

**EFFECT OF TRADING VOLUME ON VOLATILITY OF STOCK RETURNS OF
FIRMS LISTED AT NAIROBI SECURITIES EXCHANGE**

BY

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DECLARATION

This is my original research project and has not submitted to any other university or examination body.

Signature  _____

Date 29/08/2022

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This research project has been submitted for examination with my approval as university supervisor

Signature  _____

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DEDICATION

I am dedicating this wonderful piece of work to great people in my life. The process reminds me of conveyor belt where you assemble lots of material, rely on lecturers and friends for guidance, support and mentorship. Special thanks to my mother, Mrs. Teresa Karakacha for always pushing me towards academic excellence. I promise to keep soaring to greater heights.

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LIST ABBREVIATION AND ACRONOYMS

| | |
|-------------|---|
| ATS | Automated Trading System |
| CMA | Capital Market Authority |
| EMH | Efficient Market Hypothesis |
| EPS | Earnings per Share |
| FDI | Foreign Direct Investment |
| GDP | Gross Domestic Product |
| KNBS | Kenya National Bureau of Statistics |
| NSE | Nairobi Securities Exchange |
| ROA | Return on Assets |
| ROE | Return on Equity |
| SPSS | Statistical Package for Social Sciences |

ABSTRACT

Stock Return Volatility postulates the direction and the likelihood of the performance. The greater volatility means the greater risk premiums resulting from the investment. The research objective is to assess the effect trading volume volatility of the stock returns of the firms listed at NSE. The research was reinforced by three theories which include; signaling theory, Efficient Market Hypothesis and prospect theory. Moreover, the internal factors such as trading volume and trading size were critical stock return volatility as well as performance and leverage. The study maximizes descriptive research design as a tenet of this research since it reinforces the inference and interpretation. This research targeted 64 companies listed in NSE under the interval of 6 years. Additionally, secondary data utilized spanned from 2016 to 2021. The data computation was accomplished via SPSS techniques. The study maximized the multiple regression analysis. The data normality test was undertaken to assess if the data follow the normal distribution pattern. Furthermore, autocorrelation and multicollinearity were determined through the use of Durbin Watson and Variance Inflation Factor respectively. Autocorrelation value was within the normal accepted range. The condition here is that if the p value of both test in every variable is below 0.05 hence postulates that data was normal distribution. The principle here was that if the VIF values obtain are below 10 and the tolerance values bigger than 0.2 concludes the non-presence of multicollinearity. The dataset was relevant and crucial for investigation and interpretation. From the training it is very imperative to postulate that trading size was highly fluctuating followed by stock return volatility. Nonetheless, ROA was smallest fluctuating among the variables prioritized in the computation. The R which is coefficient of determination is 0.615. Additionally, this value 0.615 implies a strong correlation among the variables under the assessment. The R square, Coefficient of determination stipulated by 0.378. Therefore, this indicates that 37.8% of change in variation of stock return volatility is caused by the predictor variables captured in this study. These explanatory variables incorporate; trading volume, trade size, ROA and leverage. The remaining 62.2% of change in variation is caused by factors not captured in the above. A unit change in trading volume results to a negative effect of 0.129 on Stock return volatility when all other factors are held at constant. A single unit change in trade size results to a negative effect of 0.008 on stock return volatility. A single unit increment in ROA triggers an increase in stock return volatility by 0.710 when all variables are kept constant. Finally, an increase of leverage triggers movement to the same direction (positive effect) on Stock Return Volatility of 1.039 respectively when all other factors are kept constant. The researcher recommends for examination of macroeconomic determinants verse the stock returns. The sectorial research can be enhanced to increase the knowledge and understanding. In a nutshell, specific variables such as the nature of economic variables, inflation, and fragility index should studied in conjunction to stock return volatility.

CHAPTER ONE: INTRODUCTION

1.1 Background of the Study

The global financial market has undergone tremendous changes due to varying frequencies, fast growth, technological advancement, numerous participants, and the increase in trading volumes. The fast growth and innovations have been linked to technological advancement which has turned the whole world to operate like a village. The advancement in technology has contribute to changes in trading volume volatility. Agunda (2019) stipulated that the utilization of high-speed computer has increase the volume of demand for the financial assets. The prevailing trends in the stock market stipulates the growth of financial markets and advancement at alarming rate (Chebbi & Jebnoun, 2016). The changes in global markets have been the source of discovery to the investors on volatility of the financial market. The investors have sought more knowledge concerning the risks and returns. Many investors have demonstrated great interest in fundamental and technical knowledge and analysis. The decision-making process is done after due diligence as well as the consideration of many aspects. In a nutshell, the stock prices volatility is affected by the flow of information (Mamtha & Srinivasan, 2016). Fama (1970) stipulated that the prevailing stock prices reflects all the security information.

The study is anchored by Efficient Market Hypothesis (EMH) formulated by Fama (1965). The EMH presupposes that stock market is efficient. This postulates that all the information is reflected on the prices of stock in the market. The available information is utilized in the market. Furthermore, Prospect Theory by Kahneman & Tversky (1979) opined that, investors make decision based on the perceived gains. The theory is more of psychology since it focuses on the loss aversion and categorizes the participants into risk averse and risk takers. Finally, Signaling

Theory stipulates a fundamental role play by the information in the market. Information asymmetric has been a great challenge in the financial market. Therefore, building of portfolio is cumbersome in the financial market with informational asymmetric.

Aljafari and Hazem (2015) stated that the crucial role of the forecasting power of stock returns volatility. The issues on the prediction of the expected returns are very paramount in the investment and the returns. The efficient market is crucial for investment and prediction of that expected returns. Ahmed (2009) postulated that efficient market presuppose that the investors do not utilize the information associated with price while forecasting on the stock returns. Trading volume is cardinal in the determination of the market strength. Trading volume has been paramount for the scholars, researchers and investors in the financial market. Al-Jafari & Tliti (2013) critically analyzed the stock price utilizing longevity causality from return verses the trading volume and found the positive association. Therefore, it important to note that volatility of stock is paramount in economic growth.

1.1.1 Trading Volume

Trading volume is cardinal parameter to show quantities of shares changing owners in a specified security period. The total amount of shares fluctuates periodically grounded on the information available in the market. The information is not limited to expiry of the contracts and full or half day trading. Wang (2002) opined trading volume is the very fundamental in the price forecasting. Trading volume is very important in the economy and the stock market.

The information release periodically is useful in the decision making. Furthermore, the investors face great challenges in cases of asymmetric information. The information available for the investors is useful for the decision making. The decision is anchored on the expected return and risk. Trading volume is very important in the decision making. It stipulates when to buy and to sell the securities. The turnover and trade size are crucial pillars of investors' decision making (Agunda, 2019).

Trading volume is very critical in the stock prices. The greater the trading volume the higher the stock prices and vice versa. Liivamag (2016) utilized quantity to measure the trading volume. Nicolosi (2009) opined the use of turnover trade. Trading volume portray the overall activity. It blueprints the operationalization of the financial market. It is a pivotal factor in technical analysis. Furthermore, the investors incorporate the trading volume to indicate the trends in the financial market. The trading volume is measured through the analysis of shares and contracts changing owners in a particular time.

1.1.2 Stock Return Volatility

Stock Return Volatility is the fluctuation of prices based many factors. Stock is a form of ownership in certain percentage. The greater the percentage of shares purchase, the greater the right to own the firm and vice versa (Frimpong, 2010). Returns reflect the financial rewards resulting from the investment. Batta (2014) indicated that stock volatility is imperative for the interpretation and understanding of market performance. It is very important in the determination of futuristic performance.

Stock Return Volatility indicates the direction and the likelihood of the performance. The greater volatility is an indicator of probable decline in the financial market. However, the lower volatility postulates the likeliness of increasing market. The information plays significant role in the sound judgment by the investors. The comprehensive and detailed information is a game changer in the financial market. Agunde (2019) opined that, investors are rational and incorporates the market volatility to give accurate results on how the stock are vulnerable.

Stock Return Volatility has been subjected to several measurements. Rajput & Kakkar (2012) used variance by comparing the previous and the current prices. A great fluctuation reflects high volatility while the low volatility postulates a low volatility. The volatility directly affects the economy. The greater volatility means the greater risk premiums resulting from the investment. The shifting from highly volatile investment to lowly volatile investment is interpreted to mean the presence of large number of risk-averse investors. Pinjaman & Arala (2017) stipulated the use of EGARCH. Some studies the standard deviation to measure the stock price volatility.

1.1.3 Trading Volume and Stock Return Volatility

Trading Volume and Stock Return Volatility are intertwined. Karpoff (1987) presupposed that trading volume drives the prices. Furthermore, the researcher stated that both variables are fundamental in the determination of structure of financial market. Moreover, the information is useful in forecasting. The predictive power in the stock market cannot be ignored. The investors are determined to reap big from their investments.

Aljafari and Hazem (2015) asserted that trading volume and stock return volatility have positive correlation. Furthermore, Batta (2014) reinforced the earlier findings by stipulating that trading volume is positively associated with stock return volatility. Tapa & Hussin (2016) posited that they are positively associated. The association has received substantive attention to enhance speculation. Trading volume and stock return volatility moves to the same direction based on the magnitude and direction.

1.1.4 Nairobi Securities Exchange

In 1954, NSE was formed as voluntary organization to enhance trade by the stockbrokers. It was officially registered in July 2011. The first registration was named as Nairobi Stock Exchange Limited and later changed its name to Nairobi Securities Exchange. NSE is second in Africa after Johannesburg Stock Exchange. The evolution and development of Nairobi securities exchange has been the game changer in the financial market.

The financial instruments including derivatives, debts and equities among other have been key in the operation. The NSE have seen development and major changes to fit the current demands. NSE was further changed in September 2011 to company limited by shares from being limited by guarantee. NSE is the powerful financial securities market. It has recorded drastic increase in trading volume. The bourse is fastest growing in Sub-Saharan Africa. It is licensed and authorized by CMA to operate (NSE, 2022). Volatility is crucial yardstick in the functionality of the financial market. The investors are motivated by higher return, however, higher volatility portray unpredictable prices at NSE therefore driving investors away. The association of trading volume and volatility at NSE is associated with the prevailing information in the market.

1.2 Research Problem

The financial market has been characterized by high risk and unpredictable return. The market is risk may not be easily estimated (Batta, 2014). The volatility is very fundamental since it is very crucial for technical analysis. The price-volume association are the key indicators of the financial market state. The research on the price, return and volatility must be emphasized to enhance knowledge and skills in the prediction and speculation. It increases the understanding and knowledge required in the financial market.

The global markets have emphasized on the financial markets. Gworo (2012) used correlational research design to come up with far-reaching conclusion. The research optimized secondary data and posit that trade volume are positively associated with price volatility. The volatility experience in the financial market has direct impact of the economy. Batta (2014) stated that return fluctuation are critical for analysis for future speculation why paying key attention to the volume. The gradual rise in the trading volume has also increase the GDP (Mwaniki, 2017). The higher the number of sales by foreigners, the higher the volatility. Therefore, it is crucial for the local investors to purchase stocks. Agunde (2019) stipulated that trading volume and stock price return are critical for sound decision making and investment. Kenya has experienced increase in economy growth resulting from investments.

Globally, Boonrorachote & Lakwa (2016) studied trading activity and the stock volatility. The findings demonstrated a positive association. Karaa, Slim & Hmaied (2017) analyzed the trading volume and volatility. The research posited that the presence of well-informed investors increased the volatility. Alsamman & Al-Jafari (2015) found that stock return is positively associated with

volatility trading. The empirical studies demonstrated a practical method that favored the investors. The decrease in market performance leads to weak economic growth hence do not enhance holistic development and investment.

