

**EFFECT OF FINANCIAL LEVERAGE ON SHARE RETURN OF  
NON-FINANCIAL FIRMS LISTED IN NAIROBI SECURITIES  
EXCHANGE**

**BY**

**KHAKALI ROSE JUDITH WAKUKHA**

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## **DECLARATION**

**I declare that this is my work and has not been presented to any institution or university other than the University of Nairobi for examination.**

Signed: \_\_\_\_\_ Date: \_\_\_\_\_

**D63/80870/2015**

**KHAKALI ROSE JUDITH WAKUKHA**

**This Research project has been presented for examination with my approval as the University Supervisor.**

Signed: \_\_\_\_\_ Date: \_\_\_\_\_

**DR. WINNIE NYAMUTE**

**Senior Lecturer, Department of Finance and Accounting**

**School of Business, University of Nairobi**

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## **DEDICATION**

I dedicate this research project to my family members and those who cherish knowledge acquisition

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## **LIST OF ABBREVIATIONS**

**DER**-Debt Equity Ratio

**DR**- Debt Ratio

**EPS**- Earnings per share

**GFSR**- Global Financial Stability Report

**IMF**- International Monetary Fund

**NOI** - Net operational income

**NSE** -Nairobi Securities Exchange

**NYSE**- New York Stock Exchange

**ROA**- Return on Assets

**ROE**- Return on Equity

**SMEs**- Small and Medium Enterprises

**SR**- Stock returns

## ABSTRACT

Capital structure decision is among the key financial decisions that are taken by firms because financial leverage has an effect on the share return. Theoretical foundations on capital structure have found different conclusion where Modigliani and Miller argued on the irrelevance of debt on capital structure and agency theory to stress on the importance of debt in capital structure to control the actions of management. No agreement exists on the nature of the effect of financial leverage on share return from both the theoretical and different empirical studies. The aim of this study was to ascertain the effect of financial leverage on share return of non-financial firms quoted at the NSE. The population for the study was all the 40 non-financial firms listed at the NSE. However, out of the 40 non-financial firms, the researcher managed to get data for 39 companies amounting to 97.5% response rate. The independent variables for the study were financial leverage measured by the ratio of total debt to total assets; financial performance was measured by return on assets, liquidity measured by current ratio and firm size measured by a log of total assets. Share return was the dependent variable and was measured by change in total return. Secondary data was collected over a five 5 year time frame (January 2013 to December 2017) annually. The descriptive cross-sectional research design was employed for the study. Data analysis was undertaken using the SPSS software. The relationship between variables established using multiple linear regression analysis and correlation analysis. The study found that the independent variables had a correlation with share return of non-financial firms listed at the NSE ( $R=0.450$ ). ANOVA results show that the F statistic was significant at 5% level with a  $p=0.000$ . Therefore the model was fit to explain the association between the selected variables. From the research findings, it is evident that firm size produced positive and statistically significant values for this study (high t-value (6.387),  $p < 0.00$ ). Financial performance and firm liquidity produced positive but statistically insignificant values for this study as shown by p values that are more than 5%. Financial leverage produced negative and significant values for this study as shown by a p value  $0.021 < 0.05$ . This study recommends when firms are setting their capital structure they should strike a balance between the tax savings benefit of bankruptcy and debt costs associated with borrowing. The study also recommends that non-financial firms quoted at the NSE should maintain adequate levels of liquidity as the findings of this study depict a positive significant effect of firm liquidity on share return.

## CHAPTER ONE: INTRODUCTION

### 1.1 Background of the Study

Financing decisions are key functions in a company's decision making that helps finance managers to decide when to obtain finances and how to meet their investment needs (Zhao & Wijewardana, 2012). Nyamita (2014) explains that the decision on financing in a firm is very important. Debt financing has been noted to have a very high consequence for firms as far as its operations therefore leading to a better performance of the company as well as their failure. Financial management entails two different types of leverage. Operating leverage is defined as effect of debt on account of all fixed costs other than interest and on the other hand financial leverage is effect on account of the financial cost and interest. Financial leverage used by companies is usually meant to earn more as far as charges on funds are concerned than on costs (Abubakar, 2015).

This study is anchored on Trade-off theory, Modigliani and Miller (MM), and Pecking order theory. Trade-off-Theory was developed by Myers (1984) which argues that profitable companies are more indebted since these firms are motivated to benefit from tax shield afforded by deductibility of debt interest payments, financial distress cost and bankruptcy. Pecking order theory was developed by Myerus and Majluf (1984) and argues that managers are in favor of internal financing as compared to external, and where internal funds are insufficient, debt financing is given first priority to equity financing (Hsu, Chiang, & Liao, 2013). Modigliani and Miller (MM) Irrelevance Hypothesis theory (1958) argues that financial leverage is irrelevant and it has no effect of share returns. On the other hand, the assumption of the theory is that there are no taxes charges, hence no tax

shield benefits. Therefore the use of cheaper debt would increase investors risk exposure that would consequently require higher premium as compensation.

Financial leverage is largely employed in most non-financial firms, particularly in cases where funding via preferred stock instead of common stock is involved. In short, effects of a variation on the extent where most organization's resources are being funded through loanable funds on the return for each share of the organization are called financial debt (Al-Otaibi, 2015). Therefore, it is a representation on the extent to which the firm uses debt and equity. Financial leverage use in a firm infers that the firm is supposed to attain more returns on the fixed charge reserves as compared to their expenses. (Vengesai & Kwenda, 2017).

### **1.1.1 Financial Leverage**

Financial leverage is the percentage of assets funded debt capital in total disregard of equity capital (Rayan, 2010). The total sum of debt that is employed to fund a firm's developments is known as financial leverage (Tempel, 2011). Above all it is frequently signified as the act of transacting on equity and hence a monetary skill involving securing of extra loaned finances to maximize the return on equity. It is also referred as employment of liability in an organizational economic setting for growth of returns. The core objective of firms applying leverage is maximizing the possible earnings of the resources of companies. In cases where firms use leverage, they have to settle charges in respect of utilizing these resources (Kimathi, Galo & Melissa, 2015). Using of leverage is trading on equity and the higher the debt amount employed by the firm the higher its financial leverage (Olang, 2017).

Financial leverage is largely employed in most commercial activities, particularly in cases where funding via preferred stock instead of common stock is involved. In short, effects of a variation on the extent where most organization's resources are being funded through loanable funds on the return for each share of the organization are called financial debt. Therefore, it is a representation on the extent to which the firm uses debt and equity. Financial leverage use in a firm infers that the firm is supposed to attain more returns on the fixed charge reserves as compared to their expenses. There are several measures used in measuring financial leverage for instance, debt over asset ratio (DTA) and debt to equity ratio (D/E) based on book values and market values (Vengesai & Kwenda, 2017).

### **1.1.2 Share Return**

Share returns are referred to as rewards gained from an investment and can be either dividends or capital gains (share price increase). Returns may be calculated by either historical or expected future return. Historical is return on an investment over the holding period of the investment while expected return is the return an investor anticipates on an investment in the next period (Kothari and Warner, 2005). Previous studies done on stock returns have used different definitions. Barnor (2014) defined them as geometric mean of the share. Ward (2008) on the other hand regards stock returns as after tax profits on investments.

Firms with higher stock returns are more profitable and thus they generally contribute to economic growth. Therefore, stock markets returns' uncertainty is a fundamental aspect of the aggregate economy since unstable economic growth trends makes consumption and investment difficult (Khan, 2012). Share returns can be used to predict output and investment since they are forward-looking variable which outlines future discount rates

and cash flow expectations. The availability of adequate market information and the effectiveness and efficiency of stock in the allocation of shares and equities is determined by Stock returns. Changes in stock prices create some form of uncertainty for the investors which influence the shares' demand and supply (Taofik & Omosola, 2013).

Share return is the return on a single share of a unit on saleable stocks of a firm. Share returns can be classified into two; dividend and capital gain. Dividend is the return that distributed to shareholders when a firm makes profits, while capital gain is the return earned by investors trading in the secondary market after selling their shares at a premium. The return on shares was measured using the capital gain and dividend earned at time  $t$ .

