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Finding Best Execution in the Dark: Market Fragmentation and the Rise of Dark Pools

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FINDING BEST EXECUTION IN THE DARK: MARKET FRAGMENTATION AND THE RISE OF DARK POOLS

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INTRODUCTION

Over the past three decades, the equities markets all over the world have seen periods of fragmentation and consolidation as new players enter the industry, or two or more entities combine to unify liquidity pools. Despite major industry mergers, traders currently have more venues to send order flow than ever before. These include the primary exchanges, electronic communications networks (ECN), alternative trading systems (ATS), and opaque crossing networks which are more commonly known as "dark pools". There are currently 13 exchanges and 20 dark pools in the United States today (Avramovic, 2012). More routing options have not necessarily made attaining "best execution" any easier. Both regulators and investors have struggled not only to define best execution but also to create strategies and rules to establish a fair and transparent environment in which to conduct business.

A major focus of previous studies has been on the difference between investor types, for example, the uninformed versus informed and institutional versus retail. This paper attempts to define and analyze these differing investor classes' goals and how these goals affect their trading strategies. Investors are continually looking for new ways to access liquidity, that is, the ability to execute large transactions with ease while trying to reduce costs and minimize market impact. As the marketplace has advanced, investors have employed different order types and strategies to reach those goals. Crossing networks with non-displayed quotes, known as dark pools, are among the most recent advances in the upstairs market, where trading occurs off the trading floors or market centers in broker to broker transactions or via crossing networks. This type of trading offers chances to reach hidden liquidity anonymously and cheaply. To understand the growth of the dark pools and their impact, this paper will explore the dark pools from structures to regulations that govern their trading practices.

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The Evolution of US Equities Market - Microstructure and Fragmentation

The securities markets in the United States can trace their roots back over two hundred years to 1792. In what has become known as the Buttonwood Agreement, twenty-four brokers and merchants signed a contract to begin the trading of securities (www.nyse.com/about/history). As has been the case since their inception in the nineteenth century, the NYSE and American Stock Exchange maintain both a physical trading floor and utilize an open outcry system for trading. With the introduction of ECN's, NYSE has become a hybrid marketplace. All Nasdaq trading is done electronically as market makers and broker dealers place their bids and offers into its system. These bid/asks are shown to the entire market and trading is completed via its computer system.

In direct competition with the primary exchanges, ECN's were created to provide an alternative method of trading securities. The SEC defines ECNs as "electronic trading systems that automatically match buy and sell orders at specified prices" (www.sec.gov). Although equities are not listed on these platforms, they provide a venue to find the other side of a trade. Nasdaq operates essentially as an ECN and trades not only self-listed stocks but also offers trading in listed names of organized exchanges, such as NYSE. As the marketplace has gone through successive waves of fragmentation and consolidation, many ECNs have since merged with the larger exchanges. For example, two well known ECNs that have now merged with exchanges are ArcaEx, which was bought by the NYSE in 2006 and Brut, which was bought by Nasdaq.

Regulation in the US has changed the different fee structures ECNs charge but the costs basically remain the same. Barclay, et al., (2003) pointed out that ECNs were originally created to serve broker-dealers and institutional investors, and that the prices posted were better than those posted on Nasdaq. As the markets have become more integrated and orders can be more easily routed to different venues, these price differences have virtually disappeared. In fact, market centers are now obligated to route to the best price regardless of the venue.

There are many ways orders can be submitted to the respective exchanges or traders. In their review of the stock market microstructure, Comerton-Forde and Rydge (2004) enumerated three order types: *simple order* to be completed on the market open or close, *limit order* designating a set price or better, and *market order* which will proceed to keep executing against the other side of the order book until the order is completed. More complex order types have emerged as traders and investors seek liquidity. These order types include hidden size orders, where only pieces of the entire order are displayed to the market ("Order types and trading dynamics," 2008). While this strategy saves an investor from scaring the marketplace it does reduce the transparency of the trade. This type of trade also pose other problems including the issue of counterparties not being able to find each other because the size within the order book is minimal compared to the volume they are looking to execute. These investors are looking to execute large amounts of stock while not pushing the marketplace against them. They are forced to employ trading strategies such as using complex algorithms, trading stock in pieces over a certain time period, or attempting to do a percentage of the volume over time. Recent studies on the normative effects of computerized trading, such as in Hendershott, et al., (2011), have found that algorithmic trading improves liquidity for large stocks.

