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EFFECT OF MACROECONOMIC VARIABLES ON STOCK RETURNS OF LISTED COMMERCIAL BANKS IN KENYA

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Abstract

This study explores the impact of macroeconomic variables on stock returns of listed banks in the Nairobi Securities Exchange (NSE). The key economic variables considered for analysis are namely exchange rate, interest rate, inflation and GDP. Secondary data from secondary sources was used in this study. This constituted quarterly time series data from the Central Bank of Kenya, Bloomberg databases and the Kenya National Bureau of Statistics (KNBS) over the study period from 2000 to 2015. Correlation analysis and Unit Root test were carried out to check for multicollinearity and stationarity respectively. A linear regression model using Ordinary Least Squares (OLS) under Fixed Effects model was used to compute the regression coefficients between bank stock returns and the various macroeconomic factors affecting the same. Empirical results show that interest rate, exchange rate and inflation have significant impact on bank stock return, while GDP had an insignificant impact at 5% level of significance. Based on these findings, it is suggested that the government should ensure a stable macroeconomic environment and moderate its monetary policy interventions with a thought of their major impact on bank stock returns. Banks also have a responsibility of not engaging in foreign currency speculation, whose resultant price fluctuations affect their stock returns immensely.

Keywords: Stock Market, Monetary Policy, Fixed Effects, Macroeconomic Environment

INTRODUCTION

The stock market is vital in the economic development of an economy given its role as an intermediary between borrowers and lenders. Stock markets are especially important in mobilizing long-term capital to the listed firms by pooling funds from different investors to enable them expand their businesses, as well as offering investors alternative investment avenues to put their surplus funds in. Additionally, the level of development of an economy's stock market is a major factor in determining its overall financial development and viability (Ashaolu & Ogunmuyiwa, 2010). A well-functioning stock market contributes to economic development through more efficient allocation of resources as well as boosting savings (Junkin, 2012).

Stock return is the gain or loss of the value of a share in a particular period usually quoted as a percentage. It consists of capital gains as well as any income received by the investor from the stock. Capital gains are derived from the difference in price of a stock over two time periods divided by its purchase price.

A stock market usually trades hundreds of listed company shares on a daily basis. For investors to evaluate the performance of a stock market, they observe the level of the various composite market indices before investing their surplus funds. A market index is an aggregate value that is produced by combining several stocks together and expressing their total values against a base value, usually from a specific date. Market indices provide historical stock market performance as well as a benchmark for comparison against performance of individual investor portfolios. Analysis of market indices can also provide investors with forecasts of future market trends (Zhang, 2009).

Many factors can influence the price movement of a stock from day to day, and thus, volatility of a stock market index. Factors internal to the firm, like favourable earnings, may push its share price up due to increased demand since investors like to put their money on winners. Other factors are beyond the control of the firm including the macroeconomic, social, political and legal environment in which it operates. Potential investors therefore evaluate the overall climate and other firm specific factors to formulate expectations about the stock market before making investment decisions.

Past studies have concluded that changes in stock prices are linked to macroeconomic factors. According to Liu and Shrestha (2008), macroeconomic activities of a country influence the returns of its stock market. Muradoglu et al (2000) pointed out that changes in stock prices are linked with macroeconomic behaviour in advanced countries. The Arbitrage Pricing Theory (APT) championed by Stephen Ross (1976) also provides a theoretical framework of the relationship between stock prices and macroeconomic fundamentals by modelling them into a

linear function where sensitivity to changes in each factor is represented by a factor-specific beta.

Stock prices, hence stock returns are generally believed to be determined by some fundamental macro economic variables such as interest rates, inflation, exchange rate, and Gross domestic Product (Kirui, Wawire and Ono, 2014).

Inflation is a persistent increase in the general price level of goods and services in an economy over a period of time. As goods and services require more money to purchase, the implicit value of money falls. Thus high rates of inflation erode the purchasing power of an economy's currency.

Inflation is widely measured by calculating the movement in the Consumer Price Index (CPI). The CPI is a statistical estimate constructed using the prices of a sample of representative items whose prices are collected periodically. The percentage change in a CPI is used as a measure of inflation, and can be measured monthly, quarterly or annually.

Most studies show that inflation has a significant impact on stock return. Whether that impact is positive or negative, however, is a matter of much debate. Chen et al (2005) concluded that inflation had not been able to predict stock returns. According to Tripathi and Kumar (2014), the relationship between inflation and stock returns in the BRICS conflicted, with Russia showing a significant negative relationship, while India and China exhibited a significant positive relationship.

Interest rate is defined as the price of money. It is the proportion of loaned funds that an investor demands for the usage of said funds.

Many governments use the interest rate as a monetary policy tool to control other macroeconomic variables like investment, inflation and unemployment. Alam and Uddin (2009) found that the interest rate has a significant negative relationship with share price for 15 developed and developing countries using data from 1988 to March 2003. According to Humpe and Macmillan (2007), stock prices are negatively correlated to long term interest rates in US and Japan.

Exchange Rate is the price of one country's currency expressed in another country's currency. The level of an economy's exchange rate is usually determined against the US dollar. Empirical evidence finds a significant relationship between exchange rates and stock returns. Karoui (2006) found a positive transmission mechanism between volatilities in equity and foreign exchange rates markets in a set of emerging economies. According to Nshom (2007), there is a significant exposure of stock returns to changes in exchange rates for some companies in a sample of FTSE 100 firms used in his study. Ibrahim and Aziz (2003) concluded

that the exchange rate was negatively associated with stock prices in the Malaysian equity market.

Gross Domestic Product (GDP) is a measure of national income and output for a given country's economy. The gross domestic product is equal to the total expenditures for all final goods and services produced within the country in a stipulated period of time.

Many studies have been inconclusive as to whether an economy's GDP growth rate is a precursor to its stock market return. The Chinese stock market, for example, has exhibited poor performance over the period 2000-2013 despite the fact that the Chinese economy has been the fastest growing economy globally for the past three decades. Ritter (2005) also found that the cross-country correlation of real stock returns and per capita GDP growth for 16 countries over 1900–2002 is negative. Inker (2012) stated in his paper that GDP growth and stock market returns do not have any particularly obvious relationship, either empirically or in theory.

Most world economies have exhibited significant stock market volatility in recent years. This is especially so for emerging economies as opposed to their more developed counterparts (Bekaert and Harvey, 1997).Emerging markets are typically characterized by fewer and smaller publicly traded companies, lower liquidity, less regulation, and weaker accounting standards than more mature markets. Due to their relatively small size, emerging stock markets are more sensitive to capital flows hence their increased volatility. Capital flows in and out of a country are to a large extent affected by the economy's macroeconomic as well as political and social fundamentals.

Kenya, as an emerging economy, has seen its fair share of stock market volatility over the years. Its stock market performance is highly dependent primarily on the nature of macroeconomic variables among other factors.

Nairobi Securities Exchange (NSE)

The Nairobi Securities Exchange (NSE) limited was constituted in 1954 as a voluntary association of stockbrokers registered under the Societies Act (Ngugi and Njiru, 2005), although it was initiated much earlier, in the 1920's. Since then, NSE has seen tremendous development in structure, depth, breadth and regulation to be the third biggest exchange in Africa by 2014 in terms of volume, behind Johannesburg and Nigerian stock exchanges.

Despite its recent growth, the NSE is still considered as one of the emerging markets of the world, characterized by low trading volume, few listed companies, low turnover ratios and inefficient information delivery. The performance of the NSE largely reflects the economic, policy, institutional and political environment at the time.

Currently, there are 11 banks listed in the NSE. Banks, like other institutions, see an opportunity to expand their capital base by going public. Bank shareholders also see increased liquidity, and thus, increasing value of their holdings, while the bank itself benefits from its increased awareness and may attract even more investors and customers alike.

Problem Statement

There are currently 11 banks listed in the Nairobi Securities exchange, with Kenya Commercial Bank being the first to be privatised in 1988, while, most recently, the Cooperative Bank of Kenya went public in 2008. The stock returns of commercial banks listed on the NSE as part of the larger universe of stocks continue to be impacted differently by macroeconomic factors as compared to other sectors.

Many studies have attempted to examine the impact of macroeconomic variables on stock returns in Kenya, however, these have studies encompass the whole stock market in general. Studies on the Kenyan market specifically highlighting the impact of these variables on various sectors of the stock exchange, and specifically, the banking sector, are limited. There is therefore a need for an extensive evaluation of the relationship between stock returns of listed banks and macroeconomic variables.

