RELATIONSHIP BETWEEN COST X-EFFICIENCY AND FINANCIAL PERFORMANCE OF COMPANIES LISTED AT THE NAIROBI SECURITIES EXCHANGE

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A RESEARCH PROJECT SUBMITTED IN PARTIAL FULFILLMENT OF I OR THE AWARD OF MASTER OF BUSINESS ADMINISTRATION DEGREE TO UNIVERSITY OF NAIROBI

NOVEMBER, 2012

DECLARATION

I hereby declare that this project is my own work and effort and that it has not been submitted anywhere fos any^award.

Signature:. . . . . fflfW.....Date: tf/>/./*>•

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This research project has been submitted for examination with my approval as the candidate's University Supervisor^

Supervisor Signeddd^l^fc._____Dat

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DEDICATION

1 dedicate this study to my dear wife. Dr. Marjory and children, Gabriel, Jeremy and Emmanuel for all the support he gave all the time as I prepared and worked on this project.

ACKNOWLEDGEMENT

It has been an exciting and instructive study period in the University of Nairobi and I feel privileged to have had the opportunity to carry out this study as a demonstration of knowledge gained during the period studying for my master's degree. With these acknowledgments, it would be impossible not to remember those who in one way or another, directly or indirectly, have played a role in the realization of this research project. Let me, therefore, thank them all equally.

First, I am indebted to GOD almighty for all the blessings he showered on me and for being with me throughout the study. I am deeply obliged to my supervisor Dr. Sifujo Kisaka, for his exemplary guidance and support without whose help; this project would not have been a success. Finally, yet importantly, I take this opportunity to express my deep gratitude to my loving family, and friends who are a constant source of motivation and for their never ending support and encouragement during this project.

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LIST OF ABBREVIATIONS AND ACRONYMS

DEA: Data Envelopment Analysis (DEA)

DMU: Decision Making Units

SFA: Stochastic Frontier Analysis

SPA: Stochastic Production Approach

NSE: Nairobi Securities Exchange

NASI: Nairobi Stock Exchange All Share Index

M&A: Merger and Acquisition

TFA: Thick Frontier Approach

DFA: Distribution Free Approach

FDH: Free Disposal Hull

ROE: Return on Equity

ROA: Return on Assets

P/E: Price Earnings Ratio

D/E: Debt-to-Equity Ratio

ABSTRACT

This study sought to investigate the relationship between cost X-efficiency and financial performance of companies listed in the Nairobi Securities Exchange in Kenya,. The study findings concludes that Cost X-inefficiency may arise because managers use more input than would a best-practice firm (technical inefficiency) or because they employ an input mix that does not minimize cost for a given input vector, moreover its established that X-inefficiency arises from the fact that "neither individuals nor firms work as hard, nor do they search for information as effectively, as they could." More specifically, the results exits that cost X-efficiency as the ratio of the minimum costs that could have been expended to produce a given output bundle to the actual costs expended and varies between 0 and 100 percent. X-efficiency stems from technical efficiency.

The 46 businesses and companies listed in the Nairobi Securities Exchange formed the population of the study. The sample comprised of firms' listed in the NSE who's published financial data is available continuously over the sample period of the study 2006 to 2011. The sample included firms in the following sectors, Agriculture. Automobile and accessories, Banking, Commercial & Services, Construction & Allied, energy and Petroleum, Insurance and Investment firms.

The findings established that assets management measures demonstrate how efficient management uses a firm's assets to generate sales over a certain period of time. Asset management ratios (asset utilization ratios) show how efficiently and intensively assets are used to create sales efficiently and intensively. These ratios include, for example, inventory turnover, receivable turnover and assets .Moreover the study findings establishes that sell assets to increase their operating efficiency are typically poor performers. Firms are to sell their own assets if they find that alternative funding is too expensive and thus portend that total assets and cost of raw material and sales expenses significantly leads to a higher firm performance.

CHAPTERFOUR

INTRODUCTION

1.1 Background of the Study

A firm's performance can be affected by many factors. Cost X-efficicncy is hypothesised to be one such factor. This study aims to establish the relationship of cost X-efficiency and financial performance of companies listed on the Nairobi Securities Exchange.

1.1 The Concept of Efficiency and its Measurement

A company is said to be "listed", "quoted" or "have a listing" if its shares can be traded on a stock exchange. To be more accurate, it is the securities that are listed, not the company. The phrase "listed company" is widely used to mean a company that has listed ordinary shares. It is possible (although not common) for a company to have listed debt securities but not listed shares. Listing in more than one market is possible through secondary listings, or through the more complex approach of dual listing. A group of companies may also have separately listed subsidiaries, associates, and tracking stocks.The efficiency of individual listed firms in providing goods and services and conditions in the external environment determine the efficiency of the respective sectors, which influences the effectiveness of the economic growth.

Measuring a firm's performance has been an area of intense research taking into account the results required by shareholders' and creditors' equity into company assets. Performance is viewed in three different ways: First it is given by return on invested capitals in the firm assets. Secondly it reflects the risk undertaken by shareholders and thirdly performance is given by the value of the whole business verses the advantage or disadvantage of placing the capital in other market opportunities. Thore et. al., (1994); Hsu and Liu, (2008); Joshi and Singh, (2009) Researched on the performance and efficiency of companies over the past decades and the area continues to be given enormous attention. Previous research basically used conventional ratios such as return on assets. Later many studies used various measures of performance which include financial index (Wu et. al., 2006), a non-parametric approach -Data Envelopment

.Analysis (DEA)(Wu, 2005) and parametric approach-Stochastic Production Approach (SPA) (Radamet. al., 2008).

Efficiency is key concept in Companies (Cinca et. al 2002). Efficiency measurement is one aspect of a company's performance. Efficiency can be measured with respect to maximization of output, minimization of cost or maximization of profits. In general efficiency is important to companies themselves as it has direct relationship with profitability (present and future), competitiveness, and solvency. Also regulatory authorities demand the same from companies in provision of cost effective services and products. The numerous stake holders' interests in a firm must be satisfied. Stakeholder theory suggests that the purpose of a business is to create as much value as possible for stakeholders. In order to succeed and be sustainable over time, executives must keep the interests of customers, suppliers, employees, communities and shareholders aligned and going in the same direction. Stakeholder management can be linked to conventional concepts of organizational success through analytical argument. The main focus of this effort in the recent literature builds on established concepts of principal-agent relations (Jensen & Meckling, 1976) and the firm as a nexus of contracts (Williamson & Winter, 1991). Agency theory and firm-as-contract theory, although arising from different sources, are closely related and share a common emphasis: efficiency. Measuring of cost X-efficiency of listed companies serve two important purposes. It helps benchmark the relative efficiency of an individual company against the "best practice" firms within the industry and across industries.

Efficicncy addressed in literature is in term of scale and scope or in terms of X-efficiency or both. According to Limam (2010), Scale efficiency addresses question whether a firm is operating at the minimum of its long-run average cost curve. Scope efficiency is measured by difference between the cost of joint production and the sum of producing the different output individually. Cost X-efficiency refer to how close a firm's actual cost are to the cost of best-practice firm producing same output. Cost X-efficiency reflects managerial ability to drive down production costs, controlled for output volumes and input price levels. Cost X-inefficiency may arise because managers use more input than would a best-practice firm (technical inefficiency) or because they employ an input mix that does not minimize cost for a given input vector

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(allocative inefficiency) (Berger,2000). Leibenstein argues that X-inefficiency arises from the fact that "neither individuals nor firms work as hard, nor do they search for information as effectively, as they could." More specifically, Berger (1993) defines X-efficiency as the ratio of the minimum costs that could have been expended to produce a given output bundle to the actual costs expended and varies between 0 and 100 percent. X-efficiency stems from technical efficiency. Nyahan (1998) defines technical efficiency measures as a way of using minimum inputs to produce a given level output (output orientation). Technical efficiency could be deterministic or Stochastic and gives the maximum output that can be attained for a given level of input, or minimum cost for a given level of output and input prices. (Limama, 2001).

Interest in "frontier" analysis of economic efficiency has grown rapidly over the past two decades; and numerous books and hundreds of papers have been written on efficiency methodologies and applications. Two primary methodologies have been developed for measuring X-efficiency - the econometric approach and the mathematical programming approach. Both methodologies involve the estimation of "best practice" frontiers, with the efficiency of specific decision making units (DMUs) measured relative to the frontiers. The econometric approach specifies a functional form for the cost, profit, or production frontier. The methodology is stochastic; firms can be off the frontier because they are inefficient or because of random shocks or measurement errors that have nothing to do with inefficiency. Thus, the cost function error term is hypothesized to consist of an inefficiency component and a purely random component. Efficiency is measured by separating the efficiency component from the overall error term. Some variants of the econometric approach require that specific distributional assumptions be imposed on the components of the error terms, while others do not require distributional assumptions. By contrast, the mathematical programming approach places less structure on the frontier and is non-stochastic, i.e., any departure from the frontier is measured as inefficiency.

Some prior research on the performance and efficiency of companies had used simple financial statement ratios (e.g., asset turnover) as proxies for efficiency to examine the relation between efficiency and performance; these studies show that changes in asset turnover improve

forecasts of changes in future profitability (Fairfield and Yohn2001; Soliman 2008).Later many studies used various measures of performance which include financial index(Wu et. al., 2006), a non-parametric approach -Data Envelopment Analysis (DEA)(Wu, 2005) and parametric approach-Stochastic Production Approach (SPA) (Radamet. al., 2008). DEA is frequently used to measure efficiency of a company. DEA is a non-parametric multiple input-output efficiency technique that measures the relative efficiency of decision making units or DMUs using a linear programming model. It is non-parametric because it requires no assumption on the shape or parameters of the underlying production function. This technique has been applied for measuring the relative efficiency of DMUs in various sectors such as hospitals, financial institutions, textile industry, IT companies and transportation companies. DEA is popularly used because of its advantages. The main advantage is that it can readily incorporate multiple inputs and outputs to calculate technical efficiency.

Another set of studies uses stochastic frontier analysis (SFA) to examine the link between X-efficiency and performance (e.g., Alam and Sickles 1998; Greene and Segal2004), SFA generates an optimized efficiency measure that is essentially a "best practice" frontier against which to evaluate the performance of individual decision units. A natural question that arises is that given its computational complexity, what advantage does frontier analysis have over simple financial ratios that proxy for operational efficiency (e.g., asset turnover)? A significant advantage that SFA has over simple financial ratios is that it allows for differential weighting among multiple inputs, while simple financial ratios provide a single output based on a single input, thereby ignoring substitutions, interactions, and tradeoffs among various inputs. Thus, frontier analysis should yield a measure that better reflects a firm's strategy, which is linked to firm's performance and firm value. Additionally, stochastic frontier analysis distinguishes between random shocks (i.e., pure noise) and technical inefficiencies in the production function, while simple financial ratios cannot do so. In sum, we argue that frontier analysis likely provides a more comprehensive and conceptually appealing measure of a firm's operational efficiency and performance than simple financial ratios. If our argument holds, then the information in measures of efficiency based on (SFA) should be incremental to the information in measures of efficiency based on simple financial ratios (e.g., Fairfield and Yohn 2001; Soliman 2008),

leading to improved profitability forecasts but none of these studies has linked frontier-based efficiency measures with future profitability.

The purpose of this study is to examine whether there is cost X-efficiency of companies listed on the NSE and how this affects financial performance. The study will utilize secondary financial data that is available for the six year period from 2006 to 2011 from the published accounts of the listed firms. SFA approach is employed to measure cost X-efficiency changes.

1.2 Statement of the Problem

Numerous studies have been conducted that measured the change in cost X-efficiency in as a result of variables such as effect of Merger and Acquisition (M&A), liberation, corporate governance, ownership structure, international cross listing, board composition, competitive strategy, managerial skills and many others. The focus of their studies was whether cost X-efficiency changes occurred as a result of the variables being studied and not whether the cost X-efficiency changes had any relationship to financial performance. The Banking industry and Insurance industry have been the favorite industries of the study and in some cases manufacturing listed companies.