### **1.1.3 Financial Leverage and Share Returns**

Modigliani and Miller (1963) after factoring in taxes also support the view that debt impacts firm value and its profitability. Consequently, there is a difference between the value of the unlevered firms to those of the levered firms with the latter being higher all else held constant. This view point posits that firms in their choices of capital structure aim at an optimal target leverage which maximizes firm's value. These theories predict a positive relationship existing amid profitability and leverage. However, observation indicates existence of many creditworthy firms working at minimal leverage for long period of time. On the other side, others argue that leverage is irrelevant to the firm's profitability and its share returns. The MM (1958) seminal work on capital structure irrelevance, insinuated that the firms value is governed by the earning capability and risk of the firm's asset but is invariant to its capital structure. Experience has shown that the share prices and hence value of the firms change whenever firms issue equity securities



(Myers, 1984). Under certain economic conditions, leverage increases financial risk occasioning a decreased share returns.

Relationship between financial leverage and the company's capability to service the interests of its different stakeholders has given eminence to leverage. The manner in which the firm's capital structure is formed impacts its governance and subsequently the flexibility a company has in passing critical decisions. Due to the commitment that is associated with the use of debts, such as the periodic interest payments, and the principle paid by the company, and because of these risks shareholders will demand a higher share return, which puts the company in a critical situation (Jensen, 1986).

According to Olang (2017) a higher degree of financial debt leads to a higher payment of interests which in turn affects negatively the firm's baseline of share earnings. According to Cheng and Tzeng (2010) companies that uses leverage demonstrates in great extent that it can handle the risks which comes about with carrying debt. This can be a very crucial point to consider when deciding when to get additional finance. Also, companies that have good financials, but very scarce credit history, sometimes may encounter challenges convincing investors that the share prices will perform better in foreseen future.

#### **1.1.4 Non-Financial Firms Listed at Nairobi Security Exchange**

Established in 1954, the NSE remains the main securities exchange market of Kenya and also the leading securities market in East Africa (Kioko, 2015). NSE is a body corporate established under the Companies Act (CAP 486) of the Kenyan law and comprises of all licensed stock brokers. The government sold 20% of its stake making the market private in (1988). The NSE market operates through a Central Depository and Settlement Corporation (CDSC). The Nairobi Security Exchange is regulated by the Capital Market

Authority of Kenya where the regulator ensures compliance of the listed companies. The NSE focuses on helping trade clearance arrangements of equities, debt derivatives and other related financial tools (Olang, 2017). In Kenya, the Nairobi Securities Exchange (NSE) comprise of 65 listed companies which has been classified to identify them with various sectors in the economy (NSE, 2017). There are 40 non-financial firms listed at the NSE under the following sectors: commercial and services, agriculture, industrial and telecommunication and technology, investment, automobiles and accessories, energy and petroleum (NSE, 2017).

Non-financial firms listed in the NSE would be keen to optimize expansion opportunities to benefit from the growth opportunities in the long-term. This could be achieved through adopting capital structures and financial leverage levels that support asset growth by finance managers of the listed firms. Firms may supplement the shareholders equity by employing debt. Additional financing requirements may therefore be achieved by increasing the owners' claim through issuing of ordinary shares or use of retained earnings or by increasing creditors claim through borrowing. However, many non-financial firms have been delisted due to financial distress problem with others being placed on receivership and therefore the need for the study.

## **1.2 Research Problem**

Throughout literature, attention has been direct at existence of an ideal capital structure and as well as if the use of debt is relevant to the share return (Shahar, et al, 2015). From theoretical perspective, Market timing theory by Baker and Wurgler (2002) states that high leverage firms raise funds when they have low market valuation and a low leverage firm raises funds when they have high market valuations. On the other hand, Modigliani and

Miller (1958) argue that financial leverage has no effect on firm performance neither on share returns. As per the trade-off theory, an optimal structure of capital is derived a tough balancing of the costs that are related to debt financing and tax advantage benefit for use of debt finance. Therefore the effect of financial leverage on share return remains a theoretical concern to date.

The financing decision influences the shareholders return. Consequently, financial leverage choices may affect the profitability of the firm and therefore its overall share returns. Cases concerning financial distress on firms have been increasing both in developing and developed countries mostly caused by high debt to equity ratio. In recent times, the Kenyan economy has witnessed numerous cases of failure among globally reputed firms (Atosh, 2017). These non-financial firms were regarded as icons of corporate financial stability and their collapse came with tremendous surprise to researchers and analysts alike. A number of non-listed firms at the NSE such as Kenya Airways, Uchumi Supermarkets Limited, Mumias Sugar Limited, and Express Kenya Limited etc. have gone through cycles of financial distress in the recent past arising from high financial leverage and other factors such as poor corporate governance (NSE, 2017). These developments coupled with the lack of universal theory triggered the need for further research on effect of financial leverage on share returns of non-financial firms listed at NSE.

Globally, Barakat (2014) researched on effects of financial leverage and profitability of listed industrial firms in Saudi and found a statistically significant relation between return on equity and capital structure and stock market price. Hasanzadeh et al. (2013) did a study on the effects of Leverage on Future stocks in the Tehran stock exchange and found that

leverage does not affect future stock price of the firm. Cai and Zhang (2011) did a study in the United States stock market and observed that the change in leverage ratio affect negatively on the stock price. Hussain and Gull (2011) did a study on effect of capital structure on stock price of firms listed in Pakistan and the findings indicated a negative relationship between capital structure and stock price.

Locally, Otieno (2017) found that inflation rate, exchange rates and interest rates have positive impact on share returns of firms listed on NSE. Ochieng (2017) found that there is no correlation between size of the bank, liquidity and financial leverage. Tangut (2017) found that stock returns were affected negatively by leverage and this was an indication that shareholders of highly geared firms may not receive optimal compensation. Murikwa (2017) found that ROA was negatively related to leverage but positively related size and credit risk management of commercial banks in Kenya. Mohamed (2015) found that financial leverage had a significant negative relationship with financial performance and firm size had positive and insignificant relationship with financial performance and liquidity had a significant positive relationship with financial performance of non-financial firms listed at the Nairobi Security Exchange.

Previous empirical studies on leverage and stock returns have presented somewhat conflicting results, others agreeing some disagreeing with important theories of capital structure. The contradictory results justify further research. Also most of studies done in Kenya have focused on relationship between financial leverage and financial performance, making it impossible to give a convincing outcome and henceforth the need to do this study. Therefore this study sought to add knowledge on the topic of the study and attempts

to give an explanation to the question, what is the effect of financial leverage on stock returns of non-financial firms listed at the NSE?

### **1.3 Research Objective**

The main objective of the study was to ascertain the effect of financial leverage on share return of non-financial firms listed at NSE.

### **1.4 Value of the Study**

Findings of the study are of benefit to policy makers through developing policies that ensure that firms maintain and implement an optimal structure that is less susceptible to financial risks. This enables firms to exploit cheaper and reliable sources of finances to enhance profitability. This could be achieved by identifying specific industry-based debt thresholds that would ensure that firms are not unnecessarily exposed to risk of financial failure that results to erosion of investors' wealth.

The findings also benefits other industry practitioners involved in making financing decisions by affording them a vital reference point on the need by corporations to determine and maintain optimal financing framework necessary to improve financial performance. This not only maximizes the shareholders, wealth but also boost investor confidence in the Nairobi Securities Exchange.

Scholars and academicians in the finance discipline can also benefit from study recommendations and conduct future studies to broaden the knowledge on financial leverage. Furthermore, they can consider the methods and results of this research and possibly extend it in various directions. The study adds to the present information on

financial leverage and share return in the Kenyan context. A developed conceptual framework has been tested to establish its applicability to the firms listed at NSE.

## **CHAPTER TWO: LITERATURE REVIEW**

### **2.1 Introduction**

The chapter identifies the relevant literature relating to effects of financial leverage and share return. It presents the theoretical literature review and the determinants of financial distress and firm performance. Empirical literature from international and local studies, conceptual framework and summary based on the review is also discussed.

### **2.2 Theoretical Literature Review**

This presents a review of the relevant theories that explains the associations between various determinants of financial distress. This study is anchored by the following theories; Pecking Order Theory, Modigliani and Miller Theory and Trade-off Theory.