Research Objectives

The purpose of the study is to establish the effect of macroeconomic variables on stock returns of commercial banks listed on the Nairobi Securities exchange. The specific objectives of this study are to;

1. Examine the effect of inflation on stock returns of commercial banks listed in the NSE.
2. Examine the effect of exchange rate on stock returns of commercial banks listed in the NSE.
3. Examine the effect of Gross Domestic Product (GDP) on stock returns of commercial banks listed in the NSE.
4. Examine the effect of interest rate on stock returns of commercial banks listed in the NSE.

Research Questions

This study seeks to answer the following questions:

1. What is the effect of inflation on stock returns of banks listed on the NSE?
2. What is the effect of interest rate on stock returns of banks listed on the NSE?
3. What is the effect of foreign exchange rate on stock returns of banks listed on the NSE?
4. What is the effect of GDP on stock returns of banks listed on the NSE?

Hypotheses of the Study

Inflation

Empirical studies affirm that inflation has a significant impact on stock return, although it is in conclusive whether that impact is positive or negative. We predict that inflation has a positive impact on stock returns of listed banks.

H0: Inflation has no significant relationship with stock returns of listed banks.

H1: Inflation has a significant relationship with stock returns of listed banks.

Interest Rate

Many past studies seem to show a negative impact of interest rate on stock returns. We also predict that interest rates have a negative relationship on stock returns of listed banks.

H0: Interest rate has no significant relationship with stock returns of listed banks.

H1: Interest rate has a significant relationship with stock returns of listed banks.

Exchange Rate

World economies impose varying exchange rate management systems of their currencies. For this reason, past studies have been in conclusive of exchange rate impact on stock returns. We predict that the exchange rate negatively affects stock returns of listed banks.

H0: Exchange rate has no significant relationship with stock returns of listed banks.

H1: Exchange rate has a significant relationship with stock returns of listed banks.

Gross Domestic Product

Many studies have concluded that GDP growth has no impact on stock returns. Similarly, we predict that GDP growth rate has no effect on stock returns of listed banks.

H0: GDP growth rate has no significant relationship with stock returns of listed banks.

H1: GDP growth rate has a significant relationship with stock returns of listed banks.

Significance and Scope of the Study

Most past studies done in Kenya have focused on the impact of macroeconomic variables on general stock market returns. This study will contribute to the limited literature by evaluating the relationships between selected macroeconomic variables and stock returns of the banking sector in particular.

The study will also be essential to banks that may be willing to go public in future by acting as a resource on the macroeconomic variables expected to affect their stock returns.

Potential investors that would like to invest in the banking sector will also benefit from this study which will aid them make informed choices regarding their investment decisions.

Finally, this study will assist the Nairobi Securities Exchange (NSE) as well as both public and private policy-making institutions that are geared towards improving the stability and efficiency of the Kenyan stock market.

This study will cover the period from the year 2000 to 2015 due to data being available between these periods.

LITERATURE REVIEW

There are hundreds of stock markets around the world, each operating under different economic conditions. A lot of literature is available on the relationship between macroeconomic forces and stock market behaviour. Empirical evidence offers differing results on plausibility, magnitude and exactly which variables impact stock market return.

Bank Stock Returns

Stock returns are the benefits enjoyed by an investor when an investment made. It is therefore the motivating factor that causes investment in stocks. Jeyanthi & William, (2010) defined return as the profit earned due to an increase in stock prices. Past studies differ on whether selected macroeconomic variables are determinants of stock market returns.

Tursoy Gunsol and Rjoub (2008) tested the validity of APT model in the Istanbul Stock Exchange (ISE) using monthly data from 2001 to 2005. The APT model comprised of thirteen macroeconomic variables: exchange rate, crude oil prices, consumer price index, imports, exports, gross domestic product, foreign reserve, gold prices, unemployment rate, market pressure index, Industrial production, money supply and interest rates. They concluded that the ISE returns had not been affected by these macroeconomic factors.

A study by Lucey, Najadmalayeri and Singh (2008) investigated the relationship between macroeconomic surprises and returns of stock exchanges in developed countries between the periods of 1999 -2007. Monthly data from stock exchanges of Canada, France, Germany, Hong Kong, Italy, Singapore and UK was analyzed using the GARCH. Their findings showed that unexpected news of macroeconomic variables had significant impact on the returns of stock exchanges of Canada, France, Germany, Hong Kong, Italy, Singapore and UK.

Karam and Mittal (2011) studied the relationship between macroeconomic factors and the returns of Indian Stock Exchange. They applied Ordinary Least Squares model on quarterly data of interest rate, inflation rate, exchange rate and Gross Domestic Saving between the

periods of 1995-2008. Regression results indicated that there existed long term relationship between these risk factors and returns of Indian Stock Exchange.

Hsing. Y (2012) used the exponential GARCH model to examine the macroeconomic factors that influenced the Argentine stock market index. He chose real GDP, money policy, fiscal policy, the exchange rate, the world stock market as represented by the U.S. stock market index, and the inflation rate. His results indicated that the Argentine stock market index is positively associated with real GDP, the ratio of M2 money supply to GDP, the peso/USD exchange rate and the U.S. stock market index, while negatively influenced by the money market rate, government spending as a percent of GDP and the inflation rate.

Laichena and Obwogi (2015) sought to determine the effects of macroeconomic variables on stock returns in East Africa. Their study used stock returns, interest rate, inflation, exchange rate and GDP of the 3 East African countries from 2005 to 2014. Their multiple regression results using random effects model indicated a significant and negative relationship between stock returns and both exchange rates and interest rates, while displaying a significant but positive relationship between stock returns and both inflation and GDP.

Impact of Inflation on Bank Stock Returns

Numerous studies in this area have produced conflicting results when one accounts for geography and time.

Al-Albadi and Al-Sabbagh (2006) investigated expected and unexpected inflation by applying a multifactor model to stock returns of 13 Jordanian commercial and investment banks between the periods of 1990-2003. The results of the study indicate that expected inflation has a negative and significant impact, while unexpected inflation has a negative but insignificant impact in their relationship with banks' stock returns.

Tripathy and Kumar (2014) examined the long term relationship between inflation and stock returns in BRICS markets using panel data for the period between 2000 and 2013. Correlation results revealed a significant negative relationship between stock index and inflation rate for Russia and a significantly positive relationship for India & China.

Victor and Kuwornu (2011) used the ordinary least square estimation (OLS) model in investigating the relationship between macroeconomic variables and stock market returns in Ghana. Monthly data from 1992 to 2008 was used. The findings revealed a significant relationship between stock market returns and consumer price index (inflation).

Khan and Yousuf (2013) scrutinized the influence of selected macroeconomic variables on stock market prices in the Dhaka stock exchange, Bangladesh. Co integration analysis and Vector Error Correction Model (VECM) was used on monthly data from 1992 to 2011. They

found that inflation does not impact stock prices in the long-run.

Impact of Interest Rate on Bank Stock Returns

Interest rate is an important macroeconomic variable, which is directly related to economic growth. The interest rate is generally considered as the cost of capital, or, the price paid for the use of money for a period of time.

Addo and Suyuze (2013) studied the joint impact of interest rate and Treasury bill rate on stock market returns on Ghana Stock Exchange over the period between 1995 and 2011 using Johansen's Multivariate Cointegration Model and Vector Error Correction Model. On the basis of the Multiple Regression Analysis, the results showed that the Treasury bill rate and interest rate both have a negative relationship with stock market returns but are not significant.

Saeed and Akhter (2012)examined the impact of macroeconomic factors on a banking index that included twenty nine listed banks on Karachi Stock Exchange from 2000 to 2010. Regression results indicated that short term interest rates affects the banking index negatively.

In Al-Albadi and Al-Sabbagh (2006) study of interest rate sensitivity, market risk, inflation and banks' stock returns, the multifactor model used on the data of 13 commercial and investment banks resulted in the researchers concluding that the interest rate has a significant and negative impact on stock returns.

Alam and Uddin (2009) examined evidence supporting the existence of share market efficiency based on the monthly data between 1988 to 2003 of stock indices and interest rates for fifteen developed and developing countries. The study found that, for all of the countries, interest rate has significant negative relationship with share price and, for six countries, that changes in interest rate has significant negative relationship with changes of share price.

