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Examining the Moderating Role of the Automated Trading System on the Financial Performance of the Ghana Stock Exchange

[1]Edward Domina Attafuah, (PhD); [2]Mr Godfred Amoako; [3]Lord Emmanuel Yamoah, PhD; [4] Mr Eric Akuamoah Boateng

[1] Accountant, University Health Service, University for Development Studies

[1]Senior Tutor- New Life College

[2]Senior Audit Supervisor, Japan Motors Trading Company and Associates

[3]Lecturer, Takoradi Technical University, Procurement and Supply Chain Department

[4]Fair Wages and Salaries, Commission (Public Affairs Unit)

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ABSTRACT

The study investigates the role of the automated trading system on stock market capitalization, liquidity, efficiency, returns and volatility on the Ghana stock exchange. The project solely focus on secondary data from the internet databases of the Ghana Stock Exchange (GSE), and Bank of Ghana (BOG). The data is evaluated using a multivariate regression approach and includes monthly time series data from 2000 to 2020 as well as the volume of stock traded before and after the exchange is automated. The study finds that market performance has an impact on the automated trading system, and it also finds that the amount of stock traded is positively impacted by the automated trading system, exchange rates, and interest rates. Once more, the study draws the conclusion which asserts the economic indicator variable of the nation are marked via erratic and significant fluctuations in conversion rates. According to the report, the exchange's transaction guidelines need to alter in order to provide shareholders the knowledge and confidence to make trading decisions on their own, without the assistance of a licensed stockbroker.

INTRODUCTION

Background to the Study

Automation has become a crucial sequence in incorporating the fiscal sector's route in monetary expansion in a rising country with a burgeoning capital market. The arcade gradually automated due to the ongoing expansion of globalization, rapid development of technology, the necessity to preserve competency, and other factors. The open outcry method, in which traders had to submit their ration-related requests for transaction periods to be finished, will no longer be in existence. Jain (2018) asserts that by eliminating the human system, stockbrokers will no longer be able to extract a profit from manual transactions. Automation and trading speed are more important because of this in general. This lowers operating costs during times of

ISSN No. 2321-2705 | DOI: 10.51244/IJRSI |Volume XI Issue III March 2024

financial rivalry, enables more skillful distribution of securities among various owners, improves risk allocation also accuracy in valuing evaluating.

If the policy is executed, a knob-twisting transaction can be completed online in real time. Algorithmic transactions brings the arcade activities more rapidly to international criteria and puts the economy toward achieving its goal as a destination for investment, as well as monitoring trade-related activity and minimizing market risks.

The majority of exchanges' trade volumes have entirely change as a result of automated trading. Thanks to globally based order submission systems, brokers may easily buy and sell securities from remote locations. The financing agency recently cancel a program that have been in the works for years to automate the trading platform because it was clear that the project would not be financially feasible given the current state of the economy. Evidence from the stock market shows that the continent's economy is stimulated by the stock market (Yartey and Adjasi, 2017). Proper process of the arcade is essential to achieving higher levels of effective competency, clarity, reduce costs associated with conducting business, better marketplace openness, and shareholder trust.

Statement of Problem

Robust empirical research, such as Wuyt (2017), Chordia (2021), and Ball (2020), "investigate the relevance of automated trading system to stock performance and efficiency." In comparison to manual trading exchanges, it realize that automated exchanges are more liquid. Pirrong (2018) "investigates that automated exchanges can be deeper and produce more liquid than the open outcry exchanges. In contrast, other writers indicate that when transactions are reliant on human interaction automated trading might have a detrimental effect on liquidity hence automated trading system will not have any role to play on the Ghana stock exchange.

As given by Biais et al. (2017), automated trading system reduces liquidity since traders are unable to personally negotiate major transactions and are thus powerless to influence market circumstances. The authors further argue that automated trading system can cause cash flow to decline since it disallows a direct intervention among traders and does not permit them therefore to reserve a specific switch on trading situations. Sato (2019) contends that when trading is automated, volatility increases as a result of overshooting or undershooting since screen traders are less likely to comprehend the drivers of price changes.

In reality, traders can pick up extra trading information by observing one another's conduct and body language on the trading floor. The urgency of the trade as well as the party transacting with is included in this information. This will reveal a clear comparison between pre automation periods and post automation periods.

As given by Naidu & Rozeff (2020) their study reveal a rise in volatility and liquidity as well as a gain in efficiency. They contend that automation hastens the distribution of prices, increasing the likelihood that volatility will rise, particularly when new information enters the market. Investors are encourage to trade in order to take advantage of the information release by the quick availability of pricing and trading volume, which is expected to increase market efficiency.

As given by Derrabi (2017) the prices rise significantly and steadily as a result of automated trading. The fixing technique also allows for increase productivity and decrease volatility, although no discernible effects have been shown for continually traded equities.

These contradictory results indicate that there is insufficient understanding in the literature to support further

ISSN No. 2321-2705 | DOI: 10.51244/IJRSI |Volume XI Issue III March 2024

study in this field. With this context in mind, the study aims to evaluate the role of the automated trading system on stock market performance and also to establish a clear comparison between the pre automation period and the post automation period on the volume of stock traded.

LITERATURE REVIEW

The Role of the Automated Trading System on Stock Market Performance

Advocates of automation suggests that execution of trades was faster and less costly under computerized trading systems. Traders have access to broader information including bid and ask prices, trades sizes and volume, at lower costs, due to the existence of a limit order book than under systems that restrict access to information about standing orders above and below the market. That would attract more investors and improve volume and liquidity and generate better price discovery as well as improve performance of the stock market.

However, critics of automation argue that electronic trading could lead to less efficient prices since judgmental aspects of trade execution are lost with automation, which could be particularly important in times of fast market movements. Further, it can be argued that price efficiency remains unchanged after automation. According to this viewpoint, liquidity and efficiency on a stock market depend on rules on handling and execution of trades. If these rules do not change, then liquidity and efficiency are not expected to change. Market efficiency is an important hallmark of a sophisticated market. A market microstructure (stock market automation) is premise on the belief that it will improve the efficiency (both operational and informational) of the market.

However they point out that their results should be interpreted with caution since they rely on a relatively short sample. Volatility is likely to increase when automation speeds up the dissemination of prices especially when information is hitting the market (Naidu and Rozeff, 2014). In their study they find out reduced autocorrelations of returns, which leads them to conclude that market efficiency improves after automation at the Singapore Stock Exchange. Anderson and Vahid (2021) investigate the impact of electronic trading on price efficiency on the London and Australian stock exchanges, using smooth transition error-correction models. Spot and futures markets become more efficient under electronic trading as transaction costs face by arbitragers decrease significantly (Anderson and Vahid, 2021). Studies on the efficiency of the Johannesburg Stock Exchange reveal that the exchange is weakly inefficient except studies by Appiah-Kusi and Menyah (2003) and Smith (2008).

Mensah, Pomaa-Berko and Adom (2012) using the Unit Root Random Walk and the GARCH models find that the Ghana Stock Exchange (GSE) was weakly inefficient in both pre and post automation periods, suggesting that the automation of the GSE did not yield the needed impact towards improving the efficiency of the exchange.

Comparison Between Pre Automation Period And Post Automation Period

Electronic trading systems may increase liquidity and improve efficiency by reducing transaction costs and increasing information availability. These trading systems may also attract new pools of liquidity, by providing affordable remote access to investors but that of the open outcry system will diminish liquidity and cause stock market performance to decline. Several studies have also examine the financial effects of automation on stock market liquidity and volatility. Domowitz and Stiel (2021), Muscarella and Piwowar (2019), and Jain (2015) document that stock prices increase and liquidity improves, and cost of equity capital falls all around the world when exchanges increase transparency through computerized trading.

Similarly, a number of studies have also tested the implications of the trading system on manual basis on

ISSN No. 2321-2705 | DOI: 10.51244/IJRSI |Volume XI Issue III March 2024

market liquidity by analyzing market performance with a different price discovery process; for example, there was liquidity gain and positive liquidity externalities when stocks are traded in a continuous auction session than a call auction system on the Tel Aviv Stock Exchange with the shift from call to continuous trading process (Kalay, Wei and Wohl, 2020). There is evidence that automated trading system accomplishes its mission of increasing volume (market size); however, it fails to reduce the asymmetric information among market participants on the Stock Exchange of Thailand (SET) (Sukcharoensin, Srisopitsawat and Chuenjit, 2016).

The transfer to continuous trading enhance the market liquidity on Paris bourse (Muscarella and Piwowar, 2019). They also notice that the stock price increase as a result of market quality improvement following the shift. The study considered a sample of 134 listed firms.

