

Empirical Analysis of Macroeconomic Factors and Stock Return in Nairobi Securities Exchange, Kenya.

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Abstract: Studies about macroeconomic factors and stock return have revealed varied results despite interest and importance in this area of study. Many studies reviewed focused on macro-economic factors and stock return at firm level; none of the studies reviewed however focused on macroeconomic factors and stock return at industry level, which this study sought to analyze. The study therefore analyzed the effect of macroeconomic factors on stock return of Nairobi Securities Exchange in Kenya. This study is anchored on stock return theories, Capital Asset Pricing Model (CAPM) and Arbitrage Pricing Theory (APT). The study employed quantitative research paradigm a long side longitudinal time series analysis; quarterly secondary data spanning 2009 to 2018 was used. Data was sourced from Kenya National Bureau of Statistics (KNBS), Nairobi Securities Exchange (NSE) and the Central Bank of Kenya (CBK). Results revealed that macroeconomic factors have a significant relationship with stock return ($p=0.0035$, $R^2=31.85\%$); implying that trend of macroeconomic factors can assist in making investment decisions in Nairobi Securities Exchange in Kenya. This study is important to scholars, policy makers and investors.

Keywords— Inflation, Interest Rate, Gross Domestic Product, Stock Return, Longitudinal Time Series.

1. INTRODUCTION

Market capitalization of listed firms was 14.9% in 2022; this implies that listed firms occupy an important space in the Kenyan economy. It is from this background that the current study sought to investigate the relationship between macroeconomic factors and stock return in Nairobi Securities Exchange in Kenya. However, from empirical perspective, Amoro (2019) studied performance of Nairobi Securities Exchange, macroeconomic factors and political events. The study used data ranging from the year 2000 to February 2019. Macroeconomic variables used in the study are inflation, exchange rate and 91-Day Treasury bill. The study used ARDL Error Correction Model for data analysis. Sources of data in the study was Nairobi Securities Exchange and Central Bank of Kenya. Results in the study reveal that macroeconomic factors and political events significantly influence performance of Nairobi Securities Exchange except inflation. However, this study deviates from the present study by bringing in the aspect of political events. Besides, the study employed ARDL Error Correction Model for data analysis while the present study used pure time series analysis. Finally, the present study used Gross Domestic Product, interest rate; proxied as 91-Treasury bill and Inflation; measured using Consumer Price Index (Consumer Price Index). On the other hand, the reviewed study used an additional variable which is exchange rate.

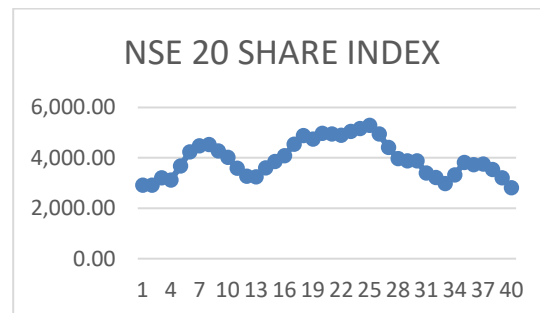


Figure 1: Trend of Nairobi Securities Exchange 20 Share Index

Source: Data from Nairobi Securities Exchange

Figure 1 shows trend of NSE-20 share Index between 2009 and 2018. The figure reveal that the NSE-20 share Index spiked in quarter seven which is the year 2010; this is then followed by a slack around quarter 13 which is around the first quarter of the year 2012. On the other hand, the share index portrayed positive trajectory after sluggish performance in the first quarter of 2012. Before slowing down around quarter 27 which is the first quarter in 2015 and finally peaking in quarter 37 which is 2018. Also, the effect of the 2017 general election on the performance of NSE-20 Share Index can be seen round quarter 33 and 34. Figure 1 also reveal the dismal performance of NSE-20 Share Index in the years 2011 and 2015 when the bourse experienced bear run.

