TRADING WITH SPEED: REGULATING HIGH FREQUENCY TRADING IN INDIA

Rishi A[±]

ABSTRACT

Technological growth is said to be exponential. We need not look at research papers to prove that, we can see our day-to-day surroundings and that would establish that fact sufficiently. Similarly, major changes are being brought **about with the help of technology in the capital markets" segment. High Frequency Trading or Algorithmic** *Trading is an algorithm or computer doing what once arbitragers performed with great effort. Because of their small sized and fleeting orders they have been held responsible for a number of market crashes around the world. Keeping in view the momentum that HFTs are gathering in India and also for the reputation they have attained, this paper attempts to analyse their problems and also recommend changes, some which have already been adopted by various countries around the world.*

± 5th Year Student, HNLU.

I.   INTRODUCTION

The Indian Capital Markets have seen tremendous growth in post-liberalization period; it stands out to be one of the most lucrative and sought after destinations for domestic and global businesses to expand and invest in. Consequently, as technology becomes ingrained in every part of the society, we are seeing an ever increasing use of computer based trading in the exchanges. Since their invention, computers have evoked mixed reactions. On one hand, they have transformed education, business, and social life, as evident from the e-commerce boom, on the other hand, computers have an increasingly disruptive potential as well. The marked increase in cyber hacks and crimes is a paramount example of the latter function of computers. However, the revolutionary impact of computers on the stock markets cannot be ignored, right from dematerialisation of shares to Electronic-Initial Public Offering (E-IPO). At the same time they have also provided potential for growth of computer aided/automated trading whose effects are being experienced in several jurisdictions, whereby their unregulated use has potential to distort the market. These computer automated trading are called High Frequency Trading (hereinafter referred to as, HFT).

HFT is defined as a form of automated trading that employs: (1) algorithms for decision making, order initiation, generation, routing, or execution, for each individual transaction without human direction; (2) low-latency technology that is designed to minimize response times, including proximity and co-location services; (3) high speed connections to markets for order entry; and (4) high message rates (orders, quotes or cancellations). [1] *„Algorithmic Trading"*(commonly known as 'algo trading'), a form of HFT, is trading conducted through a pre-programmed logic that allows the creation of an order when a signal is *„received"*, such as a security trading at a given price level.[2] These algorithms are generally faster at processing information from a variety of sources in order to make trading decisions for the particular strategy that is being used.

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[1]   *„Sub-Committee on Automated and High Frequency Trading"*, CFTC Technical Advisory Committee, *Available at:* http://www.cftc.gov/idc/groups/public/@newsroom/documents/file/wg1presentation062012.pdf (Last visited on October, 16th, 2015)

[2] *„DarkLiquidityandHighFrequencyTrading:ReviewofHFTandDarkLiquidity",available at:*http://asic.gov.au/regulatory-resources/markets/market-structure/dark-liquidity-and-high-frequency-trading/ (Last visited on October 23rd, 2015).

The Securities Exchange Commission (SEC) defines HFT firms based on the type of strategies they might adopt.[3] The concept paper released, by the SEC, highlighted four main strategies- passive market making, arbitrage, structural and directional. Passive market making involves a firm providing time between when it makes the bids and when it sells them. The firms let the orders rest which are later rewarded with liquidity rebates given by the exchanges. An arbitrage strategy would try and target differential pricing in related products or markets. Structural strategies take the advantage of market vulnerabilities or sometimes of other market participants. And finally to directional strategies, they involve establishing a long or short position in anticipation of a price movement. Two types of directional strategies deserve some attention-order anticipation and momentum ignition. While the former involves anticipating the existence of large buy/ sell orders and then trade ahead of them, in hopes that the large order will drive the price up, the latter involves the initiation of a series of orders in an attempt to rapidly move the price up or down. These strategies are not new; however, the present technology allows them to be executed more efficiently.[4] The National Association of Securities Dealers Automated Quotation (NASDAQ) categorises a firm as HFT depending on their customers and the analysis of their firm's trading, such as their order durations, order-to-trade ratio, etc.[5]

HFT are generally assumed to be risk averse and they tend to function on marginal profits, and to achieve that they trade from both ends of the market. Hence, they maintain close and small positions in the market and trade in the most liquid securities and have also been observed to play an instrumental role in the price discovery processes.[6] The HFT proponents believe that besides increasing the liquidity in the market, this format of trading is faster and more efficient too. However, the detractors claim that technology backed trading can work to create an unhealthy market environment. The anti-competitive argument is based on the

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[3] *„Equity Market Structure Literature Review, Part II: High Frequency Trading",* Staff of the Division of Trading and Markets, U.S. SECURITIES AND EXCHANGE COMMISSION, March 18th, 2014, *available at:* https://www.sec.gov/marketstructure/research/hft_lit_review_march_2014.pdf(September 10th, 2015).

[4]*Ibid.*

[5] Terrence Hendershott& Ryan Riordan, *„High Frequency Trading and Price Discovery",* REVIEW OF FINANCIAL STUDIES, August 2014, Pg. 2267-2306.

[6]   *Available at:* http://asic.gov.au/regulatory-resources/markets/market-structure/dark-liquidity-and-high-frequency-trading/(July 21st, 2015).

inference that the concept of faster price discovery, under HFTs, generally leads to higher volatility, which in-turn negatively affects the markets.[7] High frequency trading employs various strategies; from using the algorithms to enter and exit the market faster than the blink of an eye, to, posting and subsequently cancelling orders to create a false impression of activity in those respective shares by a particular company. [8] Many have stated that such bad practises by a company or firm should not be confused as a sign of algorithmic trading disruption. Moreover, it has also been observed that large-volume HFTs can potentially affect the volatility of the market.[9]

Amongst all strategies of this format of trading, directional strategies constitute the most manipulative strategy, which prejudices the market adversely. A study analysing the NASDAQ Datasets show that approximately half of the total HFT activity can be attributed to aggressive, liquidity-taking strategies that trade against passive market-making orders,[10] which raise potential issues.[11] However, studies show that since HFT's net liquidity supply is greater than its net liquidity demand, it does not have any substantial adverse effect on the market liquidity as a whole.[12] The existing lacuna of controls for these trades, coupled with the uncertainty involved

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[7] Felix Salmon, 'The problems of HFT, Joe Stiglitz', REUTERS, April 16th, 2015, available at:
http://blogs.reuters.com/felix-salmon/2014/04/15/the-problems-of-hft-joe-stiglitz-edition/(Last visited on July 21st, 2015).