Humpe and Macmillan (2007) found that there exists a long run negative relationship between long term interest rate and stock prices only in US, using US and Japanese data. They were examining whether a number of macroeconomic variables influence stock prices in the US and Japan.

Impact of Exchange Rate on Bank Stock Returns

The relationship between exchange rate fluctuations and stock market returns has differed according to numerous past studies.

Karoui (2006) examined the relationship between the volatilities of equity indexes returns and FX rates for a set of 18 emerging countries. The results found a positive transmission mechanism between volatilities in equity and foreign exchange rates markets in a set of emerging economies.

Nshom (2007) studied the relationship between stock returns and currency exchange rates through the linear regression model on a sample of 18 stocks from the London Stock Exchange. His study revealed that causation runs from stock market returns to currency exchange rates for the sample companies listed on FTSE 100 index

Ibrahim and Aziz (2003) analyzed dynamic linkages between the two variables for Malaysian stock exchange using monthly data over the period 1977-1998 and their results showed that exchange rate is negatively associated with the stock prices.

Agrawal, Srivastav & Srivastava (2010) investigated the relationship between Indian stock market returns and exchange rates using daily closing indices between 2007 and 2009. They found that correlation between Nifty returns and exchange rates was negative.

Kirui, Wawire and Onono (2014) evaluated the relationship between Gross Domestic Product, Treasury bill rate, exchange rate, inflation and stock market return in Nairobi Securities Exchange Limited by analyzing data from 2000 to 2012. Their results revealed that exchange rate showed a significant and negative relationship with stock returns.

Impact of Gross Domestic Product on Bank Stock Returns

Theoretically, it is nostalgic to believe that higher economic growth automatically translates into better stock market returns. Theory insists that the GDP is the aggregate of consumption, investment, government spending and net exports. Any increase in the consumption, investment or exports is bound to have a positive impact on corporate sales. Better corporate sales will mean higher earnings per share, which will in turn translate into higher market returns. Some empirical studies have found otherwise.

Ritter (2005) examined the relationship between real equity returns and real per capita GDP growth for 16 countries over the 1900–2002 period and found a negative correlation.

Reddy (2012), in the study “impact of inflation and GDP on stock market returns in India” regressed real GDP, interest and inflation rates against stock prices of quoted companies during the period 1997 to 2009. The results showed a reduction in interest and inflation rates increased stock prices, while an increase in real GDP had a positive impact.

Erdogan (2012) examined the effect of economic factors on the performance of the Australian stock market. Using the APT model, the results showed that real GDP, labour cost index and the US stock market have a statistically significant effect on Australian stock returns. Table 1 shows the summary of the review of literature.

Table 1: Impact of Macroeconomic Variables on Stock Returns

Macroeconomic variables	Positive	Negative	Insignificant
Inflation	Victor & Kuwornu (2011) Laichena & Obwogi (2015)	Al-Albadi & Al-Sabbagh (2006)	Khan & Yousuf (2013) Kirui, Wawire & Onono (2014)
Interest Rate		Saeed & Akhter (2012) Al-Albadi & Al-Sabbagh (2006) Alam & Uddin (2009) Humpe & Macmillan (2007) Laichena & Obwogi (2015)	Addo & Suyuze (2013) Kirui, Wawire & Onono (2014)
Exchange Rate	Karoui (2006)	Ibrahim & Aziz (2003) Agrawal, Srivastav& Srivastava (2010) Kirui, Wawire & Onono (2014) Laichena & Obwogi (2015)	
GDP	Reddy (2012) Erdogan (2012) Laichena&Obwogi (2015)	Ritter (2005)	Kirui, Wawire & Onono (2014)

THEORETICAL LITERATURE

A review of the literature has largely brought out two models that have widely been used to estimate the risk-return relationship: a single beta model known as CAPM, and a multi-factor model known as APT.

Capital Asset Pricing Model (CAPM)

The Capital Asset Pricing Model (CAPM) was introduced by William Sharpe (1964) and John Lintner (1965), who built on the earlier work of Harry Markowitz (1959),the developer of the "mean-variance model" or model of portfolio choice. This model is used to determine a theoretically appropriate required rate of return of an asset, and thus its price, if firms can estimate the expected cash flows from the asset.

CAPM describes the relationship between risk and expected return that is used in the pricing of risky securities. The general idea behind CAPM is that investors need to be compensated for only the time value of money and risk. Time value of money is compensated by the risk free rate, while risk is compensated by the Beta.

CAPM has been criticized over time in the past. Empirical tests show market anomalies like firm size and value effect which cannot be explained by CAPM. Such findings point to the

fact that beta, on its own, is insufficient in explaining stock returns. The biggest assault on CAPM came from French and Fama (2003). They found that CAPM's measure of systematic risk, beta, was unreliable, and that there are other factors that determine stock prices.

Arbitrage Pricing Theory (APT)

A major shortcoming of CAPM is the aggregation of all risks into a single risk factor, the market risk. This factor was found problematic in explaining the return on single assets. Furthermore, it is well observable that industry or country specific influences also have a large impact on returns.

The Arbitrage Pricing Theory was first introduced by Ross (1976). It predicts a relationship between the returns of a portfolio and the returns of a single asset through a linear combination of many independent macro-economic variables.APT uses the risky asset's expected return and the risk premium of a number of macro-economic factors.APT requires that returns on any stock should be linearly related to a set of multi-factors as indicated in the following equation:

$$E(r_j) = r_f + b_{j1}RP_1 + b_{j2}RP_2 + b_{j3}RP_3 + b_{j4}RP_4 + \ldots + b_{jn}RP_n + \varepsilon_j$$

Where:

E(rj) = the asset's expected rate of return.

rf = the expected level of return for stock E(rj) if all factors have a value of zero; usually called the risk-free rate.

bj = the sensitivity of the asset's return to the particular factor.

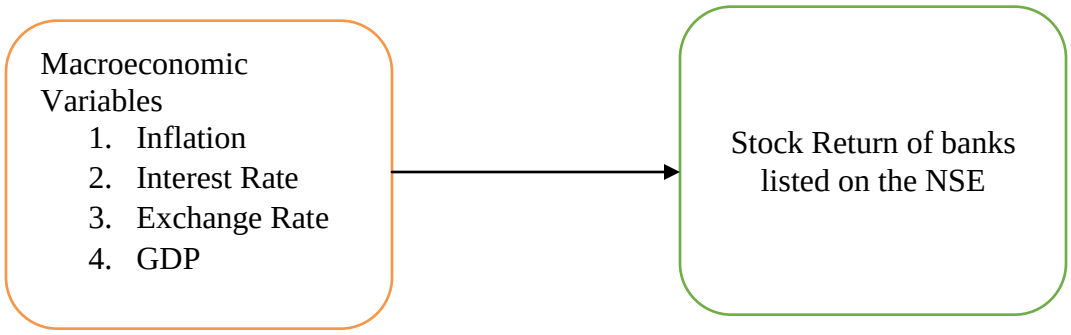
RP = the risk premium associated with the particular factor.

εj= a random error term.

Chen and Ross (1986) indicated that individual stock returns depend on anticipated and unanticipated factors. They believe that most of the returns realized by investors are the result of unanticipated events related to overall economic conditions. The identification of these risk forces for measuring the risk return relationship is based upon the researcher, who may use available literature for guidance.

This study will use the APT framework which calculates expected return by taking into account various factors and their sensitivities that might affect stock price movement. Thus, it will allow selection of factors that affect stock prices largely and specifically.

Figure 1. Proposed Conceptual Framework



RESEARCH METHODOLOGY

Research Design

The objective of the study was to investigate the impact of macroeconomic factors on the stock returns of Kenyan banks listed on the NSE. There has been very little study done in this area in the past and thus this research will attempt to explore the topic further. Since the data to be collected will be panel in nature, panel design under exploratory research was adopted for this study.