Several researchers have tried to explain the link between the trading volume and the stock return price volatility. Gworo (2012) studied the price instability and the shares trade volume. The research findings posit a positive association. Furthermore, Batta (2014) look into the trading volume verse the stock price volatility and concluded on the positive association. Agunde (2019) stated that trading volume informs the stock price volatility since they move in the same direction. Notwithstanding the global and local research, the findings have been inconclusive hence living contextual, conceptual as well as methodological gap that is address by this study. It is very imperative to note that, this subject need more emphasize, comprehensive and interactive knowledge to enhance the speculation and high returns. This research seeks to answer the question on; what is the effect trading volume volatility on the stock returns for the firms listed at NSE?

1.3 Research Objective

The research objective is to assess the effect trading volume volatility of the stock returns of the firms listed at NSE

1.4 Value of the study

The study is very incredible for theoretical reinforcement and establishing the gaps that need further analysis. The theories are analyzed with clarity and comprehension. The study blueprints the areas that need more focus and analysis. The study is critical for policy makers especially in

charting the way forward for investors, speculation and business continuity. It provides substantial impact in the financial market analysis.

Knowledge of trading volume and stock price volatility help in making sound decision on the economic development. The study enables the participants to make good investment decisions hence avoiding the risk. The research blueprints the link amid return, volatility and the volume. These are the key pillars of financial markets. The knowledge is important for speculation and hedging.

The scholars and academicians will incorporate this as one of the reference materials for future studies. It acts as the source of knowledge. This strengthens the decision making and provide the credible information. Notable, scholars and analyst can make informed conclusion by using this as a benchmark for their analysis. It very paramount in building knowledge for transfer.

The research is essential for the academic nourishment and problem solving. It is vital for economic diversification. The companies as well as the regulatory body can utilize the findings in the policies formulation. The study will pinpoint the tremendous economic strides that need special attention.

CHAPTER TWO: LITERATURE REVIEW

2.1 Introduction

This chapter presents theories reinforcing the study, the determinants of stock return volatility, the empirical review, conceptual framework and summary. The chapter is crucial for creating roadmap linking the previous studies and current research. It highlights the loopholes and the gaps and provide holistic perspective aiming at solving the prevailing problems. Theories are crucial in setting stage for this research while empirical studies provide comprehensive analysis and efforts from the previous researchers. In a nutshell, the chapter is distinctive since it introduces the specific variables and their association.

2.2 Theoretical Framework

This section composes of the theories that underpin the title under the examination. It anchors the concepts to illuminate reference in relation to the efforts by the preceding scholars. The research is guided by three theories which include; signaling theory, Efficient Market Hypothesis and prospect theory.

2.2.1 Signaling Theory

Signaling theory formulated by Spence (1972). The theory relates to information asymmetric in the financial market. The volatility in the market can be inform by asymmetric information. It is a great pillar in the financial market. The managers have greater information than investors about the firm. The information of signals can be directly observable while in many cases it requires deep and comprehensive analysis. The valuation of firms posits a crucial information about the going concern of the company.

The positive criticism on the theory is that it has been applicable in the financial market. The theory has demonstrated the power of information. The information asymmetry is very unfair in the market. The management can utilize to give fictitious results to the investors. The financial securities will have great volatility which is not good for the prediction. The market participants should have same information. The efficient market dictates the provision of similar information to investors to make informed judgment on stocks. The greater the information received by the investors the higher the confidence level.

The association between the signal theory and stock prices is supreme. The provision of wider firm information increases the predictability and earn the trust of the investors. The company with greater disclosure has greater confidence. The greater the level of confidence, the higher stock price. Gworo (2010) opined that signaling is a tenet of communication relaying paramount information and instilling confidence.

2.2.2 Efficient Market Hypothesis

The Efficient Market Hypothesis (EMH) was formulated by Fama (1970). EMH is very important in financial market. Degutis & Novickyte, 2014 opined that EMH has been useful in capital market. The trading volume and volatility of stock returns has been dictated by the efficient information in the market. The EMH is very important in the capital market. It is useful in the financial securities analysis and forecasting.

However, the theory stipulates that market timing is not important. The investors usually buy voluminous undervalued stocks and resale in the market when it is overvalued. EMH neither pay

keen attention to fundamental nor technical analysis. The analyst has earned through both technical and fundamental. EMH is very important in the availability of information to all the investors to save their time and resources though affected by the aforementioned shortcomings.

EMH has been cardinal in the speculation of stock prices and the volatility. The information has enhanced prediction and created in depth understanding of the price movement. EMH has weak, semi-strong and strong that give different perspectives on the stock prices. Weak EMH opines that stock prices reflect past data, while semi-strong insinuate that the current prices are the reflection of current and past data. Strong EMH states that all the past, present and future information are reflected on the prices. EMH is important since it saves time and relays the important information to the investors (Kiprono, 2014).

2.2.3 Prospect Theory

The theory was formulated Kahneman & Traversky (1979). The theory asserts that the investors views losses and gain in varying perspective. The theory states that investors valuing prospect theory are characterized by risk aversion whenever there are gains and risk-seekers when they experienced losses. The financial market has risk aversion, risk seekers and loss aversion. The prospect theory opines that participant assess the results linked to the risk aversion in gain and risk seeking arena. The decision making is informed by the anticipated gains and losses. The theory does not incorporate the psychological explanation. Psychology is fundamental since the human emotional and effective responses depend on it. The investors utilize various methods to approximate the gains and losses (Agunde, 2019).

The prospect theory has been useful in the research. It stipulates the decision making about the investment based on the rationality of the investors. The theory is crucial since the decision-making process is informed by trading volumes in the financial markets. It explains the candid role of the investors in the price volatility and stock returns. Darwish (2015) postulated that investors' pattern of purchase and sale results from trading activities and prediction by relying on the past trades.

2.3 Determinants Stock Price Volatility

This section provides a roadmap on the determinants that causes changes in stock price volatility. The causes are numerous ranging from economic to non-economic factors. Macro-economic factors give chief latitude to the stock volatility. Macroeconomics factors have significant effect. The internal factors such as trading volume and trading size are very important in the stock price volatility.

2.3.1 Trading Volume

Trading Volume has been measured using different methods. The scholars have tried to use trading turnover to justify. Moreover, the number of shares traded daily or even monthly have also be useful in measuring the trading volume (Agunda, 2019). The research to determine the substantial impact of trading volume on volatility is very important to shed more light. The investors have used different analysis method in order to reap from stock price volatility.

2.3.2 Trade Size

Trade size is key driver in the analysis of stock price volatility. The trade size has been quantified by the use of shares sold and bought. It is a vital aspect in the stock market arena. Agunda (2019)

calculated trade price using the number of shares bought and multiplying by standardized price. There is minimal research on trading size and volatility in the market. The aggregated shares pinpoint the trade size during a particular period.

2.3.3 Debt to Equity Ratio

The company financial health is very important in the stock price volatility. The financial level shape the pattern of trade by the investors. The company with stable financial health tends to have low stock price volatility compared to firms with varying debt to equity ratio during different times. The financial analyst while doing both fundamental and technical analysis should be interest on the debt-to-equity ratio. The growth of firm is very important in the long-term increase in stock prices. Schwart (1989) stipulated that the moves in the business cycle are critical consideration that determines the stock prices.

2.3.4 Return on Assets

The return on assets is an indicator of profitability of the firms. Higher ROA stipulates the efficient, effective and productive firms in consideration with the aggregate assets. The strategic plan of each firm is reaped big rom their total assets (Agunda, 2019). The investors can gauge the efficient through ROA. Total assets are bundles of resources that are useful in the generation of profits. ROA elaborates growth and have effects volatility of prices. The decreasing ROA is an indicator that firm is decreasing in their performance.

2.3.5 Inflation

Inflation is one of the macroeconomic factors that causes some influence in the volatility. Inflation is the continuous increase in prices of goods and services. The skyrocketing prices has influence on the purchasing power. Ngugi (2017) postulated that inflation affect the of share price volatility. Some researchers have come up with numerous findings on this area. (Tamunosiki & Ejiodan, 2017) also examined inflation and stock prices move in the same direction.

2.4 Empirical Studies

Mutalib (2011) examined the association between trading volumes and returns. The research was done in Nigeria. The research considers Granger Causality tests to assess the dynamic that informs the return-volume with the consideration of daily stock. The analysis run across 27 entities listed in Nigerian Stock Exchange. The period of study was from 2009 to 2010. The findings postulate positive association and recommend further research to determine the influence of inflation on price volatility. The research was undertaken some years ago and the current study is needed.

Al-Jafari & Tliti (2013) analyzed via empirical test the impact of trading volume on the return volatility. The study concentrated on the banking sector using longevity causality. The research utilized descriptive design and collected secondary data for in depth analysis. The findings indicated significant and positive association. However, the research was undertaken in the global arena hence there is need for the local research.

Tripathy (2011) assessed the link between stock return and the trading volume. The study was undertaken in Indian Stock Market. It employed Bivariate Regression Model for the analysis. Furthermore, VECM model was used in the time series. The study period span from 2005 to 2010. The study finding demonstrated bi-directional causality. The research utilizes the

decomposition technique in the comparison of trading volume verse the stock return. The conclusion asserted that price change possesses information that is useful in forthcoming trading activities. The research was undertaken some years ago and there need for the current study.

Attari et. al (2012) undertook the investigation on the relation amid the trading volume and the returns. The research was undertaken in Pakistan. The research employed different techniques to arrive at the findings. It included the use of unit test root as well as GARCH. The techniques were critical in the determination of relationship. The study period was January 2000 up to April 2012. The secondary data was from Bloomberg data base. The research finding postulated that trading volumes and returns move in the same direction hence positive correlation. This research was done in Pakistan and there is need for current local research.

Tamunosiki & Ejiodan (2017) studied inflation and stock prices dynamics. The research uses ordinary square unit root in the analysis. The data was collected through secondary means from Nigeria Stock of Exchange. The findings stipulate that inflation affected the stock prices. However, the research was done in the Western Africa Region and there is need for research in the Kenya set-up.

Gworo (2012) studied the relationship amid trading volume and price volatility. The study was undertaken in Kenya, NSE. The research employed correlational research design for the study. The research sourced secondary data from NSE to help the investigation. The research analyzed 20 firms listed in the NSE. The research finding showed positive association between trading volume and stock return volatility. However, further research is imperative

to enhance understanding.

Batta (2014) studied the link amid trading volume verse stock return fluctuation. The study focused on firms listed in NSE while utilizing correlational study among the firm on the NSE 20-share index daily. The research was undertaken from January 2008 to December 2013. The daily results of volatility were calculated via standard deviation in varying time horizons. The findings showed statistically insignificant postulating weak correlation amid trading volume and volatility stock. However, there need for more research using descriptive research design.

Agunda (2019) investigated the effect of trading activity on stock return volatility. The study concentrated on the firms listed in NSE while employing descriptive research design. The researcher evaluated 63 firms for a period spanning from 2013-2018. The research established a positive association amid the variables. Therefore, an increase in trading activity resulted in the increase in the stock return volatility.

2.5 Summary of Literature Review

Numerous research has been undertaken globally, regionally and even locally. Innocent, Shukla & Mugungi (2018) studied Stock market and Macroeconomics determinants. The research used descriptive design and found out that GDP has great positive significant on the stock prices. Ngugi (2017) established inflation affected the share volatility hence crucial determinant. Gworo (2012) used correctional analysis in the investigation of trading volume verse volatility and came up with positive association.

Al-Jafari & Hazem (2015) critically analyzed trading volume and stock return while employing Augmented Dickey-Fuller Test. The resulting findings stated that both trading volume and stock return moved in the same direction. Batta (2014) established that GDP was the driver in earning growth. Decline in GDP cause decrease in stock prices and vice versa.