#### **2.2.1 Modigliani and Miller (MM) Irrelevance Hypothesis**

MM (1958) expressing their disagreement to the traditional view, argued that an ideal market void of transaction and taxes costs, a firm's cost of capital and its market capitalization is insensitive to the changes in the capital structure of the firm. MM proposes that the way the assets are financed is of no consequence to the firm's value which according to them is hinged on the risk and earnings of its assets. They expound that use of cheaper debt would increase investors risk exposure who would consequently require higher premium as compensation (Mule & Mukras, 2015).

The hypothesis suffers major shortcoming by its assumption of an ideal stock market. Myers (2001) points to one of the MM theory major flaws. He argues, as regards debt tax benefits, there is a general agreement that a compelling incentive exists for corporations to borrow debt. Under the MM environment, there should be evidence that corporations are

borrowing aggressively to take advantage of the tax shield benefit. Ultimately no organization would be paying taxes. This is however not the case in real life. He attributes the deviation from the MM hypothesis to costs associated with aggressive borrowing and which leads to existence of a tradeoff model of capital structure (Pandey, 2009). Therefore, the theory suggests that under perfect a market, the share value of a firm is never affected by equity or debt that a corporation uses. This research intends to establish the validity of this theory in the Kenyan context.

### **2.2.2 Pecking Order Theory**

Pecking-order theory was developed by Myers and Majluf (1984) considers internal finance as the cheapest source of finance, then debt and finally external equity. They consider retained earnings as having no floatation costs and therefore, require no additional disclosure of financial information. Based on asymmetric information, the theory highlights issuing securities to raise external capital signals out a lower profitability to investors than what they had expected. Being rational in their decisions, investors adjust the discount rate for the firm upward since they now require a higher return on their investment. The theory assumes managers will be obliged to act in the best interest of the investors since they know more about the company future growth opportunities (Kishore, 2009). Also, it is assumed information asymmetry exists between them. This case may not be realistic in practice as it also ignores the problems that may occur when a firm's managers get more comfortable with the companies financials and become indisciplined.

Managers hence choose to finance investments by deploying retained earnings or and with debt to avoid making this type of distorted resolutions. These choices are influenced by the fact that information asymmetry problem does not exist for retained earnings and is



minimal for debt with insignificant risk (Fama & French, 2000). This theory indicates that the key considerations made by managers in making their financing choices are debt costs, flexibility, and ease of availability. Unlike in the tradeoff theory, for pecking order, managers do not have a target capital structure which they seek to attain over time as a way to maximize their returns. Following a systematic order, the theory postulates that managers will finance their investment using retained earnings, debt and lastly new equity. Within an industry, for a firm's debt and its share return, pecking order hypothesis is credited with explanation power for the negative relationship between them (Fama & French, 2000).

### **2.2.3 Trade-off Theory**

The theory was developed by Myers (1984). According to trade-off theory firms usually choose the amount of debt finance or equity finance to use by looking at advantages and disadvantages of both debt and equity. According to Kraus and Litzenberger (1973) trade-off theory is applied in a situation where the firm works towards striking a balance between taking advantage of tax shield on interest expense arising from debt financing and the actual cost of the debt. An ideal capital structure is assumed to be dictated by a tradeoff between the benefits and costs of employing debt. Debt is perceived to bear interest tax shields but also increase risk and cost of bankruptcy. In tradeoff theory, the entity is depicted as matching the value of these gains and losses (Baker & Martin 2011).

Myers (1984) finds a flaw with the theory and points out that many high profit making firms with excellent credit rating have been observed to operate at leverage that are low for years despite the theories prediction that such firm will not overlook the benefit of debt when the prospects of financial distress were minor. He points out that consistently, the

greater number of high profit making firms were found to have the least leverage. This gives rise to alternative pecking order theory. It is generally agreed that bankruptcy costs on their own are too minor to offset the value of tax shields (Ju, Parrino, Poteshman, & Weisbach 2005). This theory is relevant to this study given that non-financial listed firms in Kenya performing poorly have high leverage compared to those with low debts performing better.

### **2.3 Determinants of Share Return**

Share return is a factor of capital gains and dividends declared. When the market value of a share or its share price rises, the appreciation is a form of return known as capital gains. On the other hand dividend declared is that proposition of profit allocated to shareholders of the company. The combination of capital gain and dividend generate the share return. Some of the factors that affect share return include; financial leverage, financial performance, firm size and liquidity (Funke & Matsuda, 2006).

#### **2.3.1 Financial Leverage**

Leverage of the firm is among the key determinants of the decision made by management and they influence the shareholders return on equity, risk of the shareholders and shareholder market value of their stocks. During decision making on how the firm will raise investment funds decision are made (Salawu, 2007). This call for the management of firm to make appropriate decision on the company's leverage through properly analyzing and balancing all factors that are relevant to the company's capital structure decision.

### **2.3.2 Financial Performance**

According to Dehuan and Jin (2008), firms' performance affects share returns at the stock exchange. In a study to investigate association between company performance (Yield on Equity, return on asset, profit margin, earning per share, changes in sales, as well as total asset turnover and stock revenues of the top accomplishing stocks registered on Shanghai stock exchange, Dehuan and Jin (2008) discovered that each of the variables is expressively linked with prices of the shares in the year prior to the disaster. But, in the crisis period the company performance have no descriptive authority toward share price program.

### **2.3.3 Firm Size**

Empirical evidence supports the existence of negative association between the expenses of liquidation as a component of the estimation of the firm value. Large organizations are more expanded and hence they suffer low cost in association to bankruptcy (Titman and Wessels, 1988). As per trade-off theory large organizations which use a lot of debt experience low cost in association to bankruptcy. Rajan and Zingales (1995) established that capital structure is positively related to size of the company as seen by survey of all the G-7 countries, with exception of Germany, which exhibited a negative association. Okiro, Aduda & Omoro (2015) from this study revealed that firm size was positively associated with capital structure , however this association did not hold when short term debt only were considered.

### **2.3.4 Liquidity**

Liquidity implies the easiness with which funds are available to be employed in carrying

out firms' operations. It is also a degree of a firm's capability of meeting its commitments when they are outstanding. Liquidity indicates a firm's readiness to settle both expected and unexpected demands of cash at any time (Gamlath & Rathiranee, 2013). Thus, firms ought to be liquid to maintain its operations and remain in existence for the longest time possible. It must always be ready to meet its debts at any given juncture. Therefore, for a firm to remain liquid, efficient working capital management strategies must be applied. Cash and cash equivalents are divided by the current liabilities to measure liquidity. Therefore, liquidity ratios compare the current assets to the current liabilities of a business. Focus is placed on liquidity to determine a firm's effectiveness in meeting its bills (Nireesh, 2012).

## **2.4 Empirical Review**

Share returns are great issue for many investors in developing and developed nations and therefore, this matter has attracted the attention of researcher in the recent past. Several empirical studies on factors that affect share returns have recently emerged, but these studies have outlined mixed results. This section covers various studies conducted both globally and locally.

Barakat (2014) researched on effects of financial leverage and profitability of listed industrial firms in Saudi. A sample of 46 companies was selected from listed industrial firms. The study used descriptive research design and information collected was analyzed using multiple regression analysis. The findings were that there was a positive relationship of capital structure on return on equity while the relationship of financial leverage and stock value was negative.

Hussain and Gull (2011) did a study on effect of capital structure on stock price of cement firms listed in Pakistan. A sample of 11 cement listed firms in Karachi Stock Exchange was taken. Stock price was the responsive variable while; interest coverage ratio and debt to equity ratio were the predictor variables. Descriptive research design was used and data was analyzed using regression analysis. The study concluded that the relationship between capital structure and stock prices was negative.

Hasanzadeh et al. (2013) did a study on the effects of Leverage on Future stocks in the Tehran stock exchange. The analysis was done from 2005 to 2008 and took book value ratio as a variable to analyze data and test hypothesis. Findings showed that leverage doesn't affect future stock price of the firm. And that lack of the relationship between the variables approves the Modigliani and Miller Theorem.

Cai and Zhang (2011) did a study in the United States stock market and observed that the change in leverage ratio affect negatively on the stock price. The study suggested that the change in leverage gives market participants signals concerning the value of the stock. Stock returns calculated on a monthly basis data obtained from CRSP were used in the sample that spanned from 1975 to 2002. All financial firms were not included in the study.