Different order types also can facilitate how aggressively volume is executed. All of these order types attempt to facilitate the execution of as much liquidity with as little market impact as possible, although they are all traded through ECNs or the primary exchanges. In addition, the US equities markets also have a strong upstairs marketplace to which the evolution of dark pools could be traced. These cross currents from different trading venues to the various order types are basically utilized by investors. Behind every trade, there can be a great range in the sophistication of the end investor.

Types of Investors

When analyzing the different types of investors in the current marketplace and regulatory environment, many studies have focused not on the differences in size but the differences in knowledge between investors. Pirrong (2005) makes the argument that some investors are better informed than others regarding the value of certain securities, hence the two types of traders – *informed* and *uninformed.* The information based trading creates an adverse selection problem whereby the better informed investors make money to the detriment of the less informed. According to Pirrong informed trading does not necessarily equal insider trading. Informed traders can have a better understanding of public information, which allows them to make better investment decisions. Uninformed traders are in essence liquidity seekers whose main goal is solely to execute stock.

There are major differences in trading styles and strategies between informed and uninformed traders. According to Barclay, et al., (2003), patience is a trait of uninformed traders because they believe that they can win by waiting for opportunities that will result in better executions. Informed and uninformed traders may utilize the same strategies to execute volume but for very different reasons. One such example would be spreading order flow to different exchanges or ECNs. Informed traders are trying to hide their actions whereas uninformed liquidity seekers are just waiting for a better price. Liquidity is one of the driving forces in trading. According to Naes and Odegaard (2005), informed traders and liquidity traders prefer to trade in the large exchanges because when there are large liquidity order flows, and more liquidity traders, it becomes easier not to be visible and to lower their trading costs. The result of all this liquidity is narrower spreads. While this pattern has been true in the past, it remains to be seen how continued market fragmentation will change the way investors behave. All these strategies and nuances in trading are meant to improve the execution of the trade that results in the best execution.

Best Execution

It is important to attempt to establish the costs of trading and what defines best execution. All else being equal, the most favorable price for the customer at the time a stock is traded appears to meet the definition of best execution, i.e. the lowest available price for the buyer and highest available price for the seller. When developing their regulations for the marketplace, the Securities and Exchange Commission (SEC) had decided to use price to distinguish the good from bad, but there are other factors or costs which affect the quality of entering or exiting a position.

The more sophisticated the investor, the more that execution price becomes only one aspect of execution quality. Naes and Odegaard (2005) write about the implementation

shortfall view of trading, that is, the change in price from the time a trading decision is made until the trade is actually completed. Some of these incremental costs are shown as a part of the overall trading costs as shown below (Naes and Odegaard, 2005):

- Total Cost = Broker Commissions + Spread+ Price Impact+ Opportunity Costs

In this model, the explicit costs are reflected in the broker commissions. The rest of the costs of trading are implicit, which are much larger than explicit trading costs. The spread is the difference between the bid and ask prices that the market maker sets for a stock. Price impact results when a large volume transaction influences the market price. Opportunity costs include all non-trading costs, i.e. what the price of a security would be if an order had not been executed, which is virtually impossible to determine. This is where the concept of implementation shortfall is so important. The measurement comes from where the stock was trading when the decision to enter or exit the market was completed.

Having made the same decision, informed and uninformed investors will react differently due to their differences in knowledge. Bessembinder and Venkataraman (2004) claim that informed investors choose to remain anonymous and trade at the quoted price, whereas uninformed investors find it in their interest to have more interaction with dealers who will quote them what they think are better prices. As we can see, quality execution extends well beyond the initial price received when going to the market. Trading costs can continue to rise even after a trade is complete.

The Upstairs Market and the Rise of Dark Pools

A. *The Upstairs Market*

The traditional method of trading stocks was through the major exchanges. But in the last two decades trading has also taken place through the electronic marketplace around the globe, or in the parallel ECNs that are available. These three types of trading places are commonly referred to as "downstairs" market. In addition, all major equities markets also have an upstairs market where brokerage firms are employed by large traders to look for possible counterparties and negotiate trade terms on their behalf (Bessembinder and Venkataraman, 2004).

The existence of the upstairs market has directly or indirectly contributed to the rise of dark pools. The decision of whether to execute in the downstairs market, i.e. on an exchange or via an ECN, versus utilizing a broker to find a counterparty to cross a block of stock is a function of the type of investors and the search for best execution. Thus, crossing a block of stock simply means that the buy and sell orders are matched directly without first routing the order to an exchange or a displayed market.

