# Perception towards High Frequency Trading by Commerce Professionals

[1]Dr Nirmala K Reddy,[2]Balaji Ashok Kumar
[1] Professor,[2] Research Scholar
[1]Department of Commerce,
[1]Bangalore University, Bengaluru, India.

***Abstract :*** High Frequency trading means trading in stock market wherein computers and intelligent programs are used to generate large orders. These computer programs use various statistical and mathematical models to make intelligent decisions on transactions in split seconds. After the flash crash in US markets and recent NSE Co-Location case many people perceive that HFTs' through various methods take undue advantage over non-algorithmic traders. In this paper we try to see various methods how people perceive HFT's can manipulate market and ways suggested to overcome. We use factor analysis and T-Test to draw conclusion about the perception commerce professionals regarding HFTs.

***Index Terms*–High Frequency Trading, Perception, Factor Analysis, T-Test.**

## I. INTRODUCTION

High Frequency trading means of trading in stock market wherein computers and intelligent programs are used to generate large orders. These computer programs use various statistical and mathematical models to make intelligent decisions on transactions in split seconds. In India more than 50 percent of orders in both NSE and BSE are Algorithm trade [DEA-NIFM, 2017].After the flash crash in US stock market [Keller, 2012], there is general perception that it was caused by High Frequency traders. The opponents of HFTs' propound that HFT's use the following strategies [Aldridge, 2009] to gain undue advantage over non-algorithmic traders. Namely:

a. Market manipulation
b. Latency arbitrage
c. Spread Scalping
d. Rebate Capture
e. Quote Matching
f. Layering
g. Ignition
h. Pinging
i. Quote Stuffing
j. Spoofing
k. Pump and Dump manipulation
l. Machine learning

They also argue that HFTs' is the one main reason for market volatility, thereby reducing market quality.
In any economy technology must not be banned but a framework should be built to accommodate technology along with protecting the common public. Thus, to regulate HFTs' thereby protecting the non-algorithmic traders the following measures are suggested by Mannix, 2016.

1. A minimum resting time between HFT orders could reduce the adverse effects of HFT on Stock Market and Commodity markets.
2. Matching orders through frequent batch auctions rather than through the order book could reduce the adverse effects of HFT on Stock Market and Commodity Markets.
3. Introducing random delays (IEX style) for orders could reduce the adverse effects of HFT on Stock Market and Commodity Markets.
4. Randomizing the order queue periodically could reduce the adverse effects of HFT on Stock Market and commodity markets.
5. Order-to-trade ratio could reduce the adverse effects of HFT on Stock Market and Commodity Markets.
6. Creating separate queues for orders from co-located servers (used by HFT algorithms) could reduce the adverse effects of HFT on Stock Market and Commodity Markets.
7. Review provision of the tick-by-tick data feed could reduce the adverse effects of HFT on Stock Market and Commodity Markets.

In this paper the author explores the perception commerce professionals towards HFT strategies, market quality and the remedies.

## II. OBJECTIVES OF THE STUDY

a. To analyse the perception of commerce professional regarding HFT strategies and their severity.
b. To analyse the perception of commerce professional regarding HFTs impact on market quality.
c. To analyse the perception of commerce professional regarding remedies for HFT strategies.

d. To find the gender differences among commerce professions in perception towards HFTs.

## III. RESEARCH METHODOLOGY

**Type of the Study:** The Research methodology used to study is **descriptive and empirical** in nature. Both primary and secondary data used for smooth conduct of the study. The primary data collected through questionnaire method and secondary data collected through various reputed journal, magazines, reports, newspaper and internet.

**3.1 Sources of Data:** Both primary and processed data has been used for the study. Primary data is collected through structured Questionnaire and processed data is collected from Journals, Newspapers, and Articles etc.

**3.2 Sample Design:**
For the primary data 390 different Respondents were selected using random sampling. The questionnaire was mailed to 820 Chartered Accountants, Cost Accountants and Company Secretaries. Out of these 410 answered and after removing outliers the sample was reduced to 390 respondents.

**3.3 Statistical tools used for data:**
The information collected was analyzed and presented in a logical way to arrive at meaningful interpretation.