[8] Huw Jones and John McCrank, '*U.S. and UK fine high-***speed trader for manipulation***",* REUTERS, July 22nd 2013, *available at:*http://www.reuters.com/article/2013/07/22/us-britain-fca-hft-idUSBRE96L0G620130722 (Last visited on July 16th, 2015).

[9] '*Dark Liquidity and H***igh Frequency Trading: Proposals***"*, Consulation Paper 202, AUSTRALIAN SECURITIES & INVESTMENTS COMMISSION, March 2013, *available at:* http://asic.gov.au/regulatory-resources/find-a-document/consultation-papers/cp-202-dark-liquidity-and-high-frequency-trading-proposals/ (Last visited on July 22nd, 2015).

[10] Allen Carrion, „***Very Fast Money: High***-Frequency Trading on ***the NASDAQ***",* JOURNAL OF FINANCIAL MARKETS, June 15th, 2013, *available at:* http://ssrn.com/abstract=2122716 (Last visited on September 10th, 2015).

[11] *Supra note* 1.

[12] Jonathan Brodgaard et al, „***High***-Frequency Trading and Price Discovery***",* THE REVIEW OF FINANCIAL STUDIES, Oxford University Press Vol. 27 No. 8, 2014, Pg. 2267-2306, 2302, *available at:* http://faculty.haas.berkeley.edu/hender/hft-pd.pdf (Last visited on July 22nd, 2015); *see also,* Evangelos Benos & Satchit Sagade, „***High***-frequency trading behaviour ***and its impact on market quality: evidence from the UK equity market***",* BANK OF ENGLAND WORKING PAPER NO. 469, December 2012, *available at:*

with HFTs and its associated risks, have put the market regulators worldwide on the qui vive. Few regulators have even put in place measures, which will be discussed in the following sections briefly, to monitor them.

The Securities and Exchange Board of India (SEBI) has defined algo trading simply as, *„any order that is generated using automated execution logic."* [13] However, it should consider defining HFTs depending on not just the manner in which it conducts its trades but also on the strategies it employs to target manipulative activities specifically.

Despite a slow start due to technological and cost related reasons, HFT is growing rapidly and accounts for almost 1/3rd of the volume of trade in India.[14] It is the intent of the author to explore the regulatory framework surrounding HFTs in various jurisdictions including the United States (US) and the United Kingdom (UK), wherein HFTs make up for the bulk of the trading carried out,[15] and compare those with the type of regulations India has in place for this format. This paper discusses the systemic risks involved with HFTs and any changes that might need to be made to ensure that such risks do not hamper the working of the markets.

II.   REGULATIONS FOR HFTS AROUND THE WORLD

The increasing market share of HFT is a testament to its success as of 2010, HFT accounted for 56% by volume of the entire equity turnover in the United States, 38% in Europe and approximately 45% in Japan. However, several markets, like that of China, are not very conducive to HFT.[16] Chinese markets are not favourable to fast trading and follows a T+1

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http://www.bankofengland.co.uk/research/Documents/workingpapers/2012/wp469.pdf (Last visited on July 22nd, 2015).

[13] *„Broad Guidelines on Algorithmic Trading",* March 30th, 2012, *available at:*http://www.sebi.gov.in/cms/sebi_data/attachdocs/1333109064175.pdf (Last visited on September 16th, 2015)

[14] Biswajit Baruah,*„High frequency trades form just one-third of total volumes in India",* ET BUREAU, April 11th, 2014, *available at:*   http://articles.economictimes.indiatimes.com/2014-04-11/news/49058847_1_high-frequency-trading-hft-algorithmic-trading (Last visited on July 21st, 2015).

[15] Ben Protess, *„Regulator Warns of „Cheetah Traders",* THE NEW YORK TIMES, June 8th 2011, *available at:*
http://dealbook.nytimes.com/2011/06/08/regulator-warns-of-cheetah-traders/(Last visited on July 16th, 2015).

[16] *„High Frequency Trading: Evolution and the Future",* CAPGEMINI, Capital Markets, *available at:*
https://www.capgemini.com/resource-file
access/resource/pdf/High_Frequency_Trading__Evolution_and_the_Future.pdf (Last visited on July 22nd, 2015).

regulation, which does not allow quick selling, a key HFT attribute. Further, not only are they technologically unprepared for such kind of trading, by imposing high stamp duty for selling of securities, the regulators have also managed to make this an expensive business to conduct.[17] Incidentally, India seems favourable towards HFT as it provides facilities like co-location and sophisticated technology at the exchanges, along with smart order routing system and robust and liquid stock exchanges, all facilitating computer-based trading.[18]

It is important to note that the required regulations would vary from country to country depending on the amount of risk HFTs might pose in that particular market. For instance, in the case of the US it was only after the „flash crash‟ on the Wall Street in May 2010, when the stock exchanges faced a sharp fall in prices followed by a recovery in a span of minutes, that HFT actually became a subject of debate.[19] A sub-committee, on Emerging Regulatory Issues, of the Commodities and Futures Trading Commission (CFTC) Advisory Committee was appointed to review the existing regulatory framework relating to automated and high frequency trading. The sub-committee came up with a line of recommendations, which included measures to control/ restrict volatility of the market, co-location and direct access. It also laid heavy emphasis on liquidity enhancement and the need for the regulator's access to information.[20] Another study conducted by the SEC highlighted that the use of the low-latency tools by the brokers tends to benefit certain types of proprietary trading strategies that may not be in the interest of the investors.[21] Besides, there is also lack of transparency when it comes to algo/ high frequency

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[17] Robert J. Kauffman et al, „*Will high-frequency trading practises transform the financial markets in the Asia Pacific Region*‟, FINANCIAL INNOVATION, Springer Open Journal, 2015, at Pg. 10, *available at:* http://www.jfin-swufe.com/content/pdf/s40854-015-0003-8.pdf(Last visited on September 3rd, 2015).

