High Frequency Trading: A Canadian Perspective

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Executive Summary

We have compiled the thoughts and opinions of five equities trading professionals on the evolution of equities trading and a new paradigm in the Canadian marketplace: the growth and resulting impact of High Frequency Trading. We have presented this in three sections:

- the past – what is High Frequency Trading and why is it here
- the present – what it means for investors
- and the future – what is going to change as a result of their influence on market microstructure and regulation

High Frequency Trading (HFT) is now a household phrase. In a very short period of time, as a result of structural changes in the Canadian marketplace, HFT has grown to account for what some studies believe to be upwards of 20-30% of the volume on our exchanges. This is the work of a dynamic and emerging group of traders using sophisticated software and low-latency hardware strategically placed as close as possible to exchange data centres.

HFT is defined by trading where speed matters. While relatively new to Canada, this is a global phenomenon that has spread to many electronic markets. In addition to equities, HFT is also used in commodity, derivative, foreign exchange, and other forms of trading

A particular subset of HFT has emerged even more recently in Canada primarily as a result of the development by the TMX of the Electronic Liquidity Provider (ELP) program. The incentive-based structure is designed to attract liquidity and it has been a significant success despite the volume hurdles required of participants. Many of the active and more visible ELP players effectively operate as market makers providing as much liquidity as they can. In doing so, they attempt to capture the bid-ask spread as well as incentive rebates provided by the program. The result for market watchers is a lot more noise: faster moving quotes, more bids and offers, more volume, and in some cases, frustration.

The market has changed more in the last year than it has possibly in the last decade, amid much debate about the impact. Those who are not in favour of the evolution of HFT have raised concerns about how “real” the liquidity is that these players are enticed to provide to the marketplace, the transparency of the market and that they are increasing the costs of trading.

After reviewing how the Canadian and global markets operate and after many discussions with market participants and regulators, we believe that changes to the industry have been positive but require participants to think and act differently. We believe all liquidity can be qualitatively measured, and that of ELPs is actually quite good. We also believe that ELPs are not predatory, simply very fast and very good at what they do. We agree that exchange fees to the brokerage community have increased but it is best managed by those affected and not by regulation. We do not believe that the markets are more opaque though we argue that the way the market is read needs to evolve. Brokers will have to improve the way in which they execute trades and disseminate information to traditional buy-side clients. Lastly, we believe transaction costs to market participants have actually been reduced.

The next result of all this change is likely request for regulatory review. The heated debate over the merits of ELP players and other HFT activity has the potential to result in real changes to the Canadian market. We discuss the implications of change whether in the form of adjustments to the ELP program, modified trade through and best execution regulations, market data fees, bandwidth surcharges, dark pool regulation, and co-location.

We have written this paper to provide a balanced presentation of the facts and focus the arguments. We believe we provide pragmatic opinions on the implications of change.

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Introduction

We are presenting this paper as a summary of our thoughts and opinions on the new paradigm in the Canadian marketplace: the growth and resulting impact of High Frequency Trading. We have made every effort to ensure our information is factual, our discussion balanced, and our opinions pragmatic. We hope this paper will be educational and informative. Comments and feedback are strongly encouraged.

Authors

This paper was co-authored by five professionals involved in the Equities Trading business at CIBC. Collectively, we have over 55 years of industry experience across a variety of roles from operations to management, trading to trading technology development, buy-side to sell-side, cash trading to program trading, and exchange operations. Further, as a firm, we positioned ourselves to compete in the area of low latency direct-market-access trading; as a result, we have seen considerable growth in this business. With that has come experience and knowledge regarding the types of clients and trading activity that has become the topic of many discussions.

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Past

A brief definition of High Frequency Trading (HFT)

High frequency trading should simply be defined as **trading where speed matters**. We will discuss in more detail how various participants fit into this but we believe this simple definition is a very important concept.

A little background

High Frequency Trading (HFT) is not new. In many ways it has been around and operational in the United States and Europe for at least 10 years. Inter-listed and exchange traded fund (ETF) arbitrage have been around the longest. Other strategies such as electronic market making, relative value, and momentum trading have grown more noticeably over the last three or four years.

With that growth has come higher frequency decisions; it is a natural evolution of competition. Today, typical high frequency systems are interpreting and reacting to market data in milliseconds (thousandths of a second) and even microseconds (millionths of a second).

For the purposes of consistent terminology throughout this paper we have grouped various high frequency strategies as such:

Table 1. Types of High Frequency Trading strategies

High Frequency Group	Specific Strategy
Market Making	Liquidity-providing strategies that mimic the traditional role market makers once played. This has evolved into what is known as **Passive Rebate Arbitrage**. Exchanges provide incentives to liquidity providers by paying for passive order flow.
Latency Arbitrage	**Inter-listed Arbitrage** is a strategy that attempts to buy and sell the same security between domiciles. An example would be buying Potash Corp. (POT) in Canada and selling it in the U.S. **Intra-listed Arbitrage** is a strategy that attempts to buy and sell the same security between domestic marketplaces. An example would be buying POT on BATS and selling it on NYSE.
Information Arbitrage	**Index Arbitrage** is a strategy that attempts to profit from mispricing between the various forms of a tradable index: a future and the basket of underlying stocks. Opportunities typically involve the trading of the entire basket of underlying stocks or a highly correlated subset. **Exchange Traded Fund (ETF) Arbitrage** is similar to Index Arbitrage, except that the ETF (like the iShares S&P/TSX 60) is traded against either the basket of stocks or futures or both. Market making the ETF involves posting calculated bids and offers that reflect the current pricing of the underlying components. **Momentum** trading is not an explicit form of arbitrage although it is in this grouping as it satisfies the definition of attempting to buy and sell the same security at a higher price. The difference here is that this strategy attempts to predict over a very short period of time where the stock will trade. The profitability relies solely on the effectiveness of the trading signal. The signal can be generated by a variety of broader market measures, order book imbalances, trading activity, etc.
Statistical Arbitrage	**Relative Value Trading** relies on observed differences from past trading patterns. These patterns may be long term in nature but within this context they are very short term and can be observed by a variety of different statistical methodologies.
Market Structure	There are many trading opportunities that have been created by structural features of marketplaces. We will discuss some of these later but some examples are flash orders, locked markets, and dark pools.

In all cases, there are common competitive factors. Success is a function of speed: the speed at which market data is received, interpreted, and then acted on.

Who are these High Frequency Traders?

High Frequency Traders, predominantly the ones in the U.S., have been operating below the radar for quite some time now. They are often located outside of typical financial centres, headquartered in areas where they can maintain a low profile. There are a variety of reasons for this. Often they rely on quantitative skills or programming capabilities that are independent of financial markets training. Retaining these resources is easier where your competition is not across the street.

Many of these companies operate in such a way that the systems making the trading decisions are physically located close to or within exchange data centres. The operators of these systems often monitor the activity remotely.

By its nature, High Frequency Trading relies on very small opportunities for profit. It is scale that grants the ability to generate sustainable returns; as such, costs are critical. Addresses in financial centres are relatively expensive and unnecessary for their business objectives. It is for this reason that “high frequency hotels” have become popular, enabling smaller firms with “plug-and-play” strategies to compete.

High Frequency Traders in the equity market have typically had backgrounds in commodities and derivative trading or were former employees of ECNs exposed to the opportunities that automation presented.

Strategies are often run across asset classes and geographical regions. We have heard of employee headcount as low as five and as high as 500, varying with the scope and scale of operations. Capital usage is minimal with many strategies generating turnover of many multiples on a daily basis.

While most High Frequency Trading firms have focused on keeping a low profile, some have become more outspoken in the financial media of late. We speculate there are a few reasons for this:

1. High Frequency Trading is becoming "mainstream" and opinions from the community have become very relevant on issues of market structure.
2. Increased scrutiny of the industry has escalated to the U.S. Congress and the head of the Securities and Exchange Commission with the potential for imposed policy changes that could impact High Frequency Trading business models.
3. Some of the firms may have plans to raise capital by going public, as many private equity firms did when they were in the media spotlight.

