the staff of the CFTC and SEC should coordinate on a study designed to shed further light on these linkages. Such a study may significantly help design a coordinated system of meaningful and appropriate pauses and halts for these interlinked markets.

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<sup>51</sup> 17 CFR 18.05.

<sup>52</sup> 17 CFR 15.03.

## **B. Potential Regulatory Responses**

The Commissions are considering whether modifications to the existing market-wide circuit breakers are warranted in light of the events of May 6. Any such modifications should be done in a coordinated manner between the securities and futures markets.

An important lesson from the events of May 6 is the need to better understand cross-market linkages between trading venues for exchange-traded funds, equity index futures, and equity index options—instruments used by investors to manage their exposures in the face of broad market movements. A thorough understanding of cross-market linkages will better inform the design of a coordinated system of meaningful and appropriate pauses and halts for these interlinked markets.

In connection with better understanding inter-market mechanisms, it is also important for the agencies to review the various mechanisms used and designed by exchanges to protect orderly markets. As the study of the May 6 events continues, attention should be given to the adequacy of current mechanisms under different stress situations.

### **1. Securities Markets**

As noted above, the SEC is taking a number of steps to identify the cause or causes of the May 6 market disruption as well as factors that may have exacerbated that event, and to develop regulatory initiatives to help prevent a recurrence.

#### **a) Implement Stock-by-Stock Circuit Breakers**

The SEC staff is working with the stock exchanges and FINRA to promptly develop and implement a cross-market “circuit breaker” mechanism to be applied on a stock-by-stock basis. Although the prices of many stocks on May 6 declined in proportion with the broader market decline that occurred in securities and futures index products, the prices of many other individual stocks declined much more before returning near to the prices at which they were trading prior to the precipitous decline.

A uniform circuit breaker rule, which would briefly pause trading across the securities markets when the price of a security has rapidly declined over a short period of time, should make a recurrence of a severe market disruption, such as the one that occurred on May 6, much less likely.

#### **b) Market Orders**

As noted above, some of the most disturbing executions on May 6 likely resulted from the use of market orders. Market orders – particularly stop loss orders that convert

to market orders – are popular with certain investors, including retail investors, and it is possible such investors may have been on the losing side of a number of these trades.

We are considering ways to address the risks of market orders, and their potential to contribute to sudden price moves. Areas under consideration include: (1) requiring market order “collars,” thereby effectively converting market orders into limit orders; (2) prohibiting or limiting the use of market orders; (3) requiring broker-dealers to specifically warn retail customers about the risks of market orders, particularly in volatile markets; and (4) pursuing investor education initiatives as to the risks of market orders.

### **c) Market Making Obligations and Stub Quotes**

Liquidity providers to, or “the other side” of, the extraordinarily erroneous trades seen on May 6 appears in many cases to be “stub” quotes (*e.g.*, a \$0.01 bid) of market makers that effectively had pulled out of the market. Market makers maintain these nominal quotes to meet exchange requirements that they maintain a two-sided quote throughout the trading day. We are considering steps to deter or prohibit stub quotes, including: (1) requiring all market makers to maintain bona fide quotes that are reasonably related to the market, perhaps using objective parameters that are consistent across markets; or (2) alternatively, relaxing requirements that market makers maintain a two-sided quote throughout the day, and thereby obviate the need for market makers to post stub quotes that could be executed against in severe market conditions.

### **d) Revise Procedures for Breaking Clearly Erroneous Trades**

The SEC expects the exchanges and FINRA to improve the process for breaking “clearly erroneous” trades. Of course, the primary objective should be a market structure that minimizes the need to correct erroneous trades, and the initiatives described above should do that. To the extent any erroneous trades continue to occur, however, they should be resolved promptly and consistently across markets through a transparent process with objective standards. The SROs are considering a specified percentage threshold away from the market price at which erroneous trades uniformly would be broken. This should provide market participants clarity and certainty as to whether their trades will stand in the event the market becomes particularly volatile.

### **e) Current Initiatives to Strengthen Market Integrity**

The SEC had already undertaken a number of broader initiatives to strengthen the integrity our markets, even before the events of May 6.

In January, the SEC published a concept release on equity market structure (“Market Structure Concept Release”)<sup>53</sup> that highlighted many aspects of today’s highly automated markets and requested public comment on a wide variety of issues. The

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<sup>53</sup> See Securities Exchange Act Release No. 61358 (January 14, 2010), 75 FR 3594 (January 21, 2010).

Market Structure Concept Release was designed to further the SEC's broad review of market structure to assess whether its rules have kept pace with, among other things, changes in trading technology and practices.

The events of May 6 implicate a number of issues raised in the Market Structure Concept Release. For example, the Release asked whether the current market structure appropriately minimizes the short-term volatility that can be harmful to long-term investors. It asked whether the relatively good performance of the market structure in 2008 indicated that systemic risk was appropriately minimized in the current market structure and, if not, what further steps the SEC should take to address systemic risk. Finally, it noted the dominant role of high-frequency trading firms in today's market structure and observed that they had largely replaced the role of specialists and market makers with affirmative and negative obligations for market liquidity and market quality. More specifically, the Market Structure Concept Release asked whether there is any evidence that proprietary firms increase or reduce the amount of liquidity provided to the market during times of stress. It also asked whether co-location conveyed any unfair advantage and discussed various types of short-term trading strategies, including "directional" strategies, such as "momentum ignition," that could present serious problems in today's market structure by exacerbating short-term volatility.

We are also considering whether initiatives are warranted to address destabilizing short-term trading strategies, to the extent they contributed to the May 6 market disruption. For example, a variety of directional strategies that might be employed by proprietary trading firms are discussed in the Market Structure Concept Release. It is too early to know whether short-term professional trading strategies played any role in the events of May 6. If they contributed significantly to the precipitous decline, however, we must consider whether additional regulatory requirements are necessary to prevent such strategies from threatening the fairness and integrity of the markets.

In February, moreover, the SEC adopted a short sale circuit breaker. That rule is designed to limit short selling where an individual stock is under stress and has experienced a decline of 10 percent from the previous day's close. At that point, the restrictions of the rule provide assurances to investors that short sellers are not taking the stock down. In so doing, we believe that the rule will promote investor confidence.

In addition, the SEC has published a series of concrete market structure proposals that are designed to strengthen the U.S. securities markets and to protect investors. These include the proposal to prohibit flash orders and the proposal to increase the transparency of "dark" pools of liquidity, as well as the market access proposal to strengthen broker-dealer risk management controls and the large trader reporting proposal to enhance the SEC's surveillance and enforcement capabilities. These proposals are described in greater detail below.

## **(1) Market Access Proposal**

In January, the SEC proposed a rule that would require effective risk management controls for broker-dealers with access to markets, including those providing customers sponsored access to the markets. Our proposal would effectively prohibit the growing practice by some broker-dealers of providing “unfiltered” sponsored access, where a customer is permitted to directly access the markets using the broker-dealer’s market participant identifier but without the imposition of effective pre-trade risk management controls. All broker-dealers accessing the markets should implement controls to effectively manage the risks associated with this activity, and our proposal would unequivocally require them to do so. These risks include the potential breach of a credit or capital limit, the submission of erroneous orders as a result of computer malfunction or human error, and the failure to comply with regulatory requirements. Effective risk management controls for market access arrangements are necessary to protect the broker-dealer, the markets, the financial system, and ultimately investors. Such controls would help prevent trading activity that could trigger a severe market disruption.

## **(2) Large Trader Reporting Proposal**

Last month, the SEC proposed to create a large trader reporting system that would enhance our ability to identify large market participants, collect information on their trades, and analyze their trading activity. To keep pace with rapid technological advances that have impacted trading strategies and the ways in which some market participants trade, the SEC must be able to readily identify large traders operating in the U.S. securities markets, and obtain basic identifying information on each large trader, its accounts, and its affiliates. In addition, to support its regulatory and enforcement activities, the SEC must have a mechanism to track efficiently and obtain promptly trading records on large trader activity.

The current system for collecting transaction data from registered broker-dealers is generally utilized in more narrowly-focused investigations involving trading in particular securities, and is not generally conducive to larger-scale market reconstructions and analyses involving numerous stocks during periods of peak trading volume. In addition, existing tools often require weeks or longer to compile trading data to identify potentially large traders. The SEC needs to develop the tools necessary to readily identify large traders and be able to evaluate their trading activity is heightened by the fact that large traders, including certain high-frequency traders, are playing an increasingly prominent role in the securities markets.

The proposed rule would enhance the SEC’s ability to identify those “large trader” market participants that conduct a substantial amount of trading activity in U.S. securities, as measured by volume or market value. In addition, the proposal would facilitate the SEC’s ability to obtain from broker-dealers records of large trader activity. By providing the SEC with prompt access to information about large traders and their trading activity, the proposed rule is intended to facilitate the SEC’s efforts in



reconstructing market activity and performing analyses of trading data, as well as assist in investigations of manipulative, abusive, and other illegal trading activity.

### **(3) Consideration of Consolidated Audit Trail Proposal**

As noted above, SEC staff have been working, in consultation with SROs and others, on a rule proposal that would require the SROs to jointly develop, implement and maintain a consolidated order tracking system, or consolidated audit trail. If adopted, this rule proposal should result in a continuous reporting mechanism for market participants that would capture the data needed for effective cross-market surveillance. The proposed changes would significantly improve the SEC's ability to conduct timely and accurate trading analyses for market reconstructions and complex investigations, as well as inspections and examinations. For example, the proposed consolidated audit trail would enable the SEC to access in real time the majority of the data needed to reconstruct the type of market disruption that occurred on May 6, with remaining information available within a matter of days rather than weeks.

## **2. Futures Markets**

### **a) Review of Electronic Trading and Market Access**

CFTC staff will also continue our analysis, already begun by our Office of Chief Economist, of liquidity provision in futures markets, with a particular focus on electronic trading. The subjects to be reviewed here include high frequency and algorithmic trading, automatic execution innovations on trading platforms, market access issues, and co-location.

### **b) Review of Co-Location**

CFTC staff is considering a proposed rulemaking with respect to exchange co-location and proximity hosting services. The purpose of the proposed rule would be to ensure that all otherwise qualified and eligible market participants that seek co-location or proximity hosting services offered by futures exchanges have equal access to such services without barriers that exclude access, or that bar otherwise qualified third-party vendors from providing co-location and/or proximity hosting services. Another purpose of the proposal would be to ensure that futures exchanges that offer co-location or proximity hosting services disclose publically the latencies for each available connectivity option, so that participants can make informed decisions.

### **c) Additional Analysis of Large Traders and Review of OTC Swaps**

The CFTC will continue reviewing information from a special call on major swap traders for their trading activity on May 6, 2010. A special call is a CFTC directive to a trader holding a reportable position to furnish any pertinent information concerning the

trader's positions, transactions, or activities.<sup>54</sup> A reportable position in the E-mini S&P 500 futures contract is 1,000 contracts.<sup>55</sup> There will also be a review of special call information about the activity of swap dealers in over-the-counter broad-based security index derivatives markets on May 6, 2010. Staff also will continue its detailed review of trader activity on May 6 through a comprehensive examination of trade-register data.

#### **d) Automation of Account Identification**

CFTC staff will also be considering possible rules to enhance the CFTC's surveillance capabilities. These measures include automation of the statement of reporting traders in the large trader reporting system and obtaining account ownership and control information in the exchange trade registers.<sup>56</sup> These initiatives would increase the timeliness and efficiency of account identification, an essential step in data analysis.

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<sup>54</sup> 17 CFR 18.05.

<sup>55</sup> 17 CFR 15.03.

<sup>56</sup> 17 CFR 18.04.

## APPENDIX A

### Overview of the Securities Market Structure

#### A. The National Market System and Regulation NMS

In Section 11A of the Securities Exchange Act of 1934 (added to the Exchange Act in 1975), Congress directed the SEC to facilitate the establishment of a national market system for securities in accordance with specified findings and objectives. Congress recognized that the securities markets are an important national asset that must be preserved and strengthened, and that new data processing and communications techniques create the opportunity for more efficient and effective market operations. It mandated a national market system composed of multiple competing markets that are linked through technology. A national market system should be contrasted with a structure in which trading is confined to a single trading venue, such as one particular exchange. Congress determined that promoting competition among trading venues and giving as many market makers as possible an opportunity to provide liquidity in stocks would promote greater liquidity and price continuity than a single dominant trading venue.

Over the years, the SEC has sought to keep market structure rules up-to-date with continually changing economic conditions and technology advances. The most recent major updating of the national market system rules occurred in 2005, when the SEC adopted Regulation NMS.<sup>57</sup> Regulation NMS addresses four areas: (1) a “trade-through” rule that prevents the execution of trades at prices that are inferior to a displayed and immediately accessible quotation on another trading venue; (2) an “access” rule that, among other things, promotes private linkages among market participants and trading venues; (3) a “sub-penny” rule that prohibits the display, ranking, or accepting of orders with sub-penny prices; and (4) amendments to the joint-industry plans for collecting and distributing consolidated market data to the public.

The trade-through rule<sup>58</sup> is probably the most well-known aspect of Regulation NMS and arguably has affected the equities markets most significantly since it was adopted in 2005. The Regulation NMS trade-through rule eliminated a prior rule that benefited dominant exchanges with trading floors by protecting their manual quotations (that is, orders were required to be routed to the exchange in an attempt to access a manual quotation that could take as long as 10-20 seconds, rather than to another venue with an immediately accessible quotation at an inferior price).

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<sup>57</sup> See Securities Exchange Act Release No. 51808 (June 9, 2005), 70 FR 37496 (June 29, 2005) (“Regulation NMS Release”).

<sup>58</sup> 17 CFR 242.611.

To compete under the new regulatory structure, all exchanges developed electronic systems that are capable of providing immediate responses to incoming orders and updating their quotations immediately. These systems enable the exchanges to display quotations that are protected against trade-throughs. Trade-through protection was designed to promote best execution and price stability by preventing one trading venue from ignoring the immediately accessible quotations of another trading venue in a downturn (as well as upturn). However, the trade-through rule does not protect a trading venue's quotation if it is not immediately accessible.

## **B. The Nature of Trading in the Current Equities Market Structure**

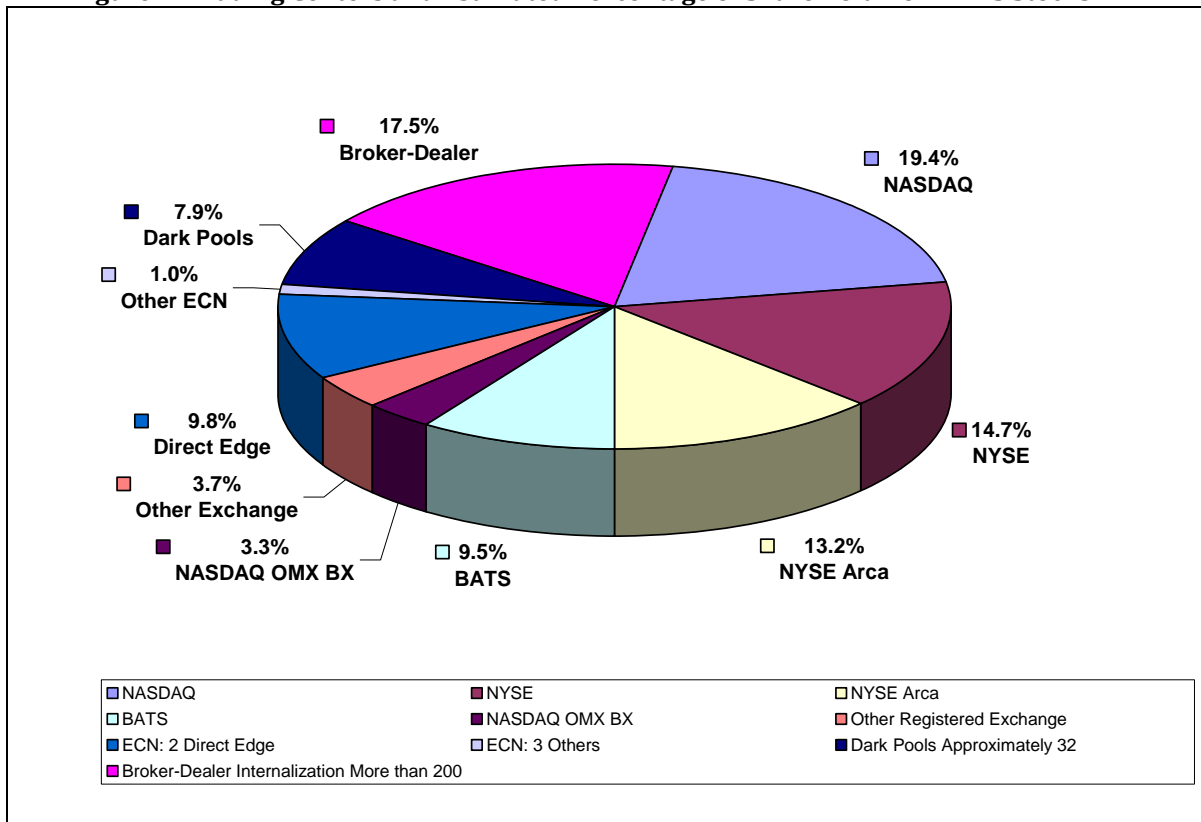
### **1. Trading Centers**

At least partly as a result of Regulation NMS, trading in U.S-listed stocks has changed dramatically in recent years. Trading volume now is dispersed among many different trading venues. For example, the share of the New York Stock Exchange in the trading in NYSE-listed stocks declined from 79.1 percent in 2005 to 25.1 percent in 2009. National securities exchanges and another type of trading venue, electronic communications networks ("ECNs"), both display quotations in the consolidated quotation data that is widely distributed to the public. In addition, two other types of trading centers exist – dark pools and broker-dealers that execute trades internally – neither of which display quotations in the consolidated quotation data. Nevertheless, more than 70 percent of volume continues to be executed by public trading venues that display quotations across a wide range of U.S-listed stocks. Figure 1 below sets forth the major types of trading venues, along with estimates of their trading volume in September 2009.<sup>59</sup>

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<sup>59</sup> Sources of estimated trading volume percentages: NASDAQ; NYSE Group; BATS; Direct Edge; data compiled from Forms ATS for 3d quarter 2009.

**Figure 1: Trading Centers and Estimated Percentage of Share Volume in NMS Stocks**



Registered exchanges (such as NASDAQ, NYSE, NYSE Arca and BATS, among others) must undertake self-regulatory responsibility for their members and file their proposed rule changes for approval with the SEC. These proposed rule changes publicly disclose, among other things, the trading services and fees of exchanges.

The registered exchanges all have adopted highly automated trading systems that can offer extremely high-speed, or “low-latency,” order responses and executions. The average response times at some exchanges, for example, have been reduced to less than 1 millisecond.<sup>60</sup> Many exchanges also offer individual data feeds that deliver information concerning their orders and trades directly to customers. To further increase speed in transmitting market data and order messages, many exchanges also offer co-location services that enable exchange customers to place their servers in close proximity to the exchange’s matching engine.

Registered exchanges typically offer a wide range of order types for trading on their automated systems. Some of their order types are displayable in full if they are not

<sup>60</sup> See, e.g., BATS Exchange, Inc., [http://batstrading.com/resources/features/bats\\_exchange\\_Latency.pdf](http://batstrading.com/resources/features/bats_exchange_Latency.pdf) (June 2009) (average latency (time to accept, process, and acknowledge or fill order) of 320 microseconds; NASDAQ, <http://www.nasdaqtrader.com/trader.aspx?id=inet> (December 12, 2009) (average latency (time to accept, process, and acknowledge or fill order) of 294 microseconds).

executed immediately. Others are undisplayed, in full or in part. For example, a reserve order type will display part of the size of an order at a particular price, while holding the balance of the order in reserve and refreshing the displayed size as needed. In general, displayed orders are given execution priority at any given price over fully undisplayed orders and the undisplayed size of reserve orders.<sup>61</sup>

In addition, many exchanges have adopted a “maker-taker” pricing model in an effort to attract liquidity providers. Under this model, non-marketable, resting orders that offer (make) liquidity at a particular price receive a liquidity rebate if they are executed, while incoming orders that execute against (take) the liquidity of resting orders are charged an access fee. Rule 610(c) of Regulation NMS caps the amount of the access fee for executions against the best displayed prices of an exchange at 0.3 cents per share. Exchanges typically charge a somewhat higher access fee than the amount of their liquidity rebates, and retain the difference as compensation. Sometimes, however, exchanges have offered “inverted” pricing and pay a liquidity rebate that exceeds the access fee.

#### **b) ECNs**

ECNs, as well as dark pools (discussed below) are regulated as alternative trading systems (“ATs”). The key characteristic of an ECN is that it provides its best-priced orders for inclusion in the consolidated quotation data, whether voluntarily or as required by Rule 301(b)(3) of Regulation ATS. In general, ECNs offer trading services (such as displayed and undisplayed order types, maker-taker pricing, and data feeds) that are analogous to those of registered exchanges.

#### **c) Dark Pools**

Dark pools are ATs that, in contrast to ECNs, do not provide their best-priced orders for inclusion in the consolidated quotation data. In general, dark pools offer trading services to institutional investors and others that seek to execute large trading interest in a manner that will minimize the movement of prices against the trading interest and thereby reduce trading costs. There are approximately 32 dark pools that actively trade NMS stocks.<sup>62</sup> ATs (both dark pools and ECNs) fall within the statutory definition of an exchange, but are exempted if they comply with Regulation ATS.

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<sup>61</sup> See, e.g., BATS Exchange, Inc., Rule 11.12 (equally priced trading interest executed in time priority in the following order: (1) displayed size of limit orders; (2) non-displayed limit orders; (3) pegged orders; (4) mid-point peg orders; (5) reserve size of orders; and (6) discretionary portion of discretionary orders); NASDAQ Rule 4757(a)(1) (book processing algorithm executes trading interest in the following order: (1) displayed orders; (2) non-displayed orders and the reserve portion of quotes and reserve orders (in price/time priority among such interest); and (3) the discretionary portion of discretionary orders).

<sup>62</sup> Data compiled from Forms ATS submitted to Commission for 3d quarter 2009. Some OTC market makers offer dark liquidity primarily in a principal capacity and do not operate as ATs. For purposes of this report, such trading centers are not defined as dark pools because they are not ATs. They may, however, offer electronic dark liquidity services that are analogous to those offered by dark pools.

Regulation ATS requires ATSs to be registered as broker-dealers with the SEC, which entails becoming a member of the Financial Industry Regulatory Authority (“FINRA”) and fully complying with the broker-dealer regulatory regime. Unlike a registered exchange, an ATS is not required to file proposed rule changes with the SEC or otherwise publicly disclose its trading services and fees. ATSs also do not have any self-regulatory responsibilities, such as market surveillance.

Dark pools can vary quite widely in the services they offer their customers. For example, some dark pools, such as block crossing networks, offer specialized size discovery mechanisms that attempt to bring large buyers and sellers in the same NMS stock together anonymously and to facilitate a trade between them. The average trade size of these block crossing networks can be as high as 50,000 shares.<sup>63</sup> Most dark pools, though they may handle large orders, primarily execute trades with small sizes that are more comparable to the average size of trades in the public markets, which was less than 300 shares in July 2009.<sup>64</sup> These dark pools that primarily match smaller orders (though the matched orders may be “child” orders of much larger “parent” orders) execute more than 90% of dark pool trading volume.<sup>65</sup> The majority of this volume is executed by dark pools that are sponsored by multi-service broker-dealers. These broker-dealers also offer order routing services, trade as principal in the sponsored ATS, or both.

#### **d) Broker-Dealer Internalization**

The other type of undisplayed trading center is a non-ATS broker-dealer that internally executes trades, whether as agent or principal. Notably, many broker-dealers may submit orders to exchanges or ECNs, which then are included in the consolidated quotation data. The internalized executions of broker-dealers, however, primarily reflect liquidity that is not included in the consolidated quotation data. There are a large number of broker-dealers that execute trades internally in NMS stocks.<sup>66</sup>

Broker-dealers that internalize executions generally fall into two categories – OTC market makers<sup>67</sup> and block positioners.<sup>68</sup> Broker-dealers that act as OTC market

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<sup>63</sup> See, e.g., <http://www.liquidnet.com/about/liquidStats.html> (average U.S. execution size in July 2009 was 49,638 shares for manually negotiated trades via Liquidnet’s negotiation product); <http://www.pipelinetrading.com/AboutPipeline/CompanyInfo.aspx> (average trade size of 50,000 shares in Pipeline).

<sup>64</sup> See, e.g., <http://www.nasdaqtrader.com/trader/asp?id=marketshare> (average size of NASDAQ matched trades in July 2009 was 228 shares); <http://nyxdata.com/nysedata/asp/factbook> (NYSE Group average trade size in all stocks traded in July 2009 was 267 shares).

<sup>65</sup> Data compiled from Forms ATS submitted to Commission for 3d quarter 2009.

<sup>66</sup> For example, more than 200 publish execution quality statistics under Rule 605 of Regulation NMS.

<sup>67</sup> An OTC market maker is defined in Rule 600(b)(52) of Regulation NMS as “any dealer that holds itself out as being willing to buy and sell to its customers, or others, in the United States, an NMS stock for its own account on a regular or continuous basis otherwise than on a national securities exchange in amounts of less than block size.”

makers and block positioners conduct their business primarily by directly negotiating with customers or with other broker-dealers representing customer orders. OTC market makers, for example, appear to handle a very large percentage of marketable (immediately executable) order flow of individual investors that is routed by retail brokerage firms.<sup>69</sup>

#### e) Market Linkages

In adopting Regulations NMS, the SEC also included an “access” rule that, among other things, promotes private linkages among market participants and trading venues. In contrast to some markets where trading is concentrated on a single exchange or market, because liquidity on the equity markets is dispersed across a large number of trading centers of different types, linking the various trading venues is critical to the successful operation of the national market system.

Rule 611 of Regulation NMS provides protection against trade-throughs.<sup>70</sup> A trade-through is the execution of a trade at a price inferior to a protected quotation for an NMS stock. A protected quotation must be displayed by an automated trading center, must be disseminated in the consolidated quotation data, and must be an automated quotation that is the best bid or best offer of a national securities exchange or FINRA.<sup>71</sup> Importantly, Rule 611 applies to all trading centers, not just those that display protected quotations. Trading center is defined broadly in Rule 600(b)(78) to include, among others, all exchanges, all ATSS (including ECNs and dark pools), all OTC market makers, and any other broker-dealer that executes orders internally, whether as agent or principal. In practice, the national best bid and national best offer (“NBBO”)<sup>72</sup> is the best bid and best offer from among the protected quotations, *i.e.*, the best bid and best offer of all the stock exchanges and FINRA’s ADF.<sup>73</sup>

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<sup>68</sup> “Block size” is defined in Rule 600(b)(9) of Regulation NMS as an order of at least 10,000 shares or for a quantity of stock having a market value of at least \$200,000. A block positioner generally means any broker-dealer in the business of executing, as principal or agent, block size trades for its customers. To facilitate trades, block positioners often commit their own capital to trade as principal with at least some part of the customer’s block order.

<sup>69</sup> For example, a 2<sup>nd</sup> quarter of 2009 review of the order routing disclosures required by Rule 606 of Regulation NMS of eight broker-dealers with significant retail customer accounts reveals that nearly 100% of their customer market orders are routed to OTC market makers. The review also indicates that most of these retail brokers either receive payment for order flow in connection with the routing of orders or are affiliated with an OTC market maker that executes the orders.

<sup>70</sup> Rule 611(a)(1) requires all trading centers to establish, maintain, and enforce written policies and procedures that are reasonably designed to prevent trade-throughs of protected quotations, subject to certain exceptions set forth in Rule 611(b).

<sup>71</sup> FINRA operates the Alternative Display Facility (“ADF”), a display-only facility that permits its participants to display quotations and report trades, among other things.

<sup>72</sup> 17 CFR 242.600(b)(42).

<sup>73</sup> Technically, the NBBO may include the best bid and best offer of a stock exchange or the ADF even if is non-automated (*i.e.*, manual). In practice, however, all such markets are fully automated with the exception of NYSE (and NYSE Amex, which operates on the same system as NYSE) for



Protection against trade-throughs is an important linkage among trading centers because it provides a baseline assurance that: (1) marketable orders will receive at least the best displayed price, regardless of the particular trading center that executes the order or where the best price is displayed in the national market system; and (2) quotations that are displayed at one trading center will not be bypassed by trades with inferior prices at any trading center in the national market system.

Rule 611 also helps promote linkages among trading centers by encouraging them, when they do not have available trading interest at the best price, to route marketable orders to a trading center that is displaying the best price. Although Rule 611 does not directly require such routing services (a trading center can, for example, cancel and return an order when it does not have the best price), competitive factors have led many trading centers to offer routing services to their customers. With Regulation NMS, the SEC adopted a “private linkages” approach that relies exclusively on brokers to provide routing services, both among exchanges and between customers and exchanges.<sup>74</sup> Under this approach, market participants obtain access to the various trading centers through broker-dealers that are members or subscribers of the particular trading center.<sup>75</sup> Rule 610(a) of Regulation NMS, for example, prohibits an SRO trading facility from imposing unfairly discriminatory terms that would prevent or inhibit any person from obtaining efficient access through an SRO member to the displayed quotations of the SRO trading facility.<sup>76</sup>

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which, when it hits a liquidity replenishment point for a given security, its quotation becomes non-firm and thus is not included in the calculation of the NBBO.

<sup>74</sup> Prior to Rule 611, exchanges routed orders through an inflexible, partially manual system called the Intermarket Trading System (“ITS”). See Regulation NMS Release, 70 FR at 37538-37539 (“Although ITS promotes access among participants that is uniform and free, it also is often slow and limited.”).

<sup>75</sup> See Regulation NMS Release, 70 FR at 37540 (“[M]any different private firms have entered the business of linking with a wide range of trading centers and then offering their customers access to those trading centers through the private firms’ linkages. Competitive forces determine the types and costs of these private linkages.”).

<sup>76</sup> In addition, Rule 610(c) limits the fees that a trading center can charge for access to its displayed quotations at the best prices. Rule 611(d) requires SROs to establish, maintain, and enforce rules that restrict their members from displaying quotations that lock or cross previously displayed quotations.

Section 6(a)(2) of the Exchange Act requires registered exchanges to allow any qualified and registered broker-dealer to become a member of the exchange – a key element in assuring fair access to exchange services. In contrast, the access requirements that apply to ATSs are much more limited. Regulation ATS includes two distinct types of access requirements: (1) order display and execution access in Rule 301(b)(3); and (2) fair access to ATS services in general in Rule 301(b)(5). An ATS must meet order display and execution access requirements if it displays orders to more than one person in the ATS and exceeds a 5% trading volume threshold. An ATS must meet the general fair access requirement if it exceeds a 5% trading volume threshold. If an ATS neither displays orders to more than one person in the ATS nor exceeds a 5% trading volume threshold, Regulation ATS does not impose access requirements on the ATS.

In a dispersed and complex market structure with many different trading centers offering a wide spectrum of services, brokers play a significant role in linking trading centers together into a unified national market system. Brokers compete to offer the sophisticated technology tools that are needed to monitor liquidity at many different venues and to implement order routing strategies. To perform this function, brokers may monitor the execution of orders at both displayed and undisplayed trading centers to assess the availability of undisplayed trading interest. Brokers may, for example, construct real-time “heat maps” in an effort to discern and access both displayed and undisplayed liquidity at trading centers throughout the national market system.

Using their knowledge of available liquidity, many brokers offer smart order routing technology to access such liquidity. Many brokers also offer sophisticated algorithms that will take the large orders of institutional investors and others, divide a large “parent” order into many smaller “child” orders, and route the child orders over time to different trading centers in accordance with the particular trading strategy chosen by the customer. Such algorithms may be “aggressive,” for example, and seek to take liquidity quickly at many different trading centers, or they may be “passive,” and submit resting orders at one or more trading centers and await executions at favorable prices. To the extent they help customers cope with the dispersal of liquidity among a large number of trading centers of different types and achieve the best execution of their customers’ orders, the routing services of brokers can contribute to the broader policy goal of promoting efficient markets.

