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Role of Fintech in the growth of Indian stock broking industry with special reference to Algo trading & mobile trading

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Abstract
The Indian Stock Broking Industry has witnessed a remarkable transformation in recent years, largely driven by the rapid advancements in financial technology (Fintech) particularly in the domains of Algorithmic (Algo) Trading and Mobile Trading. Algo Trading, enabled by sophisticated algorithms and high-speed data analysis, has redefined trading strategies and market execution in India. As a result, algo trading enhanced the efficiency, precision, and automation, reducing trading costs and liquidity in the market. Furthermore, Mobile Trading has democratized stock market participation by making it accessible to a broader audience. Mobile trading apps offered by both traditional brokerages and standalone Fintech startups have empowered retail investors with real-time market data, research tools, and seamless trade execution. This has resulted in a surge in retail investor participation in the Indian stock market. The present study is based on investors behavior towards trading platforms available for Algo trading and mobile trading in Bhubaneswar and Cuttack cities. It also tries to evaluate how introduction of Fintech solutions influenced the behavior individual traders in particular and stock broking industry as a whole. It explores the significance of mobile trading applications, its advantages and challenges faced by investors.

Keywords: Mobile trading, algorithmic trading, Fintech, stock broking industry, real-time market data

Introduction
Financial technology, often referred to as fintech, has revolutionized the way financial services are delivered and consumed. One of the areas where fintech has had a profound impact is in mobile trading and algorithmic (algo) trading. Mobile trading, which allows individuals to trade financial instruments using their smartphones or tablets, and algo trading, which involves the use of automated algorithms to execute trades, have both seen significant transformations due to fintech innovations. In the present study, we will explore the key ways in which fintech has influenced and reshaped these aspects of the financial industry.

Literature Review
Algo trading reduces the cost: Bertsimasa and Lob (1998) [1] suggest that algo trading reduces the transaction cost as it eliminates the human requirement to monitor the market, which in turn reduces the cost of the trading members.

Benefits of Algorithm Trading: Ellis, Michaely and O'Hara (2000) [2] emphasizes the benefits of algorithimic trading in terms of reducing human errors, ensuring accuracy through algorithm validation and backtesting, and optimizing trading strategies using mathematical approaches like stochastic dynamic programming. These advantages can contribute to more efficient and reliable trading in financial markets.

Liquidity and Volatility: Hendershott, Jones and Menkveld (2011) [4]. The study finds that algorithmic trading can have both positive and negative effects on liquidity, depending on the specific trading strategy and market conditions.

In some cases, algorithmic trading can improve liquidity by narrowing bid-ask spreads and increasing trading volumes. However, it can also lead to increased volatility and exacerbate price fluctuations in certain situations.

Accuracy: This ability of back testing in algo trading enables the trader to run the algorithms on historical data, which further helps in removing any mistake of a trading system before executing it live (Bailey, Borwein, Lopez and Zhu, 2014) [17]. In terms of accuracy, algorithm trading is considered to be an advantage.

Quick Decision making: Elangovan N (2016) [6]: in the research article Design quality of Mobile trading system application software for smartphones. The researcher discussed about the mobile trading system software in smartphone that enables the investor to make decision. Also tends to measure the design quality of trading application software for smartphones. This paper covers three stages of implementing the parameter to android developer to understand the concept and to get expert opinion by assessment.

Empowerment of Retail Investors: Mobile trading apps have played a significant role in empowering retail investors by providing them with real-time market information and seamless execution of trades. This has contributed to increased participation in the stock market (Sharma and Sharma, 2018) [7].

Factors influencing Mobile Trading: Jain and Agarwal (2018) [8] emphasize the importance of user-friendly interfaces and security in influencing customer adoption of mobile trading apps in India. User experience and security are critical considerations for fintech platforms.

Disruption of Traditional Stock Broking: Fintech has disrupted traditional stock broking practices in India by offering innovative solutions, improved accessibility, and cost-effective trading platforms (KPMG, 2019) [9].

Evaluation of Algorithmic Trading: Algorithmic trading strategies have evolved in the Indian market, leading to improved market performance (Gupta and Bhatia, 2019) [10-11]. This has introduced greater efficiency and automation to trading practices.

Challenges and Opportunities of Algo Trading: Algo trading presents both challenges and opportunities in the Indian market. Verma and Bansal (2019) [18] highlight the need for regulatory adaptation to fintech-driven changes in this area.

Increased Market Participation: Mobile trading has played a role in increasing market participation from remote areas and among younger investors (Kumar and Yadav, 2019) [19]. It has expanded the investor base in India.

