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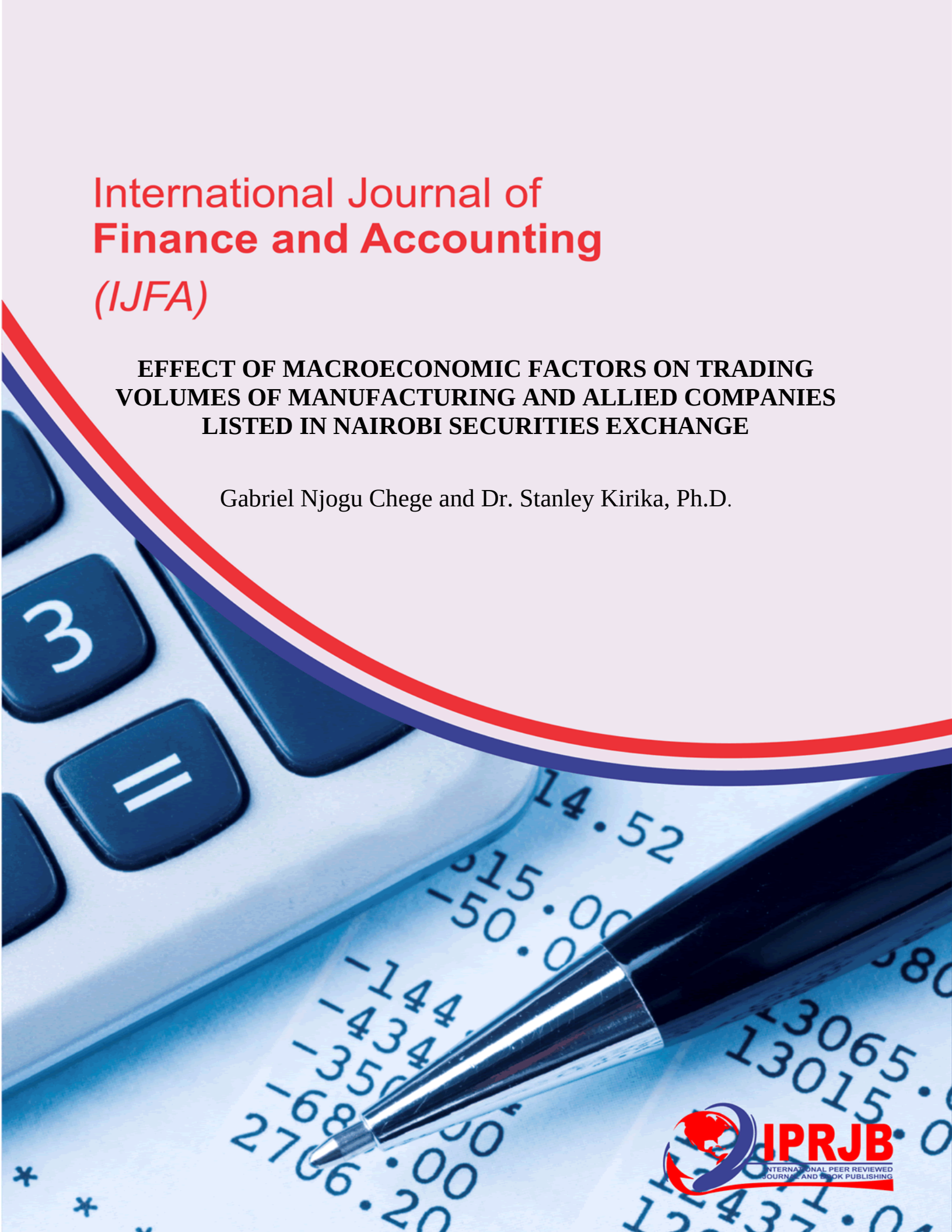
Gabriel Njogu Chege and Dr. Stanley Kirika, Ph.D.



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EFFECT OF MACROECONOMIC FACTORS ON TRADING VOLUMES OF MANUFACTURING AND ALLIED COMPANIES LISTED IN NAIROBI SECURITIES EXCHANGE

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Abstract

Purpose: The purpose of this study was to establish the effect of inflation, lending rate, exchange rates and Treasury bill interest rate on trading volumes of manufacturing and allied companies listed in the Nairobi Stock Exchange.

Materials and Methods: The research adopted a quantitative descriptive design that focuses on nine manufacturing and allied companies listed in NSE and make up in the list of 25-share index companies. The nine manufacturing and allied companies were selected through purposive sampling techniques, where samples were selected based specific factors. The data used in the research was collected from Central Bank of Kenya, Nairobi Security Exchange and Kenya Bureau of Statistics. This research employed a panel data analysis using STATA software. Treasury bill rate was dropped from the model due to multicollinearity.

Results: The analysis found that there was a negative relationship between inflation on trading volume, exchange rate had a negative correlation with stock trading, lending rate had a negative correlation with stock trading volume of manufacturing and allied companies listed in the Nairobi Stock Exchange.

Unique contribution to theory, practice and policy: The study recommends the government should initiate policies that will lower the lending rate in Kenya as lower lending rate may translate to higher stock trading volumes. Further studies should research on other factors affecting stock trade volume which may include the value of the stocks and the information size in the market.

Key words: *Inflation, Lending Rate, Exchange Rates, Trading Volumes, Nairobi Stock Exchange*

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1.0 INTRODUCTION

The natural forces of demand and supply determine the volume traded in the market. Both buyers and sellers interact to determine what is demanded and what can be supplied to effect an equilibrium on the market. For instance, the more buyers and sellers of a particular product, the more liquid the market for the product will be (Long, Malitz & Ravid, 2014). High liquidity has a significant impact on how products can move from the seller to the buyer (McEachern, 2018). The stock market is relatively complicated and does not always operate as the commodity market; forces of demand and supply only affect stock trading volumes in the short run.

Factors that influence stock trading volumes in the long-run include exchange rates, inflation, lending rates and Treasury bill rates. Investors carry out numerous assessments on the prospects of the company while assigning different weights to the factors under consideration thereby assigning different values to the stock (Angel & McCabe, 2013). Therefore, inflation, exchange rates, lending rates and Treasury bill rate are factors that impact the trading volumes in the long run. These factors play a critical role in helping investors determining the level of demand which later controls the supply of stock on the market.

Stocks bearing higher returns have higher demand from the majority of investors because such stocks exhibit a greater intrinsic value, hence give more opportunities to trading. This is reflected by the difference in stock trading volumes that occur between stocks with high intrinsic values and those with a lower value (Kleintop, 2014). The thickly traded stocks have narrow spreads resulting in higher trading volumes with smoother movements. On the other hand, the thinly traded stocks have relatively wider spreads and tend to move in a kneejerk manner. A release of new significant information in an efficient market will lead to a one-time jump or drop in stock with high trading volumes followed by relatively smooth trading as the investors rapidly make impact assessment of the new information.