Previous studies regarding X-efficiency and how it indirectly relates to firm performance employing both DEA and SFA performance have frequently provided mixed conclusive results. Alam and Sickles (1998) relate DEA efficiency innovations to stock performance using a panel of 11 airline companies and find that DEA efficiency innovation in a quarter is associated with stock market performance in the following two months. Cummins and Xie (2008) use DEA and show a positive relation between firm efficiency and stock market reactions to acquisitions and divestitures in the US property-liability insurance industry. Demerjian et al. (2009) use a large sample of firms across industries and demonstrate that managerial ability scores derived from DEA are positively and significantly associated with current and past stock returns, executive compensation, and investment opportunities. Using data reported by public school districts, Dopuch and Gupta (1997) employ SFA to estimate benchmark performance standards in relative performance evaluation. Using both SFA and DEA, Dopuch et al.(2003) estimate the relative efficiency of audit production and find that inefficiencies in audit production are associated with reduced audit fees, consistent with cost of inefficiency being partially borne by the

accounting firm. Greene and Segal (2004) argue that "cost inefficiency affects profits and growth through the negative effect of wasted resources on earnings and cash flows." This implies that more operationally efficient firms should be more profitable. Greene and Segal (2004) use SFA and document a contemporaneous association between profitability (ROE and ROA) and efficiency in the US life insurance industry. Majority of the studies done focused on changes to cost x-efficiency due to effects of the variables being studied but failed to show how these cost x-efficiency would affect financial performance.

Locally various researchers have reviewed the efficiency of companies across certain industries and especially in the banking industry and insurance industry. Simiyu (2006) studied the relationship between the effect of financial liberalization on the X-efficiency of commercial banks in Kenya; Nzioka(2007) conducted an empirical study of the relationship between managerial skill and technical efficiency of commercial banks in Kenya; Njuguna (2007), The empirical analysis of the commercial banks' efficiency and stock returns in Kenya: while Maringa (2008) established the relationship between investment in information communication technology and corporate performance at Kenya Revenue Authority. Sakina (2006) sought to investigate on the X-efficiency of commercial banks in Kenya and to establish whether the X-efficiency of these banks is affected by economies of scale. None of these researchers studied the effect of cost X-efficiency to financial performance. Cost X-efficiency would be expected to play a key role in the financial performance of a firm. This study thus seeks to fill the knowledge gap by establishing what role cost X-efficiency would have on the performance of companies listed on the NSE. This study will therefore seek to answer the question; what is the relationship of cost X-efficiency on company performance of companies listed on NSE.

1.3 Objectives of the Study

The objective of the study will be to establish the relationship between cost X-efficiency and financial performance of companies listed in the Nairobi Securities Exchange in Kenya.

1.4 Importance of the Study

The study offers valuable contributions from both a theoretical and practical standpoint. From a theoretical standpoint, it contributes to the general understanding of how firms cost X-efficiency

influences financial performance of the companies listed in the NSE; more specifically, it provides one of the few detailed examinations on how companies in listed in the NSE pursue efficiency to enhance their financial performance.

Policy maker will seek to fill this gap by conducting a broad examination of whether firm cost X-efficiency changes based on frontier analysis are incrementally informative to simple financial ratios about earnings.

Shareholders' decision making would be improved. This is because they would be able to assess whether those entrusted with the investment and management of their funds operate efficiently to drive the firm's efficiency and profitability to the required levels.

This study will help to company managers to evaluate if they are cost efficient or not and how this affects the firms' performance compared to the best practice firm in their respective industries prompting them to evaluate their operations.

The study will add to the existing body of knowledge on the concepts of firms' cost efficiency and organizational financial performance to benefit academicians and aid further research on the concept. It will form a fundamental base upon which further researches into the field will be based as it will act as both reading and secondary source material in such cases.

CHAPTERFOUR

LITERATURE REVIEW

2.1 Introduction

This chapter presents a review of the literature on the relationship between cost X-efficiency and financial perfprmance of listed firms'. The chapter is organized as follows: Section 2.2 theory of cost X-efficiency, Section 2.3 focuses on cost X-efficiency of firms in Kenya, Section 2.4 Firm cost X-efficiency in relation to firm performance. Finally, section 2.5 is the chapter summary.

2.2 Theory of Costs X-efficiency

The idea of measuring a firm's performance with respect to a best practice frontier goes back at least to the 1950s. Koopmans (1951) defined technical efficiency as the capability of a firm to maximize output for a given inputs and argued that not all producers were technically efficient. This notion did not however offer any guidance concerning the degree of inefficiency. This issue was addressed by Farrell (1957) when he extended the work initiated by Koopmans and suggested measuring inefficiency as the observed deviation from a frontier isoquant. Farrell pointed out that a technical efficiency measure could be obtained by using input and output quantity without introducing prices of these inputs and outputs.

Farrell (1957) was the first to measure productive efficiency empirically. Using data on US agriculture, he defined cost efficiency and decomposed it into its technical and allocative parts using linear programming techniques rather than econometric methods. His work using linear programming eventually led to the Data Envelopment Analysis and this method is widely used in the literature as a non-parametric non-stochastic technique. Farrell's work also led to the development of stochastic frontier analysis which involved estimating deterministic production frontiers, either by means of linear programming techniques or by modification of the least squares techniques.

Following Farrell's work on the measurement of technical efficiency, researchers in the area of firm efficiency argue that the production possibility set that economic theory associates with any productive activity is unknown (Hung, 2005). The subsequent research has therefore

focused on the best way to identify the frontier of the production possibilities set. Two methodologies are now available: a) parametric methods; and b) non-parametric methods. Parametric methods are Stochastic Frontier Approach (SFA), Thick Frontier Approach (TFA) and Distribution Free Approach (DFA) while non-parametric methods are Data Envelopment Analysis (DEA) and Free Disposal Hull (FDH).A parametric approach uses econometric techniques and imposes a priori the functional form for the frontier and the distribution of efficiency. A non-parametric approach, on the contrary, relies on linear programming to obtain a benchmark of optimal cost and production-factor combinations.

Estimating efficiency involves defining a set of inputs which are linked to another set of outputs. Inputs and outputs are included and calculated based mainly on theoretical grounds. Defining partial measures of efficiency implies that a given firm will be more efficient than another (even though globally it may be less efficient) because a given input or output has not been considered, so that the ranking may be reversed when it is included

In measuring the cost X-efficiency, one should compare observed cost and output-factor combinations with optimal combinations determined by the available technology (efficient frontier) according to Fiorentino, Karmann, Koetter (2006). The analysis could be either stochastic or deterministic. The former allows random noise due to measurement errors. The latter, on the contrary, attributes the distance between an inefficient observed firm and the efficient frontier entirely to inefficiency. A further distinction is made between parametric or nonparametric approaches.

It is asserted that there may be differences between specialized and non-specialized firms with respect to the degree of operational efficiency according to Rudi (2000), who looked at cost X-efficiency of banks which will be the model adopted. To test this conjecture, Rudi (2000) estimated a cost function for the different types of banks. Cost X-efficiency provides a measure of how close a firm's actual cost is to what a best-practice firm's cost would be for producing an identical output bundle under comparable conditions. The measure is usually derived from a cost function where the dependent variable is total costs (C) and the independent variables include the prices of inputs (p), the quantities of outputs (y), other factors that may affect performance (z), and an error term s. The function can be algebraically written as shown in equation (1)

$$C = f(p, y, z) + 8 \quad (1)$$

In equation (1), e is treated as a composite error term represented as shown in equation (2);

e = |i +v.....(2)

Where:

(a captures inefficiency and

v represents standard statistical noise.

A firm is labeled inefficient if its costs are higher than a best-practice firm after removing random error when using parametric method. The methods differ in the way p is disentangled from the composite error term e .

Aigner, Lovell, and Schmidt (1977) proposed stochastic cost frontier in analysis of cost X-efficiency. Generally non-parametric methods are less suitable because they assume away noise in the data and luck. But for the purpose of this study, the most important drawback is that these methods generally ignore prices and, thus, can only account for technical inefficiency related to using excessive inputs or producing suboptimal output levels. As Berger and Mester (1997b) observed, these methods cannot compare firms that tend to specialize in different inputs or outputs because it is impossible to compare input and output configurations without the benefit of relative prices. Moreover, Berger and Mester (1997b) used the distribution free approach as well as the stochastic frontier approach for both the translog and the Fourier specification of the cost and profit function. They concluded that the empirical findings in terms of either average industry efficiency or ranking of individual bank are similar across methods.

In equation (2), the random error term (v) is assumed to be normally distributed and the inefficiency term (p) is assumed to be one-sided. Either of the approaches (the half-nonnal and the exponential distribution approaches) can be used with similar results being reported in both cases. The model below has focused on the half-normal distribution. The inefficiency factor (p)

incorporates both allocative inefficiencies from failure to react optimally to changes in relative input prices, and technical inefficiencies from employing too much of the inputs to produce the observed output bundle. The log-likelihood function is given arithmetically by equation (3). The model can be estimated using maximum likelihood techniques.

InL = f i n g) − ***N Ina -*** ***ei***^{z} + I n [0. . . . . .(3)

Where:

= ***Hi*** +^{v}***t***

2 i

ff− = ***of*** + ***al***

N = the number of firms and

(J) (.) = the standard normal cumulative distribution function.

Inefficiency measures are calculated using the residuals after the model is estimated. For the half-normal case, an estimate of the mean inefficiency is given by (4)

Where: $o_K$is the estimate of a_.

Since the distribution of the maximum likelihood estimates is known, the approximate standard

error of (-) 1/2o^ can be easily computed. Previously, Jondrow et al. (1982) when measuring bank-level inefficiency, showed that inefficiency is usually given by the mean of the conditional distribution function of §i_t given e_r For the normal-half-normal stochastic model, the conditional distribution of ***n.*** given s.is a normal distribution N (n.,a$^{:}$) truncated at Zero where

H. = $\frac{}{\text{◁*}}r^{1}$ and a'. = $\frac{\text{r—}}{\text{O*}}$.

This can be seen by adapting for the cost function the equation for the cost function derived in Jondrow et al. (1982). The density function is algebraically illustrated in Equation (5)

$$f(Mi/Si) = \quad ^{\text{ef}}. \ (MiAi) > o. \qquad (5)$$

As Mester (1996a, 1996b) and Greene (1991) observed, the conditional mean £(;<./£,) is an unbiased but inconsistent estimator of n.since regardless of the number of observations, the variance of the estimator remains non-zero. The mean of the conditional distribution of Equation (5) is as shown in equation (6).

$$\frac{\sigma\left(\frac{\varepsilon_i\lambda}{\sigma}\right)}{\varphi\left(\frac{\varepsilon_i\lambda}{\sigma}\right)} + \frac{\varepsilon_i\lambda}{\sigma} \qquad (6)$$

A Farrell-type measure of operational efficiency can then be calculated as CEFF = e^{nM}. A CEFF score of 0.8 would mean that the firms is using 80% of its resources efficiently or alternatively wastes 20% of its costs relative to a best-practice firm. For the functional form of C ^{r} f (P>y,z) a standard translog or the Fourier flexible (FF) specification (McAllister and McManus 1992; Mitchell and Onvural 1996; Berger and Mester 1997) may be applied.

The Fourier functional form augments the translog by including Fourier trigonometric terms. It is a global approximation because the sine and cosine terms are mutually orthogonal, so that each term aids in fitting the function closer to the true path of the data. But while formal tests indicate that the Fourier terms are jointly significant, the statistical fit, and both the average levels of measured efficiency and their dispersion are very similar for both functional forms.

2.2.1 Cost X-cfficiency of Listed Firms in Kenya

Studies conducted in Kenya looked at X- efficiency and how variables such as quality improvement, quality of loans etc affect firm performance. These studies were limited to the banking industry. These studies expressed mixed views in each of their study for the various industries.