Cyber security Concerns: The rapid adoption of fintech in stock broking has raised cybersecurity concerns and potential risks related to market manipulation (Agarwal and Agarwal, 2020) [13]. Ensuring the security of financial transactions and data remains a critical issue.

Ethical Dilemmas in Algo Trading: Kaul and Kumar (2020) [20] discuss the ethical dilemmas posed by algo trading and the importance of responsible fintech practices to address these concerns.

Customer Experience and Satisfaction: Bhattacharjee *et al*. (2020) [14] analyze the impact of fintech on customer experience and satisfaction in the stock broking industry, highlighting the role of technology in shaping customer perceptions.

Impact of Liquidity and Market Efficiency: Shah and Shukla (2020) [21] find that fintech-driven algo trading has increased liquidity and reduced spreads in the Indian market, positively affecting market efficiency.

Democratization of Stock Trading: Fintech innovations have democratized stock trading in India, making it accessible to a broader range of investors (Bhattacharya and Roy, 2020) [14]. This has the potential to democratize wealth creation.

Regulatory Framework: The Securities and Exchange Board of India (SEBI) plays a crucial role in regulating fintech activities in the stock broking industry. Research by Ramachandran and Viswanathan (2021) [16] discusses SEBI's evolving regulatory framework in response to fintech innovations.

Market Volatility and Efficiency: Sharma and Mittal (2021) [15] assess the impact of fintech-driven algo trading on market volatility and efficiency in India, shedding light on how technology influences market dynamics.
Overall the literature review highlights the multifaceted impact of fintech on the Indian stock broking industry, encompassing technological advancements, regulatory considerations, market dynamics, and the experiences of market participants.

Methodology
Research Approach
Study period: the primary data through the structured questionnaire has been collected in the month of August, 2023. And Secondary Data has been collected from the website of SEBI regarding the trend of mobile and algo trading from the year 2011 to 2022.
Sample Size: the sample size for the present survey is 120 respondents covering the twin city of Cuttack and Bhubaneswar.

Tools and Techniques Used: to analyze the collected data, we have used factor analysis technique.

Research Questions
1. What are the key changes in investor behavior and trading patterns in Cuttack and Bhubaneswar following the introduction of Algo Trading and Mobile Trading platforms?
2. How have these fintech solutions transformed the operations and services offered by stock brokerage firms in India?
3. What are the technological and security challenges faced by market participants when using mobile trading applications, and how are they mitigated?

Objectives of the Study
The following are the objectives taken for this study
1. To study the investor awareness on Fintech solutions with special reference to Cuttack and Bhubaneswar city.
2. To analyze the investors behavior towards mobile trading.
3. To investigate the perception of investors for Algo trading.

Terminology needed to understand the Table 1
Direct Market Access (DMA): Is a mode of trading that allows traders to interact directly with financial markets without the need for intermediaries such as brokers or market makers. In DMA, traders send their orders directly to the exchange or trading venue, where they are matched with other market participants' orders. DMA is commonly used in electronic trading systems and is prevalent in both equities and derivatives markets.

Co-location in stock market trading: Refers to the practice of placing a trader's servers and computer systems in close physical proximity to the trading infrastructure of a stock exchange or trading venue. The goal of co-location is to reduce the latency or delay in executing trades, thereby gaining a competitive advantage in high-frequency trading (HFT) and algorithmic trading.

Internet-based trading: Refers to the practice of buying and selling financial instruments, such as stocks, bonds, commodities, currencies, and derivatives, using online platforms and technology. This form of trading has become increasingly popular and accessible due to advances in internet technology and the development of online trading platforms and brokerages.

Mobile trading: Refers to the practice of buying and selling financial instruments such as stocks, bonds, commodities, and currencies using a mobile device like a smartphone or tablet. It allows traders and investors to access the financial markets and execute trades from anywhere with an internet connection. Mobile trading has become increasingly popular due to the convenience and flexibility it offers.

Non-Algo Trading: Is a traditional approach to financial markets that remains popular among individual and institutional traders who value the human element in decision-making and are willing to put in the effort to develop their trading skills. However, it comes with its own set of challenges and risks, and traders must be prepared to adapt to changing market conditions.

Algorithmic trading, often referred to as algo trading, is a method of executing financial transactions using pre-programmed computer algorithms. These algorithms are designed to follow a set of rules and criteria to automate the trading process. Algo trading is commonly used in various financial markets, including stocks, bonds, commodities, and cryptocurrencies.

