How Do Algorithmic Trading Strategies Affect Price Discovery and Volatility in Emerging Market Equity Markets?

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Abstract

Due to technological advancements and the need for prompt execution, algorithmic trading is gaining importance, thereby changing the way stocks are traded. Although research on algorithmic trading was conducted primarily in developed equity markets, there is growing interest in understanding how algorithmic trading may affect the efficiency and stability of emerging equity markets. Emerging equity markets exhibit varying levels of liquidity and market depth, as well as distinct institutional structures. Consequently, the introduction of algorithmic trading has raised concerns about its impact on these markets.

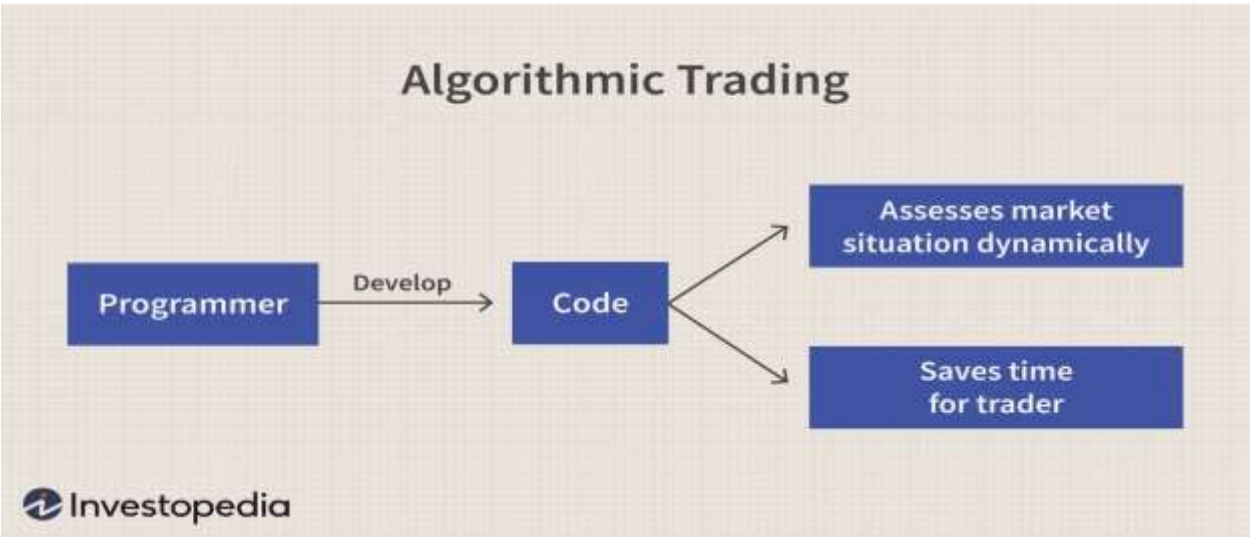
The purpose of this study is to understand how algorithmic trading, as a trading strategy, affects price discovery and price volatility in the equity markets of emerging market nations. This study specifically addresses the question of whether or not algorithmic trading increases the speed and accuracy with which financial information is incorporated into a stock's price and whether it may contribute to an increase in short-term volatility.

The qualitative methodology employed in this study includes the review of existing literature related to this issue, reviewing existing academic studies about the operation of equity markets, and reviewing institutional reports related to the changing patterns of trading activity in emerging markets. Results from the above-referenced methods reveal that algorithmic trading has the potential to improve both speed and accuracy.

Introduction

The rapid development of information and communications technologies has had an enormous impact on the operations of equity markets worldwide. Inside this evolution, one major innovation has been algorithmic trading - electronic trades executed through a predetermined set of rules established through price, volume, time, and other variables. Algorithmic trading does not require human intervention in order to function.

Initially, algorithmic trading occurred mainly in developed or industrialized markets in Western countries, such as the US and Europe. In recent years, algorithmic trading has spread to many other parts of the world and has gained popularity.