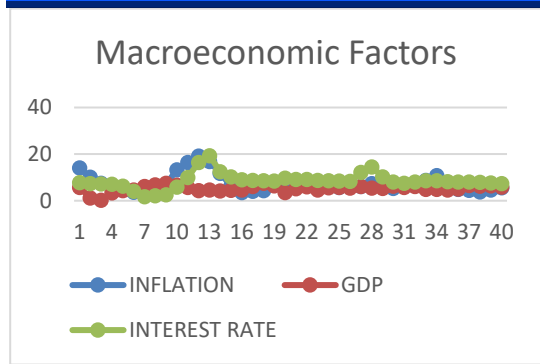
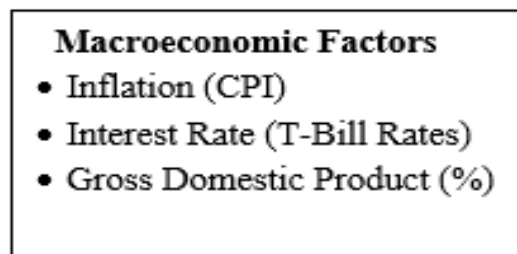


Figure 2: Trend of Macroeconomic Factors
 Source: Data from The Kenya National Bureau of Statistics.

Figure 2 indicates an interesting trend especially between inflation and interest rate. The figure reveals that at the beginning of 2009, all the macroeconomic variables are at appositive trend, however, all of them slowed down starting from GDP followed by inflation and finally interest rate. GDP is seen peaking relatively in quarter 9 which is the first quarter of 2011 before taking a stable move. Both inflation rate and interest rates spiked between quarter 11 and 13 and around quarter 27 and 34 respectively.

Conceptual Framework

Independent Variable



Dependent Variable

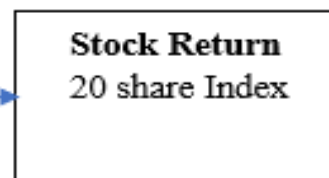


Figure 3. Analysis of Macroeconomic Factors and Stock Return.

2. Literature Review

The main reason for literature review is to gain an in depth understanding of the topic by reviewing previous work done by scholars. By doing literature review one gets to understand various concepts in that particular discipline and will be well acquainted with the traditional approaches of doing research in that particular discipline and area of study. Through this, the researcher gets to acquire knowledge and techniques of undertaking a study. Good review of literature always leads to good, reputable and rigorous scientific research papers. Weak literature review on the other hand work against an otherwise sound results and may water down important recommendations an author could present to various stakeholders or research community (Nakano & Muniz 2018). In the present study, relevant theoretical and empirical literature reviews were undertaken. The purpose for the reviews was to compare, contrast, critique, synthesize and draw conclusions using previous studies while comparing with the present study.

2.1. Theoretical Literature Review

This section presents theories related to stock return which are theory of stock return, Capital Asset Pricing Model and Arbitrage Pricing Theory. The theories helped understand stock return and its relationship with macroeconomic variables.

2.1.1. Theory of Stock Return

Keynes (1936) and Fisher (1930) viewed investment from the perspective of net present value. An optimum position is where the net present value is zero. Investors therefore are expected to evaluate values of expected future stream of cash flows given discount rates so that they will be in a position to make viable investment decisions. Investors always weigh between opportunity cost or cost forgone and expected return of an investment when making investment decisions. However, Keynes and Fisher had points of diversions in the way they treated risk and uncertainty. For instance, Keynes did not associate investment with uncertainty, risk and equilibrium while Fisher associated investment with risk, uncertainty and equilibrium. Keynes looked at human beings from psychological perspective and asserted that human beings are irrational and human “spirited” hence given volatility of the burse; they don’t need to go through fundamental analysis before making investment decisions. This theory informs the study because investors tend to weigh between expected return from their investment and opportunity cost of not investing their money. Therefore, the concept of stock return in the Nairobi Securities Exchange is anchored on this theory.