Finally, it is very important to note that High Frequency Trading extends beyond the firms described above. Many brokerage firms operate a variety of high frequency strategies covering the spectrum outlined above. In fact, it would be hard to find any bulge-bracket U.S. or Canadian broker not engaged in some form of High Frequency Trading. However, the market environment of late has decreased the appetite for risk at these firms and growth in the industry has predominantly come from the pure players.

High Frequency Trading comes to Canada

High Frequency Trading has been in Canada in a number of forms for many years. Inter-listed Arbitrage has been automated since the mid-1990s. ETF market making and arbitrage has been running in Canada for over seven years. The inception is a little harder to pinpoint but many forms of statistical arbitrage have also been active for quite some time.

However, over the past couple of years, changes in market structure made Canada more appealing to High Frequency Traders (HFTs). The entrance of new continuous books/alternative trading systems (ATSs) and dark pools (TriAct MatchNow) challenged the TMX's monopoly on Canadian equity trading. Primarily, it put pressure on the TMX to upgrade its technology. The newer technology underpinning Alpha, Instinet's Chi-X, Pure and Omega precipitated change. The TMX responded with the rollout of its current platform, Quantum.

Further, some of the new ATSs, such as Chi-X, began operations with connectivity options that were almost identical to what they already offered customers in European and U.S. markets. Trading in Canada became "plug and play" for some new entrants.

Another significant change was the move away from per trade charges to what is known as a maker-taker or fee/rebate model. In this format, Participating Organizations are charged for liquidity they take from the exchange and credited for liquidity they provide. In more detail, an order that is sent to the exchange at a marketable price that immediately hits a bid or lifts an offer is charged the fee. The order that was already in the marketplace is credited with the rebate for providing liquidity. The fee that is charged is greater than the rebate that is credited. The net spread between the two is the core revenue for exchanges and ATSs. The distribution of costs and benefits to trading participants was altered significantly.

The new structure allowed HFTs to enter Canada and in mid-2008 some of the largest U.S. players began testing their strategies on the TMX. The decision by the TMX to introduce the Electronic Liquidity Provider (ELP) program in October 2008 further increased HFTs interest in the Canadian market.

The ELP program

The TMX's Electronic Liquidity Provider program provides "fee incentives to experienced high-velocity traders that use proprietary capital and passive electronic strategies to aggressively tighten spreads on the TSX Central Limit Order Book." Participants could be Participating Organizations or clients of those and had to be pre-approved by the TSX. Minimum monthly trading volumes were set and the universe of stocks was limited to all TSX Market on Close eligible stocks and ETFs. Together, this accounted for almost 400 of the most liquid symbols on the exchange.

The program aimed to attract liquidity by improving the economics to those that had the ability to do so. In a departure from the status quo, participants are paid (or charged) directly on a monthly basis. Before this program existed, net providers of liquidity to the exchange would simply trade for free but not actually be cut a cheque for the difference.

The program was a preemptive move by the TMX. At that time, the competing exchanges did not have the market share to offer a compelling alternative. They could compete on the fee and rebate but the TSX still executed over 90% of the volume in Canada.

An update to the program was announced on August 14, 2009, becoming effective on October 1, 2009. The key change was the lowering of the rebate available to participants from $0.0035 per passive share to $0.0032. Additionally, to qualify, ELPs must now be at least 65% passive with a minimum daily cumulative average of 500,000 passive shares a month in at least 25 of the ELP-eligible securities.

The details of the updated program can be found here: http://www.tmx.com/en/trading/fee_schedule/

High Frequency Trading market share in the U.S. and Canada

Rosenblatt Securities has approximated that in the U.S. as much as 60% of volume is high frequency in nature. Tabb Group has established a number north of 70%. These numbers are significant by any measure and imply that, in many circumstances, High Frequency Trading firms are trading with each other.

In Canada, we believe that 30%–35% of the volume is high frequency in nature, of which, we estimate that 15%-20% is a result of the Electronic Liquidity Provider program. The balance would be comprised of the other High Frequency Trading strategies we described above and be dominated by the brokerage community and hedge funds. Empirically, we have noticed that as much

as half of the volume in any one name may be high frequency, with higher volume generally correlated with higher participation of high frequency.

The High Frequency Trading flashpoint

The arrest earlier this year of Sergey Aleynikov, a 39-year-old ex-Goldman Sachs computer programmer in the U.S., for allegedly stealing proprietary High Frequency Trading code from Goldman Sachs is seen as catalyst in the debate on High Frequency Trading. At a court appearance on July 4 in Manhattan, Assistant U.S. Attorney Joseph Facciponti told a federal judge that Aleynikov's alleged theft – the largest breach at Goldman Sachs – posed a risk to U.S. markets (as well as Goldman's profits) if the code that he transferred to a computer server in Germany fell into the wrong hands. The financial media's interest in the case centred on this quote:

"The bank has raised the possibility that there is a danger that somebody who knew how to use this program could use it to manipulate markets in unfair ways."

This statement, combined with a very negative response to Goldman's equity trading revenue of $2 billion in the first three months of 2009 (Citigroup's $1.9 billion, JPMorgan's $1.8 billion and Morgan Stanley's $900 million; all figures in U.S. dollars), so soon after the banking bailouts, has prompted discussions within the media as to whether High Frequency Trading is being used to unfairly manipulate markets at the expense of traditional investors.

With media attention growing on the topic – and little research available – Themis Trading, a relatively unknown firm, redistributed a paper it wrote in 2007 that expressed concerns with HFT. This report has generated a great deal of media coverage on both sides of the border and, given the dearth of research on the topic and the fact that even the financial media knew little about HFT, in many cases been has the starting point for debate on the topic.

In Canada, market participants have observed a confluence of developments in the evolution of High Frequency Trading. The step increase in High Frequency Trading has led to significantly increased volume. Traditional trading activity has been obscured by considerably more orders in the marketplace. Broker attribution for trading activity, which has typically helped institutions find natural offsetting liquidity, has also become more opaque. Trading strategies have become more active (liquidity takers) as competition for the passive fills has increased.

Present

Addressing concerns:

What is real liquidity?

An oft-mentioned criticism of High Frequency Trading is that it does not create "real" liquidity. An assessment, therefore, should start with a definition of liquidity. Deciding on the nature of liquidity should then be a matter of comparing reality with the definition.

Liquidity can be defined in a number of ways. Most commonly, however, it is the degree to which an asset can be converted to cash and vice versa as in the world of trading. Qualitatively assessing market liquidity is more difficult but there are some common measures:

Depth – The thickness of the order book, i.e., the shares available at each price level. An order book with a few large orders would be said to have good depth.

Breadth – The participation in the order book, i.e., the variety of price points and destinations at which shares are available. An order book with a variety of price points available across a variety of destinations would be said to have good breadth.

These would describe two dimensions of liquidity, i.e., point-in-time liquidity. A third dimension must be considered and that is, of course, time, which can be measured in terms of replacement (i.e., volume).

An order book that has good depth and/or breadth but comprises orders that are not replaced does not have the same degree of liquidity as a book that is constantly renewing itself as liquidity is taken. Think of the difference in terms of soup and ice cream. A spoonful of soup is removed and almost instantaneously the effect is imperceptible. A spoonful of ice cream leaves a mark that is visible for some time. The replacement rate of soup is much higher than ice cream and, therefore, more liquid.

Outside of the situational aspects of liquidity, another measure is availability. Consider the difference in liquidity on Research in Motion (RIM) if one has access only to the Canadian markets. In that instance, only a fraction of the available volume is accessible.

Quantifying the costs of liquidity is a function of these parameters and others such as volatility. This is the area of transaction cost analysis, discussed in a separate section of this report.