[18] „*RBI warns of possible systemic risks in algo, high frequency trading orders*‟, THE HINDU, June 25th, 2015, *available at:* http://www.thehindubusinessline.com/markets/stock-markets/rbi-warns-of-possible-systemic-risks-in-algo-high-frequency-trading-orders/article7354580.ece (Last visited on July 21st, 2015).

[19] '*Recommendations Regarding Regulatory Responses to the Market Events of May 6, 2010*‟, Summary Report of the Joint CFTC-SEC Advisory Committee on Emerging Regulatory Issues, February 18th, 2011, *available at*: http://www.cftc.gov/ucm/groups/public/@aboutcftc/documents/file/jacreport_021811.pdf (Last visited on July 21st, 2015).

[20]*Ibid*.

[21] *Supra note* 3.

trading, as most of them are traded in „dark pools."[22] In response to this, the SEC has recommended the expansion of the trading volume disclosures to off-exchange market makers and other broker-dealers, as information made available to the public is the best way to keep them aware and thus, allow them to take an informed decision.[23]

Co-location, another facility provided by majority of the stock exchanges around the world allows the firms to access the information being circulated between the stock exchanges faster than the firms that have not availed of the facility.[24] This provides them with an undue advantage over the rest of the traders. The IEX, a stock exchange, founded by Bradley Katsuyama, promises a fair playing field to both HFT and non-HFTs. The exchange has managed to create a delay in the time within which an HFT obtains information.[25] This helps all forms of traders, as they get their information at the same time and thus, it does not provide the HFTs with their time advantage that they generally enjoy. As of June 2015, the total volume traded at the IEX stood at 1.170%, from 1.098% in May 2015. Thus the performance of the exchange is a proof of the neutrality of the exchange.[26] Moreover, fearing the manipulative strategies adopted for HFT, especially ones which may allow them to adopt tactics like front-running, the Federal Bureau of Investigation (FBI) started investigating firms conducting such trades. Subsequently, a class action was brought against major stock exchanges like Chicago

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[22] Dark pools are a type of alternative trading system, where the quotes made on a security are not quoted on the public stream. While the proponents contend that this ensures that unfavourable price movements are not triggered. However, the detractors fear that they could be responsible for price volatility because of the opacity that it creates. For further reading please refer to: https://www.fas.org/sgp/crs/misc/R43608.pdf (Last visited on September 10th, 2015).

[23] Chair Mary Jo White, „*Enhancing Our Equity Market Structure*", Sander O'Neill & Partners, L.P. Global Exchange and Brokerage Conference, June 5th, 2014, *available at:*

http://www.sec.gov/News/Speech/Detail/Speech/1370542004312#_edn11 (Last visited on July 25th, 2015).

[24] „*Discussion paper on Co-location/ Proximity hosting facility offered by the stock exchanges*", *available at:*

http://www.sebi.gov.in/cms/sebi_data/attachdocs/1367581007462.pdf (Last visited on July 26th, 2015).

[25]Michael Lewis, "*The Wolf Hunters of Wall Street*", THE NEW YORK TIMES, March 31st, 2014.
[26]*Available at:* http://www.iextrading.com/insight/stats/ (Last visited on July 23rd, 2015).

Board Options Exchange, NASDAQ OMX Group and even the New York Stock Exchange for engaging in fraud designed to manipulate the markets.[27]

The New York Attorney-General went on implement a draconian law, which gives him the powers to investigate any incidents related to the sale/ purchase of securities and initiate civil and criminal proceedings to protect investors. [28] In the process, various investigations were initiated into the working of the stock exchanges which allegedly granted an unfair advantage to the HFT firms.[29] These rigid measures have deterred HFT businesses from growing when HFT accounted for a trading volume of 3.25 billion shares a day in 2009, it accounted for only 1.6 billion shares a day in 2012. The profits of these firms are also seen to be declining, with a study estimating that the domestic revenues of the HFT firms fell from approximately USD 7.2 billion in 2009 to USD 1.3 billion in 2014.[30]

In the European Union, with the implementation of „*Markets in Financial Instruments Directive II*‟ (MiFID II), HFTs have been subjected to equally stringent regulations. It requires firms to not just be registered but also to have sufficient capacity and tests in place to pre-empt any risks. More importantly, the traders are required to keep regulators updated about the kinds of trades being made by them.[31] Europe has also implemented additional measures/ regulations, similar to the ones proposed by the Advisory Committee in the US, discussed hereinabove. Similarly, Germany has an Act regulating HFTs, wherein the HFT firms are required register themselves with the German regulator, so that they can assess the ratio of the orders and the

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[27]*Rhode Island v. BATS Global Markets Incorporated et al.,* U.S.   District Court, Southern District of New York, April 18th, 2014, No. 14-2811.

[28]Gary Shorter et al, „*High-Frequency Trading: Background, Concerns, and Regulatory Developments*‟, CONGRESSIONAL RESEARCH SERVICE, June 19th, 2014, *available at:* https://www.fas.org/sgp/crs/misc/R43608.pdf (Last Visited on September 12th, 2015).