The increased liquidity is an important factor when analyzing upstairs trading. It may also help to explain what types of traders are involved in the upstairs market. Much of the research involving trading in the upstairs market focuses on the differences between informed and uninformed investors. Fong, et al., (2001) give a good overview of these differences. Historically, the upstairs market is a broker to broker market where often the counterparties do not know each other's end-clients. Due to the long standing relationships between brokers, reputation plays a large role in being able to find the other side to a trade. Brokers, therefore, will do their best to appear to be holding orders from uninformed investors

because their counterparties will be wary of trading if they feel they have inferior knowledge. Since reputation plays a large role, it helps to keep the parties honest—if one broker constantly takes advantage of his counterparties he will find it more and more difficult to execute blocks of stock in the upstairs marketplace. This is such an important aspect that Westerholm (2007) claims that the counterparties' trading interests are less exposed upstairs than those of the initiator of the trade and, thus, the counterparties reap the primary benefit of the upstairs market.

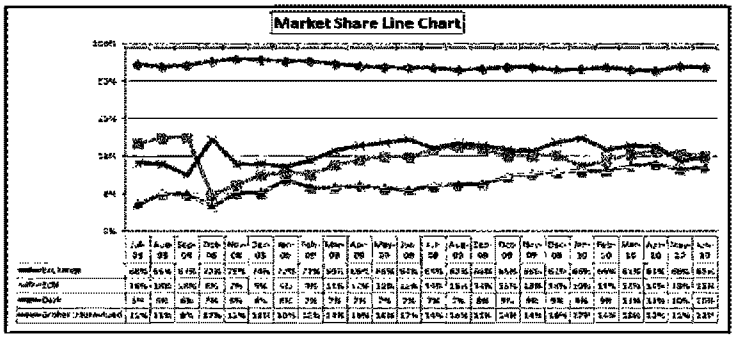
As difficult as it is to ascertain who is benefitting the most from the upstairs marketplace, there are numerous explanations about what types of trades are transacted. Naes and Odegaard (2005) find that crossed stocks (i.e. those traded upstairs) outperformed uncrossed stocks (those traded downstairs) where there was interest on one side. This supports their assertion that there are informed traders in the upstairs marketplace because if upstairs was dominated by the uninformed liquidity seekers, there should be no statistical difference in stock performance. Ignoring stock performance, Fong, et al., (2001) investigate what types of stocks that are executed in the upstairs market and find most crossing interest is found in more liquid stocks. They suggest that this is because investors cannot hide their informed/uninformed motives in more thinly traded issues.

B. *Dark Pools*

A growing component of the upstairs marketplace is dark pools of liquidity. Dark pools are the next generation of crossing networks that combine and address many of the changes in the trading world over the past thirty years including technology, anonymity and speed. Additionally, none of the trades are reported to the consolidated tape so the marketplace as a whole remains unaware of the volume being executed; however, after the trade is consummated, it will be printed on the tape without the dark pool being identified with its own mnemonic (for example, O for Nasdaq).

The phenomenal rise of dark pools is shown in the Chart 1 (Market Share Line Chart) below, which tracks market share of average daily trading volume on a monthly basis for four categories of trading venues: Exchanges, ECNs, dark pools, and trades crossed internally by brokers. Because of the uneven verifiability of dark pool data, the chart is better interpreted as a general indicator of trends over time than as a precise indicator of market share at a given point in time. The chart indicates that market share of dark pools has doubled from 5% to 10% between July 2008 and June 2010, capturing the additional share from exchanges and ECNs. The increase of dark pool market share has intensified since 2010. According to Mehta (2012), who cited the data compiled by Rosenblatt Securities, Inc., dark pools are getting a larger piece of a shrinking pie since trading volume in U.S. equity has declined to the lowest level since 1999. The market share of dark pools increased to 13.5% in 2011.