Information about inflation, exchange rates, lending rates and Treasury bill interest rate impact trading volumes in the market since studies show that these factors impact the stock values of particular stocks. The trading volume in itself is not affected by demand and supply on the stock market irrespective of the supply on the market, the demand of stock which translates into trading volumes is determined by the intrinsic value of the stock (Arthur, 2018). Majority of stock traders, for instance, would prefer thinly traded stocks taking caution of the heightened volatility involved before they buy. In the event the stock is highly volatile because of unstable trading factors in the market, traders tend to hold on the stock until its value stabilizes (Shleifer, 2015).

The relations between trading volume and inflation, exchange rates, lending rates, and Treasury bill interest rate provide insight into the structure of financial markets (Dahan, Kim, Lo, Poggio & Chan, 2017). These authors predicted that stock trading volumes depend on inflation, exchange rates, and interests in the economy. The correlation between inflation, exchange rates and lending rates, versus trading volume, might explain the movements of historical changes in stock trading volumes (Preis, Moat & Stanley, 2013). However other scholars have contradicted this concept by holding that the efficient market hypothesis (EMH) does not hold in all the cases

because past changes in trading volumes in a competitively traded stock market may not significantly be predicted by all the three factors under investigation. (Peress, 2015).

Despite their differing point of view, authors agreed that stock trading volumes are impacted by fluctuation in interest, inflation and exchange rates in the economy. They both reached an agreement that valuable information about the intrinsic value of the stock market would determine its future trading volumes on the market (Vlastakis & Markellos, 2014). For instances, the stock volume traded is higher when the value of the stocks are increasing than when the value is falling. Information size in the market and stock direction have an insignificant impact on stock conditional volatility (Vlastakis & Markellos, 2014). The authors also established that the persistence of volatility might decrease when the contemporaneous trading volumes are broken down into both expected and unexpected stock components.

The Nairobi Securities Exchange (NSE) is small but rapidly growing hence faces an array of problems of high volatility and uncertainty (Masila, 2016). However, there is limited evidence concerning stock value volatility and trading volumes in the Kenyan finance literature. It is, therefore, important to provide the investors in the NSE market with more insight in regards to the effect of trading factors including inflation, lending rates, and exchange rates on stock trading volumes. This study focuses on the Kenyan stock exchange market. The study attempts to identify and establish the effect of inflation, exchange rates and interest rates on trading volume in the Kenyan stock markets. The Kenyan stock market has undergone various transformations over the years (Jefferis & Smith, 2015). This study attempts to explain how the trading volume in the stock market is influenced by stock inflation, lending rates, and exchange rates in the NSE despite the existence of other factors such as market regulations and government policies.

Microeconomic Factors

The discount factor is split into a risk-free component and an equity risk premium to derive the present value model (Hansen, Heaton & Li, 2018). The equity risk premium signals the degree of risk aversion which affects the stocks trading volume. Additionally, higher stock value reveals a rise in the discounted expected earnings thereby providing potentially useful information about future trading opportunities. Additionally, higher stock value provides an extra stimulus for households and firms that own stocks as well as boosting their confidence in the market.

The state of the security market is viewed as a general economic performance measure of most developed economies. The stock value affects the real economy via a confidence channel (Ehrmann, Fratzscher & Rigobon, 2016). An increase in the stock value reduces the level of uncertainty investors may have concerning their future capital while a fall in the stock intrinsic value lowers the confidence of the investors (Adam, 2017). Financial experts also posit that higher stock value increases the ratio between the value of the market, installed capital and the cost of replacing capital, also known as Tobin's Q, thereby encouraging the firms to invest more in capital (Hansen, Heaton & Li, 2018). From the literature, there are various factors which support the view that rises in stock volumes may anticipate economic growth.

Concept of Stock Trading Volume

Trading volume is a measure of the number of shares exchanging hands between buyers and sellers over a specified period. The number of daily volumes of a security fluctuates on day to day basis depending on the companies' new information that reaches the market (Zacks, 2018). These may include information pertaining to the expiry of an option contract issued by a company or type of trading is either full or half day. The stock traders are watchful for any discrepancies that might occur in the stock market to decide on whether to buy, hold on, or sell their stock (O'Hara, 2015). Traders observe trading volumes to determine the direction of stock in the market. An indication of a rise in stock trading volumes is associated with a rising stock value attracting high trading volumes.

This results to increase in demand as traders notice the increase in stock's intrinsic value leading to higher demand for the stock and creating an opportunity to trade. Low valued stocks have a tendency to trade less frequently and have less liquidity. This makes it relatively harder for an investor or trader to get into or out of the market and buy the volumes he wants because of high-risk exposure. The stock markets report the average stocks traded during the day which measures the average number of times that stock listed on the market exchanges hands (Zacks, 2018).

Microeconomic Factors on Trading Volume

The lending rate, exchange rate and inflation induce changes in stock volumes because it is a significant input into trading strategies (Schwert, 2013). Most investors are risk-averse and are put off from taking up investment decisions in the presence of any unstable macroeconomic factors in the market (Inderst, & Peitz, 2014). The saying "It takes macroeconomic factors to make stock trading volumes move" has been hypothesized by several researchers who claimed that inflation, lending rates, and exchange rates would drive variability in trading volumes. This hypothesis has been supported by various empirical studies.

There is a correlation between stock trading volumes and individual company's stocks using inflation, exchange rates, and lending rates (Kyereboah-Coleman & Agyire-Tettey, 2018). The authors conducted a study using monthly data collected from 51 different stocks and four-day intervals giving them a similar conclusion (Sun, 2013). Several scholars also opined that the inflation, exchange rates, and lending rates had a correlation with trading volumes for both equity and future markets across the time intervals investigated (Cartwright, Kamerschen & Huang, 2018);. Even though, the correlation was found to be rather weak. The scholars attributed the weak correlation to the evidence of short selling is more difficult than buying a similar amount of stock.

The stock volume concept is built on the fact that stock trading volumes are controlled by factors in the market that determine demand and supply. Therefore, the higher inflation, lending rates, and exchange rates are often viewed as a consequence of stock volume volatility, average daily stock volumes, and trading activities (Chordia, Roll & Subrahmanyam, 2015). There is also a significant relationship between lending rate, exchange rate, inflation and stock trading volume

movement attributed to the phenomenon that these factors are sources of risks in the market. Stock trading volume and stock market value can be described as potential indicators of current economic performance in the country with the stock market (Olweny, & Kimani, 2015). These factors play a major role in determining stock trading activities in the market. Other than directly affecting the value of the stock by determining the cost of capital, inflation, lending rates, and exchange rates also determine the supply and value of money circulating in the stock market. Since stock trading volumes would be determined by the supply and value of money in the market, these factors, therefore, have a major impact on stock trading volumes in the NSE.