Kinds of Algorithms: Algorithms are used extensively in various stages of the trading cycle. We can classify them into pretrade analytics, execution stage, and post-trade analytics. Depending on their usage, Algorithms can also be broadly classified into Agency trading algorithms, Proprietary Trading algorithms and High Frequency Trading (HFT) algorithms. Execution Algorithms-

Execution algorithms: Mean to systematically split a larger order into many smaller orders based on the available liquidity. These amounts are often larger than what the market can absorb without impacting the price. For instance, Time Weighted Average Price (TWAP) algorithmic strategy will break an order up into many smaller equal parts and execute them during the trading day, normally at 5 minute intervals. Another example is of the Volume Weighted Average Price (VWAP) strategy that will estimate the average volume traded for each 5-minute interval the order is traded using historical trading information, with the ultimate goal to split the order into smaller pieces based on an average weighted volume.

Proprietary Trading Algorithms: Proprietary trading (also "prop trading") occurs when a trader trades stocks, bonds, currencies, commodities, their derivatives, or other financial instruments with the firm's own money, as opposed to depositors' money, so as to make a profit for itself. Proprietary Trading algorithms are typically used with the strategies that involve directional bets on the markets – Net Long or Short depending on the market direction. Within this subset, we have Momentum, Mean Reversion and Trend Following strategies. Besides, another popular set of strategies called as Spread strategies or Market Neutral (both Long/Short) is also part of this suit of algorithms.

HFT Algorithms: High-frequency trading (HFT) is a subset of automated trading. Here, opportunities are sought and taken advantage of on very small timescales from nanoseconds up to iv milliseconds. Some highfrequency strategies adopt a market maker type role, attempting to keep a relatively neutral position and proving liquidity (most of the time) while taking advantage of any price discrepancies.

Table 1: (As percentage of Total Turnover)

Period	NSE							
	ALGO	Non-ALGO	Direct Market Access	FOW-NOW	Co-location	Internet Based Trading	Mobile	Smart Order Routing
2010-11	6	75	4	0	8	8	0	0
2011-12	5	62	7	0	17	9	0	0
2012-13	5	56	8	0	21	10	0	0
2013-14	5	47	9	0	28	10	0	0
2014-15	4	46	5	0	33	11	1	0
2015-16	4	43	4	0	35	12	1	0
2016-17	4	39	7	0	34	14	2	0
2017-18	4	37	7	0	35	15	2	0

2018-19	4	31	12	0	34	15	3	0
2019-20	5	26	16	0	34	13	6	0
2020-21	4	18	14	0	39	13	11	0
2021-22	4	16	12	0	47	10	10	0
2022-23$	4	13	11	0	50	10	13	0
Source: NSE								
$ upto December 31, 2022								

The above table clearly shows that the growth of mobile trading in India as a % of total turnover has increased from the year 2014-15 onwards. During the covid and post covid the mobile trading turnover increased at a faster rate from 6% to 11% of the total turnover. But whereas the AlGo trading has reduced over the years. From our survey also we found 89% of the respondents are unaware of Algo trading.

Data Analysis and Findings
The present study is based on the role of fintech in the stock broking Industry. Here we have given importance to Algo trading and mobile trading. The analysis observed that the 80% respondent using mobile trading platform for their investment in share market (shown in Figure-1) and 20% respondent are still not aware of mobile trading. We have also observed that most of the respondent using Zerodha or Upstox for their trading practices than other apps (shown in Figure-2).
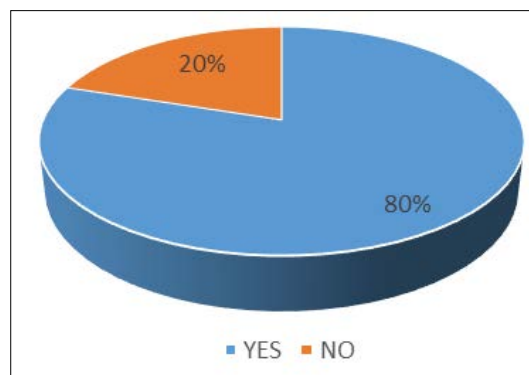

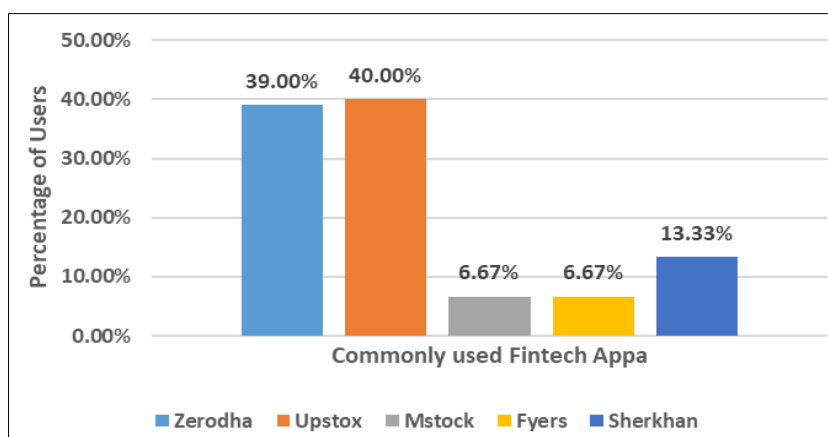**Fig 1:** Awareness about mobile trading