Chart 1



Source: *TABB Group LiquidityMatrix*™, 2010 TABB Group LLC, New York, NY USA www.tabbgroup.com

Dark Pool Structures

Not all dark pools operate in the same ways. One primary differentiation is between dark pools set up by sell-side firms and those set up by independent providers of trading systems. Sell-side firms have been matching internal order flow for years, but the advent of new technology and increased electronic trading have greatly increased the overall volume. The rationale for sell-side firms is simple: sending order flow to the different exchanges and ECNs costs money and cuts into their commission margins. If they are able to pre-match their different customers' orders against each other and against the firm's proprietary trading desks before sending the orders on to the open market, they are able to eliminate the need for a market maker to provide liquidity and, thus, they avoid paying for execution. In theory, this method also works to the customer's advantage—there is speed of execution and minimal market impact. Many sell-side firms, including almost all the bulge bracket broker dealers, now offer this as a standard. Although there is a question of the extent of protection and anonymity in an internalized dark pool, the business of sell-side firms continues (Schmerken, 2008).

A second differentiator among dark pools is how frequently stock is crossed. Some dark pools only look to cross at set scheduled intervals over the course of the day. Investment Technology Group's (ITG) positing is an example of a scheduled crosser. The Nasdaq also offers a crossing mechanism where buyers and sellers enter orders which the system looks to cross if the other side is available at the scheduled time. Other newer dark pools, such as Liquidnet and Pipeline, look to cross continuously throughout the day. Clary (2007) points out that dark pools are constantly worried about investors gaming their systems and the ability to remain anonymous. They employ different strategies for policing themselves. One way is to limit access. Some dark pools only allow buy-side participants while others allow both buy and sell-side traders.

Dark pools also vary in the types of trading that takes place between counterparties. This ranges from one-to-one trading, one-to-many trading, or many-to-many. Tabb (2006) also points out that regulating the number of counterparties involved in a trade changes not only the available liquidity in stocks but also the type of investor on the other side of the trade. Like sell-side, it also raises questions about investor protection. If retail flow is being aggregated to match an informed sophisticated investor's block trades, is this best execution for the retail investor?

Types of Orders within Dark Pools

Dark pools must also decide what types of orders they will accept. First type of orders center around committed versus uncommitted liquidity. Committed liquidity is a method used by dark pools to police their community of investors and prevent market manipulation. Committed liquidity will be executed without any notice to the investor once it is sent to the dark pool. With uncommitted orders, the investor is notified that the other side exists and must confirm that they want to trade. The second is the pass-through order types. In this case, the sell-side firms are sending their liquidity through their internal pools before sending them on to the traditional market venues. Finally, the least aggressive type of order is those that involve some amount of human negotiation (Butler, 2007). Essentially, in this type of order, indications of interest (IOI's) are expressed anonymously over the network and, if a counter party exists, some further human interaction is necessary in order to trade.

Costs and Benefits Associated with Dark Pools

There are both costs and benefits to the existence of dark pools. While the benefits are relatively self-evident and can be summarized quickly, the costs are more subtle and some are definitely unintended. The main benefits to trading via a dark pool are the ability to execute anonymously blocks of stock with very little direct market impact. Information leakage can significantly cut into trading profits when the market is able to ascertain the direction of order flow. The average size of executions on the New York Stock Exchange has dropped from 2000 shares in 2001 to under 400 shares in recent years (Tabb, 2006). More importantly, block trades (consisting of 10,000 or more shares) fell from 60% of executions to18% since Liquidnet was launched in 2001 (Bogoslaw 2007). This drastic fall coincides with the rise of electronic trading and increased market fragmentation but the net result is an increased level of difficulty in trading large blocks of stock. Under these circumstances, dark pools are one solution.

Dark pools by their nature involve counterparties submitting orders in the hopes that the other side exists and is willing to trade. The main costs to the investors relate to the construction of that marketplace, namely, the smallest price movements called tick prices. The time costs can be significant if the other side is not looking to trade. Along with time costs are the obvious opportunity costs associated with not trading. When analyzing implementation, traders are forced to balance the benefits that dark pools offer against the potential costs of not executing a trade. Related directly to this issue is the number of successful fills. Research has shown that, compared with a traditional upstairs marketplace, dark pools have a higher percentage of unfilled orders (Conrad, et al., 2003). This can be

attributed to the lack of negotiating room plus not seeing all available liquidity. Either way, this is a definite cost to trading.

Due to the increasing number of dark pools, liquidity at any given time varies considerably. If a trader wants to buy or sell large amounts of a stock, they may need to submit orders to multiple dark pools. In addition to the time and resource costs related to spreading orders across dark pools, the direct costs include ticket costs if fills come back from a number of venues. In this case there is a high probability that such a strategy will result in the trader missing liquidity (Butler, 2007). For example, an investor who wants to buy 10,000 shares might choose to send 2,000 share-lot orders to five dark pools. If a 10,000 share trade was possible in one pool but nowhere else, the investor will miss that liquidity as she/he will get filled on only 2000 shares.