The linkage function of brokers also is supported by a broker’s legal duty of best execution. This duty requires a broker to obtain the most favorable terms reasonably available when executing a customer order.<sup>77</sup> Of course, this legal duty is not the only pressure on brokers to obtain best execution. The existence of strong competitive pressure to attract and retain customers encourages brokers to provide high quality routing services to their customers.<sup>78</sup>

#### **f) Professional Liquidity Providers on Exchanges and ECNs**

Liquidity on equities exchanges and ECNs is derived from orders to buy or sell securities as well as quotations submitted by members of an exchange that are registered as market makers. Professional liquidity providers are proprietary traders in the business of providing liquidity to the market, often through the submission of limit orders that rest on the electronic order books of exchanges and ECNs.<sup>79</sup> They include registered entities,

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<sup>77</sup> See, e.g., Regulation NMS Release, 70 FR at 37537-37538 (discussion of duty of best execution).

<sup>78</sup> In this regard, Rules 605 and 606 of Regulation NMS are designed to support competition by enhancing the transparency of order execution and routing practices. Rule 605 requires market centers to publish monthly reports of statistics on their order execution quality. Rule 606 requires brokers to publish quarterly reports on their routing practices, including the venues to which they route orders for execution.

<sup>79</sup> As noted above, over-the-counter market makers also provide liquidity by trading chiefly with customer orders.

such as exchange specialists and market makers, as well as unregistered proprietary trading firms that engage in passive market making and other types of trading strategies. As discussed below, some types of professional liquidity providers have certain obligations, such as to provide liquidity whether the market is up or down and maintain fair and orderly markets. Other professional liquidity providers do not have such responsibilities, including some of the high frequency proprietary trading firms that also are discussed below.

### (1) Market Makers

In general, the rules of national securities exchanges allow a member, on a voluntary basis, to register as a market maker on a security-by-security basis and subject to certain obligations. While the rules of a national securities exchange may contain provisions that provide for market makers, these rules do not require any member to register as a market maker.<sup>80</sup> Accordingly, an exchange may not have registered market makers even though its rulebook provides for them. In addition, the rules of many exchanges permit multiple members to register as market makers for the same security.

Pursuant to exchange rules, registered market makers are required to engage in a course of dealings for their own account to assist in the maintenance, insofar as reasonably practicable, of fair and orderly markets. These exchange rules generally require a market maker to maintain a continuous two-sided quotation in the security or securities for which the member is registered as a market maker. Such rules, however, do not generally dictate the prices at which a market maker must quote. For example, when a market maker's liquidity has been exhausted, or if it is unwilling to provide liquidity, it may at that time submit what is called a stub quote – for example, an offer to buy a given stock at a penny – to comply with its obligation to maintain a continuous two-sided quotation.<sup>81</sup> Previously, market makers' quotations were required to be “reasonably related to the prevailing market.” In requesting the deletion of this requirement, exchanges argued that the market structure had changed since the requirement was originally introduced in 1987 and that the requirement was no longer a meaningful means of ensuring market execution quality because of the highly competitive and increasingly automated environment of equities trading, and also because markets were required to abide by the trade-through protections of Regulation NMS.<sup>82</sup> In addition, it was believed that the duty of best execution would ensure that market makers with the most competitive quotations receive executions and thereby provide incentives for them to

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<sup>80</sup> In addition, the Exchange Act does not require a national securities exchange to have market makers. See, e.g., Securities Exchange Act Release Nos. 61698 (March 12, 2010), 75 FR 13151 (March 18, 2010) (order granting the exchange registration of EDGX Exchange, Inc. and EDGA Exchange, Inc.).

<sup>81</sup> See, e.g. Nasdaq Rule 4613; NYSE Arca Equities Rule 7.23; and BATS Rule 11.8.

<sup>82</sup> See Securities Exchange Act Release No. 56586 (October 1, 2007), 72 FR 57085 (October 5, 2007) (SR-NASDAQ-2007-069).

quote at or near the NBBO, and that the quality of a market maker's executions could also be reviewed by looking at market execution quality reports.<sup>83</sup>

Certain exchanges have a single market maker for each security traded on that exchange. In the past, NYSE maintained a "specialist"-based market structure, with the specialist serving as the market professional that managed trading in the specific securities he was assigned.<sup>84</sup> The NYSE specialist was responsible for the execution of all orders coming into the Exchange, for conducting auctions on the NYSE floor, and for maintaining an orderly market in assigned securities. Specialists' dealer activities were governed, in part, by negative and affirmative trading obligations. Rule 11b-1 under the Exchange Act<sup>85</sup> requires exchanges that permit members to register as specialists to have rules governing specialists' dealer transactions so that their proprietary trades conform to the negative and affirmative obligations. The negative obligation as set forth in Rule 11b-1 under the Act requires that a specialist's dealings be restricted, so far as practicable, to those reasonably necessary to permit the specialist to maintain a fair and orderly market.<sup>86</sup> The affirmative obligation as set forth in Rule 11b-1 under the Act requires a specialist to engage in a course of dealings for its own account to assist in the maintenance, so far as practicable, of a fair and orderly market.<sup>87</sup>

In 2008, in order to adapt to the more electronic marketplace and increased competition from other trading venues, NYSE replaced its specialist system with a system of "Designated Market Makers" ("DMMs"). DMMs are similar to specialists in many ways, including in that there is only a single DMM on NYSE for each stock. Some obligations, such as the negative obligations specialists were subject to, no longer apply to DMMs. In addition, DMMs now have the ability to trade on parity with other market participants, as well as functionality reserved solely for DMMs that permits them to transmit a schedule setting forth additional liquidity that DMMs commit to provide in their assigned securities at specific price points. At the same time, DMMs are subject to other responsibilities, some the same as those previously imposed on specialists and others new. For example, DMMs are subject to quoting depth guidelines and are obligated to maintain a bid or an offer at the NBBO for a certain percentage of the trading day.

## (2) High Frequency Traders

Highly automated trading systems have helped enable a business model for a new type of professional liquidity provider that is distinct from the more traditional exchange specialist and over-the-counter ("OTC") market maker. In particular, proprietary traders

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<sup>83</sup> Id.

<sup>84</sup> Section 11(b) of the Exchange Act allows the rules of a national securities exchange to permit a member to be registered as a specialist and act as both a broker and a dealer. 15 U.S.C. 78k(b).

<sup>85</sup> 17 CFR 240.11b-1.

<sup>86</sup> 17 CFR 240.11b-1(a)(2)(iii).

<sup>87</sup> 17 CFR 240.11b-1(a)(2)(ii).

now use high speed systems by submitting large numbers of orders that can result in more than 1 million trades per day by a single firm. These proprietary traders often are labeled as engaging in high-frequency trading (“HFT”), though the term does not have a settled definition and may encompass a variety of strategies in addition to passive market making.

HFT traders can be organized in a variety of ways, including as a proprietary trading firm (which may or may not be a registered broker-dealer and member of FINRA), as the proprietary trading desk of a multi-service broker-dealer, or as a hedge fund (all of which are referred to hereinafter collectively as a “proprietary firm”). Other characteristics often attributed to proprietary firms engaged in HFT are: (1) the use of extraordinarily high-speed and sophisticated computer programs for generating, routing, and executing orders; (2) use of co-location services and individual data feeds offered by exchanges and others to minimize network and other types of latencies; (3) very short time-frames for establishing and liquidating positions; (4) the submission of numerous orders that are cancelled shortly after submission; and (5) ending the trading day in as close to a flat position as possible (that is, not carrying significant, unhedged positions over-night). Given the competitive pressures to maximize their speed of trading, HFT firms typically will attempt to streamline the code for their trading algorithms. However, every check and filter in that code reduces its speed, creating a tension.

HFT is one of the most significant market structure developments in recent years. Estimates of HFT volume in the equity markets vary widely, though they often are 50 percent of total volume or higher.<sup>88</sup> By any measure, HFT is a dominant component of the current market structure and is likely to affect nearly all aspects of its performance. In addition, though the term HFT implies a large volume of trades, some of the concerns that have been raised about particular strategies used by proprietary firms do not necessarily involve a large number of trades. Indeed, any particular proprietary firm may simultaneously be employing many different strategies, some of which generate a large number of trades and some that do not. Conceivably, some of these strategies – for example, if they dampen short-term volatility or promote efficient pricing by narrowing spreads – may benefit market quality and long-term investors and others could be harmful.

#### **g) Relevant Equity Market Structure Features**

A number of features relating to the equity markets are relevant to the events of May 6, 2010 and are discussed below:

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<sup>88</sup> See, e.g., Jonathan Spicer and Herbert Lash, Who’s Afraid of High-Frequency Trading?, Reuters.com, December 2, 2009 (available at <http://www.reuters.com/article/idUSN173583920091202>) (“High-frequency trading now accounts for 60 percent of total U.S. equity volume, and is spreading overseas and into other markets.”); Scott Patterson and Geoffrey Rogow, What’s Behind High-Frequency Trading, Wall Street Journal, August 1, 2009 (“High frequency trading now accounts for more than half of all stock-trading volume in the U.S.”).

## (1) Order Types

*Market Orders:* In certain cases, and particularly for illiquid securities, a large order or influx of orders can soak up available liquidity across the market, resulting in an order, particularly if it is a market order, breaking through many price levels in an effort to obtain an execution at any price. A market order is an order to buy or sell a stock at the best available market price. Market orders do not require an execution at a specific price or price range. With market orders, the order submitted is generally assured an execution; however, there is no limit on what the execution price can be. This contrasts with limit orders, which are submitted with a specified limit price. Limit orders guard against executions at prices at which the order submitter is not willing to trade, though the trade-off is that the order may not be executed if the market suddenly moves away from the specified limit price.

Stop loss market orders are orders that turn into market orders when the stop price of the order is reached. When an investor places a stop loss market order to sell, the investor is instructing the broker to sell a stock at the market if it falls to a certain price. In a normal market, where liquidity exists as the stock price goes up or down, this strategy can protect an investor from taking a major loss if the stock drops significantly by selling at a predetermined price to minimize the loss. However, during times of extreme market volatility, the use of market orders when stop loss levels are triggered could result in executions at aberrant prices if all other liquidity has already been exhausted.

The rules of some exchanges provide a “collar” for market orders. For example, on BATS, any portion of a market order that would otherwise execute at a price more than \$0.50 or 5 percent worse than the NBBO at the time the order initially reaches the exchange, whichever is greater, will be cancelled.<sup>89</sup> BATS’s market order thresholds are intended to help avoid executions on BATS of market orders at prices that are significantly worse than the initial NBBO, particularly in thinly-traded securities. BATS market participants that intend to trade against liquidity at price points beyond the market order thresholds can specify that intent by instead submitting a marketable limit order.<sup>90</sup>

Similarly, on NASDAQ, subject to certain exceptions,<sup>91</sup> market orders (called “Unpriced Orders” on NASDAQ) are “Collared Orders” that, for any portion of a Collared Order that would execute at a price more than \$0.25 or 5 percent worse than the NBBO at the time when the order reaches NASDAQ, whichever is greater, will be cancelled. In proposing to adopt its collar for market orders, NASDAQ stated that it was intended to reduce the risk that unpriced orders might execute at prices significantly

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<sup>89</sup> BATS Rule 11.9(a)(2).

<sup>90</sup> See Securities Exchange Act Release No. 34-59258 (January 15, 2009), 74 FR 4788 (January 27, 2009) (SR-BATS-2009-001).

<sup>91</sup> Unpriced Orders would not be Collared Orders for: (1) Market On Open Orders; (2) Market On Close Orders; (3) Unpriced Orders included in a Nasdaq Halt Cross or Nasdaq Imbalance Cross; or (4) Unpriced Orders that are Reference Price Cross Orders. See Nasdaq Rule 4751(e)(13).

worse than the NBBO. Nasdaq noted that market participants generally expect that their orders will be executed in full at a price reasonably related to the prevailing market, but that participants might not be aware if there is insufficient liquidity at or near the NBBO to fill the entire order, particularly for thinly-traded securities.<sup>92</sup>

*Intermarket Sweep Orders:* Regulation NMS also introduced the use of intermarket sweep orders. An intermarket sweep order is a limit order that meets the following requirements: (1) when routed to a trading center, the limit order is identified as an intermarket sweep order; and (2) simultaneously with the routing of the limit order identified as an intermarket sweep order, one or more additional limit orders, as necessary, are routed to execute against the full displayed size of all protected quotations with a superior price.<sup>93</sup> These additional limit orders must be marked as intermarket sweep orders to allow the receiving market center to execute the order immediately without regard to better-priced quotations displayed at other trading centers (by definition, each of the additional limit orders would meet the requirements for an intermarket sweep order).

A trading center may immediately execute any order identified as an intermarket sweep order.<sup>94</sup> It therefore need not delay its execution for the updating of the better-priced quotations at other trading centers to which orders were routed simultaneously with the intermarket sweep order. A trading center itself may also route out intermarket sweep orders and thereby clear the way for immediate internal executions at the trading center.<sup>95</sup>

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<sup>92</sup> See Securities Exchange Act Release No. 60371 (July 23, 2009), 74 FR 38075 (July 30, 2009) (SR-Nasdaq-2009-070).

<sup>93</sup> Rule 600(b)(3) of Regulation NMS. 17 CFR 242.600(b)(3).

<sup>94</sup> Rule 611(b)(5) of Regulation NMS. 17 CFR 242.611(b)(5).

<sup>95</sup> Rule 611(b)(6) of Regulation NMS. 17 CFR 242.611(b)(6).

To illustrate the operation of intermarket sweep orders, assume that a broker-dealer's customer wished to sell a large amount of a stock. Trading Center A is displaying the national best bid of 500 shares at \$10.00, along with quotations in its proprietary depth-of-book data feed of 1500 shares at \$9.99, and 5000 shares at \$9.97. The customer decides to sweep all liquidity on Trading Center A down to \$9.97. Assume also that Trading Center B is displaying a protected bid of 2000 shares at \$9.99, Trading Center C is displaying a protected bid of 400 shares at \$9.98, and Trading Center D is displaying a protected bid of 200 shares at \$9.97. The broker-dealer could execute this trade for its customer, subject to its best execution responsibilities, by simultaneously routing the following orders: (1) an intermarket sweep order to Trading Center A with a limit price of \$9.97 and a size of 7000 shares; (2) an intermarket sweep order to Trading Center B with a limit price of \$9.99 and a size of 2000 shares; and (3) an intermarket sweep order to Trading Center C with a limit price of \$9.98 and a size of 400 shares.

All of these orders would meet the requirements of the definition of intermarket sweep orders because the necessary orders simultaneously were routed to execute against the displayed size of all better-priced protected quotations. Trading Centers A, B, and C all could execute their orders immediately without regard to the protected quotations displayed at other trading centers. No order would need to be routed to Trading Center D because the price of its bid was not superior to the most inferior limit price of the order routed to Trading Center A. Assuming the customer obtained a fill for each of its orders at the displayed prices and sizes, it would have been able to

## (2) Temporary Unavailability of Market-Specific Liquidity

*Liquidity Replenishment Points:* NYSE utilizes a hybrid floor/electronic trading model, unlike most other markets today which are fully electronic. In attempting to meld the traditional open-outcry floor-based auction model with today's technology, NYSE's trading system utilizes what are known as "liquidity replenishment points" ("LRPs").<sup>96</sup> LRPs are best thought of as a "speed bump" and are intended to dampen volatility in a given stock by temporarily converting from an automated market to a manual auction market when a price movement of sufficient size is reached. In such a case, trading on NYSE in that stock will "go slow" and pause for a time period to allow the Designated Market Maker to solicit additional liquidity before returning to an automated market. This "speed bump" occurs even when there may be additional interest on NYSE's book beyond the LRP price point.

LRPs are calculated by NYSE automatically throughout the trading day. Specifically, the LRP is calculated upon the opening trade of the day in the security or, if there is no opening trade, on the opening quote, and is recalculated (i) every 30 seconds thereafter based on the last sale; (ii) after a manual trade by the DMM; (iii) when automatic executions resume after an LRP is reached; and (iv) upon the first sale or quote after automatic executions resume following an LRP. The precise LRP value varies according to the security's share price and average daily volume within specified ranges. LRPs are calculated by adding or subtracting the LRP value to the last sale price or quote as appropriate on the exchange in the relevant security.<sup>97</sup>

When an incoming order on the NYSE would result in an execution [at or] outside an LRP or the stock is quoted outside an LRP, automatic executions in the security are suspended on that side of the market. In addition, NYSE will suspend automated quotations in the security, and will identify its quote on the consolidated tape with a "non-firm" indicator. This is referred to as a "slow market" or "going slow" in the security. NYSE will resume automated quotations and automatic executions as soon as possible after an LRP is reached, once the DMM manually determines the reopening price. In many cases, this occurs in a fraction of a second, but when the market is particularly volatile, it can take a minute or more. Upon resumption of automatic executions, a new LRP is calculated for the security. On days of major market volatility, stocks with significant and continual declines may cause NYSE trading to remain in the "go slow" mode for extended periods or to intermittently return to automated execution status before quickly again hitting another LRP and thereby "going slow" again.

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obtain an immediate execution of a 9400-share trade by sweeping through four price levels at Trading Center A, while also honoring the protected quotations at two other trading centers.

<sup>96</sup> For example, if the last sale price in a security is \$20 and the LRP value is \$0.40, an LRP would be reached at \$20.40 on the upside or \$19.60 on the downside.

<sup>97</sup> NYSE Rule 1000(a)(iv).



*Self-Help:* An exchange may exclude the quotations of another exchange from its determination of whether the other exchange has a better “protected” price to which it must route orders for execution under Regulation NMS if that other exchange is experiencing a failure, material delay, or malfunction in its systems or equipment.<sup>98</sup> This is known as invoking “self-help” against the other exchange.<sup>99</sup> This mechanism gives trading centers a remedy if another trading center repeatedly fails to provide an immediate response (within one second) to incoming orders attempting to access its quotes.

### **(3) Stub Quotes**

As noted above, in order to comply with their obligation to maintain continuous two-sided quotations, market makers are permitted under the rules of certain exchanges to utilize stub quotes. When a market order is submitted to an exchange, the order immediately will seek the best available liquidity, including the protected quotes of other markets, regardless of price. In times of market stress, if the only liquidity available is, for example, a one-cent stub quote, the market order, by its terms, will execute against the stub quote.

### **(4) Clearly Erroneous Executions Rules**

Erroneous trades can result from a variety of causes, including human error or computer malfunction. Because the markets today are increasingly fast, automated, and interconnected, an erroneous trade on one market can very rapidly trigger a wave of similarly erroneous trades on other markets.<sup>100</sup>

The equities exchanges have each adopted “clearly erroneous execution rules” that are designed to permit them to break trades that are clearly erroneous. Under these rules, which were last revised in late 2009 to make them more consistent across the various exchanges, an exchange member may request that an exchange officer review a potentially erroneous execution and declare it null and void. Alternatively, an equities exchange may review potentially erroneous executions on its own motion.

The clearly erroneous execution rules recognize that, in most circumstances, trades that are executed between parties should be honored. On rare occasions, however, the price of the executed trade indicates a “clearly erroneous error” may exist, suggesting

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<sup>98</sup> Rule 611(b)(1) of Regulation NMS. 17 CFR 242.611(b)(1).

<sup>99</sup> See Question 4.07 of Responses to Frequently Asked Questions Concerning Rule 611 and Rule 610 of Regulation NMS, available at <http://sec.gov/divisions/marketreg/nmsfaq610-11.htm#sec4> (detailing the elements that must be included in a trading center’s policies and procedures to implement the self-help exception).

<sup>100</sup> For example, if the last trade in a stock is \$20, and a computer malfunction at one firm causes a series of trades to occur on multiple exchanges at prices exceeding \$50, the automated systems of other firms may quickly follow, with erroneous trades rapidly impacting multiple markets and market participants.

that it is unrealistic to expect that the parties to the trade had come to a meeting of the minds regarding the terms of the transaction and that the trade should be broken.

In determining whether to break trades, the rules permit equities exchanges to consider breaking a trade only if the price exceeds the consolidated last sale price by more than a specified percentage amount: 10% for stocks priced under \$25; 5% for stocks priced between \$25 and \$50; and 3% for stocks priced over \$50. These percentage thresholds may be (i) doubled for executions occurring between 9:30 a.m. and 10:00 a.m., when the S & P 500 Futures are up or down between 3% and 5% at 9:15 a.m. or (ii) tripled when the S & P 500 Futures are up or down 5% or greater at 9:15 a.m.

The equities exchanges also may consider additional factors to determine whether an execution is clearly erroneous, including but not limited to, system malfunctions or disruptions, volume and volatility for the security, news released for the security, whether trading in the security was recently halted/resumed, whether the security was subject to a corporate action, overall market conditions, consideration of primary market indications, and executions inconsistent with the trading pattern in the stock.

When an event involves erroneous trades that occur in multiple markets, the rules provide that the equities exchanges may use a higher percentage threshold in an effort to coordinate a result across markets. Although not required by the rules, the markets generally convene conference calls to discuss coordinated action when such events occur. Each exchange, however, retains the right to make its own determination on whether to nullify trades.

Pursuant to exchange rules, a clearly erroneous determination may generally be appealed, unless a determination is made that the number of the affected transactions is such that immediate finality is necessary to maintain a fair and orderly market and to protect investors and the public interest. In addition, the equities markets generally do not allow appeals of clearly erroneous rulings that are made in conjunction with other market centers.

This was the clearly erroneous execution framework in existence on May 6, 2010.

## **(5) Short Sales**

Short selling is defined by Rule 200 of Regulation SHO as “any sale of a security which the seller does not own or any sale which is consummated by the delivery of a security borrowed by, or for the account of, the seller.”<sup>101</sup> Short selling often can play an important role in the market for a variety of reasons, including contributing to efficient price discovery, mitigating market bubbles, increasing market liquidity, promoting capital formation, facilitating hedging and other risk management activities, and limiting upward

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<sup>101</sup> 17 CFR 242.200(a).

market manipulations. There are, however, circumstances in which short selling can be used as a tool to manipulate the market.<sup>102</sup>

Due to its concerns regarding persistent fails to deliver<sup>103</sup> and potentially abusive “naked” short selling, the SEC adopted Regulation SHO, which became effective in early 2005.<sup>104</sup> As adopted in 2005, this Regulation imposed three general requirements with respect to short sales: a marking requirement, a locate requirement and a close-out requirement. Since 2005, the SEC has adopted several amendments to Regulation SHO. Two of the most recent amendments included further tightening the Regulation’s close-out requirement and adding a short sale price test restriction.

In connection with further tightening the Regulation’s close-out requirement, in the fall of 2008, the SEC adopted temporary Rule 204T of Regulation SHO, with an expiration date of July 31, 2009.<sup>105</sup> Temporary Rule 204T strengthened the close-out requirements of Regulation SHO for fails to deliver resulting from sales of any equity security. Prior to the adoption of temporary Rule 204T, Regulation SHO’s close-out requirement had applied only to those securities with a persistent and substantial level of fails to deliver (known as “threshold securities”). Due to the positive impact that temporary Rule 204T, as well as other recent SEC actions, had on reducing fails to deliver in equity securities, the SEC made the requirements of temporary Rule 204T permanent, with some limited modifications.<sup>106</sup>

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<sup>102</sup> For example, in 2003, the SEC settled a case against certain parties relating to allegations of manipulative short selling in the stock of a corporation. The Commission alleged that the defendants profited from engaging in massive “naked” short selling that flooded the market with the stock, and depressed its price. See *Rhino Advisors, Inc. and Thomas Badian*, Lit. Rel. No. 18003 (Feb. 27, 2003); *SEC v. Rhino Advisors, Inc. and Thomas Badian*, Civ. Action No. 03 cv 1310 (RO) (S.D.N.Y.); see also *U.S. v. Russo*, 74 F.3d 1383, 1392 (2d Cir. 1996) (short sales were sufficiently connected to the manipulation scheme as to constitute a violation of Exchange Act Section 10(b) and Rule 10b-5); *S.E.C. v. Gardiner*, 48 S.E.C. Docket 811, No. 91 Civ. 2091 (S.D.N.Y. Mar. 27, 1991) (alleged manipulation by sales representative by directing or inducing customers to sell stock short in order to depress its price).

<sup>103</sup> A fail to deliver occurs when a seller fails to deliver securities to the buyer when delivery is due.

<sup>104</sup> See Securities Exchange Act Release No. 50103 (July 28, 2004), 69 FR 48008 (August 6, 2004).

<sup>105</sup> See Securities Exchange Act Release No. 58733 (October 14, 2008), 73 FR 61706 (October 17, 2008); see also Securities Exchange Act Release No. 58572 (September 17, 2008), 73 FR 54875 (September 23, 2008).

<sup>106</sup> See Securities Exchange Act Release No. 60388 (July 27, 2009), 74 FR 38266 (July 31, 2009). Under Rule 204, if a firm that clears and settles trades has a fail to deliver position at a registered clearing agency in any equity security for a short sale transaction in that equity security, the firm must, by no later than the beginning of regular trading hours on the settlement day following the settlement date, referred to as T+4, immediately close out the fail to deliver position by borrowing or purchasing securities of like kind and quantity. If the fail to deliver position results from a long sale or bona fide market making activity, the firm must, by no later than the beginning of regular trading hours on the third settlement day following the settlement date, referred to as T+6, immediately close out the fail to deliver position by borrowing or purchasing securities of like kind and quantity. If a firm that clears and settles trades does not purchase or borrow shares, as applicable, to close out a fail to deliver position in accordance with Rule 204, the firm, and any broker-dealer from which it receives trades for clearance and settlement, must borrow or arrange

With respect to adding a short sale price test restriction, in February 2010, the SEC approved Rule 201 of Regulation SHO, which restricts short selling in NMS stocks to a price above the national best bid after a stock's price has declined by 10% or more from the prior day's closing price.<sup>107</sup> The Rule became effective on May 10, 2010 and has a six month implementation period. Thus, compliance with the Rule was not required on May 6, 2010.

Rule 201 requires a trading center to establish, maintain, and enforce written policies and procedures that are reasonably designed to prevent the execution or display of a short sale order of an NMS stock at a price that is less than or equal to the current national best bid once the circuit breaker has been triggered. The price test restriction, once in effect, will apply to all short sales in that stock for the remainder of the day and the following day, unless an exception applies. Under the Rule, the listing market for the NMS stock must determine whether the stock's price has decreased by 10% or more from its prior day's closing price. The listing market must then immediately notify the single plan processor responsible for consolidating information for the NMS stock that the circuit breaker has been triggered. The single plan processor is then required to disseminate the information to the markets.

## **2. Overview of Listed Options Markets**

A listed option is any option traded on a registered national securities exchange or automated facility of a national securities association. To date, all orders in listed options are executed only on registered national securities exchanges. The Options Clearing Corporation ("OCC"), a clearing agency registered with the SEC, is considered the issuer and guarantor of each listed options contract, and all listed options transactions are centrally cleared through OCC.

Listed options are currently traded on eight national securities exchanges, owned by six entities. These eight exchanges are BATS, BOX (a facility of BX), CBOE, ISE, NASDAQ OMX Phlx, NOM (a facility of Nasdaq), NYSE Amex, and NYSE Arca. Based on market share data for April 2010 obtained from the OCC,<sup>108</sup> the exchange with the highest market share of option volume was CBOE, with 33.88%. The two exchanges owned by The NASDAQ OMX Group, Inc. together had a market share of 23.91% (NASDAQ OMX Phlx had 21.51% and NOM had 2.40%). The two exchanges owned by NYSE Euronext together had a market share of 23.63% (NYSE Arca had 12.98% and NYSE Amex had 10.65%). ISE had a market share of 19.17% and BOX had a market share of 2.21%.

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to borrow securities prior to accepting or effecting further short sales in that security, until the firm closes out the fail to deliver position by purchasing securities of like kind and quantity and that purchase has cleared and settled at a registered clearing agency.

<sup>107</sup> See Securities Exchange Act Release No. 61595 (February 26, 2010), 75 FR 11232 (March 10, 2010).

<sup>108</sup> See Table 8.

Similar to NMS stocks, most listed options are traded on multiple exchanges. In contrast to some markets where trading is concentrated on a single exchange or market, because liquidity on the options markets is dispersed across eight exchanges, linking the various exchanges is critical to the successful operation of the national market system for listed options. The options exchanges have implemented a joint industry plan to enhance the linking of the trading of listed options across the multiple exchanges. Most recently, in August 2009, the options exchanges implemented a new plan (the “Options Plan”), approved by the SEC,<sup>109</sup> which includes a “trade-through” rule that prevents the execution of trades on one options exchange at prices lower than a Protected Bid or higher than a Protected Offer.<sup>110</sup> Each exchange adopted rules to implement the Options Plan that prohibit its members from effecting trade-throughs, subject to certain enumerated exceptions. The approach to trade-throughs under the Options Plan is similar to that taken by the SEC under Rule 611 of Regulation NMS.<sup>111</sup>

As with NMS stocks, linkage among options exchange is an important protection against trade-throughs because it provides a baseline assurance that: (1) marketable orders will receive at least the best displayed price, regardless of the particular exchange that executes the order or where the best price is displayed in the national market system; and (2) quotations that are displayed at one exchange will not be bypassed by trades with inferior prices at any other options exchange in the national market system.

The trade-through prohibition for listed options also helps promote linkages among exchanges by encouraging them, when they do not have available trading interest at the best price, to route marketable orders to an exchange that is displaying the best price. Although the options exchanges are not required to route orders to better prices (an exchange can, for example, cancel and return an order when it does not have the best price), competitive factors have led options exchanges to offer routing services to their customers. Pursuant to the Options Plan, the options exchanges effectively adopted a

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<sup>109</sup> See Securities Exchange Act Release No. 60405 (July 30, 2009), 74 FR 39362 (August 6, 2009) (File No. 4-546).

<sup>110</sup> A “Protected Bid” “Protected Offer” means a bid or offer in an option series that is displayed by an Eligible Exchange, is disseminated pursuant to the Options Price Reporting Authority Plan (“OPRA Plan”), and is the Best Bid or Best Offer of an Eligible Exchange. A “Best Bid” or “Best Offer” means the highest bid price or the lowest offer price communicated by a member of an Eligible Exchange to any broker-dealer or to any customer at which such member is willing to buy or sell, either as principal or agent. “Eligible Exchange” means a national securities exchange registered with the Commission in accordance with Section 6(a) of the Exchange Act that, among other things, is a Participant Exchange in OCC and is a party to the OPRA Plan. See Sections 2(1), 2(2), 2(14), and 2(17) of the Options Plan.

The OPRA Plan is a national market system plan approved by the SEC pursuant to Section 11A of the Exchange Act and Rule 608 thereunder. See Securities Exchange Act Release No. 17638 (March 18, 1981), 22 S.E.C. Docket 484 (March 31, 1981).

<sup>111</sup> See supra note 58.

“private linkage” approach that relies exclusively on brokers to provide routing services among exchanges.<sup>112</sup>

Just like registered exchanges that trade NMS stocks, registered exchanges that trade listed options must undertake self-regulatory responsibility for their members and file their proposed rule changes for approval with the SEC. These proposed rule changes publicly disclose, among other things, the trading services and fees of exchanges.

The registered exchanges that trade listed options have various market structures. Some are fully electronic (such as ISE, BATS, and NOM), while others have hybrid models that combine electronic trading with floor trading (such as CBOE, NYSE Amex, and NASDAQ OMX Phlx). In addition, some of the options exchanges have in the past few years adopted the “maker-taker” pricing model that is prevalent in the markets trading NMS stocks. The introduction of the maker-taker model followed the reduction of the quoting increment in certain options in 2007.<sup>113</sup> Under this model, non-marketable, resting orders that offer (make) liquidity at a particular price receive a liquidity rebate if they are executed, while incoming orders that execute against (take) the liquidity of resting orders are charged an access fee. The SEC recently published for comment a proposal that would cap the amount of fees an options exchange could charge for executions against the best displayed prices of the exchange at \$0.30 per contract.<sup>114</sup> Exchanges typically charge a somewhat higher access fee than the amount of their liquidity rebates, and retain the difference as compensation.