Maghyereh (2015) examines the effect of the automation of Amman Stock Exchange (ASE) on the market efficiency using the daily closing price index for a period of 10 years. The sample includes those stocks of the largest and most liquid. He finds that the shift to electronic trading system increase volatility, and has no significant effect on market's efficiency as compare to the manual system. Similarly electronic trading significantly influences market liquidity and results in negative abnormal returns on the Amman Stock Exchange (ASE) (Iskandrani and Haddad, 2018). The study use data consisting of closing prices and trading volume for 38 companies for a period of 8 years and conducts an event study for the monthly relative means of 'trading volume' as a proxy for liquidity and stock price behavior is examine through conducting an event study for the stock return.

Assaf (2015) examines the effect of automation on volatility of Toronto stock exchange and finds on average, automation had a significant impact on the volatility and hence on the pricing of securities on the exchange. The evidence indicate significant changes in the structure of volatility and the risk-return relationship. The results are consistent with the interpretation that there has been an increase in the quantity of information flowing into the market post automation. Automated Trading improve liquidity and reduce adverse selection on NYSE and the evidence was strongest for large stocks on (Hendershott et al, 2011). They use the automation of the NYSE quote dissemination as an implicit experiment to measure the causal effect of Automated Trading on liquidity.

Some studies have also focuse on the effect of automation with respect to whether or not trading floor is present. Empirically, there is mixed evidence. In comparing the NYSE (which has a trading floor) with Euronext Paris (fully screen based) for a sample of similar stocks (Venkataraman, 2020) finds that spreads are lower on a floor based exchange than on an electronic exchange. Comparing the floor and the screen-based trading system of the Frankfurt Stock Exchange operating in parallel Theissen (2019) finds that an electronic (screen-based) trading system offers low spreads for liquid stocks, while the floor is more competitive for liquid stocks. Jain (2018) investigated 120 stock exchanges worldwide and finds that a change from floor to electronic trading had a number of long run beneficial effects. He finds that the equity premium is reduce significantly after the switch to electronic trading and that the cost of capital of listed firms also decline and monthly trading turnover increase and this lowers stock market liquidity. However, a study done by Jarnecic and Snape (2020) using data by the London Stock Exchange (LSE) and finds that HFT improve liquidity and is unlikely to have increased volatility.

Murinde (2016) conducts a study on micro-structure theory of the African capital markets in 1999 and discovers that with institutional changes market efficiency improves in NSE (Nigerian Stock Exchange), NSE (Nairobi stock exchange), JSE (Johannesburg stock exchange) and market liquidity also improve, while volatility reduce. There was a highly significant improvement in the performance Nigerian Stock Exchange after the introduction of the ATS in 1999 (Mailafia, 2021). Similarly, Sunday, Omah & Oladimeji (2012) evaluate the effect of the microstructure change (from manual trading system to the automated trading system) on the trading effectiveness in the Nigerian stock market from 1999 to 2011.

ISSN No. 2321-2705 | DOI: 10.51244/IJRSI |Volume XI Issue III March 2024

A similar study reveal that the ATS is an effective trading system and that it has bring about an efficient settlement system and foster new trading opportunities (Sunday, Omah & Oladimeji, 2019). The study evaluates the effect of the microstructure change (from manual trading system to the automated trading system) on the trading effectiveness in the Nigerian stock market from 1999 to 2011.

Pagano and Roell (2016) compare liquidity and price formation processes in several trading systems with different degrees of transparency. Transparency is define as the possibility to observe the size and the direction of the order flow. They suggest that greater transparency in the trading process improves market liquidity by reducing opportunities for taking advantage of less informed participants. Then, spread, volatility and pricing error are likely to decrease. Nevertheless, in terms of pre-trade reporting, Madhavan, Porter, and Weaver (2017) finds that too much transparency may be detrimental. They find a decrease in liquidity associated with the display of the limit-order book on the Toronto Stock Exchange (TSE) after controlling for volume, volatility, and price.

The study also reveals that complete transparency is not always "beneficial" to the operation of the market. It may lead to inform investors to quit the market because if they reveal their positions, they run the risk that the information will be to their disadvantge Earlier, Biais et al. (2017) suggests that automation can lead liquidity to decrease because it doesn't allow a direct negotiation between traders for important transactions and doesn't allow them therefore to preserve a certain control on trading conditions.

An efficient price discovery process is traditionally associated with lower fundamental volatility, which promotes stock market effectiveness in allocating resources. High volatility can distort resource allocation by making investors more reluctant to hold stocks. Risk-averse investors will demand a high risk premium, which increases the cost of capital and reduces market liquidity (Kim and Singal, 2020). Okumu (2013) examines the impact of microstructure change on market efficiency at the NSE. She finds that introduction of automation at NSE has led to improve market efficiency.

The results indicate that mean market returns in the post automation period were higher and more volatile than those in the pre automation period. She advances that the higher market returns is attributed to improve price discovery process, while the higher volatility is due to changes in market microstructure through the trading system.

The enthusiasm about stock markets performance in Africa has been talked about as much has been the solutions to the inherent problems. These studies indicate a mix in performance following a shift to automated trading which indicates that automation is not a guarantee for the implied benefits of automation.

The identified papers above tend to focus on the effect of automation on specific aspects of stock market variables, such as volatility or liquidity in isolation. The study instead assess the effect of automation on a local domestic market, using five variables of market performance: liquidity, price volatility, market returns, market efficiency and Market Size and establish the relationship among them. In addition, the papers consider only one aspect of stock/securities exchange automation: the Automated Trading System (ATS) or Electronic Trading System (ETS), this is a major limitation as it does not consider automation as a process with several interlinked stages but as an event.

This study considers automation as a whole by considering all aspects in automation (CDS, ATS, WAN/BBO) and how 'the automation' affects stock market performance. Furthermore, few of these papers include all listed firms categories in their analysis. This represents a significant limitation, given the significant participation of all firms in equity markets in resource mobilization and allocation and largely the performance of the market. The study considers all listed companies in all categories in evaluation of

ISSN No. 2321-2705 | DOI: 10.51244/IJRSI |Volume XI Issue III March 2024

performance.

Automation

The open outcry trading scheme and automated trading both reduce costs and speed up exchange operations and activities. As investors log onto systems to both view and trade on the markets, automation eliminates the need for trade intermediation. This supports subsequent research conducted by Black (2017); Amihud (2020); Mendelson & Lauterbach (2016); Derrabi (2017); Naidu and Rozeff (2020). These studies are in line with the alternate hypothesis which says

H_1 There is a significant difference between pre automation periods and post automation periods.

A key aspect in evaluating the performance of a particular trading system is its liquidity. The trading environment and liquidity have an impact that can be found in a recent study by Harris, Panchapagesan and Werner (2016). They investigate delisting from NASDAQ to the pink sheets. These accompany a large decline in liquidity since spreads almost triples, as did volatility. A vibrant aspect in assessing the routine of a specific trading scheme is its liquidity. Venkataman (2021) "relates the NYSE (which has a trading floor) with Euro next Paris (fully screen based) for a section of related securities and finds that spreads are lower on a floor base exchange than on an electronic exchange". Theissen (2020) "offers direct proof by linking the floor and the screen-based trading scheme of the Frankfurt Stock Exchange, which functions in parallel." He realises that automated trading scheme gives little spreads for liquid stocks.

From above literature, it is clear that automation have an impact on stock volatility and liquidity. This therefore, justifies the need for scholars to scrutinize the role and impact of automation on stock volatility and liquidity by providing empirical evidence into how automated trading system positively or negatively affects the volumes of stocks traded at GSE. This supports the altenate hypothesis which says

H_1 Automated trading system have a significant impact on stock market performance.

Interest Rate

"According to several African research, the interest rate is a crucial economic indicator that fosters the expansion of the stock market. In terms of liquidity and activity, a dissertation on the influence of real interest rates on stock market performance is one example (Jaine, 2018). The co-integration research using the Error Correction Mechanism (ECM) reveals significant long- and short-run relationships between the variables, indicating that interest rates may have effect on stock market performance.

Ehrmann and Fratscher (2018) "analyse the response of equity markets to U.S. fiscal procedure with an exceptional emphasis on comparative contributions of credit and interest rate channel for the period 1994 to 2003." Their outcomes show that fiscal policy influence individual stocks in intensely expanded means. Nwokoma (2020) tries to create an association amid some macroeconomic indicators." The outcome reveals that only manufacturing production and level of interest rates, as characterized by the 3 – month commercial bank deposit rate have a long-run connection with the market."