[29]*Ibid.*

[30] Larry Tabb, „*No, Michael Lewis, the US Equities Market Is Not Rigged*‟, TABB GROUP, March 31st, 2014.

[31] Article 17, Markets in Financial Instruments Directive II, 'Directive 2014/65/EU of the European Parliament and of the Council of 15 May 2014 on markets in financial instruments and amending Directive 2002/92/EC and Directive 2011/61/EU, June 14th, 2014, available at: http://eur-lex.europa.eu/legal-content/EN/TXT/PDF/?uri=CELEX:32014L0065&from=EN (July 22nd, 2015).

trades executed, on behalf of high investing clients.[32] Apart from that, the firms are also required to impose 'conduct of business' rules and organisational requirements for conducting such business. Moreover, the enhancement of the enforcement powers of the German supervisory authorities allows them to demand information and also permit them to investigate entities not registered with them.[33] With these regulations in place, the European regulators appear to be coming down heavily on any violators. In 2013, the U.K. regulator went ahead and fined Panther Energy Trading LLC and its owner Michael Coscia close to USD 6 million for manipulating the commodities market.

Contrary to most of the regulators around the world, in a recent report, the Australian regulators observed that the negative perception of HFTs has been grossly exaggerated. According to the said report, HFTs were responsible for 27% of the equity market turnover and this was majorly done by 20 entities.[34] It further notes that contrary to popular belief, trades conducted by HFTs were also seen to be held for more than mere seconds. The regulatory framework that Australia has in place controls not just extreme price movements but also automated trading. It places longer lock-out periods, [35] and also a „kill switch‟, which would immediately shut down any problematic algorithm.[36] The compulsory lock-out period imposed by the Australian regulator can help in controlling the order-to-trade ratios by stipulating a compulsory time period before which the order cannot be cancelled; this stops the firms from making fleeting orders and consequently, cancels out the „noise‟ created by these firms in the market.

Thus, regulators have attempted not only to quell the order-to-trade ratio but also the amount of risk the market itself can handle. Order-to-trade ration refers to the number of orders

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[32]High Frequency Trading Act (Hochfrequenzhandelsgesetz), 2013; *See also, „Germany: New Regulatory Requirements for Algorithmic and High Frequency Trading‟,* Breifing, FRESHFIELDS BRUCKHAUS DERINGER, March, 2012, *available at:* http://www.freshfields.com/uploadedFiles/SiteWide/Knowledge/35608.pdf (Last visited on July 26th, 2015).

[33]   Tyler Durden, *„How Germany Defines and Deals with HFT Market Abuse‟,* September 17th, 2014, *available at:* http://www.zerohedge.com/news/2014-09-17/how-germany-defines-and-deals-hft-market-abuse (Last visited on 12th September, 2015).

[34]*Available at:* http://asic.gov.au/regulatory-resources/markets/market-structure/dark-liquidity-and-high-frequency-trading/(July 21st, 2015).

[35] A certain amount of time before which one cannot sell the securities that it has purchased. [36]*Supra note* 34.

that are actually executed as against the ones which are cancelled before being executed. Accordingly, all algorithmic trading requires separate identification in order to ensure that such trades can be flagged at the various exchanges where the orders are to be executed which will allow for better surveillance and improved accountability. Finally, independent management by the firms of their own order-to-trade ratios will place the burden on the firms to control their trades.[37]

More importantly, HFTs have been identified to pose a risk to not just the other traders but also to the market as a whole, also known as 'systemic risks'. The RBI has recently warned against the volumes traded via HFTs or algo trading stating that it could give rise to concerns related to them.[38] The following section deals with the meaning of systemic risk with respect to HFT, supported by actual incidents of systemic failures caused by HFTs to substantiate the author's argument. Finally, the author discusses the regulations that India has in place to tackle HFTs and the changes that can be made to effectively tackle the various problems raised.

III.   SYSTEMIC RISKS POSED BY HFTS

Despite the increase in the popularity of HFTs and the volume of trades being conducted using it, various market participants are still apprehensive about the effect this form of trading could have on markets. [39] As securities and their derivatives become more inter-connected and interdependent than before, it significantly increases a potential contagion of risk. [40] These risks are the indirect consequence, a negative externality, of HFTs as will be highlighted in this section.

A. WHAT ARE SYSTEMIC RISKS?

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[37] German High Frequency Trading Act, 2013 (Hochfrequenzhandelsgesetz, 2013), *available*

at:http://www.bafin.de/SharedDocs/Veroeffentlichungen/EN/Meldung/2013/meldung_130322_hft-gesetz_en.html

(Last visited on September 21st, 2015).

[38] *Supra note* 18.

[39] *Supra note* 3.

[40] David Serritella, „*High Speed Trading Begets High Speed Regulation, SEC Response to Flash Crash, Rash",* JOURNAL OF

LAW, TECHNOLOGY & POLICY, Vol. 2010 No. 2, Pg. 433-444, *available at:*

http://www.jltp.uiuc.edu/recdevs/Serritella.pdf (Last visited on July 25th, 2015).

When a wave of pessimism leads to a general fall in the prices of financial assets and creates a demand for liquidity, and when this threatens to disrupt the entire financial system with repercussions in the broader economy, it is referred to as posing a „*systemic risk*".[41] In other words, since the HFT firms' strategies -passive market making, arbitrage, structural and directional - have the potential to cause or facilitate massive financial losses and/or damage to reputational risk, which makes the industry lose faith/confidence in that particular firm.This trend of compliance violations, corporate governance/ fraud or failure of risk management controls in the long run creates a systemic risk. [42] The Senior Supervisor Group's recent note on algo trading talks about the risk of amplifying systemic risk in this form of trading and its ability to cascade and create huge impact on the market. The complexity of market interactions among these small HFT firms and other market participants, further increases the potential for systemic risk to propagate across venues and asset classes over very short periods of time.[43]

B. INSTANCES OF SYSTEMIC RISK

As algorithms and their interactions grow in both number and complexity, various types of algorithmic trading may further amplify the systemic risk. In August 2012, a faulty algorithm operated by the Knight Capital Group was the reason for a major crash caused in the U.S. market.[44] The viral algorithm managed to quadruple the price of one company, Wizard Software, as well as bidding-up the price of much larger companies like General Electric. Within an hour, the company lost USD 440 million. In the end, it resulted in the Knight Group losing its capital and thus having to merge with a major HFT firm.[45] Instances like these demand that a close watch be kept on algorithms that have the potential to go rogue as they can very easily disturb or

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[41] Kern Alexander et al, „*Global Governance of Financial Systems*", OXFORD, 2006, Pg. 24.