Model Specification

The analytical framework used in this study is a multifactor model under the Arbitrage Pricing Theory (APT) which holds that the expected return of a financial asset can be modeled as a linear function of various macro-economic factors, where sensitivity to changes in each factor is represented by a factor-specific beta coefficient .Kirui, Wawire and Onono (2014) estimated a regression equation to evaluate the relationship between macroeconomic variables and stock returns of the Nairobi stock exchange. Therefore, the following cross-sectional panel regression model is estimated using Ordinary Least Squares:

$$\mathbf{RETURN_t = \beta_0 + \beta_1 INFLATION_t + \beta_2 EXCHRATE_t + \beta_3 INTRATE_t + \beta_4 GDP_t + \varepsilon_t}$$

Where:

$RETURN_t$ = the return on banks stock at time t

$ß_0$ = the intercept term

$INFLATION_t$ = the inflation rate at time t

$EXCHRATE_t$ = the exchange rate at time t

$INTRATE_t$ = the interest rate at time t

GDP_t = the growth rate of Gross Domestic Product at time t

β_1, β_2, β_3, β_4 = factor coefficients

ε_t= the residual error of the regression

Operational Definition and Measurement of Variables

The description and measurement of variables is explained in table 2 below

Table 2: Definition and Measurements of Variables

TYPE	VARIABLE	VARIABLE MEASURE	DESCRIPTION
Dependent Variable	Stock Returns of banks listed on the NSE	Bank stock prices	Quarterly averages of share prices of the 11 banks listed on the NSE.
Independent variables	Inflation	Inflation Rate	The persistent increase in the general price level of goods and services measured by month on month percentage change in the level of CPI. Quarterly averages to be used
	Exchange rate	Kenya Shillings per US dollar	Measured by quarterly average rate at which Kenya shillings exchange with one US dollar.
	Interest Rates	Treasury bill rate	Used as a proxy fordomestic rate of interest measured asthe quarterly average of the 91-day Treasury bill rate.
	GDP	Real GDP level	Quarterly measureof an economy's total output.

Data Type and Source

This research utilized secondary data from secondary sources. The study examines quarterly data for all the variables under study covering the period from first quarter of 2000 to fourth quarter of 2015 forming panel data of 64 observations.

Share prices of the 11 listed banks were sourced from Bloomberg databases.

Macroeconomic data including exchange rate of Kenya shilling to the US dollar, 91 Day Treasury bill rates and real GDP was sourced from the Central Bank of Kenya (CBK) databases while inflation rates were retrieved from the Kenya National Bureau of Statistics (KNBS).

Data Processing and Analysis

Firstly, all the variables under study were transformed into the logarithmic form. This ensures that the resultant regression coefficients of the log-transformed data are elasticities, which can be interpreted as a percent change in independent variable with a percent change in dependent variable.

Before the model was estimated, diagnostic tests were carried out. To assist in describing and summarizing the data, descriptive analysis was performed on all variables to establish their mean, median, maximum, minimum and standard deviation. Additionally, the Jarque-Bera (JB) test will be applied on all variables to establish whether they follow the normal probability distribution by computing their kurtosis and skewness measures.

This study utilized a variety of tools to test the regression results for the usual challenges associated with panel data econometric models namely non-stationarity and multicollinearity, Correlation Analysis was performed on the independent variables to test for multicollinearity, a phenomenon where two or more independent variables are highly correlated. The general rule of thumb is that if two or more independent variables are found to be correlated with each other, one of them should be dropped from the list of variables. This will be the case if the correlation coefficient between any two independent variables is in excess of 0.8.

Since the data has a time-series component, the Unit Root test was performed on all variables to ensure their statistical stationarity and avoid a spurious regression.

Finally, the p-values of the factor coefficients were used to test the hypotheses of the study by indicating whether the relationship between dependent and independent variable is statistically significant.

RESEARCH FINDINGS AND DISCUSSION

Descriptive Statistics

Table 3 presents a summary of descriptive statistics for independent variables under study, allowing us to investigate normality of their individual distributions. Mean, standard deviation, skewness, kurtosis, Jacque-Bera statistics and their p-values have been reported. The mean describes the average value in the series and Std. Deviation measures the dispersion of the series. The maximum and minimum statistics measures upper and lower bounds of the variables.

The Jarque-Bera (JB) test statistic was used to determine whether or not the variables follow the normal probability distribution. The JB test computes kurtosis and the skewnessby using the following test statistic:

$$JB = \frac{n}{6}\left(S^2 + \frac{(K-3)^2}{4}\right).$$

Where, n = sample size, S = skewness coefficient, and K = kurtosis coefficient. For a normally distributed variable, S = 0 and K = 3. The JB test of normality is therefore a test of the joint hypothesis that S and K are 0and 3 respectively.

Table 3: Independent Variables Descriptive Statistics

	LOGEXCHRT	LOGGDP	LOGINFL	LOGTBILL
Mean	1.899207	5.843291	0.845932	0.855633
Maximum	2.012699	6.013736	1.283018	1.286756
Minimum	1.796893	5.689027	0.089712	0.073107
Std. Dev.	0.043281	0.094057	0.266580	0.259443
Skewness	0.287008	0.212268	-0.528921	-1.435988
Kurtosis	3.397488	1.792519	2.972764	4.826126
Jarque-Bera	1.299977	4.368641	2.986063	30.88795
Probability	0.522052	0.112554	0.224691	0.000000
Observations	64	64	64	64

From the results, the Jarque-Berra statistics indicate that the null hypothesis that all macro-economic variables are normally distributed have been accepted at 5% level of significance except for interest rates (LOGTBILL) as its P-value is less than 5% (0.000<0.05). Table 4 presents the summary of descriptive statistics for dependent variable:

Table 4: Dependent Variable Descriptive Statistics

	LOGSTOCK _BBK	LOGSTOCK _CFC	LOGSTOCK _COOP	LOGSTOCK _DTB	LOGSTOCK _EQUITY	LOGSTOCK _HFCK	LOGSTOCK _IM	LOGSTOCK _KCB	LOGSTOCK _NBK	LOGSTOCK _NIC	LOGSTOCK _SCB
Mean	0.98	1.62	1.06	1.61	1.33	1.14	2.06	1.07	1.13	1.18	2.15
Maximum	1.28	2.11	1.33	2.40	1.72	1.60	2.14	1.78	1.59	1.82	2.54
Minimum	0.41	0.87	0.70	0.62	0.59	0.47	1.97	(0.03)	0.21	0.38	1.59
Std. Dev.	0.29	0.40	0.18	0.53	0.26	0.31	0.06	0.53	0.43	0.43	0.28
Skewness	(0.95)	(0.77)	(0.29)	(0.35)	(0.85)	(0.49)	(0.40)	(0.62)	(1.05)	(0.40)	(0.72)
Kurtosis	2.41	2.30	2.08	1.99	3.77	2.39	1.87	2.12	2.66	1.98	2.37
Jarque-Bera	10.55	7.60	1.42	3.99	5.46	3.56	0.88	6.15	12.05	4.46	6.62
Probability	0.01	0.02	0.49	0.14	0.07	0.17	0.64	0.05	0.00	0.11	0.04
Observations	64	64	29	64	38	64	11	64	64	64	64

Jarque-Berra statistics indicate that the stock prices of 7 out of 11 banks are normally distributed with P-values above 5% level of significance.

Inferential Statistics

Correlation Analysis

Correlation of the independent variables was performed to test the problem of multicollinearity, a situation where two or more independent variables are highly correlated. Multicollinearity has the impact of increasing the variances and standard errors of the OLS estimates. High variances usually mean that the estimates are imprecise, and therefore not very reliable.

Table 5: Independent Variable Correlation

	LOGEXCHRT	LOGGDP	LOGINFL	LOGTBILL
LOGEXCHRT	1.000000			
LOGGDP	0.613724	1.000000		
LOGINFL	0.036661	0.054067	1.000000	
LOGTBILL	0.218696	0.149188	0.044581	1.000000