Prashanta and Bishnu (2018) "reveal that the rationale for the connection amid interest rate and stock market reoccurrence is that prices of stock and rate of interest inversely correlate." These studies are in line with the alternate hypothesis which says H_1 Automated trading system plays a role on stock market performance.

Inflation Rate

Nwugi (2019) examines studies that "look at the relationship between volatility in the stock market and

ISSN No. 2321-2705 | DOI: 10.51244/IJRSI |Volume XI Issue III March 2024

volatility in macroeconomic indicators." He discovers that the analytical impact of macroeconomic volatility as measured by inflation on typical market volatility is negligible. Similar research was conducted by Schwertz (2020) by examining correlations between macroeconomic and stock market factors. Schwert's research expands upon by Davis and Kutan (2019) by taking into consideration volatility persistence in a global context. In that the variability of information and output growth rate has little predictive potential for stock market volatility, their findings are consistent with those in Schwert's work.

According to Jhingan (2020) "when there is inflation most prices rise, though some rise faster than others." Afolabi et al (2020) "explains that there is a connection amid inflation and rising prices of stock." Sogu (2020) "conditions that inflation rate expects to vary all other things being equal, positively in line to variations in stock prices." Consequently, assessing the impact of inflation on stock prices of quoted firms, if there is a connection, one should assume a positive relationship amid inflation and the variation in stock prices. Wuyts (2017) "indicates other environmental factors which determine or affect stock market liquidity. He states that a market is liquid if traders can quickly purchase or vend a huge number of shares without large price impact". This involves the readiness of a market participant to take the opposed side in a contract by another trader.

Impact of inflation on stock market is apparent from the point that it stimulates the rates of interest. If the inflation rate is high, the interest rate is also high. In a situation where inflation and interest rates are high, the creditor will have the propensity to recompense for the increase in interest rates being high.

It is believe that inflation is advantageous to common stock. This is major because it is argue that inflation increases the returns to shareholders since price of products rise faster than wages rates. The relationship between inflation and returns to owners of equity would be valid if business firms were debtors and if the current interest rates on debt finance fail to reflect the future changes in the price level. Inflation represents one of the nervous in expectation of the potentially negative consequences.

However, the rising prices and the higher interest rates do not lead to positive effects on the investment portfolios of investors. Since the revenues and earnings of companies tend to rise at the same pace as inflation, then stocks provide protection to inflation to a significant degree. Also, inflation has another negative impact, thus prices rise but no additional value is added. This means that money loses its purchasing power and as a result, a person can only buy less than before. However, when the inflation starts to fall to its normal levels, the overstated earnings and revenues will decline as well. These ups and downs lead to blurring the actual state of value.

Exchange Rate

In his article, Nwugi (2019) analyses research that "look at the relationship between volatility in the stock market and volatility in macroeconomic indicators." He finds that there is little correlation between macroeconomic volatility, as measured by inflation, and ordinary market volatility. By studying correlations between macroeconomic and stock market parameters, Schwertz (2002) carried out research along these lines. Davis and Kutan (2019) extend on Schwert's findings by taking into account volatility persistence in a worldwide setting. Their results are in line with Schwert's work in that the variability of information and output growth rate has minimal capacity to forecast stock market volatility. Prashanta and Bishnu (2018) "investigate macroeconomic variables that affect stock market in the recent empirical literature, with exchange rate being one of those variables." There are relations amid stock market earnings and exchange rate via changes in foreign investment.

Adjasi and Biekpe (2015) also investigate the relationship between stock market returns exchange rate movements in seven African countries. Co- integration tests show that the long run exchange rate

ISSN No. 2321-2705 | DOI: 10.51244/IJRSI |Volume XI Issue III March 2024

depreciation leads to increases in stock market prices in some of the countries, and in short – run, exchange rate depreciations reduce stock market returns. Mishra (2019) "examines that stock return, exchange rate return, the demand for money and interest rate relates to each other through regular connection that occur between them." Further, forecast error variance decomposition indicates that exchange rate return affects the demand for money; interest rate causes exchange rate to change; exchange rate affects the stock return; demand for money affects stock return; interest rate affects the stock return, and demand for money affects the interest rate.

In Mao and Kao (2020), exporting Stock prices of companies were seen to be more susceptible to fluctuations in foreign currency rates. Their findings also highlight a current concern: there appears to be no micro-level correlation between stock prices and exchange rates, according to available data. Macroeconomically speaking, they discover that a rise in currency value has a negative impact on the stock market of a nation that is dominating in exports and a positive impact on the stock market of a nation that is dominant in imports.

Trade Volumes

Theissen (2020) defines trade volume as the quantity (total number) of securities exchanged within a specific time period. When a security is traded on the arcade, the capacity often indicates the total number of stocks that are traded during a given time frame. "The transactions are on stocks, bonds, options contracts, futures contracts and commodities (Theissen, 2020; Venkataman (2021)." According to Gündüz and Hatemi (2015), certain outcomes of combination trading activity take the total volume of stock transaction as a measure of capacity. Others focus their research on the total number of stocks that are run by the total number of stocks that are owed using a size or capacity metric.

When analyzing price/volume and volatility/volume relationships, specific bit capacity is frequently involved (Maghyereh 2015). In support of this, studies that converge on the effect of evidence on the exchange's activity employ particular revenue as a volumetric measure. On the other hand, the results of a smaller number of research on developing markets are inconsistent.

Assessment Of Manual System of Trading And Automation

It is still up for debate whether market liquidity is preferable in organized exchanges' open outcry marketplaces or automated trading systems (Frino and Hill, 2020). One may argue that because automated systems are not as able to withstand times of high volume trading as floor-traded systems are, they are less liquid than open outcry marketplaces. This is due to the fact that automated systems lose some of the trading advantages that liquidity providers like locals and market makers have, since they have a larger degree of knowledge asymmetry regarding the identities of the traders. Limit orders are discouraged from being submitted on automated systems due to delays in order cancellation, which forces traders to provide free options with greater durations than on floor traded systems.

Market Returns

Numerous studies utilize the national stock index as a means of analyzing returns on capital markets. A market is considered to be operating well when the Index shows a gain. Capital Market Authority (2020) uses annualized market capitalization growth and index returns to compare the performance of African capital markets. Calculate the annual growth in market capitalization, which is a percentage indicator of the increase or accumulation of investors' wealth in the stock market. By identifying certain anomalous returns following the realization of the event, an event research technique of the transfer of stocks is used to determine the impact of the transfer on the behavior of stock returns (Brown and Warner, 2020).

ISSN No. 2321-2705 | DOI: 10.51244/IJRSI |Volume XI Issue III March 2024

Market Liquidity

According to Kyle (2019), market liquidity is a multifaceted term that makes it difficult to define and is hence described as "elusive" and "slippery". Tightness, depth, and resilience are a few of these. The cost of trades, such as bid-ask spreads, is considered tightness. Resiliency is the rate at which prices return to equilibrium after a significant deal, whereas depth is the market's capacity to absorb a huge amount without significantly affecting the price.

When a market allows for the capacity to trade in big quantities swiftly and affordably, it is said to be liquid (Harris, 2018). Levine and Zervos (2018) suggest that the Value Traded Ratio may be utilized to measure market liquidity throughout the whole economy. Similarly, the Turnover ratio may also be used to gauge liquidity (Popovic, 2017). If everything else is equal, the trading volume of a particular security should increase in proportion to its liquidity. As a result, once a stock is moved to the new trading system, a rise in its trading volume indicates an increase in its liquidity.

Volatility

The variance or standard deviation of stock returns is used to assess price changes in securities, which helps to understand their volatility. According to theory, share price volatility is influenced by changes in discount rates or future cash flows (Schwert, 2019). The volatility metric, which is used to gauge stock market performance, conceptualizes the fluctuation of asset prices in the market. Public confidence and financial market instability are closely related. As a result, market estimates of volatility are used by policy makers as a gauge of how vulnerable financial markets are.

The idea of stock prices as a signal about the real intrinsic worth of a business, which is central to the paradigm of informational efficiency of markets, is also undermined by the prevalence of excessive volatility or noise (Goel and Gupta, 2011). Increased stock market price volatility diminishes the effectiveness of price signals in allocating investment resources, particularly in emerging nations (Yartey and Adjasi, 2017).

In truth, media and public perceptions of stock market volatility are heavily influenced by point variations. Scholars in the field of finance contend that volatility ought to be represented as a percentage of changes in rates of return or prices, eliminating the requirement for absolute quantities of swings in.