With this framework in mind let's consider some scenarios. It has been said that High Frequency Traders (HFTs) and specifically Electronic Liquidity Providers (ELPs) do not provide "real" liquidity. We will address this by analyzing the trading patterns of a variety of market participants considering their general liquidity stance: passive traders tend to provide more liquidity than they take and active traders the opposite.

Buy-and-hold investors effectively provide half as much liquidity as traders who buy and sell, i.e., they basically reduce the float of shares available to be traded. The time horizons of these investors are so long that their effect on liquidity is virtually non-existent. At some point in time they will provide liquidity but their replacement level, i.e. volume, is negligible, as is their liquidity stance.

Institutions that actively buy and sell equities but prefer block trades do not provide visible depth or breadth to the order book. Furthermore, traditional institutions are only present in the market for the time that their block is crossed and their liquidity is only available to those other firms notified of the intent to transact. This is the upstairs market and while the liquidity can be deep it is inaccessible by the broader community of market participants. Moreover, as this liquidity is typically transacted as a cross the liquidity stance is neutral. It is worth noting that many institutions have access to information that is typically only shared with similar institutions. In this respect they have an informational advantage over the broader trading community and can fairly use this to limit or modify their liquidity. *It is a discussion for another time but is an Indication of Interest (IOI) not similar to a "flash" order in some respects?*

An offshoot of this market participant is the facilitation trader, the market maker for institutions, who may step in if sales traders cannot find a natural offsetting participant. If a natural participant is found later then nothing different from the above has happened. If facilitation traders participate in the marketplace then they are converting upstairs liquidity into visible liquidity and are likely to satisfy all of the qualitative aspects of liquidity. Facilitation traders' volume on individual trades may be substantial but in general they provide a very limited and short-term source of visible liquidity. On balance, they would tend to be active traders as their need to flatten a sizable position would require they take more liquidity than they provide. Facilitation traders benefit from the asymmetrical information of the upstairs market but are only privy to what an institution shares with them, while a typical institution is privy to the information shared with them by the broader brokerage community.

Institutions that actively buy and sell equities but prefer to trade in the visible market provide visible depth and breadth, are present in the market periodically, consistently replace their orders, and provide liquidity available to all market participants. These types of traders would tend to be the predominant users of algorithms and over time would have a relatively neutral liquidity stance with a bias to the active side. Typically, they would also benefit from the information available to them from the upstairs market participants.

Traditional market-makers act as facilitation traders to the visible market. They tend to provide more depth than breadth and have a fairly high level of replacement. Their horizon is shorter and their risk is smaller. Consequently, they usually assume relatively small positions. They would also tend to be net liquidity providers, as their typical motivation is to capture the bid-ask spread. Any informational advantage they have is purely a function of their ability to quickly analyze public market data.

Retail traders are typically one of the larger sources of active, liquidity-taking orders. Their time horizons vary significantly and they are relatively limited providers of

depth and breadth, although as a group they would have a high level of replacement.

HFTs are a diverse group with a variety of motivations. As outlined in Table 1, they may be involved in a variety of arbitrage activities, hedge funds focusing on merger-related opportunities, momentum traders, or short-horizon market makers, i.e., liquidity providers.

In all cases, however, HFTs are active in the visible market. Collectively, they provide considerable depth and breadth and have very high levels of replacement. Furthermore, with their trading motivations being defined by short-term opportunities their trading horizons are biased to the short term. They have no informational advantage over any other market participants. Their ability to identify trading opportunities is purely a function of their speed in analyzing publicly available market data and their ability to react accordingly.

The liquidity provider differs only slightly from the majority of HFT-type traders. They are defined in many ways by extremes but in their most basic form they are very fast market makers. They have a very short trading horizon as a result of their very low tolerance for risk. As such, they tend to provide limited depth, but considerable breadth. They have an extremely high replacement rate and their liquidity stance is considerably skewed to the passive side. In general, their alpha does not stem from predicting where the market is going but rather reacting to where it has gone (as prediction implies active trading, it follows inversely that passive trading implies reaction).

Do ELPs provide real liquidity?

With a discussion of liquidity in place we can now address the argument that ELPs provide no real liquidity, which, as we understand it, is because they are constantly attempting to flatten their position. As detailed above, this is simply a function of trading horizon. Even the buy-and-hold investor will eventually sell their position and, in doing so, can it be said that they have added no real liquidity? In the interim they have been exposed to considerable risks, both systemic and stock-specific. The reward for this risk should be return and hopefully a positive one.

Moving down the spectrum of participants, trading horizon and return are related in the same way as return and risk. Active traders (block or not) eventually sell their position. Facilitation traders provide liquidity to one client and then hopefully another but are eventually flat. Market makers provide short-term liquidity and again hopefully become flat. HFTs are very active traders but in general will become flat or at least manage their risk with hedging. ELPs are simply very active market makers. They operate under the assumption that by pushing the trading horizon towards zero they push risk and, therefore, return towards zero. The maker-taker model on which marketplaces operate is simply another input to the equation that allows liquidity-providing traders to push their trading horizon, risk and return that much closer to zero.

The effect on bid-ask spreads and volumes is logical. With such short trading horizons and a desire to limit risk and, as a result, return, ELPs will naturally provide liquidity at prices that increase their likelihood of achieving a passive fill.

At this point it is important to discuss the economic model of ELP's. Despite perceptions, the underlying concept is very straightforward and open to anybody as long as they can achieve certain volume hurdles.

Participants in the TSX ELP program are eligible for a rebate of $0.0032 per share for providing liquidity and charged a fee of $0.0033 for taking liquidity. To achieve these favourable rates ELPs are (as of October 1, 2009) required to trade over 500,000 passive shares per month on at least 25 of the ELP-eligible securities. An example of the economics is below:

Table 2. ELP Cost Table

Proportion of Passive Flow		0%	10%	20%	30%	40%	50%	60%	70%	80%	90%	100%
Passive Rebate	**0.32**	–	0.03	0.06	0.10	0.13	0.16	0.19	0.22	0.26	0.29	0.32
Active Fee	**(0.33)**	(0.33)	(0.30)	(0.26)	(0.23)	(0.20)	(0.17)	(0.13)	(0.10)	(0.07)	(0.03)	(0.00)
Cost Per Share		**(0.33)**	**(0.27)**	**(0.20)**	**(0.13)**	**(0.07)**	**(0.01)**	**0.06**	**0.12**	**0.19**	**0.26**	**0.32**

As can be seen from this table, if a participant were 100% active/0% passive they would have to make more than 0.33 of a penny on their trading to break even before commission and other costs. If they can manage in excess of a 50%/50% split they can subsidize their trading activities with exchange rebates. Given that ELPs are required to maintain a passive ratio of 65% to stay eligible in the program the implication is that it is possible for an ELP to lose money in their underlying trading activities. A passive ratio of 80% and a loss of $0.0010 per share in trading would still translate into a profit before commission of $0.0009. This loss is absorbed into the market by all other participants as a reduction in costs, improvement in execution, etc. If an ELP trades a million shares of a particular stock, loses money (from a trading perspective) in doing so, and simultaneously influences the bid-ask spread to tighten is it fair to say that they are not adding "real" liquidity?

Some have criticized the fee/rebate structure for not creating a level playing field, that everybody should be able to earn the rebates. Nothing from a regulatory perspective prevents this. Brokers are fully able to pass on their exchange costs of trading as part of the execution. Of course, earning the rebate would also carry with it the responsibility to pay the fee. Brokers could provide a fill of price plus/minus fee/rebate. Keep in mind, however, that from an institutional perspective

most trades are crossed and there is no associated fee/rebate.

It is fair to note that ELPs have had an impact on the trading stance for orders executed in the open market. The growth of ELPs who focus on being as passive as possible has caused other participants to become more active, liquidity takers. This has been a criticism of late primarily from the brokerage community, which is bearing the brunt of these increased trading costs. While it is a fair comment, it is important to remember that these increased costs could be pushed into the execution cost for the end client.