Nairobi Securities Exchange

Nairobi Stock Exchange (NSE) started trading in corporate shares in the 1920s under the gentleman's agreement when Kenya was a British colony. The market was later formally organized and registered in 1954 under the Societies Act of 1954 (Gray & Bythewood, 2014). It was considered as a voluntary association of stockbrokers who acted as intermediaries between sellers and buyers. They Stockbrokers were charged with the responsibility of developing the market, regulating stock trading activities, and acting as intermediaries between stock sellers and buyers.

The securities market in Kenya has been growing and diversifying rapidly as well as adopted an automated trading system which helps in keeping pace with other major world stock exchanges (Irving, 2015). Innovations within NSE have substantially increased the volume of stocks traded in the market. The manufacturing and allied sector has nine companies that include B.O.C Kenya, Carbacid Investments, British American Tobacco, Mumias Sugar, East African Breweries, Unga Group, Kenya Orchards, Eveready East Africa, and Flame Tree Group Holdings.

Determinants of Stock Trading Volumes on the Market

Researchers have identified various factors that affect stock trading volumes in the global market. These factors include inflation, lending rates, foreign exchange rates, government policy and level of competition (Kyereboah-Coleman & Agyire-Tettey, 2018). This chapter reviews studies on the four major factors being investigated in the research.

Inflation is described as the general and persistent increase in price levels of basket products. It is determined by the consumer price index (CPI). Inflation has a negative impact on the macroeconomic environment stability hence the government's efforts to keep it as low as possible. Inflation results in the loss of value of a dollar since one will need more dollars to purchase the same products in the future (Kiganda, 2014). The stock market, just like any other market requires a stable economy with a stable currency value. Fluctuating inflation rates affect the stability of a country's currency leading to fluctuating purchasing power of the currency. In the event the Kenyan shilling loses value, for instance, more money would be required to buy smaller volumes of stock. A highly volatile currency also increases investment risk exposure on the market since inflation directly impacts commodities and asset instruments on the market

(Damodaran, 2016). Investors, therefore, tend to invest less in the NSE listed stocks in the event of high inflation rates thereby impacting stock trading volumes in the stock market.

The effects of inflation are felt directly in the stock market. The Kenyan government through the central bank of Kenya develops monetary policies meant to stabilize inflation rates in the country's economy (Elly & Oriwo, 2013). It proposes various policies meant to address inflation rates in the economy including Open Market Operations (OMO), Discount window, and Reserves requirements. Inflation affects the cost of production in the economy by increasing prices of factors of production. These results in a reduction of capital returns on investments negatively impacting the performance of the stock on the market. This is reflected in the assets that generate long-term income since they automatically adjust to prevailing inflation rates based on the Gordon growth model (Miregi & Obere, 2014).

Lending rates refer to the cost of capital for borrowers or reward on saving money in a deposit account for people who forgo consumption over a specified period (Bean, 2017). It is typical for people to save when they have a surplus income after their necessary expenditures. However, there is a motivation for people to either borrow, invest or save. Lower lending rates on loans would encourage borrowing, high lending rates on deposits would encourage saving, while high returns on investments compared to lending rates on deposits would encourage investing. Lending rates and inflation directly affects productivity in any economy (Miregi & Obere, 2014).

Borrowing costs directly reduce the amount of disposable income to individuals where higher lending would discourage them from borrowing to invest in the economy. Manufacturing companies will also be discouraged to borrow from banks in the event of the high cost of borrowing (Freel, Carter, Tagg & Mason, 2016). High interests on deposits also discourage investments in stock markets. Bank deposits are considered to be less risky compared to stock investments, risk-averse investors will prefer bank deposits to stock investments reducing the demand of companies' stocks on the market. The Kenyan government realized that the cost of borrowing has a major negative impact on investment activities in the economy. The parliament passed a bill to cap bank interest rates on loans and deposits (Cytonn, 2016). The interest cap bill has affected banks and listed companies in various ways.

Manufacturing companies, for instance, found that debt financing was cheaper than equity financing prompting them to finance a bigger portion of their capital through bank loans. A cap on lending rates, therefore, affected the pricing of loans in the market which affected most banks forcing some into receivership (Petersen & Rajan, 2015). Irrespective of the increased demand of loans by manufacturing and allied companies, some banks denied extending credit to a majority of the listed companies because of high risks of defaulting and instead opted to lend to the government. The impact has since been felt by reduced productivity in the economy prompting the government to reconsider the cap and repeal the interest capping bill to allow market forces of demand and supply to determine pricing of loans in the market. It is evident, therefore, that lendings rates have both a direct and indirect impact on stock trading volumes in the market.

Exchange rates refer to the rate of conversion of currencies. In the case of the Kenyan market, it refers to the rate at which the Kenyan shillings trade against a foreign currency such as the

American dollar, Tanzanian, or Ugandan shilling. Foreign exchange majorly impacts companies that sell their products across the border or buy raw materials from other countries resulting to exchange of currencies (Aithal, 2017). The regional governments have opened up the East Africa Community (EAC) trade bloc that allows residents and companies from the three countries in the region, Kenya, Tanzania, and Uganda to trade with each other. The stability of the Kenyan shilling against the trading partners' currency affects export and import trade.

Despite numerous studies being carried on this macroeconomic factor, none has established a direct effect on foreign exchange rates and stock market performance in the Nairobi Stock Exchange. However, exchange rates affect developed global stock markets which allow players from different countries across the world to buy and sell stocks through internet platforms (Khanna & Palepu, 2015). A cheaper dollar would, for instance, encourage foreign investors to buy stocks in the US stock market because they will be cheaper. The impact of the exchange rate is, however, negligible in developing stock markets such as the Nairobi Stock Exchange. However, a combination of the three macroeconomic factors, i.e., inflation, lending rates and exchange rates impact the stock trading volumes in developing stock markets.

Treasury bills are short-term borrowing instruments issued by the governments through their Central Banks to raise money on short term basis. They are sold at a discounted price to reflect investor's return and redeemed at face (par) value. In Kenya, the 91-day Treasury rate was the official interest rate up to August 2005 when it was replaced by the Central Bank Rate (CBR). The CBR is the average Kenya Interest Rate and has been historically recorded from 1991 by the CBK. Decisions regarding interest rates are taken by The Monetary Policy Committee (MPC) of the CBK. (Central Bank of Kenya, 2012). The difference between discounted value and par value represents the rate of return to the investor. Any investor is required to have an active Central Depository System (CDS) account with the CBK so that it is easy to trade in securities. The discounted price of the Treasury bill depends on the interest rate/yield quoted by the investor.