Table 2.1 Summary of Literature Review

| Author | Focus | Methodology | Findings | Knowledge gap | Focus of the current factors |
|----------------------|---|---|---|---|--|
| Agunda (2019) | Trade activity and stock volatility | Descriptive research design | The findings stipulate a positive association between trade activity and stock volatility | The research needs to be undertaken in a period of five years | Trade volume and stock price volatility |
| Batta (2014) | Studied trade volume and stock fluctuation | Use correlational design | Trade volume has insignificant effect on stock fluctuation | There is need to use descriptive design with control variables | The current study is interested in internal factors such as trade size |
| Tamunosiki & Ejiodan | Studied Inflation and stock prices | The research used Ordinary Square unit and descriptive method | Inflation affected stock prices | The research was done in Nigeria hence there need for the local study | The current study analyzes the internal factors while previous study |
| Gworo (2012) | Studied trading Volume and price volatility | Correlational design | Trade volume has positive association | There is need to undertake the current study | Trade volume and stock price volatility |

2.6 Conceptual Framework

A conceptual framework blueprints a diagram portraying the association amid predictor and explained variables. The objective of conceptual framework is to demonstrated linkage between predicted and the predictor. This study considered predictor variables to be Trading Volume and Trade size while the stock price volatility is the predicted variable.

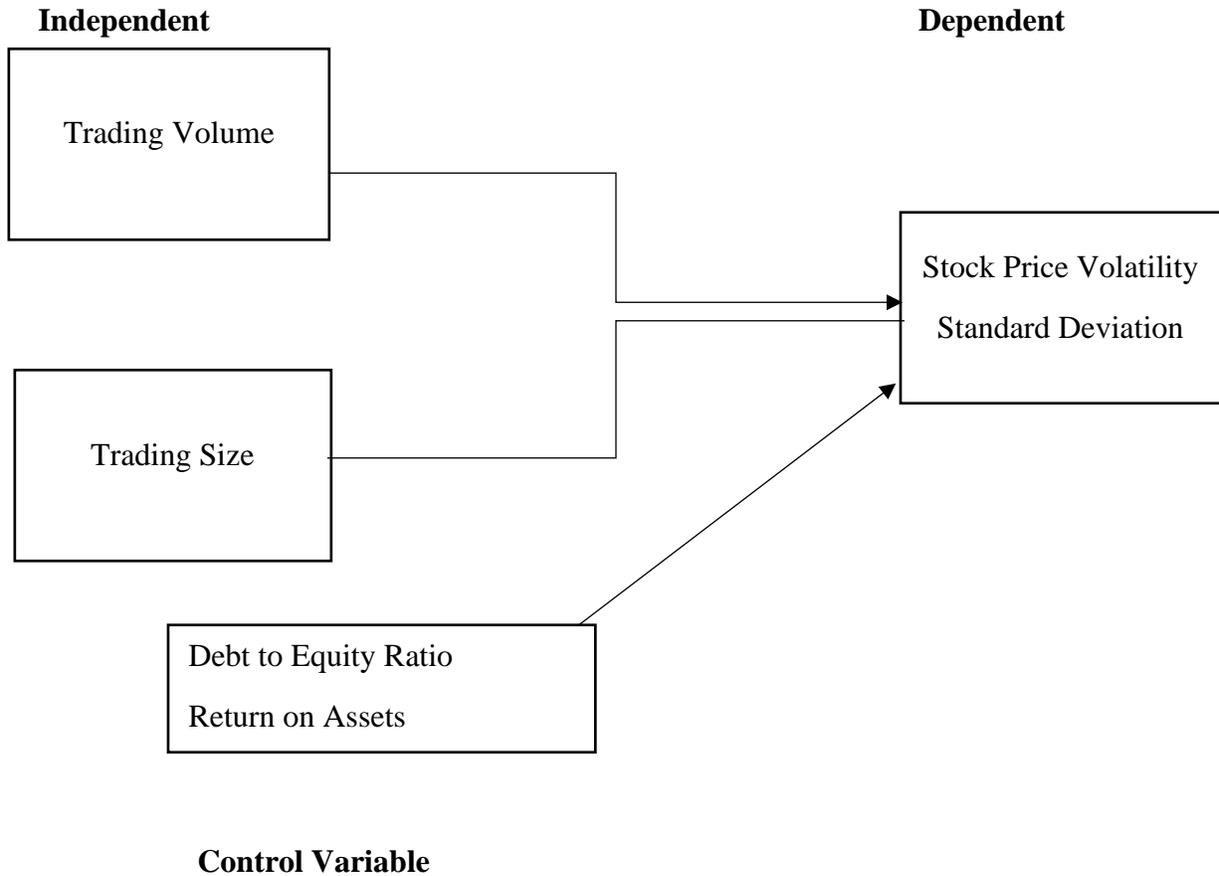


Figure 2.1 Conceptual Model:

(Source: Researcher, 2022)

CHAPTER THREE: RESEARCH METHODOLOGY

3.1 Introduction

This chapter is cardinal for research design employed in the research. It also highlights the target population by stating whether it is census or sampling. Furthermore, it blueprints data collection method applicable. It also justifies the techniques useful in the data analysis.

3.2 Research Design

The research design is critical in the study. It presents a clear roadmap for answering research questions. It helps in the understanding and the holistic perspective in conceptualization. Descriptive research design is a tenet of this research since it reinforces the inference and interpretation (Cooper and Schindler, 2008). Descriptive research is fundamental while describing persons, phenomena and the organizations (Mugenda & Mugenda, 2003).

3.3 Population

Cooper & Schindler (2008) demonstrated that population comprise of group individuals, events or object that possess similar observable traits. It elaborates the target population by the researcher. It put key emphasize on the reason that inform the research to settle on the population and summarize the components findings meant to generalize in the study. This research targeted 64 firms listed in NSE in 6years timeframe

3.4 Data collection

The data was sourced from NSE. Secondary data prioritized and utilized spanning from 2016 to 2021. Systematic collection of secondary data was key in the research. Furthermore, more secondary data was garnered from the published financial statements.

3.5 Data analysis

The data collected underwent thorough process to arrive at more presentable and quality data. The annual data collected was sourced, edited and coded. The coded data was further classified into diverse component to increase effectiveness, efficiency and productivity. The data analysis was done through SPSS method. The monthly stock was utilized in the study.

3.5.1 Analytical Model

The study utilized the multiple regression analysis. This was useful in the explanation of existing association amid variables. Data analysis utilized SPSS to come up with relevant model that explains the phenomena.

$$Y = \alpha_0 + \beta_1 X_1 + \beta_2 X_2 + \beta_3 X_3 + \beta_4 X_4 + \varepsilon$$

Y = Stock Return Volatility (Standard Deviation realized on the monthly stock return)

X₁ = Trading Volume (Log aggregate shares bought and sold over the trading hours)

X₂ = Trade Size (Multiplication of closing market price by Number of shares bought and sold)

X₃ = Debt/Equity (leverage)

X₄ = Performance (ROA)

α_0 = constant of the regression equation

$\beta_1, \beta_2, \beta_3$ and β_4 = regression coefficients that was estimated

ε = error term or disturbance term

3.5.2 Diagnostic Test

Diagnostic test was fundamental in enhancing the validity and reliability in the study. It is substantial in provision of accurate results. It is a crucial aspect that ensure that abide by the research procedures and rules. Diagnostic test eliminates biasness and highlight areas that need improvement to reach accuracy.

Diagnostic test that are cardinal to this research include linearity test to establish if the association is linear amid the variables. The data normality test was undertaken to assess if the data follow the normal distribution pattern. Furthermore, autocorrelation and multicollinearity was determined through the use of Durbin Watson and Variance Inflation Factor respectively. The data was tested to promote accuracy, reduce biasness and improve efficiency (Cooper & Schindler, 2008). Moreover, normal distribution will use Kolmogorov-Smirnova.

3.5.3 Significance Test

The data analysis is gauged to enhance analysis. T-test and F-Test are very powerful in the scalability and dependability. The findings postulate a quality information that can easily be understood. The test is very importance in the inferential statistics by enhancing validation.

CHAPTER FOUR: DATA ANALYSIS, RESULTS AND DISCUSSION

4.1 Introduction

This chapter accentuates the in-depth analysis which builds the conclusive outcomes. The section is supreme for the presentation and discussion. It justifies the findings and accentuates conclusive research outcome. Chapter four presents concrete findings to reinforce comprehensive presentation and discussion. The data garnered was reviewed deeply, and computed through SPSS after thorough processes of data cleaning were accomplished minimum thresholds. The study gave chief latitude to descriptive as well as inferential calculation to inform the presentations.

4.2 Diagnostic Test

Diagnostic test enhances the mastery of meaningful knowledge and rewarding intensive study. It is critical for the creation of realistic roadmap that resolves the knowledge gaps. In addition, it assists in learning the specific goals of the study. In addition, it reinforces the integration of multiple information that are necessary for the conclusive outcomes. These tests were spearheaded to ensure that the data that was to be prioritized in regression met the set conditions. The test performed here include normality and multicollinearity test. The autocorrelation was also undertaken to upgrade the knowhow regarding the level of connection. According to Kipkirui (2020), diagnostic tests enhance interpretability while pinpointing the areas of definite outcome. Therefore, it increases the accuracy and informed decisions.

4.2.1 Normality Test

Researcher conducted the Kolmogorov Smirnov and Shapiro-wilk test to find out if data was normally distributed. The condition here is that if the p value of both test in every variable is below

0.05 hence postulates that data was normal distribution. From the table below all the significance values of each variable in both tests was less than 0.05. This indicates that data was obeyed the normal distribution anticipations.

Table 4.1 Normality Distribution

| Tests of Normality | | | | | | |
|---------------------------|---------------------------------------|-----------|-------------|---------------------|-----------|-------------|
| | Kolmogorov-Smirnov^a | | | Shapiro-Wilk | | |
| | Statistic | df | Sig. | Statistic | Df | Sig. |
| Stock Return Volatility | .161 | 384 | .000 | .802 | 384 | .000 |
| Trading Volume | .085 | 384 | .000 | .965 | 384 | .000 |
| Trade Size | .099 | 384 | .000 | .946 | 384 | .000 |
| ROA | .229 | 384 | .000 | .699 | 384 | .000 |
| Leverage | .094 | 384 | .000 | .940 | 384 | .000 |

a. Lilliefors Significance Correction

4.2.2 Autocorrelation

The researchers spearheaded autocorrelation to ascertain trend over a time series between various points. From the findings, the Durbin Watson value obtained was 0.479. This value was within the normal accepted range. Durbin Watson statistic ranges from 0 to 4. The value 2.0 indicates Zero autocorrelation while value below 2 indicate a positive autocorrelation and values greater than 2 indicates negative autocorrelation.

Table 4.2 Model Summary of Autocorrelation

| Model | R | R Square | Adjusted R Square | Std. Error of the Estimate | Durbin-Watson |
|-------|-------------------|----------|-------------------|----------------------------|---------------|
| 1 | .615 ^a | .378 | .371 | 1.8044083 | .479 |

a. Predictors: (Constant), Leverage, Trade Size, ROA, Trading Volume

b. Dependent Variable: Stock Return Volatility

4.2.3 Multicollinearity Test

Researchers conducted this test to ascertain whether the independent variables had multicollinearity issue. The principle here was that if the VIF values obtain are below 10 and the tolerance values bigger than 0.2 concludes the non-presence of multicollinearity. The dataset was relevant and crucial for investigation and interpretation.

Table 4.2 Multicollinearity Analysis

| Model | | Collinearity Statistics | |
|-------|----------------|-------------------------|-------|
| | | Tolerance | VIF |
| 1 | (Constant) | | |
| | Trading Volume | .663 | 1.509 |
| | Trade Size | .974 | 1.027 |
| | ROA | .752 | 1.329 |
| | Leverage | .533 | 1.875 |

a. Dependent Variable: Stock Return Volatility

From the Table 4.2 above the Tolerance values of Trading Volume, Trade Size, ROA and Leverage are 0.663, 0.974, 0.752 and 0.533 while VIF values are 1.509, 1.027, 1.329 and 1.875 respectively.