Some other options exchanges use a “broker payment” model. These exchanges generally charge no or low fees for the execution of customers’ orders,<sup>115</sup> but often charge other types of fees on a per-transaction basis. For example, most options exchanges charge a surcharge or “royalty” fee for executions in certain index option classes. Many exchanges also charge a payment for order flow or “marketing” fee to market makers that trade with customer orders on the exchange. The exchange then

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<sup>112</sup> Prior to the Options Plan, the options exchanges routed specific linkage orders through a stand-alone system, or hub, which acted as a centralized data communications network that electronically linked the options exchanges to one another. See Securities Exchange Act Release No. 60405, supra note 109.

<sup>113</sup> On January 26, 2007, the then-existing six options exchanges implemented a pilot program to quote certain options series in thirteen classes in one-cent increments. Nasdaq became a participant in this program on March 31, 2008, when it commenced trading on NOM, and BATS became a participant on February 26, 2010 when it commenced trading on BATS Options Exchange Market. Since 2007, the pilot program has been extended and expanded several times.

<sup>114</sup> See Securities Exchange Act Release No. 61902 (April 14, 2010), 75 FR 20738 (April 20, 2010).

<sup>115</sup> Exchanges that use the “broker payment” model also generally give priority to customer orders at the best price over other orders or quotations at that price. After customer orders are executed, the rules of “broker payment” options exchanges dictate how the remainder of an incoming order is allocated against resting non-customer orders or quotations. Exchanges that use a “broker payment” model do not give priority to orders from certain customers who are “professional” customers under exchange rules. “Professional” customers are treated on ISE, CBOE, NYSE Amex and Nasdaq OMX Phlx in the same manner as a broker-dealer for purposes of specified order execution rules, including priority rules.

makes the proceeds from such “marketing” fees available to collectively fund payment for order flow to brokers directing order flow to the exchange.

The registered options exchanges typically offer a wide range of order types for trading on their markets. Examples of order types include market orders,<sup>116</sup> limit orders, and intermarket sweep orders.<sup>117</sup> Some of the order types are displayable in full if they are not executed immediately. Others are un-displayed, in full or in part. For example, a reserve order type will display part of the size of an order at a particular price, while holding the balance of the order in reserve and refreshing the displayed size as needed.<sup>118</sup> In general, displayed orders are given execution priority at any given price over fully un-displayed orders and the un-displayed size of reserve orders.<sup>119</sup>

Unlike with NMS stocks, all listed option orders are executed on registered national securities exchanges. Thus, broker-dealers cannot internally execute trades in listed options in the over-the-counter market. Instead, all such trades must be sent to a registered exchange for execution pursuant to the exchange priority rules. In addition, there is one registered ATS that conducts a listed options business. Any orders matched by this ATS, however, must be sent to a registered exchange for execution pursuant to the exchange’s priority rules.

As with NMS stocks, in a dispersed and complex market structure with many different options exchanges offering a wide spectrum of services, brokers play a significant role in linking exchanges together into a unified national market system. Brokers compete to offer the sophisticated technology tools that are needed to monitor liquidity at many different venues and to implement order routing strategies. To perform

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<sup>116</sup> See supra section entitled “Order Types.”

<sup>117</sup> See Section 2(9) of the Options Plan. Intermarket sweep orders in the options markets are functionally similarly to the ISO order for NMS stocks. See supra notes 93-95 and accompanying text.

<sup>118</sup> See, e.g., NYSE Arca Options Rule 6.62 (defining NYSE Arca’s reserve order as a limit order with a portion of the size displayed and with a reserve portion of the size that is not displayed on NYSE Arca). See also Nasdaq Options Rule Ch. VI. Section 1(e)(6) (defining NOM’s price improving order as an order to buy or sell an option at a specified price at an increment smaller than the minimum price variation in the security. Price improving orders that are available for display shall be displayed at the minimum price variation in that security and shall be rounded up for sell orders and rounded down for buy orders); and ISE Rule 715(c) and Supplementary Material .02 to ISE Rule 713 (defining ISE’s all-or-none order as a limit or market order that is to be executed in its entirety or not at all. These orders are contingency orders and have no priority on ISE’s limit order book. Such orders are not displayed in ISE’s best bid or offer but are maintained in the system and remain available for execution after all other trading interest at the same price has been exhausted).

<sup>119</sup> See, e.g., NOM Ch. VI, Section 1(e)(6) (providing that the non-displayed portion of reserve orders are not displayed in the system, and have lower priority within the system than an equally priced order that is displayed within the system, regardless of time stamp); BATS Rule 21.8(a)(2) (generally providing that displayed interest has priority over non-displayed interest at the same price); and Supplementary Material .02 to ISE Rule 713 (all-or-none orders are maintained in the system and remain available for execution after all other trading interest at the same price has been exhausted).

this function, brokers may monitor the execution of orders at the various exchanges to assess the available liquidity. Using their knowledge of available liquidity, brokers can offer smart order routing technology to access such liquidity. Many brokers also offer sophisticated algorithms that will take the large orders of institutional investors and others, divide a large “parent” order into many smaller “child” orders, and route the child orders over time to different exchanges in accordance with the particular trading strategy chosen by the customer.

As with NMS stocks, the linkage function of brokers also is supported by a broker’s duty of best execution. This duty requires a broker to obtain the most favorable terms reasonably available when executing a customer order.<sup>120</sup> Of course, this duty is not the only pressure on brokers to obtain best execution. The existence of strong competitive pressure to attract and retain customers encourages brokers to provide high quality routing services to their customers.<sup>121</sup>

As with the trading of NMS stocks, liquidity on options exchanges is derived from orders to buy or sell particular options series as well as quotations submitted by members of an exchange that are registered as market makers. Generally, however, investors in listed options depend upon the liquidity supplied by professional liquidity providers, such as market makers, to a greater extent than in the market for NMS stocks. This is due in part to the greater dispersion of trading interest across the thousands of series of listed options.<sup>122</sup> Professional liquidity providers are proprietary traders in the business of providing liquidity to the market, often through the submission of quotations, as well as limit orders that rest on the electronic order books of exchanges. They include registered entities, such as exchange specialists and market makers, as well as unregistered proprietary trading firms that engage in passive market making and other types of trading strategies. Some types of professional liquidity providers have certain obligations, such as to provide liquidity whether the market is up or down and maintain fair and orderly markets. Other professional liquidity providers do not have such responsibilities.

In general, the rules of the options exchanges allow a member, on a voluntary basis, to register as a market maker, either on a class-by-class or series-by-series basis. Members registered as market makers have certain obligations. Pursuant to the options exchanges’ rules, the transactions of a market maker in its market making capacity generally must constitute a course of dealings reasonably calculated to contribute to the maintenance of a fair and orderly market. These exchange rules also generally require a market maker to maintain a continuous two-sided quotation in the options for which the member is registered for a specified percentage of the time, or in a specified number of

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<sup>120</sup> See *supra* note 77.

<sup>121</sup> Rule 606 of Regulation NMS requires brokers to publish quarterly reports on their routing practices, including the venues to which they route options orders for execution.

<sup>122</sup> Options of the same class that have the same standardized terms (*e.g.*, strike price) comprise an options series. An options class is an option of the same type (put or call) with the same underlying security.



series or classes. For example, the NOM rules require that its market makers maintain a two-sided market on a continuous basis in at least 75% of the options series in which they are registered. On some options exchanges such rules also limit how wide a market maker can quote.<sup>123</sup> Other options exchanges, such as NOM, do not have any limitations on the price at which market makers can quote.

While the options exchanges' rules may contain provisions that provide for market makers, these rules do not require any particular member to register as a market maker.<sup>124</sup> Some exchanges do not trade options on their market unless there is at least one market maker registered in the class. At least one options exchange does allow options to trade without any market maker registered in the option.<sup>125</sup> Accordingly, an exchange may not have registered market makers even though its rulebook provides for them. In addition, the rules of the options exchanges permit multiple members to register as market makers for the same option. Some of the exchanges may have a "lead" or "primary" market maker assigned in a given option, while others do not.

Each options exchange has adopted an "obvious error rule" that is designed to permit the exchange to adjust or nullify options transactions that are obviously erroneous. An obvious error will be deemed to have occurred when the execution price of a transaction differs from the theoretical price<sup>126</sup> for the option by an amount equal to at least the specified minimum amount indicated in the rule. On some exchanges, an obvious error also will be deemed to occur if there are erroneous prints or quotes in the underlying, or if there are verifiable systems disruptions or malfunctions. If the options exchange determines to adjust the transaction price, the transaction price would be adjusted to the theoretical price plus or minus an adjustment penalty that is set forth in the rule. A member of an options exchange may request that its options transaction be reviewed. Several of the options exchanges also have the discretion to review options transactions on their own motion.

### 3. Overview of ETFs

As a general matter, exchange-traded products ("ETPs") are issuers of exchange-traded securities that give investors exposure to an investment benchmark or strategy. ETPs exist in a variety of legal forms, including exchange-traded funds ("ETFs") registered as investment companies under the Investment Company Act of 1940 ("1940 Act"), exchange-traded notes ("ETNs"), trust-issued receipts, commodity and currency

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<sup>123</sup> See, e.g., Nasdaq OMX Phlx Rule 1014(c)(i)(A)(1) and (2).

<sup>124</sup> See *supra* note 80.

<sup>125</sup> See Securities Exchange Act Release No. 61735 (March 18, 2010), 75 FR 14227 (March 24, 2010).

<sup>126</sup> The theoretical price of an option is, for series that are traded on at least one other exchange, the last national best bid (for erroneous sell transactions) and the last national best offer price (for erroneous buy transactions) just prior to the trade.

trusts, and commodity pools. All ETPs register offers and sales of shares under the Securities Act of 1933 (“Securities Act”), and a national securities exchange lists the securities issued by the ETPs for trading on a secondary market.

An ETF is registered under the 1940 Act as an open-end investment company or a unit investment trust (“UIT”). Unlike typical open-end investment companies (“mutual funds”) or UITs, ETFs issue and redeem shares only in large aggregations or blocks (such as 50,000 ETF shares) commonly called “Creation Units.” Purchase and redemption orders for Creation Units are placed by or through participants in the Depository Trust Company that have executed a “Participation Agreement” with the distributor of the ETF (“Authorized Participants”). Authorized Participants may purchase a Creation Unit with a “Portfolio Deposit” equal in value to the aggregate net asset value (“NAV”) of the ETF shares in the Creation Unit. The Portfolio Deposit generally consists of a basket of securities announced by the ETF’s investment adviser or sponsor at the beginning of each business day and usually mirrors the composition of the ETF’s portfolio. Under certain circumstances, the Portfolio Deposit may also consist of cash or of cash in lieu of certain securities. The value of a Creation Unit could range from hundreds of thousands of dollars to several million dollars. After purchasing a Creation Unit, an Authorized Participant may hold the ETF shares, or sell ETF shares to other investors. ETF shares are not redeemable from the ETF except when aggregated into Creation Units, and then only by or through Authorized Participants. Authorized Participants thus act as the intermediary between investors and the ETF.

Like operating companies or closed-end funds, ETFs register offers and sales of shares under the Securities Act, and a national securities exchange lists the ETF shares for trading. As with any listed security, investors also may trade ETF shares in off-exchange transactions. In either case, ETF shares trade at negotiated prices. The development of the secondary market in ETF shares depends upon the activities of market makers and upon the willingness of Authorized Participants to engage in purchase and sale transactions in ETF shares in the secondary market.

If an Authorized Participant presents a Creation Unit to the ETF for redemption, it generally receives a “Redemption Basket” that consists of securities identified by the ETF investment adviser or sponsor at the beginning of the day and that usually matches the Portfolio Deposit. In some circumstances, the Redemption Basket could also consist of cash or of cash in lieu of certain securities. As with purchases from the ETF, redemptions from the ETF are priced at NAV. An investor holding fewer ETF shares than the amount needed to constitute a Creation Unit may dispose of those ETF shares only by selling them in the secondary market at market price, which may be higher or lower than the NAV of the ETF shares. The investor also pays customary brokerage commissions on sales in the secondary market.

In the past, ETF shares have not typically traded in the secondary market at a significant premium or discount in relation to NAV because of the arbitrage opportunities inherent in the ETF structure. Under normal circumstances, if ETF shares begin to trade at a discount (i.e., a price less than NAV), arbitrageurs may purchase ETF shares in the

secondary market and, after accumulating enough shares to equal a Creation Unit, redeem them directly from the ETF at NAV if an Authorized Participant, or indirectly through that person, thereby acquiring the more valuable securities in the Redemption Basket. In purchasing the ETF shares for this purpose, arbitrageurs create greater market demand for the shares, which may raise the market price to a level closer to NAV. In contrast, if ETF shares trade at a premium (*i.e.*, a price greater than NAV), arbitrageurs may purchase the securities in the Portfolio Deposit, use them to obtain the more valuable Creation Units from the ETF, and then sell the individual ETF shares in the secondary market to realize a profit. As the supply of individual ETF shares available in the secondary market increases, the price of the ETF shares may fall to levels closer to NAV. Market makers have also been able to maintain efficient markets in ETF shares even in the absence of an actual arbitrage transaction by hedging their exposures.

The 1940 Act does not provide for the ETF structure. Accordingly, ETFs that are registered as investment companies under the 1940 Act first must apply to the SEC to obtain exemptive relief from certain provisions of the 1940 Act to permit their unique operations. The SEC issued the first order to an ETF organized as a UIT in 1992, and began issuing orders to ETFs organized as open-end funds in 1996.<sup>127</sup> The SEC now has issued more than 88 orders to permit ETF operations. As of May 11, 2010, there were 843 ETFs operating in reliance on these orders with a combined total of approximately \$740 billion in net assets.

Unlike ETFs, ETNs are senior, unsecured, unsubordinated debt securities issued by banks. ETNs are similar to ETFs in that they offer exchange-traded securities that provide investment exposure to certain market benchmarks or strategies. However, ETNs do not hold portfolios of securities and are not registered as investment companies under the 1940 Act. An investor in an ETN is therefore exposed to the credit risk of the issuer. ETNs can be redeemed from the issuer in large blocks of securities such as 50,000, typically on a weekly basis. There are approximately 90 ETNs.

Other types of ETPs include trust-issued receipts. Trust-issued receipts represent interests in a fixed trust of specified securities. Unlike other types of ETPs, owners of trust-issued receipts have the same rights and privileges as if they owned the underlying securities beneficially outside of the trust structure, and can receive the reports and communications that the issuers of the underlying securities send to their respective beneficial owners. ETPs also include commodities and currency trusts, as well as commodity pools. While these ETPs trade like ETFs, their portfolios consist of physical commodities, currency, or futures, rather than securities, and they are not registered as investment companies under the 1940 Act.

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<sup>127</sup> SPDR Trust, Series 1, Investment Company Act Rel. Nos. 18959 (September 17, 1992) (notice) and 19055 (October 26, 1992) (order) and The CountryBaskets Index Fund, Inc., Investment Company Act Rel. Nos. 21736 (February 6, 1996) (notice) and 21802 (March 5, 1996) (order).

## APPENDIX B

### Overview of the Futures Market Structure

A futures contract is an agreement to purchase or sell a commodity for delivery in the future at a price that is determined when the contract is bought or sold. Each party is obligated to fulfill the terms of the contract at the specified price. Futures contracts are used to assume or shift price risk, and most positions are satisfied by offset or cash settlement, rather than delivery of the underlying commodity or financial instrument.

#### 1. Designated Contract Markets

U.S. futures exchanges (designated by the CFTC as contract markets, as described below) are a critical component of the U.S. and world economies, providing significant benefits to the public at large as well as market participants.<sup>128</sup> Futures markets offer individuals and firms in a myriad of industries important vehicles for hedging economic risks,<sup>129</sup> resulting in more efficient production, lower costs, and other benefits. They also provide vital forums for discovering prices.<sup>130</sup> For these reasons, futures exchanges are affected with a significant national public interest. Further, as self-regulatory organizations, futures exchanges must exercise their regulatory authority effectively, impartially, and in the public interest. As essential forums for the execution of futures transactions and for price discovery, exchanges must ensure fair and financially secure trading facilities.<sup>131</sup> They must also fulfill self-regulatory responsibilities through programs and policies that help ensure market integrity, financial integrity, and the strict protection of market participants and the public.<sup>132</sup>

Futures contracts must be traded on CFTC-regulated exchanges, called Designated Contract Markets (DCMs) pursuant to Section 5 of the Commodity Exchange Act (CEA).<sup>133</sup> DCMs may allow access to their facilities to all types of traders, including retail customers. DCMs may list for trading futures or options contracts based on any underlying commodity, index, or instrument. To obtain and maintain a designation, a DCM must comply with the designation criteria and 18 core principles set forth in Sections 5(b) and 5(d) of the CEA and Part 38 of the CFTC's regulations.<sup>134</sup>

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<sup>128</sup> Commodity Exchange Act (CEA) Section 3(a), 7 U.S.C. 5(a).

<sup>129</sup> Id.

<sup>130</sup> Id.

<sup>131</sup> See, e.g., CEA Section 5(b)(3), 7 U.S.C. 7(b)(3); CEA Section 5(b)(5), 7 U.S.C. 7(b)(5).

<sup>132</sup> See, e.g., CEA Section 5(b)(2), 7 U.S.C. 7(b)(2); CEA Section 5(b)(5), 7 U.S.C. 7(b)(5); CEA Section 5(d)(4), 7 U.S.C. 7(d)(4); CEA Section 5(d)(11), 7 U.S.C. 7(d)(11); CEA Section 5(d)(12), 7 U.S.C. 7(d)(12).

<sup>133</sup> CEA Section 5, 7 U.S.C. 7.

<sup>134</sup> CEA Section 5(b), 7 U.S.C. 7(b); CEA Section 5(d), 7 U.S.C. 7(d); 17 CFR 38.

The CFTC monitors the discharge of each DCM's self-regulatory responsibilities and ongoing compliance with the CEA and CFTC regulations, including the core principles applicable to DCMs, through its program of regular rule enforcement reviews. Periodic rule enforcement reviews examine, among other things, a DCM's audit trail, trade practice, disciplinary, and dispute resolution programs. Accurate audit trails are essential to reconstruction of trading such as that which occurred on May 6.

DCMs may implement new rules or rule amendments or list new products by filing with the CFTC a certification that the rule or rule amendment complies with the CEA and CFTC regulations and policies, or by requesting approval from the CFTC.<sup>135</sup>

Currently, there are 14 DCMs designated by the CFTC that are actively trading. The total trading volume on all of these exchanges combined in 2009 was approximately 2.7 billion contracts.

## **2. Futures Market Structure**

The market structure of U.S. futures markets differs from the market structure of U.S. equities markets. In the cash equity markets, the same security may be traded on multiple venues that are linked. Under current practice, a given futures contract trades on only one exchange. For example, the E-mini S&P 500 futures contract and the S&P 500 futures contract trade exclusively on the Chicago Mercantile Exchange (CME), and the Russell 2000 futures contract trades exclusively on ICE Futures U.S. Futures exchanges are not linked in the way securities trading venues are linked. Futures contracts are not "issued" by a public company for registration and listing on an exchange. Rather, futures exchanges design and list them for trading.

The equities and futures markets also differ with respect to clearing. Equities are cleared through the National Securities Clearing Corporation. Options on equities are cleared through the Options Clearing Corporation. In the futures markets, individual exchanges are responsible for maintaining the financial integrity of trading in their listed contracts. To fulfill this obligation, exchanges select the clearinghouse(s) that will clear and settle their contracts, a clearing model which is also known as "exchange-directed clearing."

The CEA requires that all CFTC-regulated DCMs have all DCM-traded contracts cleared and settled by a CFTC registered derivatives clearing organization (DCO).<sup>136</sup> One of the critical functions that each DCO performs is the removal of debt obligations among clearing members. At a minimum, this is done at the end of the trading session for a given trade date.<sup>137</sup> This process is accomplished by independently determining a

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<sup>135</sup> CEA Section 5c(c), 7 U.S.C. 7a-2(c); 17 CFR Part 40.

<sup>136</sup> CEA Section 5(b)(5), 7 U.S.C. 7(b)(5).

<sup>137</sup> The DCO functions as the central counterparty and guarantor for the positions that result from all contracts traded on the DCM. This means that the DCO is the long to each short position and the short to each long position in all contracts that it clears. DCOs deal exclusively with clearing participants. Any market participant that is not a clearing member of a particular DCM must have

settlement (or marking) price for each contract that is cleared and marking all open positions to that price. The DCO collects cash from clearing members that have lost money on their positions and pays it to clearing members that have gained money on their positions.

Exchange-directed clearing has been the standard in the futures industry since the industry's inception. The clearinghouse associated with a futures exchange can be either vertically integrated into the exchange company itself, or serve as a third-party clearing services provider. Historically, most clearinghouses have been integrated into particular futures exchanges. The CEA mirrors the exchange-directed clearing model by placing upon exchanges the statutory obligation to ensure the financial integrity of their listed contracts.<sup>138</sup>

### **3. Equity Futures Products**

#### **a. Broad-Based Index Futures<sup>139</sup>**

Stock index futures are financial instruments whereby traders buy or sell a standardized value of a stock index for settlement on a future date at a specified price. The fundamental economic purpose of stock index futures is to provide a risk management tool for financial institutions and other market participants active in the stock market. They are widely used by mutual funds, pension funds, endowments, foundations and other entities holding securities, as an effective way to protect against adverse price movements associated with holding stock portfolios by selling futures or as a way to efficiently manage the purchase and sale of stocks as portfolios are balanced or adjusted.

Stock index futures are cash settled and do not provide for delivery of the shares underlying the indices. For most stock index futures contracts, contract expiration is on the third Friday of the contract month. All open contracts are then settled in cash, based on the Special Opening Quotation price for the relevant index on the expiration day.<sup>140</sup> Each futures exchange establishes a contract size by specifying a multiplier. For example, with respect to the CME E-mini S&P 500 contract, the contract size is set at \$50 times the S&P 500 Index value, equal to a notional value of \$55,000 per contract when the index is at 1,100. Stock index futures are subject to price limits and circuit breaker trading halts that are coordinated with trading in the underlying securities markets (circuit breakers are discussed in more detail below). Trading and open interest

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its positions carried by a clearing member. The DCO for CME is the CME Clearing House, while the DCO for ICE Futures US is ICE CLEAR US.

<sup>138</sup> See CEA Section 5(b)(5), 7 U.S.C. 7(b)(5); CEA Section 5(d)(11), 7 U.S.C 7(d)(11).

<sup>139</sup> A broad-based security index means a group or index of securities that does not constitute a narrow-based security index. 17 CFR 41.1(c).

<sup>140</sup> The "Special Opening Quotation" is calculated using normal index calculation procedures except that the values for the respective components are taken as the actual opening values for each of the component equities.

in stock index futures is concentrated in the nearby month, which typically accounts for over 90 percent of total activity in all months combined.

Two DCMs, CME and ICE Futures U.S., trade broad-based equity index futures, the CME and ICE Futures U.S. The combined total trading volume of all equity index products traded at CME and ICE in 2009 was approximately 766 million contracts.

Stock index futures contracts were introduced in the early 1980's, beginning with the Kansas City Board of Trade's Value Line Average futures contract and the CME's S&P 500 index futures contract. The CME and other futures markets have listed for trading futures on various broad market sector indices. These include the CME Nasdaq 100, S&P MidCap 400, and S&P Small Cap 600 index futures, the Chicago Board of Trade ("CBOT") Dow Jones Industrial Average Index future and the ICE Futures US Russell 2,000 index future. In addition, the CME and other exchanges list options on certain stock index futures contracts, including the CME E-mini S&P 500.

As noted, the CME first launched an S&P 500 futures contract in the early 1980s; that contract continues to trade today. That contract, however, has a larger contract size, \$250 times the level of the S&P 500, compared to the \$50 multiplier for the E-mini S&P 500 contract. The original S&P 500 contract is traded via open outcry during the day trading session and on CME Globex during overnight electronic trading hours, while the E-mini S&P 500 contract is traded exclusively on Globex. From Monday through Thursday, the E-mini S&P 500 contract trades from 4:30 to 5:30 p.m. and from 6:00 p.m. to 4:15 p.m. the following day. (It therefore trades until 4:15 p.m. on Friday.) It also trades from 6:00 p.m. Sunday through 4:15 p.m. Monday. Open outcry trading in the original S&P 500 contract, which takes place from 9:30 a.m. through 4:15 p.m. Monday through Friday, overlaps with electronic trading in the E-mini S&P 500 during those hours. Electronic trading in the original S&P 500 contract (which as noted above takes place only outside of its open outcry trading hours) also overlaps with the E-mini S&P 500 contract during overnight hours.

The E-mini S&P 500 contract was launched in 1997, as a smaller contract size version of the original S&P 500 futures contract. Since that time, trading volume and open interest in the E-mini version has grown dramatically such that, today, the E-mini S&P 500 contract is the most actively traded domestic stock index futures contract.<sup>141</sup>

Both the E-mini S&P 500 and the pit-traded S&P 500 futures contracts exhibit substantial trading volume and open interest. In April 2010, trading in the E-mini S&P 500 and the pit-traded S&P 500 futures contracts accounted for about 78 percent of the total trading volume and about 80 percent of total open interest of all domestic stock index futures contracts. For this same period, the E-mini S&P 500 contract alone accounted for about 77 percent of total US stock index futures and options activity. In this regard, in April 2010, the average daily trading volume in the E-mini S&P 500

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<sup>141</sup> Total trading volume in the E-mini S&P 500 contract exceeded that of the pit-traded contract in 2006. In 2006, total trading volume in the E-mini S&P 500 contract was 257,926,680 contracts compared to 74,221,810 E-mini equivalent contracts for the pit-traded S&P 500 contract.

contract was about 2.1 million contracts, compared to about 17,000 contracts for the S&P 500 contract. As of the close on May 5, total open interest in the E-mini S&P 500 contract was about 2.6 million contracts (representing a notional value of about \$152.4 billion), compared to about 328,000 contracts for the S&P 500 contract. The \$152.4 billion notional value of the E-mini S&P 500 contract, however, represents only about one percent of the \$14.1 trillion notional value of the entire U.S. stock market, as represented by the Russell 3000 index.

The Russell 2000 Index Mini futures contract trades on ICE Futures U.S. It was originally listed in October 2001 on the CME but moved to ICE Futures U.S. in September 2008. April 2010 average daily volume for the contract was 150,885. Open interest as of May 5, 2010 was 392,394 representing 10% of total U.S. stock index futures open interest.

## **b. Security Futures**

The term “security futures product” (SFP) encompasses security futures and options on security futures. Security futures includes both futures on a single security (called single stock futures) and futures on narrow-based security indices.

The Commodity Futures Modernization Act of 2000 (CFMA) lifted the ban on trading of futures contracts based on single stocks. A security future is a contract for the sale or future delivery of a single security or of a narrow-based security index.<sup>142</sup> Previously, these products were prohibited from being offered in the United States. With the passage of the CFMA, broad-based security index futures, which are not considered security futures products, continue to trade under the sole jurisdiction of the CFTC, while security futures products are subject to the joint jurisdiction of the CFTC and the SEC.<sup>143</sup>

Contract markets that have been designated by the CFTC may trade security futures products if they notice register with the SEC and comply with certain requirements of the Securities Exchange Act of 1934.<sup>144</sup> Likewise, national securities exchanges and national securities associations registered with the SEC may trade security futures products if they notice register with the CFTC and comply with certain requirements of the CEA.<sup>145</sup>

Only one DCM trades single stock and narrow based index futures contracts, OneChicago, which was designated as a contract market by the CFTC in 2002. At expiration of a single stock futures contract, the contract is settled by delivery of shares of the underlying stock. OneChicago lists 1,936 futures products, of which 233 are futures

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<sup>142</sup> CEA Section 1a(31), 7 U.S.C. 1a(31); 17 CFR Part 41.

<sup>143</sup> CEA Section 2(a)(1)(C), 7 U.S.C. 2(a)(1)(C); CEA Section 2(a)(1)(D), 7 U.S.C. 2(a)(1)(D).

<sup>144</sup> CEA Section 5f, 7 U.S.C. 7b-1. See also, 17 CFR Part 41.

<sup>145</sup> 15 U.S.C. 78f(g)(2).



on Exchange Traded Funds. The total trading volume on OneChicago in 2009 was approximately 3 million contracts.

#### **4. Electronic Trading**

##### **a. History of Electronic Futures Trading**

Electronic futures trading began at both CME and CBOT in 1992. Over the almost two decades since then, electronic trading has come to be the prevalent form of trading in U.S. futures markets. Electronic trading volume surpassed open outcry trading volume at CBOT in 2004, at CME in 2005, and at the New York Mercantile Exchange (NYMEX) in 2007. As of the end of April 2010, electronic trading accounted for approximately 88 percent of the combined volume of all CME Group exchanges<sup>146</sup>—which collectively account for approximately 97 percent of all U.S. futures and options volume—while open outcry trading had declined to approximately 12 percent of the combined volume of those exchanges.<sup>147</sup> For example, in 2009, total trading volume for the S&P 500 futures contract was approximately 10.4 million contracts as compared to approximately 556 million contracts for the E-mini S&P 500 contract.

The IntercontinentalExchange, Inc. was launched as a fully electronic trading venue in 2000. It acquired the former New York Board of Trade, now ICE Futures U.S., whose markets traded only by open outcry, in 2006. ICE launched electronic trading at ICE Futures U.S. in 2007, and by the end of 2007 all futures contracts there were exclusively traded electronically, with only options on futures still traded by open outcry.

##### **b. Electronic Trading Platforms**

Equity index futures on U.S. futures exchanges are traded on two electronic trading systems, CME Group's Globex system and the IntercontinentalExchange, Inc.'s ICE Trading System.

CME Globex supports electronic trading at all CME Group exchanges. The CME Globex system also supports the electronic trading of partner exchanges including the Kansas City Board of Trade, Minneapolis Grain Exchange, Dubai Mercantile Exchange, BM&F Bovespa, and Korea Exchange. Launched in 1992, CME Globex is now accessed by customers in more than 85 countries and foreign territories, and is available for trading nearly 24 hours a day from Sunday evening to Friday afternoon. In the first quarter of 2010, CME Globex processed an average daily volume of approximately 9.5 million contracts for CME, CBOT, NYMEX and COMEX products.

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<sup>146</sup> The CME Group exchanges include CME, CBOT, NYMEX, and the Commodity Exchange, Inc. (COMEX).

<sup>147</sup> Although all U.S. futures markets trade either exclusively on electronic trading systems or utilize a combination of floor trading and electronic trading, this discussion focuses solely on CME Globex and ICE Trading System, the systems used to trade the E-mini S&P 500 and the Russell 2000 equity index futures contracts.

The IntercontinentalExchange, Inc.'s ICE Trading System supports electronic trading at all ICE futures exchanges, including ICE Futures U.S. (regulated by the CFTC), ICE Europe (regulated by the United Kingdom's Financial Services Authority), and ICE Canada (regulated by Canada's Manitoba Securities Commission). It also supports electronic trading for ICE's OTC swaps markets in oil, electricity, and natural gas. It is accessed by customers in 50 countries and is available for trading for about 23 hours a day from Sunday evening through Friday afternoon. During April 2010, the ICE Trading System processed an average daily volume of about 428,000 contracts for ICE Futures U.S., and an overall combined average daily volume of almost 1.4 million contracts for all trading on the system.

## **5. Order Display and System Speed**

CME's Globex system displays bid and offer prices and volume 10-deep in the order book for the E-mini S&P 500 contract, and the ICE Trading System displays the full depth of all bids and offers in the order book for all futures contracts traded on ICE Futures U.S. At both exchanges, traders can use front-end systems as an interface to enter their orders into the respective electronic trading system.<sup>148</sup> CME and ICE offer a range of different connectivity options to market participants. Market participants' decisions related to application design, network infrastructure, hardware and configuration affect how a participant accesses the market.