1.1 Statement of the Problem

Effect of inflation, exchange rates, lending rates and Treasury bill interest rate on stock trading volume continues to attract considerable attention among finance researchers. Stock trading volumes in a country's stock market is a general indicator of the country's stock market performance. This is because, inflation, exchange rates, lending rates and Treasury bill interest rate have an impact on the general performance of the stock market. Investors, therefore, use available information in the market to determine their demand for stocks on the global market.

As a result of inflation, stock volumes in Kenya dropped due to exchange rate volatility which was greatly contributed by the depreciation of Kenya shilling against the US dollar hence touching a low of Ksh. 107 against US dollar for the period 2007-2014, (NSE, 2011). Stock trading volumes are determined by inflation, exchange rates, and interest rates of the base country. Therefore, investors across the world rely on these factors to determine the stock volumes to trade in any particular period. Trends in the US Security market have indicated that Federal Reserve rates which determine the CBK lending rates also impact the supply of T-bills

on the market (Pilinkus, 2016). Investors will, therefore, choose to either invest in T-bills or corporate stocks depended on Federal Reserve rates which are determined by inflation, exchange rates, Treasury bill interest rate and lending rates. Some of the factors that affect the Nigeria stock market, in the long run, include inflation and interest (Maku & Atanda, 2015).

The popularity in stock trading in the Kenyan Security Market has continued to grow as a result of the increasing number of companies that are offering their stocks to the public through the initial public offerings (IPOs). Some of the companies that have gone public in recent years include KenGen, Access Kenya, Safaricom, and Kurwitu Ventures, in 2006, 2007, 2008, and 2014 respectively. This has led to both positive and negative traded volumes coupled with fluctuations in the three market factors. Such phenomena contribute to a remarkable desire by the investors together with the management to understand the behavior of the stock market as far as stock volume traded is concerned. Thus, increased degrees of stock volumes fluctuations caused by fluctuations of lending rate, exchange rate and inflation in the stock market create confusion and fear to the risk-averse investors making them not to participate in the security market activities (Hirshleifer, 2014).

2.0 THEORITICAL REVIEW AND CONCEPTUAL FRAMEWORK

2.1 Theoretical Review

2.1.1 The Fisher Effect Theory

The Fisher effect theory proposed by Fisher (1930) explains the interaction between interest rates and inflation and how these affect trading activities on the stock market. The theory is based on interactions between inflation and interest rates and how these would impact the stock market by affecting money circulation (Miller, Jeffrey, & Mandelker, 1976). A stable inflation and interest rates would encourage savings and investments in the financial markets (Laichena & Obwogi, 2015). Investors have learnt to check the inflation levels and interest rates in the market to make their investment decisions. Stable inflation and interest rates would improve real and expected return on stocks and investors would increase their investment in the stock market whose economy is more stable (Kaldor, 1939). In the event there is high inflation and interest rates, most investors would be discouraged to trade in stocks since the expected returns would be lower. High inflations and interest rates, therefore, reduce stock trading volumes on the stock market.

The Fisher effect theory has been used by finance scholars to describe the effect of inflation on real and nominal interest rates. According to this theory, inflation is equal to real and nominal interest rates (Miller, Jeffrey & Mandelker, 1976). Inflation affects foreign exchange rates of currencies of different countries. This effect would equally be extended to the depended variables in this study. The research intends to establish the relationship that exists between inflation, exchange rates, interest rate and Treasury bill rate. Since inflation would have a direct impact on interest rates and exchange rates in the Kenyan market, it will equally have a significant impact on stock trading volumes in the NSE (Masila, 2010). Foreign investors in NSE, for instance, would strictly assess these factors prevailing in the entire economy to make

investment decisions on whether to or not to purchase listed shares of manufacturing and allied companies in the NSE, thereby impacting trading volumes.

2.1.2 Purchasing Power Parity Theory

Purchasing Power Parity (PPP) is a theory of exchange rate determination. It asserts that the exchange rate between two currencies over any period of time is determined by the change in the two countries price levels. As this theory singles out changes in price levels as the overriding determinant in the determination exchange rate, it is also called the 'inflation theory of exchange rates'. Versions of PPP theory can be traced to the sixteenth century in Spain and England. However, it was Cassel (1916, 1918, 1919, 1922), a Swedish economist, who popularized the use of PPP. Cassel in 1918 realized that exchange rate in the short run would diverge from PPP and identified 3 disturbances (actual and expected inflation, barriers to trade and shifts in international movements of capital) which might have caused these deviations (Frenkel, 1978) However, he concluded that these shocks were transitory and did not analyze the PPP disparities.

There can be many reasons why deviations from PPP occur. Firstly, there may be restrictions on trade and capital movements or transfer pricing in a country which will distort the relationship between home and foreign prices. Secondly, speculative activities and official intervention may create a PPP disparity. Lastly, the productivity bias when there is a relatively faster growing productivity growth in the tradable sector than in the non-tradable sector will result in systematic divergence of internal prices (Balassa (1964)). The basic concept underlying PPP is that arbitrage forces will equalize prices of goods internationally if they are measured in the same currency. Basically there are two forms of PPP; absolute and relative. In the absolute version of PPP, the nominal exchange rate is determined by the ratio of domestic and foreign prices (Rogoff, 1996). The relative version of PPP dictates that the percentage change in the exchange rate is equal to the difference in the inflation rates between the two countries.

A devaluation in a countries currency makes its exports more competitive hence more demand for local exports and foreigners. This ultimately leads to increase in stock trading volume. The theory of purchasing power parity was used to guide the study objective on the effect of exchange rates on trading volume of stocks offered by manufacturing and allied companies listed in the Nairobi Security Market.

2.2 Conceptual Framework

The independent variables have been identified as inflation measured based on consumer price index (CPI), lending rates determined based on average lending rates proposed by the Central Bank of Kenya (CBK) and foreign exchange rates. The dependent variable in this study is the stock trading volumes determined by the market capitalization of select manufacturing and allied companies listed in the NSE. (Gay, 2016).