Market Efficiency

The effectiveness of the exchange has a significant impact on the stock market's success. The extent to which share prices accurately represent all relevant and available information is explained by market efficiency (Gupta and Basu, 2015). By preventing under- and overvaluation of stocks, which promotes share purchasing, exchange efficiency maintains appropriate stock pricing. This is due to the fact that mispriced equities discourage prospective buyers from purchasing shares out of concern that they would sell their holdings at a loss, which eventually lowers the amount of cash available to businesses looking to expand.

In addition, it guarantees effective resource distribution by allowing stock prices to accurately represent a company's performance, enabling prospective investors to make the best possible investment choices.

Hypothesis Formulation

A definite, clear, as well as predictable claim or projection on anticipated outcomes on particular trait of a populace is termed as a research hypothesis. Correlations between variables or presumed disparities between groups on a given metric are two examples.. The following are the study's research hypotheses:

ISSN No. 2321-2705 | DOI: 10.51244/IJRSI |Volume XI Issue III March 2024

- H_1 Automated Trading System have a significant impact on stock market performance.
- H_1 There is a significant difference between Pre automation period and post automation periods.

Conceptual Framework

Conceptual frameworks are abstract representations that relate to the goals of a research project and guide corrections and data analysis. They can also be used as analytical tools to express different viewpoints about issues within specific contexts. To distinguish between issues pertaining to ideas and how to organize them, one may need a conceptual framework to explain the ideas that relate to each other. An effective conceptual framework would often portray real situations and show them in a way that makes them easy to remember and apply (Ravitch and Riggan 2019).

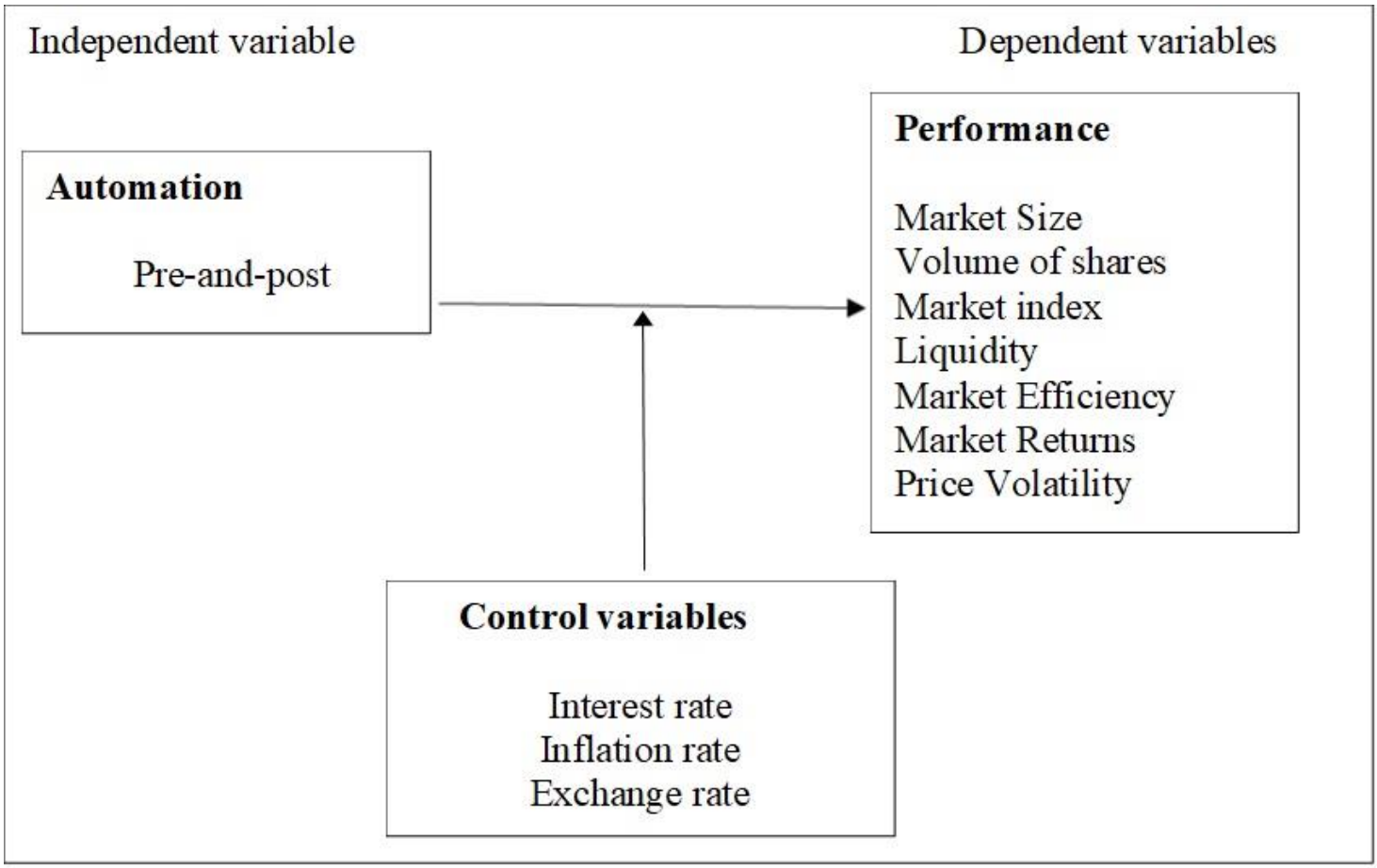


Fig. 2.1 Conceptual framework showing the relationship between automation and stock market performance.

METHODOLOGY

Research Design

This research uses an exploratory design. A technique approach known as exploratory research design looks at research problems that haven't been thoroughly examined before. Primarily exploratory, exploratory research is frequently qualitative. Nonetheless, an exploratory research with a big sample size might also be quantitative. It aims to investigate if the Ghana Stock Exchange's automation has any effect on the exchange's performance. In order to do this, the research creates a multiple regression model and analyzes

ISSN No. 2321-2705 | DOI: 10.51244/IJRSI |Volume XI Issue III March 2024

data from a monthly time series. The data is examined using Pearson correlation analysis and the Variance Inflation Factor to determine the dependability of the findings. The model created for the study is then calculated after that.

Research Philosophy

The study adopts the pragmatism research philosophy. Pragmatism asserts that ideas are only useful when they facilitate action. Pragmatist research begins with a problem and seeks to provide workable solutions that influence practice in the future. (Maarouf, H. 2019).

Data

The study exclusively employs secondary data from the online databases of the Bank of Ghana (BOG) and the Ghana Stock Exchange (GSE). The information includes the amount of stock traded both before and after automation, as well as monthly time series data for the years 2000–2020: pre–automation, from January 1, 2000, to June 30, 2007, and post–automation, from July 1, 2008, to December 31, 2020. Since they are the entities tasked with collecting the data and are the ones collecting it, the information is regarded as credible.

Estimates for the pre-automation and post-automation eras were made in order to distinguish between the performances in those two periods. The implementation periods are removed because the exchange faced institutional and implementation issues that delayed the automation process's full implementation. Consequently, the pre-automation phase is defined as the ninety months that spanned from January 1, 2000, to June 30, 2007, and the post-automation phase as the one hundred and sixty two months that spanned from July 31, 2008, to December 31, 2008. 2020.

The researcher provides a study of the overall efficiency of the exchange for the full period from January 1, 2000, to December 31, 2020, in addition to a comparative analysis of the efficiency analysis. The main goal of this is to determine whether automated trading systems affect stock market performance. It also compares stock market efficiency analyses that take into account technological advancements or manual trading methods with those that take into account technological impact and open outcry systems. (Automated trading system).

Methods

The volume of stocks traded were used as the main source of the basic data for this study, which covered the twenty-year period from 2000 to 2020. This information came from the Ghana stock exchange and Bank of Ghana database. The Data on the Ghana stock exchange were used to obtain information on the performances between the pre automation periods and post automation periods.