This exemplifies that multicollinearity does not exist among the independent variables.

4.3 Descriptive Statistics

This analysis shows the summary analysis of each variable that was under study. It shows the minimum, maximum, mean and standard deviation. The table shows that Stock return volatility had an average of 2.251582 and standard deviation of 2.2755189. The trading volume registered an average of 3.529895 and standard deviation of 0.9161805. Trading size had an average and standard deviation of 72.618904 and 12.3070974 respectively. ROA and Leverage had means of 0.888321 and 2.104074 while their standard deviation was 0.5234683 and 1.5310129 respectively for the period 2016-2021. From the computation it is very imperative to postulate that trading size was highly fluctuating followed by stock return volatility. Nonetheless, ROA was least fluctuating among the variables prioritized in the computation.

Table 4.3 Descriptive Statistics

| Descriptive Statistics | | | | | |
|-------------------------------|----------|----------------|----------------|-------------|-----------------------|
| | N | Minimum | Maximum | Mean | Std. Deviation |
| Stock Return Volatility | 384 | .0024 | 10.4376 | 2.251582 | 2.2755189 |
| Trading Volume | 384 | 1.0400 | 5.0000 | 3.529895 | .9161805 |
| Trade Size | 384 | 52.7200 | 100.0000 | 72.618904 | 12.3070974 |
| ROA | 384 | .2958 | 3.5871 | .888321 | .5234683 |
| Leverage | 384 | .0345 | 5.6800 | 2.104074 | 1.5310129 |
| Valid N (listwise) | 384 | | | | |

4.4 Correlation Analysis

This analysis shows the relationships between various variables under study. The relationship ranges from strongly positive to weakly negative. As seen below; Trading volume and Leverage had a positive correlation towards stock return volatility while, Trading Size and ROA had a negative correlation towards the stock return volatility. Leverage had a strong positive correlation towards the stock return volatility of 0.5936 while ROA had a strong negative correlation of -0.162684709.

Table 4.4 Pearson Matrix

| | Stock Return Volatility | Trading Volume | Trade Size | ROA | Leverage |
|----------------|------------------------------------|---------------------------|-----------------------|------------|-----------------|
| Stock Return | 1 | | | | |
| Volatility | | | | | |
| Trading Volume | 0.307886564 | 1 | | | |
| Trade Size | -0.122235807 | -0.0028 | 1 | | |
| ROA | -0.162684709 | -0.26986 | -0.03886 | 1 | |
| Leverage | 0.593630132 | 0.577526 | -0.10261 | -0.48902 | 1 |

4.5 Regression Analysis

This was accomplished by the regressing trading volume, trade size, ROA and leverage against stock return volatility. The linear multiple regression was spearheaded to elaborate on the consequences resulting in stock return volatility that are related to trading activity. Table 4.5 elucidates the outcomes from the model summary. It posts the coefficient of determination to expedite the prevailing correlation. This is suitable in elaborating the deviation.

4.5.1 Model summary

The table 4.6 is manifestation of computation in the model summary. The R which is coefficient of determination is 0.615. Additionally, this value 0.615 implies a strong correlation among the variables under the assessment. The R square, Coefficient of determination stipulated by 0.378. Therefore, this indicates that 37.8% of change in variation of stock return volatility is caused by the predictor variables captured in this study. These explanatory variables incorporate; trading volume, trade size, ROA and leverage. The remaining 62.2% of change in variation is caused by factors not captured in the above.

Table 4.6 Model Summary of Regression

| Model | R | R Square | Adjusted R Square | Std. Error of the Estimate | Durbin-Watson |
|-------|-------------------|----------|-------------------|----------------------------|---------------|
| 1 | .615 ^a | .378 | .371 | 1.8044083 | .479 |

a. Predictors: (Constant), Leverage, Trade Size, ROA, Trading Volume

b. Dependent Variable: Stock Return Volatility

4.5.2 ANOVA

The ANOVA table determines the significance level of the model. From the table below the Significance level is at 0.001 and the F statistics is 57.525 and the Significance level is 0.001. This implies a positive F statistic and 0.001 is below 0.05 portraying that the model is statistically significant in describing the effect of Leverage, Trade Size, ROA and Trading Volume on Stock Return volatility. Regression has 749.187 as sum of squares with mean square of 187.297 and 4 as degree of freedom. Residual has 1233.982 sum of squares and 3.256 Mean Square with 379 degree of freedom.

Table 4.7 ANOVA^a

| Model | | Sum of Squares | Df | Mean Square | F | Sig. |
|--------------|------------|-----------------------|-----------|--------------------|----------|-------------------|
| | Regression | 749.187 | 4 | 187.297 | 57.525 | .001 ^b |
| 1 | Residual | 1233.982 | 379 | 3.256 | | |
| | Total | 1983.169 | 383 | | | |

a. Dependent Variable: Stock Return Volatility

b. Predictors: (Constant), Leverage, Trade Size, ROA, Trading Volume

4.5.3 Coefficient of Determination

Coefficient of determination was the lifeblood in initiation of the forecasting formula. If all the variables are held constant at 0, the autonomous figure was 0.484 effect on stock Return Volatility. A unit change in trading volume results to a negative effect of 0.129 on Stock return volatility when all other factors are held at. A unit change in Trade Size results to a negative effect of 0.008 on stock return volatility. A single unit advancement in ROA triggers an increment in stock return volatility by 0.710 when all variables are maintained constant. Finally, an increment of leverage causes movement to the same direction (positive effect) on Stock Return Volatility of 1.039 respectively when all other factors are kept constant.

Table 4.8 Coefficients^a

| Model | Unstandardized Coefficients | | Standardized Coefficients | | Sig. | 95.0% Confidence Interval for B | | Collinearity Statistics | |
|----------------|-----------------------------|------------|---------------------------|--------|------|---------------------------------|-------------|-------------------------|-------|
| | B | Std. Error | Beta | | | Lower Bound | Upper Bound | Tolerance | VIF |
| (Constant) | .484 | .724 | | .669 | .504 | -.939 | 1.907 | | |
| Trading Volume | -.129 | .124 | -.052 | -1.040 | .299 | -.372 | .114 | .663 | 1.509 |
| Trade Size | -.008 | .008 | -.044 | -1.080 | .281 | -.023 | .007 | .974 | 1.027 |
| ROA | .710 | .203 | .163 | 3.498 | .001 | .311 | 1.109 | .752 | 1.329 |
| Leverage | 1.039 | .082 | .699 | 12.598 | .000 | .877 | 1.201 | .533 | 1.875 |

a. Dependent Variable: Stock Return Volatility

Thus, the researchers developed a mathematical formula as below;

$$Y = 0.484 - 0.129 X1 - 0.008 X2 + 0.710 X5 + 1.039 X4$$

Where;

Y = Stock Return Volatility

X1 = Trading Volume

X2 = Trade Size

X5 = ROA

X4 = Leverage

4.6 Discussion and Conclusion

Diagnostic test gave the green light for further investigation. The diagnostic test undertaken include; multicollinearity and normality. The outcomes emphasize normal distribution pattern at

the same time emphasizing the absence of multicollinearity. Additionally, the findings were in conjunction with the Mukolwe (2019) postulation that data ascribed to diagnostic thresholds.

Summary computation of each variable under descriptive stipulated minimum and mean. Moreover, the standard deviation was also generated to increase the understanding on the nature of data. Stock volatility returns posted a standard deviation of 2.2755189. In addition, it exhibited an average of 2.251582. In addition, trading size posted highest standard deviation of 12.3070974. This postulated greater incidence of fluctuation. It recorded an average of 72.618904. ROA recorded a standard deviation of 0.5234683 and leverage portrayed a standard deviation of 1.5310129. Furthermore, both leverage and ROA posted a mean of 2.104074 and 0.888321 respectively.

Table 4.6 exemplify coefficient of determination. It accentuated a strong association amid the variables considered in the investigation. This was defined by 0.615 therefore in concurrence with preceding findings Mukolwe (2019) postulation of strong association between trading activity verse the stock volatility return. Moreover, R-Square illustrated by 0.378 communicated the level of variation caused by the explanatory variables. It is worthwhile to elaborate that 37.8% of stock volatility returns' deviation was triggered by trading volume, trading size, ROA and leverage. The remaining 62.2% associated with wide-array of non-factored variables. According to Sifuna (2018) the regressed and regressor factors commanded a strong correlation which is in concurrence with this investigation. Gworo (2012) accentuated a strong and substantial association amid trading activity verse stock returns. Al-Samman and Al-Jafari (2015) provided contrary outcome that was expounded by Batta (2014) postulation that trading activity verse the stock returns exhibited weak association though insignificant.

The coefficient of determination explained via the linear multiple regression that autonomous figures whenever all determinants are kept constant 0.484. One unit advancement in volume size triggers a negative effect of 0.129 on stock return volatility when all variables held unchanged. A positive change in one unit of trade size triggered a significant reduction in stock return volatility by 0.8%. Further, a unit increment in ROA translates to positive advancement of stock return volatility by 0.710 all factors maintained constant. In summary, an increase in leverage spurs the increment in stock return volatility by 1.039 whenever all factors are maintained constant.

Whereby; **$Y = 0.484 - 0.129 X1 - 0.008 X2 + 0.710 X5 + 1.039 X4$**

CHAPTER FIVE: SUMMARY, CONCLUSION AND RECOMMENDATIONS

5.1 Introduction

This chapter delineates study by wrapping up the outcomes and pinpointing the areas of more scrutiny. The study highlights assessed and summarized information. Besides that, the study scrutinizes conclusive results that enhance in-depth understanding. Moreover, it gives chief latitude to recommendations aiding theories and policy making. Apart from delving on the building blocks of the research, it also looks at the drawbacks and remedy to assist future scholars in undertaking the study with ease. Finally, the study call attention to suggestion needed to expound on this investigation.

5.2 Summary

The computation of correlation to give level association blueprinted that trading volume and leverage moves to the same direction with stock return volatility. Nevertheless, Trading size and ROA moves to the opposite direction with stock price volatility. In a nutshell, leverage delineated a strong positive connection with stock return volatility of 0.5936.

ANOVA was critical in elaborating the significance. The computation coined the significance level of 0.001 with F-Test of 57.525. This significance value was below 0.005 hence statistical significance. The regression analysis indicated 749.187 sum square while mean was 187.297 under 4 degrees of freedom. Nevertheless, under residual value the sum square obtained was 1233.982 a mean square of 3.256 under 379 degrees of freedom.

The analysis of regression under the model summary showed that the four independent variables (Leverage, Trade Size, ROA, and Trading Volume) explained 37.8% of variation in stock return volatility while the remaining 62.2% of variation in stock return volatility were caused by factors not captured in the study above. The ANOVA table showed that the model was statistically significant in that the Significance level obtained was 0.001 which is less than the P value of 0.05.

Some preceding scholars stated a positive and substantial association between the predictor and predicted factors. Gworo (2012) concluded on the positive as well as strong correlation by concurring with Attari et al. (2012). Al-Jafari and Tliti (2013) stipulated a positive linkage that was enhanced by Tamunosiku and Ejiodan (2017). Batta (2014) illustrated weak association that was insignificant hence contradicting the findings.