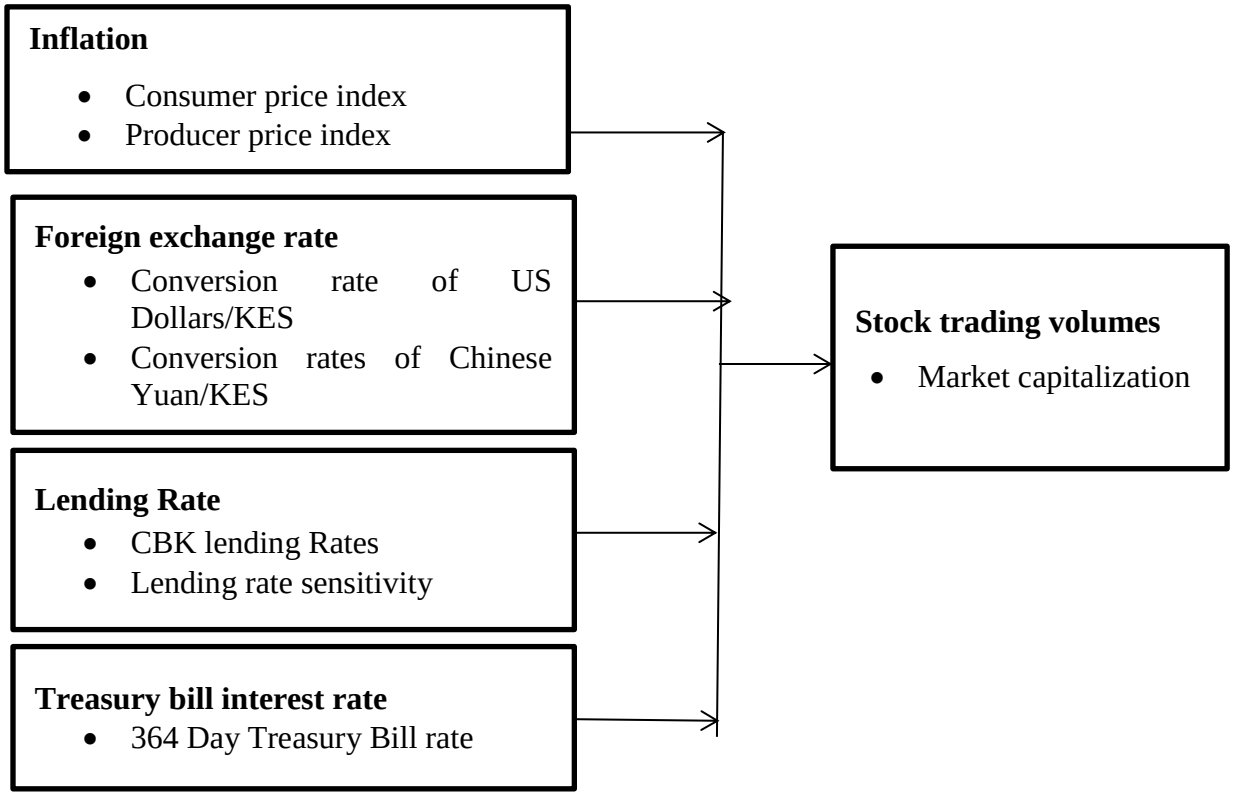

Figure 1: Conceptual Framework

3.0 METHODOLOGY

The research adopted a descriptive quantitative design since it involved gathering of panel data about the stock trading volumes on the Nairobi Stock Exchange Market and comparing it against macroeconomic factors under investigation for a period of 10 years. The study targeted the 9 manufacturing and allied firms listed in the Nairobi Securities. The study used purposive sampling techniques, where samples were selected based specific factors which include having been listed in NSE for at least 10 years, a market value of over KES. 10 Million, and its shares categorized in the 25-share index and among the manufacturing and allied companies. The research used secondary data collection method which involved collecting data already stored in printed or online sources. Independent data which included lending rates, inflation, exchange rates and Treasury bill interest rate for the 10-year period under investigation was collected from printed and stored sources from Central Bank of Kenya (CBK) and Kenya Bureau of Statistics (KBS). The dependent variable on the other hand which included the trading volumes of the listed manufacturing and allied companies being investigated in the 5-year period was collected

from Nairobi Stock Exchange (NSE) and Capital Markets Authority (CMA). Regression and correlation analysis techniques were used to accurately establish the effect of inflation, lending rates, exchange rates and Treasury bill interest rate to stock trading volumes. Data that was collected was sorted, edited and corded to have the required quality and accuracy. It was entered into STATA for generation of the required outputs. Analysis of variance (ANOVA) was used to test the significance of the model at 95% confidence interval.

4.0 RESULTS

4.1 Descriptive statistics

Table 1: Descriptive statistics

Year	Variable	N	Minimum	Maximum	Mean	Std. Deviation
2009	Inflation	9	14.11	14.11	14.1100	.00000
	Foreign exchange rate	9	77.35	77.35	77.3520	.00000
	Lending rate	9	7.88	7.88	7.8750	.00000
	TB rate	9	9.00	9.00	9.0000	.00000
	Stock trading volume	9	.11	168.30	22.6268	55.06755
2010	Inflation	9	5.62	5.62	5.6150	.00000
	Foreign exchange rate	9	79.23	79.23	79.2333	.00000
	Lending rate	9	6.42	6.42	6.4175	.00000
	TB rate	9	7.00	7.00	7.0000	.00000
	Stock trading volume	9	.12	173.00	24.8502	56.22119
2011	Inflation	9	7.99	7.99	7.9925	.00000
	Foreign exchange rate	9	88.81	88.81	88.8110	.00000
	Lending rate	9	8.40	8.40	8.3950	.00000
	TB rate	9	6.00	6.00	6.0000	.00000
	Stock trading volume	9	.19	154.20	21.9129	50.24488
2012	Inflation	9	14.28	14.28	14.2800	.00000
	Foreign exchange rate	9	84.53	84.53	84.5283	.00000
	Lending rate	9	15.75	15.75	15.7500	.00000
	TB rate	9	18.00	18.00	18.0000	.00000
	Stock trading volume	9	.42	176.34	27.6873	57.84376
2013	Inflation	9	5.56	5.56	5.5625	.00000
	Foreign exchange rate	9	86.12	86.12	86.1228	.00000
	Lending rate	9	8.83	8.83	8.8325	.00000

	TB rate	9	9.50	9.50	9.5000	.00000
	Stock trading volume	9	.16	253.05	36.7279	83.29866
2014	Inflation	9	6.81	6.81	6.8125	.00000
	Foreign exchange rate	9	87.92	87.92	87.9225	.00000
	Lending rate	9	8.50	8.50	8.5000	.00000
	TB rate	9	8.50	8.50	8.5000	.00000
	Stock trading volume	9	.77	288.53	44.1023	96.11853
2015	Inflation	9	6.54	6.54	6.5400	.00000
	Foreign exchange rate	9	98.18	98.18	98.1793	.00000
	Lending rate	9	10.13	10.13	10.1250	.00000
	TB rate	9	8.50	8.50	8.5000	.00000
	Stock trading volume	9	.64	288.53	42.6381	95.59246
2016	Inflation	9	7.13	7.13	7.1300	.00000
	Foreign exchange rate	9	101.50	101.50	101.5040	.00000
	Lending rate	9	10.54	10.54	10.5425	.00000
	TB rate	9	11.50	11.50	11.5000	.00000
	Stock trading volume	9	.41	240.40	38.2816	81.31613
2017	Inflation	9	6.15	6.15	6.1525	.00000
	Foreign exchange rate	9	103.41	103.41	103.4110	.00000
	Lending rate	9	10.90	10.90	10.9025	.00000
	TB rate	9	10.00	10.00	10.0000	.00000
	Stock trading volume	9	.48	219.84	34.1704	73.84048
2018	Inflation	9	4.97	4.97	4.9675	.00000
	Foreign exchange rate	9	101.35	101.35	101.3525	.00000
	Lending rate	9	10.78	10.78	10.7800	.00000
	TB rate	9	10.00	10.00	10.0000	.00000
	Stock trading volume	9	.49	223.42	34.7869	75.06229