Once an order message is received by the Globex matching engine, the system affixes a time stamp to the order message and transmits it back to the end-user acknowledging the time of receipt at the matching engine. In the E-mini S&P 500 market on May 6, the average latency at the matching engine level during the period from 2:30 p.m. -3:00 p.m. was 3 milliseconds. The average latency during this period for market data updates to the last best price and 10-deep book was 1.5 milliseconds. Similarly, once an order message is received by the ICE Trading System's matching engine, the system affixes a time stamp to the order message and transmits it back to the end-user acknowledging the time of receipt at the matching engine. In the Russell 2000 market on May 6, the average latency at the matching engine level during the period from 2:30 p.m. -3:00 p.m. was 250 microseconds. The average latency during this period for market data updates to the last best price and full order book depth was 250 microseconds.

During the period from 2:30 p.m. to 3:00 p.m. on May 6 in the June E-mini S&P 500 index futures contract, the average number of trades per second was approximately 106 trades, and the average volume per second was approximately 600 contracts. The peak number of trades per second occurred at 1:43:21 p.m. with 889 trades. The peak volume in one second occurred at 2:46:51 p.m., with 4,456 contracts traded. In comparison, on May 13, the Thursday following May 6, the peak message volume in the

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<sup>148</sup> "Front-end system" refers generally to the technology and infrastructure by which a trader interacts with an exchange's electronic trading system. Front-end systems provide the immediate interface through which orders are entered for transmission to the exchange, and through which market data is received by the trader. Front-end systems can be proprietary to the trader, furnished by third-party providers, or even provided by the exchange itself.

E-mini S&P 500 occurred between 9:30 a.m. - 10:00 a.m. The average volume per second was 133 contracts and the peak volume per second was 2,806 contracts. The average number of trades per second was 39 and the peak number of trades per second was 891 trades.

During the period from 2:30 to 3:00 p.m. on May 6 in the Russell 2000 index futures contract, the average number of trades per second was 32 trades, and the average volume per second was 44 contracts. The peak number of trades per second occurred at 2:41:41 p.m. with 320 trades. The peak volume in one second occurred at 2:41:44 p.m. with 431 contracts traded. For comparison, during the period of 2:30 p.m. -3:00 p.m. on May 13, the average volume per second was 11 contracts and the peak volume per second was 194 contracts. The average number of trades per second was 7.7 trades and the peak number of trades per second was 126 trades.

## **6. Co-location**

A driving force behind the growth of electronic trading in the futures industry has been the continuing evolution of technologies for generating and executing orders. These technologies have improved the speed, capacity, and sophistication of trading functions that are available to market participants.

Many trading firms have trading strategies that are highly dependent upon speed in a number of areas: speed of market data delivery from exchange servers to the firms' servers; speed of processing of firms' trading engines; speed of access to exchange servers by firms' servers; and, speed of order execution and response by exchanges. For some trading firms, speed is now measured in microseconds, and any latency or delay in order arrival or execution can adversely affect their trading strategy. These trading firms are typically referred to as "high frequency" and/or "algorithmic" traders. High frequency traders are professional traders that use computer systems to engage in strategies that generate a large number of trades on a daily basis. Competition among high frequency traders has led to extensive use of co-location and/or proximity hosting services.<sup>149</sup>

Co-location and proximity services refer to trading market and/or certain third-party facility space that is made available to market participants for the purpose of locating their network and computing hardware closer to the trading market's matching engine. Along with space, co-location and proximity hosting services usually involve providing various levels of power, telecommunications, and other ancillary products and services necessary to maintain the trading firms' trading systems.

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<sup>149</sup> Other characteristics of high frequency trading may also include: (1) the use of computer systems to generate, route and execute orders, (2) short time-frames for establishing and liquidating positions, (3) submission of numerous orders that are cancelled shortly thereafter, and/or (4) ending the trading day in a neutral overall position.

## 7. Futures Market Participants

As shown in the CFTC's Commitments of Traders (COT) reports, almost all of the participants in equity index futures markets are reportable traders on whom the CFTC regularly collects substantial information.<sup>150</sup> The vast majority of these traders are classified as "commercial traders"<sup>151</sup> For example, in the E-mini S&P 500 futures market, approximately 90 percent of all traders are reportable, and 70 percent are classified as commercial traders. The commercial category includes institutional investors such as pension funds, endowments, corporations, insurance companies, broker-dealers, large U.S. and non-U.S. commercial banks, and swaps dealers.

The remaining traders include hedge funds and other managed funds, as well as day traders. Day traders typically are in and out of the market rapidly, and usually do not maintain significant open interest from one trading day to the next, or even one hour to the next, although they may represent a significant portion of daily volume. A new type of futures market day trader, high frequency traders (described above), employ computer trading algorithms to spot market trends that signal when to enter and exit a market, and to execute their trading strategies. High frequency traders typically place large numbers of orders for small-quantities of contracts, either within a single market or across many different markets.

## 8. Order Entry

Participants in equity index futures markets place orders in a variety of ways. Some use the traditional method of telephoning an order to an exchange member firm, which takes the order and transmits it either to an electronic trading system or to an exchange floor.<sup>152</sup> The majority of participants, however, transmit their orders

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<sup>150</sup> The COT reports provide a breakdown of each Tuesday's open interest for futures markets in which 20 or more traders hold positions equal to or above the reporting levels established by the CFTC. The information is available on the CFTC Website, [cftc.gov](http://cftc.gov).

<sup>151</sup> When an individual reportable trader is identified to the CFTC, the trader is classified either as "commercial" or "non-commercial." All of a trader's reported futures positions in a commodity are classified as commercial if the trader uses futures contracts in that particular commodity for hedging as defined in CFTC Regulation 1.3(z), 17 CFR 1.3(z). A trading entity generally gets classified as a "commercial" trader by filing a statement with the CFTC, on CFTC Form 40: Statement of Reporting Trader, that it is commercially "...engaged in business activities hedged by the use of the futures or option markets." To ensure that traders are classified with accuracy and consistency, CFTC staff may exercise judgment in re-classifying a trader if it has additional information about the trader's use of the markets. A trader may be classified as a commercial trader in some commodities and as a non-commercial trader in other commodities. A single trading entity cannot be classified as both a commercial and non-commercial trader in the same commodity. Nonetheless, a multi-functional organization that has more than one trading entity may have each trading entity classified separately in a commodity. For example, a financial organization trading in financial futures may have a banking entity whose positions are classified as commercial and have a separate money-management entity whose positions are classified as noncommercial.

<sup>152</sup> In the case of the open outcry S&P 500 futures contract, the member firm will transmit the order to CME's trading floor.

electronically themselves. Many of these orders are first transmitted to the exchange clearing member firm that guarantees that participant's trades, and then to the trading system. Some participants who have been approved by their clearing members and the exchange can transmit their orders directly to the trading system.

In 2008, CME implemented "Globex Credit Controls," a risk management system that enables intermediaries to set credit limits for each customer placing orders directly to Globex. While these risk limits are set by the intermediary firm, they are applied on an automated basis by the electronic trading system as a backstop to the firm's own risk management architecture. In April 2010, CME promulgated its Rule 949 and Advisory 10-153, which specifically require members to make use of these controls. Starting at the beginning of 2011, CME will be reviewing member firms' use of these controls (e.g., the reasonableness of the size of the limits) in light of the firms' financial resources.

ICE has an integrated pre-trade risk management system within the ICE Trading System to allow futures commission merchants to set credit limits for each customer placing orders into the system. Once set by the FCM, the limits are automatically applied to the user by the ICE Trading System. Modifications to the credit limits take effect in real-time in the trading system and can be made via the ICE website 24 hours a day, 7 days a week. These credit settings can be used as the primary risk management tool for firms or as a backstop to the firm's own risk management architecture. All participants who trade ICE U.S. Futures' contracts must utilize these controls to trade on the ICE trading system.

## **9. Market Making in Futures Markets**

Futures exchanges are not required to have market makers. However, a futures exchange may enter into agreements with an exchange member calling for the member to act as a market maker on a specific product or products, in order to provide liquidity for new product or in low volume contracts.<sup>153</sup> Market maker agreements provide the market maker with certain incentives if the market maker, trading for its own account, complies with the particular obligations. These market maker agreements generally specify volume requirements and impose an affirmative duty on the market maker to make a continuous, two-sided market within some specified bid-ask spread in order to receive the incentives.<sup>154</sup> The requirement that the market maker provide its quotes in a particular bid-ask spread means that any quotes the market maker provides to qualify for the market maker program must be within a certain range of the then current market price.

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<sup>153</sup> In the case of CME, it has market maker programs in the following equity index contracts: E-mini S&P MidCap 400 Futures, E-mini S&P MidCap 600 Futures, S&P 500 Technology Index Futures, S&P 500 Financial Sector Index Futures, E-mini MSCI EAFE Futures, E-mini MSCI Emerging Markets Index Futures, and E-mini Dow Futures (European Hours).

<sup>154</sup> Futures exchanges must also make the terms and conditions of market maker programs publically available. See, Designation Criteria 7, CEA Section 5(b)(7), 7 U.S.C. 7(b)(7); Core Principle 7, CEA Section 5(d)(7), 7 U.S.C. 7(d)(7).

Market maker programs must comply with applicable core principles and designation criteria set out in the CEA,<sup>155</sup> and prior to its implementation, a program's criteria must be submitted to the CFTC, either by self-certification or for approval.<sup>156</sup> In reviewing market maker programs, the CFTC considers, among other things, whether market maker incentives would encourage wash or fictitious trading or other trading abuses. The CFTC also examines whether the exchange has adequate regulatory compliance mechanisms in place to detect trade practice abuses by market maker program participants.

## **10. Existing Mechanisms to Promote Orderly Markets and Customer Protection**

Both CME Globex and the ICE Trading System have automatic safety features—termed “pre-trade risk management functionality”—to protect against errors in the entry of orders (such as “fat finger” errors), extreme price swings, and erroneous prices. As discussed below, these features help ensure fair and orderly markets.

First, CME Globex and the ICE Trading System both automatically reject orders priced outside a range of reasonability, also known as a “price band.”<sup>157</sup> For instance, on the E-mini S&P 500 futures contract, the price band is 12 points (approximately one percent) above and 12 points below the last executed trade.<sup>158</sup> This prevents clearly erroneous orders from entering the trading system and helps to prevent “fat finger” errors.

Second, both CME and ICE have maximum order size limitations that prevent entry into the trading system of an order that exceeds a maximum quantity established by the exchange. In the E-mini contract, for example, the maximum quantity is 2,000 contracts. This protection also helps to prevent “fat finger” errors. With the S&P 500 Index at 1,100 points as it was on May 6, two thousand E-mini contracts would have a notional value of \$110 million. The average transaction size in the E-mini contract, however, tends to be six contracts, or \$330,000.

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<sup>155</sup> Market maker programs must comply, for example, with Core Principle 2—Compliance with Rules (monitor for trade practice abuses), Core Principle 9—Execution of Transactions (ensuring that the market remains open, competitive and efficient), Core Principle 12—Protection of Market Participants (fiduciary obligations to customers), and Core Principle 18—Antitrust Considerations, as well as Designation Criteria 3—Fair and Equitable Trading. See generally, CEA Section 5(b), 7 U.S.C. 7(b) and CEA Section 5(d), 7 U.S.C. 7(d).

<sup>156</sup> CEA Section 5c(c), 7 U.S.C. 7a-2(c). See also, 17 CFR 40.5; 17 CFR 40.6.

<sup>157</sup> The electronic trading functionality involved is known as “price banding functionality.” Generally, the price band is calculated dynamically by the system, based on the last traded price or the best bid or offer, and the price band thus moves dynamically with the market price, with its outer parameters remaining a fixed distance in points (12 in the case of the E-mini) above and below the market price. A “point” on a broad-based equity index, such as the S&P 500, is a concept used to measure the collective value of the securities included in the index.

<sup>158</sup> At CME and ICE Futures US, the number of points involved in the price band is set separately by each exchange for the products they trade.

Third, both CME Globex and the ICE Trading System have protections with regard to “stop loss” orders.<sup>159</sup> Such orders are triggered if the market declines to a level pre-selected by the person entering the order. CME and ICE rules provide that when the market declines to the trader’s pre-selected stop level for such an order, the order becomes a limit order executable only down to a price within the range of reasonability permitted by the system, instead of becoming a market order.<sup>160</sup> Requiring that stop orders have a limit avoids the possibility that such stop orders could be executed no matter how low the market goes. This requirement for all stop orders to convert to limit orders prevents, for example, any stop orders from being posted or executed at a price unreasonably below the market.

Fourth, CME Globex has “Stop Logic” functionality that protects against cascading stop orders—the domino effect of one stop order triggering others.<sup>161</sup> Globex’s Stop Logic functionality pauses trading—the pause is termed “the Stop Logic reserve period”—when the trading engine recognizes that it has a series of resting stop orders that could lead to a cascade and move the market up or down beyond a specified amount. The length of the Stop Logic reserve period varies by product and time of day. For the E-mini S&P 500, the period is 5 seconds from 9:30 a.m. to 4:15 p.m. and 10 seconds during the balance of the trading session. The pause allows new orders to enter the system to restore liquidity and balance to the order book.<sup>162</sup>

## 11. Trade Cancellation

Trade cancellation policies balance the adverse effects on market integrity of executing trades and publishing trade information inconsistent with prevailing market conditions. The intent is to preserve legitimate expectations that executed transactions will not be cancelled.

At CME, a “no-bust range” is established for each product traded electronically on CME Globex. Trade prices within the no-bust range—six points above or below the

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<sup>159</sup> In the futures markets, however, a stop order as a limit order in the CME Globex and ICE systems. As a limit order, a trade cannot be executed at a price below its limit price.

<sup>160</sup> At CME, a market participant entering a stop loss order can pre-select a limit price only within a 12-point range of reasonability below the stop price. If the participant did not pre-select a limit price, the system defaults to a limit price three points below the stop price. At ICE, the participant can pre-select a limit price only within four points below the stop price, and the system defaults to a limit price four points below the stop price if no limit price is pre-selected.

<sup>161</sup> Absent this Stop Logic functionality, all stop orders at a particular price point would be triggered and traded on a first-in, first-out basis; additional resting stops would be triggered and traded as the market declined, and new orders would continue to be accepted and traded. While the protected range would still be operable, it would continuously adjust downwards with the market until a new equilibrium was reached, including, potentially, the execution of all resting stop orders in the order book.

<sup>162</sup> Globex’s Stop Logic functionality was originally developed to address thin markets in back contract months at times of night when open outcry markets were closed. However, it has played a role in volatile markets, such as the May 6 E-mini S&P 500 futures market.

market price in the case of the E-mini S&P 500 contract—will not generally be busted or adjusted. The only exception to this rule is if the Globex Control Center (GCC) determines that not busting or adjusting a trade within the no-bust range will have a material, adverse effect on the market.<sup>163</sup> Exchange rules state that the GCC can adjust trade prices or bust trades when such action is necessary to mitigate market disrupting events caused by the improper or erroneous use of the electronic trading system or by system defects. The GCC may review a trade based on its analysis of market conditions or on a request for review by a Globex user. A request for review must be made as soon as possible, but will generally not be considered if more than eight minutes have passed since the trade occurred. On May 6, CME received no requests to cancel any trades in the E-mini S&P 500 futures market, and CME did not cancel any trades.

ICE Futures U.S. has established a “No Cancellation Range” (“NCR”) for each ICE Futures U.S. product traded on its electronic platform. The NCR for the Russell 2000 Index Mini futures contract is 400 index points above or below the current anchor price (the anchor price is generally the last traded price). Trades within the NCR are not, under most circumstances, cancelled, whether as the result of error or otherwise. Traders generally have 5 minutes from the time of executing a trade in which to notify ICE Futures U.S. of an alleged error trade. ICE generally decides whether an alleged error trade will stand or be cancelled within 15 minutes after the time the alleged error trade occurred. On May 6, ICE received no requests to cancel any trades in the Russell 2000 contract, and did not cancel any trades.

## **12. Internalization of Orders by Futures Commission Merchants**

In futures markets, FCMs can match orders in two limited ways. Such orders can be matched as a block trade or as an exchange of physicals for related positions transaction (“EFRP”), with the permission of customers.<sup>164</sup> However, all such transactions must be reported to the exchange promptly, and are included in the exchange’s audit trail and in market data the exchange subsequently transmits to market participants. If a block trade or EFRP is not executed, the FCM can match orders only if it follows strict exchange rules governing cross-trades, which require that, before the FCM can match such orders, they must be exposed to the market for a certain period of time during which they are visible to and available for matching by any market

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<sup>163</sup> The GCC is the Market Operations and Customer Service desk for electronic trading on the Globex System. The GCC handles inquiries, issues, and support requests for the Globex platform, including electronic trading, order routing and market data interfaces, and network connectivity.

<sup>164</sup> Exchange of Futures for Related Positions includes, among other things, Exchange for Physicals (“EFP”), Exchange of Futures for Swaps (“EFS”), and Exchange of Futures for Risk (“EFR”). An EFP is a transaction in which the buyer of a cash commodity transfers to the seller a corresponding amount of long futures contracts, or receives from the seller a corresponding amount of short futures, at a price difference manually agreed upon. An EFS is a privately negotiated transaction in which a position in a physical delivery futures contract is exchanged for a cash-settled swap position in the same or a related commodity, pursuant to the rules of a futures exchange. An EFR is an exchange of futures for, or in connection with, over-the-counter derivative transactions.



participant. Both the orders and any resulting permissible cross-trade are included in the exchange's market data transmitted to market participants, as well as in the exchange's audit trail. This differs from the situation in equities markets, where orders internalized by broker-dealers may not be included in consolidated quotation data visible to the entire market.

### **13. Sources of Regulatory Data**

The CFTC's primary mission is fostering markets that accurately reflect the forces of supply and demand for the underlying commodity and are free of abusive trading practices. In this capacity, the CFTC conducts oversight of trade execution facilities through its market surveillance and market compliance programs.

The surveillance program identifies situations that could pose a threat of manipulation and to initiate appropriate preventive actions. Each day, for all active futures and option contract markets, CFTC staff monitors the daily activities of large traders, key price relationships, and relevant supply and demand factors in a continuous review for potential market problems. Surveillance is not conducted exclusively at the CFTC, surveillance issues are usually handled jointly by the CFTC and the appropriate futures exchange. Relevant surveillance information is shared and corrective actions are taken, when appropriate. Potential problem situations are jointly monitored and, if necessary, verbal contacts are made with the participants in question. These contacts may be for the purpose of understanding their trading, confirming reported positions, alerting the brokers or traders as to the regulatory concern for the situation, or warning them to trade responsibly. If an exchange fails to take actions that the CFTC deems appropriate, the CFTC has broad emergency powers under which it can order the exchange to take actions specified by the CFTC.

The CFTC's surveillance program uses many sources of market information to accomplish its objectives. Some of this information is publicly available, including data on the overall supply, demand, and marketing of the underlying commodity; futures, option, and cash prices; and trading volume and open interest data. Other information is highly confidential under statutory requirements, including data which identifies the activity or positions of individual traders.

Exchanges report the daily positions and transactions of each clearing member to the CFTC. The data are transmitted electronically during the morning after the "as of" date. They show, separately for proprietary and customer accounts, the aggregate position and trading volume of each clearing member in each futures and option contract. The data are used to identify the clearing firms that clear the largest buy or sell volumes or hold the biggest positions in a particular market.

The clearing member data do not identify the beneficial owners of the positions. Information on beneficial owners, however, is provided through the CFTC's large trader reporting system ("LTRS"). Under the CFTC's LTRS, clearing members, FCMs, and foreign brokers (collectively called reporting firms) file daily reports with the CFTC

pursuant to Part 17 of the CFTC's regulations, 17 CFR Part 17. As is the case with clearing member data, the data are transmitted electronically during the morning after the "as of" date. The reports show futures and option positions of traders with positions at or above specific reporting levels as set by the CFTC. Current reporting levels are found in CFTC Regulation 15.03(b), 17 CFR 15.03(b).<sup>165</sup>

If, at the daily market close, a reporting firm has a trader with a position at or above the CFTC's reporting level in any single futures or option expiration month, the firm reports that trader's entire position in all futures and options expiration months in that commodity, regardless of size. The CFTC uses additional information obtained from the reporting firms—*i.e.*, CFTC Form 102: Identification of "Special Accounts"—and traders themselves—*i.e.*, Form 40 "Statement of Reporting Trader"—to aggregate positions of a trader that may exist across multiple accounts or firms.

The CFTC also collects trade data on a daily, transaction date + 1 ("T+1"), basis from all U.S. futures exchanges through "Trade Capture Reports." Trade Capture Reports contain trade and related order information for every matched trade facilitated by an exchange, whether executed via open outcry or electronically, or non-competitively (*e.g.*, block trades, exchange for physical, etc.). Among the data included in the Trade Capture Report are trade date, product, contract month, trade execution time, price, quantity, trade type (*e.g.*, open outcry outright future, electronic outright option, give-up, spread, block, etc.), trader ID, order entry operator ID, clearing member, opposite broker and opposite clearing member, order entry date, order entry time, order number, customer type indicator, trading account numbers, and numerous other data points. Additional information is also required for options on futures, including put/call indicators and strike price, as well as for give-ups, spreads, and other special trade types.

All transactional data is received overnight, loaded in the CFTC's databases, and processed by specialized software applications that detect patterns of potentially abusive trades or otherwise raise concern. Alerts are available to staff the following morning for more detailed and individualized analysis using additional tools and resources for data mining, research, and investigation.

Time and sales quotes for pit and electronic transactions are also received from the exchanges daily. CFTC staff is able to access the market quotes to validate alerts as well as reconstruct markets for the time periods in question. Currently, staff is working with exchanges to receive all order book information in addition to the executed order information already provided in the Trade Capture Report. This project is expected to be completed within the next year; at present such data remains available to staff through "special calls" (described below) requesting exchange data.

In addition to information received daily, the CFTC may also obtain information through what is referred to as a Special Call. Under CFTC Regulation 18.05, every trader

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<sup>165</sup> The current reporting levels, in number of contracts, for securities products are as follows: S&P 500 Index, 1,000; Other Broad-Based Securities Indices, 200; Individual Equity Securities, 1,000; and Narrow-Based Security Indices, 200.

who holds or controls a reportable futures or option position is required to keep books and records showing details concerning all positions and transactions in the commodity, as well as details concerning all positions and transactions in the cash commodity, and all commercial activity that the trader hedges in the futures or option contract in which the trader is reportable.<sup>166</sup> Such information must be made available to the CFTC upon request. A current use of the special call provision is in the capture of relevant information of index activity in commodity markets. To obtain the necessary data on OTC swap agreements, CFTC staff issued a special call to financial firms to receive data about the index activity of a variety of investors.

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<sup>166</sup> 17 CFR 18.05.

## APPENDIX C

### Cross-Market Circuit Breakers

Circuit breakers are coordinated, cross-market trading halts that were designed to operate during significant market declines and to substitute orderly, pre-planned halts for the *ad hoc* trading halts which can occur when market liquidity is exhausted. Circuit breakers also provide opportunities for markets and market participants to assess market conditions and potential systemic stress during a historic market decline. The U.S. securities and futures markets adopted circuit breaker procedures in October 1988 in response to their experiences during the historic market declines of October 1987 and to recommendations contained in studies of the pricing and liquidity problems that arose during the sharp price swings and volume surges on October 20, 1987, that came close to shutting down the markets.

In addition, futures exchanges have “price limits” for stock index futures contracts.<sup>167</sup> These price limits were also adopted in response to the historic market declines in October 1987. A price limit, in itself, does not halt trading in the futures, but prohibits trading at prices below (and sometimes above) the pre-set limit based on the previous session’s settlement price. Intra-day price limits are removed at pre-set times during the trading session, such as 10-minutes after the futures are determined to be “locked limit” down (up).<sup>168</sup> Daily price limits remain in effect for the entire trading session. Specific price limits are set for each stock index futures contract.

#### 1. Cross-Market Circuit Breaker Halts

##### a. The October 1987 Market Break and the Adoption of Circuit Breakers in 1988

In October 1987, the U.S. securities markets experienced an extraordinary surge in price volatility and trading volumes (“October 1987 Market Break”). On Monday, October 19, the DJIA declined 508 points, representing a record one-day decline of almost 23%. On October 20, the DJIA again declined sharply before share prices stabilized. The combination of historic price swings and unprecedented trading volumes overwhelmed the operational capacities and liquidity of the securities and futures markets. By mid-day on October 20, heavy selling pressure had produced large order imbalances and numerous *ad hoc* trading halts in individual stocks. Liquidity and pricing difficulties also resulted in uncoordinated mid-day trading suspensions on major options

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<sup>167</sup> While price limits are common in futures contracts, there are no price limits for stocks, equity options or index options.

<sup>168</sup> A futures contract is found to be “locked limit” if exchange officials determine that prices are consistently at the limit price. A price decline that touches a limit but quickly bounces back will not trigger a “locked limit” determination.

exchanges and several large stock index futures exchanges. While the subsequent rally in market prices in the afternoon averted more widespread financial problems, the near shutdown of the markets on October 20 became a central focus of several studies of the October 1987 Market Break and resulted in the adoption of circuit breaker procedures in 1988.

Immediately following the October 1987 Market Break, the Presidential Task Force on Market Mechanisms was established with Nicholas F. Brady as Chairman. The report issued by the Task Force on January 8, 1988 (“Brady Report”) recommended a number of initiatives to address future periods of extreme market volatility, including the implementation of circuit breaker mechanisms coordinated across the markets for stocks, options, and stock index futures. The Brady Report noted that the market disorders of October 1987 “became, in effect, *ad hoc* circuit breakers, reflecting the natural limits to market liquidity.” Accordingly, the Brady Report maintained that the October 1987 Market Break “demonstrates that it is far better to design and implement coherent, coordinated circuit breaker mechanisms in advance, than to be left at the mercy of the unavoidable circuit breakers of chaos and system failure.”<sup>169</sup>

After the issuance of the Brady Report, the President’s Working Group on Financial Markets (“Working Group”) was formed with the mandate to determine the extent to which coordinated regulatory action was necessary to strengthen the nation’s financial markets.<sup>170</sup> The May 1988 Interim Report (“Interim Report”) of the Working Group recommended a number of initiatives to assist the markets in coping with future periods of extraordinary price swings and volume surges, including the adoption of circuit breakers that would provide coordinated trading halts and reopenings for large, rapid market declines that threaten to create panic conditions.<sup>171</sup> The Working Group recommended that all U.S. markets for stocks, options, and futures halt trading for one hour if the DJIA declined 250 points from its previous day’s closing level and halt trading for two hours if the DJIA declined 400 points from its previous day’s closing level.<sup>172</sup> In addition, the Working Group anticipated quarterly reviews of the circuit breaker thresholds to determine whether changes in index levels necessitated changes to the triggers so that they continue to reflect percentage declines approximately equivalent to 12% and 20%.<sup>173</sup>

Partly in response to the October 1987 Market Break and the recommendations of the Brady Report and the Working Group, the securities and stock index futures markets submitted proposals to the SEC and CFTC in 1988 to implement circuit breakers that would impose temporary trading halts following significant market declines. The circuit

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<sup>169</sup> See *Report of the Presidential Task Force on Market Mechanisms* (January 1988) at 66.

<sup>170</sup> The Working Group, established in March 1988, consists of the Secretary of the Treasury and the Chairmen of the SEC, CFTC, and the Board of Governors of the Federal Reserve System.

<sup>171</sup> See *Interim Report of the Working Group on Financial Markets* (May 1988) at 5.

<sup>172</sup> See *Interim Report* at 4.

<sup>173</sup> See *Interim Report* at Appendix A.

breaker rules for the securities and stock index futures markets were implemented in October 1988.<sup>174</sup>

The circuit breakers approved in 1988 provided for a one-hour trading halt in all securities markets if the DJIA declined 250 points from its previous day's closing level and for a subsequent two-hour trading halt if the DJIA declined 400 points from its previous day's close. In approving the original circuit breakers, the SEC and CFTC noted that the circuit breakers were not an attempt to prevent markets from reaching new price levels, but an effort by the securities and futures markets to arrive at a coordinated means to address potentially destabilizing market volatility along the lines of the historic decline of the October 1987 Market Break.<sup>175</sup> The SEC and CFTC also believed that circuit breakers would help promote stability in the equity and equity-related markets by providing for increased information flows and enhanced opportunity to assess information during times of extreme market movements. The SEC and CFTC believed that circuit breakers could provide market participants with an opportunity to re-establish an equilibrium between buying and selling interest and ensure that market participants had a reasonable opportunity to become aware of and respond to a dramatic market decline.<sup>176</sup>

#### **a) Modifications to the Circuit Breakers from 1996 to 1998**

The SEC and CFTC approved several modifications to the markets' circuit breaker rules starting in 1996. In July 1996, the agencies approved rule modifications to reduce the length of the trading halts by half. In addition, when the SEC and CFTC approved a six-month extension of the circuit breakers in October 1996,<sup>177</sup> the agencies urged the markets to reach a consensus on the size of increases in the trigger levels required to ensure that cross-market trading halts would be imposed only during market declines of historic proportions.<sup>178</sup> In response to the agencies' recommendations, the markets submitted proposals to increase the circuit breaker triggers to levels of 350 and 550 points in the DJIA.<sup>179</sup> In approving the 350/550 trigger levels through January 31, 1998, the agencies stated that the new trigger levels represented a substantial improvement over the existing 250/400 trigger levels. Nevertheless, the agencies noted

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<sup>174</sup> See Securities Exchange Act Release Nos. 26198 (Oct. 19, 1988), 53 FR 41637 (October 24, 1988) (Amex, CBOE, NASD, and NYSE) ("1988 Approval Order"); 26218 (October 26, 1988), 53 FR 44137 (Nov. 1, 1988) (CHX); 26357 (December 14, 1988), 53 FR 51182 (December 20, 1988) (BSE); 26368 (December 16, 1988), 53 FR 51942 (Dec. 23, 1988) (PSE); 26386 (December 22, 1988), 53 FR 52904 (December 29, 1988) (PHLX); and 26440 (January 10, 1989), 54 FR 1830 (January 17, 1989) (CSE).

<sup>175</sup> Id.

<sup>176</sup> Id.

<sup>177</sup> See Securities Exchange Act Release No. 37890 (October 29, 1996), 61 FR 56983 (November 5, 1996) (Amex, NYSE, and PHLX).

<sup>178</sup> Id.

<sup>179</sup> See Securities Exchange Act Release No. 38221 (January 31, 1997) 62 FR 5871 (NYSE, Amex, CBOE, CHX, BSE, and PHLX) ("1997 Approval Order").

that trigger levels should be amended to reflect an extraordinary decline under prevailing market conditions and that the SEC and CFTC would work with the markets to develop procedures for reevaluating the circuit breaker triggers on at least an annual basis.<sup>180</sup>

On October 27, 1997, the nation's securities markets fell by a then-record absolute amount, with the DJIA declining 554.26 points (7.18 percent) to close at 7161.15. This was first and only day that the cross-market trading halt circuit breaker procedures were implemented. At 2:36 p.m., the DJIA had declined 350 points, thereby triggering a 30-minute halt on the stock, options, and index futures markets. After trading resumed at 3:06 p.m., prices fell rapidly to reach the 550-point circuit breaker level at 3:30 p.m., thereby ending the trading session 30 minutes prior to the normal stock market close.

Immediately following the events of October 27, the markets and regulators began considering further revisions to the circuit breaker procedures. There was general consensus that the 7 percent decline in the DJIA on October 27 did not justify the early closure of the markets on that day. Accordingly, an agreement was reached by the markets and the agencies that trigger points for circuit breaker halts should be increased substantially and measures should be taken to permit normal market closings if circuit breaker thresholds were reached late in a trading session.