Although it is likely the US equities market will remain fragmented, dark pools will probably see the same wave of consolidation that ECNs have seen in recent years (Conrad, et al., (2003). Today, five have been merged or consolidated out of existence, and yet electronic trading is more important than ever. The real question is; will investors be able to efficiently utilize all the tools at their fingertips? In addition, will the existence of dark pools help or harm price discovery? The evidence from existing empirical studies is inconclusive although some researchers find preliminary evidence that the existence of dark pools reduces the noise in exchange order flow and, thus, may improve price discovery (Zhu, 2012). Liquidity could also be a problem. Although buyers and sellers are matched in a dark pool at some agreed upon price, for there to be liquidity, buyers and sellers have to participate in the dark pools.

Regulation of Dark Pools

As technology trading styles and volumes in the equities markets have changed; the SEC is continually challenged to fulfill the original mandate of the Securities Act of 1934, "*protecting investors, maintaining fair, orderly and efficient markets, and facilitating the formation of capital.*" The National Market System (NMS) was instituted in 1975 to provide much greater transparency to the marketplace. The rationale was simple, if investors could see all current quotes and then could route to the venues listing those quotes, all would be protected. Although the marketplace would still be fragmented where different trading venues compete for order flow, best execution would be secured by routing to the venue with the best pricing. The crux of the regulation was that, best execution and investor protection was focused solely on price.

In response to changing conditions brought on by new technologies, a series of rules designed to modernize the regulatory structure of the US equity markets, called Regulation NMS (Reg. NMS) was adopted by the SEC in 2005. Regulation NMS was enacted due to the need for greater competition in the marketplace and for addressing the needs of small investors. With the advent of Reg NMS, dark pools are committed to best execution and price protection (Dorsey, et al., 2005). As they have grown, dark pools have been subjected to even more regulation. This is especially pertinent for larger pools. If they are executing more than the SEC- prescribed 5% threshold of the daily volume in a name, they must provide open access to all market participants. These pools would be forced to display their quotes, which would negate most of the inherent benefits of being a dark pool. How this regulation plays out will greatly affect dark pools in the years to come.

Two recent releases from the SEC simultaneously demonstrate the Commission's concerns that the benefits of dark pools to market participants are preserved and are consistent with its regulatory objectives. There are two SEC regulations that are in the process of being enacted, the first proposed in November 2009 is called, "Regulation of Non-Public Trading Interest" and the second, proposed in January 2010 is, "Concept Release on Equity Market Structure." While the changes proposed in these documents have not yet been implemented, the SEC's sensitivity to issues associated with market fragmentation is clearly evident from the releases. The commission is determined to maintain its regulatory goals of efficiency, price transparency, best execution of investor orders, and order interaction. The releases focus on three topics of interest to the commission: market structure performance, high frequency trading, and un-displayed liquidity (activities of the dark pools). Within the topic of undisplayed liquidity, the Commission invited comments on three issues in particular: the effect of dark pools on order execution quality, the effect of dark pools on public price discovery, and fair access to sources of dark pools.

The sweeping regulatory changes in the controversial Dodd-Frank Wall Street Reform and Consumer Protection Act passed by the 110th Congress in 2010 do not deal directly with dark pools in the equity markets. The Act created the Financial Stability Oversight Council to supervise large companies whose failure could threaten the economy, called "systematically important financial institutions," or SIFIs. It is unclear whether any hedge funds, private equity firms, or dark pools would meet the criteria of a SIFI (Kinsley 2012).

It is reasonable to expect that the SEC will be more focused than ever on these issues of market structure, efficiency and fairness in the near-to-intermediate future. For example, the so-called "Flash Crash" of May 6, 2010, which saw brief but dramatic stock price dislocations and sent regulators and legislators searching for causes in its wake, has called renewed attention to the roles and responsibilities of high-frequency traders and dark pools. An important question arises: What is the legacy of the "Flash Crash" to dark pools and in the U.S. equities market regulation?