To a certain degree, trading technology has posed one hurdle, as confirmations, tickets, and FIX messaging systems from client through broker would have to be modified to reflect and accept this information. However, the more pragmatic hurdle is do clients really want this? Logically, exchanges make money because their fees exceed the rebates. If clients were to accept the full cost of the trade then this exchange revenue would be sourced from clients rather than from the brokerage community. Commission compression might continue as the broker cost structure would change but would it be worth it to the end client? The current system requires brokers to absorb the net fees as a cost of doing business.

Since brokers have the ability to control order routing decisions and internalize flow it would seemingly be more logical for brokers to continue paying/receiving the fees/rebates as they can better manage their costs. An internalized trade would have no fee and brokers are free to route to the cheapest exchange as long as they satisfy best execution. For a client to take on the fee/rebate responsibility it would follow that they would also want more granular control of individual order executions, requiring technology and infrastructure already in place at the brokerage level. While this might work for some clients it is likely to be burdensome to the broader community.

This development in our marketplace will force change. Algorithm logic, institutional routing rules and capabilities, internalization, and proprietary trading can all be modified and managed by the broker community to better control costs. The argument, therefore, is quite simple – what is more important to participants in Canada's marketplaces: increased trading fees to brokers or reduced spreads and increased liquidity for all participants?

Lastly, regarding the fee/rebate structure, if the marketplaces were to charge a flat transaction fee, the ELP traders would not disappear; they would simply adjust their approach such that their trading horizon was slightly longer, their risk and returns slightly larger. The effect on the marketplace would be slightly wider spreads and slightly less volume but ELP traders would remain.

Regardless of the debate about the "real"-ness of HFT liquidity there are some very tangible benefits to additional volume, one of the most significant being the absolute change. Volume is often a criterion of quantitative or qualitative filters that determine whether investors will even consider a particular stock within their potential trading universe. A boost in volumes increases the universe of stocks suitable for investment, bringing new participants to the marketplace and expanding the list money managers will consider. This in turn allows managers to broaden diversification and participation across the marketplace. It also follows, and is evident now, that increased volume simply creates more opportunity to trade. More opportunity translates into more participants, which should translate into reduced transaction costs for all and better price discovery.

Some stats to consider: as at the end of June 2008, 52 stocks in the TSX Composite traded on average in excess of 20 million shares per month and 89 stocks in excess of 10 million. As at June 2009 these numbers had increased to 61 and 102 stocks, respectively. Furthermore, the top 200 stocks traded 3.58 billion shares for the month of June 2007, 4.02 billion for June 2008, and 4.84 billion for June 2009. This is growth of 12% from 2007 to 2008 and 20% from 2008 to 2009.

Are ELPs predatory?

A number of market participants have claimed that HFTs and, more specifically, ELPs are predatory in nature. Again, a clear definition is important before making such a claim.

There are several dictionary definitions for "predatory", but the closest as it pertains to the issue in hand would be the act of exploiting others for one's own gain.

Implicit in that definition is a requirement that the predator does something to achieve this gain. As noted earlier, ELPs are often considerably more passive than active; therefore, to imply that they are actively doing anything is counter-intuitive.

It is also important to note that it is possible for ELPs to lose money in their day-to-day trading. Again, it is counter-intuitive to state that by effectively giving a profit to broader market participants, ELPs are in any way exploiting these same participants.

We thought a trading scenario at this point would have been appropriate to exhibit a more "predatory" type of trading than that of an ELP participant. However, in putting this together, we recognized that in any scenario either side could be perceived to be "predatory". Frankly, it could be said that the entire investment process is a form of predatory trading. Every individual decision to buy a stock is done so with the intent of taking it off the hands of a seller who is perceived to know less and later selling it back to another less knowledgeable soul.

Along the same vein, another justification of this argument stems from the technological edge that HFTs and ELPs are said to have. While it is, of course, true that they rely on sophisticated software and hardware, they are still solely reliant on public market data and are relatively no different than those that have been trading index arbitrage, inter-listed arbitrage, ETF arbitrage, etc., in an automated fashion for years. HFTs and ELPs have built an advantage in a niche area of trading and compete quite aggressively in this space. Investors should not feel disadvantaged by their presence unless it is their intent to compete. With different motivations and strategies come different priorities.

We believe that deciding where the line of "predatory" trading exists is futile. All trading is motivated by taking pennies or dollars from one to give to another. There is no Robin Hood in the world of trading.

Effects on Institutional Implementation costs

In the heated debate about High Frequency Trading some commentators have claimed that market impact costs have increased. This is far from clear. High Frequency Trading has represented a significant proportion of trading volumes for the U.S. market for at least the last five years. In general, studies have shown that subsequent to decimalization, in Q1/2001 and prior to the financial crisis, in Q2/2008, total trading costs in the U.S. were in decline.

One potential flaw in some studies is significant data issues that could lead to potential biases in results. Most significant of these is the potential lack of information about the size of unexecuted orders. Information regarding unexecuted orders is very sensitive, with most institutions reluctant to share such data with external parties. Consequently, a number of studies of trading costs fail to consider opportunity costs, leading to an understatement of total trading costs. Institutions with a best execution process – whereby they measure their trading costs, including opportunity costs, in a disciplined manner – are best positioned to gauge the trends in their own trading costs.

However, while comparing realized trading costs over time and stating that trading costs have risen or fallen may be a trivial exercise, interpreting changes in trading costs is much more difficult, even for those in possession of detailed data that allows the calculation of costs related to delay and opportunity costs. To understand this difficulty we need to discuss trading costs and the factors that influence those costs.

Trading costs are best represented by Implementation Shortfall, the difference in returns to a paper portfolio assuming no frictional costs from trading, and an actual portfolio, which must bear all of the frictional costs of trading. Implementation Shortfall can be broken down into visible costs that are relatively easy to estimate (commissions, taxes, and spreads), and less visible costs that are variable and more difficult to estimate (market impact and timing costs). The less visible costs are generally significantly larger than the visible costs.

The market impact of the trade is the movement in the stock price directly caused by the execution of the trade under consideration. It is the theoretical difference between the stock's price trajectory with the trade and what the price trajectory would have been had the trade not been executed. The measurement of market impact is difficult because it is not possible to simultaneously measure how a stock price would evolve in the market both with and without the trade. Researchers have observed that market impact is a concave function of trade size: as order size (quantity of shares/ADV) increases, market impact costs per share increase but at a decreasing rate. Consistent with this observation, most market impact models assume that market impact varies with the square root of trade size. Market impact has two components: 1) a temporary price impact due to a temporary increase in the demand for liquidity; and, 2) a longer-lasting or permanent price impact caused by information communicated by the trade about the state of available liquidity.

Timing costs are the costs from unrealized slippage from the time that the investment decision is made to the end of the trading horizon and include the cost of unfilled orders at the end of the trading horizon, i.e., timing costs are the costs of not trading (missed trades).

Timing costs arise from price volatility and liquidity risk, the risk that actual liquidity will differ from expected liquidity. The longer the trading horizon the greater is the exposure to volatility. This risk can work for or against investors. Most investors are more concerned with the risk of an unfavorable outcome, or higher than expected costs.

The implementation problem is a matter of how to schedule trades to minimize the combination of market impact and timing costs. The more aggressive the trading strategy (the higher the trading rate), the greater the market impact and the lower the timing cost. The more passive the trading strategy (the lower the trading rate), the lower the market impact and the higher the timing cost.

A number of factors influence market impact and opportunity costs. Market impact costs are a function of stock characteristics (spreads, depth, trade frequency, volatility), order characteristics (order size/ADV, composition of the trade list and associated cross-correlation in a trade list), and trading strategy (trading intensity, information leakage).

High Frequency Trading can affect many of the cost-driving factors. Let's look at each variable from a high level in order to make an assumption as to the impact of High Frequency Trading.