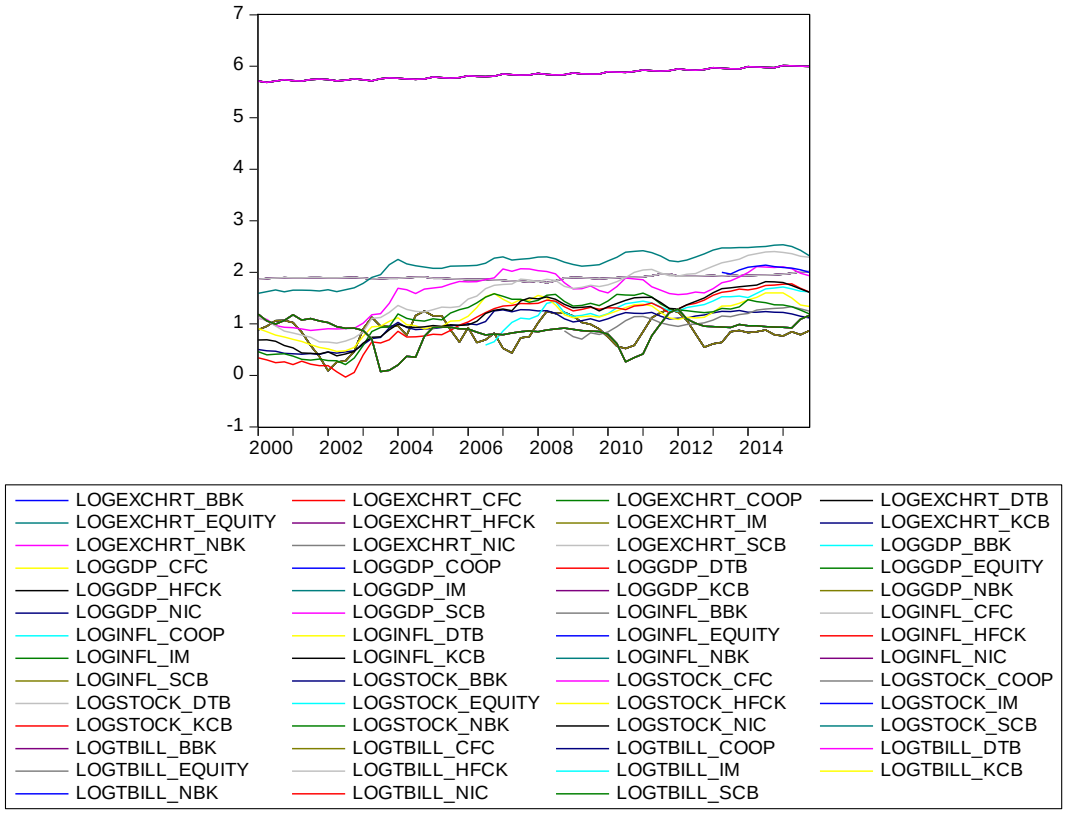
The results indicate that not a single correlation coefficient exceeds 0.8. We can therefore conclude that the model is devoid of multicollinearity.

Unit Root Test

Time series data is often known to have problems with non-stationarity. Therefore, it is important to determine whether a series is stationary (do not contain a unit root) ornot stationary (contains a unit root) before using it. One can obtain a high $R^2$with non-stationary data even though there is no meaningful relation between variables, otherwise known as a spurious regression between unrelated variables.

The Variables were plotted on a graph to establish a trend. Figure 2 shows trends depicted by the variables:

Figure 2: Graph of Panel Data Trend



The above figure shows that the majority of variables have an upward trend over time. This exogenous variable is inputted into the panel unit root test whose results are displayed in the table 6:

Table 6: Panel Unit Root Test: Level with Trend and Intercept

Method	Statistic	Prob.**	Cross-sections	Obs
Null: Unit root (assumes common unit root process)				
Levin, Lin & Chu t*	3.23499	0.9994	55	3220
Breitung t-stat	-0.11231	0.4553	55	3165
Null: Unit root (assumes individual unit root process)				
Im, Pesaran and Shin W-stat	-4.58711	0.0000	55	3220
ADF - Fisher Chi-square	213.045	0.0000	55	3220
PP - Fisher Chi-square	323.435	0.0000	55	3351

** Probabilities for Fisher tests are computed using an asymptotic Chi--square distribution. All other tests assume asymptotic normality.

The results indicate that the Levin, Lin & Chu and the Breitung tests that assume a common unit root had p-values that were higher than the critical value of 5%. Therefore, the null hypothesis of the data consisting of a unit root could not be rejected at 5% level of significance (0.9994, 0.4553>0.05). The Im, Pesaran & Shin W-stat, ADF - Fisher Chi-square and PP - Fisher Chi-square tests results showed p-values of less than 5% critical value and thus their null hypotheses of unit roots were rejected.

At first difference, however, all five null hypotheses were rejected as shown in table 7:

Table 7: Panel Unit Root Test: at First Difference

Method	Statistic	Prob.**	Cross-sections	Obs
Null: Unit root (assumes common unit root process)				
Levin, Lin & Chu t*	-23.0464	0.0000	55	3194
Breitung t-stat	-24.1559	0.0000	55	3139
Null: Unit root (assumes individual unit root process)				
Im, Pesaran and Shin W-stat	-29.9340	0.0000	55	3194
ADF - Fisher Chi-square	994.373	0.0000	55	3194
PP - Fisher Chi-square	1330.17	0.0000	55	3296

** Probabilities for Fisher tests are computed using an asymptotic Chi -square distribution. All other tests assume asymptotic normality.

The panel data therefore becomes stationary without a doubt at first difference.

Panel Multiple Regression Analysis

The dependent variable consists of grouped data on stock prices of 11 banks over time. To account for group-level variation and improve model fit, this research chose to use either a fixed-effects or random-effects model.

Fixed versus Random Effects Test

To test for fixed and random effects, the study utilized Redundant Fixed Effects Test, whose null hypothesis is to concur that Fixed Effects model is appropriate. Table 8 shows the results of the test:

Table 8: Redundant Fixed Effects Test

Redundant Fixed Effects Tests			
Pool: BASEEQUATION			
Test cross-section fixed effects			
Effects Test	Statistic	d.f.	Prob.
Cross-section F	0.531426	(10,564)	0.8683
Cross-section Chi-square	5.430053	10	0.8607

The results indicate that the cross-sectional F p-value is significantly more than the critical value of 5% (0.8683>0.05) and thus fails to reject the null hypothesis and conclude that Fixed Effects model is appropriate.

Panel Regression Output

This study sought to establish the extent to which the macroeconomic variables explained the variation of bank stock prices and hence returns. The following OLS regression using fixed effects model was carried out:

$$D(LOGSTOCK)_t = \beta_0 + \beta_1 D(LOGINFL)_t + \beta_2 D(LOGEXCHRT)_t + \beta_3 D(LOGTBILL)_t + \beta_4 D(LOGGDP)_t + \varepsilon_t$$

Where,

D is the first difference. The model output is summarized in table 9:

Table 9: OLS Regression Result

Dependent Variable: D(LOGSTOCK?)				
Method: Pooled Least Squares				
Sample (adjusted): 2000Q2 2015Q4				
Included observations: 63 after adjustments				
Cross-sections included: 11				
Total pool (unbalanced) observations: 579				
Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	0.019422	0.002764	7.027166	0.0000
D(LOGTBILL?)	-0.158931	0.020052	-7.925894	0.0000
D(LOGINFL?)	0.075851	0.016362	4.635697	0.0000
D(LOGEXCHRT?)	-1.746724	0.170308	-10.25626	0.0000
D(LOGGDP?)	-0.125874	0.135900	-0.926222	0.3547
Fixed Effects (Cross)				
_BBK—C	-0.005063			
_CFC—C	-0.001620			
_COOP—C	0.004754			
_DTB—C	0.003799			
_EQUITY—C	0.017287			
_HFCK—C	-0.008009			
_IM—C	-0.002539			
_KCB—C	0.005441			
_NBK—C	-0.003154			
_NIC—C	-5.82E-05			
_SCB—C	-0.003198			
	Effects Specification			
Cross-section fixed (dummy variables)				
R-squared	0.242044	Mean dependent var		0.014022
Adjusted R-squared	0.223230	S.D. dependent var		0.072341
S.E. of regression	0.063758	Akaike info criterion		-2.641890
Sum squared resid	2.292680	Schwarz criterion		-2.528903
Log likelihood	779.8273	Hannan-Quinn criter.		-2.597837
F-statistic	12.86477	Durbin-Watson stat		1.509234
Prob(F-statistic)	0.000000			

The OLS output shows the impact of macroeconomics variables on bank stock returns. Log-transformed variables assure the elasticity of their relationship such that percentage change in Y is caused by one percentage change in X. In the case of this study, 1% increase in inflation will cause bank stock prices to increase by 7.58%.

The OLS results show that all macroeconomic variables have a significant relationship with bank stock return except for GDP, which has a p-value greater than the critical value of 5%(0.3547>0.05).

The coefficient of determination (R^2) is a statistical measure of how close the data is to the fitted regression line by measuring the percentage of the response variable variation that is

explained by a linear model. In this study's case, an $R^2$of 0.242044 suggests that the model has explained 24% of the variation of the dependent variable. The small difference between the R^2 and adjusted R^2 suggests a small penalty for inclusion of extra predictor variables that don't improve the existing model.