Accordingly, the SEC and the CFTC approved revised circuit breaker rules for the markets in April 1998.<sup>181</sup> The revised rules established trading halts following one-day declines in the DJIA of 10 percent, 20 percent, and 30 percent. The NYSE would calculate the trigger levels at the beginning of each calendar quarter, using the average closing value of the DJIA for the previous month to establish specific point values for the quarter. Trading would halt for one hour if the DJIA declined 10 percent prior to 2:00 p.m., and for one-half hour if the DJIA declined 10 percent between 2:00 p.m. and 2:30 p.m. If the DJIA declined by 10 percent at or after 2:30 p.m., trading would not halt at the 10 percent level. If the DJIA declined 20 percent prior to 1:00 p.m., trading would halt for two hours; trading would halt for one hour if the DJIA declined 20 percent between 1:00 p.m. and 2:00 p.m., and trading would halt for the remainder of the day if a 20 percent decline occurred at or after 2:00 p.m. If the DJIA declined 30 percent at any time, trading would halt for the remainder of the day.

These were the circuit breaker levels in place on May 6, 2010.<sup>182</sup>

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<sup>180</sup> Id.

<sup>181</sup> See Securities Exchange Act Release No. 39846 (April 9, 1998), 63 FR 18477 (April 15, 1998) (NYSE, Amex, BSE, CHX, NASD, and PHLX) (“April 1998 Approval Order”).

<sup>182</sup> In November, 2002, trading in security futures products (SFPs) began. Any NYSE-declared circuit breaker trading halts would apply also to DCMs that trade SFPs including single security and narrow-based security index futures.

## 2. CME Price Limit “Speed Bumps”

In response to the historic market volatility in October 1987, the CME adopted downside intra-day price limits for index futures even before the cross-market circuit breaker trading halts were established. The CME’s 1988 price limits were set at 5 percent, 10 percent, and 15 percent, as well as a daily limit at 20 percent. These were not coordinated with the circuit breakers or any stock exchange rules and were based on the price of the index futures contract from the previous day’s settlement price. For each of the intra-day price limits, trading would be subject to the price limit for 10 minutes after a “locked limit” finding by exchange officials. If the futures contract were limit offered at the end of that 10-minute period, then trading would halt for two minutes, after which the next price limit would be in effect. The daily price limit of 20 percent would remain in effect for the remainder of the trading session.

The futures price limits also have changed since their adoption in 1988. The CME eliminated the 5 percent and 15 percent intra-day price limits effective on January 1, 2008 in order to harmonize rules across CME and CBOT contracts. The CME and ICE 10 percent and 20 percent intra-day price limits act as “speed bumps” - once a stock index futures contract is determined to be locked limit, the limit remains in effect and/or halts for a period of time determined by the exchange, after which, the next price limit becomes effective. The daily price limit of 20% was replaced by a new limit of 30%.

The CME also currently maintains a 5% price limit above or below the regular trading hour closing level applicable to overnight electronic trading only. No trading may occur at a price more than 5% above or below the regular trading hours closing level. If the price limit is bid or offered at the limit within five minutes prior to the opening of regular trading hours, then trading will be halted for the remainder of electronic trading hours until the commencement of regular trading hours at 9:30 a.m. During the trading halt, the CME will provide an indicative opening price for the re-opening of regular trading hours.

These were the index futures price limits in place on May 6, 2010.

A review of the history of price limit declarations shows that the 5 percent price limit was hit for the S&P 500 and E-mini S&P 500 futures contracts only 5 times since 1988.<sup>183</sup> At no time during that period were any higher level price limits hit. However, over the period 1998 through 2007, when the 5 percent price limit was in effect, there was a total of six days when the E-mini S&P 500 futures contract fell by 5% or more during the trading day. This discrepancy could be explained by method used to calculate the 5 percent price limit, which is reset each calendar quarter based on the average settlement price over the prior calendar month. After the CME eliminated the 5 percent limit, the E-mini S&P 500 fell by more than 5% on 21 days.

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<sup>183</sup> The S&P 500 5 percent price limit was hit on October 8, 1988, October 13, 1989, October 27, 1997, April 4, 2000, and April 14, 2000.



# **APPENDIX D**

## **Futures Market Information**

- A. Most Active U.S. Stock Index Futures
- B. List of Active Designated Contract Markets
- C. Detailed Trading Statistics for the E-mini S&P 500 June 2010 futures on May 6, 2010. Volume, Price, Account, User Summary by hour, minute and second

## **A. MOST ACTIVE U.S. STOCK INDEX FUTURES**

	Name	Multiplier	Index Close 5/6/10	Notional Value at close	Open Interest as of close on 5/6/10	Notional Futures on Close on 5/5/10	Market Share of US Stock Index futures (Notional futures)	Volume on 5/6/10 (30-day avg. vol.)
1	CME E-MINI S&P 500	\$50 x Index	1,128	\$56,400	2,719,296	\$152,482,722,429	48.97%	5,682,565 (2,482,578)
2	CME S&P 500 STOCK INDEX	\$250 x Index	1,128	\$281,250	333,153	\$95,546,157,913	30.69%	54,701 (72,622)
3	ICE US RUSSELL 2000 MINI INDEX FUTURE	\$100 x Index	672	\$67,200	399,159	\$27,419,678,895	8.81%	392,565 (171,686)
4	CME NASDAQ-100 STOCK INDEX (MINI)	\$20 x Index	1,893	\$37,860	381,569	\$15,439,860,428	4.96%	736,784 (320,934)
5	CME NASDAQ-100 STOCK INDEX	\$100 x Index	1,893	\$189,300	26,667	\$4,882,124,351	1.57%	4,302 (1,823)
6	CME E-MINI S&P 400 STOCK INDEX	\$100 x Index	776	\$77,600	97,062	\$7,841,925,535	2.52%	56,629 (29,161)
7	CME S&P 400 MIDCAP STOCK IDX	\$500 x Index	776	\$388,000	1,788	\$720,427,400	0.23%	115 (61)
8	CBT DOW JONES INDUSTRIAL AVG- x \$5	\$5 x Index	10,520	\$52,600	84,706	\$4,557,248,441	1.46%	326,704 (145,245)

9	CBT DOW JONES INDUSTRIAL AVG x \$10	\$10 x Index	10,520	\$105,200	11,045	\$1,190,212,740	0.38%	894 (720)
10	CBT DOW JONES INDUSTRIAL AVG x \$25	\$25 x Index	10,520	\$263,000	28	\$7,311,500	0.00%	10 (5)
11	ICUS RUSSEL 1000 MINI INDEX FUTURE	\$100 x Index	621	\$62,100	19,589	\$1,250,936,760	0.40%	1842 (918)
12	CME E-MINI S&P SMALLCAP 600 INDEX	\$100 x Index	360	\$36,000	689	\$23,348,990	0.01%	392 (141)

## **B. DCMS WITH CONTRACTS THAT ACTIVELY TRADE**

1. **CBOE Futures Exchange**. An electronic exchange operating in Chicago, IL; CBOE Futures lists contracts on various volatility measures; CBOE Futures is a subsidiary of the Chicago Board of Options Exchange (designated on August 7, 2003).
2. **CBOT**. CBOT (Board of Trade of the City of Chicago, Inc.) is located in Chicago, IL; Trading takes place both electronically on CME Globex and on trading floors; CBOT listed contracts include agricultural, indexes, interest rates, and treasuries; originally organized as a grain cash market in 1848, and became a subsidiary of the CME Group, Inc. in 2007.
3. **CCFE**. An electronic exchange located in Chicago, IL; CCFE (Chicago Climate Futures Exchange, LLC) is a wholly owned subsidiary of the Chicago Climate Exchange Inc. (CCX); CCFE listed contracts include emissions contracts (designated November 9, 2004).
4. **CME**. CME (Chicago Mercantile Exchange Inc.) is located in Chicago, IL; trading takes place both electronically on CME Globex and on trading floors; CME listed contracts include agricultural, weather, FX, indexes, and real estate; began operation in 1898; the parent of CME (CME Group, Inc.) purchased CBOT in 2007.
5. **COMEX**. COMEX (The Commodity Exchange, Inc) is located in New York, NY; trading take place electronically on CME Globex and on trading floors in New York; COMEX lists contracts on precious metals; COMEX became a subsidiary of the New York Mercantile Exchange in 1994.
6. **ELX**. An electronic exchange located in New York, NY; ELX (ELX Futures, L.P.) was founded by a consortium of dealers, trading firms, and technology providers, including a number of large commercial and investment banks; ELX currently lists only treasury contracts. (designated May 22, 2009).
7. **ICE US**. ICE U.S. (ICE Futures US, Inc) is located in New York, NY; trading takes place both electronically on the ICE Trading system and on trading floors in New York; ICE US listed contracts include currencies, iron ore, agricultural products, and the Russell 1000 stock index. NYBOT was created by the merger of the Coffee, Sugar and Cocoa Exchange and the New York Cotton Exchange in 2004; NYBOT changed its name to ICE Futures US, Inc. after it became a wholly-owned subsidiary of the IntercontinentalExchange in 2007.
8. **KCBT**. KCBT (Kansas City Board of Trade) is located in Kansas City, KS; trading takes place both electronically on CME Globex and on trading floors in Kansas City; listed contracts include wheat and a broad-based stock index; KCBT futures trading in grains began in 1876.
9. **MGEX**. MGEX (Minneapolis Grain Exchange) is located in Minneapolis, MN; trading takes place both electronically on CME Globex and on trading floors; listed contracts

- include wheat and agricultural indexes; MGEX was started in 1881 and renamed MGEX in 1947.
10. **NFX**. NFX (NASDAQ OMX Futures Exchange) is an electronic exchange in New York, NY; primarily lists currency and currency-related contracts. NFX was started as Philadelphia Board of Trade; its parent (then PHLX) was bought by NASDAQ OMX in 2008.
  11. **NYMEX**. NYMEX (New York Mercantile Exchange) is located in New York, NY; trading takes place both electronically on CME Globex and on trading floors in New York; listed contracts include energy-related and, emissions. NYMEX was originally founded in 1872 as the Butter and Cheese Exchange of New York (which became NYMEX in 1882) and became a wholly-owned subsidiary of CME Group Inc. in 2008.
  12. **NADEX**. NADEX (North American Derivatives Exchange, Inc.) is a Chicago-based, electronic exchange offering retail-oriented, binary and variable payout options on stock indices, foreign exchange rates, economic events, metals, and certain agricultural commodities (designated February 18, 2004).
  13. **NYSE Liffe**. NYSE Liffe (NYSE Liffe U.S. LLC) is an electronic exchange located in New York, NY; listed contracts include precious metals and equity indexes; NYSE Liffe was launched in 2008 as a subsidiary of NYSE Euronext (designated August 21, 2008).
  14. **OneChicago**. OneChicago (OneChicago LLC Futures Exchange; also called OCX) is an electronic exchange located in Chicago, IL; listed contracts include individual stocks, narrow-based indexes, and exchange traded funds. OneChicago is owned by a consortium that includes Interactive Brokers Group, LLC, the CME Group, Inc., and the CBOE (designated June 11, 2002).

## **C. Detailed Trading Statistics for the e-Mini S&P 500 June 2010 futures**

This section contains detailed trading data for the CME e-mini S&P 500 June 2010 futures contract covering the following three time periods (all times Eastern Daylight Time):

- Activity by hour from May 5 4:00 PM through May 6 5:00 PM
- Activity by minute from May 6 1:00 PM through May 6 4:15 PM
- Activity by second from May 6 2:41:00 PM through May 6 2:50:00 PM

For each time slice, the following information is displayed:

- The number of trades (Trades)
- The number of individual contracts traded (Volume)
- The price of the first trade (First)
- The highest trade price (High)
- The lowest trade price (Low)
- The price of the last trade (Last)
- The difference between the last price and the first price (Last – First Range)
- The difference between the highest price and the lowest price (High/Low Range)
- The volume weighted average price (VWAP)
- The number of unique Globex accounts executing buys (Buy Accts)
- The number of unique Globex accounts executing sells (Sell Accts)
- The number of unique parties executing buys (Buy User IDs)<sup>184</sup>
- The number of unique parties executing sells (Sell User IDs)
- A graphical display of the volume (Volume Graph)

As can be seen in the tables, the number of User IDs is normally greater than the number of Accounts. This can be due to the use of a single account by multiple User IDs. For example, there is not a specific limit to the number of automated trading systems (ATS) that an individual can use to trade his personal account. Each ATS would be given a unique User ID.

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<sup>184</sup> CME Group Rule 576 requires that each order entered into CME Globex include the submission of an operator ID, also referred to as the “Tag 50 ID” or “User ID”, which is unique to the party who entered the order. For orders entered manually, the Tag 50 ID must be unique to the individual entering the order into CME Globex. For orders entered by an automated trading system (“ATS”), the Tag 50 ID must be unique to the person, or the identified team of persons on the same shift, who are responsible for the operation of the ATS. All Tag 50 IDs must be unique at the level of the clearing member firm. See Market Regulation Advisory Notice RA0915-5, “Operator ID (‘Tag 50’) Required on All CME Globex Orders,” available from CME Group at [http://www.cmegroup.com/rulebook/files/CME\\_Group\\_RA0915-5.pdf](http://www.cmegroup.com/rulebook/files/CME_Group_RA0915-5.pdf) (visited May 15, 2010).

The numbers for Buy Accts and Sell Accts provide a rough idea of the breadth of participation from an account owner/controller standpoint. The numbers for Buy User IDs and Sell User IDs provide a rough idea of the breadth of participation from the standpoint of users directly interfacing with the Globex system. Many participants were both buyers and sellers and they would be included in both the Buy and Sell columns.

Source of data: CME Group as of May 13, 2010

**CME E-Mini SP Futures  
June 2010 Contract  
Summarized Activity By Hour (Eastern Daylight Time)  
Trade Date May 6, 2010**

Row	Date	Time (EDT)	Trades	Volume	First	High	Low	Last	Last - First Range	High/Low Range	VWAP	Buy Accts	Sell Accts	Buy User IDs	Sell User IDs	Volume Graph
1	5/5/2010	4 PM	732	5,817	1163.75	1164.25	1163.50	1163.75	0.00	0.75	1163.890	181	157	196	162	5,817
2		5 PM	749	4,808	1163.50	1165.00	1163.00	1164.50	1.00	2.00	1163.867	143	166	151	171	4,808
3		6 PM	1,117	5,053	1164.75	1166.25	1164.50	1166.25	1.50	1.75	1165.403	209	264	223	281	5,053
4		7 PM	1,453	5,368	1166.25	1167.00	1165.00	1166.50	0.25	2.00	1166.108	203	228	218	253	5,368
5		8 PM	2,988	9,572	1166.50	1167.00	1164.50	1166.25	-0.25	2.50	1165.952	254	266	301	295	9,572
6		9 PM	1,513	4,312	1166.50	1167.00	1165.75	1166.75	0.25	1.25	1166.451	172	184	183	206	4,312
7		10 PM	1,690	5,196	1167.00	1167.25	1165.50	1166.75	-0.25	1.75	1166.492	218	209	238	228	5,196
8		11 PM	1,370	3,430	1167.00	1167.00	1165.50	1165.75	-1.25	1.50	1166.247	161	128	179	141	3,430
9		12 AM	1,813	6,008	1165.75	1166.00	1164.00	1164.75	-1.00	2.00	1164.717	266	199	315	223	6,008
10	5/6/2010	1 AM	1,221	4,890	1164.75	1165.00	1164.00	1164.25	-0.50	1.00	1164.328	151	154	166	160	4,890
11		2 AM	7,204	34,675	1164.25	1165.25	1159.25	1159.50	-4.75	6.00	1162.248	591	583	656	655	34,675
12		3 AM	24,652	71,899	1159.75	1166.50	1158.00	1165.25	5.50	8.50	1161.506	785	769	937	913	71,899
13		4 AM	14,339	43,310	1165.25	1167.75	1163.00	1167.50	2.25	4.75	1165.649	593	594	700	691	43,310
14		5 AM	9,014	30,262	1167.25	1168.00	1164.75	1166.50	-0.75	3.25	1166.422	433	467	507	554	30,262
15		6 AM	7,953	30,743	1166.75	1168.75	1166.75	1168.50	1.75	2.00	1168.051	433	559	498	636	30,743
16		7 AM	19,841	64,871	1168.25	1168.75	1162.25	1163.00	-5.25	6.50	1165.817	855	785	1,009	940	64,871
17		8 AM	34,226	152,841	1163.00	1165.00	1155.50	1156.00	-7.00	9.50	1160.594	2,086	1,728	2,415	1,971	152,841
18		9 AM	93,015	398,117	1156.25	1164.50	1155.25	1161.75	5.50	9.25	1159.933	4,325	4,200	4,953	4,755	398,117
19		10 AM	113,467	524,215	1161.50	1165.00	1153.25	1155.50	-6.00	11.75	1158.877	4,949	4,843	5,661	5,524	524,215
20		11 AM	122,268	618,337	1155.50	1155.50	1147.25	1151.75	-3.75	8.25	1151.039	5,540	4,804	6,252	5,377	618,337
21		12 PM	73,439	347,471	1152.00	1157.25	1148.50	1152.00	0.00	8.75	1153.052	3,495	3,681	3,888	4,124	347,471
22		1 PM	83,577	414,013	1152.25	1153.50	1140.75	1142.25	-10.00	12.75	1145.918	4,368	3,866	4,850	4,271	414,013
23		2 PM	290,556	1,600,843	1142.25	1143.75	1056.00	1112.75	-29.50	87.75	1113.142	6,939	6,873	7,669	7,564	1,600,843
24		3 PM	247,380	1,109,014	1112.75	1136.00	1103.25	1123.00	10.25	32.75	1122.277	4,735	5,215	5,214	5,698	1,109,014
25		4 PM	30,105	177,523	1123.50	1125.00	1119.50	1122.75	-0.75	5.50	1122.310	1,609	1,330	1,727	1,429	177,523



**CME E-Mini SP Futures  
June 2010 Contract  
Summarized Activity By Minute 1:00 PM-3:15 PM (Eastern Daylight Time)  
Trade Date May 6, 2010**

Row	Time (EDT)	Trades	Volume	First	High	Low	Last	Last - First Range	High /Low Range	VWAP	Buy Accts	Sell Accts	Buy User IDs	Sell User IDs	Volume Graph
1	1:00 PM	2,211	9,653	1152.25	1153.50	1151.75	1153.00	0.75	1.75	1152.724	253	405	284	452	9,653
2	1:01 PM	724	3,089	1153.00	1153.25	1152.25	1152.25	-0.75	1.00	1152.812	134	138	151	166	3,089
3	1:02 PM	1,140	5,034	1152.25	1152.75	1151.25	1152.00	-0.25	1.50	1151.966	201	183	232	209	5,034
4	1:03 PM	544	1,885	1152.25	1152.25	1151.25	1151.25	-1.00	1.00	1151.579	121	79	139	97	1,885
5	1:04 PM	629	2,732	1151.25	1152.50	1151.25	1152.25	1.00	1.25	1152.094	76	135	95	160	2,732
6	1:05 PM	879	3,112	1152.25	1152.75	1151.75	1152.50	0.25	1.00	1152.367	125	162	149	183	3,112
7	1:06 PM	854	3,334	1152.25	1152.75	1151.50	1151.75	-0.50	1.25	1151.850	118	111	150	132	3,334
8	1:07 PM	1,484	4,860	1151.75	1151.75	1150.25	1150.50	-1.25	1.50	1150.864	204	202	242	243	4,860
9	1:08 PM	1,234	4,996	1150.25	1151.00	1150.00	1150.50	0.25	1.00	1150.424	181	164	220	191	4,996
10	1:09 PM	520	2,237	1150.75	1151.50	1150.50	1151.25	0.50	1.00	1150.867	84	118	97	138	2,237
11	1:10 PM	581	2,516	1151.25	1151.75	1150.50	1151.00	-0.25	1.25	1151.250	109	120	135	138	2,516
12	1:11 PM	2,143	9,643	1151.00	1151.00	1148.75	1149.25	-1.75	2.25	1149.609	313	236	371	273	9,643
13	1:12 PM	1,418	8,563	1149.25	1149.25	1148.25	1148.50	-0.75	1.00	1148.767	246	192	297	226	8,563
14	1:13 PM	1,720	8,078	1148.25	1149.00	1147.75	1148.50	0.25	1.25	1148.308	322	226	369	265	8,078
15	1:14 PM	1,696	8,144	1148.50	1149.00	1147.25	1147.50	-1.00	1.75	1148.174	381	198	426	231	8,144
16	1:15 PM	1,963	9,130	1147.50	1148.50	1147.25	1147.50	0.00	1.25	1148.000	259	209	307	254	9,130
17	1:16 PM	2,625	13,845	1147.75	1148.50	1146.75	1147.25	-0.50	1.75	1147.400	410	355	483	399	13,845
18	1:17 PM	3,259	18,800	1147.25	1147.50	1145.50	1146.50	-0.75	2.00	1146.316	600	454	694	510	18,800
19	1:18 PM	1,494	8,070	1146.50	1147.25	1146.25	1146.50	0.00	1.00	1146.730	270	195	311	230	8,070
20	1:19 PM	1,253	5,010	1146.50	1147.50	1146.50	1147.00	0.50	1.00	1147.051	185	211	212	238	5,010
21	1:20 PM	1,877	8,456	1147.25	1147.50	1146.25	1146.25	-1.00	1.25	1147.037	258	193	301	221	8,456
22	1:21 PM	1,197	5,020	1146.25	1147.25	1146.00	1146.50	0.25	1.25	1146.604	185	156	219	189	5,020
23	1:22 PM	504	2,009	1146.75	1146.75	1146.00	1146.25	-0.50	0.75	1146.411	116	90	131	104	2,009
24	1:23 PM	1,913	12,084	1146.25	1146.50	1145.25	1145.25	-1.00	1.25	1145.789	337	243	407	280	12,084
25	1:24 PM	3,181	18,284	1145.25	1145.50	1144.50	1145.00	-0.25	1.00	1145.001	598	411	691	472	18,284
26	1:25 PM	2,087	9,681	1144.75	1145.75	1144.25	1145.50	0.75	1.50	1144.870	406	269	477	293	9,681
27	1:26 PM	2,007	9,837	1145.75	1146.25	1145.25	1146.25	0.50	1.00	1145.776	266	250	323	305	9,837
28	1:27 PM	1,033	6,052	1146.25	1146.50	1145.75	1146.25	0.00	0.75	1146.204	173	182	193	216	6,052
29	1:28 PM	1,530	5,544	1146.00	1146.50	1145.50	1146.25	0.25	1.00	1145.986	153	191	188	227	5,544
30	1:29 PM	1,095	4,838	1146.25	1147.50	1146.25	1147.50	1.25	1.25	1146.895	203	280	227	316	4,838
31	1:30 PM	817	3,254	1147.25	1147.50	1146.75	1146.75	-0.50	0.75	1147.219	182	192	192	226	3,254
32	1:31 PM	735	2,374	1147.00	1147.00	1146.50	1147.00	0.00	0.50	1146.812	139	142	164	160	2,374
33	1:32 PM	744	3,221	1147.00	1147.25	1146.50	1146.75	-0.25	0.75	1146.994	127	129	149	153	3,221
34	1:33 PM	1,061	3,608	1146.75	1146.75	1145.75	1146.00	-0.75	1.00	1146.203	185	171	215	202	3,608
35	1:34 PM	773	2,427	1146.00	1146.50	1145.50	1146.25	0.25	1.00	1145.975	128	142	149	158	2,427
36	1:35 PM	664	2,514	1146.25	1146.50	1145.75	1146.25	0.00	0.75	1146.095	138	91	158	108	2,514
37	1:36 PM	1,564	9,536	1146.25	1146.50	1144.75	1144.75	-1.50	1.75	1145.268	305	236	349	271	9,536
38	1:37 PM	1,768	7,963	1144.75	1145.75	1144.25	1145.00	0.25	1.50	1144.912	297	212	355	242	7,963
39	1:38 PM	1,847	10,833	1145.00	1145.00	1143.75	1144.00	-1.00	1.25	1144.256	366	329	418	375	10,833
40	1:39 PM	1,217	6,900	1144.00	1145.00	1143.75	1144.25	0.25	1.25	1144.605	236	194	273	232	6,900
41	1:40 PM	3,003	19,136	1144.50	1144.50	1142.75	1143.00	-1.50	1.75	1143.368	577	430	650	477	19,136
42	1:41 PM	2,357	13,605	1143.00	1144.00	1142.50	1143.75	0.75	1.50	1143.173	351	342	398	393	13,605
43	1:42 PM	963	4,703	1143.75	1144.00	1143.50	1143.75	0.00	0.50	1143.834	178	161	201	181	4,703
44	1:43 PM	859	4,315	1144.00	1144.50	1143.75	1144.00	0.00	0.75	1144.211	188	185	208	211	4,315
45	1:44 PM	1,184	5,763	1144.25	1144.75	1144.00	1144.50	0.25	0.75	1144.386	203	150	233	185	5,763
46	1:45 PM	863	5,790	1144.50	1145.00	1144.25	1145.00	0.50	0.75	1144.828	205	186	229	207	5,790
47	1:46 PM	1,116	7,157	1145.00	1145.25	1144.25	1145.00	0.00	1.00	1144.827	221	184	252	220	7,157
48	1:47 PM	874	4,457	1145.00	1145.50	1144.50	1145.25	0.25	1.00	1144.979	142	208	169	232	4,457
49	1:48 PM	919	3,922	1145.50	1145.75	1144.25	1144.50	-1.00	1.50	1145.047	204	196	229	220	3,922
50	1:49 PM	955	4,795	1144.25	1145.00	1144.00	1144.25	0.00	1.00	1144.502	138	159	157	186	4,795

Row	Time (EDT)	Trades	Volume	First	High	Low	Last	Last - First Range	High / Low Range	VWAP	Buy Accts	Sell Accts	Buy User IDs	Sell User IDs	Volume Graph
51	1:50 PM	859	3,530	1144.50	1144.50	1143.75	1144.25	-0.25	0.75	1144.146	152	178	188	199	3,530
52	1:51 PM	535	1,991	1144.25	1144.75	1144.00	1144.75	0.50	0.75	1144.488	121	106	142	124	1,991
53	1:52 PM	559	2,437	1144.50	1144.75	1144.25	1144.25	-0.25	0.50	1144.449	147	85	159	95	2,437
54	1:53 PM	1,262	5,103	1144.25	1145.00	1144.00	1144.50	0.25	1.00	1144.484	196	151	230	170	5,103
55	1:54 PM	1,273	5,363	1144.25	1144.25	1143.50	1143.75	-0.50	0.75	1143.856	226	225	266	263	5,363
56	1:55 PM	1,286	6,229	1143.75	1144.00	1142.75	1143.00	-0.75	1.25	1143.290	243	246	276	283	6,229
57	1:56 PM	3,607	22,058	1143.00	1143.25	1140.75	1141.25	-1.75	2.50	1141.613	713	521	817	572	22,058
58	1:57 PM	2,329	11,814	1141.00	1143.00	1141.00	1143.00	2.00	2.00	1142.141	289	333	329	376	11,814
59	1:58 PM	1,639	8,610	1142.75	1143.75	1142.50	1142.75	0.00	1.25	1143.179	271	279	302	327	8,610
60	1:59 PM	1,150	6,069	1142.75	1142.75	1141.75	1142.25	-0.50	1.00	1142.221	231	186	270	214	6,069
61	2:00 PM	1,522	8,523	1142.25	1143.50	1142.00	1143.25	1.00	1.50	1142.869	207	260	254	292	8,523
62	2:01 PM	1,173	8,806	1143.25	1143.75	1142.50	1143.25	0.00	1.25	1143.237	168	212	194	240	8,806
63	2:02 PM	1,314	6,373	1143.25	1143.50	1142.25	1142.50	-0.75	1.25	1142.872	164	184	198	224	6,373
64	2:03 PM	1,467	6,691	1142.75	1142.75	1141.50	1142.00	-0.75	1.25	1142.066	245	240	289	275	6,691
65	2:04 PM	2,844	13,478	1141.75	1142.25	1140.25	1141.00	-0.75	2.00	1141.183	418	339	479	388	13,478
66	2:05 PM	1,899	9,946	1141.00	1141.75	1141.00	1141.00	0.00	1.00	1141.048	323	202	373	232	9,946
67	2:06 PM	3,230	23,234	1141.00	1141.25	1139.00	1139.25	-1.75	2.25	1139.953	679	452	758	502	23,234
68	2:07 PM	2,458	14,820	1139.00	1140.50	1138.75	1140.50	1.50	1.75	1139.477	398	385	456	429	14,820
69	2:08 PM	2,550	15,361	1140.25	1140.50	1138.25	1138.25	-2.00	2.25	1139.106	435	304	500	351	15,361
70	2:09 PM	3,751	21,942	1138.25	1138.50	1137.25	1137.25	-0.50	1.25	1137.833	662	489	763	546	21,942
71	2:10 PM	3,369	22,577	1137.50	1138.25	1136.00	1136.25	-1.25	2.25	1137.251	583	437	651	486	22,577
72	2:11 PM	7,309	37,762	1136.25	1137.25	1133.50	1134.00	-2.25	3.75	1135.314	807	654	930	726	37,762
73	2:12 PM	4,419	22,212	1134.00	1136.75	1134.00	1136.50	2.50	2.75	1135.512	500	439	557	498	22,212
74	2:13 PM	3,181	15,895	1136.50	1138.00	1136.00	1137.50	1.00	2.00	1137.258	362	475	406	534	15,895
75	2:14 PM	1,929	8,471	1137.50	1137.75	1136.50	1137.00	-0.50	1.25	1137.171	214	274	244	307	8,471
76	2:15 PM	2,227	11,221	1137.00	1138.00	1136.75	1137.00	0.00	1.25	1137.493	312	276	352	319	11,221
77	2:16 PM	1,989	9,677	1137.25	1137.50	1135.50	1135.50	-1.75	2.00	1136.732	271	242	315	279	9,677
78	2:17 PM	3,466	15,947	1135.50	1135.75	1133.25	1133.50	-2.00	2.50	1134.739	481	383	561	442	15,947
79	2:18 PM	5,353	27,127	1133.50	1133.75	1131.00	1133.75	0.25	2.75	1132.452	665	628	768	693	27,127
80	2:19 PM	2,289	13,431	1133.75	1134.25	1131.50	1131.75	-2.00	2.75	1132.789	378	305	424	362	13,431
81	2:20 PM	6,930	37,893	1131.75	1132.00	1128.25	1128.50	-3.25	3.75	1130.122	753	715	863	792	37,893
82	2:21 PM	6,519	30,954	1128.25	1129.50	1125.75	1125.75	-2.50	3.75	1127.951	776	639	880	749	30,954
83	2:22 PM	5,868	29,438	1126.00	1129.00	1124.75	1129.00	3.00	4.25	1127.144	578	545	673	633	29,438
84	2:23 PM	3,064	13,631	1128.75	1130.00	1128.25	1129.50	0.75	1.75	1129.132	348	422	385	476	13,631
85	2:24 PM	4,590	27,243	1129.50	1132.50	1129.25	1132.25	2.75	3.25	1130.730	439	512	493	585	27,243
86	2:25 PM	2,716	12,503	1132.25	1132.75	1131.00	1132.75	0.50	1.75	1131.976	351	431	380	485	12,503
87	2:26 PM	3,341	18,074	1132.50	1133.75	1132.25	1133.25	0.75	1.50	1133.216	402	481	462	527	18,074
88	2:27 PM	3,109	16,079	1133.25	1133.50	1131.25	1132.25	-1.00	2.25	1132.473	301	353	340	413	16,079
89	2:28 PM	3,012	14,046	1132.25	1132.50	1130.00	1130.25	-2.00	2.50	1131.005	356	358	409	410	14,046
90	2:29 PM	2,684	12,150	1130.25	1131.25	1129.50	1130.25	0.00	1.75	1130.230	336	292	383	345	12,150
91	2:30 PM	2,768	12,878	1130.25	1131.00	1128.00	1128.75	-1.50	3.00	1129.476	391	329	449	381	12,878
92	2:31 PM	2,931	13,014	1128.75	1130.00	1127.25	1127.75	-1.00	2.75	1128.652	370	319	424	357	13,014
93	2:32 PM	2,233	10,135	1127.50	1128.00	1126.25	1126.50	-1.00	1.75	1127.072	391	279	445	303	10,135
94	2:33 PM	3,081	14,914	1126.75	1128.50	1126.25	1127.75	1.00	2.25	1127.612	380	262	435	304	14,914
95	2:34 PM	3,418	22,939	1127.50	1128.00	1125.75	1126.00	-1.50	2.25	1127.055	378	301	434	348	22,939
96	2:35 PM	6,431	31,297	1126.00	1126.00	1122.50	1124.50	-1.50	3.50	1124.045	788	631	898	717	31,297
97	2:36 PM	5,149	25,391	1124.50	1124.50	1120.00	1120.00	-4.50	4.50	1122.544	659	539	729	606	25,391
98	2:37 PM	5,923	32,938	1120.00	1121.50	1119.50	1121.25	1.25	2.00	1120.354	720	536	814	607	32,938
99	2:38 PM	6,094	29,242	1121.25	1123.50	1121.00	1121.00	-0.25	2.50	1122.423	562	510	644	589	29,242
100	2:39 PM	8,441	42,855	1121.25	1121.25	1113.50	1114.00	-7.25	7.75	1116.926	836	839	953	958	42,855