Factor	Observation	Discussion
Spreads	Spreads have tightened and ratios of active to passive fills have increased – effect on market impact can be calculated. We believe it has been reduced.	It is hard to argue that High Frequency Trading has not narrowed bid-ask spreads considerably. As discussed earlier, it is the core competency of ELP players to compete for passive fills. As such they will post ever-tighter bids or offers, right down to the minimum tick. Empirically, we have all seen this in action. Data to show this effect is readily available. However, in terms of market impact there is another aspect that must be considered and that is the ratio of active to passive fills. To determine whether there is a reduction in market impact the relevant formula is: *(New Active Ratio x New Bid-Ask Spread) < (Old Active Ratio x Old Bid-Ask Spread)* If the left-side of the equation is less than the right-side then there is a net reduction in overall cost (though as discussed earlier the executing broker would see an increase in exchange fees). An example, if the Old Active Ratio was 40% and the New Active Ratio is 60%, and the Old Spread was 40bps then if the New Spread is less than 27 bps there is a net reduction in costs (27bps = 40bps / (60% / 40%)). We believe that the reduction in spreads has more than compensated for the increase in the active to passive ratio and therefore a reduction of market impact. We will be doing more analysis on our transaction data to confirm this belief.
Depth	Quotes are deeper and broader – implies a reduction of market impact.	It follows logically from the discussion on spreads that if ELPs and other High Frequency Traders are competing for the quote on price then they will also be competing for size. Further, they are incremental participants to our market so quote depth and breadth (especially with the emergence of multiple marketplaces) have both increased. Once again, data to show this effect is also readily available and has been part of many market structure discussions of late. Deeper and broader quotes should have the effect of reducing market impact.
Trade frequency	Volume and trade counts have increased – implies a reduction of market impact.	High Frequency Trading by definition increases both volume and trade count. As discussed earlier in the paper, the tangible benefits that incremental volume brings – mainly in the form of new participants. New participants bring with them incremental depth and breadth. Higher trade frequency (volume and trade count) should have the effect of reducing market impact.
Volatility	Undetermined though our belief is that High Frequency Trading has not had a perceptible negative effect and therefore we do not believe there to be an effect on market impact.	Proving that High Frequency Trading has increased volatility is no easy task. The core problem is trying to determine which trades belong to High Frequency Traders and compare data sets with and without their presence. Some studies have attempted to correlate the growth of our broker activity or that of more pure High Frequency Trading brokers with changes in the marketplace over time. This approach is dangerous as it ignores causality by making conclusions over what may just be coincidence. Regulators may one day require ELP trading to be tagged as such (like program trading is today in the U.S.). This could make this analysis easier. Further, volatility is influenced by many other factors. High Frequency Trading has grown considerably in Canada over a period of wild fluctuations in volatility, further clouding the picture. We have recently read some papers that have claimed to find proof that ELPs have increased volatility. We believe the results are examples of coincidence as causality is ignored. Some papers have shown that lower-priced securities have become more volatile over the last year and cited HFT as the cause. One justification was that the majority of High Frequency Trading occurs in lower-priced stocks. It is important to note that the ELP program does not just apply to low-priced stocks nor does it apply to all stocks (and these studies were done on broader universes). Many of the most active ELP stocks are very high-priced securities such as RIM and POT where one of these studies actually showed lower volatility. This could also imply a relationship between the possible rebate and the stock in percentage terms, i.e. the rebate is considerably larger with respect to a lower-priced security than a higher-priced one. One study compared **inter**-day volatility with longer-term volatility in an effort to measure changes in the ratio. However, the study did not adjust for underlying broader market volatility, i.e. neither the numerator or denominator of their equation is stable over time. Their straight line result of lower-priced stocks being more volatile now than higher-priced stocks implies a problem with the underlying analysis. We believe that the lack of papers claiming High Frequency Trading has increased volatility is a testament to our belief that this argument is both very difficult to analyze and therefore to show evidence of.

We believe that changes in spreads (net of the active to passive ratio), depth, and trade frequency have all had positive effects on market impact while volatility is undecided. We do not believe that even if a negative effect as a result of volatility were proven that it would outweigh that of the first three factors.

What do you need to do to adapt?

Few would argue that HFT and ELP trading has not impacted trading. So how should the sell-side adapt? Although all market participants – whether sell-side brokers or investment managers – must review the way in which they interact with the market, we will focus on the sell-side. Broker dealers need to ensure that they are trading in the most discrete and efficient manner.

Some changes are simple and more a reflection of procedural adjustments; other changes will require significant investment.

Reading the tape

With the emergence of ELPs, buy and sell-side traders have encountered challenges in interpreting trading activity or "reading the tape." Unlike other global marketplaces, the standard practice in Canada is to attribute trades through broker identification numbers. Broker activity summaries (like Bloomberg's BAS function) provide a quick, useful reference tool for traders, detailing for them supply and demand sources as they attempt to uncover contra flow.

Broker activity summaries have always been clouded by derivative blocks, retail trading flow, direct market access (DMA) and anonymous trade attribution. All are sources of market activity that cannot be easily interacted with from an institutional perspective. Regardless of the shortfalls, the summaries have remained extremely popular. The periodic frustration, especially from large derivative-motivated blocks, has been largely overlooked…until now.

Buy-side traders using the broker activity summaries are no longer finding them as reliable. The increased HFT activity is the oft-noted source of blame.

Although HFT appears to be limited to a few brokers, we believe many are trying to win this type of business. Assuming that High Frequency Trading is, or will be, limited to just one or two brokers is wrong.

As the relevancy of broker activity summaries continues to decrease, broker dealers will need to improve their indications of interest (IOI) and ensure that their agency trading relationships are strong. In the past, brokers have focused on increasing their market share as a means of advertising trade flow; in the future, we believe that more effort will be directed towards IOIs.

The quality of IOIs has always been an issue with buy-side traders. Historically it was felt that brokers used them as a means to source orders instead of as a true reflection of actual order flow. To overcome this, the sell-side will not only need to improve the quality and reliability of IOIs but also the technology that disseminates them.

Today's IOIs tend to be vague and lack commitment. In the future IOIs will provide information that should help buy-side traders better determine if an IOI is a match for their trading blotter and if it is actionable. Information such as expiry time, whether the order is a natural or pro, a working order, over the day, etc., are generally available now but used only sparingly. We believe this will change. Frequency will be increased and relevancy improved. If CIBC sends out an IOI as a buyer of 100,000 shares of XYZ and it is followed by CIBC trading 50,000, an IOI known as a notice of trading activity will be sent to report the trade. Additionally, we will amend our earlier IOI to reflect our revised situation. The "new" broker activity summary will be the IOI activity screen.

In recent years the relevance of the sell-side trader appeared to be waning. However, the increased "noise" in the marketplace along with the decreased effectiveness of broker activity summaries has forced the agency sell-side trader to evolve. More important today is an understanding of trading technology and how best to use algorithms, better liquidity sourcing and greater sharing of trading ideas. Buy-side clients should expect their sales trader to help dissect and better leverage trading activity.

Gaming

There has been a sense that High Frequency Traders are quick studies of traditional trading flow. While we believe there is truth to this statement, it is important to approach this proactively, as the behaviour is not new nor is it violating any rules. As has always been the case, chances are that someone will eventually notice and act accordingly if an order is worked in a predictable manner. "Algo sniffing" technology and less scientific iceberg detectors have been available and used for years but few traders felt or noticed their impact.

Some old trading "rules of thumb" need to be revisited. Working an order at a third of the volume is likely to leave a noticeable footprint and it is more likely now that a computer is watching for exactly this type of behaviour. Reducing participation rates is a simple first step to minimize the risk of showing one's hand. It is worth noting that increased volumes in conjunction with lower participation rates have offsetting impacts in terms of trading horizon.