In 2009, the mean of inflation was 14.11, mean of foreign exchange was 77.352, mean of lending rate was 7.875, TB rate was 9 and the mean of stock trading volume was 22.6268. In 2010 the mean of inflation was 5.6150, the mean of foreign exchange rate was 79.2333, the mean of lending rate 6.4175, the mean of TB rate was 7 and the mean of stock trading volume was 24.8502. In 2011 the mean of inflation was 7.9925, the mean of foreign exchange rate was 88.811, the mean of lending rate was 8.3950, the mean of TB rate was 6 and the mean of stock trading volume was 21.9129.

In 2012 the mean of inflation was 14.28, Foreign exchange rate was 84.5283, Lending rate was 15.7500, TB rate was 18.0000 and the mean of stock trading volume was 27.6873. In 2013 the mean of; inflation was 5.5625, the mean of foreign exchange rate was 86.1228, the mean of lending rate was 8.8325, TB rate was 9.5 and the mean of stock trading volume was 36.7279. In 2014 the mean of inflation was 6.8125, mean of foreign exchange rate was 87.9225, mean of lending rate was 8.5000, mean of TB rate was 8.5 and the mean of stock trading volume was 44.1023.

In 2015 the mean of inflation was 6.54, mean of foreign exchange rate was 98.1793, mean of lending rate was 10.125, mean of TB rate was 8.5 and the mean of stock trading volume was 42.6381. In 2016 the mean of inflation was 7.13, mean of foreign exchange rate was 101.504 mean of lending rate was 10.5425, mean of TB rate was 11.5 and the mean of stock trading volume was 38.2816. In 2017 the mean of inflation was 6.1525, the mean of foreign exchange rate 103.4110, the mean of lending rate was10.9025, the mean of TB rate was 10 and the mean of stock trading volume was 219.84. In 2018 the mean of inflation was 4.9675, the mean of foreign exchange rate was 101.3525, the mean of lending rate was 10.78, TB rate was 10 and the mean of stock trading volume was 34.7869.

4.2 Test for Panel data fixed or random model

Table 2: Test for fixed effect

```
. xtreg Y X1 X2 X3 X4, fe

Fixed-effects (within) regression               Number of obs      =        90
Group variable: NUMBER                          Number of groups   =         9

R-sq:  within  = 0.0843                         Obs per group: min =        10
       between = 0.0630                                        avg =      10.0
       overall = 0.0456                                        max =        10

                                                F(4,77)            =      5.77
corr(u_i, Xb)  = 0.1586                         Prob > F           =    0.0028

------------------------------------------------------------------------------
           Y |      Coef.   Std. Err.      t    P>|t|     [95% Conf. Interval]
-------------+----------------------------------------------------------------
          X1 |  -0.08065    0.238289    -0.34   0.002    -3.13393    0.957799
          X2 |  -0.03486    0.162963    -0.21   0.041    -0.41304    1.199741
          X3 |  -0.056492   0.25129     -0.22   0.046    -7.52111    4.096668
          X4 |   0.0532527  0.13012      0.41   0.024    -2.14710    5.898328
       _cons |   4.078738   33.21015     0.12   0.903   -62.05112   70.208590
-------------+----------------------------------------------------------------
     sigma_u |  72.156661
     sigma_e |  18.692578
         rho |  .93711074   (fraction of variance due to u_i)
------------------------------------------------------------------------------
F test that all u_i=0:     F(8, 77) =   149.01                 Prob > F = 0.0000
```

The probability value is less than 0.05. The probability value is significant hence the model is good and nicely fitted. All the coefficients of the model are not equal to zero.

Hausman Test

Table 3: Hausman Test

International Journal of Finance and Accounting
ISSN 2513-4311X (online)
Vol.5 Issue 2, No.2. pp. 27 - 49, 2020
www.iprjb.org

```
. hausman fixed .

                 ---- Coefficients ----
             |      (b)          (B)            (b-B)     sqrt(diag(V_b-V_B))
             |     fixed        random       Difference          S.E.
-------------+------------------------------------------------------------
          X1 |  -0.4778029     -0.2734607      -0.2043422       .86253
          X2 |   2.108981      -1.978584       -0.130397       1.4538
          X3 |  -4.192089      -4.36473          .172641        .67143
          X4 |   1.537098        .684342         .852756        .67746
------------------------------------------------------------------------------
                           b = consistent under Ho and Ha; obtained from xtreg
            B = inconsistent under Ha, efficient under Ho; obtained from xtreg

    Test:  Ho:  difference in coefficients not systematic

                  chi2(4) = (b-B)'[(V_b-V_B)^(-1)](b-B)
                          =  0.03
                Prob>chi2 =  0.875
```

To decide between fixed or random effects a Hausman test was conducted where the null hypothesis was that the preferred model is random effects, that is if the Prob>chi^2 value was greater than 0.05. The alternative the fixed effects if the Prob>chi^2 value was less than 0.05. It basically tested whether the unique errors (ui) are correlated with the regressors. Since the Prob>chi^2 value (0.875) was greater than 0.05. The null hypothesis for the test is that the random effect model is preferred to fixed effect model and is to be rejected if the p value is less than 5%. This imply that fixed model is preferred.

4.3 Diagnostic Tests

4.3.1 Test for Heteroscedasticity

Table 4: Test for Heteroscedasticity

```
Breusch-Pagan / Cook-Weisberg test for heteroskedasticity
         Ho: Constant variance
         Variables: fitted values of Y

         chi2(1)      =    0.0061
         Prob > chi2  =    0.1063
```

The presence of heteroscedasticity doesn't have an impact on the unbiasedness and linearity of the regression coefficient. Heteroscedasticity (the violation of homoscedasticity) is present when the size of the error term differs across values of an independent variable. Heteroscedasticity only affects the best property of OLS, which renders the conclusion made when testing hypothesis invalid. The study therefore, carried out Breusch-Pagan test to check the presence of heteroscedasticity (Gujarati, 2004).

The impact of violating the assumption of homoscedasticity is a matter of degree, increasing as heteroscedasticity increases. From the findings, the chi-square value was low, indicating heteroscedasticity was not a problem. Also, it was revealed that the p value of 0.1063 was more than 0.05 significant level implying that the study did not reject the null hypothesis of homoscedasticity and thus there was no heteroscedasticity which means the variance between variables was not homogenous.