2.1.2. CAPITAL ASSET PRICING MODEL THEORY

Capital Asset Pricing Model (CAPM) is a model used for calculating stock return or valuation of stock. It has its origin in Harry Markowitz's work of 1952. The model is based on mean variance theory. The proponent of Capital Asset Pricing Model (CAPM) was William Sharpe in 1964. Other scholars such as Treynor (1962), Lintner (1965) and Mossin (1966) also contributed to the development of this theory. One of the assumptions of this model is that investors are always risk averse. The key elements of the model are risk measured by beta; the model holds that expected return is a factor of risk-free rate, the beta of the security and prevailing market return. When the model is plotted in graphical form, risk premium which is given by the difference between prevailing market return and risk-free rate is demonstrated. Investors therefore can choose investment options falling in efficient frontiers when guided by the graphical diagram showing security market line. This model however has been criticized leading to development of Arbitrage pricing theory by Ross (1976). The present study is guided by CAPM; however, not all investors are skilled enough to employ such complicated financial techniques when making investment techniques. Instead, average investors may seek help from financial analysts for advice.

2.1.3. CONCEPT OF STOCK RETURN AND CAPITAL ASSET PRICING MODEL

Return in an investment is the difference between initial investment and current price. In stock exchanges, return is considered to be the net present value of the future expected cash flows. In this study, NSE 20 Share Index is used as a proxy of stock return. Capital Asset Pricing Model has factors which are related to stock prices and NSE 20 share Index such as market portfolio prices. Capital Asset Pricing Model is therefore used to inform this study. Empirical studies link Capital Asset Pricing Model to stock return. For instance, Herbert *et al* (2017) used Capital Asset Pricing Model (CAPM) to assess application of Capital Asset Pricing Model (CAPM) in the Nigerian Chemicals and paints Industrial sector. They used data on quoted firms in the Nigerian Securities Exchange (NSE). They then used all share Index as a proxy for the market portfolio. Results indicate that the unsystematic risk content in chemical/paints sector stocks constitutes the bulk of the sectors risk profile and most of the stocks betas had defensive attributes in the study period. Separately, Njogo *et al* (2017) modified Capital Asset Model (CAPM) by adding five factors to it to determine the ability of the combined six equity risk factors in explaining the variation of stock returns in the Nairobi Securities Exchange in Kenya. Ahmet (2017) further stated that Capital Asset Pricing Model (CAPM) became very popular because of its simplicity or the structure; beta is the only factor that affects stock prices and return rates in Capital Asset Pricing Models. From the foregoing, it is confirmed that indices are used to determine expected return by investors. Furthermore, market prices are used in Capital Asset Pricing Model (CAPM) to determine stocks expected return.

2.1.4.. ARBITRAGE PRICING THEORY

Arbitrage Pricing Theory (APT) is a substitute of Capital Asset Pricing Model (CAPM). The theory was developed by Stephen Ross in 1976. While Capital Asset Pricing Model emphasizes prevailing market return and risk premium, Arbitrage pricing theory focuses on various factors that may affect expected stock return. The factors can be identified using factor analysis. However, each model/theory assumes linear relationship between expected return of asset prices and their respective co variances and random factors. The co variances are a measure of risks that investors can try to avoid through the process of investment diversification. This theory helps understand the relationship between stock return and macroeconomic factors.

2.2. Empirical Literature Review

Mureithi *et al* (2019) studied macro- economic factors and performance of listed firms in Nairobi Securities Exchange. The study employed descriptive survey research design. The research identified macro-economic factors as money supply, inflation rate, exchange rate and interest rate. The population consisted of twenty firms from which 95 respondents were drawn. The study also used 20 Share Index to indicate performance of listed firms in Nairobi Securities Exchange.