Coefficient of determination showed that a unit change in trade volume and Trade Size brought about a negative change in stock return volatility of 12.9% and 0.8% respectively when all other factors are kept constant. A unit change in ROA and Leverage had a positive effect on Stock Return Volatility of 71% and 103% respectively. If all Predictor factors were held at 0, then stock return volatility would a positive effect of 48.4%. The mathematical formula generated that can be used in predicting the future of the firms was thus;

$$Y = 0.484 - 0.129 X1 - 0.008 X2 + 0.710 X5 + 1.039 X4$$

Y = Stock Return Volatility

X1 = Trading Volume

X2 = Trade Size

X5 = ROA

X4 = Leverage

5.3 Conclusion

The findings on the descriptive statistics showed that trading volume of the 64 companies for the period of 2016 to 2021 recorded a minimum volume of 1.0400 and a maximum volume of 5.000. Trading size had a minimum of 52.7200 and a maximum of 100.00. The minimum value of ROA and leverage recorded in that period was 0.2958 and 0.0345 while their maximum value was 3.5871 and 5.6800 respectively.

The findings in the Diagnostic statistic, Test for Normality, ascertained that data obtained was normally distributed. This was shown by ($p < 0.05$) significance values obtained from carrying out Kolmogorov-smirnov and Shapiro-Wilk test on each variable. Further to the findings the Durbin Watson value obtained was 0.479. Implying that a positive autocorrelation and that data was lies within the normal range. The tolerance values obtained from Multicollinearity test were all greater than 0.2 and VIF values were all less than 10. This indicated that there was no multicollinearity among the independent variables under study.

Correlation analysis revealed that trade volume and leverage had positive correlation towards the dependent variable; Stock return volatility. Trade Size and ROA variables had negative correlation towards the stock Return Volatility. The findings wrapped-up that a single increment in trade volume bring about an increase in stock return volatility by 12.9% all factors kept constant. Further, an increase in trade size by singular unit leads to positive change in stock return volatility by 8% when all the variables are maintained stable. A unitary advancement in ROA causes a negative change in stock return volatility by 71% whenever all variables are constant. Finally, an increment in leverage triggers a decrease in stock return volatility by 103.9%.

According to Tripathy (2011) the volume of transaction was critical in the positive prediction of price volatility which is in concurrence with the prevailing study. Wange et al (2012) postulated that investors rely on the traded volume for futuristic forecasting. Pathirawasam (2011) delineated how investors' misspecification causes challenges on the futuristic earnings and predicaments of liquidation.

5.4 Limitation

The study was undertaken covering a span of 6 years. The study wider timeframe of 10-15 years can increase the research findings. On top of that, the study analysed four variables to inform the research findings. The additional of more predictor variables can enhance the conclusive research outcomes. Moreover, the model utilized is historical in nature and it entails past information which may not be useful in predicting trending issues and emerging market needs.

5.5 Recommendations

The study recommends the current policy formulation by NSE and CMA to increase the productivity and reduce informational asymmetries. The study recommends the prudent management and initiation of strategies to counter the market trends. Further, the institutions should benchmark the development of securities of exchange and regulators in the develop world and execute the journey towards transformation. The creation of convenient, favourable and quality policies a game changer in the market.

The past hypothesis should be subjected to test periodically to create more knowledge and awareness. The in-depth analysis of trade volume, size, and macroeconomics variables can aid the market understanding and strategies accordingly. Quality policies and framework are key stimulus

for economic growth. The longevity market sustainability indicates the securities maturity and good demand verse supply.

5.6 Suggestion for More Studies

This study advocate for comprehensive and intensive study relating to trade activity as well as stock return volatility. Research on determinants of trade activity will increase the understanding of its cornerstone. In other words, it investigates trading activities as the regressed variable. The exploration of same study while taking longer time span of 10years and above can increase the outcomes quality. The researchers recommend for assessment of macroeconomic determinants verse the stock returns. The sectorial research can be enhanced to increase the knowledge and understanding. In a nutshell, specific variables such as the nature of economic variables, inflation, and fragility index should studied in conjunction to stock return volatility.

REFERENCES

- Achieng, O. (2003). The relationship between trading volume and stock prices of firms quoted at the Nairobi securities exchange. Unpublished MBA Research Project, University of Nairobi, Kenya.
- Agunda. (2019). Effect of Trading Activity on Stock Return Volatility on stock listed in NSE.
- Al Samman, H. &.J. (2015). Trading Volume and Stock Returns Volatility. *Evidence from Industrial Firms of Oman, Asian Social Science*, 11(24), 139-146.
- Al-jafari, A. a. (2015). Stock Returns Volatility.
- Al-Jafari, M. K. (23). An empirical investigation of the relationship between stock return and trading volume. *Journal of Applied Finance & Banking*, 3(3), 45-64. .
- Al-Saad, K. (2004). Asymmetry in the price-volume relationship: Evidence from the Kuwait stock market. *Journal of Accounting and Finance*, 3, 53-56, 3, 53-56.
- Ang, A. G. (2010). The Efficient Market Theory and Evidence: Implications for Active Investment Management. *Foundations and Trends in Finance*. 5(3), 157–242.
- Angko. (2013). *Determinants of Stock market volatities in Ghana*.
- Angko, W. (2013). The Determinants of Stock Market Volatilities in Ghana. *Research Journal of Finance and Accounting*, 4(13), 146-165.
- Attari, M., & Rafiq, S. &. (2012). The dynamic relationship between stock volatility and trading volume. *Asian Economic and Financial Review* 2(8), 1085–1097.
- Ayako, D. (2005). An empirical investigation into the relationship between trading volume and stock returns of companies quoted at the NSE. Research project. Nairobi. University of Nairobi.
- Batta. (2014). Trading Activity and stock price volatility.

- Bhowmik, D. (2013). Stock Market Volatility. *An Evaluation, International Journal of Scientific and Research Publications*, 3(10), 1-18.
- Boonvorachote, T. &. (2016). Price volatility, trading volume, and market depth in Asian commodity futures exchanges. *Kasetsart Journal of Social Sciences*, 37(1), 53-58.
- Chebbi, M. R. (2016). Impact of Trading Activity on Price Volatility. *Case of Tunisian Stock Market. International Journal of Economics and Finance*, 8(12), 37- 43.
- Cooper, D. R. (2011). *Business Research Methods. (11th ed.* New York: McGraw-Hill.
- Creswell, J. (2008). *Educational research: Planning, conducting, and evaluating quantitative and qualitative research. New Jersey: Pearson: Merrill Prentice Hall.*
- Ejiodan, T. a. (2017). *Inflation and stock prices.* Nigeria.
- Fama, E. (1965). The behavior of stock market prices. *Journal of Business* 38(1), 34-105. 38(1), 34-105.
- Fama, E. F. (1965). Random Walks in Stock Market Prices. *Financial Analysts Journal*, 21(5), 55–59.
- Gworo, C. O. (2013). The Relationship between Trading Volume and Price Volatility of Shares in the Nairobi Securities Exchange. Research project. Nairobi. University of Nairobi.
- Handayana. (2013). *Stock Price Volatility.*
- Innocent, S. &. (2018). *Rwanda Stock Market and Macroeconomics.* Kigali.
- Kakkar, R. &. (2012). Stock Return Volatility and prices.
- Kaler, D. &. (2014). Macroeconomics and price volatility.
- Karaa, S. a. (2017). Volume Volatility and Trading.
- Karpoff, J. (1987). The relation between price changes and trading volume: A survey. *Journal of Financial and Quantitative Analysis*, 22(1), 109-126.

- Kothari, C. .. (2004). *Research Methodology: Methods and Techniques. Second Edition. New Age International (P) Ltd.*
- LeRoy, S. &. (1981). The present-value relation: Tests based on implied variance bounds. *Econometrica*. 49, 555-74.
- Li, S. &. (2015). Trading Volume and Stock Return Volatility.
- Mugenda, O. &. (2003). *Research methods: qualitative and quantitative approaches. Nairobi: Africa Centre for Technology Studies. Nairobi: Africa Centre for Technology Studies.*
- Mwaniki. (2017). Trading Volume and Price Volatility.
- Olweny, T. &. (2011). The effect of macro-economic factors on stock return volatility in the Nairobi stock exchange. *Economics and Finance Review*, 1(10), 34-48.
- Osborne, M. (Operations Research). Brownian motion in the stock market. *Operations Research* . *Operations Research*, 7(2), 145–173.
- P, N. (2017). *Volatility of share prices at NSE. Nairobi .*
- Pasquariello, P. (n.d.). Prospect Theory and market quality. *Journal of Economic Theory*, 149,276–310. 2014.
- Schwert, G. (1989). Why does stock market volatility change over time? *The Journal of Finance XLIV, 1115-1153*, 1115-1153.
- Schwert, G. (1990). Stock market volatility. *Financial Analysts*, May-June, 23-34.
- Shleifer, A. &. (1990). The noise trader approach to finance. *Journal of Economic Perspectives*, (4), 19-33.
- Tripathy, N. (2011). The relation between price changes and trading volume: a study in Indian stock exchange. *Interdisciplinary Journal of Research in Business* , 51(2), 485-505.

Waweru, N. N. (2013). Analysis of the Determinants of Stock Price Volatility at Nairobi Securities Exchange. Research project. Nairobi. University of Nairobi.

APPENDICES

Appendix I: Companies Listed at the NSE

| S/No. | Company |
|-------|-----------------------------|
| 1 | ARM |
| 2 | B O C |
| 3 | BamburiCement |
| 4 | Barclays-ABSA |
| 5 | BATKenya |
| 6 | BKGroup |
| 7 | Britam |
| 8 | Car & General (K) |
| 9 | Carbacid Investments |
| 10 | Centum Investment |
| 11 | CICInsuranceGroup |
| 12 | Co-operativeBank of Kenya |
| 13 | CrownPaints Kenya |
| 14 | Deacons (East Africa) |
| 15 | DiamondTrust Bank Kenya |
| 16 | Eaagads |
| 17 | EastAfrican Breweries |
| 18 | EastAfrican Cables |
| 19 | EastAfrican Portland Cement |
| 20 | EquityGroup Holdings |
| 21 | Eveready East Africa |
| 22 | ExpressKenya |
| 23 | FlameTree Group Holdings |
| 24 | HFGGroup |
| 25 | HomeAfrika |
| 26 | I&MHoldings |

| | |
|----|-------------------------------|
| 27 | JubileeHoldings |
| 28 | Kakuzi |
| 29 | Kapchorua Tea Kenya |
| 30 | KCB Group |
| 31 | KenGen Company |
| 32 | KenolKobil |
| 33 | Kenya Airways |
| 34 | KenyaOrchards |
| 35 | KenyaPower & Lighting |
| 36 | KenyaRe-Insurance Corporation |
| 37 | KurwituVentures |
| 38 | Liberty Kenya Holdings |
| 39 | Limuru Tea |
| 40 | Longhorn Publishers |
| 41 | Mumias Sugar Co |
| 42 | NairobiBusiness Ventures |
| 43 | NairobiSecurities Exchange |
| 44 | NationMedia Group |
| 45 | NationalBank of Kenya |
| 46 | NICGroup |
| 47 | OlympiaCapitalHoldings |
| 48 | Safaricom |
| 49 | SameerAfrica |
| 50 | SanlamKenya |
| 51 | Sasini |
| 52 | StanbicHoldings |
| 53 | StandardChartered Bank Kenya |
| 54 | StandardGroup |
| 55 | StanlibFahari I-REIT |
| 56 | TotalKenya |

| | |
|----|--------------------|
| 57 | TPSEastern Africa |
| 58 | TransCentury |
| 59 | UchumiSupermarkets |
| 60 | Umeme |
| 61 | UngaGroup |
| 62 | WilliamsonTeaKenya |
| 63 | WPPScangroup |