The above example is a simple approach to a complex problem that broker dealers must address. The suite of algorithms provided by the sell-side community need to be revisited to ensure they fit within the new trading environment.

Among the issues that need to be addressed is how algorithms post to the market. Until this point, most brokers have introduced some basic ability to post randomly to the market (generally limited to random times and volumes). Future generations of algorithms will need to consider randomly selecting visible marketplaces (TSX versus Alpha, Chi-X, Pure, and U.S. markets), posting orders within the depth of book instead of always or frequently at the top of the book, or immediately crossing the spread instead of always posting first. Algorithms should be looking to post in dark

pools like MatchNow either for full orders or on reserve quantities (volume the algorithm needs to "catch up on").

Some other examples of how algorithms can be adjusted[1]:

- Avoid posting and take liquidity instead. Bid-ask spreads for many stocks have narrowed considerably as a result of increased volume in the marketplace; as a result, lifting an offer is not as costly as it once was. Further, more intelligent logic can be used to decide when an offer is a good one, i.e., at a statistically tighter-than-normal spread.
- Skip and double-up time periods. One of the simplest ways to notice an algo is when its behaviour is methodical and consistent. Random breaks in the logic are sure to confuse.
- Alternating between broker numbers and anonymous. The broker attribution in Canada has the unintended consequence of being an additional parameter that can be monitored for patterns. Randomly using anonymous can cause breaks in the typical pattern.
- Random time periods. Move away from discrete intervals to a more continuous approach.
- Random volumes. Move away from a series of similar-sized orders, towards a more random approach or one that adjusts based on stock movements.
- Random marketplaces (including the U.S.). Using multiple marketplaces allows for greater order fragmentation and a reduced footprint in the domestic market.
- Random pegging strategies serve to hide intentions.
- Random usage of top-of-the-book versus off-market orders. When monitoring for trading patterns the usefulness of the top of the book exceeds that of the levels behind. A child order placed two or three levels deep would likely go unnoticed.
- Reduced order sizing. As average trade sizes have decreased, it is important to follow the trend. Larger orders are now more readily identified.
- Random limits. Using some discretion around limit prices can remove the obvious footprint at a particular level. One example is the overlay of a participation rate cap.

The next generation of algorithms will have the intelligence to recognize when they are being gamed and react accordingly. A measure of the expected impact of the order and the execution approach subject to some thresholds will be compared to the actual outcome. The algorithm may consider holding back or becoming more aggressive. Mean reversion strategies are used by HFTs so it is logical that an algorithm use the same. Algorithms will also look to broader sector and market performance as a benchmark. This is a common feature of HFT trading.

Algorithmic providers will need to continually update the manner in which their products operate. They should understand that purely being complacent means they are allowing their algorithms to be gamed. Staying ahead of the game means more frequent updates and performance tracking is required. Gaming will be evident in deviations from past performance. For the most part these changes would not necessarily be significant but more in order to ensure that the methods in which the algorithms present themselves to the market are harder to interpret.

Concerns have been raised recently that iceberg orders are now more transparent. Nothing has functionally changed with iceberg orders but software embedded in trading platforms like that from IRESS highlight iceberg orders within the views of market depth. Most iceberg orders used in Canada are those provided by the exchanges as opposed to ones offered by algorithmic providers. The exchange icebergs are generally quite crude and easily identified but have the benefit of having the hidden order maintain priority in the order book. Iceberg orders sent to the TSX have historically protected traders from being traded through. Today, with multiple marketplaces and more sophisticated smart order routers, orders may only be sent to marketplaces for their displayed quantities, meaning traders may only get filled for the displayed quantity while the balance trades away. In the future, this may even mean that the stock trades through your price. For these reasons, the use of "hide and hit" or hidden order types may become more popular for those traders finding that their iceberg orders have been compromised. These algorithms can be designed to trade a little more discretely and participate in dark pools like MatchNow.

It is important to point out that many traders have found the transparency of icebergs to be beneficial. Liquidity-seeking traders will often reach through the quote for the potential depth of icebergs when they might otherwise hold back.

Smart order router evolution

For the past few years smart order routers (SORs) in Canada have been used to protect against "trade-throughs" by providing certainty of best execution. It was the development of multiple ATSs that created the need for SORs but it is their success that will dictate the evolution. Outside of the TSX there was limited liquidity or opportunity to trade in the new marketplaces. However, as more volume has migrated to the new exchanges, the sell-side has been pressured to ensure that their SORs are keeping pace. The pressure is not just over the technology but the decisions used in designing routing tables (the rules that decide if the order is sent to one marketplace over another and how).

Although this paper is not the forum in which to discuss SORs, it is important to recognize that the speed of HFT dictates that if an order is not properly routed the opportunity to transact may disappear. An HFT may be able to recognize an incoming order and react. They may back off or take the liquidity before the SOR can and offer the stock at a worse price. This is not an example of flash orders (we reiterate these are NOT present in Canada) or non-public information; it is simply an example of latency arbitrage. In Canada, there are significant differences in speed between exchanges and outbound market data so it is very common and well within the capabilities of HFT firms. This has been noticed more of late when a large bid or offer is seen, but when it is hit or lifted the result is less than what is expected.

[1] It should be noted that many of these features are available at CIBC and at other algorithm providers.

Future

Possible evolution of Canadian market structure

Given some of the issues outlined above regarding High Frequency Trading, and the resulting criticisms, it is likely that marketplaces will respond, to some degree, in order to be seen as addressing the concerns of their broader customer base. These responses will take the form of addressing criticisms and challenges related to enhancing the information content of the order book.

Pricing of ELP rebates

We expect continued change to the pricing of the ELP rebating system as the pressure from the dealer community grows. Indeed, we believe the most recent changes to the TSX ELP program[2], which flattened the program to one uniform tier level and removed the inversion of the top tier was a response to the perceived favoritism of High Frequency Traders over the exchange's traditional customer base. The ELP rebate program is marketed directly to the end client rather than the broker, meaning that, in most cases, ELP rebates are passed back to sophisticated, fully informed clients. To our knowledge, the TSX was the first marketplace in the world to engage in this innovative strategy with end clients. The issue is that these rebates challenge relationships with some dealers. In particular ELPs have crowded out passive dealers forcing them to become more active traders, thus raising their fees to the exchange.

We believe that economic interest will prevail. Other marketplaces such as Chi-X and Pure do not have the self-funding capacity to carry the working capital necessary for a large and successful rebate program (the TSX cuts cheques to ELP participants on a monthly basis). Alpha has not indicated a willingness to effectively disintermediate its own shareholder base by marketing directly to dealers' end clients. Therefore, we expect the cost of the rebate program will continue to be reduced marginally by the TSX to continue to placate the existing customer base but without materially impacting core liquidity providers. The reduction in incentives continues to be a logical outcome.

This reduction could include one of the following alternatives (from the most innocuous to most radical):

- **Continue to cut the marginal ELP passive rate.** This would directly compensate the TSX by removing some of the incentive without necessarily threatening the viability of the program. We believe this may continue downward toward the lowest TSX rebate tier.
- **Force ELPs to mark trades like participants in NYSE's supplemental liquidity provider (SLP) program.** In order to provide more information to the tape in response to buy-side concerns, the TSX could force ELPs to mark their trades. In this manner, it may be possible to gain a better picture of the "natural" liquidity in the marketplace when seeking counterparties to trade with.
- **Force ELPs to trade anonymously.** At the margin this would reduce their fill rates by 5%–10% but not necessarily render their strategies moot. In the U.S., where there is no internal cross rule, this has been the case for years. This would counteract the benefit currently received largely by ELPs and provide more information on the tape.
- **Charge for the benefit provided by the internal cross rule.** This would be an opportunity for the TSX to enhance revenues outside the ELP program and would address concerns that the internal cross rule disadvantages smaller dealers. Simply put, in this scenario, those who see benefit in advertising and getting ahead of the queue would pay for the benefit.
- **Eliminate the internal cross rule.** This would benefit the TSX as it reduces the incentives for ELPs to trade with larger broker without shutting down the ELP program directly. It would do so by removing some of the increasing returns available from consolidating flow. This consolidation incentive has been historically beneficial to the TSX as it motivates participants to pick one focused market. To date, we believe this has kept the critical mass at the TSX but has also created conditions whereby that mass could quickly shift to another market offering customers more attractive allocation rules. The TSX may be concerned about this possibility as market share losses have accelerated.