Fig 2: Preferable Fintech Apps

To study the benefit of investors towards mobile trading in comparison to traditional method we have taken 13 variables. These variables are analysed using factor analysis to reduce the variables to smaller set of factors.

Table 1: Variables Used in the study to measure the benefit of mobile trading solutions.

1	Accessibility
2	Lower Costs
3	User-Friendly Interfaces
4	Real-Time Information
5	Automation
6	Portfolio Management
7	Mobile Trading
8	Fractional Shares
9	Security
10	Social Trading
11	Global Markets
12	Efficiency
13	24/7 Trading

The above variables are taken to study the benefit of mobile trading solutions using factor analysis. Kaiser-Meyer-Olkin (KMO) and Bartlett's Test are conducted in this context of factor analysis to assess the suitability of data for factor analysis and the presence of relationships among variables. The result of Kaiser-Meyer-Olkin Measure of Sampling Adequacy is 0.742(Table-2), which is acceptable to conduct the factor analysis from our data set.

Table 2: KMO and Bartlett's Test

Kaiser-Meyer-Olkin Measure of Sampling Adequacy.		.742
Bartlett's Test of Sphericity	Approx. Chi-Square	2298.231
	Df	78
	Sig.	.000

Further Communalities test result is shown in Table-3. Communalities test refer to the proportion of variance in an observed variable (or item) that is explained by the common factors identified by the factor analysis. Communalities are an important concept as they help measure the extent to which the factors extracted from the data account for the variability in each observed variable. Here we have used the Principal Component Analysis.

Table 3: Communalities

	Initial	Extraction
Accessibility	1.000	.655
Lower Costs	1.000	.447
User-Friendly Interfaces	1.000	.826
Real-Time Information	1.000	.892
Automation	1.000	.841
Portfolio Management	1.000	.906
Mobile Trading	1.000	.918
Fractional Shares	1.000	.867
Security	1.000	.765
Social Trading	1.000	.784
Global Markets	1.000	.755
Efficiency	1.000	.811
24/7 Trading	1.000	.767
Extraction Method: Principal Component Analysis.		

Table 4: 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	9.189	70.685	70.685	9.189	70.685	70.685	5.254	40.417	40.417
2	1.044	8.028	78.714	1.044	8.028	78.714	4.979	38.296	78.714
3	.781	6.009	84.723						
4	.629	4.837	89.560						
5	.410	3.156	92.716						
6	.386	2.967	95.684						
7	.181	1.394	97.078						
8	.113	.870	97.948						
9	.106	.814	98.762						
10	.066	.505	99.267						
11	.058	.447	99.714						
12	.029	.226	99.939						
13	.008	.061	100.000						
Extraction Method: Principal Component Analysis.									

The total variance explained in factor analysis refers to the proportion or percentage of the total variance in the observed variables that is accounted for by the extracted factors. A high percentage of total variance explained indicates that the factors account for a substantial portion of the variability in the data. Conversely, a low percentage suggests that the factors do not capture much of the variability, and there may be unexplained variance in the data. Looking at the Eigenvalues from the table-4, we found that there are two factors whose Eigenvalues are greater than one. Therefore, we have extracted two factors from this analysis to be observed.

The component matrix or factor loading matrix is a key output that shows the relationships between the observed variables (items or questions) and the extracted factors. It helps to understand how strongly each variable is associated with each factor. Here's how to interpret the component matrix. Here we have used rotation technique (e.g., Varimax, Promax) to make the factor structure more interpretable. Rotation can change the component matrix to simplify the factor loadings. Rotated Component Matrix is shown in table -5.

Table 5: Rotated Component Matrix^a

	Component	
	1	2
Accessibility	.802	
Lower Costs		.554
User-Friendly Interfaces	.875	
Real-Time Information	.753	.570
Automation	.453	.797
Portfolio Management	.432	.848
Mobile Trading	.750	.596
Fractional Shares	.647	.669
Security		.873
Social Trading	.754	.464
Global Markets	.683	.538
Efficiency	.536	.723
24/7 Trading	.663	.573
Extraction Method: Principal Component Analysis. Rotation Method: Varimax with Kaiser Normalization.		
a. Rotation converged in 3 iterations.		