Descriptive statistics

In the analysis, descriptive statistics like percentages and charts are used. Regression analysis, which is a type of inferential statistics, is used to analyze how the automated trading system affects trade volume in addition to the control variables (interest rate, exchange rate, and inflation). To assess the exchange's behavior and provide support for the comparison of the pre- and post-automation periods, some trend analysis of the GSE's trading volume is conducted. The study's descriptive statistics, which included details on the number of observations, mean, standard deviation, minimum, and maximum values, were created using the data that were gathered. The following formula represents the Mean for the descriptive statistics

ISSN No. 2321-2705 | DOI: 10.51244/IJRSI |Volume XI Issue III March 2024

used in the study: The studies' descriptive statistics are as follows:

mean = (x). SD= $\sqrt{}$ $(x-xi)$ n

Models and Estimation Techniques

The estimation technique used in this study is the multivariate regression technique as well as the monthly capitalization ratio to measure the role of automation on volume of stock traded and the performance of the exchange. The following models are estimated

$$vol_e = a_0 + a_1 Int_t + a_2 Inf_t + a_3 Exch_e + a_4 D + \varepsilon$$

Where;

vol_e= Volume of shares traded

a_0= constant;

a_1 = coefficient

Int= Interest rate

INF= Inflation

Exch= Exchange rate

D = Dummy Variable

ε = error term

The stock market's performance before and after automation is estimated using the monthly market capitalization ratio. How to calculate the Monthly Market Capitalization Ratio

$$MCR = \frac{Value\ of\ listed\ shares(Price\ x\ Volume)}{GDP}$$

The value of listed shares divided by the GDP is known as the market capitalization ratio, or MCR. Because new instruments are only accessible in the secondary market when more firms enter the market and raise capital, the size of the stock market is a function of the primary market's activity. This metric made the assumption that the capacity to raise capital and disperse risk throughout the economy is positively connected with the size of the market overall (Agarwal 2018). The valuation of the equity securities alone is used to calculate market capitalization. Yartey (2018) used this metric to calculate the Johannesburg Securities Exchange's size.

RESULTS

Introduction

The data acquired for the study is evaluated in this chapter. Before estimating the model developed for the study, various data attributes are examined to measure the behavior of the exchange. Following that, the model developed for the study is calculated.

ISSN No. 2321-2705 | DOI: 10.51244/IJRSI |Volume XI Issue III March 2024

Descriptive statistics for monthly volume of trade

Table 4.1 shows the descriptive statistics for the data utilized in the investigation. The average monthly transaction volume is GH20,074,745. The median of GH8,397,958 implies that the exchange has reported GH8,397,958 in the majority of the months under consideration. The median score of 1 for automation indicates that the data for the months following the GSE's automation are greater than the data before the automation.

Table 4.1 Descriptive Statistics

	Volume	Exchange	Inflation	Interest	Automation
Mean	20074745	2.06	14.94	17.31	0.77
Median	8397958.	1.52	14.05	16.00	1.00
Maximum	1.29E+09	4.48	25.66	26.00	1.00
Minimum	23520.00	0.90	8.39	12.50	0.00
Observations	250	250	250	250	250

Source: Researchers Computation from GSE and Bank of Ghana online database (2023)

Descriptive Statistics on market performance

The findings indicate that the trading system's mean market capitalization was lower before automation (M=.890383) than after automation (M=1.734761). According to market liquidity statistics, things were better before automation (M=-1.98045) than they were after (M=-2.9024). The pattern in liquidity positions is similar to that of market liquidity prior to automation liquidity (M=-1.98045). For the goods examined as part of the market performance, descriptive data are given.

The findings indicate that the trading system's mean market capitalization was lower before automation (M=.890383) than it was after automation (M=1.734761). According to market liquidity statistics, things were better before automation (M=-1.98045) than they were after (M=-2.9024). In terms of market returns, things became a little worse once the automated trading system was implemented, going from M=.003318 to M=.003497. The identical actions.

Measures of skewness and kurtosis, as well as the minimum, maximum, and standard deviation, are also provided by the descriptive statistics. Higher values of the standard deviation indicate lesser quality and, thus, less representativeness of the mean numbers. The standard deviation tells us about the variability of the data. In the case of a symmetric distribution, the index of skewness is 0. A distribution that is negatively skewed is shown by a negative number, and a positively skewed distribution by a positive value.

The degree to which the peak of a unimodal frequency distribution deviates from the normal distribution form is measured by the kurtosis index. A normal distribution has a value of zero; a more pointed distribution than a normal distribution is indicated by a positive value, and a flatter distribution is indicated by a negative value. See Table 4.1.1

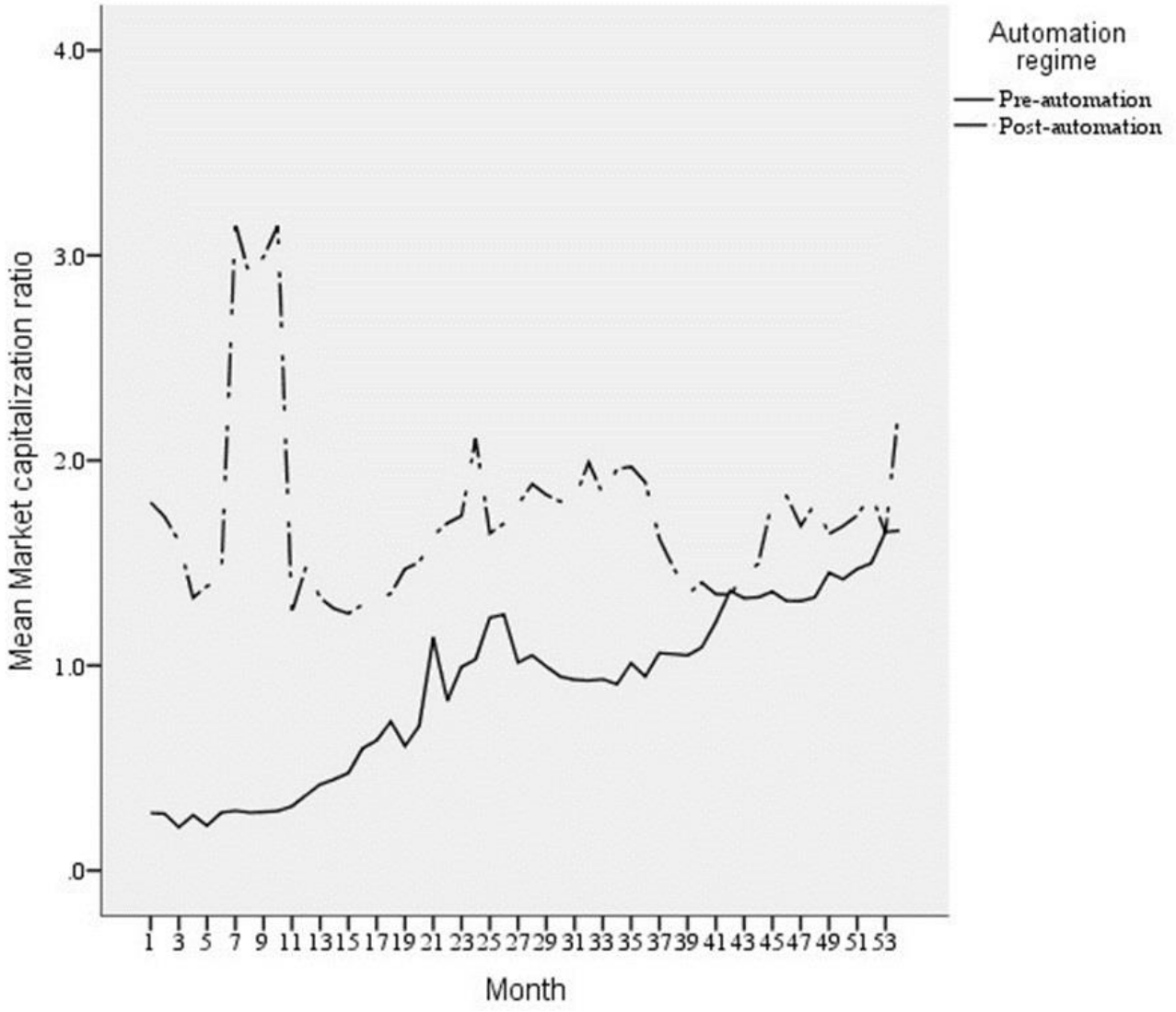
Table 4.1.1: Description of Market Performance Indicators

		n	Min	Max	Mean	Std. Dev.	Skewness	Kurtosis
MCR	Before	54	.2109	1.658	.89038	.43142	-.161	-1.181
	After	54	1.254	3.156	1.73476	.443951	1.898	3.857
Liquidity i.	Before	54	-2.5711	-1.2929	-1.9805	.299263	-.043	-.569