**3.4 Tools and Techniques:**
Factor analysis to explore the dimensions of Perception towards HFTs
T-Test is used for the factor scores obtained to find out the significance in difference between different genders in their perception about HFTs strategies and remedies.

**3.5 Limitations of the Study:**
First major limitations are related to sampling where in about 5 – 10 % of sampling error due to the sampling biasness and time biasness which reduce the validity of the results. The study is confined only to analyze the perceived impact of HFT strategies and their remedies.

## IV. RESULTS AND DISCUSSIONS

### 4.1 FACTOR ANALYSIS

**Table 1: KMO and Bartlett's Test**

| KMO and Bartlett's Test | | |
|---|---|---|
| Kaiser-Meyer-Olkin Measure of Sampling Adequacy. | | .906 |
| Bartlett's Test of Sphericity | Approx. Chi-Square | 17080.801 |
| | Df | 378 |
| | Sig. | .000 |

**Analysis and Interpretation:**
The result of KMO is 0.906 which is higher than 0.5 which is meritious.Bartlett test is used to test the null hypothesis that correlation matrix is an identity matrix. Chi square value is 17080.801and sig value is less than 0.05.
Therefore, the test outcome suggests reject null hypothesis and conclude that correlation matrix is not an identity matrix. Given these two results above, the correlation matrix appears to be factorable.

**Principal Component Method**
Principal Component Method for factor extraction is used, wherein the number of factors necessary to represent the data and the method of calculating them are to be determined.

**Table 2:Total Variance**

| Total Variance Explained | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| Component | Initial Eigenvalues | | | Extraction Sums of Squared Loadings | | | Rotation Sums of Squared Loadings | | |
| | Total | % of Variance | Cumulative % | Total | % of Variance | Cumulative % | Total | % of Variance | Cumulative % |
| 1 | 17.705 | 63.232 | 63.232 | 17.705 | 63.232 | 63.232 | 11.030 | 39.394 | 39.394 |
| 2 | 3.294 | 11.766 | 74.998 | 3.294 | 11.766 | 74.998 | 8.455 | 30.195 | 69.590 |
| 3 | 1.385 | 4.947 | 79.945 | 1.385 | 4.947 | 79.945 | 2.899 | 10.355 | 79.945 |
| 4 | .766 | 2.735 | 82.679 | | | | | | |
| 5 | .695 | 2.483 | 85.162 | | | | | | |
| 6 | .554 | 1.980 | 87.142 | | | | | | |
| 7 | .472 | 1.686 | 88.828 | | | | | | |
| 8 | .384 | 1.373 | 90.201 | | | | | | |
| 9 | .370 | 1.321 | 91.522 | | | | | | |
| 10 | .346 | 1.237 | 92.759 | | | | | | |

| | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| 11 | .273 | .974 | 93.733 | | | | | | |
| 12 | .244 | .873 | 94.606 | | | | | | |
| 13 | .207 | .738 | 95.343 | | | | | | |
| 14 | .169 | .604 | 95.948 | | | | | | |
| 15 | .166 | .592 | 96.539 | | | | | | |
| 16 | .147 | .526 | 97.066 | | | | | | |
| 17 | .134 | .480 | 97.546 | | | | | | |
| 18 | .128 | .459 | 98.005 | | | | | | |
| 19 | .107 | .382 | 98.386 | | | | | | |
| 20 | .096 | .341 | 98.728 | | | | | | |
| 21 | .077 | .274 | 99.002 | | | | | | |
| 22 | .069 | .247 | 99.248 | | | | | | |
| 23 | .060 | .215 | 99.463 | | | | | | |
| 24 | .046 | .165 | 99.628 | | | | | | |
| 25 | .045 | .162 | 99.790 | | | | | | |
| 26 | .024 | .085 | 99.876 | | | | | | |
| 27 | .020 | .072 | 99.948 | | | | | | |
| 28 | .015 | .052 | 100.000 | | | | | | |
| Extraction Method: Principal Component Analysis. | | | | | | | | | |

**Analysis:**

At this step, how well the chosen model fits the data is also ascertained. Eigen value is kept closer or greater than 1 to extract factors from the given variables. This step is to determine the method of factor extraction, number of initial factors and the estimates of factors. Here Principal Components Analysis (PCA) is used to extract factors to represent the data.