Appendix II: Data Collection

| Stock Return Volatility | Trading Volume | Trade Size | ROA | Leverage |
|------------------------------------|---------------------------|-------------------|------------|-----------------|
| 0.5776 | 4.1000 | 80.4800 | 0.5285 | 2.3300 |
| 2.1576 | 3.8700 | 59.4800 | 0.5367 | 2.1000 |
| 2.0424 | 4.1500 | 53.7200 | 0.5492 | 2.3800 |
| 2.0424 | 3.7500 | 53.7200 | 0.5677 | 1.9800 |
| 2.1376 | 4.3300 | 58.4800 | 0.5605 | 2.5600 |
| 2.3424 | 4.3600 | 68.7200 | 0.5647 | 2.5900 |
| 2.1376 | 3.7100 | 58.4800 | 0.5687 | 1.9400 |
| 2.2424 | 4.3200 | 63.7200 | 0.5870 | 2.5500 |
| 0.9376 | 4.8000 | 98.4800 | 0.5985 | 3.0300 |
| 3.0224 | 4.0300 | 59.0000 | 0.6120 | 2.2600 |
| 0.7176 | 4.1800 | 87.4800 | 0.4202 | 2.4100 |
| 3.3424 | 3.9700 | 55.1700 | 0.4390 | 2.2000 |
| 0.7376 | 4.2900 | 88.4800 | 0.4662 | 2.5200 |
| 3.2424 | 3.9800 | 75.0000 | 0.4712 | 2.2100 |
| 0.9023 | 3.6300 | 96.7200 | 0.6207 | 1.8600 |
| 1.4022 | 4.5100 | 75.5300 | 0.6377 | 2.7400 |
| 2.0024 | 3.5500 | 88.6200 | 0.4935 | 1.7800 |
| 0.0176 | 4.0700 | 59.0000 | 0.4965 | 2.3000 |
| 0.1576 | 4.0300 | 59.4800 | 0.5050 | 2.2600 |
| 0.1576 | 3.7600 | 59.4800 | 0.4992 | 1.9900 |
| 0.2822 | 3.9100 | 65.7200 | 0.5817 | 2.1400 |
| 0.1823 | 3.6700 | 60.7200 | 0.5402 | 1.9000 |
| 0.4424 | 4.3000 | 73.7200 | 0.4725 | 2.5300 |
| 0.6629 | 4.1700 | 84.7200 | 0.4517 | 2.4000 |
| 0.3228 | 3.8800 | 67.7200 | 0.3960 | 2.1100 |
| 0.4426 | 3.7800 | 73.7200 | 0.3885 | 2.0100 |
| 0.8223 | 3.8300 | 92.7200 | 0.4002 | 2.0600 |

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|--------|--------|---------|--------|--------|
| 0.9422 | 3.6400 | 98.7200 | 0.3980 | 1.8700 |
| 0.4425 | 3.4800 | 73.7200 | 0.4095 | 1.7100 |
| 0.2023 | 4.1100 | 61.7200 | 0.4177 | 2.3400 |
| 1.0224 | 4.0000 | 85.6200 | 0.4755 | 2.2300 |
| 0.5021 | 4.1000 | 76.7200 | 0.4597 | 2.3300 |
| 0.5826 | 3.8700 | 80.7200 | 0.4802 | 2.1000 |
| 0.2224 | 4.1500 | 62.7200 | 0.5122 | 2.3800 |
| 0.6421 | 3.7500 | 83.7200 | 0.5162 | 1.9800 |
| 0.2222 | 4.3300 | 62.7200 | 0.5352 | 2.5600 |
| 0.6629 | 4.3600 | 84.7200 | 0.5487 | 2.5900 |
| 1.1223 | 3.7100 | 59.2300 | 0.5945 | 1.9400 |
| 0.3025 | 4.3200 | 66.7200 | 0.5777 | 2.5500 |
| 0.5425 | 4.8000 | 78.7200 | 0.5882 | 3.0300 |
| 0.6623 | 4.0300 | 84.7200 | 0.6302 | 2.2600 |
| 1.2224 | 4.1800 | 68.2300 | 0.6480 | 2.4100 |
| 0.5621 | 3.1000 | 79.7200 | 0.6615 | 1.3300 |
| 0.5224 | 2.8700 | 77.7200 | 0.6662 | 1.1000 |
| 2.2776 | 3.1500 | 65.4800 | 0.6600 | 1.3800 |
| 1.3824 | 2.7500 | 75.6500 | 0.6615 | 0.9800 |
| 1.9024 | 3.3300 | 75.5600 | 0.7157 | 1.5600 |
| 1.3823 | 3.3600 | 61.6300 | 0.7235 | 1.5900 |
| 0.1824 | 2.7100 | 60.7200 | 0.7015 | 0.9400 |
| 0.6823 | 3.3200 | 85.7200 | 0.7022 | 1.5500 |
| 0.4624 | 3.8000 | 74.7200 | 0.5607 | 2.0300 |
| 0.2221 | 3.0300 | 62.7200 | 0.5705 | 1.2600 |
| 2.1824 | 3.1800 | 60.7200 | 0.6040 | 1.4100 |
| 1.9222 | 2.9700 | 75.4400 | 0.6175 | 1.2000 |
| 1.1824 | 3.2900 | 88.6200 | 0.6372 | 1.5200 |
| 1.3024 | 2.9800 | 75.3600 | 0.6482 | 1.2100 |
| 0.1024 | 2.6300 | 56.7200 | 0.6550 | 0.8600 |

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|--------|--------|---------|--------|--------|
| 0.8423 | 3.5100 | 93.7200 | 0.6552 | 1.7400 |
| 0.4824 | 2.5500 | 75.7200 | 0.6600 | 0.7800 |
| 0.9222 | 3.0700 | 97.7200 | 0.6527 | 1.3000 |
| 0.0176 | 3.0300 | 71.0000 | 0.5320 | 1.2600 |
| 0.0576 | 2.7600 | 54.4800 | 0.5490 | 0.9900 |
| 1.1424 | 2.9100 | 59.2300 | 0.5692 | 1.1400 |
| 0.4223 | 2.6700 | 72.7200 | 0.6085 | 0.9000 |
| 0.7624 | 3.3000 | 89.7200 | 0.6112 | 1.5300 |
| 0.0422 | 3.1700 | 53.7200 | 0.6320 | 1.4000 |
| 1.1624 | 2.8800 | 68.2300 | 0.6500 | 1.1100 |
| 1.3624 | 2.7800 | 59.2300 | 0.6607 | 1.0100 |
| 0.6623 | 2.8300 | 84.7200 | 0.6690 | 1.0600 |
| 0.1976 | 2.6400 | 61.4800 | 0.6655 | 0.8700 |
| 0.5424 | 2.4800 | 78.7200 | 0.5110 | 0.7100 |
| 0.9224 | 3.1100 | 97.7200 | 0.5172 | 1.3400 |
| 0.9576 | 3.0000 | 99.4800 | 0.5122 | 1.2300 |
| 0.2224 | 3.1000 | 62.7200 | 0.5160 | 1.3300 |
| 2.9576 | 2.8700 | 99.4800 | 0.5550 | 1.1000 |
| 0.7176 | 3.1500 | 87.4800 | 0.5632 | 1.3800 |
| 0.6424 | 2.7500 | 83.7200 | 0.5687 | 0.9800 |
| 0.3776 | 3.3300 | 70.4800 | 0.5657 | 1.5600 |
| 2.6024 | 3.3600 | 81.7200 | 0.5515 | 1.5900 |
| 1.5776 | 2.7100 | 61.3200 | 0.9790 | 0.9400 |
| 0.9576 | 3.3200 | 99.4800 | 0.9765 | 1.5500 |
| 1.2024 | 3.8000 | 92.2300 | 0.9805 | 2.0300 |
| 2.5424 | 3.0300 | 78.7200 | 0.9772 | 1.2600 |
| 1.0176 | 3.1800 | 78.7200 | 0.9890 | 1.4100 |
| 0.2424 | 2.1000 | 63.7200 | 1.0010 | 0.3300 |
| 1.4576 | 2.1300 | 61.6200 | 1.0107 | 0.3600 |
| 1.2176 | 2.1500 | 59.2300 | 1.0177 | 0.3800 |

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|--------|--------|---------|--------|--------|
| 1.0376 | 2.2500 | 89.6300 | 1.0260 | 0.4800 |
| 0.8976 | 2.3300 | 96.4800 | 1.0307 | 0.5600 |
| 0.8824 | 2.3600 | 95.7200 | 0.9337 | 0.5900 |
| 0.6176 | 2.2900 | 82.4800 | 0.9487 | 0.5200 |
| 0.9376 | 2.3200 | 98.4800 | 0.9587 | 0.5500 |
| 3.0224 | 2.8000 | 91.0000 | 0.9665 | 1.0300 |
| 0.7576 | 2.0300 | 89.4800 | 0.9612 | 0.2600 |
| 0.9576 | 2.1800 | 99.4800 | 0.9865 | 0.4100 |
| 1.1776 | 2.0300 | 61.6300 | 0.9867 | 0.2600 |
| 1.6424 | 2.2900 | 75.5600 | 0.9967 | 0.5200 |
| 0.3976 | 2.0200 | 71.4800 | 1.0052 | 0.2500 |
| 2.4576 | 2.3700 | 74.4800 | 1.0212 | 0.6000 |
| 1.3576 | 2.5100 | 91.2300 | 0.8595 | 0.7400 |
| 2.8024 | 2.4500 | 91.7200 | 0.8782 | 0.6800 |
| 0.3976 | 2.0700 | 71.4800 | 0.9027 | 0.3000 |
| 0.3776 | 2.0300 | 70.4800 | 0.9302 | 0.2600 |
| 0.9224 | 2.2400 | 97.7200 | 0.9552 | 0.4700 |
| 0.7176 | 2.0900 | 87.4800 | 0.9775 | 0.3200 |
| 2.4824 | 2.3300 | 75.7200 | 1.0035 | 0.5600 |
| 0.4976 | 2.3000 | 76.4800 | 1.0307 | 0.5300 |
| 1.6576 | 2.1700 | 59.2300 | 1.0512 | 0.4000 |
| 1.2776 | 2.1200 | 68.2300 | 1.0622 | 0.3500 |
| 1.2576 | 2.2200 | 91.2300 | 0.8965 | 0.4500 |
| 1.9376 | 2.1700 | 69.2300 | 0.9232 | 0.4000 |
| 0.2824 | 2.3600 | 65.7200 | 0.9610 | 0.5900 |
| 0.3376 | 2.5200 | 68.4800 | 0.9955 | 0.7500 |
| 0.7824 | 2.1100 | 90.7200 | 1.0187 | 0.3400 |
| 1.1776 | 2.0000 | 72.5200 | 1.0332 | 0.2300 |
| 1.7976 | 2.1000 | 71.2300 | 1.0565 | 0.3300 |
| 1.3976 | 2.1300 | 58.0000 | 1.0802 | 0.3600 |