ISSN No. 2321-2705 | DOI: 10.51244/IJRSI |Volume XI Issue III March 2024

	After	54	-3.89	-1.55	-2.9024	.29671	.959	9.209
ii.	Before	37	-3.0960	-.7248	-1.9805	.534132	.385	-.102
	After	37	-4.4496	-.6239	-2.9031	.890632	.316	.050
Returns	Before	53	-.0733	.1013	.003318	.032627	.061	1.185
	After	53	-.0866	.0720	-.0035	.033316	-.223	.447
Market efficiency %	Before	53	-.0733	.1013	.003318	.032627	.061	1.185
	After	53	-.0866	.0720	-.00350	.033316	-.223	.447
Volatility	Pre-std deviation	37	0.0241	0.4997	0.15259	0.07905	2.54	10.011
	Post-std deviation	37	0	0.374	0.12628	0.07500	1.478	3.41
	Prevariance	37	0.0006	0.2497	0.02936	0.04132	4.563	23.618
	Postvariance	37	0	0.1399	0.02142	0.02837	3.033	9.97

Researcher's compilation from GSE annual stock report 2023



ISSN No. 2321-2705 | DOI: 10.51244/IJRSI |Volume XI Issue III March 2024

Stock market performance

Determining the effect of automated trading systems on the performance of the GSE stock market was the study's primary goal. Monthly time series data showed a rise in activity on the stock market, particularly in the first few months after the trading system's automation. A graphical representation of the time series pattern is shown in Figure 4.1, where post-automation market capitalization is typically larger across the study period. There is a higher likelihood of market liquidity declines than increases during the pre-automation period, as indicated by the negatively skewed market capitalization ratio. However, the market capitalization ratio during the post-automation period is positively skewed, suggesting that there is a greater likelihood of gains in the ratio than falls; in other words, the ratios is adversely biased during the pre-automation period, suggesting a higher likelihood of market liquidity declines than increases. However, the market capitalization ratio during the time after automation is favorably biased, suggesting that gains in the ratio are more likely than declines. That is, it is possible to characterize the market capitalization ratio as asymmetric for both eras. The most recent data, however, suggests that the market capitalization increased more quickly after automation

Correlation Analysis

The Pearson Correlation Matrix is shown in Table 4.2. It shows the link among the study's selected pairs of variables. It is clear that the amount of commerce is positively impacted by automation and the control factors (interest rate, inflation, and currency rate). Regarding automation, the view is that there is evidence to support the idea that automation increases exchange volume trading. The GSE's trading volume is positively correlated with the control variables (interest rate, inflation, and exchange rate), indicating that changes in these factors will probably have a favorable impact on the amount of trade. The conventional criterion commonly seen in the literature is that the correlation between two regression model's right-hand side variables shouldn't be greater than 0.80.

Table 4.2 provides evidence that the correlations between the variables on the right-hand side fall under the permitted level. However, it is seen that there is more connection than this threshold between the interest rate and inflation, as well as the interest rate and currency rate, raising worries about multicollinearity. Two regression models are calculated in order to mitigate the potential bias in the findings arising from this issue. First, by generating a model with inflation and exchange rate as the only control variables, the impact of automated trading systems on the performance of the GSE as assessed by trade volume is evaluated. The interest rate serves as the sole control variable in the second model.

Table 4.2 Pearson Correlation Matrix

	Volume	Automation	Inflation	Exchange	Interest
VOLUME	1				
AUTOMATION	0.10	1			
INFLATION	0.05	0.28	1		
EXCHANGE	0.20	0.52	0.58	1	
INTEREST	0.16	0.36	0.81	0.84	1

Source: GSE Website and bank of Ghana online database, 2023

Trend Analysis of Volume of Trade

The capacity of the arcade of the Ghana Stock Exchange (GSE) trend is shown in Figure 4.1. There have

ISSN No. 2321-2705 | DOI: 10.51244/IJRSI |Volume XI Issue III March 2024

been fluctuations in the capacity of securities traded for the past twenty periods (2000-2020). It is observed that volumes of stocks exhibited gradual increase from 2000 to 2004 and fell in 2005. Volumes then rise again to 2008 where automation has been introduce. There is a slight drop in volumes in 2009 but surges in the following year till 2020 although it was not consistent. It is imperative to know that 2016 recorded a very sharp and the highest volume of stock trade ever in Ghana. Although volumes traded have shown an inconsistent movement, increasing and decreasing, dropping, over the years, the graph tends to exhibit an upward trend.

In summary, two major observations are made from figure 4.1. These are the fluctuations and the upward trend of the volumes of stock trade in the capital market of Ghana. Since there is constant certainty in trading volumes and profits, a shifting trend tends to erode investor trust. The upward trend on the other hand tends to suggest the merits of automation era to non-automation era with the motivation to invest.

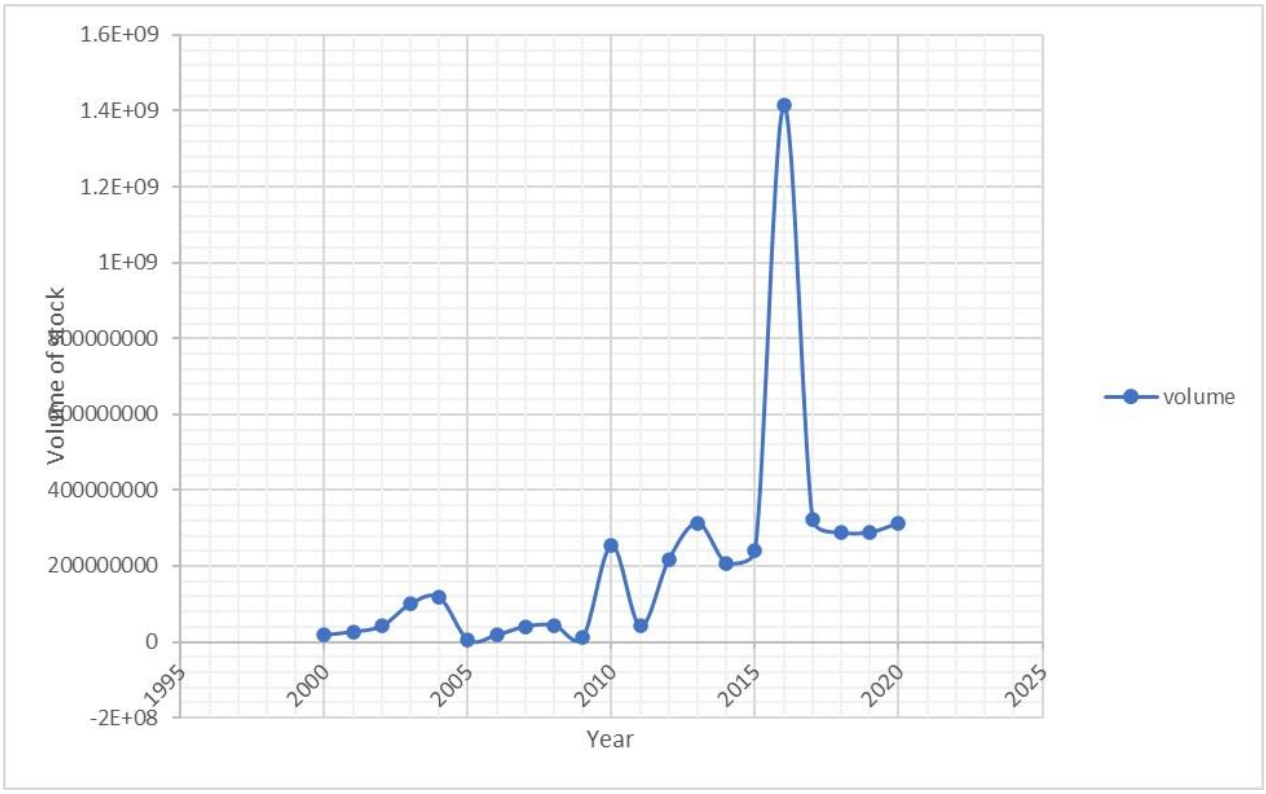


Figure 4.1.1 Distribution of volume traded on GSE (2000-2020)

Source: Serwaa (2023)

Regression Results

There are two aspects in this chapter. The findings are shown in the first chapter as without the interest rate acting as a control variable. The results are shown and discussed in the second chapter as without the use of exchange rates or inflation as control variables. This has been described above as to why. In addition to the previously mentioned, the results in the second portion will also be used to assess how reliable the results are evaluated.

Regression Results without Interest Rate

Table 4.3 portrays the outcomes once interest rate is left out during the analysis. The R^2 of the model is 0.52 which proposes that approximately 52% variants in the volume are attributed to automated trading system as

ISSN No. 2321-2705 | DOI: 10.51244/IJRSI |Volume XI Issue III March 2024

well as the economic indicators within the model. The F-statistic of 41.00 at 1% significance shows that mutually the forecaster variables in the model meaningfully affect capacity of the arcade.