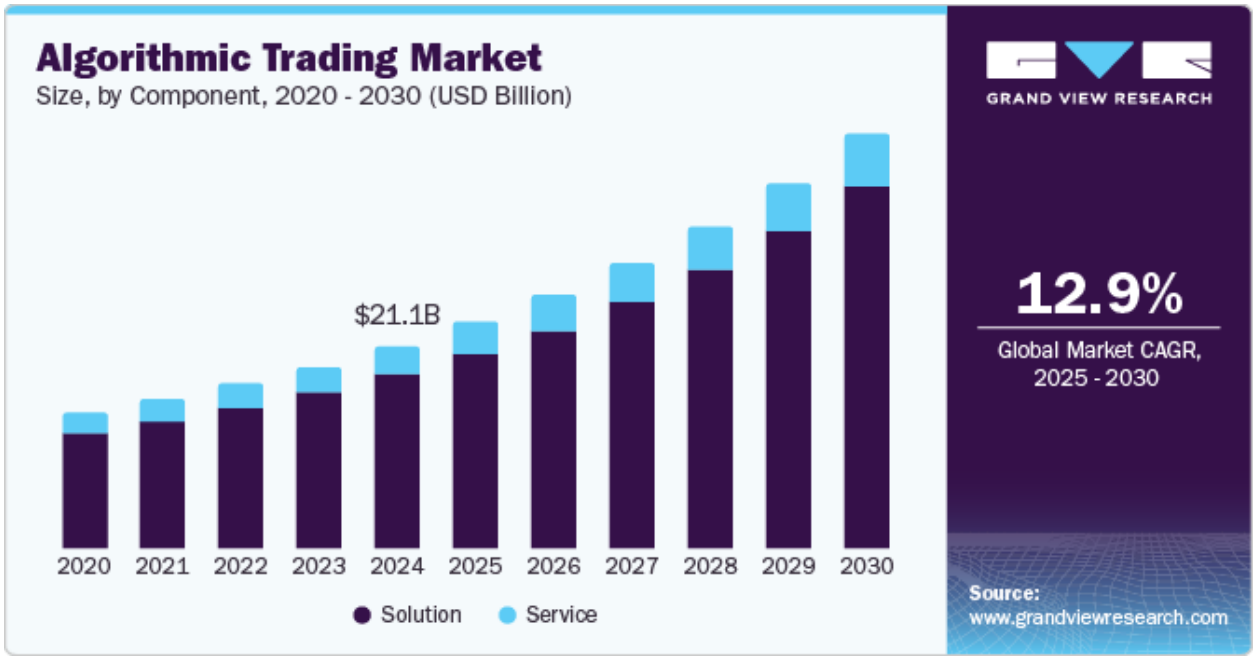


Source: Investopedia

Most recently, the increased relevance of technologies associated with algorithmic trading, combined with many attributes associated with emerging market economies (increased foreign institutional investors, increased financial institution funding, establishment of electronic trading platforms, and establishment of regulation), continues to make them more prevalent in these markets as they become connected to the global capital markets. As emerging markets become more integrated into the global financial system, algorithmic trading will play an important role in enhancing trade volume, liquidity, and price volatility.

Equity markets depend on both the ability to determine the price of an equity based on its most recent closing price and the ability for that price to reflect the event information available within a given time frame. Price discovery is important because it ensures participants can access the most up-to-date information and make informed decisions, thereby increasing the likelihood of sound decisions. Additionally, volatility provides investors with an indication of when a market is likely to experience instability.

The relationship between algorithmic trading, price discovery, and market volatility is critical to the overall efficiency of the market. However, because of the low liquidity in many developing (or less developed) countries, there is also a low level of institutional strength to support this type of methodology.



Source: GrandViewResearch

This research examines whether the introduction of algorithmic trading can enhance the efficiency of emerging markets by improving the accuracy of price discovery; however, it could also increase market volatility. By leveraging the rapid advancement in how trading is conducted through automation and the unique structural characteristics of these developing markets, this research will provide greater insight into the relationship among these three important factors.

This study attempts to address the following research questions:

- How do algorithmic trading strategies affect price discovery in emerging market equity markets?
- What effects do these algorithmic trading strategies have on market volatility under different market conditions?
- To what extent are these effects influenced by structure and regulatory framework?