Pooja (2018) studied macroeconomic factors and Indian Stock Market. The study employed Johansen Cointegration tests, Granger causality and VECM to investigate the relationships among the study variables. Macroeconomic variables included Industrial Production Index (IIP), inflation, interest rates and money supply. On the other hand, the dependent variable was BSE Sensex. The study period was between 1999 and 2017.

Giri and Joshi (2017) sought to study prices of stocks in India. The study used annual data ranging from 1979 to 2014. They used autoregressive distributed lag model approach and vector error correction model to test for variance decomposition. Results revealed existence of long-run association among study variables; further, results reveal that economic growth and inflation has significant association with stock prices. The study did not use quarterly data and time series analysis, the study period differs from the study period in the present study; the reviewed study was done in India; the economic environments, legislations and general economic performance coupled with the nature of demography may be different in India.

Ouma and Muriu (2014) studied macroeconomic factors and stock return in Kenya. Their study adopted APT and CAPM and monthly data from 2003 and 2013. They used ordinary list squares model to determine the study coefficients. They also tested for stationarity to determine existence of unit root. The study findings revealed a significant association between market return and macroeconomic variables with exception of interest rates. They however did not use quarterly data and time series to

analyze interactions among the study variables, they used monthly data while the present study used quarterly data, and their study period also differs from the present study.

Kirui *et al.* (2014) sought to study return on stocks in the market using TGARCH model in Kenya. The study used published data between 2000 and 2012 and adopted quarterly time series analysis; they sourced data from The CBK and the KNBS. Results revealed that Gross Domestic product and inflation insignificantly influence stock return. The present study however used ARIMA (p, d, q) model and quarterly data to transform data to stationary. Furthermore, some of their variables differ from the variables used in this study. Finally, the study period differs from the study period in the present study.

Senturk *et al.* (2014) sought to study economic growth and stock returns in Turkey, their study used data spanning from 1998 to 2014. They used bootstrapping and frequency domain in their data analysis. The study concludes that there is no influence among the variables in the study. Detailed analysis in the short run demonstrated that there is significant influence among the variables in the study. Their study did not use time series analysis. Furthermore, their study was undertaken in a different time period; their study period was sixteen years while the present study covered only ten years. Their study was done in Turkey hence economic conditions, political and legislative environment in Turkey and Kenya are not the same; this can affect making inferences, conclusions and generalizations.

Kullaporn and Lalita (2010) sought to study inflation and stock prices in Thailand. Their study followed realism to investigate stock prices mechanism towards inflation changes. Their study was both objective and subjective. Their study used non- probability sampling; they applied purposive sampling. They used the most recent ten years' data. They choose the study period followed by the world economic crises and Tsunami. The period was chosen based on the need to observe how the extreme circumstances affected the influence of inflation on stock prices. During the interviews, a theoretical sampling approach was employed. The study also tested for co-integration and stationarity. The study confirms that inflation positively influence prices of stock in Thailand during the period of the study between 2000 and 2010. The study however did not use only quantitative analysis; instead, it adopted both qualitative study and quantitative approach. In addition, the study did not use time series analysis.

Reviewed studies differed in their methodological approach, place of study and period in which the data for the study was conducted. For instance, Giri and Joshi (2017) carried out their research in India using autoregressive distributed lag model approach and vector error correction model and they revealed existence of long run association among study variables and then concluded that economic

growth and inflation has significant association with stock prices. Their data was collected between 1979 and 2014. In Kenya, Ouma and Muriu (2014) used a different technique; Arbitrage Pricing Theory and Capital Asset Pricing Model to determine the study coefficients. The study revealed significant association between market return and economic variables except interest rate. Kirui *et al.* (2014) used TGARCH model in Kenya using data collected from 2000 to 2012 and they concluded that Gross Domestic product and inflation insignificantly influence stock return. Senturk *et al.* (2014) used bootstrapping and frequency domain in their data analysis with data ranging from 1998 to 2014. They revealed that there is significant influence among variables under study. Kullaporn and Lalita (2010) used co integration and stationarity tests in their analysis in Thailand. They used non-probability sampling with study period between 2000 and 2010. The study used autoregressive distributed lag model approach and vector error correction model, Arbitrage Pricing Theory and Capital Asset Pricing Model, Threshold Generalized Autoregressive Conditional Heteroscedasticity Model (TGARCH) , bootstrapping and frequency domain and cointegration tests. Besides, the study periods differed. The present study however used longitudinal time series approach to establish the relationship between macroeconomic factors and stock return in Nairobi Securities Exchange.