  We believe that the review of the internal cross rule by the regulators has been precipitated by one of the marketplaces which may believe that if they unilaterally change allocation rules flows will migrate at an accelerated pace. Specifically, it is likely that both Pure and Alpha on their own would likely maintain such an allocation rule, which, in turn, could reduce the incentive for ELP participants to prefer the TSX if the TSX eliminated the internal cross.

  Ultimately, we believe that greater customer choice was a known benefit of a multiple marketplace environment and strict time priority is moot in this world. Over time a multiplicity of allocation methods serving differing interests will evolve, and we believe the regulators will recognize this.
- **Eliminate broker identification on the exchange.** This is the most aggressive and least direct method of reducing ELP incentives, as dealers would no longer benefit from the internal cross rule and would lose any advertising benefits. ELPs would compete more directly with all flows. We believe this alternative is unpalatable to the buy-side, as evidenced by the performance of Chi-X in gaining market share and its demand for more, not less, information content in the order book.

Trade-through policy

Recently, a committee meeting was held wherein the OSC provided the CSA's position on trade-through. It determined that the responsibility to protect against trade-through will be on the marketplaces. It has recommended the introduction of immediate action

[2] PO Notice No. 2009-032 – Equity Trading Fee Change Notice, August 14, 2009.

orders (IAOs) similar to U.S. inter-market sweep orders (ISOs) to relieve markets of trade-through obligations when routing decisions are managed by brokers in parallel sweep fashion.

It also determined to continue full depth of book trade through protection. This strict interpretation effectively makes best price the primary element of best execution, which the community may find too rigid. However, this change would benefit Alpha, Pure, and Chi-X by explicitly providing protection to posted depth away from the primary market. We believe that there will be challenges in implementing this technology that could make strict adherence unpractical. This debate will not end with this latest determination.

Finally, in the trade-through committee, we found there was additional debate on "fee caps" and the need to regulate exchange costs. Two specific issues emerged: market data costs and trading rebates.

Market data fees

In Canada, unlike in the U.S., market data is an unregulated business. Exchanges can effectively charge how they see fit. While not necessarily an issue in and of itself, when coupled with perceived regulatory subsidies of ATSs, this is a challenge. Under Canadian regulation, all participants are required to access (either directly or through another participant as a jitney trade) all ATSs. The jitney arrangement is unpractical, as direct access rules effectively prevent electronic jitney relationships and, pragmatically speaking, force direct connectivity by participants to marketplaces. This strict interpretation effectively ensures a steady market demand for marketplace services. Participants are particularly concerned when marketplaces seek to generate revenue from market data without offering commensurate value. They may feel "forced" into consuming a product they do not want.

This is particularly valid in some instances for highly illiquid marketplaces where a dealer does not even execute. The effective per share cost of using marketplaces services would be uneconomic under normal circumstances.

We believe that rather than regulating fees (which opens a Pandora's Box on regulation creep and could also open the door for regulation of brokerage commissions), it would be more effective to remove the regulatory subsidy, done by allowing participants to begin trading electronically through a jitney relationship through other brokers. A network of brokers' brokers would develop who would remove some of these costs by acting as resellers of exchange access. Brokers not wanting to subscribe to uneconomic market data feeds would not be "forced" to.

We also believe that this would be an interesting opportunity of growth for exchanges and ATSs who would be well-positioned to serve smaller dealers in solving trade-through issues. It remains to be seen how they would balance this brokers' broker model, with the potential of being in competition with their customers should they engage in such a strategy.

Trading rebates

The other issue to emerge from the committee was the level of trading rebates. Some argue that, at the extreme end, competitive forces may generate rebate inflation to the degree that the take rate on trading fees could theoretically rise above rational levels. Rebates on liquidity would tick up in a competitive race to attract liquidity providers. These take rates would make trading costs uneconomic for active participants. Examples of this were seen earlier this year when Pure trading offered greater than $0.0030 rebates on stocks trading under $1 and, therefore, greater than $0.0030 take fees.

Another argument is that the U.S. has fee caps and that this would be a logical evolution in the Canadian context in order to keep Canada in line with the U.S.

Our view is that some rebates have been deliberately set higher in order to stimulate new businesses. The ELP rebate scheme needed to be higher than U.S. levels in order to attract new participants who have a multitude of global choices when determining which markets to enter. Higher rebates are a sign of competitiveness to the extent they do not create uneconomic active rates.

We believe that free markets will respond to customer needs. In this case, marketplaces balance the interests of their liquidity providers with their liquidity consumers, and will adjust their pricing to satisfy those needs. Indeed, we have seen this in Canada as:

- Pure went to lower rebates on sub-dollar stocks;
- The TSX lowered ELP rebates (the highest rebate on the Street);
- Alpha created competition on MOC and open rotation orders; and,
- The TSX continues to lower the spread on maker-taker rates.

To be precise, there has been no practical inflation to speak of since Alpha was launched.

Likewise, we believe that very competitive market makers will emerge that will not necessarily rely on the rebate spread. Anecdotal evidence suggests that market-making activity is so competitive in the U.S. that some are willing to trade away from markets that offer rebates in order to have better accessibility to flows.

We are, therefore, reticent to see regulation of trading fees for the same reasons we are reticent to see regulation of data fees. As a business that creates price discovery we believe transparent competitive forces are the best means by which to create price discovery, including for exchange services.

Yet, if there were caps on trading fees, we believe that these caps should be rational. Specifically, similar to some option market proposals, we believe that caps on rebates should be no more than the minimum tick size. This means if the minimum tick was a penny and markets rebated for just less than a penny the marketplace would still be better off as a whole.

Bandwidth surcharges to reduce "flickering"

Marketplaces may begin to deal with "noise" around the quote and overuse of quote bandwidth by applying surcharges on participants or strategies that create unnecessary quote traffic. The concept of charging for bandwidth has come up in Canada but was rejected due to dealer concerns. Given the impetus from the buy-side community to reduce noise we believe it is possible that if proposed again the dealer community might not oppose surcharges.

At its core, a surcharge is intended to act like a "speeding ticket" or "speed bump." Where people use a public good, whether it is a road or marketplace, within acceptable confines, the public good is "safe." When they engage in negative behavior that threatens others' use of the good, a disincentive is needed. This is a classic example of a "market failure" and need for regulatory intervention or correction.

Growth of order-to-trade growth is depicted in the figure below:

The challenge has always been determining what disincentive is fair. Whether on an absolute, relative, or incremental basis[3], the marketplace would determine the direction of market development and put some curbs on innovation. As we have seen in the U.S., innovative solutions can be found in areas once considered dangerous, an example being the penny increment. We expect the marketplaces and their participants will seek a way to address this noise as they increasingly focus on the quality of the information in the order book as a differentiating factor without providing disincentives to innovation.

More movement on dark pools

One of the consequences of strict trade-through price protection is that hyper-competition for price discovery creates challenges for size discovery. At the extreme in a few years, hyper-efficient price discovery mechanisms could conceivably create markets that are 1 cent wide, with 100 share average executions taking 30 microseconds.

Yet, as discussed earlier, it becomes more and more challenging to find block-sized liquidity in such markets. Not all participants put speed of execution and transparency ahead of other objectives, such as one-price, one point liquidity aggregation. Yet, strict trade-through protection favours the continuous trading model, as transparent limit orders at the quote, regardless of size, are more "valued" than quotes off-market of size as marketplaces recognize these as the raw material for their survival. As participants continue to recognize that the challenges in finding size are directly related to the consequences of strict trade-through price protection, they will seek alternative, more "size"-friendly mechanisms.