Inferential Analysis

The relationship between bank stock returns and macro economic variables is analyzed individually. OLS regression resultant estimations display the degree to which the different macroeconomic variables affect bank stock prices and hence return. Table 10 summarizes the results of hypothesis testing at 5% level of significance.

Table 10: Research Hypotheses Testing

Null hypothesis	**P value**	**Reject or not?**	**Result**
Inflation (INFL) has no significant relationship with stock returns of listed banks.	0.0000	Reject	Inflation has a significant relationship with stock returns of listed banks.
Interest Rate(TBILL) has no significant relationship with stock returns of listed banks.	0.0000	Reject	Interest Rate has a significant relationship with stock returns of listed banks.
Exchange Rate(EXCHRT) has no significant relationship with stock returns of listed banks.	0.0000	Reject	Exchange Rate has a significant relationship with stock returns of listed banks.
GDP has no significant relationship with stock returns of listed banks.	0.3547	Do not reject	GDP has no significant relationship with stock returns of listed banks.

The regression output shows a significant and positive relationship between inflation (DLOGINFL) and bank stock prices (β =0.075851, p value <0.05).This result is consistent with the researcher's expectations and therefore the null hypothesis is rejected. The finding is also consistent with Laichena and Obwogi (2015) study that found a positive relationship between stock returns and inflation in the 3 East African countries. Victor and Kuwornu (2011) also established a positive connection between stock returns and inflation in Ghana. This finding was however different from those of Kirui, Wawire and Onono (2014) who established an insignificant relationship between inflation and stock returns of the Nairobi Stock Exchange. Khan & Yousuf (2013) also found an insignificant correlation between Bangladesh stock market returns and inflation.

The results displays a significant and negative relationship between interest rate (DLOGTBILL) and bank stock prices (β =-0.158931, p value <0.05). This is as the researcher

anticipated and the null hypothesis is rejected. The outcome is also consistent with earlier studies of Saeed and Akhter (2012), Al-Albadi and Al-Sabbagh (2006), Alam and Uddin (2009), Humpe and Macmillan (2007) and Laichena and Obwogi (2015) who all found a significant negative relationship between interest rate and stock returns. Kirui, Wawire & Onono (2014) however found an insignificant relationship between inflation and stock returns of the Nairobi Stock Exchange.

Exchange rate (DLOGEXCHRT) was found to have a negative significant relationship (β=-1.746724, p value <0.05) with stock returns according to the regression results. This is also as expected and the null hypothesis is rejected. This finding is also consistent with the studies of Ibrahim and Aziz (2003), Agrawal, Srivastav and Srivastava (2010), Kirui, Wawire and Onono (2014), and Laichena and Obwogi (2015) who all found similar negative and significant relationships.

The regression output shows a negative but insignificant relationship between GDP (DLOGGDP) and bank stock prices (β =-0.125874, p value 0.3547>0.05). This result is as expected and therefore the researcher fails to reject the null hypothesis. The finding is consistent with Kirui, Wawire & Onono (2014) who established insignificant relationship between GDP and stock returns in the Nairobi Stock Exchange. However, Laichena & Obwogi (2015) found a positive relationship between GDP and stock returns of the 3 East African countries.

Summary of the Findings

The objectives of this study were to establish the effects of the macroeconomic variables namely inflation (INFL), exchange rate (EXCHRT), interest rate (TBILL) and GDP on the stock returns of the banks listed on the Nairobi Securities Exchange.

Panel design under exploratory research was adopted for the study. Panel monthly data of bank stock prices and macroeconomic variables was collected over the period of 2000 to 2015. Quarterly averages of the data were derived and converted into logarithmic form.

All the variables underwent a descriptive analysis where, out of four independent variables, GDP exhibited a non-normal distribution at 5% level of significance. Furthermore, seven out of 11 bank stocks were normally distributed. A correlation analysis of independent variables revealed no two variables were highly correlated, thus the model was devoid of any multicollinearity. Panel data unit root test showed the panel was non-stationary at level, and became stationary at first difference.

Ordinary Least Square (OLS) regression within fixed effects model was applied to examine the sensitivity of bank stock prices and hence returns to the macroeconomic variables. The multiple regression resulted in the following linear relationship:

$$RETURN_t = 0.019422 + 0.07585INFL_t - 1.74672EXCHRT_t - 0.15893INTRT_t - 0.125874GDP_t + \varepsilon_t$$

The results indicated a positive and significant relationship between bank stock returns and inflation. For every one percent increase in inflation, bank stock return was predicted to increase 7.58%. A negative and significant relationship was found between bank stock return and exchange rate, with a percentage appreciation of the Kenya Shilling causing a 174.7% decrease in bank stock prices. A similar negative and significant relationship was exhibited between interest rates and bank stock returns. A one percent increase in 91-day Treasury bill rate reduced bank stock prices by 15.9%. GDP exhibited a negative but insignificant relationship.

CONCLUSIONS

The theoretical literature advanced earlier in this study such as Capital Asset Pricing Model (CAPM) and the arbitrage price theory (APT) both imply a relationship between the stock market and economic activity. The macroeconomic variables included in this analysis were selected based upon the APT theory which advocates for a multi factor analysis. This theory implies that all factors that may directly or indirectly affect the stock prices and subsequently expected returns may be analyzed.

The findings of this research attest to the fact that a stable macroeconomic environment matters, where, with the exception of GDP, there exists a significant relationship between stock returns of listed banks and macroeconomic variables. These findings also confirm that macroeconomic variables affect the banking sector stocks returns differently from how they affect the aggregate stock market, as concluded by Kirui, Wawire & Onono (2014) who established that only the exchange rate had a significant impact on the NSE 20 Share Index returns.

Empirical evidence from the study showed a positive and significant relationship between bank stock returns and inflation. The inherent reason behind this could be that increasing inflation rates prompts the Central Bank of Kenya to increase the KBRR as part of its monetary policy intervention. The Kenya Bank's Reference Rate (KBRR) is a benchmark rate prescribed by the Central Bank of Kenya for pricing all variable interest rate Kenya shilling denominated loans or credit facilities.

The KBRR increase has the effect of increasing banks' incomes and therefore their profitability, boosting the demand of their stocks. The Central Bank of Kenya through its monetary policy should accommodate the impact of its inflation-curbing interventions on the banking sector of the stock market.

The study findings also show a negative and significant correlation between interest rates and bank stock returns. Firstly, the Treasury bill is seen as an alternative investment

vehicle to the stock market. As their rates rise, more investors channel their funds to them to enjoy their perceived superior returns as compared to the stock market in general. The demand for equity therefore drops along with their prices.

Secondly, rising Treasury bill rates force banks to raise their deposits rates to attract customer deposits. Interest rate expense has a major negative effect on banks' profitability and subsequently renders their stock undesirable to investors, reducing their demand and hence their prices.

The Central Bank of Kenya, through its monetary policy, has in the past used the Treasury bill rate to intervene during runaway inflation and currency depreciation. The governing body should minimize the volatility of this key variable due to its considerable impact on banking sector stock returns.

The study results have also indicated a negative and significant relation between exchange rates and bank stock returns. According to the Nairobi Securities Exchange data, foreign investors account for between 50% - 60% of the stock market activity. Currency volatility has significant impact on foreign investors' stock market return in general. When the currency depreciates, they get more value for their foreign currency, but similarly, the depreciation erodes their returns when converting local currency back to foreign currency for repatriation.

This finding therefore confirms the theory that foreign investors shy away from an economy with a volatile currency. The Central Bank of Kenya should ensure a stable exchange rate to minimize the substantial impact its volatility has on bank stock returns. Banks, who transact the majority of foreign currency in the open market, also have a role to play in exchange rate stability. They should refrain from speculative tendencies as eluded by the CBK Governor during the 2015 currency crisis.

Empirical evidence from this study suggests an insignificant relationship between bank stock returns and GDP. This could be as a result of the small size of the stock market as compared to overall GDP. According to World Bank database, Kenya's stock market capitalization has averaged 26% of its GDP from years 2000-2011. The relative smallness of this market may have resulted in its lack of correlation to economic GDP since a small market's price movements have a potentially smaller impact on aggregate wealth.

This finding notwithstanding, a robust GDP fuels growth in all sectors of the economy, whose multiplier effect ensures more disposable income for households and firms alike, thus boosting investment in the wider stock market and the banking sector in particular.