It is assume that the present capacity of the arcade is influence by the preceding month's trade capacity hence a vibrant model is projected where the monthly delay of trade volumes forms part of the expounding variables. The one-month lag in trade volume's positive and statistically significant impact on the current month's trade volume implies that the GSE's volume of trade performance is persistent. At the 1% significance level, Table 4.3's data demonstrate that the coefficient of automation is positive and statistically significant. The obvious conclusion is that the exchange's efficiency has increased dramatically as a result of the GSE's automation. This is not unexpected given the advantages of automation, which include lower transaction costs, simple information access, and faster transaction times.

The exchange rate has also shown a statistically significant positive coefficient. In fact, the coefficient has a 1% significance threshold. This is taken to indicate that changes in exchange are probably going to increase GSE's efficiency. Because they may purchase more shares with a less sum of money due to their currencies' supremacy over the local currency, international investors are more willing to participate in economies with high exchange rate volatility.

The results align with a study by Prashanta and Bishnu (2018), which demonstrates that stock prices and interest rates adversely correlate, explaining the relationship between interest rates and stock market recurrence. In other words, the advance interest rate lowers the value of equity; reduces the propensity of investors to borrow money and purchase stocks, and makes fixed-income instruments more alluring as an alternative to stock ownership.

As a control variable, inflation has a negative coefficient that is statistically significant at the 1% significance level. This is clarified in terms of the detrimental consequences of inflation on investors' portfolio quality. Financial assets might not be appealing during periods of high and erratic inflation as inflation lowers the buying power of income received from them unless they are priced correctly and efficiently. Thus, investors could purchase fewer shares during periods of volatile inflation. The results are in line with a research by Nwugi (2019), which investigates the relationship between stock market volatility and macroeconomic indicator volatility and concludes that macroeconomic volatility, measured in terms of inflation, has a negligible analytical impact on regular market volatility.

The results are consistent with a research by Wuyts (2017), which found that a market is liquid if traders may buy or sell a large number of shares fast without having a significant influence on prices. This has to do with a market participant's willingness to take the opposing side in a deal made by another trader. This conclusion implies that, if a relationship between inflation and stock price fluctuation exists, it should be assumed that there is a positive correlation between the two. Additionally, the outcome suggests that inflation's effect on the stock market is visible from the moment it raises interest rates. An elevated inflation rate corresponds to an elevated interest rate. In a circumstance

Table 4.3 Regression Results: Dependent Variable- Log Volume of Trade

Variable	Coefficient	Std. Error	t-statistic	Prob.
Log Volume of trade(-1)	0.29	0.08	3.62	0.0004***
AUTOMATION	1.21	0.37	3.30	0.0012***
INFLATION	-0.08	0.03	-2.65	0.0090***

ISSN No. 2321-2705 | DOI: 10.51244/IJRSI |Volume XI Issue III March 2024

EXCHANGE	0.73	0.16	4.48	0.0000***
CONSTANT	9.42	1.10	8.55	0.0000***
R^2=0.52; F-statistic=41.00(0.0000) N=155				

*** represent 1% significance level

Source: GSE 2023

Regression Results with Interest Rate

The model for this study is estimated again, but this time it does not take exchange rates or inflation into account as control variables. Instead, the interest rate is the only control variable. This action's rationale is outlined above. The results are displayed in Table 4.4. Its R2 value is 0.47. This suggests that the model can account for 47% of the variation in the GSE's trading volume. The F-statistic of 44.08 at the 1% significance level indicates that the predictors in the model jointly and significantly explain the changes in the volume of trading of the GSE. The GSE's volume of trade performance is persistent, as evidenced by the positive and statistically significant coefficient of the one-month lag of trading volume at 1%. In terms of automation, Table 4.4's result confirms Table 4.3's findings. Once more, the results are consistent with a study conducted by Nwokoma (2020) on the long-term relationship between the market and a few macroeconomic indicators.

The study concludes that the only factors that have a long-term relationship with the arcade are industrial production and interest rates, as measured by the 3-month commercial bank deposit rate. The results, however, are at odds with a study by Prashanta and Bishnu (2018), which discovers that stock prices and interest rates adversely correlate as the reason for the relationship between interest rates and stock market recurrence. The result suggests that higher interest rates reduce the value of equity as predicted by the dividend discount model, increase the cost of holding commercial property, which in turn impacts turnover, and make fixed-income securities more alluring as an alternative to stock investments.

Table 4.4 Regression Results: Dependent variable- log Volume of trade

Variable	Coefficient	Std. Error	t-statistic	Prob.
Log Volume of trade(-1)	0.44	0.07	6.07	0.0000***
AUTOMATION	1.38	0.38	3.63	0.0000***
INTEREST RATE	0.05	0.03	1.55	0.1229
CONSTANT	6.37	0.99	6.40	0.0000***
R^2=0.47; F-statistic=44.08(0.0000) N=250				

*** represent 1% significance level

Source GSE 2023

ISSN No. 2321-2705 | DOI: 10.51244/IJRSI |Volume XI Issue III March 2024

DISCUSSION OF THE FINDINGS

Discussion of results on the role of the automated trading system on stock market performance.

The finding of the research show that there were a lot more trades at any given price during the pre-automation era, which led to lower transaction costs, resulting in a huge increase in the market capitalization ratio (Yartey and Adjasi, 2017). The securities market may see an increase in trading frequency as a result of several minor deals made possible by the decreased transaction costs. Reduced transaction costs might also be linked to more activity in the main market, which would expand the size of the market overall.

Automation plays a significant role in market liquidity by enabling equities traders to execute stock deals more efficiently and affordably when necessary. Although the initial cost of launching an electronic exchange may be higher than that of floor-based exchanges, over time, operating expenses associated with an electronic exchange are significantly cheaper. It's common knowledge that floor-based exchanges have higher trading expenses than computerized exchanges. (Song, Tan and Wu, 2015).

Since liquidity has decreased generally, the current analysis indicates a considerable difference between the liquidity situation before and after the exchange's automation. According to Maxfield (2019), the degree to which trading is automated, dependent on orders or quotations, or if it is negotiated, is a crucial characteristic that sets exchange trading systems apart. The main problem is that as automated trading increases, so do transparency and surveillance capabilities. However, negotiated trading can increase volume and liquidity, which are crucial indicators of a successful stock market. The main players in negotiated trading are dealers, traders who work for themselves and sometimes as brokers for customers. By taking on risks that other market players are unwilling to take, they provide a market-making role that may be quite significant in emerging stock exchanges.

The securities exchange may be seeing a reduction in employee engagement, which might be the reason behind the decline in liquidity. As of right now, we know that human intermediaries are necessary for two main reasons. First, an intermediary may be able to uncover hidden liquidity that enhances and expedites client order matching by having a thorough understanding of the market and its participants. The matching function has a greater value when trade volume is lower and finding matches is more challenging. Second, in circumstances when information asymmetry is considerable, regular communication between an intermediary and its customers helps it to protect against well-informed trades and offer better price to clients. In support of this, the study finds that automation has a beneficial effect on stock market performance. As a result, automated trading systems promote trade activity and liquidity while reducing expenses and inefficiencies in stock markets. This suggests that automation increases the stock market's efficiency. The currency rate and automation (the Ghana Stock Market's performance) had a substantial positive correlation (β=1.826; ρ=0.000). This indicates that the performance of the Ghana Stock Exchange Market increases by 1.826 for every 1.826 increase in the exchange rate.

The results are in line with a research by Naidu and Rozeff (2020), which claims that automated trading systems speed up the spread of prices, especially when fresh information enters the market. The results are in line with a research by Naidu and Rozeff (2020), which claims that automated trading systems speed up the spread of prices, especially when fresh information enters the market. Without it, investors are more likely to trade or make use of the disclosed information as prices and trading volume are available more quickly, which is expected to improve market efficiency.

The results are in line with a research by Prashanta and Bishnu (2018), which indicates that a negative correlation exists between stock prices and interest rates, explaining the relationship between interest rates and stock market recurrence. This means that higher interest rates lower the value of equities, increase the

ISSN No. 2321-2705 | DOI: 10.51244/IJRSI |Volume XI Issue III March 2024

appeal of fixed-income instruments as an alternative to stock ownership, and perhaps lessen investors' propensity to borrow money and buy stocks. Ultimately, these factors will enhance the stock market's performance.