Form Rotated Component Matrix in table-5 we have derived the component of each factor. We have summarized the analysis in the below table-6.

Table 6: represents the factors we have derived from factor analysis

Ease of use	Perceived Usefulness
Accessibility	Lower Costs
User-Friendly Interfaces	Automation
Real-Time Information	Portfolio Management
Mobile Trading	Fractional Shares
Social Trading	Security
Global Markets	Efficiency
24/7 Trading	

Table-6 represents the factors we have derived from factor analysis. Factor 1 is having 7 components and we named it as ease of use and the 2nd factor is having 6 components and named as perceived usefulness.

Further, we have studied the awareness of investors regarding algo trading. Here we have observed that out of 120 respondents only 11% of respondents are aware of algo trading, remaining 89% of respondents are not aware about algo trading (shown in Figure-3). Therefore the sample size is not sufficient to study the behaviour of investors regarding algo trading mechanism.
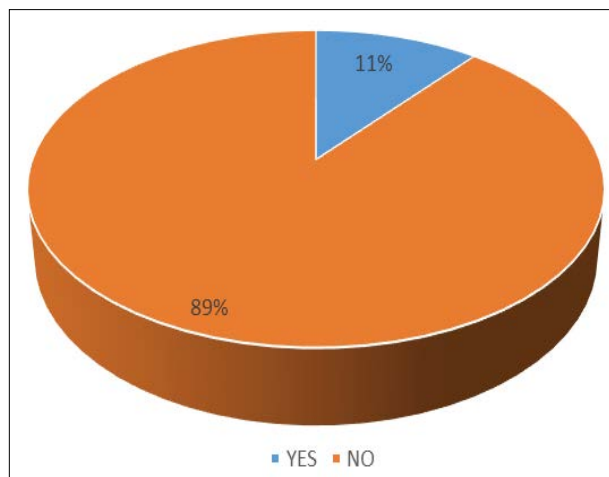

Fig 3: Awareness about Algo trading

Findings
- The analysis observed that the 80% respondent using mobile trading platform for their investment in share market and 20% respondent are still not aware of mobile trading. We have also observed that most of the respondent using Zerodha or Upstox for their trading practices than other apps.
- The growth of mobile trading in India as a % of total turnover has increased from the year 2014-15 onwards. During the covid and post covid the mobile trading turnover increased at a faster rate from 6% to 11% of the total turnover. But whereasthe AlGo trading has reduced over the years. From our survey also we found 89% of the respondents are also unaware of Algo trading.

Implications
Scope for further studies: The study was conducted only in the cities of Cuttack and Bhubaneswar study can be extended to other cities in India.

We have conducted survey only on mobile trading and ALGO trading. Further study can be conducted on non-Algo trading, Co-Location trading and internet trading.

Further study can be conducted by comparing the trading mode of Indian stock market with other advance countries.

Implications: In conclusion, Fintech, with its emphasis on Algo Trading and Mobile Trading, has revolutionized the Indian stock broking industry. It has not only enhanced the efficiency and accessibility of stock trading but has also contributed to the overall growth and development of the market. As Fintech continues to advance, its role in shaping the future of the Indian stock broking industry is expected to be even more significant. However, it is crucial for all stakeholders, including regulators, to strike a balance between innovation and risk management to ensure the long-term sustainability of this transformative trend.
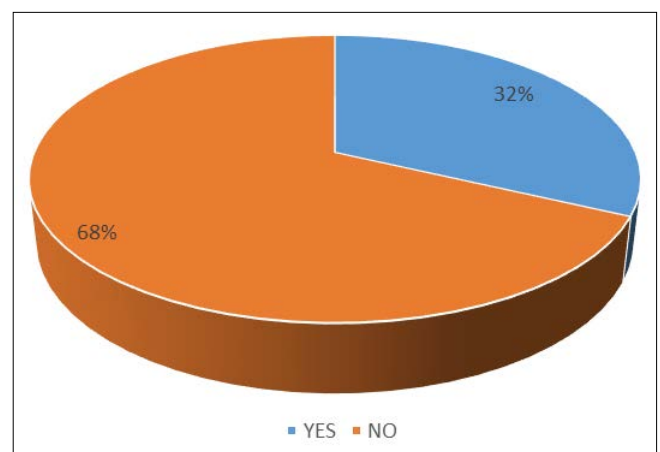

Fig 4: Awareness about Algo trading

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