RECOMMENDATIONS

Recommendations for Policy Improvements

This study has found that Inflation, interest rate and exchange rate have significant impact on stock returns of listed Kenyan banks. These variables are contained in the Central Bank of Kenya's monetary policy, where the CBK intervenes whenever the levels of these macroeconomic variables are not within desirable levels. The governing body should moderate its interventions to avert the adverse impact they have on bank stock returns.

Similarly, banks, as majority transactors of foreign exchange in the open market, have a responsibility of not engaging in currency speculation with the intention to profit from currency price movements that are contrary to market fundamentals. These foreign currency price fluctuations have a major impact as evidenced by the exchange rate coefficient being the largest in influencing bank stock returns.

Recommendations for Further Research

Future studies may identify other variables that were not captured in this study that significantly affect bank stock returns. Bank specific factors like the KBRR, bank profitability and balance sheet footings may have a role in their stock return variation. Other macro-economic variables like money supply, foreign direct investment and Government spending may be added as regressors to the equation. Such variables would be a significant addition to account for the impact of both bank-specific and wider macroeconomic shocks to the returns of listed banks in the NSE.

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APPENDICES

Appendix 1: Research Panel Data

			DEPENDENT VARIABLE - BANK STOCK PRICE											INDEPENDENT VARIABLES			
YEAR	Qtr	Period	BBK	CFCStanbic	Co-op	DTB	Equity	HFCK	I&M	KCB	NBK	NIC	SCB	T-Bill	ExchRate	Inflation	GDP
2000	Q1	1	3.17	12.76		13.18		8.11		2.19	2.89	4.85	38.99	15.47	72.78	7.68	517,397
2000	Q2	2	3.00	12.20		11.41		7.02		1.98	2.49	4.92	42.54	11.38	75.96	9.00	488,683
2000	Q3	3	2.94	9.24		9.04		6.05		1.77	2.57	4.60	45.55	9.84	77.02	11.45	519,130
2000	Q4	4	2.67	8.56		7.26		5.53		1.82	2.61	3.79	41.80	11.57	78.95	11.56	545,378
2001	Q1	5	2.61	8.38		6.65		4.98		1.61	2.37	3.42	45.00	15.01	78.20	10.53	527,990
2001	Q2	6	2.57	7.96		6.01		4.55		1.89	2.05	2.73	45.19	11.83	78.22	6.88	518,201
2001	Q3	7	2.64	7.41		5.49		3.95		1.65	1.97	2.67	44.68	12.70	78.96	3.79	552,754
2001	Q4	8	2.56	7.70		4.44		3.47		1.54	2.07	2.61	43.34	11.38	78.87	2.32	562,921
2002	Q1	9	2.83	8.04		4.40		3.25		1.34	1.94	2.84	46.04	10.55	78.30	1.23	548,783
2002	Q2	10	2.69	7.92		4.21		2.92		1.17	1.91	2.38	42.32	8.80	78.42	1.80	520,423
2002	Q3	11	2.85	8.07		4.64		2.99		0.92	1.62	2.60	43.93	8.19	78.75	1.90	558,155
2002	Q4	12	3.00	8.16		5.36		3.50		1.14	2.17	2.90	49.93	8.25	79.47	2.90	565,552
2003	Q1	13	3.94	10.23		6.97		5.71		2.47	3.79	4.21	61.30	7.46	77.05	7.98	546,877
2003	Q2	14	5.17	15.02		12.79		8.77		4.47	7.07	5.48	79.20	5.05	73.66	13.43	522,745
2003	Q3	15	5.42	15.70		13.20		8.99		4.23	8.51	5.59	89.68	1.18	76.20	9.02	574,487
2003	Q4	16	8.50	24.97		16.57		11.20		4.90	8.81	7.82	140.93	1.25	76.84	8.80	594,857
2004	Q1	17	10.62	49.20		22.73		13.15		7.14	15.56	9.92	178.21	1.58	76.65	9.11	584,876
2004	Q2	18	8.49	46.11		19.06		9.60		5.52	12.72	8.73	146.32	2.35	78.81	6.06	566,717
2004	Q3	19	7.72	38.60		17.45		9.13		5.58	11.72	8.49	133.58	2.24	80.51	14.44	557,895
2004	Q4	20	7.97	47.34		17.04		7.94		5.78	11.31	8.75	127.17	3.68	80.73	17.59	569,677
2005	Q1	21	8.10	49.34		18.88		8.84		6.25	12.50	9.28	119.25	8.49	76.56	14.32	619,867
2005	Q2	22	8.46	51.90		21.08		8.79		6.18	11.90	8.87	120.13	8.61	76.41	14.24	600,261
2005	Q3	23	9.27	58.07		20.77		11.24		7.42	16.11	9.60	131.39	8.61	75.38	7.63	590,651
2005	Q4	24	9.35	66.23		21.67		11.50		9.46	18.74	9.30	132.54	8.03	73.85	4.42	602,879
2006	Q1	25	10.11	85.28		30.29		14.09		10.91	20.70	9.54	134.53	7.95	72.10	8.43	655,824
2006	Q2	26	9.62	86.12		34.52		20.78		13.53	25.60	11.19	136.29	6.88	72.16	4.33	636,277
2006	Q3	27	11.04	72.57		48.32	3.88	33.67		16.50	32.93	15.92	150.73	6.10	73.13	4.88	628,546
2006	Q4	28	17.81	77.72		36.13	4.51	38.83		19.71	38.37	18.34	189.33	6.32	71.01	6.38	645,421
2007	Q1	29	18.60	116.39		58.12	7.23	30.00		22.11	34.23	19.39	198.78	6.18	69.60	3.35	707,741
2007	Q2	30	17.06	104.42		59.48	10.70	24.47		22.66	29.99	17.96	173.91	6.65	67.43	2.71	686,388
2007	Q3	31	18.89	117.77		73.69	12.86	29.64		24.71	29.90	27.75	180.58	7.06	67.01	5.34	672,326
2007	Q4	32	18.72	115.94		71.03	12.42	28.68		24.62	26.28	31.75	185.81	7.31	65.21	5.63	679,059
2008	Q1	33	17.80	107.31		65.75	14.39	35.65		25.11	28.59	30.44	197.19	7.04	67.88	10.50	726,285
2008	Q2	34	17.89	108.29		72.81	25.14	32.02		28.77	35.76	33.23	199.81	7.61	62.65	17.44	694,403
2008	Q3	35	16.03	93.33		69.38	27.07	23.14		27.48	37.39	29.90	183.45	7.91	68.60	15.88	677,639
2008	Q4	36	12.52	63.00	7.32	53.36	16.48	15.00		21.51	27.16	23.91	157.79	8.24	77.62	16.58	689,120
2009	Q1	37	10.89	47.82	5.87	48.55	14.08	13.12		17.85	22.20	20.55	142.00	7.77	79.38	14.13	737,906
2009	Q2	38	11.47	47.93	5.02	51.00	14.55	13.74		19.05	22.71	20.90	131.28	7.37	78.45	10.61	713,364
2009	Q3	39	12.56	54.70	6.69	55.78	15.83	14.22		20.84	25.00	21.76	135.50	7.26	78.24	9.76	705,260
2009	Q4	40	11.14	44.32	6.24	53.10	13.95	13.55		19.21	22.56	17.74	140.92	7.10	75.14	7.98	707,159
2010	Q1	41	12.51	39.87	6.94	57.05	15.67	15.46		20.51	27.68	21.55	166.73	6.25	76.49	5.56	786,481
2010	Q2	42	14.67	52.86	8.82	65.57	20.47	17.85		20.37	37.18	24.83	196.62	4.12	78.94	5.67	767,418
2010	Q3	43	16.49	77.49	11.51	78.75	24.64	20.72		18.75	36.10	28.49	246.59	1.82	80.93	3.33	761,159
2010	Q4	44	16.00	74.65	13.80	100.11	28.11	23.36		22.03	35.83	31.92	256.37	2.20	80.38	3.84	789,245
2011	Q1	45	15.87	71.47	13.87	110.61	27.50	23.87		23.05	39.30	32.63	261.89	2.61	82.24	7.03	845,861
2011	Q2	46	16.58	52.23	12.56	113.70	25.55	22.28		25.25	33.19	32.68	240.93	5.85	86.12	13.16	818,825
2011	Q3	47	13.98	45.07	10.48	96.98	21.04	16.64		20.80	24.40	26.10	206.58	10.03	95.01	16.51	805,573
2011	Q4	48	12.42	38.72	9.55	85.90	18.11	12.95		16.14	19.76	19.85	167.66	16.41	93.87	19.19	823,766
2012	Q1	49	12.91	37.00	8.90	84.17	17.83	12.16		19.43	18.58	19.40	160.16	19.35	84.14	16.87	883,368
2012	Q2	50	12.83	37.80	9.69	92.01	20.65	13.42		23.25	17.89	23.46	173.11	12.43	84.12	11.78	854,348
2012	Q3	51	14.13	41.46	9.87	94.25	22.14	13.06		23.09	17.17	27.22	197.15	10.22	84.28	6.58	841,814
2012	Q4	52	14.90	39.67	10.50	112.27	23.70	13.35		28.96	16.43	31.82	227.27	9.03	85.58	3.53	862,535
2013	Q1	53	16.36	47.93	11.80	131.39	27.66	16.77		35.73	17.17	40.22	271.10	8.78	86.72	4.08	958,759
2013	Q2	54	17.40	62.91	14.14	159.58	33.61	22.12	99.50	40.86	19.96	47.99	297.69	8.68	84.81	4.37	914,363
2013	Q3	55	17.22	68.55	15.78	165.35	33.55	22.26	92.75	42.99	19.45	50.08	295.89	8.31	87.26	7.00	898,848
2013	Q4	56	18.06	81.21	15.16	180.50	34.47	23.00	110.62	47.27	21.31	52.66	302.45	9.75	85.91	7.42	887,968
2014	Q1	57	16.82	98.59	15.91	213.63	32.39	29.06	125.06	45.51	29.47	54.58	301.84	9.13	86.33	6.78	982,998
2014	Q2	58	16.75	128.49	18.44	229.08	38.91	32.65	131.46	48.37	26.98	56.47	311.13	9.14	87.25	7.03	968,776
2014	Q3	59	17.50	126.77	19.40	247.52	47.62	39.76	137.72	55.61	25.72	65.78	318.75	8.82	88.24	7.54	945,392
2014	Q4	60	16.84	124.27	19.98	252.79	49.67	39.75	129.13	56.69	23.39	65.01	335.34	8.63	89.88	6.18	936,615
2015	Q1	61	16.69	127.64	20.24	243.06	52.15	39.68	124.37	58.89	23.13	63.31	343.79	8.56	91.32	5.82	1,032,154
2015	Q2	62	15.60	117.00	21.54	230.44	47.60	31.65	120.59	59.77	21.54	55.30	317.36	8.31	95.84	6.99	1,023,287
2015	Q3	63	13.98	96.52	19.48	205.10	45.08	23.15	112.11	49.20	18.49	47.49	267.38	12.24	102.97	6.14	1,000,281
2015	Q4	64	13.01	86.17	17.59	195.43	41.67	21.69	99.73	41.25	15.63	41.10	209.44	14.60	102.38	7.35	992,185