3. Conceptual and Theoretical Framework

An algorithmic trading strategy uses computer algorithms to buy and sell stocks based on rules that specify price, volume, time, or other market factors. Simple execution strategies include time-weighted average price (TWAP) and

volume-weighted average price (VWAP); more complex strategies include market-making, arbitrage, momentum-driven trading, and multiple algorithmic trading systems designed to maximize the profitability of high-volume trades typical of today's high-frequency trading operations.

Price discovery occurs when a company's price adjusts in response to available information about its fundamental value. When this occurs efficiently, it reduces overall information asymmetry among traders by providing fairly rapid updates to market prices based on relevant company data. Price discovery is facilitated by liquidity in the trading market, trade volume, and the speed at which information is provided to traders.

The term "market volatility" refers to the degree of price change in a particular asset over time and is routinely used to indicate the level of market uncertainty and risk. Moderate volatility can facilitate asset pricing; therefore, excessive volatility could indicate inefficiencies or market instability.

4. Literature Review

The research investigating the effect of algorithmic trading on market behavior has received considerable attention from the academic community and has become an increasingly significant trading method in world financial markets. For instance, a study of the Austrian equity market reported that as the percentage of algorithmic trading increased, both quoted and effective spreads decreased, suggesting that algorithmic trading provides Benefits to Trade Execution Price Liquidity without negatively affecting price impact (Breckenfelder et al., 2018). Empirical evidence from U.S.-Canadian cross-listed shares suggests that the enhanced liquidity provided by algorithmic trading is associated with improved Price Discovery but may also adversely impact the ability of slower market participants to compete (Hasbrouck & Saar, 2018).

There are distinct differences among existing studies of emerging markets, indicating that different markets will have different implications. While the most recent studies of the retail-dominated markets in India have demonstrated that algorithmic trading reduces the bid-ask spread and increases the liquidity of larger capital stocks, it simultaneously causes higher levels of volatility to occur in smaller capital stock segments, indicating a liquidity-volatility trade-off (Rizvi et al. 2025).

In addition, a study that used level two (L2) quotes of the Chinese stock market to study algorithmic trading found evidence of the positive benefit of algorithmic trading on market quality; algorithmic trading has been shown to considerably reduce volatility and enhance market quality (the 2025 Chinese study indicates that the effect of algorithmic trading depends on the board or segment of the market).

A significant number of studies in the literature have demonstrated that algorithmic trading provides an overall positive impact on the quality of asset markets. Automation is viewed as an effective tool to facilitate the rapid incorporation of new information into the bid-ask price, thereby allowing for a reduction in the bid-ask spread and an increase in the level of liquidity available for larger capital stocks, which are key components of effective price discovery (Garg, 2023). In addition, the execution of algorithmic trades is performed quickly due to the ability of algorithmic trading systems to monitor vast quantities of real-time data (Yadava, 2024).

Source: GrandViewResearch

On the contrary, evidence shows both negative and mixed effects. For Instance, studies show that during uncertain times, algorithmic traders can exacerbate the price fluctuation over short time frames and increase market volatility. Studies using Machine Learning have also shown (even though they improve overall efficiency) that extremely fast algorithms also introduce noise-driven price fluctuations that can cause sudden spikes in the overall market volatility once things become stressed (Yadav, 2024). Finally, research on cross-listed stocks indicates a crowding-out effect, where, along with the growth of algorithmic trading by some participants, it may crowd out other participants, negatively affecting overall price discovery (Hasbrouck & Saar, 2018).

Despite a great number of studies to date, some research gaps remain. One gap in research on the use of algorithms for trading in the stock markets of emerging economies is the lack of studies using long-horizon data from these countries. Another research gap is the different types of algorithms used in trading. For example, many studies have failed to distinguish between algorithms used for high-frequency arbitrage and those used for market making in their analyses of the effects of algorithms on market performance. Lastly, the interaction between algorithmic and human traders remains an underexplored area (Aggarwal et al., 2024).

5. Channels Through Which Algorithmic Trading Affects Markets

The impact of algorithmic trading on equity markets occurs through several channels that directly influence liquidity, pricing, and volatility. An important channel of influence is liquidity provision and bid-ask spreads. Algorithmic strategies, including many types of market-making algorithms, constantly place buy and sell orders on the market, increasing trading volume and, in turn, decreasing the bid-ask spread. Enhanced liquidity will lower transaction costs and improve price discovery for high-activity stocks.