[42] „*Beyond The Horizon: A White Paper to the Industry on Systemic Risk*", August 2013, *available at:* http://www.dtcc.com/~/media/Files/Downloads/WhitePapers/Beyond_the_Horizon_White_Paper_Systemic_Risk.ashx (Last visited on July 25th, 2015).

[43] „*Algorithmic Trading Brief Note*", SENIOR SUPERVISORS GROUP, April, 2015, *available at:*http://www.ny.frb.org/newsevents/news/banking/2015/SSG-algorithmic-trading-2015.pdf (Last visited on July 23rd, 2015).

[44] Gary Shorter et al, „*High-Frequency Trading: Background, Concerns, and Regulatory Developments*", CONGRESSIONAL RESEARCH SERVICE, June 19th, 2014, *available at:* https://www.fas.org/sgp/crs/misc/R43608.pdf (Last Visited on September 12th, 2015).

[45]*Ibid.*

manipulate the market.[46]There is need for business units to establish compensating controls to mitigate both firm-specific and systemic risk.[47]

HFT strategies involve trading on asset mispricing across and within markets. This implies excessive cross and intra-market correlation of returns or liquidity, which could translate into higher systematic risk.[48]

The technology being used and the speed at which orders are executed in HFTs adversely affect the market and liquidity and thus, it is a major factor affecting the system.[49] Take for example the time in 2010 when a single entity, by using *spoofing* and *layering* algorithms, placed thousands of orders which it planned on cancelling later. These orders amounting to about „*USD 200 million worth of bets that the market would fall*" were „*replaced or modified 19,000 times*" before they were cancelled. This crash went on to be famously referred to as the '*flash crash*'. Spoofing, layering and front-running, were later banned, but the possibility of the markets being manipulated further requires the regulator to effectively combat such possibilities.

However, the stock exchanges must also be equipped to handle the pressure created by the HFT firms' demand. If one considers the case of Facebook's IPO on NASDAQ, it is evident that the exchange failed to operate under the pressure created by the large buy, sell and cancel orders placed by the HFT firms. It finally resulted in a 30-minute delay on NASDAQ's side, and 17-second blackout for all stock trading at the exchange.[50] Thus, exchanges must too be able to handle the orders placed during HFT. Minimum facilities required to conduct such trading effortlessly must be made mandatory for an exchange allowing HFT.

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[46]Subhankar Chakraborty, „*High Frequency Trading: Enforcing the Right Controls*", WHITE PAPER*:* TATA CONSULTANCY SERVICES, *available at:*http://www.tcs.com/SiteCollectionDocuments/White%20Papers/Consulting_Whitepaper_High-Frequency-Trading_1212-1.pdf (Last visited on July 27th, 2015).

[47] *Supra note* 43.

[48]Laura Laube et al, „*The Impact of High Frequency Trading: Systematic Risk in European Equity Markets*", April 2013, SSE RIGA, *available at:*http://www.nasdaqomxbaltic.com/files/riga/stipendiju_konkurss/2013/Laube_Malcenieks.pdf (Last visited on July 25th, 2015).

[49]Peter Gomber et al, „*High-Frequency Trading*", Research Paper, DEUTSCHE BORSE GROUP, 2011, *available at:* http://ssrn.com/abstract=1858626 (Last visited on July 23rd, 2015).

[50] *Supra note*15

C. LIQUIDITY AS A FACTOR OF SYSTEMIC RISK

Liquidity is defined as the ease with which shares can be traded at prices that reflect the underlying demand and supply conditions. HFT, with the added facility of co-location, massively boosts up their efforts in improving on faster price discovery. [51] Since an algorithm is programmed to pick out a marginal shift in prices of stocks, on any shift, the algorithm either executes a buy order or a sell order, depending on the command. These marginal shifts are caught by the computer and then the required orders are placed. This way, they manipulate the price discovery process. An early price discovery can affect the liquidity of the markets, as in many circumstances securities may be sold before they can experience their full price escalation. Thus, HFTs which are generally known to affect the price discovery process, can easily manipulate the markets and this directly affects liquidity.

The IEX[52] provided the perfect solution for preventing the HFT firms from obtaining access to information before it is made public. Since, it is only through this information circulated can a price of a stock be determined, the stock exchange, by placing a 38 miles optical fibre coil in front of their trading engine, added a round-trip delay of 0.0007 seconds for the high frequency trades.[53] This delay allows the HFT firms to receive information at the same time as the rest of the investors. Thus, through this mechanism, the stock exchange has managed to avoid any manipulation in the price discovery process. In order to ensure that HFT firms hold on to their securities longer, in 2012, the Italian Government, targeting their strategic fleeting orders, placed a tax of 0.02% on every on equity transactions lasting less than 0.5 seconds generated by an algorithm.[54] Known as the 'Tobin Tax', named after the Nobel Laureate James Tobin who proposed it in the 1970s, it is imposed on financial transactions to help investments to have longer holding periods so as to curb the volatility of the market.[55] May countries in the

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[51]   Naveen Alle, *„Green Shoe Options in India,* National Stock Exchange of India Limited, March 2012, *Available at*: http://www.nseindia.com/research/content/RP_6_Mar2012.pdf (Last visited on October, 15th, 2015).