Ochieng (2017) did a research study on the relationship between firm size and financial leverage of commercial banks in Kenya. Descriptive research design was used for the study. Target population involved a survey of all the Kenyan commercial banks. Secondary data was derived from CBK annual reports for duration of five years from 2012 to 2016. Secondary data was used and analysed using SPSS through, inferential statistics and descriptive statistics. The study found no correlation between sizes of the bank, profitability, liquidity, equity structure with financial leverage. The research recommended

that commercial banks should use their long-term debt efficiently to boost the bank's profitability and overall financial performance.

Otieno (2017) researched on macroeconomic determinants of stock market returns in Kenya. The study used secondary data from NSE, CBK and KNBS. The study used Auto-Regressive Fractionally Integrated Moving Average and Auto-Regressive Distributed Lag Cointegration tests for data analysis. The study found that macroeconomic variables were jointly cointegrated to stock market returns and also positively related to stock returns in the long-run. This research creates a conceptual knowledge gap because it only focused on macroeconomic factors.

Murikwa (2017) conducted a research study on relationship between financial leverage and financial performance among banking sector in Kenya. Descriptive research design methodology was used covering a 10 years period, 2007- 2016. Secondary data on the 11 listed commercial banks at the NSE was collected and analysed using a multiple regression, correlation analysis and descriptive statistics. The independent variables were degree of financial leverage (DFL), non-performing loans ratio (NPLR), and bank size while ROA was the dependent variable. The finding of the study showed the existence of a negative relationship between ROA and leverage and a positive relationship between ROA and credit risk management with bank size. Thus the study recommends that commercial banks should maintain leverage levels at a minimum and increase size so as to maximize performance. The study found a presence of a negative significant effect between share return and capital structure.

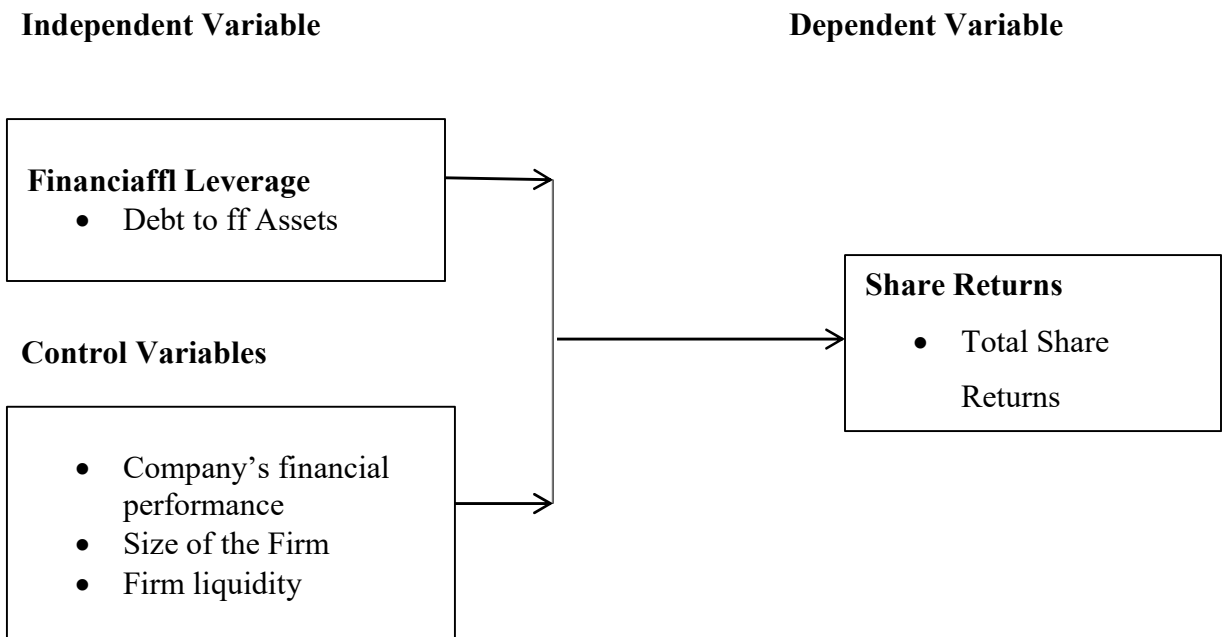
Tangut (2017) investigated on the impact of financial leverage on stock returns of non-listed firms listed on NSE. The research study used both primary and secondary data.

Exploratory research design methodology was used covering a 16 years period, 2002-2016. Both independent and dependent variable data collected was tested using unit root test, multicollinearity, normality and Housman test, analyzed on a multiple regression, correlation analysis and descriptive statistics on SPSS. The study concluded that financial leverage has a negative significant effect on share returns of a firm.

Mohamed (2015) did a study to evaluate the effect of financial leverage on financial performance of non-financial firms listed at the Nairobi Securities Exchange. This study used a quantitative research design. The population of the study was made up of the 48 non-financial firm listed at Nairobi Security Exchange. The study employed secondary data that was from the annual audited financial reports, which had audited and published by the non-financial firms listed at Nairobi Security Exchange for a period of 5 years between 2011 and 2015. This study employed a correlation analysis and a multiple linear regression method in analyzing the collected data. The study found that financial leverage had a significant negative relation with financial performance while firm size had positive and insignificant relationship with financial performance and liquidity had a significant positive relationship with financial performance of non-financial firms listed at the NSE. This study concluded that financial leverage has an adverse effect on financial performance whereas the size of the firm improves the financial performance and liquidity improves (increases) financial performance of the listed non-financial firms. The study recommended that management of the non-financial firms at the Nairobi Security Exchange should employ minimal debt level or use an optimal debt level and work on developing their firms to be able to enjoy the economies of scale like large firms, They need good management and improve their financial performance.

## 2.5 Conceptual Framework

Conceptual framework explains the relationship between independent and dependent variables of the study. This research seeks to establish effect of financial leverage, financial performance, firms size and firm liquidity (independent variables) on share return (dependent variables).



**Figure 2 1: Conceptual Framework**

**Source: Researcher, 2018**

## 2.6 Summary of Literature Review

From the above literature, studies have been carried out in relation to financial leverage and size on stock returns both in the local and global setting. A number of researches have been done with different scholars getting mixed findings and sometime contradictory. Many of them document negative relation between the level of leverage and stock price. Although some of the literature produces opposite results, getting positive relationships between stock returns and leverage. Although the findings of all the studies undertaken in



Kenya so far indicate negative responses to stock splits, the studies done in the Kenyan market are quite few to give a conclusive result. As such it is important that this relationship be explored further to establish if there exists a relation between the two variables in Kenyan non-financial firms listed at the NSE. Financial firms will be excluded in the analysis because they are considered highly regulated and their leverage level is heavily influenced by the regulation.

## **CHAPTER THREE: RESEARCH METHODOLOGY**

### **3.1 Introduction**

The chapter establishes the methods used during these study to realize the set objective. It starts with research design, a description of the population size, sample design, data collection, and analytical model.

### **3.2 Research Design**

Research design can be defined as an outline of the actual measures, adopted by an investigator for testing the correlation involving dependent variables as well as independent variables (Kothari, 2008). Descriptive research design was adopted by the study. A descriptive research design is appropriate because it helps answer the questions of the form "what". The study questions can well be answered if the research design applied guides the analysis method that aimed to establish the effect of financial leverage on share return among listed non-financial firms at NSE.

### **3.3 Population**

Population is the total set of data points observed and measured (Maxwell 2012). The population of interest consisted of 40 non-financial firms registered at the NSE. Census study was adopted to enable focus on all 40 listed firms under the following segments in the NSE sector categorization; Automobile, Commercials and Services, Energy and Petroleum and Manufacturing and Allied, Construction and Allied, Agricultural sector and Telecommunication.

### **3.4 Data Collection**

The research used secondary data. Secondary data was obtained using financial statements, annual reports, as well as websites of firms studied. The data collected was quantitative in nature. The data on independent variables (total debt, shareholders equity, total assets and net income) was obtained from financial statements for period of our study. Share return data (dependent variable) was obtained from daily price list at NSE. Financial information of a five-year period between 2013 and 2017 was used since it is considered current and long enough to provide sufficient data for analysis.