Another main channel of influence is the processing of information and the speed of adjustment. An algorithmic trader can process large amounts of market data instantly and react to it nearly instantly when new information becomes available. Therefore, algorithmic traders, by quickly adjusting to the information that is available to them, allow for faster adjustment of prices to the fundamentals, thus enhancing the informational efficiency of pricing in the market. Given that faster adjustment can also lead to greater price overshooting in less stable markets, this effect of improved speed of adjustment on price may create issues.

Order book dynamics and depth of market are further mechanisms through which algorithmic trading impacts equity markets. As algorithms place new orders and cancel previously placed orders, the number of orders submitted increases

over time. As a result, all other things being the same, the order book will appear to have more visible depth during the time the market is in a stable position than it otherwise would if there were no algorithms in the market.

Lastly, feedback trading and herding behavior may also emerge when numerous algorithms act similarly. As a result of this combined action, price trends may be amplified for short periods, and short-term volatility may increase as many algorithms respond to similar signals during periods of uncertainty.

6. Impact on Price Discovery

The role of algorithmic trading in price discovery is to facilitate the faster pricing of information into assets by increasing the responsiveness of asset prices to new information through continuous processing of news and order-book data. Algorithms have the ability to continuously monitor the changing conditions of markets in order to recognize opportunities for trading quickly and to react to them before other market participants do, thereby lessening the informational asymmetries between the trading parties and allowing asset prices to be more representative of the true value of the underlying assets in a timely fashion.

Algorithmic trading has a quantitative advantage over traditional or manual trading in the efficiency and consistency of price adjustments to new information. Manual traders rely on subjective human judgment to determine when to act, making it likely that orders will not be executed until after a delay between the trader making the determination and the order's actual execution, thereby slowing the price discovery process. In contrast, algorithmic traders process large volumes of data electronically and execute their orders instantaneously, thereby bringing the asset price into equilibrium more quickly than a manual trader would.

Many market participants classify algorithmic trading strategies into two categories: 1) High-Frequency Trading (HFT) and 2) Non-High-Frequency Trading (non-HFT). HFT strategies tend to focus on very short-term price opportunities and therefore add a great deal of order activity to the market and respond to price movements in very quick succession (milliseconds). Non-HFT strategies, including execution algorithms and statistical arbitrage, generally provide more stable pricing over longer periods.

Price discovery effects in emerging markets depend on the depth of the market, the regulatory environment, and the technological capabilities of market participants.

7. Impact on Market Volatility

It's important to note that algorithmic trading does not affect volatility equally across all time horizons and market conditions; its effects are more pronounced in the short term due to the rapid submission and cancellation of orders and the high degree of correlation with micro-pricing activities on a single day. There will be a marked spike in volatility at both short- and long-term intervals, depending on the speed of market participants' reactions to new information. In the long term, volatility tends to be lower or unaffected because improved liquidity and better price discovery help stabilize prices.

In addition, the implications of algorithmic trading will vary according to "normal" and "stressful" market conditions. In times of stability, for example, market makers that utilize algorithmic trading models will help to create and enhance liquidity. On the other hand, during periods of stress or uncertainty, automated algorithms can provide liquidity by being structured to act as a single large entity, supporting each other. As a result, by aggressively cancelling orders, they can increase price and volatility in times of uncertainty.