This indicates that the study adopts the alternative hypothesis, according to which the Ghana Stock Exchange Market is statistically significantly impacted by Automated Trading System and that it influences stock market performance. The research demonstrates that the pre- and post-automation eras can be clearly compared.

Discussion of results between pre automation period and the post automation period on the volume of stock traded.

The second objective of the research attempts to ascertain the comparison between pre automation period and post automation period on the arcade. The multiple regressions are conducted to assess how the manual system of trading and the automated system of trading identified influence the Ghana stock exchange market (Table 4.5).There is a strong correlation (adjusted R-square=0.723) between the independent variable (automation) and the dependent variables (interest, inflation, and exchange rates). The independent factors influence almost 75% of the overall variability in automation, according to the corrected R-square score of 0.723.

The regression model's degree of good fit was determined using the F statistics. Given that the significance threshold is less than 0.05 (p=0.000), the regression model is consequently regarded as having a good fit, according to the F-statistics score of F (3, 68) 62.634, ρ= 0.000). This indicates that the study adopts the alternative hypothesis, according to which the Ghana Stock Exchange Market is statistically significantly on Automated Trading System and that it influences on stock market performance.

According to the report, the economy's macroeconomic policies are typified by substantial fluctuations in exchange rates, high interest rates, and variable and typically high inflation. These variables make it difficult for medium- to long-term investors to see the macro environment clearly.

There was a substantial positive correlation between the currency rate and automation (the performance of the Ghana Stock Market) when the inflation and interest rates were held constant ($\beta = 1.826$; $\rho = 0.000$). This indicates that the performance of the Ghana Stock Exchange Market increases by 1.826 for every 1.826 increase in the exchange rate. The results are in line with a research by Benimadhu (2020), which identifies the exchange-specific issues that are troubling stock markets as being restricted listed businesses, low liquidity levels, and tiny size of the exchange.

When the exchange rate and inflation rate were held constant, there was a substantial positive correlation between automation and inflation ($\beta = 0.044$; $\rho = 0.003$). This implies that for every 0.044 unit increase in the inflation rate, the performance of the Ghana Stock Exchange Market increases by 0.044. The results support the hypothesis that, excluding other factors, the inflation rate will fluctuate favorably in response to changes in stock prices (Sogu, 2020). The result suggests that there is a tendency to compensate for a substantial increase in interest rates when both inflation and interest rates are high.

While automation kept inflation and exchange rates unchanged, there was a statistically significant negative interest rate (β=-0.056; ρ=0.044). This means that the performance of the Ghana Stock Exchange Market falls by 0.056 for every unit increase in interest rates, and vice versa. The findings are consistent with a study by Prashanta and Bishnu (2018), which shows that interest rates and stock prices have a negative correlation, which explains why interest rates and stock market recurrence are related.

ISSN No. 2321-2705 | DOI: 10.51244/IJRSI |Volume XI Issue III March 2024

Table 4.5 multiple regression of macroeconomic variables and automation

Automation	**Coef.**	**St.Err.**	**t-value**	**p-value**	**[95% Conf**	**Interval]**	**Sig**
Exchange	1.826	0.154	11.88	0.000	1.519	2.133	***
Inflation	0.044	0.015	3.03	0.003	0.015	0.073	***
Interest	-0.056	0.027	-2.05	0.044	-0.111	-0.001	**
Constant	-1.269	0.276	-4.61	0.000	-1.819	-0.719	***
Mean dependent var	0.500			SD dependent var		0.504	
Adj R-squared	0.723			Number of obs		72.000	
F-test	62.634			Prob > F		0.000	
*** *p<0.01, ** p<0.05, * p<0.1*							
Source: GSE Website (2023)							

Further Check

The model created for the study is re-estimated without any of the control variables to further verify the validity of the conclusion that the automation of the GSE has enhanced its performance in terms of trade volume. The results are shown in Table 4.6. The results imply that the GSE's automation has had a significant influence on the exchange's performance. The results align with Yartey and Adjasi's (2017) study, which indicates that automation reduces inefficiencies in African markets while boosting trade activity and liquidity. In addition to minimizing costs associated with the open outcry scheme, automated trading schemes help speed up exchange operations and procedures (Yartey & Adjasi, 2017). The results also concur Using a research by Venkataman (2021), he compares Euro Next Paris (totally screen based) with the New York Stock Exchange (NYSE), which includes a trading floor, for a group of comparable assets, and comes to the conclusion that spreads are smaller on a floor base exchange than on an electronic exchange. The findings are also consistent with a research by Theissen (2020), which provides direct evidence by establishing a parallel operation between the Frankfurt Stock Exchange's floor and screen-based trading scheme and concluding that the automated trading scheme offers small spreads for liquid equities.

Table 4.6 Regression Results: Dependent Variable- Log Volume O Trade

Variable	Coefficient	Std. Error	t-statistic	Prob.
Log Volume of trade(-1)	0.47	0.07	6.49	0.0000***
AUTOMATION	1.50	0.37	4.04	0.0000***
CONSTANT	6.85	0.95	7.21	0.0000***
R^2=0.46; F-statistic=64.32(0.0000) N=250				

*** represent 1% significance level

Source: GSE online database 202

ISSN No. 2321-2705 | DOI: 10.51244/IJRSI |Volume XI Issue III March 2024

SUMMARY OF FINDINGS, CONCLUSION AND RECOMMENDATIONS

Introduction

This chapter summarizes the results, draws conclusions, and offers suggestions. As a result, the chapter is split into three portions. The primary conclusions of the study are outlined in Section 1. The study's conclusion is given in Section 2. The study's suggestions are presented in Section 3.

Summary of Findings

The role of the automated trading system on Stock Market Performance

The research proves that automated trading system improves the efficiency of the stock market. As a result, automation promotes trading activity and liquidity while reducing expenses and inefficiencies in stock markets. This suggests that automation increases the stock market's efficiency.

Comparison between Pre automation periods and Post automation periods

The results of the study show that the volume of stock traded before and during the automation period differed significantly. The analysis's findings demonstrate a notable shift in the volume of stocks traded following the introduction of this new trading mechanism. The findings also demonstrate a favorable functional link between automation and trading volume. This suggests that the automation system's functionality—or operation—determines whether the volume of shares traded rises or falls. Nonetheless, there is a lag function in the link between automation and the amount of stocks traded, making the association noteworthy.

The analysis finds that the economy's macroeconomic policies are typified by erratic and typically high inflation, high substantial fluctuations in currency rates and interest rates. These variables make it difficult for medium- to long-term investors to see the microenvironment clearly.

Conclusion

The study assesses the role of the automated trading system on Stock Market performance. The study only uses secondary data from the internet databases of the Bank of Ghana (BOG) and the Ghana Stock Exchange (GSE). The data set comprises monthly time series data from 2000 to 2020 that is evaluated using the multivariate regression approach, as well as the volume of stocks traded before and after automation.

The study comes to the conclusion that automated trading systems significantly affect market efficiency based on its findings. It goes on to say that automation, interest rates, and exchange rates all have a favorable effect on the amount of stocks traded.

Once more, the study comes to the conclusion that there is a substantial difference between the pre- and post-automation periods and that the macroeconomic policies of the economy are typified by high and unstable inflation huge fluctuations in currency rates and high interest rates.

Recommendations

1. **Automated trading system have a significant impact on stock market performance**

The study's conclusions demonstrate that automation significantly affects the stock market's performance. According to the study, online discount trading services should be improved as automated trading on the exchange progresses. This is more suitable for people who need quick execution, low commissions, and the

ISSN No. 2321-2705 | DOI: 10.51244/IJRSI |Volume XI Issue III March 2024

know-how to make trading decisions without the assistance of a licensed stock broker. Additionally, in order to increase the market's efficiency, data and other information on the security market should be readily available to the general public, particularly prospective investors.

2. **There is a significant difference between pre automation period and post automation periods**

A. The study shows that automation has a bigger influence on the exchange's performance than the manual approach, which should help to increase public trust in GSE's operations. In addition to automating the process to increase transparency and speed, the securities exchange must advance the demutualization process to allow the broader investor community to participate in its structure and management.
B. The last Finding show that the GSE's liquidity situation deteriorated. According to the report, the GSE should ascertain whether of the services that human intermediates originally offered can no longer be replicated in a completely automated trading system. According to theory and previous research, human intermediation is most beneficial in thin trading and high information asymmetry situations. The two variables have a strong correlation.

Suggested Further Studies

Upon the results from the research, In order to firmly support automation's influence on the Ghana Stock Exchange, more research on the subject ought to use appropriate economic data and take a longer time frame into account.

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