The most common mechanisms to deal with the consequences of trade-through rules on finding blocks are crossing networks and dark liquidity pools. They attempt, via some market mechanism, to blindly match two offsetting block orders using some automated means of evaluating market interest. Traditional dark pools and crossing networks have found the probability of finding perfectly offsetting matches falls as price (rather than volume) discovery mechanisms slice up more and more blocks. Some change in market structure would be necessary to accelerate the ability of dark pools to provide size and liquidity discovery.

Simply put, we believe the market structure debate will begin to focus on the need to create aggregated liquidity and shift away from maintaining the primacy of price discovery at the expense of other trading objectives. We believe that the IIROC / CSA review of dark pools, dark order types and other market structure issues, has been driven by a number of proposals in the dark pool space. These proposals intend to solve the liquidity aggregation "problem". The questions raised in this paper have the potential to create the most radical change in Canadian market structure in years.[4]

One means by which to meld the mechanisms of price and volume discovery has appeared in the U.S., where ELPs are attracted to dark pools to consistently provide offsetting orders to algorithms in a way that reduces market impact.

The challenge is that these alternative mechanisms require alternative rules. In particular, we believe that dark pools with automated market making will not take hold in Canada until there is more regulatory clarity on three specific issues:

1. The requirement that trades be "matched" on a marketplace before a match is considered a trade generates significant race condition issues in hyper-fast markets. Specifically, a dealer willing to provide liquidity to a client runs the risk that the agreed price may change by the time the order is sent to the marketplace. In contrast, U.S. dark pools can print to the "third market" or the NASDAQ TRF, and simply provide evidence that they were respecting the best price at the time of the match. In Canada, if the quote moved during this time the match would be interfered with by new orders entered on the TSX book between the time the match was generated at the dealer and printed on the Exchange. At microsecond execution speeds there could be numerous new orders interfering with a trade.
2. While price improvement is necessary when internalizing or to match another order, it is unclear to what extent price improvement is required.

[3] An absolute surcharge for example would charge for messages above say 250:1. A relative surcharge would charge participants or stamp IDs for messages above 50% of the average or median of the marketplace. An incremental surcharge would allow participants who are a certain percentage of volume to have a certain percentage of order traffic.

[4] We urge you to review our summary and make comments to the regulators.

Specifically, sub-penny price improvement is not explicitly banned in Canada and in many cases (where spreads are 1–3 cents) it is an economical outcome. Price improvement is made unpractical by the fact that orders on a visible marketplace have to be in minimum price increments, therefore pragmatically sub-penny improvement can not be offered. Since crosses are actually two-sided orders they cannot be submitted at a sub-penny.

We would like to see these issues also considered in the debate on trade-throughs.

Discussions on co-location / equal access vs. naked access

Co-Location

Services like co-location are driven by the desire of participants to reduce latency from the point of order entry to the processing of a transaction. This can be achieved by installing servers in the Exchange data centre in order to minimize the physical distance messages must travel. The benefit is ultra-fast access to market data and subsequent automated order generation. Typical users are high frequency traders and especially ELPs.

The challenge had been that TMX Datalinx, the operator of the TMX co-location facility, and the dealer community itself, underestimated demand and underinvested in the product. Only 28 spots have been released to the marketplace to date. While we estimate that demand exists for a few dozen more co-location spots by the end of the year this limitation creates equitable access challenges. Datalinx has made efforts to catch up to demand by announcing the growth in supply by up to 200 spots, with 100 being available in Q1, 2010.

This is very important for perceptions of fairness[5]. The TMX has also engaged in the practice of selling co-location spots directly to end clients of brokers, a policy that continues to reduce the ability of members of the broker community to ensure fair access for their own clients. The challenge being that at best the industry could not plan its growth and at worst the Exchange could be seen as selecting winners and losers among their participating dealers. We are encouraged by the efforts to make this significant investment. Yet eventually, this space itself may be "sold out". In the long run, either a transparent allocation method, unlimited co-location facilities or an open auction of scarce facilities is necessary to ensure an economically fair distribution of co-location space.

Naked Sponsored Access

In addition to co-location, marketplaces have allowed some participants with more advanced risk monitoring and risk management tools to have unfettered access into their order entry gateways. By not engaging orders with a risk management filter pre-trade, there is a latency savings in the sub-milliseconds. Risk is managed by due diligence and post–trade risk monitoring.

Dealers view this practice differently based on their respective risk tolerance thresholds. A pair of securities dealers in the U.S. submitted letters to the SEC condemning the practice as challenging because "Any [risk] control, including controls in the sponsored participant's own computer system, slow down the process and make it less likely that the trader will win the [speed] race to the market… Thus there is a perverse incentive to eliminate all checks and balances." The specific challenge is that a "run-away" or "malicious" program could enter orders on such a rapid basis that it would create significant market impact and counterparty risk. Further, the two dealers argue that not all direct market access participants are regulated entities.

From a Canadian perspective, IIROC monitors the marketplace on a real-time basis and access qualification rules under Policy 2-501 are not as broad as those in the United States.

Others believe that broker-dealers should control their risk tolerances based on their specific financial and risk management thresholds. Ultimately, the question that will be raised by regulators is whether or not the risks imposed by individual broker-dealers are focused on that broker-dealer or could be systemic in nature due to a "run-away program." We expect that this debate will be raised by those who are slower to adapt their risk management systems to lower latencies.

While we welcome analysis of the nature of sponsored access, we believe that the debate should center on the sophistication and the financial strength and risk management of the dealers that offer this service. To the extent it meets acceptable thresholds, and systematic risk is not introduced, the benefits of enhanced liquidity by low latency trading models should not be ignored. We expect a healthy debate to ensure on what constitutes acceptable thresholds.

Dealing with fragmentation through marketplace consolidation

One scenario in dealing with marketplace fragmentation is that participants themselves choose to consolidate order book information, effectively reducing the demand for multiple marketplaces.

It has been argued that Canada does not have the liquidity to support numerous alternative marketplaces. It is possible that in order to aggregate what liquidity does exist Canadian participants choose to enter orders and liquidity on two or three marketplaces. Clearly, we believe the TSX as the principal market and with the widest and deepest distribution of order entry devices and data is a survivor. It is likely that the other survivors would be Alpha and Chi-X, and probably Pure and others would consolidate in groups around these.

This consolidation would likely include the integration of TriAct with one of these markets as the leading dark pool provider in Canada provides opportunity for a visible marketplace to be the first touch on routing tables. Coupled with dark and light proximity services the synergy value of coupling these offerings is strong. This has not been lost on traditional exchanges in the U.S., as demonstrated by the NYSE's involvement in the BIDS platform, and one would expect that even the TSX may

[5] See National Instrument 21-101 on Exchanges obligations to provide fair access.

re-enter the marketplace after its exit of the ATX platform and try to develop a new dark pool, likely with a partner.

Likewise, we continue to see DirectEdge, BATS, or NASDAQ as possible investors in one of the surviving entities or as potential new participants.

One potential corporate development would be a marketplace buying a key liquidity provider. While we have seen key liquidity providers taking stakes in marketplaces, it is possible that existing marketplaces defending market share begin to realize that the discounted value of their incentive programs could fund the development or acquisition of captive ELPs. As the stage has been set for dealers to own exchanges and marketplaces within the holding company structure, it is conceivable that an exchange holding company would own a dealer. Technically, Shorcan Brokers of the TMX Group is a broker-dealer. Nothing prevents this concept from being practiced other than creativity. Marketplaces would benefit immensely from better captivity of passive order flows, and, therefore, market share, generating enduring value for their liquidity investments rather than from fleeting rebates.

In any event, Canada will continue to have a dynamic market with changing alliances, new players and features, and market structure debates for years to come.

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