### **3.5 Diagnostic Test**

Various diagnostic tests such as tests for multicollinearity, normality and autocorrelation were used. Multicollinearity test is said to occur when there is nearly exact or exact linear relation among two or more of independent variables. This can be tested by determinants of the correlation matrices, which varies from zero to one. Orthogonal independent variable is an indication that the determinant is one while it is zero it there is a complete linear dependence between them and as it approaches to zero then multicollinearity becomes more intense. The variance of inflation was used to test multicollinearity. Normality is the test for assumption that the residual of the response variable are normally distributed around the mean and was determined by Shapiro-wilk test. Autocorrelation is the measure of the similarity between a certain time series and lagged value of the same time series over successive time intervals. It is tested using Durbin-Watson statistics.

### 3.6 Data Analysis

The use of statistical measures and logical methods to evaluate and establish a relationship in the data (Tully, 2014). Data collected was analyzed through use of Microsoft Excel (MS Excel) and Statistical Software for Social Scientists (SPSS) Version 21. SPSS and MS Excel are preferred as they produced output that found adequate statistical inference and generally easy to use. The output of the data analysis was reported in various tables highlighting the relevant statistics.

#### 3.6.1 Analytical Model

The study used a multiple regression in carrying out analysis to find out the outcome between the responsive variable and predictors variables. A responsive variable is the share return of while the predictor variables are (financial leverage, financial performance, firm size and dividend payout).

$$Y_t = \alpha + \beta_1 X_1 + \beta_2 X_2 + \beta_3 X_3 + \beta_4 X_4 + \epsilon$$

Where;

$Y_t$  = Share Returns - Measured using;

$$Y_t = \frac{(P_t - P_{t-1}) + D_1}{P_{t-1}}$$

Where;

$P_t$  - price of the share  $i$  on day  $t$  (end of year)

$P_{t-1}$  price of share  $i$  on day  $t-1$  (start of the year)

$D_1$  =dividend per share at year end

$X_1$ = Financial Leverage; measured by (Debt/Equity r)

$X_2$ = Financial Performance; measured by Return on Asset ratio (N.I/ T.A)

$X_3$ = Size of the firm; measured by natural Asset log

$X_4$ = Firm Liquidity; measured by (Current Assets/ Current Liabilities).

$\alpha$  = Constant; y intercept that is, the value of y when x is equal to zero

$\beta$  = Coefficients of the model

$\epsilon$  = Error term

### **3.6.2 Test of Significance**

Test for joint significance of all coefficients was done using the F-test while the test for individual coefficient was done using the T-test. The significance of the regression model was ascertained at 5% and 95% confidence level interval.

## CHAPTER FOUR: DATA ANALYSIS, FINDINGS AND INTERPRETATION

### 4.1 Introduction

The section represents study's findings established on the objectives of research. This chapter focused on collected data analysis from companies' annual reports to measure the effect of financial leverage on share return of non-financial firms quoted at the NSE. By using descriptive statistics, correlation analysis and regression analysis, the results of the study were presented in form of tables for easy interpretation.

### 4.2 Diagnostic Tests

#### 4.2.1 Multicollinearity Test

The researcher carried out diagnostic tests on the collected data. The test of Multicollinearity was done and tolerance of the variable and the VIF value were used.

**Table 4.1: Multicollinearity Test**

Coefficients			
Model		Collinearity Statistics	
		Tolerance	VIF
1	Financial Leverage	.897	1.114
	Financial Performance	.952	1.051
	Firm Size	.922	1.084
	Liquidity	.836	1.196
a. Dependent Variable: Share Return			

**Source: Research Findings (2018).**

The report indicates, all the variables had a tolerance values  $>0.2$  and VIF values below 10 which is an indication of absence of Multicollinearity.

### 4.2.2 Normality Test

Shapiro-walk test and Kolmogorov-Smirnov test was used in normality test. The null hypothesis for the test was, secondary data wasn't normal. If the p-value recorded was more than 0.05, the researcher would reject it. The test findings are as illustrated in table 4.2.

**Table 4.2: Normality Test**

Tests of Normality						
	Kolmogorov-Smirnov			Shapiro-Wilk		
	Statistic	df	Sig.	Statistic	df	Sig.
Share Return	.086	195	.200*	.950	195	.102
Financial Leverage	.103	195	.200*	.853	195	.242
Financial Performance	.189	195	.300	.870	195	.324
Firm Size	.089	195	.200*	.966	195	.074
Liquidity	.218	195	.423	.727	195	.542
1. Lilliefors Significance Correction						

**Source: Research Findings (2018)**

Kolmogorov--Smirnova and Shapiro-Wilk tests recorded o-values greater than 0.05 meaning the data points were normally distributed and so the null hypothesis rejected. The data was adequate enough for use to conduct parametric tests like Pearson's correlation, regression analysis and analysis of variance.

### 4.2.3 Autocorrelation Test

**Table 4 3: Autocorrelation Test**

Summary of the Model	
Model	Durbin-Watson
i	1.629 <sup>a</sup>
a. Predictors: (Constant), Liquidity, Financial Performance, Firm Size, Financial Leverage	

**Source: Research Findings (2018)**

A durbin-watson statistic of 1.629 indicated residual variable not being serially correlated as they were as per the acceptable range of between 1.5 and 2.5.

### **4.3 Descriptive Analysis**

This gives a presentation of the mean, maximum and minimum values of variables applied together with their standard deviations in this study. Table 4.4 below indicates the descriptive statistics for the variables applied in research. An analysis of the variables was obtained by use of SPSS software for the term of five years (2013 to 2017) on an annual basis. Share return had 0.0573 as mean with a 0.0226 standard deviation. Financial leverage had a 0.2580 mean average and 0.2227 standard deviation. Financial performance resulted to 0.0554 mean with a 0.1461 standard deviation. Firm size had a mean of 5.938 and a standard deviation of 0.7366 while liquidity recorded a 2.155082 mean with a 2.154 standard deviation.

**Table 4.4: Descriptive Statistics**

	N	Minimum	Maximum	Mean	Std. Deviation
Share Return	195	.0176	.0951	.057289	.0225835
Financial Leverage	195	.0000	1.6354	.258029	.2226863
Financial Performance	195	-.6137	.5195	.055403	.1461040
Firm Size	195	4.4691	7.4359	5.938811	.7366034
Liquidity	195	.0827	12.6315	2.155082	2.1544397
Valid N (listwise)	195				

**Source: Research Findings (2018)**



#### 4.4 Correlation Analysis

Correlation analysis test whether there is a relations that exists in both variables and ranges between (-1) big negative correlation and (+1) perfect positive correlation. The use of Pearson correlation to check the level of the share return of non-financial firms quoted at NSE and the independent variables for this study (financial leverage, financial performance, firm size and liquidity).

**Table 4 5: Correlation Analysis**

		Share Return	Financial Leverage	Financial Performance	Firm Size	Liquidity
Share Return	Pearson Correlation	1				
	Sig. (2-tailed)					
Financial Leverage	Pearson Correlation	-.140	1			
	Sig. (2-tailed)	.051				
Financial Performance	Pearson Correlation	.086	-.070	1		
	Sig. (2-tailed)	.231	.333			
Firm Size	Pearson Correlation	.363**	-.171*	-.047	1	
	Sig. (2-tailed)	.000	.017	.514		
Liquidity	Pearson Correlation	.125	-.303**	.196**	.240**	1
	Sig. (2-tailed)	.082	.000	.006	.001	

**Source: Research Findings (2018)**

Correlation analysis established there was a negative correlation between financial leverage and share return ( $r = -.140$ ,  $p = .051$ ). The correlation between share returns and financial performance ( $r = .086$ ,  $p = .231$ ) and share returns and size of the firm ( $r = .363$ ,  $p = .000$ ) was positive. Liquidity also produced a positive correlation with share return ( $r$

= .125, p = .082). However, only the correlation between share returns and size of the firm was statistically significant.