Row	Time (EDT)	Trades	Volume	First	High	Low	Last	Last - First Range	High / Low Range	VWAP	Buy Accts	Sell Accts	Buy User IDs	Sell User IDs	Volume Graph
101	2:40 PM	7,100	37,916	1114.00	1114.25	1111.25	1113.00	-1.00	3.00	1113.050	783	590	899	659	37,916
102	2:41 PM	5,644	30,279	1113.25	1115.75	1113.00	1114.00	0.75	2.75	1114.355	630	540	719	624	30,279
103	2:42 PM	7,497	38,943	1114.00	1114.25	1106.50	1107.00	-7.00	7.75	1111.189	690	739	789	831	38,943
104	2:43 PM	13,983	73,083	1107.00	1107.25	1098.00	1098.75	-8.25	9.25	1101.973	974	914	1104	1032	73,083
105	2:44 PM	14,388	67,432	1098.50	1098.75	1080.50	1082.00	-16.50	18.25	1092.413	838	992	959	1131	67,432
106	2:45 PM	14,645	78,412	1081.50	1082.00	1056.00	1069.00	-12.50	26.00	1069.028	986	922	1115	1010	78,412
107	2:46 PM	7,800	55,833	1068.75	1077.75	1061.00	1072.50	3.75	16.75	1070.273	756	595	823	651	55,833
108	2:47 PM	5,939	44,721	1072.75	1088.25	1070.75	1086.00	13.25	17.50	1076.332	646	573	712	621	44,721
109	2:48 PM	7,818	54,995	1085.75	1097.00	1082.00	1090.50	4.75	15.00	1091.335	737	745	800	851	54,995
110	2:49 PM	5,494	42,133	1090.50	1093.25	1083.25	1088.75	-1.75	10.00	1088.248	538	514	591	565	42,133
111	2:50 PM	4,787	37,168	1089.00	1097.75	1084.75	1097.00	8.00	13.00	1090.106	541	524	596	569	37,168
112	2:51 PM	7,964	47,024	1097.00	1109.75	1094.25	1107.50	10.50	15.50	1101.499	744	767	836	865	47,024
113	2:52 PM	5,695	39,953	1107.25	1111.50	1102.25	1111.25	4.00	9.25	1105.792	579	740	650	825	39,953
114	2:53 PM	6,750	41,315	1111.50	1118.00	1109.50	1117.75	6.25	8.50	1113.585	614	810	685	909	41,315
115	2:54 PM	6,689	39,728	1118.00	1119.00	1107.50	1109.25	-8.75	11.50	1113.659	592	907	664	1006	39,728
116	2:55 PM	4,429	22,460	1109.25	1114.25	1107.75	1112.50	3.25	6.50	1110.954	521	453	579	496	22,460
117	2:56 PM	4,541	20,325	1112.50	1117.50	1112.50	1116.50	4.00	5.00	1115.534	421	506	472	568	20,325
118	2:57 PM	3,536	26,535	1116.50	1119.50	1115.75	1118.75	2.25	3.75	1118.314	458	567	513	603	26,535
119	2:58 PM	5,173	22,715	1118.75	1118.75	1113.75	1115.75	-3.00	5.00	1115.829	421	604	461	666	22,715
120	2:59 PM	4,643	20,765	1115.75	1116.00	1110.75	1112.75	-3.00	5.25	1113.017	397	488	459	544	20,765
121	3:00 PM	5,975	30,079	1112.75	1112.75	1103.25	1105.50	-7.25	9.50	1107.815	494	661	564	737	30,079
122	3:01 PM	4,811	20,309	1105.75	1115.25	1105.75	1113.00	7.25	9.50	1110.935	628	532	716	590	20,309
123	3:02 PM	4,111	20,445	1112.75	1116.50	1110.50	1116.50	3.75	6.00	1113.190	405	444	445	494	20,445
124	3:03 PM	5,457	23,106	1116.25	1121.00	1115.75	1120.00	3.75	5.25	1118.382	557	661	630	723	23,106
125	3:04 PM	4,856	22,346	1120.00	1121.25	1117.75	1119.00	-1.00	3.50	1119.233	426	515	484	581	22,346
126	3:05 PM	5,715	27,322	1118.75	1123.50	1116.75	1123.50	4.75	6.75	1119.836	496	578	560	631	27,322
127	3:06 PM	5,147	22,114	1123.75	1124.00	1120.25	1121.75	-2.00	3.75	1122.412	461	555	525	636	22,114
128	3:07 PM	4,109	24,415	1121.75	1126.50	1121.00	1126.00	4.25	5.50	1123.137	463	520	515	584	24,415
129	3:08 PM	6,410	27,632	1126.25	1131.25	1125.50	1131.00	4.75	5.75	1127.955	633	798	710	881	27,632
130	3:09 PM	6,749	28,343	1131.25	1131.75	1125.00	1126.25	-5.00	6.75	1128.235	569	762	628	861	28,343
131	3:10 PM	3,751	18,702	1126.50	1128.00	1125.75	1127.75	1.25	2.25	1126.762	382	374	423	422	18,702
132	3:11 PM	6,450	25,509	1128.00	1128.00	1117.50	1118.25	-9.75	10.50	1122.901	565	590	631	669	25,509
133	3:12 PM	4,867	16,313	1118.25	1122.25	1117.75	1120.25	2.00	4.50	1120.268	490	443	578	505	16,313
134	3:13 PM	3,372	11,372	1120.25	1122.50	1119.00	1121.25	1.00	3.50	1120.292	352	351	396	410	11,372
135	3:14 PM	2,170	8,121	1121.25	1121.75	1119.25	1119.75	-1.50	2.50	1120.707	229	267	260	297	8,121
136	3:15 PM	3,620	15,347	1119.75	1121.25	1118.00	1120.25	0.50	3.25	1119.750	363	388	417	437	15,347
137	3:16 PM	3,674	12,236	1120.25	1122.75	1120.25	1122.00	1.75	2.50	1121.620	333	304	386	347	12,236
138	3:17 PM	3,139	12,052	1121.75	1125.50	1121.00	1125.00	3.25	4.50	1123.507	386	344	438	393	12,052
139	3:18 PM	5,900	21,477	1125.00	1125.75	1118.50	1119.00	-6.00	7.25	1121.851	436	490	504	568	21,477
140	3:19 PM	4,962	20,821	1119.00	1119.00	1115.25	1115.75	-3.25	3.75	1117.026	482	482	547	552	20,821
141	3:20 PM	5,739	20,310	1115.75	1116.00	1111.75	1112.25	-3.50	4.25	1113.553	614	551	706	633	20,310
142	3:21 PM	6,334	23,136	1112.00	1113.50	1108.00	1113.25	1.25	5.50	1110.479	657	573	751	650	23,136
143	3:22 PM	3,632	13,831	1113.25	1116.75	1112.50	1114.75	1.50	4.25	1114.068	516	432	588	496	13,831
144	3:23 PM	3,861	14,472	1114.75	1115.50	1111.50	1112.50	-2.25	4.00	1113.478	381	397	444	451	14,472
145	3:24 PM	2,230	7,490	1112.50	1113.50	1111.75	1112.25	-0.25	1.75	1112.577	231	202	262	237	7,490
146	3:25 PM	3,979	14,881	1112.25	1112.25	1108.25	1108.50	-3.75	4.00	1110.268	436	425	485	486	14,881
147	3:26 PM	5,071	19,247	1108.25	1112.00	1106.50	1107.25	-1.00	5.50	1108.335	552	469	633	539	19,247
148	3:27 PM	3,514	11,622	1107.25	1111.25	1106.50	1110.00	2.75	4.75	1108.517	476	348	545	400	11,622
149	3:28 PM	2,230	8,758	1110.00	1111.00	1109.00	1110.50	0.50	2.00	1110.079	261	239	289	276	8,758
150	3:29 PM	4,647	16,857	1110.50	1118.00	1110.00	1117.50	7.00	8.00	1115.133	543	510	617	561	16,857

Row	Time (EDT)	Trades	Volume	First	High	Low	Last	Last - First Range	High / Low Range	VWAP	Buy Accts	Sell Accts	Buy User IDs	Sell User IDs	Volume Graph
151	3:30 PM	4,700	17,153	1117.75	1122.00	1116.50	1121.50	3.75	5.50	1118.999	469	638	519	663	17,153
152	3:31 PM	4,288	15,811	1121.50	1122.25	1118.25	1121.00	-0.50	4.00	1120.193	410	566	463	632	15,811
153	3:32 PM	2,877	11,096	1121.00	1121.25	1117.00	1119.25	-1.75	4.25	1119.014	329	363	367	421	11,096
154	3:33 PM	2,789	11,402	1119.50	1120.25	1118.00	1119.00	-0.50	2.25	1119.245	259	252	289	289	11,402
155	3:34 PM	2,523	10,495	1119.00	1122.50	1118.75	1122.00	3.00	3.75	1120.688	337	295	380	331	10,495
156	3:35 PM	4,281	16,895	1122.25	1126.25	1120.00	1125.50	3.25	6.25	1123.863	497	542	553	606	16,895
157	3:36 PM	4,664	15,980	1125.50	1127.25	1123.75	1124.50	-1.00	3.50	1125.700	411	585	461	659	15,980
158	3:37 PM	3,541	13,798	1124.50	1124.50	1121.50	1121.75	-2.75	3.00	1122.571	399	398	445	444	13,798
159	3:38 PM	3,152	14,019	1121.75	1123.25	1120.25	1122.75	1.00	3.00	1121.699	345	298	390	336	14,019
160	3:39 PM	2,239	9,543	1122.75	1124.50	1122.00	1122.00	-0.75	2.50	1123.195	291	288	328	328	9,543
161	3:40 PM	3,132	14,200	1122.00	1123.25	1121.25	1122.00	0.00	2.00	1122.173	264	314	301	350	14,200
162	3:41 PM	2,781	14,018	1122.00	1125.00	1121.50	1124.75	2.75	3.50	1122.843	325	276	369	308	14,018
163	3:42 PM	4,129	20,843	1124.50	1126.50	1123.25	1125.50	1.00	3.25	1125.139	384	411	438	460	20,843
164	3:43 PM	2,613	14,759	1125.75	1127.25	1125.00	1127.00	1.25	2.25	1126.243	302	362	331	401	14,759
165	3:44 PM	2,373	9,782	1127.25	1127.25	1125.50	1125.75	-1.50	1.75	1126.335	258	318	287	354	9,782
166	3:45 PM	3,477	18,902	1125.50	1128.00	1124.50	1127.75	2.25	3.50	1125.709	435	469	492	514	18,902
167	3:46 PM	3,378	16,747	1128.00	1128.00	1125.75	1126.75	-1.25	2.25	1127.037	394	332	429	384	16,747
168	3:47 PM	3,295	18,379	1126.75	1130.00	1126.50	1129.75	3.00	3.50	1128.657	410	433	445	484	18,379
169	3:48 PM	7,560	41,942	1129.75	1136.00	1129.50	1134.75	5.00	6.50	1133.156	705	861	775	948	41,942
170	3:49 PM	6,756	34,999	1134.75	1135.75	1132.25	1133.50	-1.25	3.50	1133.945	508	653	559	725	34,999
171	3:50 PM	4,380	24,016	1133.75	1134.00	1130.00	1131.00	-2.75	4.00	1131.096	478	455	531	509	24,016
172	3:51 PM	3,147	14,376	1131.25	1131.75	1129.50	1129.50	-1.75	2.25	1130.569	341	320	381	357	14,376
173	3:52 PM	3,086	12,720	1129.50	1131.50	1129.50	1131.00	1.50	2.00	1130.219	347	268	381	299	12,720
174	3:53 PM	2,489	12,039	1131.00	1133.75	1130.75	1132.00	1.00	3.00	1132.266	387	297	424	331	12,039
175	3:54 PM	3,126	12,940	1132.00	1132.75	1130.75	1131.75	-0.25	2.00	1131.791	274	360	289	390	12,940
176	3:55 PM	2,630	13,383	1132.00	1132.00	1129.75	1130.25	-1.75	2.25	1130.613	262	312	278	349	13,383
177	3:56 PM	4,949	27,735	1130.25	1130.50	1126.00	1126.25	-4.00	4.50	1127.954	467	476	501	527	27,735
178	3:57 PM	4,019	25,401	1126.00	1127.25	1125.50	1125.75	-0.25	1.75	1126.170	458	294	494	324	25,401
179	3:58 PM	2,944	17,147	1125.75	1126.50	1125.25	1126.00	0.25	1.25	1125.925	311	257	321	277	17,147
180	3:59 PM	5,580	49,829	1126.00	1126.25	1123.00	1123.00	-3.00	3.25	1125.008	495	399	529	432	49,829
181	4:00 PM	7,144	41,540	1123.50	1125.00	1122.25	1123.00	-0.50	2.75	1123.565	637	444	656	466	41,540
182	4:01 PM	4,153	25,393	1123.00	1123.50	1119.50	1121.75	-1.25	4.00	1121.074	498	427	539	462	25,393
183	4:02 PM	2,727	17,112	1122.00	1124.00	1120.25	1123.75	1.75	3.75	1121.772	356	294	381	323	17,112
184	4:03 PM	1,962	13,194	1123.75	1124.50	1122.00	1124.25	0.50	2.50	1123.326	245	257	265	280	13,194
185	4:04 PM	1,641	10,631	1124.25	1124.50	1122.50	1124.00	-0.25	2.00	1123.807	182	213	192	235	10,631
186	4:05 PM	1,174	5,859	1124.00	1124.50	1123.00	1123.00	-1.00	1.50	1123.596	181	141	186	158	5,859
187	4:06 PM	1,502	6,522	1123.00	1123.75	1122.25	1123.25	0.25	1.50	1122.888	150	168	164	184	6,522
188	4:07 PM	1,453	7,492	1123.25	1123.50	1121.50	1122.00	-1.25	2.00	1122.639	185	134	196	143	7,492
189	4:08 PM	1,245	7,770	1122.00	1122.25	1121.00	1121.50	-0.50	1.25	1121.641	168	139	178	161	7,770
190	4:09 PM	1,022	5,105	1121.75	1122.00	1121.00	1121.25	-0.50	1.00	1121.492	154	105	160	118	5,105
191	4:10 PM	1,575	9,974	1121.25	1122.00	1119.50	1120.50	-0.75	2.50	1120.303	275	185	292	199	9,974
192	4:11 PM	1,027	5,020	1120.25	1121.00	1119.75	1120.00	-0.25	1.25	1120.392	163	157	169	165	5,020
193	4:12 PM	612	3,237	1120.00	1120.75	1120.00	1120.50	0.50	0.75	1120.315	131	105	137	112	3,237
194	4:13 PM	1,414	6,391	1120.50	1121.75	1120.50	1121.75	1.25	1.25	1121.069	161	181	167	186	6,391
195	4:14 PM	1,454	12,283	1121.50	1122.75	1121.25	1122.75	1.25	1.50	1122.219	256	268	255	270	12,283



**CME E-mini SP Futures June 2010 Contract  
Summarized Activity By Second 2:41 PM-2:50 PM (Eastern Daylight Time)  
Trade Date May 6, 2010**

Row	Time (EDT)	Trades	Volume	First	High	Low	Last	Last - First Range	High / Low Range	VWAP	Buy Accts	Sell Accts	Buy User IDs	Sell User IDs	Volume Graph
1	2:41:00 PM	40	185	1113.25	1113.25	1113.00	1113.25	0.00	0.25	1113.230	13	22	13	22	185
2	2:41:01 PM	74	524	1113.25	1113.50	1113.00	1113.00	-0.25	0.50	1113.229	27	19	29	22	524
3	2:41:02 PM	26	195	1113.25	1113.50	1113.25	1113.25	0.00	0.25	1113.382	14	9	14	9	195
4	2:41:03 PM	6	29	1113.50	1113.50	1113.50	1113.50	0.00	0.00	1113.500	5	1	5	1	29
5	2:41:04 PM	15	72	1113.50	1113.50	1113.25	1113.25	-0.25	0.25	1113.483	11	4	11	4	72
6	2:41:05 PM	159	1,089	1113.50	1114.00	1113.50	1114.00	0.50	0.50	1113.581	21	57	26	60	1,089
7	2:41:06 PM	31	295	1113.75	1114.00	1113.75	1114.00	0.25	0.25	1113.968	17	7	17	6	295
8	2:41:07 PM	140	503	1114.00	1114.25	1113.75	1114.25	0.25	0.50	1113.996	46	43	52	45	503
9	2:41:08 PM	123	352	1114.50	1114.75	1114.25	1114.75	0.25	0.50	1114.548	43	47	45	53	352
10	2:41:09 PM	129	644	1114.75	1115.00	1114.50	1115.00	0.25	0.50	1114.903	52	46	57	51	644
11	2:41:10 PM	142	654	1115.00	1115.25	1114.75	1115.00	0.00	0.50	1115.088	34	57	39	66	654
12	2:41:11 PM	122	449	1115.25	1115.25	1115.00	1115.25	0.00	0.25	1115.223	34	47	36	55	449
13	2:41:12 PM	102	537	1115.25	1115.25	1114.75	1115.00	-0.25	0.50	1115.091	37	21	39	22	537
14	2:41:13 PM	46	175	1115.00	1115.00	1114.75	1115.00	0.00	0.25	1114.823	25	8	26	8	175
15	2:41:14 PM	153	1,099	1115.00	1115.00	1114.75	1114.75	-0.25	0.25	1114.807	38	33	40	47	1,099
16	2:41:15 PM	99	439	1114.75	1115.00	1114.50	1114.75	0.00	0.50	1114.739	25	31	27	36	439
17	2:41:16 PM	131	603	1114.75	1115.00	1114.50	1114.50	-0.25	0.50	1114.707	36	31	37	35	603
18	2:41:17 PM	45	248	1114.75	1115.00	1114.50	1115.00	0.25	0.50	1114.787	15	15	16	15	248
19	2:41:18 PM	91	803	1115.00	1115.00	1114.75	1115.00	0.00	0.25	1114.994	23	41	24	46	803
20	2:41:19 PM	75	299	1115.25	1115.50	1115.00	1115.50	0.25	0.50	1115.254	21	24	25	25	299
21	2:41:20 PM	85	515	1115.25	1115.50	1115.00	1115.25	0.00	0.50	1115.264	33	14	35	19	515
22	2:41:21 PM	90	392	1115.00	1115.50	1115.00	1115.25	0.25	0.50	1115.306	19	49	22	50	392
23	2:41:22 PM	60	267	1115.25	1115.25	1114.75	1114.75	-0.50	0.50	1114.991	28	10	32	10	267
24	2:41:23 PM	175	984	1114.75	1115.00	1114.50	1115.00	0.25	0.50	1114.858	45	51	49	57	984
25	2:41:24 PM	69	321	1115.00	1115.50	1115.00	1115.25	0.25	0.50	1115.240	9	36	10	40	321
26	2:41:25 PM	32	111	1115.25	1115.50	1115.25	1115.25	0.00	0.25	1115.430	9	20	9	22	111
27	2:41:26 PM	20	79	1115.25	1115.50	1115.25	1115.50	0.25	0.25	1115.459	12	9	12	9	79
28	2:41:27 PM	28	105	1115.25	1115.50	1115.25	1115.50	0.25	0.25	1115.452	10	15	11	15	105
29	2:41:28 PM	145	688	1115.25	1115.50	1115.25	1115.25	0.00	0.25	1115.299	36	29	38	28	688
30	2:41:29 PM	90	370	1115.50	1115.75	1115.50	1115.75	0.25	0.25	1115.567	18	40	19	46	370
31	2:41:30 PM	123	575	1115.50	1115.50	1115.00	1115.50	0.00	0.50	1115.407	39	18	39	21	575
32	2:41:31 PM	35	132	1115.50	1115.75	1115.50	1115.50	0.00	0.25	1115.572	12	17	12	17	132
33	2:41:32 PM	179	873	1115.50	1115.75	1114.75	1115.00	-0.50	1.00	1115.243	60	14	76	16	873
34	2:41:33 PM	58	308	1114.75	1115.00	1114.75	1115.00	0.25	0.25	1114.892	17	22	18	27	308
35	2:41:34 PM	66	271	1115.00	1115.25	1114.75	1115.00	0.00	0.50	1115.030	18	23	20	23	271
36	2:41:35 PM	306	1,557	1115.00	1115.00	1114.00	1114.25	-0.75	1.00	1114.466	70	20	91	23	1,557
37	2:41:36 PM	174	840	1114.25	1114.50	1113.75	1113.75	-0.50	0.75	1114.094	43	34	51	36	840
38	2:41:37 PM	124	654	1113.75	1114.25	1113.75	1114.00	0.25	0.50	1114.021	25	36	29	41	654
39	2:41:38 PM	93	714	1113.75	1114.00	1113.75	1114.00	0.25	0.25	1113.788	37	18	39	18	714
40	2:41:39 PM	65	232	1113.75	1114.00	1113.50	1113.75	0.00	0.50	1113.748	11	29	12	31	232
41	2:41:40 PM	37	208	1113.75	1114.00	1113.50	1113.50	-0.25	0.50	1113.807	20	11	21	11	208
42	2:41:41 PM	107	442	1113.75	1114.00	1113.50	1113.50	-0.25	0.50	1113.852	18	43	23	43	442
43	2:41:42 PM	39	265	1113.50	1113.75	1113.50	1113.75	0.25	0.25	1113.593	23	17	24	16	265
44	2:41:43 PM	200	1,154	1113.75	1114.25	1113.50	1114.00	0.25	0.75	1113.876	27	41	33	55	1,154
45	2:41:44 PM	151	646	1114.00	1114.50	1113.75	1114.00	0.00	0.75	1114.038	27	30	33	37	646
46	2:41:45 PM	11	81	1114.00	1114.25	1114.00	1114.25	0.25	0.25	1114.164	6	6	6	7	81
47	2:41:46 PM	52	325	1114.00	1114.50	1114.00	1114.50	0.50	0.50	1114.317	15	24	15	27	325
48	2:41:47 PM	112	1,160	1114.50	1114.50	1113.75	1114.00	-0.50	0.75	1114.221	44	15	47	20	1,160
49	2:41:48 PM	32	117	1114.00	1114.00	1113.75	1113.75	-0.25	0.25	1113.951	7	16	8	16	117
50	2:41:49 PM	59	365	1113.75	1114.00	1113.75	1113.75	0.00	0.25	1113.977	13	17	15	23	365
51	2:41:50 PM	58	438	1114.00	1114.00	1113.75	1114.00	0.00	0.25	1113.792	22	11	21	13	438
52	2:41:51 PM	90	638	1114.00	1114.00	1113.50	1113.50	-0.50	0.50	1113.641	23	19	27	20	638
53	2:41:52 PM	52	181	1113.50	1113.50	1113.25	1113.25	-0.25	0.25	1113.385	21	15	23	15	181
54	2:41:53 PM	235	1,710	1113.50	1114.00	1113.25	1114.00	0.50	0.75	1113.809	23	58	30	67	1,710
55	2:41:54 PM	65	319	1113.75	1113.75	1113.50	1113.50	-0.25	0.25	1113.741	21	12	21	11	319
56	2:41:55 PM	80	463	1113.50	1113.75	1113.50	1113.75	0.25	0.25	1113.545	26	14	27	17	463
57	2:41:56 PM	22	180	1113.50	1113.75	1113.50	1113.50	0.00	0.25	1113.560	18	9	18	9	180
58	2:41:57 PM	77	330	1113.50	1113.50	1113.25	1113.25	-0.25	0.25	1113.314	29	20	29	21	330
59	2:41:58 PM	56	247	1113.25	1113.50	1113.25	1113.25	0.00	0.25	1113.463	11	20	11	18	247
60	2:41:59 PM	343	1,828	1113.25	1114.25	1113.25	1114.00	0.75	1.00	1113.888	24	77	25	90	1,828

Row	Time (EDT)	Trades	Volume	First	High	Low	Last	Last - First Range	High / Low Range	VWAP	Buy Accts	Sell Accts	Buy User IDs	Sell User IDs	Volume Graph
61	2:42:00 PM	37	97	1114.00	1114.25	1114.00	1114.25	0.25	0.25	1114.052	17	11	18	13	97
62	2:42:01 PM	57	320	1114.25	1114.25	1113.75	1114.00	-0.25	0.50	1113.997	31	8	30	8	320
63	2:42:02 PM	22	309	1114.00	1114.25	1114.00	1114.00	0.00	0.25	1114.014	8	11	8	11	309
64	2:42:03 PM	40	712	1114.25	1114.25	1114.00	1114.25	0.00	0.25	1114.188	19	12	21	13	712
65	2:42:04 PM	56	335	1114.00	1114.00	1113.50	1113.75	-0.25	0.50	1113.798	30	8	32	10	335
66	2:42:05 PM	5	15	1113.75	1113.75	1113.50	1113.50	-0.25	0.25	1113.700	3	4	3	4	15
67	2:42:06 PM	65	353	1113.50	1113.50	1113.25	1113.25	-0.25	0.25	1113.460	33	14	33	19	353
68	2:42:07 PM	63	260	1113.25	1113.50	1113.25	1113.25	0.00	0.25	1113.253	20	12	20	12	260
69	2:42:08 PM	60	221	1113.50	1113.50	1113.25	1113.50	0.00	0.25	1113.441	17	23	19	21	221
70	2:42:09 PM	65	296	1113.50	1113.75	1113.25	1113.50	0.00	0.50	1113.593	15	27	17	26	296
71	2:42:10 PM	67	466	1113.50	1113.50	1113.25	1113.25	-0.25	0.25	1113.430	22	14	25	16	466
72	2:42:11 PM	75	345	1113.25	1113.50	1113.25	1113.50	0.25	0.25	1113.260	22	10	23	10	345
73	2:42:12 PM	118	468	1113.50	1113.50	1113.00	1113.00	-0.50	0.50	1113.213	32	20	32	21	468
74	2:42:13 PM	282	1,813	1113.00	1113.25	1112.50	1112.50	-0.50	0.75	1112.878	67	52	78	70	1,813
75	2:42:14 PM	58	182	1112.50	1112.75	1112.50	1112.50	0.00	0.25	1112.589	9	38	9	38	182
76	2:42:15 PM	265	1,646	1112.50	1113.00	1112.50	1112.75	0.25	0.50	1112.874	28	60	40	76	1,646
77	2:42:16 PM	27	327	1112.75	1113.00	1112.75	1112.75	0.00	0.25	1112.924	11	14	12	15	327
78	2:42:17 PM	47	509	1112.75	1113.00	1112.75	1112.75	0.00	0.25	1112.800	15	15	19	20	509
79	2:42:18 PM	78	706	1113.00	1113.00	1112.75	1113.00	0.00	0.25	1112.899	15	26	15	30	706
80	2:42:19 PM	60	381	1112.75	1113.00	1112.75	1112.75	0.00	0.25	1112.754	19	10	22	10	381
81	2:42:20 PM	55	342	1112.75	1113.00	1112.75	1113.00	0.25	0.25	1112.990	3	24	3	26	342
82	2:42:21 PM	220	1,925	1113.25	1113.75	1113.00	1113.50	0.25	0.75	1113.312	46	49	55	59	1,925
83	2:42:22 PM	119	677	1113.50	1113.50	1113.00	1113.00	-0.50	0.50	1113.116	39	13	46	16	677
84	2:42:23 PM	149	616	1113.00	1113.50	1112.75	1113.50	0.50	0.75	1113.168	20	41	29	56	616
85	2:42:24 PM	18	44	1113.50	1113.50	1113.25	1113.25	-0.25	0.25	1113.278	7	8	8	7	44
86	2:42:25 PM	22	97	1113.50	1113.50	1113.25	1113.25	-0.25	0.25	1113.356	8	12	8	12	97
87	2:42:26 PM	126	969	1113.25	1113.50	1113.00	1113.00	-0.25	0.50	1113.229	32	27	39	30	969
88	2:42:27 PM	36	169	1113.00	1113.00	1112.75	1113.00	0.00	0.25	1112.999	9	16	9	19	169
89	2:42:28 PM	29	224	1113.00	1113.25	1113.00	1113.00	0.00	0.25	1113.032	11	14	11	14	224
90	2:42:29 PM	8	20	1113.00	1113.25	1113.00	1113.00	0.00	0.25	1113.075	3	7	3	7	20
91	2:42:30 PM	28	114	1113.00	1113.00	1113.00	1113.00	0.00	0.00	1113.000	16	4	18	4	114
92	2:42:31 PM	18	47	1113.00	1113.00	1112.75	1113.00	0.00	0.25	1112.952	14	3	15	3	47
93	2:42:32 PM	42	137	1112.75	1113.00	1112.75	1113.00	0.25	0.25	1112.796	21	6	21	6	137
94	2:42:33 PM	47	197	1113.00	1113.00	1112.75	1112.75	-0.25	0.25	1112.924	9	24	9	22	197
95	2:42:34 PM	170	671	1112.75	1113.00	1112.50	1112.75	0.00	0.50	1112.582	54	17	72	19	671
96	2:42:35 PM	100	550	1112.50	1112.50	1112.25	1112.50	0.00	0.25	1112.420	25	31	27	35	550
97	2:42:36 PM	39	152	1112.50	1112.50	1112.25	1112.25	-0.25	0.25	1112.355	16	11	16	11	152
98	2:42:37 PM	66	317	1112.50	1112.75	1112.25	1112.50	0.00	0.50	1112.446	21	26	23	27	317
99	2:42:38 PM	45	219	1112.50	1113.00	1112.50	1112.75	0.25	0.50	1112.753	7	24	7	27	219
100	2:42:39 PM	21	209	1112.75	1113.00	1112.75	1112.75	0.00	0.25	1112.841	7	11	8	11	209
101	2:42:40 PM	24	120	1112.75	1112.75	1112.75	1112.75	0.00	0.00	1112.750	14	6	16	6	120
102	2:42:41 PM	111	606	1112.75	1112.75	1112.25	1112.50	-0.25	0.50	1112.498	36	20	42	20	606
103	2:42:42 PM	55	237	1112.50	1112.75	1112.50	1112.75	0.25	0.25	1112.714	7	24	7	19	237
104	2:42:43 PM	86	293	1112.50	1112.50	1112.25	1112.50	0.00	0.25	1112.365	32	16	37	17	293
105	2:42:44 PM	680	3,154	1112.50	1112.50	1111.00	1111.00	-1.50	1.50	1111.583	133	82	165	97	3,154
106	2:42:45 PM	289	1,123	1111.25	1111.25	1110.50	1110.75	-0.50	0.75	1110.792	69	67	81	69	1,123
107	2:42:46 PM	176	646	1110.75	1111.25	1110.50	1110.75	0.00	0.75	1110.822	25	59	29	64	646
108	2:42:47 PM	275	1,113	1110.75	1111.25	1110.25	1110.25	-0.50	1.00	1110.657	51	41	71	46	1,113
109	2:42:48 PM	608	2,764	1110.50	1110.50	1109.25	1109.50	-1.00	1.25	1109.672	127	78	146	93	2,764
110	2:42:49 PM	267	1,141	1109.50	1109.75	1109.00	1109.50	0.00	0.75	1109.304	58	55	66	59	1,141
111	2:42:50 PM	376	1,714	1109.50	1109.50	1108.50	1108.75	-0.75	1.00	1108.867	78	51	95	56	1,714
112	2:42:51 PM	106	878	1108.75	1109.00	1108.75	1109.00	0.25	0.25	1108.792	22	41	23	44	878
113	2:42:52 PM	215	970	1108.75	1109.25	1108.50	1109.00	0.25	0.75	1108.858	51	47	58	50	970
114	2:42:53 PM	85	603	1108.75	1109.25	1108.75	1109.25	0.50	0.50	1108.961	21	39	26	41	603
115	2:42:54 PM	288	1,605	1109.00	1109.50	1108.75	1109.00	0.00	0.75	1109.128	57	45	68	53	1,605
116	2:42:55 PM	170	717	1108.75	1109.00	1108.25	1108.25	-0.50	0.75	1108.705	45	36	47	35	717
117	2:42:56 PM	164	1,044	1108.50	1108.50	1107.75	1108.00	-0.50	0.75	1108.119	61	41	64	47	1,044
118	2:42:57 PM	246	960	1108.00	1108.00	1107.25	1107.25	-0.75	0.75	1107.570	71	42	86	48	960
119	2:42:58 PM	215	1,181	1107.25	1107.50	1106.75	1106.75	-0.50	0.75	1107.057	56	54	60	60	1,181
120	2:42:59 PM	156	617	1107.00	1107.25	1106.50	1107.00	0.00	0.75	1106.964	36	51	39	52	617