Reviewed studies did not adopt the time series model. Furthermore, none of the studies used ARIMA (p, d, q) model and lags for data transformation. On the other hand, most studies reviewed used panel data and studied firms at the micro or firm level. Most of the studies reviewed were done in developing countries where securities exchanges are more developed. Furthermore, the studies were anchored on different research philosophies; some used quantitative paradigm, others used qualitative paradigm while the rest used pragmatism paradigm or triangulation approach.

3.Methodology

Research Design

Decisions about what, where, when, how much, by what means by inquiry or research are all about research design. A design in research constitutes arrangements of conditions for collection and analysis of data in such a way that aims to combine relevance to the research purpose with economy in the procedure. Research design is considered a foundation, in this context, the word foundation is used figuratively; the design is done before a building and a foundation is put up. Given a proper foundation a building will stay for long. On the other hand, a weak and disorganized research design may lead to a research which is not water tight; a research which is not valid and reliable. Kothari (2005) and Cooper and Schindler (2014) opines that a research design is a blueprint which is geared towards fulfilling research objectives and answering research questions.

Research Philosophy

The congruency among philosophy, methodology and research problem can be better understood and appreciated by understanding research paradigm and research philosophy. Research philosophy is a system of thoughts of a researcher leading to new knowledge (Pranas, Jolita, & Regina, 2018). There has been arguments about which philosophy is better; researchers have varied opinion whether quantitative philosophy, qualitative philosophy or triangulation research methods is a better research philosophy (Pranas, Jolita, & Regina, 2018). However, some researchers argue that the most important thing is the end result rather than processes; that is, the process may be good but results are poor. Such researchers therefore tend to advocate for pragmatism philosophy (Simpson, 2018). Grammatical meaning of pragmatism is the practice of just getting on and doing things according to the situation it demands. As such, in research, this philosophy is used to imply compromise practice; it is therefore viewed as a neutral philosophy or rightfully put, none philosophy. In this regard therefore, it emphasizes the end results as opposed to the means and processes (Simpson, 2018). Given the philosophical background therefore, the current study considered all these underpinnings and settled on quantitative paradigm; not based on the foresaid underpinnings, but also considering other factors such as the theories guiding the study, type and sources of data and finally the mechanisms put in place to ensure validity and reliability.

The study used pure secondary data drawn from Kenya National Bureau of statistics, The Central Bank of

Kenya and Nairobi Securities Exchange in Kenya. To ensure validity, the quarterly time series used were standardized by transforming them into their natural logarithms; the data was then converted to their first differences to attain stationarity.

Model Specification

Regression analysis of macroeconomic factors and stock return in Nairobi Securities Exchange.

$$Y_{t-1} = \beta_0 + \beta_1 In_{1t-1} + \beta_2 I_{2t-1} + \beta_3 Gdp_{3t-1} + \epsilon_t \dots \dots \dots 1.$$

Where;

Y_{t-1} = NSE 20 Share Index at time

β_0 = Constant representing the multiple regression coefficients,

β_1 = coefficient of inflation factor (In),

β_2 = coefficient of interest rate (I),

β_3 = coefficient of gross domestic product (GDP).

4. Results and Discussions

RELATIONSHIP BETWEEN MACROECONOMIC FACTORS AND STOCK RETURN IN NAIROBI SECURITIES EXCHANGE

The research hypothesis stated that there is no relationship between macroeconomic factors and stock return in Nairobi Securities Exchange.