**Interpretation:**

For our study, we have 28 variables. As per the above table, the 28 parameters in the data were reduced to 3 factor models.

**Table 3: Rotated Component Matrix**

| | Component | | |
|---|---|---|---|
| | 1 | 2 | 3 |
| HFT firms could do Market manipulation. | .790 | | |
| HFT firms could do Latency arbitrage | .813 | | |
| HFT firms could do Spread Scalping | .808 | | |
| HFT firms could do Rebate Capture | .765 | | |
| HFT firms could do Quote Matching | .825 | | |
| HFT firms could do Layering | .840 | | |
| HFT firms could do Ignition | .809 | | |
| HFT firms could do Pinging/ Sniping/ Sniffing | .896 | | |
| HFT firms could do Quote Stuffing | .870 | | |
| HFT firms could do Spoofing | .890 | | |
| HFT firms could do Pump and Dump manipulation | .882 | | |
| HFT firms could do Machine learning | .873 | | |
| HFT firms could do Commit crimes against public like collocation scam. | .776 | | |
| HFT firms could do Market crash | .793 | | |
| High Frequency trading activity improves liquidity. | | | .791 |
| High Frequency trading activity reduces volatility. | | | .837 |
| Higher the High Frequency trading activity better is the price discovery. | | | .776 |
| Good laws governing HFT firms would be useful to prevent scams. | | .778 | |
| Strict laws would increase investors confidence on Stock Market and Commodity Markets. | | .804 | |

| | | | |
|---|---|---|---|
| High level of transparency and frequent audits would increase effectiveness in identifying scams earlier and nullifying their effect. | | .805 | |
| Strict laws would prevent Stock Markets and Commodity Markets scams. | | .817 | |
| A minimum resting time between HFT orders could reduce the adverse effects of HFT on Stock Market and Commodity markets | | .778 | |
| Matching orders through frequent batch auctions rather than through the order book could reduce the adverse effects of HFT on Stock Market and Commodity Markets. | | .807 | |
| Introducing random delays (IEX style) for orders could reduce the adverse effects of HFT on Stock Market and Commodity Markets. | | .804 | |
| Randomizing the order queue periodically could reduce the adverse effects of HFT on Stock Market and commodity markets | | .824 | |
| Order-to-trade ratio could reduce the adverse effects of HFT on Stock Market and Commodity Markets | | .793 | |
| Creating separate queues for orders from co-located servers (used by HFT algorithms) could reduce the adverse effects of HFT on Stock Market and Commodity Markets. | | .770 | |
| Review provision of the tick-by-tick data feed could reduce the adverse effects of HFT on Stock Market and Commodity Markets. | | .674 | |
| Extraction Method: Principal Component Analysis.<br>Rotation Method: Varimax with Kaiser Normalization. | | | |
| a. Rotation converged in 9 iterations. | | | |

**Analysis:**
Using Principal component analysis in Varimax rotation we could derive variables having common attributes.

**Interpretation:**
Based on the above test we have reduced the 28 variables into the following dimensions namely:

1. 1st Dimension: Severity
    a) Market manipulation
    b) Latency arbitrage
    c) Spread Scalping
    d) Rebate Capture
    e) Quote Matching
    f) Layering
    g) Ignition
    h) Pinging
    i) Quote Stuffing
    j) Spoofing
    k) Pump and Dump manipulation
    l) Machine learning
    m) Commit crimes against public like collocation scam
    n) Market crash
2. 2nd Dimension: Quality
    a) Liquidity
    b) Volatility
    c) Price Discovery
3. 3rd Dimension: Effectiveness
    a) Good Law
    b) Strict law
    c) Transparency
    d) Prevent scam
    e) Minimum resting time
    f) Matching orders
    g) Random delays
    h) Random order queue
    i) Order to trade ratio
    j) Separate queues
    k) Review provision

**4.2 T-TEST**

Through factor analysis the scores of various dimensions are saved as scores. Further independent T- Test is applied on these scores by using gender as categorical variable.