Appendix 2: Panel Unit Root Test: Level with Trend and Intercept

Group unit root test: Summary

Series: LOGEXCHRT_BBK, LOGEXCHRT_CFC, LOGEXCHRT_COOP, LOGEXCHRT_DTB, LOGEXCHRT_EQUITY, LOGEXCHRT_HFCK, LOGEXCHRT_IM, LOGEXCHRT_KCB, LOGEXCHRT_NBK, LOGEXCHRT_NIC, LOGEXCHRT_SCB, LOGGDP_BBK, LOGGDP_CFC, LOGGDP_COOP, LOGGDP_DTB, LOGGDP_EQUITY, LOGGDP_HFCK, LOGGDP_IM, LOGGDP_KCB, LOGGDP_NBK, LOGGDP_NIC, LOGGDP_SCB, LOGINFL_BBK, LOGINFL_CFC, LOGINFL_COOP, LOGINFL_DTB, LOGINFL_EQUITY, LOGINFL_HFCK, LOGINFL_IM, LOGINFL_KCB, LOGINFL_NBK, LOGINFL_NIC, LOGINFL_SCB, LOGSTOCK_BBK, LOGSTOCK_CFC, LOGSTOCK_COOP, LOGSTOCK_DTB, LOGSTOCK_EQUITY, LOGSTOCK_HFCK, LOGSTOCK_IM, LOGSTOCK_KCB, LOGSTOCK_NBK, LOGSTOCK_NIC, LOGSTOCK_SCB, LOGTBILL_BBK, LOGTBILL_CFC, LOGTBILL_COOP, LOGTBILL_DTB, LOGTBILL_EQUITY, LOGTBILL_HFCK, LOGTBILL_IM, LOGTBILL_KCB, LOGTBILL_NBK, LOGTBILL_NIC, LOGTBILL_SCB

Date: 05/11/16 Time: 19:49

Sample: 2000Q1 2015Q4

Exogenous variables: Individual effects, individual linear trends

Automatic selection of maximum lags

Automatic selection of lags based on SIC: 0 to 6

Newey-West bandwidth selection using Bartlett kernel

Method	Statistic	Prob.**	Cross-sections	Obs
Null: Unit root (assumes common unit root process)				
Levin, Lin & Chu t*	3.23499	0.9994	55	3220
Breitung t-stat	-0.11231	0.4553	55	3165
Null: Unit root (assumes individual unit root process)				
Im, Pesaran and Shin W-stat	-4.58711	0.0000	55	3220
ADF - Fisher Chi-square	213.045	0.0000	55	3220
PP - Fisher Chi-square	323.435	0.0000	55	3351

** Probabilities for Fisher tests are computed using an asymptotic Chi -square distribution. All other tests assume asymptotic normality.

Appendix 3: Panel Unit Root Test: at First Difference

Group unit root test: Summary

Series: LOGEXCHRT_BBK, LOGEXCHRT_CFC, LOGEXCHRT_COOP, LOGEXCHRT_DTB, LOGEXCHRT_EQUITY, LOGEXCHRT_HFCK, LOGEXCHRT_IM, LOGEXCHRT_KCB, LOGEXCHRT_NBK, LOGEXCHRT_NIC, LOGEXCHRT_SCB, LOGGDP_BBK, LOGGDP_CFC, LOGGDP_COOP, LOGGDP_DTB, LOGGDP_EQUITY, LOGGDP_HFCK, LOGGDP_IM, LOGGDP_KCB, LOGGDP_NBK, LOGGDP_NIC, LOGGDP_SCB, LOGINFL_BBK, LOGINFL_CFC, LOGINFL_COOP, LOGINFL_DTB, LOGINFL_EQUITY, LOGINFL_HFCK, LOGINFL_IM, LOGINFL_KCB, LOGINFL_NBK, LOGINFL_NIC, LOGINFL_SCB, LOGSTOCK_BBK, LOGSTOCK_CFC, LOGSTOCK_COOP, LOGSTOCK_DTB, LOGSTOCK_EQUITY, LOGSTOCK_HFCK, LOGSTOCK_IM, LOGSTOCK_KCB, LOGSTOCK_NBK, LOGSTOCK_NIC, LOGSTOCK_SCB, LOGTBILL_BBK, LOGTBILL_CFC, LOGTBILL_COOP, LOGTBILL_DTB, LOGTBILL_EQUITY, LOGTBILL_HFCK, LOGTBILL_IM, LOGTBILL_KCB, LOGTBILL_NBK, LOGTBILL_NIC, LOGTBILL_SCB

Date: 05/11/16 Time: 19:56

Sample: 2000Q1 2015Q4

Exogenous variables: Individual effects, individual linear trends

Automatic selection of maximum lags

Automatic selection of lags based on SIC: 0 to 6

Newey-West bandwidth selection using Bartlett kernel

Method	Statistic	Prob.**	Cross-sections	Obs
Null: Unit root (assumes common unit root process)				
Levin, Lin & Chu t*	-23.0464	0.0000	55	3194
Breitung t-stat	-24.1559	0.0000	55	3139
Null: Unit root (assumes individual unit root process)				
Im, Pesaran and Shin W-stat	-29.9340	0.0000	55	3194
ADF - Fisher Chi-square	994.373	0.0000	55	3194
PP - Fisher Chi-square	1330.17	0.0000	55	3296

** Probabilities for Fisher tests are computed using an asymptotic Chi -square distribution. All other tests assume asymptotic normality.