To establish the relationship between macroeconomic factors and stock return in Nairobi Securities Exchange, the three macroeconomic variables (inflation, GDP and Interest rate) were regressed against NSE-20 share Index.

TABLE 1: REGRESSION OF NSE 20 SHARE INDEX ON MACROECONOMIC VARIABLES

SOURCE	SS	DF	MS	NUMBER OF OBS	=	39
MODEL	.078917596	3	.026305865	F (3, 35)	=	5.45
RESIDUAL	.168888234	35	.004825378	PROB > F	=	0.0035
				R-SQUARED	=	0.3185
				ADJ R-SQUARED	=	0.2600
TOTAL	.24780583	38	.006521206	ROOT MSE	=	.06946
NSE20 SHARE INDEX	COEF.	STD. ERR.	T	P> T	(95% CONF. INTERVAL)	
GDP	-.0104846	.0205691	-0.51	0.613	-.052242	.0312728
INTERESTRATE	-.1014234	.0483351	-2.10	0.043	-.1995487	-.0032981
INFLATION	-.087405	.0453892	-1.93	0.062	-.1795499	.0047399
_CONS	.0032153	.011174	0.29	0.775	.0194692	.0258997

NSE, CBK and KNBS Quarterly data 2009 – 2018

From the findings in Table 1. coefficient of determination R^2 was 0.3185, $F(3, 35) = 32$, $p = 0.0035$. The results of this study reveal that the probability of variance in the NSE 20 Share Index that is explained by macroeconomic

$$NSE\ 20\ Share\ Index = -0.0032153 - 0.0104846(GDP)t - 0.1014234(Interest\ rate)t - 0.087405(Inflation)t$$

(0.613) (0.043) (0.062)

..... Eq 1

Results in Table 1. indicates that -0.0104846 change (negative) in the gross domestic product at time t will lead to a corresponding change in NSE- 20 Share Index at time t by one unit, -0.1014234 change (negative) in the interest rate at time t will lead to a corresponding change in NSE- 20 Share

factors (Gross Domestic Product, Interest rate, and Inflation) is 31.85% however -26% variations in inflation could be explained by independent variables. The final equation for the model in Table 1. is given by Equation 1. (p-values in parentheses):

Index at time t by one unit and, -0.087405 change (negative) in inflation at time t will lead to a corresponding change in NSE- 20 Share Index at time t by one unit.

Results in Table 1. further reveal that macroeconomic factors have a significant relationship with

the stock return, $p=0.0035$. However, individual macroeconomic factors reveal mixed results. The results in Table 1 reveal that inflation have an inverse insignificant relationship with stock return ($\beta=-0.08$, $p=0.062$). The inverse relationship or negative gradient implies that when inflation increases, stock return reduces. This implies therefore that investors are skeptical and avoid investment during high inflation. Results in Table 1. reveal that there exists an inverse significant relationship between interest rate and stock return ($\beta=-0.10$, $p=0.043$).

This implies that when interest decreases, stock return increases. It can therefore be concluded that when there is a low-interest rate, many investors tend to be willing to avoid parting with their liquid cash and instead invest it in Nairobi Securities Exchange. From a theoretical perspective, Keynes's (1936) explains that interest rate is considered as the price paid by those who are willing to part with cash in its liquid form hence enjoys having money in liquid form or parting with liquidity. Interest rate according to Keynes, (1936) can be associated with the law of demand and supply; that is, when the demand for cash that those who wish to hold the cash in liquid form diminishes, then it means the public will be forced to hold more money hence the amount of money in circulation will be more and the interest rate will be low; on the other hand, the opposite will be true when those who would want hold more money in liquid form are many; there will be high rate of interest. This process occasioned by demand and supply; always make sure that the quantity of money in supply attains equilibrium (Keynes, 1936).