[52] *Supra note* 25.

[53]*Ibid.*

[54]Luke Nelson & Laura Cox, *„HFT and the question of Regulation",* *available at:* http://www.pwc.co.uk/financial-services/regulation/other/hft-and-the-question-of-regulation.jhtml (Last visited on July 26th, 2015)

[55] Rajshri Singhal, *„Tobin Tax makes a lot of sense",* THE HINDU, February 15th, 2015, *available at:*http://www.thehindubusinessline.com/opinion/tobin-tax-makes-a-lot-of-sense/article6898724.ece (Last visited on October 16th, 2015).

European Union have imposed such a tax and in countries like Brazil and Malaysia the tax is said to have received the desired result of curbing the volatility.[56] The Government imposing such a tax also benefit by generating revenue at the same time. For example, in the US, the Financial Transaction Tax, akin to the Tobin Tax, is expected to generate close to USD 350 billion in 10 years.[57]

D. STEPS TAKEN BY REGULATORS TO COMBAT SYSTEMIC RISK

The Federal Republic of Germany requires mandatory registration for trading firms with the regulators before they can be allowed to conduct this form of trading. It allows the regulators to assess the trades made by these firms or their clients in real time. [58] Prior to receiving their license to trade, the firms must demonstrate that their technology and surveillance systems are able to withstand the volume of orders generally associated with algo/ high frequency trading.[59] Another important aspect relating to the algorithms in use is to check them regularly for default or any defects, a lesson that was learnt from the *Knight Capital Group* case. It would serve the interest of both the firm and the regulator to ensure that defected algorithms do not jeopardise the operations of the business or the market. Furthermore, the European Securities and Markets Authority (ESMA) requires investment firms to ensure that their trades are *„Markets in Financial Instruments Directive"* (MiFID) compliant and that they have appropriate risk management in place, for instance, trades that are not MiFID consistent must be

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[56] *Ibid.*

[57] Lee Sheppard, *„A Tax to kill High Frequency Trading",* FORBES, October 16th, 2012, *available at:* http://www.forbes.com/sites/leesheppard/2012/10/16/a-tax-to-kill-high-frequency-trading/2/ (Last visited on September 25th, 2015).

[58] *„German High Frequency Trading Act: Potential implication for HFT firms and other firms using automated trading strategies",* September 11th, 2012, available at: https://www.orrick.com/Events-and-Publications/Documents/4890.pdf (Last visited on July 25th, 2015)

[59] Kay Swinburne, *„Report on Regulation of Trading in Financial Instruments-"Dark Pools", etc.",* COMMITTEE ON ECONOMIC AND MONETARY AFFAIRS, Ref. A7-0326/2010, November 16th, 2010, *available at:* http://www.europarl.europa.eu/sides/getDoc.do?pubRef=-//EP//NONSGML+REPORT+A7-2010-0326+0+DOC+PDF+V0//EN (Last visited on July 25th, 2015)

automatically blocked from conducting that business. [60] The firms are also required to have *„effective systems and risk controls to ensure that its trading systems are resilient and have sufficient capacity, are subject to appropriate trading thresholds and limits and prevent the ending of erroneous orders or the system* **otherwise functioning in a way that may create or contribute to a disorderly market"**,[61] which will ensure that no trades are made that could potentially disrupt the smooth functioning of the market and thus, this places a burden on firms to make sure that their investments or orders placed are not contrary to the provisions of the MiFID.

The United States of America, hoping to further control the risks involved in HFTs, has proposed implementation of various measures like the submission of all locked-in trade data on a near-real-time basis and to prohibit practises such as pre-netting, a tool which will allow the regulatory body to place post-trading limits or triggers for clients, equity trading desks, and the like.[62] The SEC has made recommendations for an anti-disruptive trading rule, which would address the risk of various aggressive and destabilising trading strategies, used by the HFT firms, in vulnerable market conditions, which could further affect price volatility,[63] proving detrimental to the market as a whole.[64]

Modern regulated markets that encourage HFTs must have in place effective systems that can handle the volume of the orders placed and also contingency measures that can ensure continuance of services in case of any failures.[65] They must also have the capacity to cancel

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[60]Draft Guideline 4*„Guidelines on Systems and Controls in a Highly Automated Trading Environment for Trading Platforms"*, CONSULTATION PAPER FROM INVESTMENT FIRMS AND COMPETENT AUTHORITIES, Ref. ESMA/2011/224, July 20th, 2011,*available at*: http://www.esma.europa.eu/system/files/2011_224.pdf (Last visited on July 25th, 2015)

[61]Art. 17(1), '*Proposal For a Directive of the European Parliament and of the Council on Markets in Financial Instruments repealing Directive 200*4/39/EC of the European Parliament and of the Council", Ref. COM (2011) 656 Final, October 20, 2011, at Pg. 70, *available at*:http://eurlex.europa.eu/LexUriServ/LexUriServ.do?uri=COM:2011:0656:FIN:EN:PDF (Last visited on July 25th, 2015)

[62]*Supra note* 42.