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|--------|--------|----------|--------|--------|
| 0.4976 | 2.1500 | 76.4800 | 1.0912 | 0.3800 |
| 0.4376 | 2.2500 | 73.4800 | 1.1022 | 0.4800 |
| 0.2176 | 2.3300 | 62.4800 | 0.7110 | 0.5600 |
| 0.0176 | 2.3600 | 100.0000 | 0.7375 | 0.5900 |
| 0.5376 | 2.2900 | 78.4800 | 0.7890 | 0.5200 |
| 0.3176 | 2.3200 | 67.4800 | 0.7980 | 0.5500 |
| 0.6176 | 2.8000 | 82.4800 | 0.8252 | 1.0300 |
| 1.2776 | 2.0300 | 59.0000 | 0.8412 | 0.2600 |
| 0.1824 | 2.1800 | 60.7200 | 0.8685 | 0.4100 |
| 0.0224 | 2.9000 | 52.7200 | 0.8860 | 1.1300 |
| 0.0176 | 3.1300 | 98.5600 | 0.8865 | 1.3600 |
| 0.5376 | 2.8500 | 78.4800 | 0.8797 | 1.0800 |
| 0.6176 | 3.2500 | 82.4800 | 0.8302 | 1.4800 |
| 0.0024 | 2.6700 | 90.0000 | 0.8562 | 0.9000 |
| 0.2624 | 2.6400 | 64.7200 | 0.9070 | 0.8700 |
| 0.7576 | 3.2900 | 89.4800 | 0.9307 | 1.5200 |
| 2.9224 | 1.5600 | 80.0000 | 0.9415 | 0.9100 |
| 0.3976 | 2.2000 | 71.4800 | 0.9597 | 0.4300 |
| 0.7376 | 2.9700 | 88.4800 | 0.9692 | 1.2000 |
| 0.4376 | 2.8200 | 73.4800 | 0.9765 | 1.0500 |
| 2.8224 | 3.0300 | 91.2300 | 0.9872 | 1.2600 |
| 3.0424 | 2.7100 | 88.6300 | 0.9990 | 0.9400 |
| 2.4976 | 3.0200 | 66.5200 | 0.9927 | 1.2500 |
| 0.8376 | 3.3700 | 93.4800 | 0.9947 | 1.6000 |
| 1.4624 | 2.4900 | 73.3760 | 1.0222 | 0.7200 |
| 1.5827 | 3.4500 | 75.7560 | 1.0520 | 1.6800 |
| 1.0623 | 2.9300 | 76.6960 | 1.0637 | 1.1600 |
| 0.8421 | 2.9700 | 77.2160 | 1.0702 | 1.2000 |
| 1.7224 | 3.2400 | 79.1760 | 1.0947 | 1.4700 |
| 2.0222 | 3.0900 | 80.3160 | 1.1090 | 1.3200 |

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|--------|--------|---------|--------|--------|
| 0.6424 | 3.3300 | 80.8760 | 1.1160 | 1.5600 |
| 2.4223 | 2.7000 | 81.5960 | 1.1250 | 0.9300 |
| 0.1825 | 2.8300 | 57.9760 | 0.8297 | 1.0600 |
| 1.6624 | 3.1200 | 59.5960 | 0.8500 | 1.3500 |
| 1.6827 | 3.2200 | 60.9360 | 0.8667 | 1.4500 |
| 0.7024 | 3.1700 | 62.1160 | 0.8815 | 1.4000 |
| 1.7821 | 3.3600 | 61.9160 | 0.8790 | 1.5900 |
| 1.2824 | 3.5200 | 64.6960 | 0.9137 | 1.7500 |
| 3.0623 | 2.8900 | 67.1760 | 0.9447 | 1.1200 |
| 1.7224 | 3.0000 | 67.3360 | 0.9467 | 1.2300 |
| 2.0623 | 2.9000 | 66.3760 | 0.9347 | 1.1300 |
| 1.7823 | 3.1300 | 66.1960 | 0.9325 | 1.3600 |
| 1.4224 | 2.8500 | 57.9760 | 0.8297 | 1.0800 |
| 2.2623 | 3.2500 | 58.9160 | 0.8415 | 1.4800 |
| 1.2224 | 2.6700 | 60.7960 | 0.8650 | 0.9000 |
| 2.782 | 2.6400 | 63.3360 | 0.8967 | 0.8700 |
| 1.7220 | 3.2900 | 66.0760 | 0.9310 | 1.5200 |
| 2.2627 | 2.6800 | 67.0360 | 0.9430 | 0.9100 |
| 1.7625 | 2.2000 | 68.6560 | 0.9632 | 0.4300 |
| 1.6424 | 2.9700 | 69.7760 | 0.9772 | 1.2000 |
| 1.9026 | 2.8200 | 69.9560 | 0.9795 | 1.0500 |
| 2.2624 | 3.9000 | 71.6560 | 1.0007 | 2.1300 |
| 2.0429 | 4.1300 | 65.2960 | 0.9212 | 2.3600 |
| 0.4429 | 3.8500 | 73.7200 | 0.9455 | 2.0800 |
| 0.3576 | 4.2500 | 69.4800 | 0.9610 | 2.4800 |
| 0.8020 | 3.6700 | 91.7200 | 0.9760 | 1.9000 |
| 0.8628 | 3.6400 | 94.7200 | 0.9950 | 1.8700 |
| 0.4376 | 4.2900 | 73.4800 | 1.0080 | 2.5200 |
| 0.7828 | 3.6800 | 90.7200 | 1.0090 | 1.9100 |
| 1.7428 | 3.2000 | 82.1000 | 1.0145 | 1.4300 |

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|--------|--------|---------|--------|--------|
| 0.2024 | 3.9700 | 61.7200 | 1.0220 | 2.2000 |
| 0.5028 | 3.8200 | 76.7200 | 1.0362 | 2.0500 |
| 0.0828 | 4.0300 | 55.7200 | 0.9027 | 2.2600 |
| 0.7225 | 3.7100 | 87.7200 | 0.9332 | 1.9400 |
| 0.1023 | 4.0200 | 56.7200 | 0.9692 | 2.2500 |
| 0.5976 | 4.3700 | 81.4800 | 0.9787 | 2.6000 |
| 1.1622 | 3.4900 | 59.2300 | 0.9980 | 1.7200 |
| 0.7576 | 4.4500 | 89.4800 | 1.0132 | 2.6800 |
| 0.2824 | 3.9300 | 65.7200 | 1.0360 | 2.1600 |
| 0.2024 | 3.9700 | 61.7200 | 1.0560 | 2.2000 |
| 0.3376 | 4.2400 | 68.4800 | 1.0587 | 2.4700 |
| 0.0376 | 4.0900 | 53.4800 | 1.0692 | 2.3200 |
| 0.5176 | 4.3300 | 77.4800 | 0.4525 | 2.5600 |
| 0.7424 | 3.7000 | 88.7200 | 0.4510 | 1.9300 |
| 0.4824 | 3.8300 | 75.7200 | 0.4520 | 2.0600 |
| 0.0972 | 4.1200 | 56.4800 | 0.3947 | 2.3500 |
| 0.2974 | 4.2200 | 66.4800 | 0.3485 | 2.4500 |
| 0.1976 | 4.1700 | 61.4800 | 0.3962 | 2.4000 |
| 0.5779 | 4.3600 | 80.4800 | 0.3525 | 2.5900 |
| 0.8970 | 4.5200 | 96.4800 | 0.3610 | 2.7500 |
| 0.3624 | 3.8900 | 69.7200 | 0.3775 | 2.1200 |
| 0.1424 | 4.0000 | 58.7200 | 0.3832 | 2.2300 |
| 0.3424 | 3.9000 | 68.7200 | 0.8950 | 2.1300 |
| 0.1176 | 4.1300 | 57.4800 | 0.8910 | 2.3600 |
| 0.4424 | 3.8500 | 73.7200 | 0.8885 | 2.0800 |
| 0.3576 | 4.2500 | 69.4800 | 0.8962 | 2.4800 |
| 0.8024 | 3.6700 | 91.7200 | 0.8945 | 1.9000 |
| 0.8624 | 3.6400 | 94.7200 | 0.9445 | 1.8700 |
| 0.4376 | 4.2900 | 73.4800 | 0.9652 | 2.5200 |
| 0.7824 | 3.6800 | 90.7200 | 0.9872 | 1.9100 |

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|--------|--------|---------|--------|--------|
| 1.7424 | 3.2000 | 99.5600 | 0.9702 | 1.4300 |
| 0.2024 | 3.9700 | 99.3450 | 0.9635 | 2.2000 |
| 0.5024 | 3.8200 | 76.7200 | 0.3812 | 2.0500 |
| 1.6572 | 4.9000 | 87.5600 | 0.3915 | 3.1300 |
| 2.1173 | 4.5690 | 88.6000 | 0.3817 | 3.3600 |
| 1.5574 | 4.8500 | 81.2300 | 0.4900 | 3.0800 |
| 2.3575 | 4.2560 | 98.6300 | 0.4895 | 3.4800 |
| 1.1976 | 4.6700 | 88.2300 | 0.6275 | 2.9000 |
| 1.1377 | 4.6400 | 65.6700 | 0.6267 | 2.8700 |
| 2.4379 | 4.8900 | 67.7700 | 0.6477 | 3.5200 |
| 1.2177 | 4.6800 | 68.8450 | 0.6585 | 2.9100 |
| 0.2573 | 4.2000 | 70.9200 | 0.6792 | 2.4300 |
| 1.7972 | 4.9700 | 71.6950 | 0.6870 | 3.2000 |
| 1.4975 | 4.8200 | 72.8200 | 0.6982 | 3.0500 |
| 1.9177 | 4.2300 | 72.3450 | 0.6935 | 3.2600 |
| 1.2775 | 3.9100 | 71.5700 | 0.6857 | 2.9400 |
| 1.8971 | 4.2200 | 59.6450 | 0.5665 | 3.2500 |
| 2.5971 | 4.5700 | 60.0950 | 0.5710 | 3.6000 |
| 0.8371 | 3.6900 | 67.8200 | 0.6482 | 2.7200 |
| 2.7573 | 4.6500 | 68.4450 | 0.6545 | 3.6800 |
| 1.7174 | 4.1300 | 68.2700 | 0.6527 | 3.1600 |
| 1.7976 | 4.1700 | 73.0200 | 0.7002 | 3.2000 |
| 2.3379 | 4.4400 | 73.2950 | 0.7030 | 3.4700 |
| 2.0374 | 4.2900 | 72.6200 | 0.6962 | 3.3200 |
| 2.5171 | 4.5300 | 73.4700 | 0.7047 | 3.5600 |
| 1.2572 | 3.9000 | 55.9450 | 0.5295 | 2.9300 |
| 1.5173 | 4.0300 | 57.1700 | 0.5417 | 3.0600 |
| 2.0975 | 4.3200 | 58.1950 | 0.5520 | 3.3500 |
| 2.2976 | 4.4200 | 58.8700 | 0.5587 | 3.4500 |
| 2.1976 | 4.3700 | 58.8200 | 0.5582 | 3.4000 |

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|---------|--------|---------|--------|--------|
| 2.5777 | 4.5600 | 60.6450 | 0.5765 | 3.5900 |
| 2.8977 | 4.7200 | 60.5450 | 0.5755 | 3.7500 |
| 1.6376 | 4.0900 | 61.1950 | 0.5820 | 3.1200 |
| 7.8574 | 4.2000 | 61.3200 | 0.5832 | 3.2300 |
| 7.6574 | 4.1000 | 61.4450 | 0.5845 | 3.1300 |
| 8.1174 | 4.3300 | 65.5950 | 0.6260 | 3.3600 |
| 7.5576 | 4.0500 | 66.3700 | 0.6337 | 3.0800 |
| 8.3578 | 4.4500 | 72.1200 | 0.6912 | 3.4800 |
| 7.1979 | 3.8700 | 73.1700 | 0.7017 | 2.9000 |
| 7.1370 | 3.8400 | 73.4700 | 0.7047 | 2.8700 |
| 8.4371 | 4.4900 | 73.4950 | 0.7050 | 3.5200 |
| 7.2172 | 3.8800 | 73.2200 | 0.7022 | 2.9100 |
| 6.2573 | 3.4000 | 75.0700 | 0.7207 | 2.4300 |
| 7.7974 | 4.1700 | 75.8450 | 0.7285 | 3.2000 |
| 7.4975 | 4.0200 | 76.2950 | 0.7330 | 3.0500 |
| 9.6576 | 4.7000 | 85.0000 | 0.4752 | 4.1300 |
| 10.1177 | 4.9300 | 55.1200 | 0.5212 | 4.3600 |
| 9.5574 | 4.6500 | 57.6950 | 0.5470 | 4.0800 |
| 10.3574 | 4.5690 | 60.2950 | 0.5730 | 4.4800 |
| 9.1975 | 4.8700 | 62.5700 | 0.5957 | 3.9000 |
| 9.1374 | 4.8400 | 63.8700 | 0.6087 | 3.8700 |
| 10.4374 | 2.3600 | 66.2200 | 0.6322 | 4.5200 |
| 9.2174 | 4.8800 | 65.3950 | 0.6240 | 3.9100 |
| 8.2573 | 4.4000 | 62.6950 | 0.5970 | 3.4300 |
| 9.7974 | 4.6200 | 59.5950 | 0.5660 | 4.2000 |
| 9.4974 | 3.2500 | 65.2950 | 0.6230 | 4.0500 |
| 9.9174 | 3.5600 | 72.3200 | 0.6932 | 4.2600 |
| 9.2773 | 4.9100 | 75.6950 | 0.7270 | 3.9400 |
| 2.9373 | 4.8960 | 78.0200 | 0.7502 | 4.2500 |
| 3.3373 | 5.0000 | 80.9950 | 0.7800 | 4.6000 |