Musyoki (2003) compared quality improvement of banks with financial performance in an attempt to establish if there is any link between quality improvement and bank profitability. Using a sample of 46 commercial banks for the period 1998 to 2002, he found out that quality improvement has a short term effect on financial performance and that there are undoubtedly other benefits gained from improved quality, but they may be difficult to measure. Two years later, Njihia (2005) sought to determine the detenninants of profitability of commercial banks in Kenya. The sample data was comprised of 36 banks over a period of six years, from 1998 to 2004. Using multiple regression analysis technique, established that the critical variables affecting profitability of commercial banks in Kenya are: non performing loans and advances, interest expense on customers' deposits, operating expenses, provision for doubtful debts and total assets (Njihia, 2005). Efficiency in expense management (cost efficiency) was one of the most significant determinants of commercial bank profitability. Finally, Sakina (2006) sought to investigate on the X-efficiency of commercial banks in Kenya and to establish whether the X-efficiency of these banks is affected by economies of scale. X-efficiency is defined as the general efficiency of a firm judged on managerial and technological criteria in transforming inputs at minimum costs into maximum profits. It includes intra-bank economic efficiency; intra-bank motivational efficiency - individual personality; and external motivational efficiency - arising from management incentives and the environment (Adongo et al., 2005;. The data set consisted

of annual operation costs of banks including interest expense. Deposits and borrowed funds were treated as the inputs while the loans to customers, investments, and other incomes were treated as outputs. The sample comprised of 33 banks for the period 2000 to 2005. A stochastic econometric cost frontier was used to measure X-efficiency level of commercial banks in Kenya. The empirical results obtained established that X-efficiency existed in the Kenya's commercial banks industry at 18% and it was found to be affected by economies of scale. In a bid to establish whether the persistence of X-efficiency was related to bank size, Sakina (2006) further found out that average large banks tend to be more persistent than average small banks at the level of 23%. Besides, bank size affects X-efficiency for large banks.

All these studies were limited to banking Industry and looked at topics such as performance by Musyoki (2003), profitability by Njehia (2005), efficiency by Mutanu (2002) and X-efficiency by Sakina (2006), They did not look at what relationship cost X-efficiency had on firm performance even within the banking industry let alone other industries as well of firm listed in the Nairobi Securities exchange.

2.2.2 Firm Cost X-efficiency in Relation to Firm Performance

Several studies have examined the relationship of efficiency measures and or X-efficiency changes due to variable such as ownership structure Mergers and accusation, managerial ability etc to firm performance using frontier analysis. It must be pointed out that estimation of production frontier allows us to measure only technical efficiency, while the estimation of cost frontier allows us to measure both technical and allocative efficiency. Namely, cost X-efficiency is the composed technical and allocative efficiency.

Greene and Segal (2004) argue that "cost X-inefficiency affects profits and growth through the negative effect of wasted resources on earnings and cash flows." This implies that more operationally efficient firms should be more profitable. Greene and Segal (2004) use SFA and document a contemporaneous association between profitability (ROE and ROA) and efficiency in the US life insurance industry.

Cummins and Xie (2008) use DEA and show a positive relation between firm efficiency and

stock market reactions to acquisitions and divestitures in the US property-liability insurance industry.

In their study, Joshua and Daehoon (2005) focused on ten domestically owned retail banks listed on the Australian Stock Exchange (ASX). They analyzed the cost and profit efficiency of ten Australian banks between 1995 and 2002. Their results indicated that the major banks had experienced improvements in cost and profit efficiency, while the regional banks" cost X-efficiency remained relatively unchanged and their profit efficiency had declined. The regional banks had relatively high cost efficiency initially, and up until 2000 the majors and regional bank cost X-efficiency scores converged.

2.3 Measurement of Financial Performance

There are a number of methods to measure a firm's performance, such as financial performance, efficiency performance, productivity, growth, employment, export and market share. From finance and accounting literature financial ratios are widely used to reflect the firms performance such as profitability measures (financial leverage), and liquidity (cash flows).

2.3.1 Profitability Measures

Profitability can measure how efficient a firm uses its assets to manage its operations. Financial rations that indicate how well a firm is performing included, for example , profit margin, return on assets (ROA), return on investment and return on Equity (ROE).Some empirical studies find that a firm's profitability is positively associated with the firm's stock price, and also technical efficiency (Cho and Pucik, 2005; Mok et al . 2007). Cho and Pucik, (2005) find that a firm's profitability has a significant and positive effect on its market value in for US firm's profitability, since the firms profitability can directly reflect investors' confidence and in turn increase its stock price. Mok et a1. (2007) find that a firm's profitability has a positive effect on its technical efficiency based on a sample of 238 of the largest foreign-invested toy manufacturing firms in southern China in 2002. The ROE and ROA will be the ratios used to measure firm performance for the study.

2.3.2 Market Value Measures

Market value can be used to measure the performance of publicly listed firms since it requires information on the current stock prices. These ratios include, for example, the price to earnings ratio (P/E) ratio and market-to-book value ratio (Ross et al., 2007). A number of empirical studies have used these ratios to represent the firm performance of publicly listed enterprises (McConnel and Servaes, 1990; Smith 1990; Cho, 1998: Xu and Wang, 1999; Claessens et al., 2000; Dewenter and Malatesta, 2001;)

2.3.3 Efficiency Measures (Assets Management)

Assets management measures demonstrate how efficient management uses a firm's assets to generate sales over a certain period of time. Asset management ratios (asset utilization ratios) show how efficiently and intensively assets are used to create sales efficiently and intensively. These ratios include, for example, inventory turnover, receivable turnover and assets turnover (Ross et al.,2007) Lang et al (1995) argues that firms that sell assets to increase their operating efficiency are typically poor performers. Firms are to sell their own assets if they find that alternative funding is too expensive

2.3.4 Capital Structure Measures (Financial Leverage)

There are two types of leverages, which includes (i) operating leverage and (ii) financial leverage. Operating leverage refers to the rate at which earnings rise as sales volume increased (Asaf, 2004). A firm that has a higher operating leverage is likely to face greater risk (Quiry et al.,2005) Financial leverage is a capital structure measure, and reflects a firm's ability to meet its long-run obligation (Ross et al.,2007). The debt-to-equity ratio **(D/E)** can be used to measure financial leverage. In other words, it refers to the used of debt, financial leases, and preferences shares in a firm's capital structure to increase returns to equity shareholders (Petty et al., 2006: Beal et al.,2008). Firms also have an obligation to pay cash or returns for use their use of debt., financial leases, and share issuance. For instance, debt requires periodic interest and principle payments; leases require rental payments; preference shares require dividends payments (Petty et al.,2006). Petty et al.,(2006) suggest that firms normally should not increase their

financial leverage if their operating leverage is high, but they can do so with a low operating leverages. The leverage level of each industry may be different depending on future of its own business. The banking sector is likely to have a high leverage ratios compared with other industries. Therefore corporate analyst, investors, bankers and the rating agencies practically compare the leverage ratios of a firm with its industry leverage ratio.

2.4 Summary

Different types of approaches have been employed in literature when evaluating the cost X-efficiency of firms'. These methods differ primarily in the assumptions imposed on the data in terms of (a) the functional form of the best practice frontier (a more restrictive parametric functional form versus a less restrictive nonparametric form), (b) whether or not account is taken of random error that may temporarily give some production units high or low outputs, inputs, costs, or profits, and (c) if there is random error in the probability distribution assumed for the inefficiencies (e.g., half-normal, truncated normal) used to disentangle the inefficiencies from the random error. Thus, the established approaches to efficiency measurement differ primarily in how much shape is imposed on the frontier and the distributional assumptions imposed on the random error and inefficiency.

Empirical studies in Kenya (Mutanu, 2002; Musyoki, 2003; Njihia, 2005; and Sakina, 2006) have focused on the efficiency changes in the Kenya banking industry whilst establishing that commercial banks are efficient from different perspectives. Mutanu (2002) compared cost efficiency scores of highly and low capitalized banks. Musyoki (2003) in his study mentioned that there are undoubtedly other benefits gained by quality improvement but maybe difficult to measure. Cost X-efficiency would be one. Njihia (2005) looked at determinant of profitability in bank. Sakina (2006) looked at X-efficiency of commercial banks which was affected by economies of scale. However, none of theses and other studies have looked at cost X-efficiency and established the relationship between firms cost X-efficiency and effect on the firm performance. The present study seeks to fill the gap on the relationship of cost X-efficiency and firms' performance of firms listed in the NSE in Kenyan including other industries not just banking industry alone as has been the case in the previous studies.

CHAPTER THREE

RESEARCH METHODOLOGY

3.1 Introduction

This chapter presents the research methodology used in this study. Section 3.2 describes the Research design,; Section 3.3 describes the study Population and Sample; Section 3.4 outlines the data collection procedures and sources; and Section 3.5 describes the research model and the data analysis tools to be applied.

3.2 Research Design.

The quantitative approach to research involves numerical data, and the qualitative approach involves textual data (Symonds & Gorard, 2010). A third method of research that utilizes elements from both the qualitative and the quantitative approaches is categorized as mixed-methods (Symonds & Gorard,2010). The quantitative approach was selected for its suitability to the purpose of developing research questions and is appropriateness for the type of numerical data required in the study (Schweitzer, 2009). Creswell (2009) stated that the quantitative approach is most appropriate for the analysis of numerical data.

Quantitative design selected for the study was non-experimental. In experimental designs, researchers measure the influence of a variable on another variable through the application of a treatment (i.e., experiment) (Creswell, 2009). According to Herzinger and Campbell (2007), the experimental design involves determining causation between variables. A quantitative design that does not involve the determination of influence of a treatment is non-experimental (Belli, 2008). The experimental design was rejected for the study because the purpose was not to introduce a change in the settings or participants. The non-experimental design aligned with the objectives of the study.

The study used the Stochastic Frontier Analysis (SFA) to measure Cost X-efficiency

of Firms in the NSE. The aim is to establish the level of cost X-efficiency and this affects Financial Performance of firms on NSE. Using the Stochastic Frontier Analysis, the efficient cost frontier was determined hence the level of cost X-efficiency in each firm. The persistency of cost X-efficiency was measured using the Spearman Rank correlation coefficient. The Pearson correlation coefficient will be used to compare the relationship between cost X-efficiency and financial performance

3.3 Research Population

There are 46 businesses and companies listed in the Nairobi Securities Exchange according to the Nairobi Securities Exchange Handbooks. These companies formed the population of the study. The sample comprised of firms' listed in the NSE who's published financial data is available continuously over the sample period of the study 2006 to 2011. The sample included firms in the following sectors, Agriculture, Automobile and accessories, Banking, Commercial & Services, Construction & Allied, energy and Petroleum, Insurance and Investment firms.

3.4 Data Collection

The study applied secondary data which was extracted from the firms' annual reports and financial statements for the six-year period commencing 2006 up to 2011. The period was selected because continuous financial data may be available for the firms over the entire period. This was obtained from the published financial report. The data extracted from the financial statements included the following: Total Assets, Cost of raw materials and cost of sales expenses, Net Sales and the Profit earned before tax.

3.5 Research Model

In assessing the relationship between cost X-efficiency and firm performance of listed firms in Nairobi Securities exchange, this study used a Stochastic Frontier Analysis (SFA) model.

SFA has two principal advantages: (i) it separates random error from production unit inefficiency and takes into account the existence of exogenous shocks; and (ii) it is less sensitive to outliers. SFA is implemented by making an econometric estimate of the best practice frontier. A production unit efficiency score is given by the ratio of the observed output to the

maximum of feasible output, where the maximum is the frontier of best practice. SFA leads to estimation of the objective frontier function (cost or production function), by its specification in a Cobb-Douglas, CES, or trans logarithmic function.

3.5.1 Conceptual Model

The study conceptualized that a firm's performance is a function of changes in cost X-efficiency as represented by equation (7) below.

$$P_{it} = f(CE_{it}) \quad \text{...(7)}$$

Where:

Denotes the profitability of the th firm

C£".fDenotes the changes in cost efficiency of the th firm

The conceptual model defines the relationship between variable and the independent variable. The dependent variable is financial performance or profitability while the independent variable are Total Assets (TA), Cost of raw materials and cost of sales expenses (CRSE), Net Sales (NA) and Net Profit (NP).