**Table 4: Group Statistics**

| | Gender | N | Mean | Std. Deviation | Std. Error Mean |
|---|---|---|---|---|---|
| Severity | Male | 215 | .0758698 | 1.05037216 | .07163479 |
| | Female | 175 | -.0932114 | .92890886 | .07021891 |
| Effectiveness | Male | 215 | .3004827 | .91086671 | .06212059 |
| | Female | 175 | -.3691645 | .98315445 | .07431949 |
| Quality | Male | 215 | .1756318 | 1.02473597 | .06988641 |
| | Female | 175 | -.2157763 | .92693465 | .07006967 |

**Table 5: T – Test for equality of means**

| | | Levene's Test for Equality of Variances | | T-Test for Equality of Means | | |
|---|---|---|---|---|---|---|
| | | F | Sig. | t | df | Sig. (2-tailed) |
| Severity | Equal variances assumed | 1.327 | 0.25 | 1.665 | 388 | 0.097 |
| | Equal variances not assumed | | | 1.686 | 385.309 | 0.093 |
| Effectiveness | Equal variances assumed | 1.864 | 0.173 | 6.968 | 388 | 0.000 |
| | Equal variances not assumed | | | 6.913 | 359.419 | 0.000 |
| Quality | Equal variances assumed | 8.308 | 0.004 | 3.915 | 388 | 0.000 |
| | Equal variances not assumed | | | 3.955 | 383.666 | 0.000 |

**Analysis:**

Using Independent sample T- Test and gender as categorical variable the equality of means was compared. In the questionnaire a 7-point Likert scale was used with strongly disagree coded as 1 and strongly agree coded as 7.

**Interpretation:**

Based on the above tests the following can be deduced.

1. Female respondents disagree that HFT causes severe problems to non-algorithmic traders and male respondents agree that HFT causes severe problem with not significant difference between male and female respondents.
2. Female respondents disagree that various measures can effectively reduce the undue advantage of HFT and male respondents agree that various measures can effectively reduce the undue advantage of HFT with significant difference between male and female respondents.
3. Female respondents disagree that HFT's provide liquidity, help in price discovery and causes volatility whereas male respondents agree that HFT's provide liquidity, help in price discovery and causes volatility with significant difference between male and female respondents.

## V. FINDINGS OF THE STUDY

1. Male respondents feel that High Frequency Traders have immense advantage over conventional traders thus they can do Market manipulation, Latency arbitrage, Spread Scalping, Rebate Capture, Quote Matching, Layering, Ignition, Pinging, Quote Stuffing, Spoofing, Pump and Dump manipulation, Machine learning, Commit crimes against public like collocation scam, Market crash.
2. At the same time, they also perceive that High frequency trading firms help the market by providing liquidity and helping in price discovery.
3. Male respondents also perceive that High frequency traders cause volatility.
4. Female respondents perceive that High frequency trading firms do not help the market by providing liquidity and helping in price discovery.
5. Female respondents also perceive that High frequency traders do not cause volatility.

## VI. CONCLUSION AND RECOMMENDATION

Even though many researchers have found by using advanced econometric tools like [Brogaard et al., 2015, Dubey et al., 2017] found that High Frequency traders do not manipulate the market unduly, many people who are unaware of the ways of stock markets, still view High frequency traders as entities making money unethically using the delinquencies of common public and loopholes within the legal system. After the recent NSE co-location scam [Airan, 2020], this further intensified the thoughts. Thus, to gain the trust of the common public SEBI can impose stricter laws and other techniques which forbids HFTs' to gain undue advantage over non-algorithmic traders. This can be done by the implementing suggestions of Mannix, 2016, like:

1. Imposing strict laws
2. Maintaining high level of transparency and frequent
3. A minimum resting time between HFT orders
4. Matching orders through frequent batch auctions rather than through the order book
5. Introducing random delays (IEX style)
6. Randomizing the order queue periodically
7. Creating separate queues for orders from co-located servers (used by HFT algorithms)
8. Review provision of the tick-by-tick data feed.

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