4.3.2 Testing for Normality

Table 5: Shapiro-wilk normality test

Variable	Obs	W	V	z	Prob>z
Y	90	0.51806	36.454	7.931	0.00000
X1	90	0.73973	19.687	6.572	0.00000
X2	90	0.92227	5.880	3.907	0.00005
X3	90	0.86970	9.856	5.046	0.00000
X4	90	0.80907	14.442	5.889	0.00000

The classical linear regression model assume that the error term must be normally distributed with zero mean and a constant variance denoted as μ (0, σ 2). The error term is used to capture all other factors which affect dependent variable but are not considered in the model. However, it is assumed that the omitted factors have a small impact and at best random. For OLS to be applied, the error term must be normal (Gujarati, 2004). Non-normally distributed variables can distort relationships and significance tests. In this study normal distribution of data was tested by use of Shapiro Wilk Test. The Shapiro–Wilk test is a test of normality in frequentist statistics.

The null-hypothesis of this test was that the population is normally distributed. Thus, if the p-value is less than the chosen alpha level, then the null hypothesis is rejected and there is evidence that the data tested are not from a normally distributed population. In other words, the data are not normal. On the contrary, if the p-value is greater than the chosen alpha level, then the null hypothesis that the data came from a normally distributed population cannot be rejected. The findings show that the stock trading volume had (p-value=0.00000), Inflation rate had (p-value=0), Exchange rate (p-value=0.00005), lending rate (p-value=0) while Treasury bill interest rate had (p-value=0). This is an indication that all the variables had a p value of < 0.05 and hence we reject the null hypothesis and thus there is evidence that the data tested were not from a normally distributed population.

4.3.3 Test for Multicollinearity

Table 2: Test for Multicollinearity

Variable	VIF	1/VIF
X3	12.71	0.078683
X4	10.15	0.098477
X2	3.50	0.286084
X1	2.86	0.349481
Mean VIF	7.31	

When there is a perfect linear relationship among the predictors, the estimates for a regression model cannot be uniquely computed. The term collinearity implies that two variables are near perfect linear combinations of one another. When more than two variables are involved it is often called multicollinearity, although the two terms are often used interchangeably. The variance inflation factor (VIF) was employed in testing the data's multicollinearity. Collinearity or multicollinearity seeks to deduce how perfect a linear combination of a variable is to another variable. In case the VIF value is higher than 10 or incase the tolerance is deduced to be greater than 0.2 then the model has signs of multicollinearity. Tolerance levels are gotten by dividing 1 with the VIF value and the t statistic equation is arrived at by dividing the coefficient by the standard error. In all the occasions, the p value and the T static values must be inverse.

The investigation shows signs of multicollinearity in spite of the fact that they are low levels. The results show that the overall VIF is 7.31 which is less than 10 suggesting that the study information did not show multicollinearity issue as prescribed by (Field, 2009). Hence, all the factors based on the VIF pointers have no serious multicollinearity issue (Field, 2009).

The findings show that there is multicollinearity between interest rate and treasury bill. Therefore, the treasury bill rate was dropped from the model. The resultant test findings as in Table 7

Table 3: Test for Multicollinearity after dropping Treasury bill rate

Variable	VIF	1/VIF
X1	2.86	0.349557
X2	2.70	0.370479
X3	2.34	0.427535
Mean VIF	2.63	

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www.iprjb.org

After dropping Treasury bill rate, the results show that the overall VIF is 2.31, which is less than 10 suggesting that the study information did not show multicollinearity. Figure 2 below shows a revised conceptual framework after dropping treasuring bill rates due to multicollinearity.

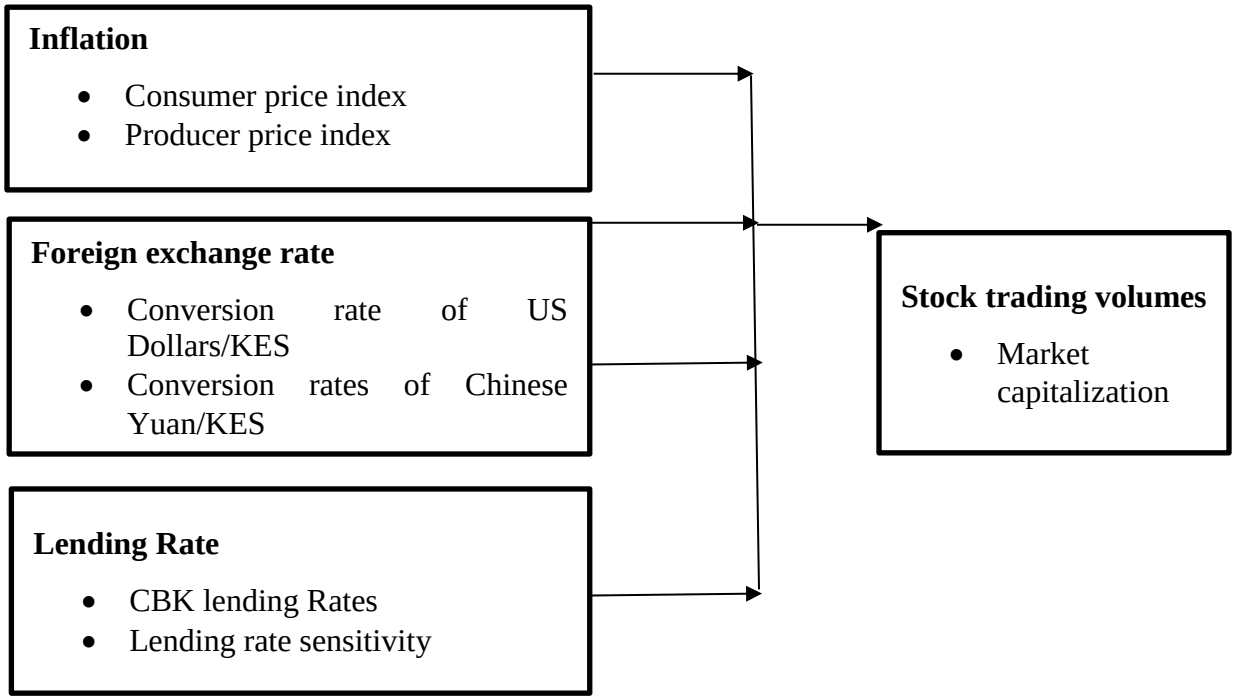

Figure 2: Updated Conceptual framework

4.4 Correlations Analysis

Table 4: Correlations Analysis

	Y	X1	X2	X3
Y	1.0000			
X1	-0.0039	1.0000		
X2	-0.0491	-0.3091	1.0000	
X3	-0.0855	-0.0061	0.5879	1.0000

The correlation matrix results show that the study exhibited a weak negative correlation coefficient between inflation rate and stock trading volume, as can be seen from the correlation

coefficient of -0.0039. The findings were inconsistent to those of Elly and Oriwo (2013) who established a weak positive relationship between inflation and stock trading volume. The study revealed that there was a weak negative correlation between exchange rate and stock trading volume as shown by a value of -0.0491. The findings were consistent to Njau (2013) who revealed that foreign exchange rates negatively affect the stock trading volumes of listed companies. The study found a weak negative correlation between lending rate and stock trading volume as shown by correlation coefficient of -0.0855. Similar to the findings of the current study Kitatia, Zablonb and Maithyac (2015) revealed that lending rates were negatively correlated to stock trading volumes.