3.5.2 Empirical Model

3.5.2.1 Measuring Cost X-efficiency

To measure cost X-efficiency change scores as directly as possible, that is, management's success in controlling costs (that is, cost X-efficiencies), two input and two output variables, namely, Total Assets (TA), Cost of raw materials and cost of sales expenses (CRSE)

(inputs) and Net Sales (NA) and Net Profit (NP) (outputs) was used here after referred to as Model A and algebraically denoted by equation (8).

$$CE.. = KTA_{it}, CRSB_{it}, NA_{it}, NP_{it}) \quad \ldots\ldots (8)$$

Where:

$CE_{,t}$ is percentage changes cost x-efficiency of ith firm

TAj_t is Total Assets of ith firm

CRSEu is Cost of raw material and cost of sales expenses of ith firm

NAj_t is Net Assets of ith firm

NP_{it} is the Net Profit of ith firm

Cost x-efficiency (CE) measures the possible reduction in cost that can be achieved is a firm if it able to have both technical and allocated efficiency and operating on efficient cost frontier.

3..5.2.2 Measuring Firm Performance

Firm performance was measured by Return on Equity (ROE).. The Return on Equity focuses on just the equity component of the investment. It relates the earnings left over for equity investors after debt service costs have been factored in to the equity invested in the asset.

Return on Equity = Net Income/Shareholder's Equity

ROE measures the net income that a firm is able to earn as a percent of stockholders' investment. Many analysts consider ROE the single most important financial ratio applying to stockholders and the best measure of performance by a firm's management. This orientation has been informed by the need for shareholder value assessment.

3.5.2.3 Linking Cost X-efficiency to Firm Performance

After computing cost X-efficiency scores using publicly available information (accounting data), the next step was to link the scores to firm performance. The model assumes the algebraic form shown in equation (9).

(9)

Where:

RE,$_t$ is the return on assets equity i at time t,

CE,, is the percentage change in cost X-efficiency and

£„is a random error term.

.3.5.2.4 Diagnostic Test

This study used the F-test, t-test, and the coefficient of determination (R^2) to measure the relationship between firm performance and cost X-efficiency. A regression of the cost efficiency was performed to establish whether there exists links between cost efficiency and financial performance. The model was further subjected to F-Test to establish whether variables are jointly significant. T statistics for individual parameters' coefficient was examined to determine their significance in the model as part of further test to the parameters.

CHAPTER FOUR

DATA ANALYSIS, RESULTS AND PRESENTATION

4.1 Introduction

This chapter presents analysis and findings of the research. From the study population target of 54 companies, 44 companies were sampled used for analysis since they had traded consistently for the 6-year period ending 2011, representing 100% response. The data was collected from the NSE offices and consisted of Return on Equity (ROE); Total Assets (TA), and Cost of Sales Expenses (CRSE) (inputs) and Net Sales (NS) and Net Profit (NP) (outputs). The study used both descriptive and inferential statistics to analyze the data found. The sample consists of 44 NSE companies (Appendix 1) for the period 2006 to 2011.The source of data for this section was NSE offices and consisted the below variables in table 4.1. because of the flexibility it offers in terms of increasing the degrees of freedom. The cost x-efficiency scores were calculated using the Frontier 4.1

4.2. Summary Statistics

From Table 4.1 below, tests the significant outliers in the transformed data as this is particularly important if the translog function is to perform well without incorporating the Fourier-flexible component. The mild skewness reflects normal distribution character of the data. The relatively high Jarque-Bera is because of the large number of observations. The kurtosis measure is generally above 3 which suggests a high pitched distribution. The descriptive statistics in Table 4.1 review the data characteristics before the translog regressions are estimated

Table 4.1: Statistics for variables of model

1	V(P1)	V(P2)	V(P3)	V(P4)	V(Q1)	V(Q2)	V(Q3)
Mean	-1.55	-2.43	-3.8	-2.75	11.45	10.88	10.87
Median	-1.81	-2.44	-3.73	-2.76	11.56	10.9	10.97
maximum	0	4.37	-1.8	-1.06	15.15	14.17	14.92
minimum	-2.2	-6.61	-10.93	-5.19	3.71	1.1	5.41
std. dev	0.65	0.76	0.95	0.48	1.39	1.49	1.45
skewness	1.39	1.8	-3.22	-0.07	-0.71	-1.23	-0.34
Kurtosis	3.55	25.55	19.36	5.33	5.52	8.48	3.64
Jarque-Bera	102.98	6670.87					
Probability	0	0	0	0	0	0	0
Observations	307	307	307	307	307	307	307

Source: Author's own computation based on data obtained from Nairobi Securities Exchange

4.3 Relationship between cost X-cfficiency score and financial performance

The financial sector exhibited delining cost x-efficiency from 10.02 % in 2006 to 10% before recovering to 10.02% in and down to 10.016% in 2011. Industiral and Alied sector saw declining x-efficiency from 10.03% in 2006 to 10% in 2011.Alternative investment market sector's scores exhibited a mixed trend but overall declined to 10% in 2011 form a high of 10.03% in 2007. Different Macro economic factors affected each sector differently resulting in different level and trend on X-efficiency score over the study period. When there was sever drought, the power generation became expensive affecting all sectors lowering cost efficiency during the study period. In 2007 the GDP of the country was at 7% but saw a sharp decline in 2008 to 1% .This pattern is also exhibited in the costx-efficiency score of the different firms over the study period.

4.3.1 Correlation Analysis

Correlation matrix shows that the natural logarithms of Return on Equity (ROE); Total Assets (TA), and Cost of Sales Expenses (CRSE) (inputs) and Net Sales (NS) and Net Profit (NP) (outputs), have correlation coefficients of more than 0.8.

The computed data is susceptible to autocorrelation because it combines cross-section and time series. This leads to inefficient estimators as variances tend to be larger, thus rendering t and F tests unreliable. It is therefore recommended to carry out stationarity tests to assess the effect of data characteristics on the results generated. However, in the context of the translog model, this is not a

Table 4.2: Correlation matrix of the translog variables

	V(P1)	V(P2)	V(P3)	V(P4)	V(Q1)	V(Q2)	V(Q3)
V(P1)	1.00						
V(P2)	-0.12	1.00					
V(P3)	-0.13	0.00	1.00				
V(P4)	-0.16	-0.04	0.29	1.00			
V(QD	-0.11	-0.50	0.02	-0.09	1.00		
V(Q2)	-0.18	-0.20	0.06	-0.05	0.85	1.00	
V(Q3)	-0.03	-0.34	0.00	0.03	0.83	0.71	1.00

Sourcc: Author's own computation based on data obtained from Nairobi Securities Exchange

critical issue since we are not estimating parameters. Nevertheless, we test for stationarity as a routine procedure and find that each of the explanatory variables is stationary in at least one of the two tests (Augmented Dickey-Fuller and Phillips-Perron tests: Table 4.3)

The Stationarity results below as a routine procedure and find that each of the explanatory variables is stationary in at least one of the two tests

Table 4.3:Stationarity results

Variable	Test	Intercept + Trend t-statistic	Intercept t-statistic	None t-statistic
V(P1)	ADF	-4.099228***	-4.129149***	-0.60983
	PP	-14.616360***	-14.524800***	-3.967063***
V(P2)	ADF	-3.870997***	-4.200769***	-0.730380
	PP	-11.444710***	-10.720760***	-1.357797
V(P3)	ADF	-1.028530	-1.313390	0.482325
	PP	-3.948159**	-3.979140***	0.231380
V(P4)	ADF	-2.199497	-1.748951	2.364647**
	PP	-1.889636	-1.403750	2.959200***
V(Q1)	ADF	-2.389576	-2.328587	-1.166032
	PP	-4.146960***	-4.095859***	-2.567877***
V(Q2)	ADF	-1.279421	-1.197791	-0.993683
	PP	2.432302	2.361893	-4.712204***
V(Q3)	ADF	-2.808927	-2.895271**	-0.768144
	PP	-3.863469**	-3.861525***	-1.795849

Notes: ADF Augmented Dickey Fuller Test
PP Phillips-Perron Test
*** 1% Level of significance
** 5% Level of significance

* 10% Level of significance

Source: Author's own computation based on data obtained from Nairobi Securities Exchange

4.3.2 The Max Likelihood Estimates (MLEs) for SF Cost Function

The Maximum Likelihood Estimates (MLEs) of the stochastic frontier cost model were generated and the findings are presented in Table **4.4** below. Equation **(8)** in Chapter three was applied in computing the MLEs. MLEs were computed based on the sample data (see Section 3.4). The table indicates that the forty four firms sample data yielded a γ value of 0.48486614. (whichis the ratio of the variance of the firm-specific cost efficiency to the total variance of the output). This implies that more than **48.48%** of the variations in the cost efficiency scores reported were due to variations in the level of input variables across firm. The results of Table 4.4 further indicate that the t-statistics were significant at 95% level of confidence.

Table 4.4: Maximum Likelihood Estimated of the Stochastic Cost Function

SAMPLE DATA $CEit = a + 3L(TA)+p2(CRSE)+P3(NA)+\|34(NP)+e_{/t}$				
Variable	**Parameter**	**coefficient**	**standard-error**	**t-ratio**
Constant	beta 0	(0.25626801]	0.57375240	(0.44665261)
TA	beta 1	0.22059607	0.67572921	0.32645632
NA	beta 2	0.79203244	0.83526361	0.94824249
NP	beta 3	(0.11910630)	0.36689042	(0.32463726)
	delta 0	(0.19744535)	0.15372318	(0.12844214)
	sigma-squared	0.11893453	0.99651850	0.11935004
	gamma	0.48486614	0.26427513	0.18347021
	log likelihood function	(0.38159207)		
	N	264		

Source: Author's own computation based on data obtained from Nairobi Securities Exchange

The provided maximum likelihood estimates of a wide variety of testing the inefficiency measures using the residual function .The results indicate that the variations in the level of inputs had less significant impact on cost efficiency of the sampled firms over the sample period. The desire to maximize on the outputs (profits) had led to intensive investments by firms which in turn led to a sharp decline in their cost X efficiency during the study period. With non-significance priors, the Bayesian posterior means of the parameters are going to converge

to the same point that the maximum likelihood estimators converge to. This is merely the well known result that with non significance priors, the likelihood function must eventually dominate the posterior, and the mode of the likelihood converges to the posterior mean as the sample size grows without bound as Likelihood Estimated revels. The end result of this result estimated is that the variations in the level of inputs had less significant impact on cost efficiency of the sampled firms over the sample period, while the latter computes the function directly using the MLEs.

Table 4.5: Regression Coefficients

Model	Lnstandardized Coefficients		Standardized Coefficients	t	Sig.
	B	Std. Error	Beta		
(Constant)	beta 0	04961			
TA	-43.058	.4032	46.648	1.814	.129
NA	34.154	23.901		.070	.876
NP	28.138	13.469	72.336	1.295	.787
Net Profit	23.235	22.145	33.302	0.622	.136

Source: Author's own computation based on data obtained from Nairobi Securities Exchange

The regression of equation (8) was performed to establish whether or not there existed a significant relationship between the dependent variable is return on equity, which was measured as a ratio of net profit to equity and the cost X efficiency. The model was first subjected to F-Test to establish whether the variables were jointly significant. T statistics for the individual parameters' coefficients were examined to determine their significance in the model. Using the return on equity as dependent variables, the F-Test yielded $F_{(J>S)}$ = 33.753; (P-value < 0.01). This value of F-statistic is statistically significant at 95% and 99% levels of confidence.

Table 4.6: Regression Estimate on relationship between Cost X-efficiency and Return on Equity'

RE.. = A. + ***6.CE,.*** + t.