## 4.5 Regression Analysis

Share return of non-financial firms listed at the Nairobi Security Exchange was regressed against four predictor variables; financial leverage, financial performance, firm size and liquidity. The analysis was executed at 5% significance level. It obtained a model summary statistics.

### 4.5.1 Model Summary

**Table 4 6: Model Summary**

<b>Models Summary</b>				
Model	R	R Square	Adjusted R Square	Std. Error of the Estimate
1	.450 <sup>a</sup>	.202	.185	.0203829
a. Predictors: (Constant), Liquidity, Financial Performance, Firm Size, Financial Leverage				

**Source: Research Findings (2018)**

R squared is the coefficient of determination and depicts a variations in response variable that is brought about by the variation of predictor variables. The outcome in table 4.5 as shown, the value of R square was 0.202, a discovery of 20.2 percent deviations in share return of non-financial firms quoted at the NSE are caused by changes in financial leverage, financial performance, firm size and firm liquidity of the firms. Other variables excluded in the model justify for 79.8 percent of the variations in share return of non-financial firms quoted at the Nairobi Security Exchange. Also, It revealed that there exists a moderate

relationship among the selected independent variables and the share return as shown by the correlation coefficient (R) equal to 0.450.

#### 4.5.2 Analysis of Variance.

**Table 4 7: Analysis of Variance.**

ANOVA						
Model		Sum of Squares	df	Mean Square	F	Sig.
1	Regression	.020	4	.005	12.038	.000 <sup>b</sup>
	Residual	.079	190	.000		
	Total	.099	194			

i. Dependent Variable: Share Return

ii. Predictors: (Constant), Liquidity, Financial Performance, Firm Size, Financial Leverage

The significance value is 0.000 that is less than  $p=0.05$ . This means the model was statistically significant in predicting how financial leverage, financial performance, firm size and liquidity affects share return of non-financial firms listed at the Nairobi Security Exchange.

#### 4.5.3 Coefficients of Determination

**Table 4 8: Model Coefficients**

Coefficients						
Model		Un-standardized Coefficients		Standardized Coefficients	t	Sig .
		B	Std. Error	Beta		
1	Constant	-.021	.013		-1.685	.094
	Financial Leverage	-.016	.007	-.159	-2.319	.021
	Financial Performance	.003	.010	.020	.306	.760
	Firm Size	.013	.002	.431	6.387	.000
	Liquidity	.002	.001	.176	2.488	.014

a. Dependent Variable: Share Return

**Source: Research Findings (2018)**

The used of a t-test to determine the significance of each individual variable used in this study as a predictor of financial performance of manufacturing, commercial and service firms listed at the Nairobi Security Exchange. The p-value used as an indicator of the significance of the association between the dependent and the independent variables. At 95% level of confidence, a p-value of less than 0.05 interpreted as a statistical significance measure. As such, a p-value above 0.05 shows that a statistically insignificant association of the dependent and the independent variables. From the findings, it is evident that firm size produced positive and statistically significant values for the study (high t-value (6.387),  $p < 0.00$ ). Financial performance and firm liquidity produced positive but statistically insignificant values for this study as shown by p values that are more than 5%. Financial leverage produced negative and significant values for this study as shown by a p value  $0.021 < 0.05$ .

The estimated Regression equation was

$$Y = -0.021 - 0.016X_1 + 0.003X_2 + 0.013X_3 + 0.002X_4$$

Where,

Y = Share Return

$X_1$  = Financial Leverage

$X_2$  = Financial Performance

$X_3$  = Firm Size

$X_4$  = Firm Liquidity

## 4.6 Discussion of Research Findings

The main objective of “the study was to find out the effect of financial leverage on share returns of non-financial firms listed in Kenya. The independent variables considered in the study included financial leverage, financial performance, size of the firm and firm liquidity. The study established that there was a relationship ( $R= 0.450$ ) share returns and the independent variables (financial leverage, financial performance, size of the firm and firm liquidity). The study also established that the variables chosen explain 20.2% of the total variance in the share price margin of the non-financial firms listed at the Nairobi Security Exchange .

Pearson correlation coefficients between these variables revealed that was a negative correlation between financial leverage and share return of listed non-financial firms in Kenya. The correlation between share returns and financial performance was positive. Liquidity also produced a positive correlation with share return non-financial firms listed in Kenya. However, only the correlation between share returns and size of the firm was statistically significant.

The study findings are agreement with Cai and Zhang (2011) who did a study in the United States stock market and observed that the change in leverage ratio affect negatively on the stock price. Hussain and Gull (2011) studied on effect of capital structure on stock price of corporation listed in Pakistan and findings indicated a negative relation on capital structure and the price of stock . Tangut (2017) found t stock returns were affected negatively by leverage and this was an indication that shareholders of highly geared firms may not receive optimal compensation

The study finding contrast those of Barakat (2014) researched on effects of financial leverage and profitability of listed industrial company in Saudi and found a statistically significant relation between return on equity and capital structure and stock market price. Hasanzadeh et al. (2013) did a study on the effects of Leverage on Future stocks on the Tehran stock exchange and the outcome was leverage doesn't affect future stock value of firms.

## **CHAPTER FIVE: SUMMARY, CONCLUSION AND RECOMMENDATIONS**

### **5.1 Introduction**

This section summarizes the previous chapter's findings, conclusion and study limitations. The section also elucidates the policy recommendations that policy makers can implement to achieve the expected share return of non-financial firms listed at the Nairobi Security Exchange. In conclusion, the chapter indicates ideas for future research studies, that will be useful to scholars.

### **5.2 Summary of Findings**

Main objective of the “study was to establish determinants of share returns of the listed commercial firms in Kenya. The study period was five years (2013-2017). The data analysis used both descriptive statistics (average and standard deviations) and inferential statistics (correlation and regression) with the use of Statistical Package for Social Sciences (SPSS). Both Kolmogorov-Smirnov and Shapiro-Wilk tests recorded p-values that were more than 0.05. The implication of this was that the study used secondary data that was sourced from a normally distributed population. The data could therefore be used to carry out inferential analysis such as regression and Pearson correlation. Multicollinearity tests recorded VIF values of less than 10 implying that there was no multicollinearity among the independent variables.

From the model summary R-square amount was 0.202 meaning the predictor variables used explains 20.2% of changes in the dependent variable. It implies presence of factors

excluded in the model of around 79.8% of changes in share return of non-financial company quoted at Nairobi Security Exchange. At 95% confidence level and F value of 12.038. A multiple regression model was statistically significant and good in explaining ways that share return of non-financial Corporation listed at the NSE will be influenced by the selected independent variables.

Results indicate that when all the independent variables used for the study have zero digit, share return of non-financial Corporation quoted at the NSE will be -0.021. It is also noted that a unit increase in financial leverage would result to a reduction in share return of 0.016. A one (Unit) addition in financial performance would lead to an increase in share return of the firms quoted at the Nairobi Security Exchange by 0.003 while a unit rise in firm size and firm liquidity result to an increase in share return of non-financial firms at the NSE by 0.013 and 0.002 respectively.

### **5.3 Conclusion**

As per the findings, it can be concluded that share return of non-financial firms quoted at NSE is affected significantly included financial leverage, financial performance, size of the corporation and firm liquidity. Financial leverage have a negative and statistically significant relation with share return of non-financial firms listed at the NSE and this implies an increase in leverage result to a decrease in share return to a big extent. The study found out financial performance had a positive but insignificant effect on non-financial firms' share return. The study therefore concludes that financial performance leads to a rise in share price of non-financial company listed at the Nairobi Security Exchange but not to a significant extent.



The liquidity had a positive and significant impact on share return of non-financial corporation quoted at the Nairobi Security Exchange and deduced that higher levels of liquidity increases the share return. Firm size had a positive and statistically significant effect on share return of non-financial corporation quoted at the NSE and therefore this concludes, the size of the firm does significantly influence share return.

This study affirms that independent variables chosen for the study financial leverage, financial performance, size of the firm and firm liquidity affect share return of non-financial firms quoted at the Nairobi Security Exchange. It can therefore, be affirmed that these variables significantly affect share return as indicated by the p value of ANOVA summary. Since the four independent variables explain 20.2% of changes in share return of non-financial corporation listed at the N. Security Exchange implies the variables not added in the model explain 79.8% of variables in share return.