5. Conclusion

The study concludes that there is positive significant relationship between macroeconomic factors and stock return in Nairobi Securities Exchange in Kenya ($R=.56$, $P=0.0035$). However, individual variables reveal that GDP has insignificant relationship with stock return ($\beta =-0.01$, $p=0.613$), interest rate have a negative significant relationship with stock return ($\beta=-0.10$, $p=0.043$) and inflation has insignificant relationship with stock return ($\beta =-0.08$, $p=0.062$). Results implies that investors, managers, regulators and policy makers should consider macroeconomic factors when making investment decisions, coming up with regulation laws and when making various policies affecting Nairobi Securities Exchange and various listed firms in Nairobi Securities Exchange.

6. References

[1].Amoro, D. N. (2019). The Effect of Macroeconomic Factors and Political Events on Performance of Nairobi Securities Exchange in Kenya. *European Scientific Institute*.
 [2].Cooper, D. R., & Schindler, P. S. (2014). *Business Research Methods*. New York: McGraw-Hill, Irwin.
 [3].Giri, A., & Joshi, p. (2017). The Impact of Macroeconomic Indicators on Indian Stock Prices: An Empirical Analysis. *Studies in Business and Economics no 12(1)* , 61- 78

[4].Herbert, W. E., Nwude, E. C., & Onyilo, F. (2017). The Application of Capital Asset Pricing Model (CAPM) in the Nigerian Chemicals and Paints Industrial Sector. *European Journal of Accounting Auditing and Finance Research 5(8)*, 12-32.
 [5]. Kothari, C. R. (2005). *Research Methodology, Methods and Techniques*. New Delhi: New Age International Publishers (p) Ltd.
 [6].Kirui, E., Nelson, H., Wawire, W., & Onono, P. (2014). Macroeconomic variables, volatility and stock market returns. A case of Nairobi Securities Exchange. *Macroeconomic variables, volatility and stock market re International Journal of Economics and Finance*, 6(8), 214-228.
 [7].KNBS. (2011). *Kenya Economic Report*. Nairobi, Kenya.
 [8].KNBS. (2009). *The Kenya Financial Sector Stability Report*. Nairobi, Kenya.
 [9].KNBS. (2011). *The Kenya Financial Sector Stability Report*. Nairobi, Kenya.
 [10].KNBS. (2015). *The Kenya Financial Sector Stability Report*. Nairobi, Kenya: KNBS.
 [11].Kullaporn, L., & Lalita, R. (2010). Relationship Between Inflation and Stock Prices in Thailand. *Unpublished masters thesis in Finance, Umea School of Business, Thailand*
 [12]. Mureithi, S., Mukhongo, A., & Datche, E. (2019). Macro-Economic Factors Affecting Performance of Firms Listed in Nairobi Securities Exchange. *The Strategic Journal of Business and Change Management 6(3)*, 860-874.
 [13].Nakano, D., & Muniz, J. (2018). Writing the literature review for empirical papers. *Production Journal* , 1-9.
 [14].Ouma, W., & Muriu, P. (2014). The Impact of Macroeconomic Variables on Stock Market
 [15].Returns in Kenya. *International Journal of Business and Coomerces*, 3(11), 1-31
 [16].Pooja, M. (2018). An investigation of the Macroeconomic Factors Affecting the Indian Stock Market. *Australasian Accounting Business and Finance Journal 12(2)*, 71-86.
 [17]. Pranas, Z. S., Jolita, V., & Regina, A. (2018). Philosophy and Paradigm of Scientific Research. *Management Culture and Corporate Social Responsibility*, 122-134.
 [18].Simption. (2018). The SAGE handbook for qualitative Business and Management Research Methods. *SAGE Publications*.
 [19]. Senturk, M., Ozkan, G., & Akbas, Y. (2014). The Relationship between Economic Growth and Stock Returns. Evidence from Turkey. *Dogus University Dergisi, sp 15(2)* , 155-164.