Parameter	coefficient	t-ratio	P-Values
Constant (X0)	-52.55	-1.19**	0.24
51	263.85	1.04**	0.31

Denotes*** significance at 5% level, (P -valueo .7023) Critical Value = 1.96 (at 5%)
Denotes*** significance at 5% level, (P -valueo 0.201) Critical Value = 1.96 (at 5%)
Depended Variable =Return on Equity from pooled data; CE= Cost X-efficiency scores
Source: Author's own computation based on data obtained from Nairobi Securities Exchange

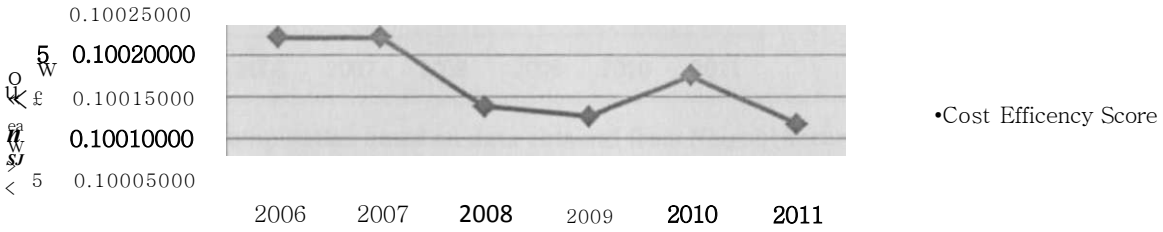
4.3.3 Average Annual Mean of Cost X- efficiency Score (2006- 2011)

Table 4.7: Average Annual Mean of Cost X- efficiency Score (2006- 2011)

Year	2006	2007	2008	2009	2010	2011
Cost X-Efficiency Score	0.100221	0.100221	0.100138	0.100126	0.100175	0.100117

Source: Author's own computation based on data obtained from Nairobi Securities Exchange

Figure 4.1: Annual Average Cost X-efficiency Score



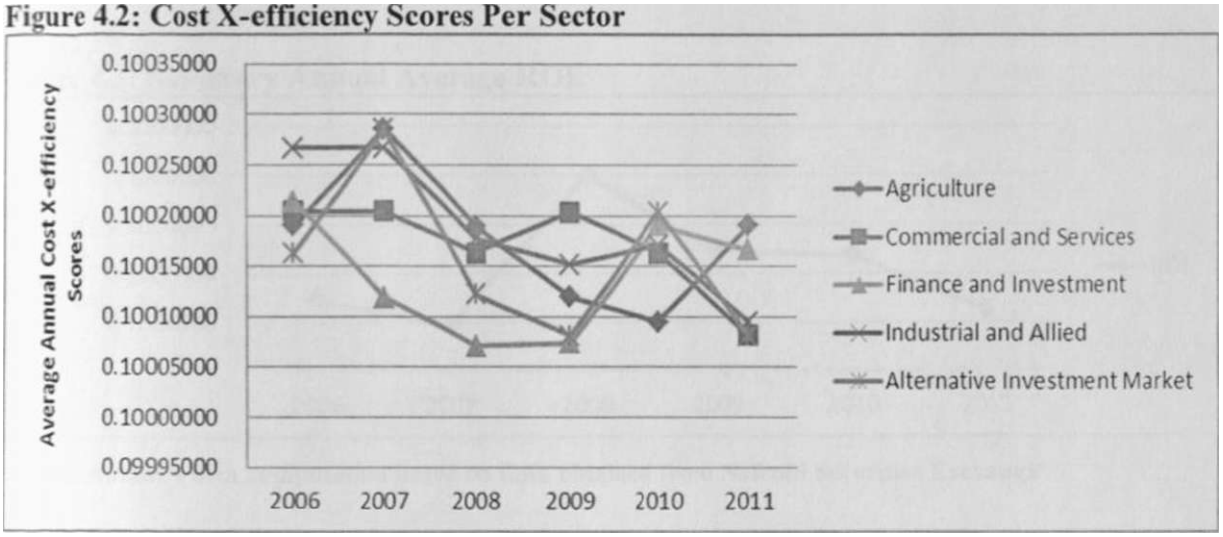
Source: Author's own computation based on data obtained from Nairobi Securities Exchange

Overall there has been a drop in annual average cost x-efficiency from a high of 10.0221% in 2006 and 2007 to lowest 10.0117% the lowest in 2011.

Table 4.8: Cost X-efficiency Score Per Sector

Year	Agriculture	Commercial and Services	Finance and Investment	Industrial and Allied	Alternative Investment Market
2006	0.10019053	0.100204371	0.100213766	0.100266591	0.100163121
2007	0.10028573	0.100204179	0.100118843	0.100266497	0.100285144
2008	0.10018995	0.10016291	0.100071267	0.100177323	0.100122234
2009	0.10011954	0.100203673	0.100074517	0.100152055	0.100081403
2010	0.10009496	0.100162946	0.10018995	0.100170962	0.100203629
2011	0.10019014	0.10008146	0.10016627	0.100095029	0.100081364

Figure 4.2: Cost X-efficiency Scores Per Sector



Source: Author's own computation based on data obtained from Nairobi Securities Exchange

During the study period the different sectors have exhibited differenct trends of cost x-efficiency. The Agriculture sector in 2007 reached a high of 10.03% before declining to 10% in 2010 but in 2011 it was up againing to 10.019%. The Agriculture sector was hit severely by drought.Commercial sector had been steady between 2006 and 2010 having x-efficiencv scores of 10.02% before declining in 2011 to a low of 10%.

Return on Equity was calculated as a net of income as a percentage of share holders equity. A detailed report of the firms ROE for the 44 sampled firms is in Appendix II. Table 4.9 shows the annual average ROE for the 2006 to 2011

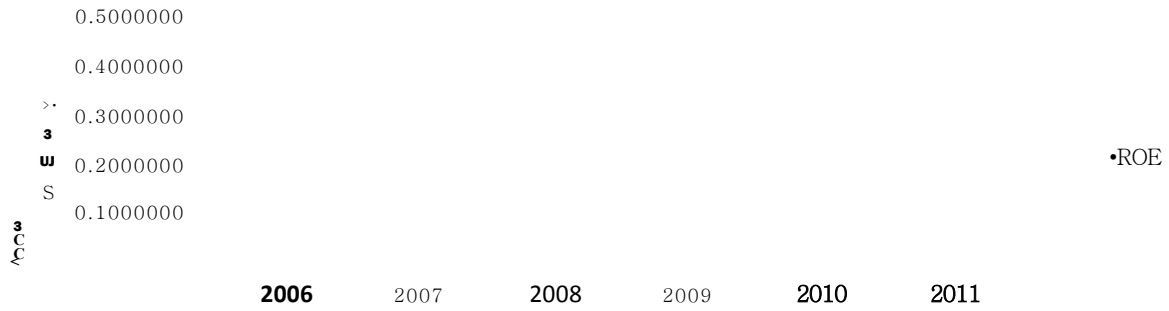
Table 4.9:Annual Average ROE

Year	2006	2007	2008	2009	2010	2011
ROE	0.1475712	0.09481839	0.39894847	0.24606659	0.23821218	0.12487571

Source: Author's own computation based on data obtained from Nairobi Securities Exchange

Average ROE of the firms declinced to 9.38% in 2007 then rose to a high of 39.89% in 2008 but declined trend to 12.48% by 2011.

Figure 4.3: Summary Annual Average ROE



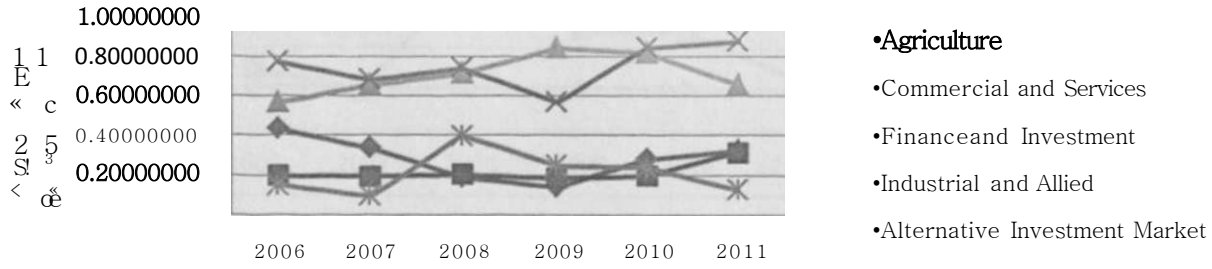
Source: Author's own computation based on data obtained from Nairobi Securities Exchange

Table 4.10: Annual ROE For Sectors

ROE	Agriculture	Commercial and Services	Finance and Investment	Industrial and Allied	Alternative Investment Market
2006	0.43422171	0.196241901	0.56582914	0.772690506	0.147571185
2007	0.33705043	0.192960548	0.65649834	0.682305166	0.094818393
2008	0.19115538	0.202070792	0.71388875	0.740573849	0.398948469
2009	0.13845608	0.184491184	0.84280277	0.566420221	0.24606659
2010	0.28014868	0.195950174	0.81592008	0.843060696	0.238212183
2011	0.32427916	0.313130161	0.65765946	0.875471162	0.124875708

Source: Author's own computation based on data obtained from Nairobi Securities Exchange

Figure 4.4: Annual Average ROE Per Sector



Source: Author's own computation based on data obtained from Nairobi Securities Exchange

Table 4.10 and Fig 4.3 above show average annual ROE per sector from 2006 to 2011. The Agriculture sector showed a decline in ROE from 43.42% to 13.85% in 2009 and then took a recovery path to 32.42% in 2011. Commercial and Service sector ROE continued to grow from 19.62% to 31.31%. The Finance and investment sector saw average ROE continuously grew from 56.58% in 2006 to 84.28% in 2008 but declined to 65.76% in 2011.Industrial and allied sector return continued to increase from 77.27% in 2008 to 87.54% in 2011. It experienced a drop down to 56.64% in 2009. Growth in this sector has been fuelled by construction of that period. Alternative investment market has had erratic ROE. It declined from 14.75% in 2006 to 9.5% in 2007 but increased to 39.89% in 2008 but has been declining down to 12.48% in 2011. Each of the sectors have exhibited different ROE pattern over the study period.

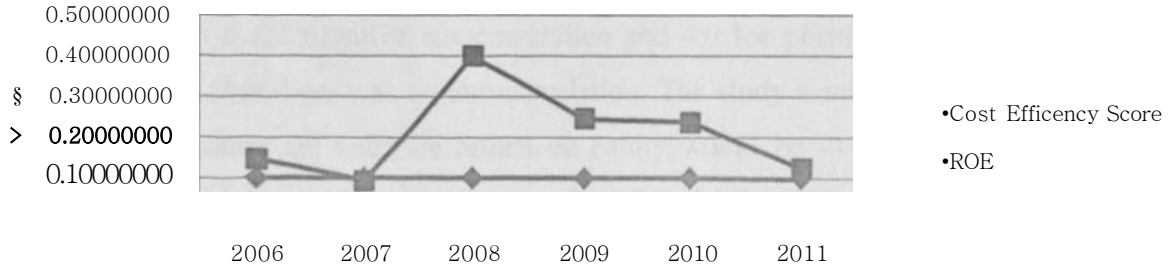
4.3.4 Comparing Annual Average Cost X-efficiency Scores and ROE

Table 4.11: Annual Average Cost X-efficiency and ROE

	2006	2007	2008	2009	2010	2011
Cost Efficency Score	0.10022064	0.10022059	0.10013820	0.10012566	0.10017488	0.10011661
ROE	0.1475712	0.0948184	0.3989485	0.2460666	0.2382122	0.124757

Source: Author's own computation based on data obtained from Nairobi Securities Exchange

Figure 4.5:Annua l Average Cost X-efficiency Scores and ROE



Source: Author's own Computation based on data obtained from Nairobi Securities Exchange

Tables 4.11 and Figure 4.4 show Annual average Cost x-efficiencies scores against the Return on Equity. From the graph, cost x-efficiency scores show an average 10 % over the study

period but the ROE has depicts both decline and increase during the same period. ROE declined from 14.75% in 2006 to 9.48% in 2007 or a 5.27% drop while Cost X-efficiency score decline in the same period was negligible. Between 2007 and 2008 ROE increase by 30.41% from 9.48% to 39.89.%. During the same period Cost X-efficiency score declined by 0.01%. in 2008 to 2009 ROE declined by 15.29% form 39.89% to 24.6% while cost x-efficiency scores declined by less that 0.01%. between 2010 to 2011 ROE declined for 23.82% to 12.49% which was a decline of 11.33% while Cost x-efficiency declined by 0.01%.Form the above there does not seem to be any pattern of relationship between the Cost X-efficiency scores and Return on Equity. While Cost x-efficency has been declining negligibly on average ,Return on Equity has shown both significant increase and decrease during the period 2007 - 2008 and 2008- 2011 respectively.The big spike in both direction by ROE while Cost x-efficiency has remained average does not suggest any relationship of the two.