#### **5.4 Recommendations**

Financial leverage was found to have a significant negative effect on share return of non-financial corporation listed at the NSE. The research therefore recommends that when firms are setting their debt financing they should strike a balance in the case of the tax savings benefit of debt and costs of bankruptcy linked with borrowing. High levels of leverage has been found to reduce share return of listed non-financial firms from the findings of this study and so firm managers should maintain debt in levels that do not affect negatively on share return to ensure the goal of maximizing shareholders' wealth is attained.

The study found out that a positive and significant relationship exists between share return and liquidity position. This study recommends that a comprehensive assessment of listed

non-financial firm's immediate liquidity position should be undertaken to ensure the company is operating at sufficient levels of liquidity that will lead to improved share return of firms. This is because a firm's liquidity position is of high importance since it influences the firm's current operations.

## **5.5 Limitations of the Study**

The five years period was examined 2013-2017. The results may fail to hold for a longer study period as it has not been determined. It is uncertain if similar findings would result beyond 2017.

Another limitations was the quality of the data. The Legitimacy of the situation can't be ascertained and this affects the derivation of the conclusion from the study. The data used is only assumed to be accurate. Deviation from one period to another can be caused by prevailing condition and this may affect measures used to check effects affecting share profit of non-financial corporation quoted on the Nairobi Security Exchange.

For data analysis purposes, the researcher applied a multiple linear regression model. Due to the shortcomings involved when using regression models such as erroneous and misleading results when the variable values change, the researcher cannot be able to generalize the findings with certainty. If more and more data is added to the functional regression model, the hypothesized relationship between two or more variables may not hold.

## **5.6 Suggestions for Further Research**

The study was not exhaustive of independent variables affecting share return of non-financial firms quoted at the Nairobi Security Exchange thus recommending that further

studies be undertaken to incorporate other variables like efficiency in management, growth opportunities, industry practices, age of the firm, political stability and other macro-economic variables. Establishing the effect of each variable on stock return of non-financial corporation quoted at the NSE will enable policy makers know what tool to use when maximizing shareholder's wealth.

The study concentrated on the last five years since it was the most recent data available. Future studies may use a range of many years e.g. from 2000 to date and this can help to confirm or disapprove the findings of this study. The study limited itself by focusing on listed non-financial corporation at the Nairobi Security Exchange. The recommendations of this study are that further studies be conducted on all listed firms operating in Kenya. Finally, due to the shortcomings of regression models, other models such as the Vector Error Correction Model (VECM) can help to explain other relationships between the variables.

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**APPENDIX I: NON-FINANCIAL FIRMS LISTED AT NAIROBI  
SECURITIES EXCHANGE**

**A. COMMERCIAL AND SERVICES**

1. Atlas African Industries Ltd
2. Express Kenya Ltd
3. Hutchings Biemer Ltd
4. Kenya Airways Ltd
5. Longhorn Publishers Ltd
6. Nairobi Business Ventures Ltd
7. Nation Media Group Ltd
8. Standard Group Ltd
9. TPS Eastern Africa Ltd
10. Uchumi Supermarket Ltd
11. WPP Scangroup Ltd
12. Deacons (East Africa) PLC

**B. CONSTRUCTION & ALLIED**

13. ARM Cement Ltd
14. Bamburi Cement Ltd
15. Crown Paints Kenya Ltd
16. E.A.Cables Ltd
17. E.A.Portland Cement Co. Ltd

**C. AUTOMOBILES & ACCESSORIES**

18. Car & General (K) Ltd

**D. ENERGY & PETROLEUM**

19. KenGen Co. Ltd
20. KenolKobil Ltd
21. Kenya Power & Lighting Co Ltd
22. Total Kenya Ltd
23. Umeme Ltd

**E. MANUFACTURING & ALLIED**

24. Unga Group Ltd

25. B.O.C Kenya Ltd
26. British American Tobacco Kenya Ltd
27. Carbacid Investments Ltd
28. East African Breweries Ltd
29. Eveready East Africa Ltd
30. Mumias Sugar Ltd.
31. Flame Tree Group Holdings Ltd
32. Kenya Orchards Ltd

**F. TELECOMMUNICATION AND TECHNOLOGY**

33. Safaricom PLC

**G. AGRICULTURAL**

34. Eaagads Ltd
35. Kapchorua Tea Co. Ltd
36. Kakuzi Ord
37. Limuru Tea Co. Ltd
38. Rea Vipingo Plantations Ltd Ord
39. Sasini Ltd Ord 1.00
40. Williamson Tea Kenya Ltd Ord

## APPENDIX II: DATA

Y	X1	X2	X3	X4
0.07852	0.1305	0.0005	5.6817	0.6402
0.0843	0.2391	-0.1619	5.6794	0.5926
0.0754	0.4197	-0.136	5.6453	1.1256
0.07424	0.5295	-0.2554	5.5793	0.8521
0.0731	0.6876	-0.251	5.5562	0.5974
0.02306	0.1558	0.1094	6.5645	3.374
0.02554	0.1585	-0.0174	6.5863	2.5238
0.02628	0.1449	-0.0042	6.5742	2.205
0.0304	0.2519	-0.1982	6.5173	1.5805
0.04281	0.1996	0.0044	6.4727	1.5485
0.07831	0.5136	-0.064	5.0888	0.5234
0.07979	0.6127	-0.023	5.1663	0.4648
0.07745	0.8117	-0.1414	5.2602	0.5091
0.08092	0.898	-0.1685	5.1922	0.4073
0.08173	0.9563	-0.068	5.1657	0.3752
0.0387	0.4367	0.1371	5.8357	1.534
0.03245	0.4627	0.127	5.8736	1.4815
0.03276	0.4749	0.1314	5.8384	1.5002

0.01896	0.017	0.0707	6.2711	1.6456
0.0327	0.0166	0.072	6.2692	1.37
0.03525	0.3166	0.0226	4.6541	1.4812
0.01914	0.4264	0.0978	4.9003	1.9782
0.02632	0.5199	0.0245	5.0483	1.9839
0.0312	0.5674	0.0285	5.1915	2.7346
0.0296	0.5552	-0.2286	5.1575	2.9902
0.03389	0.0082	0.2209	5.0586	2.4279
0.03826	0.0057	0.2063	5.0772	2.3651
0.04073	0.003	0.175	5.1037	2.0954
0.04116	0	0.1385	5.0854	2.0727
0.04425	0	0.1153	5.0539	2.0176
0.06051	0.2494	0.0474	6.6194	1.1561
0.06365	0.2468	0.0512	6.613	1.2192
0.06087	0.3657	-0.0553	6.639	0.9547
0.05456	0.2948	0.0398	6.6439	1.1693
0.05797	0.29	-0.0608	6.6493	0.8473
0.08593	0.1092	0.0255	5.2078	0.8674
0.08603	0.1247	0.0154	5.2025	0.8038
0.0853	0.1629	-0.0188	5.1991	1.0404

0.08003	0.2206	0.0053	5.2249	1.635
0.08486	0.256	0.0037	5.2427	1.0788
0.06903	0.1387	0.064	6.7462	0.7049
0.07176	0.1314	0.0527	6.84	0.574
0.06812	0.2967	-0.6137	6.7462	0.3431
0.07405	0.2605	-0.4423	6.8071	0.2587
0.08888	0.1961	-0.336	6.6992	0.0827
0.01793	0.0277	0.0597	5.1053	2.4555
0.01777	0.0221	0.0427	5.1233	2.4602
0.0187	0.0143	0.034	5.0958	2.7554
0.0176	0	0.0314	5.1299	2.3779
0.0206	0	0.033	5.1386	2.2816
0.03452	0.1594	0.09	6.2973	3.3886
0.03917	0.1191	0.0313	6.2927	2.8984
0.03192	0.2634	0.0458	6.3955	2.9022
0.04039	0.2935	-0.1211	6.3583	1.6445
0.04315	0.1844	-0.5419	6.1911	0.9427
0.07694	0.5476	0.0457	5.4728	0.9451
0.07765	0.5646	0.0404	5.5679	0.4709
0.08504	0.4694	-0.0557	5.7155	0.3835