[63]   Andrei Kirilenko et al, *„The Flash Crash: The Impact of High Frequency Trading on an Electronic Market"*, WORKING PAPER, 2014,*available at*: http://papers.ssrn.com/sol3/papers.cfm?abstract_id=1686004 (Last visited on July 25th, 2015)

[64] Chair Mary Jo White, *„Enhancing Our Equity Market Structure"*, Sander O'Neill & Partners, L.P. GLOBAL EXCHANGE AND BROKERAGE CONFERENCE, June 5th, 2014, *available at*:http://www.sec.gov/News/Speech/Detail/Speech/1370542004312#_edn11 (Last visited on July 25th, 2015)

[65] Art. 51(1), MiFID, at Pg. 116.

orders if need be and also be able to use a „kill switch', to halt trade in case of any significant price movements in a financial instrument.[66] And most importantly, investment firms must not be allowed to create or contribute to disorderly market conditions.[67]

IV. SEBI AS A REGULATOR

SEBI issued broad guidelines for algo trading in March 2012, some months after an erroneous algorithm created havoc during Bombay Stock Exchange's (BSE) Muhurat trading session.[68] However, trading accidents have continued, such as when the price of Infosys Ltd futures fell by 20% on the National Stock Exchange (NSE) due to an error in algorithmic trading software.[69] Following the incidents, SEBI placed various market-wide circuit breakers for when the indices fell by 10%, 15% or 20%. [70] The regulations placed an upper limit to an individual permissible investment.[71] Subsequently, this measure was heavily criticised for not regulating the method adopted to execute the order, which was alleged to be the actual problem. The problem with HFTs is not just the quantity of the order being placed, but also the manner in which they are placed.[72]

A. BROAD GUIDELINES

In 2012, SEBI released a circular placing forth numerous guidelines for the regulation of high frequency/ algo trading. The guidelines allowed the separate stock exchanges to regulate the trading so long as the order-to-trade ratios were maintained properly, proper monitoring mechanisms and a check for faulty algorithms was put in place.[73] Further, SEBI also allowed the exchanges to obtain any information, from the traders, for the purposes of inquiry, surveillance,

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[66] Art. 51(2), MiFID, at Pg. 116.

[67] Art. 51(3), MiFID, at Pg. 116.

[68] MobisPhilipose, „*Is algorithmic trading over or under-regulated,* LIVE MINT, April 27th 2015, *available at:* http://www.livemint.com/Money/tDdXVHOJWq2s7ifiX3jzSI/Is-algo-trading-underregulated.html (Last visited on July 16th 2015).

[69] *Supra note* 18.

[70] *Ibid.*

[71] *Supra note* 68.

[72] *Ibid.*

[73] „*Broad Guidelines on Algorithmic Trading",* CIR/MRD/DP/09/2012, March 30th, 2012, *available at:* http://www.sebi.gov.in/cms/sebi_data/attachdocs/1333109064175.pdf (Last visited on July 23rd, 2015).

investigation.[74] SEBI, through another Circular in 2013, placed further regulation with regards to algo trading, which included compulsory auditing of stock brokers or trading members of any facility that provides algorithmic trading. For the sake of better surveillance, the stock exchanges were allowed to take all necessary steps to improve their mechanisms, which would be subject to periodic review.[75] Keeping in mind the added risks involved with respect to a HFT firm, SEBI proposed to place mechanisms to conduct risk profiling of the brokers and listed companies so as to understand the associated risk. The risk is in the fact that HFTs or algo trading, in specific, could be really fast and quite significant, which would require a robust surveillance system. However, it has been suggested that the surveillance could be carried out by profiling the trading activities of major investors in various segments and assess the impact their participation has on the market.[76] Moreover, a number of the market participants flagged the high order-to-trade ratio and monitoring of the exchanges' system to control such trades to be a major issue.

In order to boost its ability to regulate the marketplace and strengthen its surveillance system, SEBI has adopted a supervision model based on risk levels for various market entities including brokers and mutual funds. Under the current model, various market entities are divided into four groups — very low risk, low risk, medium risk and high risk — and the quantum of surveillance and number of inspections increasing as per the risk level. This regulatory reform has been implemented as per the recommendations of an independent global consultant and the subsequent suggestions made by an internal task force at SEBI, taking into account practices followed by many overseas regulators.[77] These measures may qualify as bold steps taken towards regulating such firms; SEBI must sincerely consider placing the burden of ensuring that the firms don't conduct any activity that might adversely affect the market on the firms itself. We see the example of a number of countries, some which have been discussed above, who implemented such a measure and have reaped the benefits from the same.

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[74]*Ibid.*

[75] *„Broad Guidelines on Algorithmic Trading"*, CIR/MRD/DP/16/2013, May 21st, 2013, *available at:* http://www.sebi.gov.in/cms/sebi_data/attachdocs/1369137134098.pdf (Last visited on July 23rd, 2015).

[76] *„SEBI plans profiling of major investors to boost surveillance"*, THE HINDU, February 15th, 2015, *available at:* http://www.thehindu.com/business/markets/sebi-plans-profiling-of-major-investors-to-boost-surveillance/article6898369.ece (Last visited on July 16th, 2015).

[77]*Ibid.*

The Forward Market Commission, in order to regulate HFTs in the commodity futures market and with a view to penalise high order-to-trade ratios, promulgated that any algo orders entered into or modified within 1% of the 'Last Traded Price' shall not be included in the calculation of the penalty amount for a high order-to-trade ratio.[78] It has further mandated that only firms making more than 10,000 orders in a day would be considered for being penalised. It places an additional restriction of just 20 orders per second.[79] The FMC requires the exchanges to maintain a capacity of 4 times the peak order that it encounters and also compels them to regularly update their systems from the same. These systems are required to be audited by certain specific certified auditors.[80]

SEBI envisages new regulations for algo trading and hopes to target HFT firms to curtail the risks that they are associated with.[81] In such a case, it should consider implementing the FMC's regulations, as they evidently target the HFT's nature of making fleeting orders which is the primary concern of all major market regulators.

B. REGULATORY LACUNAE

In February 2013, 94.16% of the orders placed in the Equity Derivative Segment, in the National Stock Exchange, were made by availing the facility of 'co-location'. [82] Providing a separate facility from where information can be obtained regarding the trades to be made, plays both positive and negative role in the trades conducted in the market. While there are positive impacts of a co-location facility in terms of faster access to information among the traders which also benefits the investors, there are fears of it granting unfair advantage to bigger traders as against smaller who cannot afford and seek permission for such facility. Furthermore, when

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[78] *„Broad Guidelines on Algorithmic Trading",* FMC/3/2013/G/166, December 24th,2013, *available at:* http://www.sebi.gov.in/cms/sebi_data/commodities/Guidelines/Guide24Dec13.pdf(Last visited on November 23rd, 2015).