4.4 Discussion

From the determination coefficients, it can be denoted that there is a moderately strong

relationship between dependent and independent variables in the 2006-2011 datasets since the R" values were between 0.340 and 0.479. However, the strongest relationship was experienced in the 2008 dataset. That is, within the year, Cost X-efficiency accounted to 47.9% variations in firms' financial performance.

The study also used Durbin Watson (DW) test to check that the residuals of the models were not auto correlated since independence of the residuals is one of the basic hypotheses of regression analysis. Being that the DW statistics were close to the prescribed value of 2.0 for residual independence, than 0 for negative autocorrelation and 4.0 for positive autocorrelation. It can, thus, be concluded that there was no autocorrelation. The study results illustrates that when all the independent factors are null, the return on equity would be -0.460. This depicts that the company/firm would go at a loss in absence of good technological efficiency. Further, holding other factors constant, a unit increase in total assets would lead to a 0.500 decrease in financial performance; a unit increase in cost of raw material and sales expense would lead to a 0.404 increase in financial performance; a unit increase in net sales would lead to a 0.204 increase in financial performance; while a unit increase in net profits would yield a 0.058 in financial

performance. The absence of the independent variables, financial performance value would be 0.154. Holding other factors constant, a unit increase in total assets would lead to a 0.138 decrease in financial performance; a unit increase in sales expense/raw materials would yield a 0.259 decrease in financial performance. On the other hand, a unit increase in net profit would yield a 0.430 improvement.

The absence of the independent variables, financial performance value would be -4.960. Holding other factors constant, a unit increase in total assets would lead to a 0.278decrease in financial performance and a unit increase in net profit would yield a 0.408 improvement. On the other hand, a unit increase in sales expense/raw materials would yield a 0.146 increase in financial performance; a unit increase in net profits yields 1.231 increase in performance.

The multiple regression when independent variables value are null, financial performance value would be 1.430. Holding other factors constant, a unit increase in total assets would result to a 1.549 decrease in financial performance and a unit increase in net profit would yield a 0.235 improvement. On the other hand, a unit increase in sales expense/raw materials would yield a 0.037 increase in financial performance; a unit increase in net sales yields 1.231 increase in performance.

4.5 Summary

This study summarizes the statistical relationships in a regressions and does not establish a concrete relationship. The interpretation of the above results ought to be considered in the context of short and long-term relationships being insignificant. The Granger causality, if applied with sufficient lags, is about long-term phenomenon, whereas the regression is short to medium term. The results do not reveal any discernible long-term pattern of causation between cost X-efficiency and financial performance, to confirm or reject either the relationship of the main variables in the study. Following the statistic results the insignificant F-statistics in both directions suggest independent relationship between cost X-efficiency and financial performance, which implies that cost X-efficiency and financial performance are not necessarily dichotomous, but could exist either singularly or simultaneously.

CHAPTER FIVE

SUMMARY AND CONCLUSIONS

5.1 Introduction

This chapter presents discussions of the key findings presented in chapter four, conclusions drawn based on such findings and recommendations there-to. This chapter is, thus, structured into 5.2 summary, 5.3 conclusions, 5.4 Policy recommendations, 5.5 suggestions for further research and 5.6 limitations of the study.

5.2 Summary

The study sort to find out the relationship between cost X-efficiency and Financial performance. Efficiency measurement is one aspect of a company's performance with the objective of finding the relationship between maximization of output and minimization of cost or maximization of profits. In general efficiency is important to companies themselves as it has direct relationship with profitability (present and future), competitiveness, and solvency. Agency theory and firm-as-contract theory, although arising from different sources, are closely related and share a common emphasis: efficiency. Measuring of cost X-efficiency of listed companies serve two important purposes. It helps benchmark the relative efficiency of an individual company against the '"best practice" firms within the industry and across industries. Efficiency addressed in literature is in term of scale and scope or in terms of X-efficiency or both, as posted by Limam (2010) that Scale efficiency addresses question whether a firm is operating at the minimum of its long-run average cost curve. Scope efficiency is measured by difference between the cost of joint production and the sum of producing the different output individually. Cost X-efficiency refer to how close a firm's actual cost are to the cost of best-practice firm producing same output. Cost X-efficiency reflects managerial ability to drive down production costs, controlled for output volumes and input price levels. Cost X-inefficiency may arise because managers use more input than would a best-practice firm (technical inefficiency) or because they employ an input mix that does not minimize cost for a given input vector (allocative inefficiency) (Berger,2000). Leibenstein argues that X-inefficiency arises from the fact that "neither individuals nor

firms work as hard, nor do they search for information.

Two primary methodologies have been developed for measuring X-efficiency - the econometric approach and the mathematical programming approach. Both methodologies involve the estimation of "best practice" frontiers, with the efficiency of specific decision making units (DMUs) measured relative to the frontiers. The econometric approach specifies a functional form for the cost, profit, or production frontier. The methodology is stochastic; firms can be off the frontier because they are inefficient or because of random shocks or measurement errors that have nothing to do with inefficiency. Thus, the cost function error term is hypothesized to consist of an inefficiency component and a purely random component. Efficiency is measured by separating the efficiency component from the overall error term. Cost X-efficiency scores were calculated using Frontier 4.1. Firm performance was measured by ROE of the individual firms as calculated by dividing Net profit of individual firm over the shareholders' equity. The study compared the relationship between Cost X-efficiency scores and the Financial performance to establish whether the level of significance does exists.

The results do not reveal any discernible long-term pattern of causation between cost X-efficiency and financial performance, to confirm or reject either the relationship of the main variables in the study. Following the statistic results the insignificant F-statistics in both directions suggest independent relationship between cost X-efficiency and financial performance, which implies that cost X-efficiency and financial performance are not necessarily dichotomous, but could exist either singularly or simultaneously. The study establishes how assets management measures demonstrate how efficient management uses a firm's assets to generate sales over a certain period of time. Asset management ratios (asset utilization ratios) show how efficiently and intensively assets are used to create sales efficiently and intensively. These ratios include, for example, inventory turnover, receivable turnover and assets .Moreover the study findings establishes that firms that sell assets to increase their operating efficiency are typically poor performers. Firms are to sell their own assets if they find that alternative funding is too expensive and thus portend that total assets and cost of raw material and sales expenses significantly leads to a higher firm performance.

5-3 Conclusions

This study sought to investigate the relationship between cost X-efficiency and financial performance of companies listed in the Nairobi Securities Exchange in Kenya.The study findings concludes that Cost X-inefficiency may arise because managers use more input than would a best-practice firm (technical inefficiency) or because they employ an input mix that does not minimize cost for a given input vector,moreover its established that X-inefficiency arises from the fact that "neither individuals nor firms work as hard, nor do they search for information as effectively, as they could." More specifically, the results exits that X-efficiency as the ratio of the minimum costs that could have been expended to produce a given output bundle to the actual costs expended and varies between 0 and 100 percent. X-efficiency stems from technical efficiency. This concurs with Nyahan (1998) who defines technical efficiency measures as a way of using minimum inputs to produce a given level output (output orientation). Finally, technical efficiency could be deterministic or Stochastic and gives the maximum output that can be attained for a given level of input, or minimum cost for a given level of output and input prices.

5.4 Policy Recommendations

The study recommends that in measuring the cost X-efficiency, one should compare observed cost and output-factor combinations with optimal combinations determined by the available technology (efficient frontier) .The analysis could be either stochastic or deterministic. A further distinction is made between parametric or nonparametric approaches.

Moreover the study assert that there may be differences between specialized and non-specialized firms with respect to the degree of operational efficiency .X-efficiency thus provides a measure of how close a firm's actual cost is to what a best-practice firm's cost would be for producing an identical output bundle under comparable conditions. The measure is usually derived from a cost function where the dependent variable is total costs (C) and the independent variables include the prices of inputs (p), the quantities of outputs (y), other factors that may affect performance (z), and an error term.

5.5 Suggestions for further study

There is need for further studies to carry out similar tests for a longer time period. A similar study should also be carried out on MFIs with cost as the proxy for output to try and assess whether the cost X-efficiency and Financial performance is drastically altered by the change of variables.

5.6 Limitation of the study

Time was a major constrain in undertaking this study. This left out valuable contribution from the respondents who are involved in the day-to-day duties in these organizations. It therefore may not be representative of all organization in the country. However it has taken into account other views along theoretical analysis.

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APPENDICES

Appendix 1: List of Listed Companies at the NSE

1. Eaagads
2. Kakuzi Ltd.
3. Kapchorua tea Co.
4. Limuru tea Co.
5. Rea Vipingo
6. Sasini Ltd,
7. Williamson Tea
8. Car & General (K)
9. CMC holding
10. Marshalls (EA)
11. Sameer Africa
12. Barclays Bank of Kenya (BBK)
13. C.F.C Stanbic Holdings (CFC)
14. Diamond Trust Bank Kenya (DTK)
15. Equity Bank (EQUITY)
16. Housing Finance (HF)
17. Kenya Commercial Bank (KCB)
18. National Bank of Kenya (NBK)
19. National Industrial Credit Bank (NIC)
20. Standard Chartered Bank (SCBK).
21. Co-operative Bank,Express,
22. Hutching Biemer
23. Kenya Airways
24. Nation Media Group
25. ScanGroup
26. Standard Group
27. TPS EA (Serena)
28. Uchumi Supermarkets
29. AthiRiver Mining
30. Bamburi Cement
31. Crown Berger
32. E.A. Cables
33. E.A. PortlandCement
34. Ken Gen
35. KenolKobil Ltd
36. KP&LC,
37. Total Kenya
38. British American Investment
39. CFC Insurance Holding
40. Jubilee Holding
41. Kenya Re-Corporation

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9. CMC holding
10. Marshalls (EA)
11. Sameer Africa
12. Barclays Bank of Kenya (BBK)
13. C.F.C Stanbic Holdings (CFC)
14. Diamond Trust Bank Kenya (DTK)
15. Equity Bank (EQUITY)
16. Housing Finance (HF)
17. Kenya Commercial Bank (KCB)
18. National Bank of Kenya (NBK)
19. National Industrial Credit Bank (NIC)
20. Standard Chartered Bank (SCBK).
21. Co-operative Bank,Express,
22. Hutching Biemer
23. Kenya Airways
24. Nation Media Group
25. ScanGroup
26. Standard Group
27. TPS EA (Serena)
28. Uchumi Supermarkets
29. AthiRiver Mining
30. Bamburi Cement
31. Crown Berger
32. E.A. Cables
33. E.A. PortlandCement
34. Ken Gen
35. KenolKobil Ltd
36. KP &LC,
37. Total Kenya
38. British American Investment
39. CFC Insurance Holding
40. Jubilee Holding
41. Kenya Re-Corporation

42. Pan African Insurance
43. Centum Investment
44. City Trust
45. Olympia Capital Holding
46. Trans -Century

Appendix II: Consolidate Firms Data (2006 -2011)