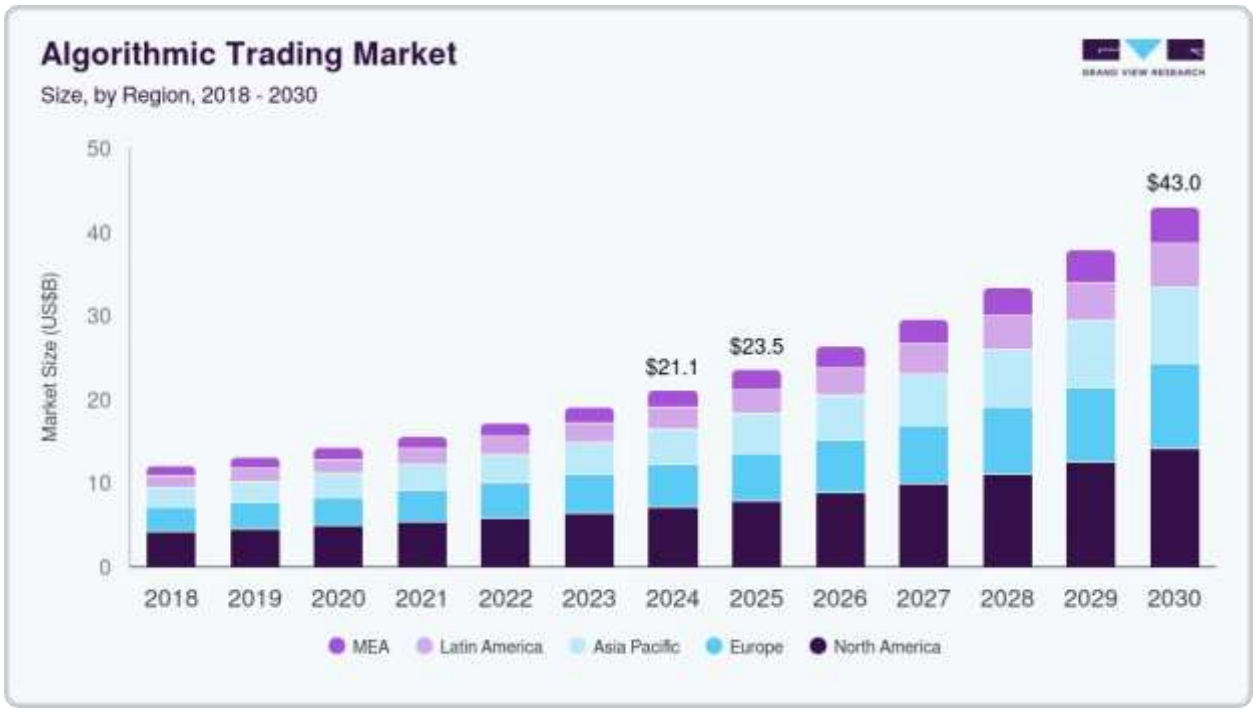
Flash events, or sudden, extreme price changes, result from automated reactions to increasingly aggressive market prices driven by correlated market volatility. Flash events illustrate how nearly all market participants and markets can cause and transmit risk across related markets in just seconds. Moreover, liquidity withdrawals from market makers are an important factor in determining the volume of trades that can be executed across many asset classes, driven by increased

volatility. Moreover, when liquidity is removed and the market depth is reduced due to the removal of those traders using algorithmic trading, volatility will also reach its maximum level of occurrence at that time.

8. Emerging Market Perspective

The regulatory framework and institutional environment affect how algorithmic trading affects traders in emerging equity markets. These regulatory environments are less developed than those in more developed economies and thus are subject to ongoing evolution, limited supervisory capabilities, and inconsistencies in how regulations are enforced. As regulatory authorities continue to introduce new controls on algorithmic trading, such as algorithmic approval, speed limits and circuit breakers to enhance the orderly functioning of algorithm-based trading, regulatory gaps may still prevent orderly algorithm-driven trading even when these controls are in place in emerging equity markets. Similarly, the microstructure characteristics of a market dictate how algorithmic trading occurs. Typically, emerging equity markets have lower liquidity, higher trading costs, and less market depth than developed equity markets. Because of this, the impact of algorithmic trading on the price movements of underlying assets may be greater in emerging equity markets than in developed markets, particularly due to higher short-term volatility associated with algorithmic trading of small-cap or thinly traded assets. Additionally, there is the further consideration of how much of this increased volatility is attributable to foreign investor demand and capital flows.

In most cases, foreign institutional investors dominate the use of algorithmic trading in emerging equity markets because they have access to more sophisticated trading systems and quantitative methods than domestic institutional investors. Therefore, the benefits and challenges of Algorithmic Trading will differ significantly between developed and developing equity markets due to differences in investor composition and the maturity of the regulatory environment. While algorithmic trading presents risks for investors in developed and developing equity markets, the degree of risk associated with these systems varies depending on the regulatory environment of the particular equity market(s) in which they are employed.