[79]*Ibid.*

[80]*Ibid.*

[81]MobisPhilipose, *„Is SEBI missing the mark on algo trading, selective disclosure?",* Live Mint, July 27th, 2015, *available at:* http://www.livemint.com/Money/9brcCLjEbzGHM08eQlq72K/Is-Sebi-missing-the-mark-on-algo-trading-selective-disclosu.html (Last visited on November 25th, 2015).

[82] *„Discussion paper on Co-location/ Proximity hosting facility offered by the stock exchanges",* *available at:* http://www.sebi.gov.in/cms/sebi_data/attachdocs/1367581007462.pdf (Last visited on July 26th, 2015)

considering the positions of the traders who do not use the co-location facility at all, they will most probably get side-lined, as the time in which they receive the information the HFTs would already have affected the prices of the securities by placing faster orders. Moreover, the guidelines provided for who can avail the co-location facility, are soft in nature and thus, are likely to be discretionary and arbitrary as it is left to the stock exchanges to decide what ground rules are required and who should be allowed to access the information.[83] However, a study of the trading conducted in the OMX Stockholm 30, a stock exchange in Stockholm, suggests that a non-HFT firm is equally likely to avail the facility of co-location as an HFT firm is.[84] Despite equal opportunity granted to both HFT and non-HFT firms, the benefit is still reserved for the rich.

There is also no clarity on taxation related to co-located servers and whether their use by foreign firms constitutes a permanent establishment. This has led to a drop in interest from conducting HFT business, unless they decide to set up shop in India.[85] India already recognizes its own version of the Tobin tax, known as the Securities Transaction Tax, introduced in 2004. It has helped the Government earn Rs. 5,497 crores during 2013-14.[86] Its dual benefits of helping earn revenue and also curbing market volatility should encourage the government to implement a similar tax specifically for HFTs. It will not only deter fleeting orders but also maintain the stability of the market. Thus, SEBI must consider implementing regulations that are HFT specific as specialised regulations are most efficient mode of moderating such trading.

V.   CONCLUSION

It may be true that HFT is a thing of the future and it is wise to want to prepare for the future instead of waiting for the event to come about before developing a framework for it, the same is challenged by the fact of HFT in the markets. In a country like India, where the exchanges did not see any major high frequency trading prior to 2008, to where HFTs now

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[83] *„Co-location/ Proximity hosting facility offered by the stock exchanges"*, May 13th, 2015, *available at:*http://www.sebi.gov.in/cms/sebi_data/attachdocs/1431512252858.pdf (Last visited on July 26th, 2015).

[84]   Jonathan Brogaard et al, *„Trading Fast and Slow: Colocation and Market Quality"*, REVIEW OF FINANCIAL STUDIES, August 5th, 2015, *available at:* http://ssrn.com/abstract=2317797 (Last visited on September 10th, 2015).

[85]*Supra note* 68.

[86]*Supra note* 55.

comprise of 1/3rd of the total trades executed by volume, the need to regulate demands and rightly deserves attention from the regulators with considerable urgency.

It has been established that HFTs have the potential to destabilise the entire market and thus without effective reforms or controls in place, it could jeopardise the entire state of the economy.[87] Regulating such a new system is a learning curve. Effective plugs can only be devised once the leaks have been identified. It is true that HFTs are manipulative and also disruptive in certain occasions, but various regulators around the world have implemented regulations that can effectively prevent these activities. SEBI must artfully emulate such regulations, allowing sufficient space for developing this form into a full-fledged branch of trade. Technology will eventually completely phase out the arbitragers and for then, SEBI should be ready with proper rules to not just control/regulate HFTs, but also let it function freely. The regulator should also try to create a level playing field for all the investors, which should run parallel to the drive to encourage high frequency trading. Imposing Securities Transaction Taxes, specifically aimed at the HFTs could prove to be beneficial for the stability of the market. France too implemented a similar tax, known as the Financial Transaction Tax, in 2012, which later motivated other European countries to follow suit. An increase in the exposure time for such trades could also be fruitful. Consequently, HFT would have to leave their orders in the market for a specific period of time before they cancel/execute the order.

The co-location facility being used by non-HFT firms confirms that it is not an advantage claimed only by HFT firms. In this regard, the SEBI could consider stopping the co-location facilities provided or heavily restricting to a kind of trade where only computer-based traders are involved. Since co-location is a facility that can be easily bought, it hinders the establishment of a fair/level playing field.

Hence, SEBI, if it wants to effectively regulate HFTs, must do so in real time, wherein, each and every trade is under surveillance and thus such trades would not be able to be made contrary to any regulations in place. HFT firms/ companies must be asked to ensure that their trades executed are compliant with all the laws in place and thus place the burden of maintaining the trades, on the firms also.The access to information to researchers and journalists for

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[87]   Diego Lies, „*High Frequency Trading: Market Manipulation System Risks from an EU Perspective*", February 29th, 2012, *available at:* SSRN: http://ssrn.com/abstrat=2108344 (Last visited on July 23rd, 2015)

academic and research purposes must also be made free by the stock exchanges and the regulators. Primarily, investigations and research in this field must be encouraged. This will ensure transparency and also allow public to access information that will allow them to stay informed and aware.

HFTs, while risky, promises a bright future powered by unrelenting technology. However, it must be kept in mind that the need for a particular type of regulation may vary from market to market depending on the kind of controls it might require, thus that too must be considered while legislating or formulating regulations. SEBI must also promote independent research based on the data of the market -it may do so by making the information/data available at low costs and easily accessible for researchers or academicians to study and by providing literature to the public to encourage discussion and awareness.