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|--------|--------|---------|--------|--------|
| 2.4572 | 4.6900 | 82.0450 | 0.7905 | 3.7200 |
| 5.0573 | 2.3500 | 84.4200 | 0.8142 | 4.6800 |
| 4.1575 | 4.7300 | 88.0950 | 0.8510 | 4.1600 |
| 7.6773 | 4.7700 | 87.9200 | 0.8492 | 4.2000 |
| 5.5372 | 4.8900 | 85.9700 | 0.8297 | 4.4700 |
| 5.0171 | 4.8900 | 81.4700 | 0.7847 | 4.3200 |
| 3.7171 | 4.9200 | 82.8950 | 0.7990 | 4.5600 |
| 3.4171 | 4.9000 | 83.2950 | 0.8030 | 3.9300 |
| 6.1370 | 4.6300 | 83.3450 | 0.8035 | 4.0600 |
| 4.3372 | 4.9200 | 86.0700 | 0.8307 | 4.3500 |
| 5.8776 | 4.9600 | 86.0700 | 0.8307 | 4.4500 |
| 4.2174 | 4.9700 | 85.5450 | 0.8255 | 4.4000 |
| 5.8372 | 2.6530 | 85.8200 | 0.8282 | 4.5900 |
| 3.3976 | 4.5600 | 85.4950 | 0.8250 | 4.7500 |
| 3.1173 | 4.6900 | 87.0700 | 0.8407 | 4.1200 |
| 5.0771 | 4.8000 | 59.2300 | 0.4947 | 4.2300 |
| 3.7576 | 4.7000 | 92.5600 | 0.4895 | 4.1300 |
| 5.7576 | 4.9300 | 56.9800 | 0.4960 | 4.3600 |
| 5.5974 | 4.6500 | 53.8450 | 0.5085 | 4.0800 |
| 6.1573 | 1.2350 | 54.0700 | 0.5107 | 4.4800 |
| 6.1972 | 4.8700 | 56.9450 | 0.5395 | 3.9000 |
| 2.9373 | 4.8400 | 59.8700 | 0.5687 | 3.8700 |
| 6.5973 | 4.9000 | 61.6450 | 0.5865 | 4.5200 |
| 4.0172 | 4.8800 | 62.8200 | 0.5982 | 3.9100 |
| 6.5573 | 4.4000 | 64.4450 | 0.6145 | 3.4300 |
| 3.9974 | 4.8200 | 57.2950 | 0.5430 | 4.2000 |
| 6.0175 | 2.8200 | 58.9450 | 0.5595 | 4.0500 |
| 4.8774 | 3.9000 | 61.5950 | 0.5860 | 5.1300 |
| 7.9175 | 4.1300 | 62.6700 | 0.5967 | 5.3600 |
| 6.2574 | 3.8500 | 65.1200 | 0.6212 | 5.0800 |

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|--------|--------|---------|--------|--------|
| 2.9377 | 4.2500 | 66.0950 | 0.6310 | 5.4800 |
| 3.8577 | 3.6700 | 67.6450 | 0.6465 | 4.9000 |
| 2.5976 | 3.6400 | 68.2950 | 0.6530 | 4.8700 |
| 2.9774 | 4.2900 | 67.1700 | 0.6417 | 5.5200 |
| 3.1373 | 3.6800 | 66.3950 | 0.6340 | 4.9100 |
| 4.4774 | 3.2000 | 69.1700 | 0.6617 | 4.4300 |
| 2.9373 | 3.9700 | 72.2200 | 0.6922 | 5.2000 |
| 4.5374 | 3.8200 | 72.2450 | 0.6925 | 5.0500 |
| 4.0773 | 4.0300 | 73.4950 | 0.7050 | 5.2600 |
| 4.9974 | 3.7100 | 73.9450 | 0.7095 | 4.9400 |
| 3.6574 | 4.0200 | 75.4200 | 0.7242 | 5.2500 |
| 2.4374 | 4.3700 | 75.1200 | 0.7212 | 5.6000 |
| 4.3773 | 3.4900 | 79.3200 | 0.7632 | 4.7200 |
| 2.8773 | 4.4500 | 81.3450 | 0.7835 | 5.6800 |
| 3.4677 | 3.9300 | 81.1450 | 0.7815 | 5.1600 |
| 3.3376 | 3.9700 | 78.0000 | 0.4790 | 5.2000 |
| 5.3372 | 4.2400 | 79.0000 | 0.4930 | 5.4700 |
| 2.1376 | 4.0900 | 52.8200 | 0.4982 | 5.3200 |
| 4.4173 | 4.3300 | 53.3200 | 0.5032 | 5.5600 |
| 4.0773 | 3.7000 | 67.9950 | 0.6500 | 4.9300 |
| 2.9572 | 3.8300 | 65.6700 | 0.6267 | 5.0600 |
| 5.8978 | 4.5600 | 65.0950 | 0.6510 | 5.3500 |
| 5.6378 | 4.3000 | 64.8350 | 0.3910 | 5.0900 |
| 5.3777 | 4.0400 | 64.5750 | 0.7543 | 4.8300 |
| 5.1171 | 3.7800 | 64.3150 | 0.7525 | 4.5700 |
| 4.8573 | 3.5200 | 64.0550 | 0.7241 | 4.3100 |
| 4.5975 | 3.2600 | 63.7950 | 0.2958 | 4.0500 |
| 4.3377 | 3.0000 | 63.5350 | 0.7276 | 3.7900 |
| 4.0774 | 2.7400 | 63.2750 | 0.6990 | 3.5300 |
| 3.8176 | 2.4800 | 63.0150 | 1.3240 | 3.2700 |

| | | | | |
|--------|--------|---------|--------|--------|
| 3.5570 | 2.2200 | 62.7550 | 0.5418 | 3.0100 |
| 3.2973 | 1.9600 | 62.4950 | 1.5335 | 2.7500 |
| 3.0374 | 1.7000 | 62.2350 | 0.4892 | 2.4900 |
| 2.7776 | 1.4400 | 61.9750 | 1.5162 | 2.2300 |
| 2.5177 | 1.1800 | 61.7150 | 0.5022 | 1.9700 |
| 2.2573 | 1.5600 | 61.4550 | 1.3326 | 1.7100 |
| 1.9976 | 1.3000 | 61.1950 | 0.9845 | 1.4500 |
| 1.7375 | 1.0400 | 60.9350 | 0.7521 | 1.1900 |
| 1.4773 | 3.5600 | 60.6750 | 3.5707 | 0.9300 |
| 1.2172 | 2.8180 | 60.4150 | 2.8238 | 0.6700 |
| 0.7525 | 2.9083 | 60.1550 | 2.8240 | 0.4100 |
| 0.7241 | 2.8472 | 59.8950 | 2.8694 | 0.1500 |
| 0.2958 | 3.0858 | 59.6350 | 3.2433 | 0.1100 |
| 0.7276 | 2.7547 | 59.3750 | 2.3133 | 0.1500 |
| 0.6990 | 2.1963 | 59.1150 | 1.8685 | 0.1100 |
| 1.3240 | 2.0206 | 58.8550 | 2.5860 | 0.1500 |
| 0.5418 | 1.5382 | 58.5950 | 2.2468 | 0.1100 |
| 1.5335 | 5.0000 | 58.3350 | 1.6125 | 0.1500 |
| 0.4892 | 1.5820 | 58.0750 | 1.4785 | 0.1100 |
| 1.5162 | 1.5620 | 57.8150 | 2.2608 | 0.1500 |
| 0.5022 | 1.6633 | 57.5550 | 2.9516 | 0.1100 |
| 1.3326 | 1.7803 | 74.3200 | 1.2376 | 0.1500 |
| 0.9845 | 2.5851 | 77.6950 | 1.8729 | 0.1100 |
| 0.7521 | 2.4180 | 80.0200 | 1.7349 | 0.1500 |
| 3.5707 | 2.6356 | 82.9950 | 2.5827 | 0.1100 |
| 2.8238 | 2.9756 | 84.0450 | 1.6428 | 0.1500 |
| 2.8240 | 3.0182 | 86.4200 | 2.5808 | 0.1100 |
| 2.8694 | 3.2205 | 90.0950 | 1.6132 | 0.1500 |
| 3.2433 | 3.3644 | 89.9200 | 1.1575 | 0.1100 |
| 2.3133 | 3.8530 | 87.9700 | 2.3241 | 0.1500 |

| | | | | |
|--------|--------|---------|--------|--------|
| 1.8685 | 3.6740 | 83.4700 | 1.7945 | 0.1100 |
| 2.5860 | 3.7862 | 84.8950 | 1.6127 | 0.1500 |
| 2.2468 | 4.2261 | 85.2950 | 1.0930 | 0.1100 |
| 1.6125 | 4.4093 | 85.3450 | 1.7624 | 0.1500 |
| 1.4785 | 4.5572 | 88.0700 | 1.8298 | 0.1100 |
| 2.2608 | 4.6093 | 88.0700 | 0.6789 | 0.1500 |
| 2.9516 | 4.5406 | 87.5450 | 0.9986 | 0.1100 |
| 1.2376 | 4.5614 | 87.8200 | 0.7805 | 0.1500 |
| 1.8729 | 4.5200 | 87.4950 | 0.9953 | 0.1100 |
| 1.7349 | 3.2500 | 89.0700 | 2.7167 | 0.1500 |
| 2.5827 | 4.9983 | 61.2300 | 1.5793 | 0.1100 |
| 1.6428 | 1.5230 | 94.5600 | 1.9504 | 0.1500 |
| 2.5808 | 3.4801 | 58.9800 | 2.5741 | 0.1100 |
| 1.6132 | 3.6019 | 55.8450 | 0.7011 | 0.1500 |
| 1.1575 | 3.9592 | 56.0700 | 0.7757 | 0.1100 |
| 2.3241 | 4.1034 | 58.9450 | 1.1141 | 0.1500 |
| 1.7945 | 4.3144 | 61.8700 | 1.0397 | 0.1100 |
| 1.6127 | 4.4337 | 63.6450 | 3.0701 | 0.1500 |
| 1.0930 | 4.5058 | 64.8200 | 1.3927 | 0.1100 |
| 1.7624 | 4.5084 | 66.4450 | 1.8967 | 0.1500 |
| 1.8298 | 4.5591 | 59.2950 | 1.3150 | 0.1100 |
| 0.6789 | 4.4818 | 60.9450 | 3.5871 | 0.1500 |
| 0.9986 | 3.1788 | 63.5950 | 3.3465 | 0.1100 |
| 0.7805 | 3.3465 | 64.6700 | 1.1506 | 0.1500 |
| 0.9953 | 3.5639 | 67.1200 | 2.0317 | 0.1100 |
| 2.7167 | 3.9870 | 68.0950 | 1.4894 | 0.1500 |
| 0.6248 | 4.3250 | 62.4400 | 0.5620 | 0.0345 |