NectorVFirm	Year	Total Assets	CRSE	Net Sales	Pre-Tax Profit	ROE
Agriculture						
Rea Vipingo Ltd.	2011	1,414,243	214,222	214,066	60,234	0.1373
Sasini Tea & Coffee Ltd.	2011	8,000,066	1,929,050	759,722	331,612	0.1419
;<akuzi Ltd.	2011	2,872,203	212	558,890	210,932	0.6936
Commercial and Sen ices						
Uarshalls E.A. Ltd.	2011	1,436,207	329,984	117,479	57,748	0.0604
Car & General Ltd.	2011	3,204,878	221,552	1,793,900	911,638	0.4791
Kenya Airways Ltd.	2011	76,037,020	37,081,000	5,664,000	1,827,573	0.0311
CMC Holdings Ltd.	2011	2,190,951	338,558	807,283	484,477	0.7156
Nation Media Group Ltd.	2011	6,575,622	89,300	1,617,400	1,176.689	0.6331
TPS (Serena) Ltd.	2011	6,995,489	1,943,771	520,002	382,930	0.1306
v.andard Group Ltd.	2011	3,002,895	891,572	376,493	247,619	0.1421
Finance and Investment						
Barclays Bank of Kenya Ltd.	2011	164,876,000	2,553,894	9,002,000	7,667,532	1.6789
Housing Finance Ltd.	2011	18,239,359	608,586	544,100	311,638	0.1671
Centum Investment Ltd.	2011	6,398,081	67,171	475,653	376,587	0.1943
Kenya Commercial Bank Ltd.	2011	195,011,548	760,334	5,113,456	3,300,361	0.5562
National Bank of Kenya Ltd.	2011	51,404,408	1,929,755	3,422,862	2,159,441	0.6093
Pan Africa Insurance Holdings Co. Ltd	2011	7,563,815	2,099,178	3,732,267	173,647	0.0401
D;amond Trust Bank of Kenya Ltd.	2011	66,679,080	1,085,191	3,041,672	1,929.862	1.2700
Jubilee Insurance Co. Ltd	2011	23,736,372	438,019	3,516,778	1,115,776	0.4825
Standard Chartered Bank Ltd.	2011	123,778,972	1,392,560	4,660.483	3,559,028	1.2685

NIC Bank Ltd.	2011	47,558,241	1,223,952	4,969,889	2,916,342	0.8979
Equity Bank Ltd.	2011	100,812,000	2,056,671	5,279,294	3,694.921	0.6168
:(Wmpia Capital Holdings Ltd	2011	511,767	36,170	61,945	46,587	0.1101
Industrial and Allied						
Aihi River Mining Ltd.	2011	12,132,107	4,658,399	948,714	559,028	0.0698
BOC Kenya Ltd.	2011	1,017,943	454,607	231,682	178,535	0.1227
Sntsh American Tobacco Kenya Jd.	2011	10,376,647	1,248.055	2,108,964	1,694,921	0.2966
Cinacid Investments Ltd. .	2011	669,273	142,237	2,525,633	1,871,811	8.9652
EA Cables Ltd.	2011	3,540,261	635,519	726,444	497,823	0.2644
EA Breweries Ltd.	2011	35,850,167	2,746,441	11,989,258	8,416,342	0.6911
iameer Africa Ltd.	2011	930,329	117,044	221,464	144,483	1.2344
Vfamas Sugar Company Ltd.	2011	17,477,844	975,907	1,193,161	903,983	0.1216
Unga Group Ltd.	2011	5,569,106	334,142	260,439	120,662	0.0499
Bamburi Cement Ltd.	2011	32,094,520	6,227,000	9,596,000	7,236,005	0.6477
Own berger (K) Ltd.	2011	1,862,341	97,860	139,818	83,582	0.0818
EA Portland Cement Co. Ltd.	2011	12,053,583	4,426,723	1,881,678	920,873	0.1551
fccya Power & Lighting Co. Ltd.	2011	70,611,963	2,461,017	4,782,433	3,990,543	0.0911
T-xal Kenya Ltd.	2011	31,601,321	3,978,000	733,699	533,596	0.0236
Evready East Africa Ltd.	2011	999,964	469,496	741,568	316,281	0.3170
Alternative Investment Market						
A- Baumann & Company	2011	253,312	5,935	15,799	-7,394	(0.1127)
^igads Ltd	2011	218,174	6,750	16,830	11,156	0.1701
» Hiamson Tea Kenya	2011	2,754,040	349,183	145,341	76.689	0.1450
KenyaOchards	2011	1,276,950	29,984	132,911	82,930	0.1832

Express Ltd	2011	2,525,126	389,913	225,916	118.920	0.1334
Kapchorua Tea Co. Ltd	2011	1,167,195	271,966	99,735	-87,619	(0.1831)
Limuru Tea	2011	19,043	11,693	38,731	15,520	0.5383
Agriculture						
Rea Vipingo Ltd.	2010	1,633,460	202,358	227,219	110,516	0.1460
Sasini Tea & Coffee Ltd.	2010	6,796,198	1,717,778	1,266,406	935,202	0.4498
Kakuzi Ltd.	2010	2,660,669	604,515	390,189	247,861	0.2446
Commercial and Services						
Marshalls E.A. Ltd.	2010	1,208,104	449,880	169,688	113,319	0.1169
Car & General Ltd.	2010	2,744,780	208,038	321,565	147,040	0.0907
Kenya Airways Ltd.	2010	76,798,760	3,679,400	5,513,000	2,159,610	0.0424
CMC Holdings Ltd.	2010	12,054,071	240,868	1,328,849	744,068	0.1035
Nation Media Group Ltd.	2010	6,610,765	131,200	1,910,300	1,771,591	0.7689
TPS (Serena) Ltd.	2010	6,508,425	1,738,714	330,014	276,587	0.1004
Standard Group Ltd.	2010	2,689,994	842,960	428.774	251.312	0.1489
Finance and Investment						
Barclays Bank of Kenya Ltd.	2010	168,510,000	1,926,705	8,016,000	6,803,565	1.4493
Housing Finance Ltd.	2010	14,294,368	149,051	436,755	334.334	0.1894
Centum Investment Ltd.	2010	8,146,143	26,039	985,280	747,861	0.5899
Kenya Commercial Bank Ltd.	2010	191,211,586	559,835	4,843,356	3,658,583	0.6222
National Bank of Kenya Ltd.	2010	42,695,700	1,612,990	3,118,207	2,002,833	0.5828
Pan Africa Insurance Holdings Co. Ltd	2010	6,094,129	1,826,155	3,432,080	1,903,726	0.4450
Diamond Trust Bank of Kenya Ltd.	2010	56,145,697	959,309	2,745,951	2,073,700	1.4435
Jubilee Insurance Co. Ltd	2010	20,202,824	92,467	3,059,824	2,660,220	1.1354

Standard Chartered Bank Ltd.	2010	99,019,571	973,729	4,373,698	3,001,257	1.1621
NIC Bank Ltd.	2010	42,619,119	893,814	4,687,567	3,714,367	1.2712
Equity Bank Ltd.	2010	78,879,000	1,508,064	5,601,439	4,717,081	0.8482
Olympia Capital Holdings Ltd	2010	500,720	76,798	34,875	21,550	0.0520
Industrial and Allied						
Athi River Mining Ltd.	2010	6,347,257	2,382,004	705,450	686.169	0.1624
BOC Kenya Ltd.	2010	919,958	603,119	295,179	129,172	0.0806
British American Tobacco Kenya Ltd.	2010	10,304,789	1,013,524	2,416,913	1,718,047	0.3173
Carbacid Investments Ltd..	2010	1,071,603	146,750	2,506,467	1,863,391	10.0692
E.A. Cables Ltd.	2010	3,043,397	488,078	669,927	503,618	0.3004
E.A. Breweries Ltd.	2010	33,278,212	2,269,487	12,316,332	9,083,267	0.8156
Sarneer Africa Ltd.	2010	6,300,573	128,528	165,522	90,478	0.0411
Mumias Sugar Company Ltd.	2010	14,158,660	1,712,983	1,589,204	913,768	0.1788
Unga Group Ltd.	2010	4,760,910	259,438	564,016	324,277	0.1804
Bamburi Cement Ltd.	2010	28,194,120	2,170,000	4,889,000	2,322,788	0.2000
Crown berger (K) Ltd.	2010	1,952,436	96,002	77,781	23,645	0.0210
E.A Portland Cement Co. Ltd.	2010	9,070,216	650,221	715,889	512,909	0.1016
Kenya Power & Lighting Co. Ltd.	2010	59,797,115	1,412,457	2,738,309	1,101.894	0.0307
Total Kenya Ltd.	2010	14,554,316	902,908	1,031,368	950,843	0.1000
Evcready East Africa Ltd.	2010	836,886	86,765	27,855	22,107	0.0469
Alternative Investment Market						
A. Baumann & Company	2010	230,906	58,511	94,479	42,138	0.5009
Eaagads Ltd	2010	216,752	38,511	42,960	22,811	0.2712
Williamson Tea Kenya	2010	3,623,534	80,201	143,984	77,216	0.0731

KenyaOchards	2010	1,111,299	49,880	116,725	61,107	0.1573
Express Ltd	2010	2,247,040	78,979	52,864	19,140	0.0215
Kapchorua Tea Co. Ltd	2010	981,722	43,165	103,081	67,612	0.1874
Limuru Tea	2010	17,243	11,39?	15,234	9,875	0.4560
Agriculture						
Rea Vipingo Ltd.	2009	1,166,763	60,026	167,785	113,381	0.2479
Sasini Tea & Coffee Ltd.	2009	3,826,192	61,433	70,723	33,019	0.0379
Kakuzi Ltd.	2009	2,371,746	27,784	270,330	143,525	0.1296
Commercial and Services						
Marshalls E.A. Ltd.	2009	1,257,800	60,090	142,321	97,066	0.0808
Car& General Ltd.	2009	2,045,490	189,960	257,446	162,925	0.1410
Kenya Airways Ltd.	2009	77,226,570	4,108,400	5,975,000	4,155.862	0.0747
CMC Holdings Ltd.	2009	9,308,870	256,508	879,236	753,314	0.1431
Nation Media Group Ltd.	2009	5,904,414	267,200	1,601,600	1,125,316	0.5204
TPS (Serena) Ltd.	2009	6,778,670	177,465	617,380	510,201	0.1644
Standard Group Ltd.	2009	2,207,221	70,917	413,120	235,852	0.1671
Finance and Investment						
Barclays Bank of Kenya Ltd.	2009	157,655,668	995,542	7.078.800	6,066,012	1.4617
Housing Finance Ltd.	2009	10,369,255	212,099	352,814	250,894	0.1506
Centum Investment Ltd.	2009	8,422,008	73,363	1,185,778	916,110	0.7808
Kenya Commercial Bank Ltd.	2009	120,479,553	889,498	3,598,781	2,325,291	0.4768
National Bank of Kenya Ltd.	2009	41,414,272	289,024	2,733,201	1,354,852	0.4041
Pan Africa Insurance Holdings Co. Ltd	2009	5,901,463	190,510	3,867,619	2,641,375	0.5918
Diamond Trust Bank of Kenya Ltd.	2009	35,997,571	912,895	2,002,037	1,335,713	1.0783

Jubilee Insurance Co. Ltd	2009	17,942,462	179,307	3,136,456	2,631,995	1.3409
Standard Chartered Bank Ltd.	2009	91,121,942	1,071,572	4,270,874	3,910,188	1.6827
NIC Bank Ltd.	2009	31,281,018	911,902	4,405,295	3,049,907	1.1110
Equity Bank Ltd.	2009	53,129,246	1,059,132	4,539,715	3,378,520	0.6759
Olympia Capital Holdings Ltd	2009	325,131	106,687	260,090	142,675	0.3590
Industrial and Allied						
Athi River Mining Ltd.	2009	4,505,342	166,635	620,640	485,887	0.1778
BOC Kenya Ltd.	2009	1,860,189	62,531	399,769	269.929	0.1850
British American Tobacco Kenya Ltd.	2009	9,281,857	1,032,190	2,049,596	1,859,438	0.4063
Carbacid Investments Ltd..	2009	919,343	199,670	2,452,291	1,002,404	5.6045
E.A. Cables Ltd.	2009	3,206,272	671,922	597,486	383,748	0.1821
E.A. Breweries Ltd.	2009	53,011,124	2,051,597	10,635,771	7,742,910	0.3842
Sameer Africa Ltd.	2009	3,445,559	151,947	166,520	92,439	0.0417
Mumias Sugar Company Ltd.	2009	11,924,045	196,583	1,909,894	1,131,910	0.3162
Unga Group Ltd.	2009	3,723,169	50,571	156,665	117,890	0.0843
Bamburi Cement Ltd.	2009	20,722,600	2,422,000	5,443,000	3,101,068	0.5493
Crown berger (K) Ltd.	2009	1,522,921	102,678	140,293	75,474	0.1060
E.A Portland Cement Co. Ltd.	2009	8,940,111	389,622	1,112,625	956,679	0.1794
Kenya Power & Lighting Co. Ltd.	2009	47,378,524	722,646	2,648,691	1,833,229	0.0731
Total Kenya Ltd.	2009	12,516,693	384,343	781,935	403,938	0.0520
Eveready East Africa Ltd.	2009	1,189,419	101,757	179,505	115,141	0.1543
Alternative Investment Market						
A. Baumann & Company	2009	155,164	16,667	13,059	5,473	0.1079
Eaagads Ltd	2009	245,483	4,428	28,921	15,738	0.2896