Row	Time (EDT)	Trades	Volume	First	High	Low	Last	Last - First Range	High / Low Range	VWAP	Buy Accts	Sell Accts	Buy User IDs	Sell User IDs	Volume Graph
121	2:43:00 PM	392	1,913	1107.00	1107.25	1106.25	1106.25	-0.75	1.00	1106.766	68	47	91	61	1,913
122	2:43:01 PM	235	1,002	1106.25	1106.50	1105.75	1106.00	-0.25	0.75	1106.125	57	42	66	52	1,002
123	2:43:02 PM	202	718	1106.00	1106.00	1105.25	1105.50	-0.50	0.75	1105.593	56	40	57	43	718
124	2:43:03 PM	244	908	1105.50	1105.50	1104.75	1105.00	-0.50	0.75	1105.107	61	52	70	59	908
125	2:43:04 PM	100	352	1105.00	1105.25	1104.75	1105.00	0.00	0.50	1105.002	28	31	29	34	352
126	2:43:05 PM	87	388	1105.00	1105.25	1104.75	1104.75	-0.25	0.50	1105.012	44	18	48	20	388
127	2:43:06 PM	206	972	1104.75	1105.50	1104.50	1105.25	0.50	1.00	1105.046	38	62	43	72	972
128	2:43:07 PM	394	1,911	1105.50	1106.00	1105.25	1105.50	0.00	0.75	1105.482	83	68	99	82	1,911
129	2:43:08 PM	340	1,748	1105.75	1106.50	1105.25	1106.00	0.25	1.25	1105.935	69	58	83	74	1,748
130	2:43:09 PM	188	949	1106.25	1106.50	1106.00	1106.00	-0.25	0.50	1106.161	53	44	58	51	949
131	2:43:10 PM	243	1,590	1106.00	1106.00	1105.50	1105.75	-0.25	0.50	1105.795	72	37	81	42	1,590
132	2:43:11 PM	485	2,276	1105.50	1105.75	1104.50	1104.50	-1.00	1.25	1104.934	104	49	123	60	2,276
133	2:43:12 PM	548	2,201	1104.50	1104.50	1103.50	1103.50	-1.00	1.00	1103.915	80	71	103	80	2,201
134	2:43:13 PM	215	877	1103.50	1103.50	1102.75	1103.00	-0.50	0.75	1103.174	69	39	72	47	877
135	2:43:14 PM	137	725	1103.00	1103.50	1103.00	1103.00	0.00	0.50	1103.151	42	49	45	51	725
136	2:43:15 PM	115	306	1103.00	1103.25	1102.75	1103.25	0.25	0.50	1103.068	37	36	41	38	306
137	2:43:16 PM	127	842	1103.25	1103.50	1103.00	1103.50	0.25	0.50	1103.319	34	47	37	50	842
138	2:43:17 PM	124	929	1103.50	1103.75	1103.25	1103.75	0.25	0.50	1103.549	47	33	53	35	929
139	2:43:18 PM	252	939	1103.50	1104.00	1103.25	1103.75	0.25	0.75	1103.567	55	44	65	51	939
140	2:43:19 PM	254	1,379	1103.75	1104.00	1103.25	1103.25	-0.50	0.75	1103.494	54	39	69	48	1,379
141	2:43:20 PM	272	1,137	1103.25	1103.50	1102.75	1103.50	0.25	0.75	1103.171	53	60	63	77	1,137
142	2:43:21 PM	889	4,316	1103.50	1104.00	1101.50	1101.50	-2.00	2.50	1102.844	112	93	142	115	4,316
143	2:43:22 PM	327	1,428	1101.50	1102.75	1101.50	1102.25	0.75	1.25	1102.358	50	55	66	77	1,428
144	2:43:23 PM	177	1,137	1102.50	1103.25	1102.25	1103.00	0.50	1.00	1102.771	29	54	39	57	1,137
145	2:43:24 PM	202	1,530	1103.00	1103.25	1102.75	1103.00	0.00	0.50	1103.068	46	42	53	47	1,530
146	2:43:25 PM	83	761	1102.75	1103.00	1102.50	1102.75	0.00	0.50	1102.719	35	23	37	26	761
147	2:43:26 PM	156	1,103	1102.75	1103.50	1102.50	1103.25	0.50	1.00	1102.987	29	51	33	58	1,103
148	2:43:27 PM	61	472	1103.25	1103.25	1103.00	1103.25	0.00	0.25	1103.228	22	22	22	26	472
149	2:43:28 PM	255	1,781	1103.00	1103.75	1102.75	1103.75	0.75	1.00	1103.170	58	56	68	64	1,781
150	2:43:29 PM	264	1,728	1103.50	1103.75	1102.50	1102.75	-0.75	1.25	1103.108	65	43	78	48	1,728
151	2:43:30 PM	172	512	1102.50	1102.75	1101.50	1101.75	-0.75	1.25	1102.132	57	28	62	30	512
152	2:43:31 PM	232	737	1101.75	1102.00	1100.75	1100.75	-1.00	1.25	1101.274	82	43	91	46	737
153	2:43:32 PM	342	1,652	1101.00	1101.25	1100.50	1101.00	0.00	0.75	1100.939	67	56	80	60	1,652
154	2:43:33 PM	127	483	1100.75	1101.00	1100.50	1100.50	-0.25	0.50	1100.764	41	30	43	32	483
155	2:43:34 PM	131	788	1100.75	1101.00	1100.50	1100.50	-0.25	0.50	1100.798	44	39	43	41	788
156	2:43:35 PM	192	1,193	1100.75	1101.00	1100.25	1100.50	-0.25	0.75	1100.660	51	27	58	31	1,193
157	2:43:36 PM	156	1,086	1100.50	1100.75	1100.25	1100.75	0.25	0.50	1100.492	32	50	38	56	1,086
158	2:43:37 PM	202	913	1100.25	1100.75	1100.00	1100.50	0.25	0.75	1100.372	55	56	59	66	913
159	2:43:38 PM	152	1,181	1100.50	1100.75	1100.00	1100.50	0.00	0.75	1100.341	40	38	45	45	1,181
160	2:43:39 PM	190	882	1100.25	1100.50	1099.50	1099.50	-0.75	1.00	1099.910	82	27	92	29	882
161	2:43:40 PM	429	1,742	1099.50	1100.50	1099.00	1100.00	0.50	1.50	1099.832	64	82	77	95	1,742
162	2:43:41 PM	403	2,012	1100.25	1100.25	1099.00	1100.00	-0.25	1.25	1099.659	56	50	71	65	2,012
163	2:43:42 PM	130	718	1100.00	1100.50	1099.75	1100.00	0.00	0.75	1100.128	34	40	39	46	718
164	2:43:43 PM	609	3,573	1100.00	1100.50	1098.75	1099.75	-0.25	1.75	1099.347	93	54	112	69	3,573
165	2:43:44 PM	246	1,278	1099.75	1100.00	1098.75	1098.75	-1.00	1.25	1099.249	53	41	64	52	1,278
166	2:43:45 PM	333	1,284	1098.50	1100.00	1098.50	1099.75	1.25	1.50	1099.473	35	73	43	85	1,284
167	2:43:46 PM	194	1,135	1099.75	1100.00	1099.00	1099.25	-0.50	1.00	1099.637	45	40	53	46	1,135
168	2:43:47 PM	156	846	1099.25	1099.50	1098.25	1098.50	-0.75	1.25	1098.792	58	26	62	28	846
169	2:43:48 PM	133	707	1098.50	1098.75	1098.25	1098.75	0.25	0.50	1098.571	34	38	41	42	707
170	2:43:49 PM	189	846	1098.75	1099.00	1098.00	1098.25	-0.50	1.00	1098.369	47	43	54	46	846
171	2:43:50 PM	224	1,012	1098.25	1099.25	1098.00	1099.25	1.00	1.25	1098.693	39	57	42	64	1,012
172	2:43:51 PM	211	1,171	1099.25	1099.25	1098.25	1099.00	-0.25	1.00	1098.635	44	40	53	53	1,171
173	2:43:52 PM	214	1,397	1099.00	1099.25	1098.50	1099.25	0.25	0.75	1098.835	39	54	44	63	1,397
174	2:43:53 PM	229	1,392	1099.25	1099.50	1098.75	1099.50	0.25	0.75	1099.228	40	55	52	62	1,392
175	2:43:54 PM	53	371	1099.50	1099.50	1099.00	1099.00	-0.50	0.50	1099.162	20	14	23	15	371
176	2:43:55 PM	147	1,128	1099.25	1099.75	1099.25	1099.50	0.25	0.50	1099.447	41	43	47	52	1,128
177	2:43:56 PM	149	1,221	1099.50	1099.50	1099.00	1099.25	-0.25	0.50	1099.245	46	20	57	22	1,221
178	2:43:57 PM	189	1,105	1099.25	1099.25	1098.50	1099.25	0.00	0.75	1098.967	56	34	65	45	1,105
179	2:43:58 PM	164	954	1099.00	1099.50	1098.75	1098.75	-0.25	0.75	1099.132	40	35	43	39	954
180	2:43:59 PM	111	1,446	1099.00	1099.00	1098.50	1098.75	-0.25	0.50	1098.867	41	18	49	20	1,446



Row	Time (EDT)	Trades	Volume	First	High	Low	Last	Last - First Range	High / Low Range	VWAP	Buy Accts	Sell Accts	Buy User IDs	Sell User IDs	Volume Graph
181	2:44:00 PM	170	1,049	1098.50	1098.50	1098.00	1098.00	-0.50	0.50	1098.256	56	29	60	37	1,049
182	2:44:01 PM	77	700	1098.25	1098.50	1098.00	1098.50	0.25	0.50	1098.240	24	36	26	37	700
183	2:44:02 PM	319	2,314	1098.50	1098.75	1097.50	1098.00	-0.50	1.25	1098.048	86	41	98	52	2,314
184	2:44:03 PM	283	1,422	1098.00	1098.00	1096.75	1097.50	-0.50	1.25	1097.484	65	52	81	53	1,422
185	2:44:04 PM	510	1,267	1096.75	1097.25	1096.50	1097.00	0.25	0.75	1096.948	55	66	61	79	1,267
186	2:44:05 PM	204	691	1097.25	1097.25	1096.75	1097.00	-0.25	0.50	1096.920	45	41	52	44	691
187	2:44:06 PM	369	1,519	1096.75	1097.50	1096.25	1097.25	0.50	1.25	1097.011	42	60	52	71	1,519
188	2:44:07 PM	180	1,036	1097.25	1097.75	1097.00	1097.50	0.25	0.75	1097.487	33	46	41	53	1,036
189	2:44:08 PM	138	936	1097.75	1098.00	1097.50	1097.75	0.00	0.50	1097.829	42	41	51	48	936
190	2:44:09 PM	59	315	1097.75	1097.75	1097.50	1097.50	-0.25	0.25	1097.643	18	27	19	27	315
191	2:44:10 PM	121	862	1097.50	1098.00	1097.25	1097.75	0.25	0.75	1097.605	39	31	39	35	862
192	2:44:11 PM	195	1,479	1097.75	1098.50	1097.75	1098.25	0.50	0.75	1098.054	44	56	50	62	1,479
193	2:44:12 PM	184	2,095	1098.00	1098.75	1098.00	1098.50	0.50	0.75	1098.364	50	66	52	64	2,095
194	2:44:13 PM	110	569	1098.75	1098.75	1098.50	1098.50	-0.25	0.25	1098.616	53	22	56	22	569
195	2:44:14 PM	160	1,822	1098.75	1098.75	1098.25	1098.75	0.00	0.50	1098.419	52	35	59	42	1,822
196	2:44:15 PM	96	912	1098.50	1098.75	1098.25	1098.50	0.00	0.50	1098.451	35	28	38	32	912
197	2:44:16 PM	57	499	1098.25	1098.50	1098.25	1098.25	0.00	0.25	1098.289	24	20	25	19	499
198	2:44:17 PM	187	768	1098.25	1098.50	1098.00	1098.50	0.25	0.50	1098.348	34	54	36	55	768
199	2:44:18 PM	156	971	1098.25	1098.50	1097.75	1098.00	-0.25	0.75	1098.004	48	31	57	33	971
200	2:44:19 PM	119	674	1098.25	1098.25	1097.50	1097.75	-0.50	0.75	1097.898	34	27	41	29	674
201	2:44:20 PM	189	983	1097.50	1098.25	1097.50	1097.75	0.25	0.75	1098.063	28	59	34	65	983
202	2:44:21 PM	74	263	1097.75	1098.00	1097.50	1097.50	-0.25	0.50	1097.858	24	18	26	15	263
203	2:44:22 PM	196	935	1097.50	1097.75	1097.25	1097.50	0.00	0.50	1097.474	52	39	57	43	935
204	2:44:23 PM	80	209	1097.50	1097.75	1097.00	1097.25	-0.25	0.75	1097.188	27	20	29	20	209
205	2:44:24 PM	119	388	1097.00	1097.25	1096.25	1096.50	-0.50	1.00	1096.671	48	32	55	33	388
206	2:44:25 PM	98	406	1096.50	1096.50	1096.00	1096.00	-0.50	0.50	1096.169	34	40	36	42	406
207	2:44:26 PM	181	700	1096.00	1096.25	1095.25	1095.50	-0.50	1.00	1095.696	44	55	48	57	700
208	2:44:27 PM	477	1,807	1095.50	1095.75	1093.25	1094.75	-0.75	2.50	1094.812	94	76	108	80	1,807
209	2:44:28 PM	516	1,909	1094.75	1095.75	1093.25	1094.25	-0.50	2.50	1094.848	55	63	73	77	1,909
210	2:44:29 PM	162	627	1094.25	1094.25	1093.50	1093.50	-0.75	0.75	1094.028	45	29	48	35	627
211	2:44:30 PM	449	2,681	1093.50	1095.00	1093.50	1094.75	1.25	1.50	1094.437	40	67	48	76	2,681
212	2:44:31 PM	146	1,132	1094.50	1095.00	1094.25	1094.75	0.25	0.75	1094.655	34	35	40	37	1,132
213	2:44:32 PM	203	818	1094.75	1094.75	1093.25	1093.75	-1.00	1.50	1093.823	53	26	59	32	818
214	2:44:33 PM	136	833	1093.50	1094.25	1093.50	1093.75	0.25	0.75	1093.877	32	43	34	47	833
215	2:44:34 PM	234	1,132	1093.50	1093.75	1092.50	1092.50	-1.00	1.25	1093.135	55	32	61	37	1,132
216	2:44:35 PM	349	1,040	1092.75	1093.25	1092.25	1093.25	0.50	1.00	1092.624	52	57	62	59	1,040
217	2:44:36 PM	314	1,368	1093.00	1093.25	1091.50	1091.50	-1.50	1.75	1092.449	64	50	74	53	1,368
218	2:44:37 PM	442	1,730	1091.75	1092.25	1090.50	1091.25	-0.50	1.75	1091.246	68	50	84	56	1,730
219	2:44:38 PM	176	698	1091.00	1091.25	1090.50	1091.00	0.00	0.75	1090.883	36	38	38	42	698
220	2:44:39 PM	284	1,078	1090.75	1091.25	1089.75	1091.25	0.50	1.50	1090.284	67	64	77	71	1,078
221	2:44:40 PM	271	1,896	1091.00	1091.75	1090.75	1091.00	0.00	1.00	1091.289	54	60	69	72	1,896
222	2:44:41 PM	263	1,059	1090.75	1091.25	1089.75	1089.75	-1.00	1.50	1090.576	65	51	71	61	1,059
223	2:44:42 PM	193	850	1090.00	1090.00	1088.50	1089.00	-1.00	1.50	1089.348	67	25	75	28	850
224	2:44:43 PM	320	1,197	1089.00	1089.25	1088.25	1088.75	-0.25	1.00	1088.776	44	63	47	68	1,197
225	2:44:44 PM	328	1,182	1088.50	1088.75	1086.75	1087.00	-1.50	2.00	1087.544	70	45	88	47	1,182
226	2:44:45 PM	260	891	1086.75	1088.25	1086.50	1088.00	1.25	1.75	1087.372	47	60	50	63	891
227	2:44:46 PM	354	1,815	1088.00	1088.50	1086.50	1086.50	-1.50	2.00	1087.713	63	46	72	47	1,815
228	2:44:47 PM	439	1,613	1086.50	1087.75	1086.25	1086.75	0.25	1.50	1086.996	63	49	82	66	1,613
229	2:44:48 PM	502	1,718	1086.50	1086.50	1084.75	1085.00	-1.50	1.75	1085.604	65	67	85	75	1,718
230	2:44:49 PM	325	1,158	1085.00	1086.25	1084.25	1086.00	1.00	2.00	1085.184	38	64	51	72	1,158
231	2:44:50 PM	236	1,451	1086.00	1086.25	1085.25	1085.75	-0.25	1.00	1085.644	51	55	59	59	1,451
232	2:44:51 PM	220	1,889	1085.75	1086.75	1085.75	1086.00	0.25	1.00	1086.251	43	54	53	59	1,889
233	2:44:52 PM	348	1,667	1086.00	1086.25	1084.50	1085.25	-0.75	1.75	1085.410	80	48	92	53	1,667
234	2:44:53 PM	126	549	1085.25	1085.25	1084.00	1084.50	-0.75	1.25	1084.611	40	31	44	33	549
235	2:44:54 PM	250	775	1084.25	1084.75	1083.75	1084.75	0.50	1.00	1084.251	41	47	49	52	775
236	2:44:55 PM	370	1,543	1084.50	1084.50	1082.00	1082.25	-2.25	2.50	1083.358	76	46	85	50	1,543
237	2:44:56 PM	317	921	1082.00	1082.25	1081.00	1081.50	-0.50	1.25	1081.574	48	61	60	72	921
238	2:44:57 PM	301	858	1081.50	1082.75	1081.00	1081.25	-0.25	1.75	1081.875	50	58	59	64	858
239	2:44:58 PM	197	579	1081.50	1082.00	1080.50	1081.50	0.00	1.50	1081.292	39	38	44	43	579
240	2:44:59 PM	249	1,184	1081.25	1082.50	1080.75	1082.00	0.75	1.75	1081.787	46	57	52	66	1,184



Row	Time (EDT)	Trades	Volume	First	High	Low	Last	Last - First Range	High / Low Range	VWAP	Buy Accts	Sell Accts	Buy User IDs	Sell User IDs	Volume Graph
241	2:45:00 PM	179	1,136	1081.50	1082.00	1081.00	1081.25	-0.25	1.00	1081.537	42	38	45	42	1,136
242	2:45:01 PM	163	633	1081.00	1081.50	1080.50	1080.75	-0.25	1.00	1081.084	49	47	53	49	633
243	2:45:02 PM	168	797	1081.00	1081.25	1080.25	1081.00	0.00	1.00	1080.854	40	39	47	45	797
244	2:45:03 PM	438	1,678	1081.25	1081.25	1078.25	1078.75	-2.50	3.00	1079.915	87	51	108	58	1,678
245	2:45:04 PM	147	647	1079.00	1079.50	1078.75	1079.25	0.25	0.75	1079.194	39	45	43	51	647
246	2:45:05 PM	107	388	1079.25	1079.75	1079.00	1079.75	0.50	0.75	1079.368	30	38	32	39	388
247	2:45:06 PM	312	1,136	1079.50	1079.50	1077.75	1078.25	-1.25	1.75	1078.809	54	43	59	49	1,136
248	2:45:07 PM	215	688	1078.25	1078.50	1077.25	1077.25	-1.00	1.25	1077.902	39	40	42	45	688
249	2:45:08 PM	412	1,320	1077.50	1077.75	1076.00	1076.75	-0.75	1.75	1076.966	64	55	73	62	1,320
250	2:45:09 PM	234	659	1076.75	1077.00	1075.50	1076.75	0.00	1.50	1076.412	38	45	39	51	659
251	2:45:10 PM	390	1,396	1077.00	1077.00	1074.75	1074.75	-2.25	2.25	1076.140	50	51	59	56	1,396
252	2:45:11 PM	436	1,348	1075.25	1077.00	1074.50	1076.00	0.75	2.50	1075.844	49	66	55	75	1,348
253	2:45:12 PM	627	1,543	1076.25	1076.50	1071.75	1074.00	-2.25	4.75	1074.310	68	50	76	57	1,543
254	2:45:13 PM	387	1,400	1074.00	1075.75	1071.25	1071.75	-2.25	4.50	1074.146	58	48	65	54	1,400
255	2:45:14 PM	323	1,703	1071.75	1075.50	1071.50	1074.50	2.75	4.00	1074.399	41	51	48	60	1,703
256	2:45:15 PM	279	2,549	1075.00	1075.00	1072.75	1073.25	-1.75	2.25	1073.559	55	40	64	46	2,549
257	2:45:16 PM	235	1,186	1073.50	1074.50	1072.75	1074.25	0.75	1.75	1073.567	40	45	42	58	1,186
258	2:45:17 PM	358	2,157	1074.25	1075.25	1072.50	1072.50	-1.75	2.75	1074.149	60	50	72	57	2,157
259	2:45:18 PM	523	2,663	1072.75	1072.75	1066.50	1072.50	-0.25	6.25	1071.324	103	60	118	67	2,663
260	2:45:19 PM	273	1,223	1072.25	1072.50	1070.00	1070.75	-1.50	2.50	1071.532	51	49	58	54	1,223
261	2:45:20 PM	249	1,467	1070.75	1073.25	1070.75	1071.75	1.00	2.50	1072.383	40	62	45	68	1,467
262	2:45:21 PM	361	1,601	1071.75	1071.75	1066.75	1069.00	-2.75	5.00	1069.051	71	37	81	37	1,601
263	2:45:22 PM	337	1,692	1069.00	1071.25	1066.50	1071.25	2.25	4.75	1069.555	58	52	66	61	1,692
264	2:45:23 PM	171	831	1071.00	1071.25	1068.75	1069.25	-1.75	2.50	1069.925	42	33	47	37	831
265	2:45:24 PM	185	1,081	1068.75	1070.75	1068.75	1070.75	2.00	2.00	1069.970	33	42	34	46	1,081
266	2:45:25 PM	247	2,430	1070.50	1070.75	1068.75	1069.25	-1.25	2.00	1069.838	44	31	51	36	2,430
267	2:45:26 PM	572	3,594	1069.25	1071.00	1062.75	1064.50	-4.75	8.25	1068.156	95	62	109	75	3,594
268	2:45:27 PM	390	1,527	1064.50	1069.50	1063.00	1063.00	-1.50	6.50	1067.946	55	55	62	63	1,527
269	2:45:28 PM	133	705	1063.00	1063.00	1056.00	1056.00	-7.00	7.00	1060.909	28	13	27	13	705
270	2:45:29 PM	0	0					Stop Logic Halt							
271	2:45:30 PM	0	0					Stop Logic Halt							
272	2:45:31 PM	0	0					Stop Logic Halt							
273	2:45:32 PM	0	0					Stop Logic Halt							
274	2:45:33 PM	688	2,990	1056.75	1061.00	1056.50	1061.00	4.25	4.50	1057.120	110	94	123	104	2,990
275	2:45:34 PM	201	1,637	1060.50	1064.75	1060.25	1064.75	4.25	4.50	1063.772	38	33	44	39	1,637
276	2:45:35 PM	305	2,488	1064.50	1064.75	1060.75	1061.50	-3.00	4.00	1063.174	65	34	73	39	2,488
277	2:45:36 PM	183	930	1061.50	1062.75	1060.75	1062.75	1.25	3.00	1061.439	51	37	56	40	930
278	2:45:37 PM	186	1,342	1062.75	1066.75	1062.75	1065.00	2.25	4.00	1064.701	33	44	39	53	1,342
279	2:45:38 PM	80	430	1065.00	1066.00	1064.50	1065.00	0.00	1.50	1065.455	31	31	33	33	430
280	2:45:39 PM	299	2,521	1065.00	1066.00	1058.50	1058.75	-6.25	7.50	1062.613	81	31	90	37	2,521
281	2:45:40 PM	267	2,242	1058.75	1065.75	1058.25	1059.50	0.75	7.50	1062.432	46	45	50	52	2,242
282	2:45:41 PM	159	1,225	1062.25	1062.75	1057.50	1058.50	-3.75	5.25	1060.095	51	33	57	41	1,225
283	2:45:42 PM	263	1,605	1059.00	1066.75	1057.50	1059.25	0.25	9.25	1061.802	41	63	48	65	1,605
284	2:45:43 PM	106	711	1058.50	1061.25	1057.25	1061.00	2.50	4.00	1058.831	41	30	46	36	711
285	2:45:44 PM	160	1,077	1061.00	1062.50	1058.00	1061.25	0.25	4.50	1060.375	38	42	43	48	1,077
286	2:45:45 PM	146	1,109	1062.50	1062.50	1058.25	1059.00	-3.50	4.25	1060.047	51	26	61	33	1,109
287	2:45:46 PM	157	1,145	1061.25	1062.25	1058.50	1062.00	0.75	3.75	1060.145	43	49	49	54	1,145
288	2:45:47 PM	203	1,237	1061.75	1063.50	1059.75	1062.25	0.50	3.75	1061.904	37	37	44	48	1,237
289	2:45:48 PM	154	938	1062.25	1063.25	1062.00	1062.50	0.25	1.25	1062.393	37	33	40	36	938
290	2:45:49 PM	133	571	1062.50	1064.25	1062.25	1064.25	1.75	2.00	1063.649	28	38	32	40	571
291	2:45:50 PM	126	532	1064.25	1065.25	1063.50	1065.25	1.00	1.75	1064.420	35	36	40	42	532
292	2:45:51 PM	177	871	1065.25	1068.25	1065.00	1068.25	3.00	3.25	1065.790	30	53	33	54	871
293	2:45:52 PM	121	666	1065.75	1068.50	1065.25	1068.00	2.25	3.25	1067.091	34	30	37	30	666
294	2:45:53 PM	180	1,609	1067.75	1070.00	1067.00	1069.50	1.75	3.00	1068.991	42	50	45	53	1,609
295	2:45:54 PM	289	1,675	1069.75	1073.50	1069.50	1073.50	3.75	4.00	1071.237	59	65	62	69	1,675
296	2:45:55 PM	412	2,235	1073.25	1075.00	1070.25	1070.75	-2.50	4.75	1072.412	65	54	77	54	2,235
297	2:45:56 PM	168	956	1070.25	1071.25	1069.75	1069.75	-0.50	1.50	1070.486	52	31	55	36	956
298	2:45:57 PM	114	760	1069.75	1071.75	1069.50	1071.75	2.00	2.25	1070.562	36	34	39	35	760
299	2:45:58 PM	233	1,790	1071.25	1074.25	1068.50	1070.25	-1.00	5.75	1071.076	70	36	72	42	1,790
300	2:45:59 PM	284	1,942	1070.00	1072.50	1065.00	1069.00	-1.00	7.50	1068.054	71	42	78	45	1,942