0.08377	0.2594	-0.0549	5.7081	0.5852
0.09128	0.3381	0.1536	5.6304	0.2166
0.06272	0.0144	0.0081	5.6336	2.6768
0.06208	0	0.0087	5.6127	2.2968
0.05686	0	0.0125	5.6236	2.3571
0.05352	0	0.0128	5.6115	2.6966
0.07039	0.0307	0.0035	5.674	1.7187
0.02641	0.1795	0.0726	4.4691	1.3816
0.0256	0.3076	0.0051	4.5858	1.1464
0.02744	0.2925	0.0068	4.657	1.1065
0.02525	0.2681	0.0261	4.7041	1.1635
0.02259	0.3096	0.038	4.7688	1.1905
0.04716	0.2832	0.0506	6.8351	1.3014
0.05124	0.3377	0.0373	6.897	1.1679
0.06487	0.373	0.0668	6.9235	0.9334
0.07046	0.4251	0.0602	6.8779	0.6717
0.06623	0.5502	0.0805	6.8475	0.5992
0.07767	0.3423	0.11	5.2077	1.0851
0.07885	0.2943	-0.0246	5.1964	0.9464
0.08634	0.2303	0.3097	5.3638	0.8385



0.0924	0.2042	0.1489	5.4447	0.4262
0.09288	0.2157	-0.0538	5.4371	0.3146
0.03931	0.2786	0.0428	4.8389	1.112
0.03835	0.3088	0.0323	4.9113	1.1994
0.04129	0.313	0.0034	4.9537	1.0562
0.04161	0.3615	0.0092	4.987	0.971
0.04881	0.3772	0.0073	4.9731	0.9951
0.08668	0.429	0.0277	6.2757	1.4219
0.08896	0.544	0.0113	6.3983	1.0966
0.09376	0.4281	0.0336	6.5347	0.9506
0.09403	0.3728	0.0184	6.565	1.2048
0.09214	0.3678	0.024	6.5766	1.4751
0.03108	0.5468	0.0199	5.449	0.9346
0.03524	0.439	0.0456	5.3787	0.9502
0.03868	0.2683	0.116	5.24	1.2374
0.02712	0.3044	0.0997	5.3838	1.2576
0.02461	0.3031	0.1023	5.382	1.4404
0.07952	0.3142	0.0187	6.2653	0.9705
0.07713	0.3337	0.0317	6.3442	1.0342
0.07574	0.41	0.0273	6.435	1.4488

0.08319	0.3828	0.0242	6.4735	0.9822
0.08089	0.371	0.0213	6.5336	0.8675
0.02488	0.0624	0.0328	5.6019	1.2788
0.03166	0.2256	0.0438	5.5124	1.4902
0.03146	0.1189	0.0472	5.5343	1.5252
0.02986	0.1051	0.0617	5.5585	1.647
0.03034	0.136	0.072	5.5799	1.7356
0.05451	0.1171	0.0941	6.9489	1.0651
0.05994	0.2425	0.0582	7.0835	1.0341
0.07654	0.2872	0.0596	7.2492	1.0141
0.07863	0.3376	0.0624	7.3475	0.871
0.08166	0.2993	0.0151	7.371	0.6027
0.02803	0.0201	0.0242	4.9089	1.8427
0.03166	0.0675	0.0344	4.9045	2.3321
0.03685	0.074	0.0462	4.9363	2.3685
0.03674	0.0506	0.0355	4.9638	2.2986
0.03573	0.0336	0.002	5.0115	1.6392
0.05399	0	0.077	6.4205	2.227
0.04857	0	0.0998	6.3618	2.139
0.04605	0	0.064	6.3657	2.0635

0.0458	0.2412	0.057	6.3454	2.2831
0.04588	0.277	0.0177	6.3481	1.9539
0.04864	0.0921	0.4371	5.2197	1.2562
0.05085	0.1058	0.4743	5.2613	1.2491
0.04872	0.1587	0.5195	5.2714	1.4512
0.05139	0.1614	0.4721	5.266	1.4132
0.05133	1.6354	0.385	5.2506	1.318
0.05953	0	0.2157	6.3433	10.0893
0.06129	0	0.1937	6.4037	6.2963
0.06245	0	0.1327	6.4726	4.5106
0.06144	0	0.1219	6.4888	7.0885
0.06952	0	0.1065	6.5194	6.8022
0.06779	0.5386	0.1172	5.7613	0.6988
0.06849	0.5822	0.1034	5.7984	0.7213
0.06157	0.5214	0.1374	5.814	1.0229
0.06718	0.4088	0.1469	5.8175	0.7707
0.0668	0.4242	0.1152	5.8239	1.0069
0.02738	0.2498	0.0479	5.974	1.5404
0.01792	0.4159	-0.1909	5.9685	1.3339
0.05811	0.2455	-0.1511	6.1251	0.8696

0.07538	0.4094	-0.1907	6.0346	0.4538
0.02521	0.0058	0.3458	5.888	2.6948
0.07412	0.2214	0.0609	7.4359	0.8396
0.08152	0.2436	0.1149	7.3722	0.4093
0.08753	0.3085	0.2276	7.3097	0.1865
0.0927	0.346	0.1775	7.4282	0.1807
0.09228	0.4822	0.2812	7.3819	0.1093
0.0212	0.2407	0.1702	5.9424	1.2061
0.02359	0.2023	0.1452	6.023	1.554
0.02058	0.175	0.1348	6.1227	1.641
0.02503	0.222	0.0953	6.1822	1.5305
0.03208	0.2516	0.0237	6.2255	1.2907
0.06769	0.7971	0.0342	4.8488	1.926
0.04174	1.1274	0.5032	4.7007	1.9709
0.05667	0.7294	0.3673	4.8961	2.0757
0.04737	0.6569	0.0422	4.9506	2.0214
0.04398	0.5965	0.0383	4.9747	1.9486
0.08077	0.0803	0.1361	6.1101	0.7921
0.07896	0.0937	0.171	6.129	0.7402
0.07924	0.0678	0.2031	6.1958	0.6245

0.08262	0	0.2394	6.2019	0.6517
0.08444	0.1023	0.2996	6.2087	0.4642
0.09054	0.124	0.1185	5.6986	1.3317
0.0926	0.1063	0.0935	5.6491	0.8699
0.08996	0.0681	0.0492	5.6334	0.8862
0.09494	0.0643	0.0627	5.8815	0.9822
0.08425	0.0658	0.0196	5.9651	5.1728
0.06039	0.1951	0.0865	6.3177	2.1166
0.06778	0.2212	0.0653	6.2854	5.1013
0.06721	0.2224	-0.0115	6.2974	5.6818
0.05824	0.1959	0.0495	6.3313	4.2586
0.06115	0.1906	-0.0255	6.3076	3.4628
0.06721	0.1866	0.0462	6.5527	7.9538
0.06791	0.1889	0.0435	6.5659	6.657
0.0608	0.1773	0.1261	6.6218	4.4438
0.05591	0.1724	0.121	6.6672	4.9176
0.05307	0.1574	0.1153	6.7101	3.9021
0.06162	0.2224	0.0852	5.5248	5.6485
0.09508	0.2189	0.001	5.5082	0.5649
0.04273	0.1951	0.0089	5.4557	5.8029

0.04328	0.191	-0.075	5.4053	5.1654
0.03697	0.1563	-0.0994	5.3475	3.5568
0.06279	0.1719	0.1582	6.4468	4.7171
0.05978	0.0357	0.1096	6.5056	5.8384
0.0522	0.028	0.3005	6.6885	11.781
0.04085	0.1449	0.394	6.6796	8.206
0.04416	0.1747	0.2063	6.6637	12.6315
0.0857	0.2143	0.0101	6.9569	7.1435
0.09166	0.1523	0.003	7.174	1.7027
0.08717	0.1258	0.0686	7.2053	3.8491
0.07703	0.0896	0.044	7.1175	6.4362
0.07738	0.0891	0.0257	7.1204	5.2342
0.06315	0.1959	0.1175	6.8624	3.8133
0.06692	0.1991	0.0277	6.9147	3.6804
0.06663	0.2009	0.0899	6.9158	8.5293
0.06215	0.1719	0.0541	6.9509	10.5557
0.06398	0.1676	0.0313	6.9224	4.4175