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9. Empirical Analysis

The final findings of this analysis are that algorithmic trading affects both price discovery and volatility for stocks of companies listed on emerging markets. Generally speaking, when there is increased use of algorithms for trading, there will likely be an increase in liquidity and the speed with which all the information is incorporated into stock prices (compared to times when there are few to none algorithmic trades).

A high ratio of algorithmic trading relative to other forms of trading would likely result in more efficient price formation, due to narrower bid-ask spreads when algorithmic trading participation is high, compared with when it is low.

On the flip side, the increased liquidity and price-formation efficiencies created by algorithmic trading have also historically been correlated with higher short-term volatility when trading intensity is high or uncertainty is present. The evidence supporting the positive effects of algorithmic trading on both price formation and price volatility is also consistent with the Microstructure Theory, which posits that both informed and agile traders improve the price formation process. Additionally, these improvements in speed and liquidity from the use of algorithmic trading are consistent with previous studies on developed-market equities, which attribute greater liquidity and superior information processing to algorithmic trading.

The increased volatility observed as a result of algorithmic trading presents additional concerns about the potential for large numbers of simultaneous algorithmic traders to create feedback loops or "amplifications" that affect market volatility, driven by the artificial creation and destruction of liquidity.

10. Policy and Regulatory Implications

Increasing reliance on algorithmic trading in emerging equity markets means those markets are developing a much more sophisticated approach to accessing information through a variety of techniques. In general market conditions, algorithmic trading will facilitate liquidity and price discovery, while at the same time creating additional volatility in short-term trading prices, negatively influencing market sentiment, and diminishing the amount of liquidity available in the marketplace. Regulatory authorities must identify methods to keep the market relatively stable and promote efficiency in emerging markets with respect to algorithmic trading practices.

To mitigate these threats, there are several regulatory tools and safeguards that could be used: pre-trade risk controls for brokers (which prevent traders from statistically improbable/detrimental behavior); approval and testing of algorithms; establishing limits on positions and orders by traders and brokers (for many different conditions); implementing circuit breaker mechanisms to prevent extreme movements, when the price decreases rapidly, and developing real-time surveillance systems supported by analytics, to monitor the behavior of participants, for such behaviors as definition of large orders being submitted and then cancelled.

The evidence of these findings will be relevant to both exchanges and regulators. Stock exchanges must invest in high-quality, reliable technology that can handle high-frequency trading and provide equitable access to all traders. The regulatory environment should evolve along with technology; both the exchange and the regulatory environment will need to adapt to new and emerging market conditions. For investors, algorithmic trading has changed expectations for how investments will perform, driven by increased competition and lower transaction fees. But it has increased execution risk and volatility.

11. Conclusion

Through examination of algorithmic trading strategies has provided us with sufficient proof on how algorithmic trading affects price discovery and stock performance characteristics within (and related to) emerging-market stock exchanges. The results of this study show that algorithmic trading can increase capital resources in these markets, thereby increasing liquidity and enhancing the ability to rapidly and efficiently receive data. Therefore, this study concludes that the use of algorithmic trading strategies will reduce the total volatility of the price discovery process within emerging market countries. However, the increased use of these trading strategies will increase short-term volatility of price discovery during periods of market instability and reduced liquidity.

This research provides a more in-depth examination of emerging equity markets with regard to algorithmic trading strategies than has been done previously for developed markets. The research takes into consideration three very important areas of distinction when comparing the microstructural framework for developed equity markets versus that of developing equity markets. The research combined concepts from both theoretical and empirical literature on the effects of algorithmic trading on the developing market exchange system. The research indicates that algorithmic trading supports the process of price discovery in developing markets as long as the market structure provides an appropriate level of depth, and that there is sufficient technological development to support algorithmic trading and that appropriate levels of regulation exist. Therefore, regulatory authorities and policymakers must establish an appropriate regulatory framework to help develop new and innovative means of accessing information, while ensuring the market operates in a stable and safe environment.

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