Dark Pools and the Flash Crash of 2010

The financial crisis of 2007-2008 had many root causes that do not directly relate to the underlying microstructure of equities. But the media speculation combined with a general public mistrust of Wall Street has raised the awareness and suspicion of industry buzzwords including "dark pools" and "high frequency trading" (HFT). This scrutiny was particularly intense after the Flash Crash of May 6th 2010, when the US equities markets saw a massive selloff and eventual recovery in a period of just over thirty minutes. Much of the immediate finger pointing after the crash sought to place blame on HFT, but the actual tipping point came from a large but legitimate sell program from a mutual fund. HFT's certainly played a role in accelerating and exacerbating an already volatile situation but was not the initial catalyst (Esley, et al., 2010).

In hindsight, there are three key takeaways from the flash crash. First, there is an incredible interconnectedness between different financial markets and instruments. Second, although liquidity and volume are often used interchangeably, the concepts are not completely synonymous. Finally, the technological arms race that firms have engaged in an attempt to win trading revenue still depend on the human knowledge behind the machines to implement

them correctly. Did dark pool liquidity play a major role in the Flash Crash? Dark pools may impair price discovery and advantage certain market participants over others, but they did not overtly influence price action during the crash. Indeed, as traders rushed to exit the markets there by reducing their risk or sell short and profit from the decrease in prices, they probably sought the posted liquidity from the 'lit' markets such as an exchange or ECN. Price discovery was essential during this frenzied time and traders would want the most transparent market as possible. Routing to a dark pool at this time could have had several negative consequences. A trader could execute at unintended prices because of the market's wild moves. More dangerously, the entire move could have been missed. As one sat in a dark pool waiting to execute, the market would quickly have moved away from the trader's limits. A trader could ill afford to place orders in the dark if they needed to find liquidity immediately.

While dark pools may not have caused the crash nor were they largely employed during the period, their role may be important in preventing future market instability. Utilizing dark pools to quietly seek off market liquidity and patiently spreading the order out over both time and execution venues hides a market participants footprints in the market. Keeping that information leakage to a minimum and interacting with other fundamental buyers/sellers in a dark pool as opposed to shorter term high frequency traders on the displayed exchanges will improve overall execution quality especially, when trying to move bulky pieces of stock in thin markets (Kirilenko, et al., 2011).

The initial response of the SEC to the Flash Crash was a series of measures that would negate some of the unrestricted and free transactions that might have contributed to the crash. These measures include new circuit breakers for single stock, new trade break rules, and additional risk controls. Moreover, the SEC eliminated the stub quotes, which are placeholder requests that can range from pennies to thousands of dollars used by traders to maintain bids and offers (Angstadt, 2010). There are other existing regulatory proposals which address issues such as large trade reporting and the need for a consolidated audit trail. There is still some uncertainty as to whether there will be additional measures in the future to address the role of market makers and non-market makers alike, such as high frequency traders and dark pools, particularly when markets are under severe stress.

CONCLUSION

Fragmentation of the industry has made it increasingly difficult to execute large blocks of stock and dark pools have certainly exacerbated this situation. One thing is certain, dark pools benefit from the price discovery that the marketplace freely provides them. Since there are no published quotes from a dark pool, it relies on other investors to trade freely in the traditional marketplace to price stocks. The exchanges make no money but the dark pools benefit by not having to make a market. The market has been created for them. In highly liquid stocks this may not be an issue, but in thinly traded issues losing twenty percent of the volume to a dark pool obviously affects the way a stock trades. Another important issue is the growing number of separately organized dark pools, which increases search costs for market participants to find hidden liquidity. Regulators and policy makers, here and abroad, have launched various committees to address issues of whether trading in the dark pools is consistent with the spirit of a free, open and efficient marketplace.

Definitely, technology has played a bigger role in the dynamic changes taking place in the global equities markets. Technology has changed the role of the modern trader as they

not only seek liquidity with minimal market impact, but are forced to comprehend and react to an ever changing trading landscape. The fragmentation of the industry is expected to continue in the future. This along with new efforts by the SEC to regulate the marketplace will force investors to invest time and resources into improving their technology and understanding of the marketplace. In this fragmented and dynamic market the dark pools do have an important and useful role for investors but they are not a panacea for all traders' execution problems. The SEC is clearly amenable to preserving the benefits of dark pools, if it can be done consistent with promoting other regulatory goals including market transparency and improved price discovery. It is also clear that the equity markets will continue to evolve and innovation will be introduced. Trading volumes in different markets will determine which innovation should survive, and dark pools seem to be winning.

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