4.5 Regression Analysis

The study adopted the fixed effect model.

Table 5: Regression Analysis

```
Fixed-effects (within) regression               Number of obs      =        90
Group variable: NUMBER                          Number of groups   =         9

R-sq:  within  = 0.0843                         Obs per group: min =        10
       between = 0.0630                                        avg =      10.0
       overall = 0.0456                                        max =        10

                                                F(3,78)            =      5.77
corr(u_i, Xb)  = 0.1586                         Prob > F           =    0.0028

------------------------------------------------------------------------------
           Y |      Coef.   Std. Err.      t    P>|t|     [95% Conf. Interval]
-------------+----------------------------------------------------------------
          X1 |   -0.08065    0.238289    -0.34    0.002    -3.13393    0.957799
          X2 |   -0.03486    0.162963    -0.21    0.041    -0.41304    1.199741
          X3 |   -0.056492   0.25129     -0.22    0.046    -7.52111    4.096668
       _cons |    4.078738   33.21015     0.12    0.903   -62.05112   70.208590
-------------+----------------------------------------------------------------
```

$Y_{it} = \beta_1 X_{1it} + \beta_2 X_{2it} + \beta_3 X_{3it} + \varepsilon_{it}$

$Y_{it} = -0.0805 X_{1it} + -0.03486 X_{2it} + -0.05649\ X_{3it} + \varepsilon_{it}$

The outcome reveals that adjusted R^2, which is the coefficient of determination, showed that 8.43% of the variations within the stock trading volume were explained by the independent factors. Preis, Moat and Stanley, (2013) revealed that inflation, exchange rates and lending rates might explain the movements of historical changes in stock trading volumes. Other predictors not included in the model account for 95.88% of the variations in stock trading volume. The table showed that the population parameters significance level was at 0.005 revealing that the data can be used to make inferences as the p value was 0.05. The overall model relationship was

considered significant since F calculated (5.77) was higher than the F critical (value = 2.7218) at 5% level of significance.

On the regression model it was noted that when all independent variables were held to constant zero, stock trading volume would be at 4.078738. A unit increase in inflation rate would reduce stock trading volume with 0.081 units. Consistently Kamau (2015) found that an increase in inflation rate would reduce the stock trading volume. Inconsistent to the findings, the study by Elly and Oriwo (2013) found that inflation had a weak positive relationship with the stock trading volume. A unit increase in exchange rate would lead to 0.035 units decrease in stock trading volume. The findings show that a unit increase in lending rate would lead to a reduction in stock trading volume by 0.056 units. Dependably Mohanasundaram, Karthikeya and Shanti, 2017 established that rise in exchange rate would reduce the stock traded in a stock market.

5.0 SUMMARY, CONCLUSIONS AND RECOMMENDATIONS

5.1 Summary

The correlation analysis results revealed that there existed a weak negative correlation coefficient between inflation rate and stock trading volume which was demonstrated by correlation coefficient of -0.0039. Furthermore, the regression analysis established that a unit increase in inflation rate would reduce stock trading volume with 0.088 units. The relationship was found to be significant (p=0.0042). The correlation analysis established that there was a weak negative correlation between exchange rate and stock trading volume which was illustrated by -0.0491. The findings from the regression analysis determined that a unit increase in exchange rate would lead to 0.3933 units decrease in stock trading volume. The relationship was found to be significant (p=0.0191). The correlation analysis determined that there was weak negative correlation between lending rate and stock trading volume as was demonstrated by a correlation coefficient of -0.0855. The regression analysis findings revealed that a unit increase in lending rate would lead to a reduction in stock trading volume by 0.612 units. The relationship was found to be significant (p=0.0269).

5.2 Conclusion

The exploration concludes that there was a negative relationship between inflation on trading volume of stocks offered by manufacturing and allied companies listed in the Nairobi Security Market. A unit change in inflation rate would negatively change the stock trading volume of stock offered by manufacturing and allied companies listed in the Nairobi Security Market. Higher inflation leads to higher prices of the stock to consumers. This slows business since the investors are unable to invest in the stock. The traded volumes are thus low. The study concludes that exchange rate had a negative correlated with stock trading volume of stock offered by manufacturing and allied companies listed in the Nairobi Security Market. A unit change in exchange rate would negatively change the stock trading volume. When the foreign exchange is rises the investors develop a low confidence in the country's currency and thus reduce their levels of investment in the stock market and thus low traded volumes. The study concludes that lending rate had a negative correlation with stock trading volume of stock offered by

manufacturing and allied companies listed on Nairobi Security Exchange. A unit change in lending rate would lead to negative change in stock trading volume. When the lending rates rise the cost of financing rises and the listed firms risk having low incomes. Speculation of low incomes of the firms by the investors lowers their investments in the stock market.

5.3 Recommendations

The study concludes that the government should put various measures in place to help contain the inflationary expectations in the economy. It should therefore be very careful when applying both the monetary and the fiscal policies to avoid building inflationary expectations which end up hurting the investors as the overall stock prices react to them affecting the trading volume at the end. The government through Central Bank of Kenya (CBK) should come up with monetary policy that will have an impact on foreign exchange rate, thus making CBK intervention significant in stabilizing and predicting the movement of foreign exchange rate. A strategy preventing the inflation rate will reduce the exchange rate which will positively impact on the stock trading volume. The study also recommends that there is need for the government to initiate policies that will lower the lending rates in Kenya as lower lending rates may translate to higher stock trading volumes. The lower lending rates help improve the liquidity in the market and therefore lead to more investment. The central bank should formulate monetary and fiscal policies that will ensure stable lending rate and inflation rate to avoid surprising the economy.

The current study focused on the effect of macroeconomic factors on trading volumes of manufacturing and allied companies listed in Nairobi Securities Exchange focusing on three macroeconomic factors; inflation rate, exchange rate and lending rate. These factors only predicted 4.12% of the variations in the stock trading volume. Other predictors not included in the model account for 95.88% of the stock trading volumes. Further studies should research on these other factors which may include the value of the stocks, money supply, unemployment rate and the information size in the market.

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