Row	Time (EDT)	Trades	Volume	First	High	Low	Last	Last - First Range	High /Low Range	VWAP	Buy Accts	Sell Accts	Buy User IDs	Sell User IDs	Volume Graph
301	2:46:00 PM	297	3,110	1068.75	1072.00	1061.00	1072.00	3.25	11.00	1064.924	76	52	80	58	3,110
302	2:46:01 PM	167	480	1071.00	1071.75	1063.25	1066.00	-5.00	8.50	1067.491	32	29	36	32	480
303	2:46:02 PM	110	856	1067.50	1069.25	1063.75	1064.50	-3.00	5.50	1066.697	32	25	32	30	856
304	2:46:03 PM	148	741	1063.75	1070.00	1063.75	1066.75	3.00	6.25	1067.304	36	33	42	34	741
305	2:46:04 PM	108	638	1066.75	1067.25	1063.75	1065.75	-1.00	3.50	1066.247	38	27	40	29	638
306	2:46:05 PM	112	339	1065.75	1067.00	1064.25	1064.25	-1.50	2.75	1065.759	31	30	33	33	339
307	2:46:06 PM	121	987	1065.75	1067.50	1063.50	1066.00	0.25	4.00	1064.643	38	24	40	29	987
308	2:46:07 PM	244	1,484	1064.50	1067.50	1062.75	1067.25	2.75	4.75	1064.520	48	40	55	46	1,484
309	2:46:08 PM	127	981	1063.75	1067.50	1063.00	1065.25	1.50	4.50	1065.028	35	31	38	35	981
310	2:46:09 PM	134	353	1065.50	1065.75	1063.00	1064.50	-1.00	2.75	1064.688	33	24	33	25	353
311	2:46:10 PM	113	482	1064.50	1064.75	1063.00	1063.50	-1.00	1.75	1063.830	39	29	41	31	482
312	2:46:11 PM	115	1,075	1063.50	1065.00	1062.25	1062.75	-0.75	2.75	1064.064	43	33	45	37	1,075
313	2:46:12 PM	137	612	1062.75	1065.50	1062.25	1065.50	2.75	3.25	1064.184	23	35	25	38	612
314	2:46:13 PM	75	269	1065.75	1065.75	1063.00	1065.75	0.00	2.75	1065.117	27	26	28	30	269
315	2:46:14 PM	106	658	1065.50	1065.75	1064.25	1064.75	-0.75	1.50	1065.089	40	26	44	28	658
316	2:46:15 PM	104	539	1065.00	1065.75	1063.50	1064.75	-0.25	2.25	1064.384	33	27	39	33	539
317	2:46:16 PM	130	1,275	1064.75	1068.25	1063.75	1065.50	0.75	4.50	1066.139	33	64	35	68	1,275
318	2:46:17 PM	125	884	1066.25	1066.75	1064.00	1065.75	-0.50	2.75	1064.845	38	31	41	34	884
319	2:46:18 PM	92	1,104	1065.75	1066.75	1065.50	1066.75	1.00	1.25	1066.047	22	27	25	31	1,104
320	2:46:19 PM	97	563	1066.75	1068.00	1066.25	1067.25	0.50	1.75	1066.886	35	25	37	28	563
321	2:46:20 PM	115	608	1067.25	1069.75	1066.50	1068.00	0.75	3.25	1067.811	29	41	31	49	608
322	2:46:21 PM	118	519	1068.00	1069.75	1067.75	1068.75	0.75	2.00	1068.663	33	24	35	27	519
323	2:46:22 PM	78	303	1069.50	1069.75	1068.75	1069.75	0.25	1.00	1069.229	22	22	24	24	303
324	2:46:23 PM	89	606	1069.75	1071.00	1068.25	1071.00	1.25	1.75	1070.003	27	40	31	42	606
325	2:46:24 PM	206	701	1071.00	1072.75	1070.00	1070.50	-0.50	2.75	1071.316	38	49	40	57	701
326	2:46:25 PM	203	1,558	1070.25	1072.75	1069.50	1072.25	2.00	3.25	1070.929	48	36	50	43	1,558
327	2:46:26 PM	127	1,835	1072.25	1072.25	1068.75	1070.25	-2.00	3.50	1069.976	43	26	48	28	1,835
328	2:46:27 PM	138	927	1070.75	1071.00	1068.25	1069.00	-1.75	2.75	1069.257	38	37	39	41	927
329	2:46:28 PM	124	873	1070.00	1072.75	1067.75	1072.25	2.25	5.00	1070.933	33	46	35	49	873
330	2:46:29 PM	104	427	1071.25	1072.25	1070.75	1071.25	0.00	1.50	1071.412	23	26	25	26	427
331	2:46:30 PM	180	1,083	1071.25	1074.75	1071.00	1074.75	3.50	3.75	1073.468	32	43	34	49	1,083
332	2:46:31 PM	118	739	1073.50	1074.75	1072.75	1073.00	-0.50	2.00	1073.595	28	31	32	31	739
333	2:46:32 PM	58	336	1073.50	1073.50	1072.75	1073.25	-0.25	0.75	1073.056	23	17	26	18	336
334	2:46:33 PM	282	1,950	1073.50	1077.75	1073.00	1074.75	1.25	4.75	1075.677	43	66	40	76	1,950
335	2:46:34 PM	127	673	1074.75	1075.75	1072.75	1073.00	-1.75	3.00	1074.145	33	23	37	27	673
336	2:46:35 PM	100	1,086	1073.00	1074.75	1072.75	1074.00	1.00	2.00	1074.185	29	31	33	36	1,086
337	2:46:36 PM	76	1,448	1073.75	1074.00	1072.50	1072.75	-1.00	1.50	1073.508	40	19	42	22	1,448
338	2:46:37 PM	88	926	1072.75	1073.00	1072.25	1072.50	-0.25	0.75	1072.617	26	32	26	38	926
339	2:46:38 PM	184	1,038	1072.50	1073.00	1071.00	1071.50	-1.00	2.00	1071.864	38	31	41	32	1,038
340	2:46:39 PM	320	665	1072.00	1072.50	1071.00	1072.25	0.25	1.50	1071.604	25	43	28	43	665
341	2:46:40 PM	288	1,786	1071.50	1073.75	1071.00	1071.50	0.00	2.75	1072.478	28	42	32	51	1,786
342	2:46:41 PM	142	1,271	1072.00	1073.75	1071.25	1072.75	0.75	2.50	1072.059	27	33	33	37	1,271
343	2:46:42 PM	70	424	1072.75	1073.75	1072.25	1073.25	0.50	1.50	1073.153	19	27	19	31	424
344	2:46:43 PM	72	466	1073.50	1073.75	1073.25	1073.50	0.00	0.50	1073.351	22	24	23	28	466
345	2:46:44 PM	125	958	1073.50	1074.25	1073.25	1074.00	0.50	1.00	1073.653	28	31	31	36	958
346	2:46:45 PM	57	590	1074.00	1074.50	1073.75	1074.50	0.50	0.75	1074.123	16	28	22	27	590
347	2:46:46 PM	76	683	1074.50	1074.50	1073.50	1074.00	-0.50	1.00	1073.991	26	22	30	24	683
348	2:46:47 PM	75	862	1073.75	1075.25	1073.50	1074.25	0.50	1.75	1074.077	26	34	26	40	862
349	2:46:48 PM	75	738	1074.50	1075.00	1074.00	1075.00	0.50	1.00	1074.519	27	20	29	23	738
350	2:46:49 PM	116	920	1074.50	1075.25	1073.50	1074.50	0.00	1.75	1074.220	41	24	45	28	920
351	2:46:50 PM	183	1,888	1074.25	1076.25	1074.25	1075.75	1.50	2.00	1075.027	29	41	35	49	1,888
352	2:46:51 PM	251	4,456	1075.50	1075.50	1069.50	1070.25	-5.25	6.00	1072.623	92	32	97	37	4,456
353	2:46:52 PM	126	512	1071.00	1072.50	1069.75	1071.50	0.50	2.75	1070.887	25	20	27	23	512
354	2:46:53 PM	72	368	1070.75	1071.00	1070.00	1070.50	-0.25	1.00	1070.584	20	24	22	27	368
355	2:46:54 PM	137	867	1070.00	1072.75	1069.50	1069.75	-0.25	3.25	1071.144	25	35	26	42	867
356	2:46:55 PM	162	854	1069.75	1071.75	1069.50	1071.75	2.00	2.25	1070.456	33	29	36	33	854
357	2:46:56 PM	143	1,256	1071.75	1074.50	1071.50	1072.50	0.75	3.00	1072.984	29	46	30	49	1,256
358	2:46:57 PM	41	367	1073.25	1074.00	1073.00	1073.50	0.25	1.00	1073.480	13	19	13	23	367
359	2:46:58 PM	51	393	1073.25	1073.75	1072.50	1072.75	-0.50	1.25	1073.223	11	18	14	22	393
360	2:46:59 PM	41	443	1072.50	1073.00	1072.50	1072.50	0.00	0.50	1072.621	10	16	11	20	443

Row	Time (EDT)	Trades	Volume	First	High	Low	Last	Last - First Range	High / Low Range	VWAP	Buy Accts	Sell Accts	Buy User IDs	Sell User IDs	Volume Graph
361	2:47:00 PM	154	1,207	1072.75	1073.50	1071.75	1072.75	0.00	1.75	1072.326	29	24	34	29	1,207
362	2:47:01 PM	54	198	1072.75	1073.00	1071.25	1073.00	0.25	1.75	1072.188	21	19	23	22	198
363	2:47:02 PM	46	570	1072.25	1073.00	1072.25	1072.50	0.25	0.75	1072.652	15	19	19	19	570
364	2:47:03 PM	41	215	1072.50	1072.50	1071.75	1072.00	-0.50	0.75	1072.286	19	18	20	19	215
365	2:47:04 PM	72	535	1072.25	1073.00	1072.00	1072.50	0.25	1.00	1072.526	16	30	19	34	535
366	2:47:05 PM	43	267	1072.50	1072.50	1072.00	1072.50	0.00	0.50	1072.279	18	14	19	16	267
367	2:47:06 PM	57	695	1072.50	1072.50	1072.00	1072.25	-0.25	0.50	1072.227	21	13	26	19	695
368	2:47:07 PM	157	1,197	1072.25	1072.75	1070.75	1072.25	0.00	2.00	1071.912	41	31	43	33	1,197
369	2:47:08 PM	57	1,073	1072.25	1072.50	1071.75	1072.50	0.25	0.75	1072.130	14	24	17	28	1,073
370	2:47:09 PM	73	529	1072.50	1073.00	1072.25	1073.00	0.50	0.75	1072.648	13	30	18	32	529
371	2:47:10 PM	49	537	1073.00	1073.50	1073.00	1073.50	0.50	0.50	1073.426	17	28	18	30	537
372	2:47:11 PM	66	701	1073.50	1074.00	1073.25	1073.75	0.25	0.75	1073.529	23	26	23	28	701
373	2:47:12 PM	57	478	1073.75	1074.00	1073.00	1073.75	0.00	1.00	1073.742	17	26	21	27	478
374	2:47:13 PM	42	309	1073.75	1074.00	1073.25	1073.75	0.00	0.75	1073.733	19	19	20	19	309
375	2:47:14 PM	31	304	1073.75	1074.00	1073.25	1073.75	0.00	0.75	1073.688	12	15	15	15	304
376	2:47:15 PM	83	1,061	1073.75	1074.50	1073.00	1073.25	-0.50	1.50	1073.792	38	18	42	18	1,061
377	2:47:16 PM	24	205	1073.25	1074.00	1073.00	1073.25	0.00	1.00	1073.082	13	13	13	13	205
378	2:47:17 PM	47	599	1073.00	1073.75	1073.00	1073.75	0.75	0.75	1073.377	13	19	13	21	599
379	2:47:18 PM	82	1,180	1073.50	1073.75	1072.75	1072.75	-0.75	1.00	1073.313	26	23	29	23	1,180
380	2:47:19 PM	30	270	1073.00	1073.25	1072.50	1073.00	0.00	0.75	1072.931	19	9	21	9	270
381	2:47:20 PM	54	303	1073.25	1073.75	1073.00	1073.50	0.25	0.75	1073.301	17	30	18	30	303
382	2:47:21 PM	50	444	1073.50	1073.50	1073.00	1073.25	-0.25	0.50	1073.319	17	17	17	18	444
383	2:47:22 PM	101	1,407	1073.25	1074.00	1073.00	1074.00	0.75	1.00	1073.769	23	40	25	36	1,407
384	2:47:23 PM	76	744	1073.75	1074.00	1073.25	1074.00	0.25	0.75	1073.616	21	20	21	19	744
385	2:47:24 PM	123	680	1073.75	1073.75	1072.50	1073.50	-0.25	1.25	1073.358	33	25	36	27	680
386	2:47:25 PM	64	870	1073.75	1074.00	1072.50	1073.25	-0.50	1.50	1073.107	22	24	21	27	870
387	2:47:26 PM	47	718	1073.50	1073.75	1073.25	1073.75	0.25	0.50	1073.456	14	19	18	20	718
388	2:47:27 PM	71	722	1074.00	1074.50	1073.75	1074.25	0.25	0.75	1074.087	24	27	24	31	722
389	2:47:28 PM	34	186	1074.50	1074.50	1074.25	1074.25	-0.25	0.25	1074.356	15	17	16	17	186
390	2:47:29 PM	64	397	1074.50	1074.50	1073.75	1074.00	-0.50	0.75	1074.132	32	21	40	23	397
391	2:47:30 PM	158	1,969	1074.00	1074.75	1073.00	1074.50	0.50	1.75	1073.887	40	39	48	41	1,969
392	2:47:31 PM	137	402	1074.50	1074.75	1073.00	1073.00	-1.50	1.75	1073.905	34	17	39	19	402
393	2:47:32 PM	84	632	1073.75	1074.00	1072.75	1074.00	0.25	1.25	1073.703	29	19	31	21	632
394	2:47:33 PM	109	641	1074.00	1074.50	1073.50	1074.00	0.00	1.00	1073.968	28	28	34	30	641
395	2:47:34 PM	129	788	1074.25	1074.75	1073.00	1074.50	0.25	1.75	1073.839	34	26	40	28	788
396	2:47:35 PM	34	276	1074.00	1074.25	1073.25	1073.25	-0.75	1.00	1073.349	13	17	14	19	276
397	2:47:36 PM	221	1,396	1073.50	1075.00	1073.00	1074.25	0.75	2.00	1074.262	33	61	39	68	1,396
398	2:47:37 PM	56	364	1074.25	1075.00	1073.50	1075.00	0.75	1.50	1074.471	19	21	19	23	364
399	2:47:38 PM	45	243	1074.75	1075.25	1074.50	1075.25	0.50	0.75	1075.089	20	19	22	20	243
400	2:47:39 PM	108	422	1075.00	1075.75	1074.50	1075.75	0.75	1.25	1075.117	30	37	33	39	422
401	2:47:40 PM	57	414	1075.50	1076.00	1075.25	1075.75	0.25	0.75	1075.506	30	23	34	25	414
402	2:47:41 PM	77	463	1075.25	1076.00	1075.25	1075.75	0.50	0.75	1075.389	22	26	28	30	463
403	2:47:42 PM	107	544	1075.75	1076.75	1075.50	1075.75	0.00	1.25	1076.127	26	37	29	41	544
404	2:47:43 PM	75	337	1076.00	1077.00	1076.00	1077.00	1.00	1.00	1076.596	21	30	22	31	337
405	2:47:44 PM	128	433	1076.75	1077.50	1076.00	1076.50	-0.25	1.50	1076.780	53	23	56	24	433
406	2:47:45 PM	256	1,716	1076.50	1079.50	1076.25	1077.50	1.00	3.25	1077.623	50	79	54	83	1,716
407	2:47:46 PM	105	556	1077.50	1078.50	1076.25	1077.75	0.25	2.25	1077.003	36	34	40	37	556
408	2:47:47 PM	82	663	1077.75	1078.50	1077.50	1078.00	0.25	1.00	1078.012	26	27	32	30	663
409	2:47:48 PM	98	592	1078.00	1079.00	1077.50	1077.50	-0.50	1.50	1078.138	36	28	39	28	592
410	2:47:49 PM	74	316	1078.50	1078.50	1077.50	1078.25	-0.25	1.00	1078.078	33	21	35	23	316
411	2:47:50 PM	124	795	1078.00	1078.75	1077.50	1077.75	-0.25	1.25	1077.991	40	28	51	30	795
412	2:47:51 PM	169	1,011	1077.75	1079.50	1077.50	1079.25	1.50	2.00	1078.846	28	45	30	48	1,011
413	2:47:52 PM	98	1,203	1079.25	1080.25	1079.00	1080.25	1.00	1.25	1079.812	37	46	39	50	1,203
414	2:47:53 PM	130	770	1080.25	1081.25	1080.00	1081.25	1.00	1.25	1080.604	29	46	32	48	770
415	2:47:54 PM	305	1,486	1081.25	1083.25	1080.00	1081.00	-0.25	3.25	1081.832	60	68	69	75	1,486
416	2:47:55 PM	136	1,655	1081.00	1081.75	1078.00	1081.75	0.75	3.75	1079.775	60	44	63	47	1,655
417	2:47:56 PM	327	2,364	1081.75	1084.75	1077.75	1084.00	2.25	7.00	1081.643	52	81	59	85	2,364
418	2:47:57 PM	153	1,017	1084.00	1085.25	1083.25	1085.00	1.00	2.00	1084.748	37	44	44	46	1,017
419	2:47:58 PM	234	1,743	1085.00	1088.25	1084.50	1088.25	3.25	3.75	1085.611	46	70	46	71	1,743
420	2:47:59 PM	174	909	1086.50	1088.25	1085.00	1086.00	-0.50	3.25	1086.133	40	34	41	35	909



Row	Time (EDT)	Trades	Volume	First	High	Low	Last	Last - First Range	High / Low Range	VWAP	Buy Accts	Sell Accts	Buy User IDs	Sell User IDs	Volume Graph
421	2:48:00 PM	183	1,555	1085.75	1086.75	1082.00	1082.00	-3.75	4.75	1085.323	43	40	45	43	1,555
422	2:48:01 PM	366	2,584	1086.00	1090.75	1082.00	1089.50	3.50	8.75	1087.360	46	99	53	102	2,584
423	2:48:02 PM	88	643	1089.50	1090.75	1089.50	1090.25	0.75	1.25	1090.117	29	33	32	36	643
424	2:48:03 PM	95	415	1090.50	1091.75	1090.25	1091.50	1.00	1.50	1091.066	42	34	46	34	415
425	2:48:04 PM	108	811	1091.50	1092.00	1090.75	1092.00	0.50	1.25	1091.507	40	33	41	37	811
426	2:48:05 PM	177	1,091	1092.00	1094.25	1090.25	1092.50	0.50	4.00	1092.034	47	69	51	71	1,091
427	2:48:06 PM	109	641	1092.25	1094.50	1090.25	1092.00	-0.25	4.25	1092.878	44	46	48	46	641
428	2:48:07 PM	85	449	1092.25	1093.25	1090.25	1091.25	-1.00	3.00	1091.146	37	35	38	36	449
429	2:48:08 PM	84	915	1091.00	1091.75	1090.50	1091.00	0.00	1.25	1091.121	39	35	44	36	915
430	2:48:09 PM	111	1,362	1090.50	1092.00	1090.25	1090.50	0.00	1.75	1091.432	31	47	33	50	1,362
431	2:48:10 PM	110	864	1090.50	1092.25	1090.25	1090.50	0.00	2.00	1091.324	33	40	37	44	864
432	2:48:11 PM	143	1,553	1090.25	1093.25	1090.00	1090.75	0.50	3.25	1091.522	38	70	40	75	1,553
433	2:48:12 PM	85	1,095	1090.75	1093.50	1090.25	1092.00	1.25	3.25	1092.289	23	37	28	39	1,095
434	2:48:13 PM	109	1,325	1093.00	1094.00	1092.00	1093.50	0.50	2.00	1093.301	30	49	33	64	1,325
435	2:48:14 PM	153	1,556	1093.50	1095.25	1093.00	1095.00	1.50	2.25	1094.181	34	73	38	84	1,556
436	2:48:15 PM	86	884	1095.25	1095.25	1093.00	1094.50	-0.75	2.25	1094.093	35	28	43	34	884
437	2:48:16 PM	83	533	1093.25	1094.50	1093.00	1093.00	-0.25	1.50	1093.348	26	37	29	41	533
438	2:48:17 PM	173	794	1092.75	1094.50	1090.25	1091.75	-1.00	4.25	1092.369	59	56	65	61	794
439	2:48:18 PM	72	404	1091.75	1093.25	1091.00	1091.50	-0.25	2.25	1091.443	32	27	33	29	404
440	2:48:19 PM	81	529	1091.25	1093.00	1091.00	1091.75	0.50	2.00	1091.586	29	38	32	40	529
441	2:48:20 PM	102	562	1092.25	1094.00	1091.25	1092.50	0.25	2.75	1092.306	36	45	38	49	562
442	2:48:21 PM	79	384	1092.50	1092.75	1090.75	1092.00	-0.50	2.00	1092.105	22	30	23	32	384
443	2:48:22 PM	168	798	1092.25	1093.25	1091.25	1092.00	-0.25	2.00	1092.374	33	32	35	35	798
444	2:48:23 PM	100	1,137	1091.50	1092.00	1090.75	1091.25	-0.25	1.25	1091.332	26	26	31	27	1,137
445	2:48:24 PM	115	539	1091.25	1091.75	1090.50	1091.25	0.00	1.25	1091.305	31	27	36	30	539
446	2:48:25 PM	133	979	1091.75	1092.00	1090.75	1091.75	0.00	1.25	1091.466	25	44	27	51	979
447	2:48:26 PM	81	658	1092.00	1092.00	1090.50	1091.75	-0.25	1.50	1091.196	32	29	34	34	658
448	2:48:27 PM	539	2,614	1091.75	1093.75	1090.75	1091.75	0.00	3.00	1092.525	26	68	30	74	2,614
449	2:48:28 PM	94	744	1091.50	1093.75	1091.25	1093.00	1.50	2.50	1092.921	31	27	34	29	744
450	2:48:29 PM	81	485	1092.75	1093.25	1092.00	1093.00	0.25	1.25	1092.771	30	25	32	24	485
451	2:48:30 PM	134	1,722	1093.00	1094.00	1092.50	1093.50	0.50	1.50	1093.524	45	51	49	55	1,722
452	2:48:31 PM	84	413	1092.75	1093.50	1092.25	1092.75	0.00	1.25	1092.647	23	30	28	32	413
453	2:48:32 PM	213	1,303	1092.75	1094.75	1092.75	1094.00	1.25	2.00	1093.620	30	59	36	63	1,303
454	2:48:33 PM	174	861	1094.00	1095.00	1093.25	1094.00	0.00	1.75	1094.190	29	38	35	42	861
455	2:48:34 PM	229	2,060	1094.00	1097.00	1093.50	1095.25	1.25	3.50	1095.259	37	91	42	97	2,060
456	2:48:35 PM	246	1,051	1095.75	1096.75	1093.00	1094.25	-1.50	3.75	1095.086	58	33	62	41	1,051
457	2:48:36 PM	114	515	1094.75	1095.00	1092.75	1093.25	-1.50	2.25	1093.586	30	19	33	21	515
458	2:48:37 PM	128	721	1093.25	1093.75	1092.25	1093.25	0.00	1.50	1092.962	34	32	36	37	721
459	2:48:38 PM	126	1,432	1093.00	1094.25	1091.75	1091.75	-1.25	2.50	1092.906	41	35	41	37	1,432
460	2:48:39 PM	106	1,081	1091.75	1092.75	1091.25	1092.00	0.25	1.50	1091.885	36	32	40	36	1,081
461	2:48:40 PM	100	552	1092.50	1092.75	1091.25	1091.50	-1.00	1.50	1091.727	30	26	33	27	552
462	2:48:41 PM	241	1,407	1091.50	1093.25	1089.25	1089.25	-2.25	4.00	1091.496	65	44	69	48	1,407
463	2:48:42 PM	97	560	1090.75	1090.75	1089.25	1089.50	-1.25	1.50	1089.841	29	26	30	29	560
464	2:48:43 PM	110	701	1089.50	1089.75	1087.00	1087.50	-2.00	2.75	1088.796	41	34	45	36	701
465	2:48:44 PM	137	620	1087.50	1088.25	1085.25	1086.00	-1.50	3.00	1086.752	42	31	44	33	620
466	2:48:45 PM	463	789	1086.00	1087.50	1083.25	1085.00	-1.00	4.25	1084.997	58	29	61	30	789
467	2:48:46 PM	98	273	1085.00	1086.25	1083.75	1086.25	1.25	2.50	1084.992	22	31	26	31	273
468	2:48:47 PM	80	308	1086.25	1086.50	1085.25	1086.50	0.25	1.25	1085.821	32	29	38	30	308
469	2:48:48 PM	124	1,314	1086.00	1090.00	1086.00	1089.50	3.50	4.00	1088.815	20	50	20	56	1,314
470	2:48:49 PM	89	504	1089.75	1091.25	1089.50	1090.50	0.75	1.75	1090.189	27	35	29	38	504
471	2:48:50 PM	113	717	1090.75	1091.50	1089.50	1091.50	0.75	2.00	1090.793	35	39	37	39	717
472	2:48:51 PM	66	961	1091.25	1091.50	1090.50	1091.25	0.00	1.00	1090.951	20	27	23	30	961
473	2:48:52 PM	101	1,085	1091.00	1092.25	1090.00	1090.00	-1.00	2.25	1090.940	37	31	38	32	1,085
474	2:48:53 PM	62	476	1091.25	1091.25	1089.75	1090.50	-0.75	1.50	1090.365	25	20	30	21	476
475	2:48:54 PM	51	395	1090.50	1090.50	1089.50	1089.75	-0.75	1.00	1089.948	22	22	24	25	395
476	2:48:55 PM	58	576	1089.75	1090.25	1089.25	1089.25	-0.50	1.00	1089.534	26	25	29	27	576
477	2:48:56 PM	96	1,289	1089.25	1089.75	1087.75	1089.00	-0.25	2.00	1089.218	26	28	30	31	1,289
478	2:48:57 PM	36	306	1088.00	1089.75	1088.00	1089.00	1.00	1.75	1089.141	19	25	19	26	306
479	2:48:58 PM	102	1,351	1088.75	1090.50	1088.50	1090.50	1.75	2.00	1089.785	33	52	36	53	1,351
480	2:48:59 PM	47	749	1090.50	1090.50	1088.75	1090.50	0.00	1.75	1089.115	26	18	32	18	749

Row	Time (EDT)	Trades	Volume	First	High	Low	Last	Last - First Range	High / Low Range	VWAP	Buy Accts	Sell Accts	Buy User IDs	Sell User IDs	Volume Graph
481	2:49:00 PM	97	391	1090.50	1090.75	1088.75	1090.00	-0.50	2.00	1089.750	32	25	38	26	391
482	2:49:01 PM	67	463	1089.75	1091.00	1089.00	1090.50	0.75	2.00	1090.273	22	31	23	33	463
483	2:49:02 PM	89	440	1090.50	1091.50	1089.50	1091.25	0.75	2.00	1090.819	32	32	35	32	440
484	2:49:03 PM	81	574	1091.00	1091.50	1089.00	1090.75	-0.25	2.50	1090.407	36	18	39	22	574
485	2:49:04 PM	29	179	1090.75	1090.75	1089.75	1090.00	-0.75	1.00	1090.306	15	10	16	13	179
486	2:49:05 PM	92	731	1089.75	1091.00	1089.50	1089.75	0.00	1.50	1090.053	25	31	29	34	731
487	2:49:06 PM	50	412	1090.25	1091.50	1089.75	1089.75	-0.50	0.75	1090.026	20	14	21	18	412
488	2:49:07 PM	82	718	1090.25	1091.50	1089.75	1090.50	0.25	1.75	1090.989	24	35	24	38	718
489	2:49:08 PM	123	657	1090.50	1091.25	1090.00	1091.00	0.50	1.25	1090.683	27	30	31	32	657
490	2:49:09 PM	158	985	1091.25	1091.50	1090.00	1090.75	-0.50	1.50	1091.002	36	34	37	38	985
491	2:49:10 PM	56	399	1090.50	1091.25	1090.50	1090.75	0.25	0.75	1090.882	16	19	20	22	399
492	2:49:11 PM	51	449	1090.75	1091.25	1090.50	1091.00	0.25	0.75	1090.863	22	16	23	19	449
493	2:49:12 PM	61	439	1090.75	1091.50	1090.50	1091.25	0.50	1.00	1091.016	21	21	24	22	439
494	2:49:13 PM	81	469	1091.25	1091.50	1090.75	1091.25	0.00	0.75	1091.212	23	22	26	23	469
495	2:49:14 PM	188	1,780	1091.25	1093.25	1091.25	1092.00	0.75	2.00	1092.005	32	62	33	64	1,780
496	2:49:15 PM	197	1,029	1091.75	1093.00	1089.75	1090.00	-1.75	3.25	1090.753	75	24	79	26	1,029
497	2:49:16 PM	97	1,300	1090.75	1090.75	1088.50	1089.25	-1.50	2.25	1089.624	42	18	43	18	1,300
498	2:49:17 PM	41	275	1088.75	1089.00	1088.50	1088.50	-0.25	0.50	1088.730	19	23	21	24	275
499	2:49:18 PM	47	267	1088.50	1089.50	1088.50	1089.00	0.50	1.00	1088.874	21	21	22	24	267
500	2:49:19 PM	69	967	1089.00	1090.25	1088.50	1090.25	1.25	1.75	1089.134	27	30	29	32	967
501	2:49:20 PM	37	387	1090.00	1090.25	1089.00	1089.50	-0.50	1.25	1089.830	15	22	16	22	387
502	2:49:21 PM	99	1,230	1090.00	1090.75	1089.25	1089.50	-0.50	1.50	1090.287	18	30	21	34	1,230
503	2:49:22 PM	48	265	1089.50	1090.50	1089.50	1090.25	0.75	1.00	1089.887	17	14	22	17	265
504	2:49:23 PM	71	1,046	1090.25	1090.75	1089.50	1090.50	0.25	1.25	1089.924	36	16	40	17	1,046
505	2:49:24 PM	72	876	1090.25	1090.50	1089.25	1090.25	0.00	1.25	1089.974	27	24	29	27	876
506	2:49:25 PM	51	553	1090.00	1091.00	1090.00	1091.00	1.00	1.00	1090.397	13	21	15	21	553
507	2:49:26 PM	70	487	1090.50	1091.00	1089.75	1090.00	-0.50	1.25	1090.292	23	17	27	22	487
508	2:49:27 PM	77	660	1090.00	1090.50	1089.25	1090.00	0.00	1.25	1089.871	34	20	36	23	660
509	2:49:28 PM	68	387	1089.50	1090.00	1089.00	1089.00	-0.50	1.00	1089.464	32	23	34	26	387
510	2:49:29 PM	67	622	1089.25	1089.25	1088.50	1088.75	-0.50	0.75	1088.871	36	18	37	19	622
511	2:49:30 PM	38	618	1088.75	1089.25	1088.50	1089.25	0.50	0.75	1088.789	14	12	16	13	618
512	2:49:31 PM	89	629	1089.00	1089.50	1088.50	1088.75	-0.25	1.00	1089.168	34	23	34	24	629
513	2:49:32 PM	121	674	1088.50	1089.00	1088.25	1088.25	-0.25	0.75	1088.595	36	26	43	31	674
514	2:49:33 PM	182	1,003	1088.25	1088.50	1087.00	1087.25	-1.00	1.50	1087.656	46	39	53	42	1,003
515	2:49:34 PM	145	524	1087.25	1088.50	1086.25	1086.75	-0.50	2.25	1087.198	33	30	37	37	524
516	2:49:35 PM	102	962	1086.50	1087.50	1086.00	1087.25	0.75	1.50	1086.485	34	28	37	32	962
517	2:49:36 PM	59	507	1087.50	1087.50	1085.75	1086.00	-1.50	1.75	1086.810	31	16	33	18	507
518	2:49:37 PM	78	598	1086.00	1086.50	1085.25	1085.50	-0.50	1.25	1085.777	40	15	43	16	598
519	2:49:38 PM	93	1,019	1085.25	1086.00	1084.75	1084.75	-0.50	1.25	1085.173	42	26	46	30	1,019
520	2:49:39 PM	81	529	1085.00	1085.00	1083.75	1084.50	-0.50	1.25	1084.559	30	23	33	25	529
521	2:49:40 PM	66	501	1084.50	1084.75	1083.25	1083.75	-0.75	1.50	1084.136	24	31	25	31	501
522	2:49:41 PM	59	599	1084.25	1085.00	1083.50	1085.00	0.75	1.50	1084.521	23	30	25	33	599
523	2:49:42 PM	103	1,062	1084.75	1085.75	1084.00	1085.00	0.25	1.75	1084.917	41	30	47	32	1,062
524	2:49:43 PM	74	628	1085.00	1086.50	1084.50	1085.25	0.25	2.00	1085.522	26	34	29	35	628
525	2:49:44 PM	69	362	1085.25	1085.25	1084.00	1084.25	-1.00	1.25	1084.588	34	17	36	19	362
526	2:49:45 PM	99	839	1084.75	1085.25	1083.25	1085.00	0.25	2.00	1084.473	26	29	31	30	839
527	2:49:46 PM	78	358	1084.75	1085.00	1084.00	1085.00	0.25	1.00	1084.633	22	19	25	21	358
528	2:49:47 PM	107	868	1085.00	1085.50	1084.00	1084.75	-0.25	1.50	1084.778	28	29	33	32	868
529	2:49:48 PM	62	564	1084.75	1085.50	1084.75	1085.50	0.75	0.75	1085.274	19	22	22	24	564
530	2:49:49 PM	123	993	1085.50	1086.75	1085.00	1086.25	0.75	1.75	1085.900	42	33	48	34	993
531	2:49:50 PM	86	439	1086.00	1086.50	1085.50	1085.75	-0.25	1.00	1085.897	31	20	35	20	439
532	2:49:51 PM	107	734	1085.75	1086.75	1085.50	1085.50	-0.25	1.25	1086.052	25	31	29	34	734
533	2:49:52 PM	129	658	1085.50	1086.25	1085.25	1086.00	0.50	1.00	1085.795	29	19	33	22	658
534	2:49:53 PM	96	638	1086.00	1086.25	1085.25	1086.25	0.25	1.00	1085.847	28	27	32	27	638
535	2:49:54 PM	258	1,876	1086.00	1088.75	1085.00	1088.25	2.25	3.75	1086.380	37	56	41	60	1,876
536	2:49:55 PM	167	1,144	1088.25	1088.75	1085.25	1088.00	-0.25	3.50	1087.939	33	40	35	48	1,144
537	2:49:56 PM	80	514	1088.00	1088.25	1086.75	1087.75	-0.25	1.50	1087.744	24	23	27	24	514
538	2:49:57 PM	121	1,177	1087.75	1089.25	1087.75	1088.75	1.00	1.50	1088.525	26	35	31	39	1,177
539	2:49:58 PM	59	370	1089.00	1089.50	1088.75	1089.50	0.50	0.75	1089.114	20	20	22	21	370
540	2:49:59 PM	147	1,309	1089.25	1089.50	1086.50	1088.75	-0.50	3.00	1088.258	43	23	45	29	1,309

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