Williamson Tea Kenya	2009	3,133,474	62,681	214,067	133,850	0.1599
KenyaOchards	2009	1,032,081	60,905	124,699	93,436	0.2759
Express Ltd	2009	1,229,265	12,362	112,380	80,157	0.2110
Kapchorua Tea Co. Ltd	2009	947,655	23,937	20,545	-13,372	(0.0430)
Limuru Tea	2009	26,684	14,426	24,458	14,366	0.7212
Agriculture						
Rea Vipingo Ltd.	2008	1,066,042	168,381	157,358	105,505	0.2546
Sasini Tea & Coffee Ltd.	2008	3,831,538	50,418	349,493	181,760	0.2272
Kakuzi Ltd.	2008	2,292,944	66,045	189,752	114,773	0.0916
Commercial and Services						
Marshalls E.A. Ltd.	2008	1,085,248	60,861	534,850	317,352	0.2607
Car & General Ltd.	2008	1,431,411	160,461	176,815	117,246	0.1679
Kenya Airways Ltd.	2008	69,316,470	1,362,180	6,960,000	5,128,759	0.0986
CMC Holdings Ltd.	2008	7,820,183	409,723	559,036	322,549	0.0755
Nation Media Group Ltd.	2008	5,290,372	358,900	1,150,800	943,799	0.5257
TPS (Serena) Ltd.	2008	6,140,073	207,753	498,605	113,619	0.0415
Standard Group Ltd.	2008	1,290,214	173,964	304,507	176.959	0.2446
Finance and Investment						
Barclays Bank of Kenya Ltd.	2008	117,722,000	910,558	6,475,000	3,143,217	0.8344
Housing Finance Ltd.	2008	9,133,831	29,597	278,684	120,218	0.0732
Centum Investment Ltd.	2008	6,430,230	48,604	696,489	416,396	0.4001
Kenya Commercial Bank Ltd.	2008	92,526,571	852,037	3,502,189	2,178.870	0.5156
National Bank of Kenya Ltd.	2008	36,122,843	105,798	2,663,204	1,189,176	0.3627
Pan Africa Insurance Holdings Co. t Ltd	2008	4,752,584	925,096	3,850,217	2,510,937	0.7331

Diamond Trust Bank of Kenya Ltd.	2008	21,737,391	663,324	1,985,233	1,002,579	0.9606
Jubilee Insurance Co. Ltd	2008	15,356,375	76,708	3,146,248	2,197,452	1.1542
Standard Chartered Bank Ltd.	2008	81,014,123	947,619	4,307,263	3,728,611	1.7228
NIC Bank Ltd.	2008	26,062,413	953,807	4,468,275	2,494,259	0.9880
Equity Bank Ltd.	2008	20,024,484	926,279	4,629,292	2,360,177	0.5383
Olympia Capital Holdings Ltd	2008	158,010	106,687	231,960	103,870	0.2838
Industrial and Allied						
Athi River Mining Ltd.	2008	4,257,578	179,814	1,438,211	1,059,793	0.3680
BOC Kenya Ltd.	2008	1,707,159	69,191	333,705	150,200	0.1048
British American Tobacco Kenya Ltd.	2008	7,764,229	760,959	1,746,526	1,165,799	0.3255
Carbacid Investments Ltd..	2008	789,479	240,643	2,181,358	1,380,313	8.0913
E.A. Cables Ltd.	2008	1,908,250	333,311	422,812	360,523	0.3270
E.A. Breweries Ltd.	2008	55,718,512	1,905,700	8,577,049	6,333,955	0.4014
Sameer Africa Ltd.	2008	3,311,601	20,183	114,865	92,599	0.0635
Mumias Sugar Company Ltd.	2008	1 1,861,648	215,541	2,219,889	1.554,636	0.3735
Unga Group Ltd.	2008	3,589,766	89,098	142,427	118,813	0.0853
Bamburi Cement Ltd.	2008	18,522,820	2,319,000	3,838,000	1,317,900	0.2759
Crown berger (K) Ltd.	2008	1,536,272	11,648	80,350	67,931	0.0889
E.A Portland Cement Co. Ltd.	2008	9,051,361	457,733	924,364	800,793	0.1340
Kenya Power & Lighting Co. Ltd.	2008	38,670,930	604,355	2,497,983	1,732,381	0.0954
Total Kenya Ltd.	2008	15,334,536	310,448	677,194	332,881	0.0311
Eveready East Africa Ltd.	2008	919,049	82,900	234,036	163,418	0.3431
Alternative Investment Market						
A. Baumann & Company	2008	189,057	16,188	49,991	-12,177	(0.2847)
Eaagads Ltd	2008	203,564	47,085	191,070	115,396	2.3233

Williamson Tea Kenya	2008	5,481,984	68,580	86,666	50,677	0.0557
KenyaOchards	2008	968,662	6,861	58,818	19,367	0.0673
Express Ltd	2008	1,768,261	13,370	102,508	91,456	0.1766
Kapchorua Tea Co. Ltd	2008	1,034,277	24,691	133,720	100,984	0.2879
Limuru Tea	2008	27,777	1,386	6,955	3,180	0.1665
Agriculture						
Rea Vipingo Ltd.	2007	1,046,435	18,298	185,139	91,082	0.2138
Sasini Tea & Coffee Ltd.	2007	3,441,606	42,491	524,894	468,966	0.7154
Kakuzi Ltd.	2007	2,066,488	54,003	112,082	94,483	0.0819
Commercial and Services						
Marshalls E.A. Ltd.	2007	988,016	5,211	61,850	45,378	0.0435
Car & General Ltd.	2007	1,159,794	119,619	283,010	121,085	0.2171
Kenya Airways Ltd.	2007	44,873,360	1,849,000	4,652,000	3,153,265	0.0971
CMC Holdings Ltd.	2007	7,048,455	369,782	461,680	211,903	0.0528
Nation Media Group Ltd.	2007	4,426,745	37,100	1,018,400	922,287	0.7711
TPS (Serena) Ltd.	2007	5,024,784	18,998	140,300	100,284	0.0381
Standard Group Ltd.	2007	980,914	86,335	118,051	81,102	0.1310
Finance and Investment						
Barclays Bank of Kenya Ltd.	2007	104,226,000	1,075,208	5,427,000	4,096,408	1.1586
Housing Finance Ltd.	2007	9,861,078	175,937	283,041	122,679	0.0731
Centum Investment Ltd.	2007	4,092,521	182,198	373,999	278,817	0.2963
Kenya Commercial Bank Ltd.	2007	78,315,052	425,521	2.686,303	1,045,718	0.2632
National Bank of Kenya Ltd.	2007	32,583,569	109,763	1,750,764	914,309	0.2873
Pan Africa Insurance Holdings Co. ! Ltd	2007	3,696,063	769,865	2,815,235	1,635,032	0.5914

Diamond Trust Bank of Kenya Ltd.	2007	16,384,422	442,037	1,559,698	1,003,875	1.0121
Jubilee Insurance Co. Ltd	2007	11,590,704	814,209	2,944,162	2,216,419	1.1708
Standard Chartered Bank Ltd.	2007	72,841,617	786,381	3,008,627	2,332,929	1.2005
NIC Bank Ltd.	2007	20,585,232	985,804	3,073,092	2,563,617	1.0702
Equity Bank Ltd.	2007	19,678,091	907,664	3,137,556	2,767,707	0.6756
Olympia Capital Holdings Ltd	2007	107,972	14,275	48,706	22,559	0.0790
Industrial and Allied						
Athi River Mining Ltd.	2007	3,238,171	15,082	295,920	116,568	0.0575
BOC Kenya Ltd.	2007	1,612,618	57,480	291,257	180,180	0.1338
British American Tobacco Kenya Ltd.	2007	6,253,409	661,449	2,008,971	1,185,083	0.5036
Carbacid Investments Ltd..	2007	706,859	184,305	1,578,437	1,061,073	6.2969
E.A. Cables Ltd.	2007	1,051,631	44,592	294,035	187,576	0.4051
E.A. Breweries Ltd.	2007	49,914,318	1,690,612	8,599,051	7,729,550	0.5372
Sameer Africa Ltd.	2007	3,206,447	146,024	294,253	175,225	0.1490
Mumias Sugar Company Ltd.	2007	9,503,625	180,885	1,843,381	1,173,941	0.3435
Unga Group Ltd.	2007	3,868,468	91,987	155,017	122,007	0.0699
Bamburi Cement Ltd.	2007	15,337,890	1,030,000	3,147,000	2,116,524	0.5225
Crown berger (K) Ltd.	2007	1,257,681	13,194	69,726	40,436	0.0661
E.A Portland Cement Co. Ltd.	2007	7,720,497	457,036	1,086,280	942,608	0.1725
Kenya Power & Lighting Co. Ltd.	2007	35,831,836	635,567	1,979,276	1,019,275	0.0602
Total Kenya Ltd.	2007	10,777,662	281,708	798,190	518,136	0.0842
Eveready East Africa Ltd.	2007	858,122	100,969	303,004	242,087	0.8329
Alternative Investment Market						
A. Baumann & Company	2007	387,655	35,214	2,393	-11,228	(0.0926)
Eaagads Ltd	2007	167,436	3,646	12,868	8,891	0.2232

Williamson Tea Kenya	2007	4,738,097	69,859	139,754	85,255	0.0970
KenyaOchards	2007	812,194	52,131	108,963	94,260	0.3278
Express Ltd	2007	1,423,809	41,680	76,580	43,525	0.1198
Kapchorua Tea Co. Ltd	2007	992,753	2,503	37,277	21,451	0.0670
Limuru Tea	2007	26,235	5,565	4,490	-1,610	(0.0785)
Agriculture						
Rea Vipingo Ltd.	2006	1,028,620	20,218	177.941	86,090	0.1901
Sasini Tea & Coffee Ltd.	2006	4,019,102	590,503	1,104,137	843,518	1.0385
Kakuzi Ltd.	2006	2,144,457	68,320	92,996	78,152	0.0741
Commercial and Services						
Marshal Is E.A. Ltd.	2006	958,488	7,329	22,256	16,224	0.0111
Car & General Ltd.	2006	742,755	29,436	44,006	15,247	0.0443
Kenya Airways Ltd.	2006	29,405,160	1,350,200	2,075,000	908,915	0.0433
CMC Holdings Ltd.	2006	6,308,240	44,829	381,875	114,160	0.0320
Nation Media Group Ltd.	2006	4,047,449	10,600	894,700	676,408	0.5672
TPS (Serena) Ltd.	2006	2,053,081	32,851	197,540	145,032	0.1506
Standard Group Ltd.	2006	976,693	13,322	451,908	360,284	0.5251
Finance and Investment						
Barclays Bank of Kenya Ltd.	2006	106,195,000	974,141	5,391,000	3,002,466	0.8667
Housing Finance Ltd.	2006	9,460,632	24,842	195,022	164,256	0.1063
Centum Investment Ltd.	2006	3,254,264	60,496	348,451	225,951	0.2635
Kenya Commercial Bank Ltd.	2006	69,600,167	992,666	2,266,545	1,521,820	0.4004
National Bank of Kenya Ltd.	2006	30,593,625	256,302	1,296,963	726,854	0.3211
Pan Africa Insurance Holdings Co. Ltd	2006	3,353,620	130,666	2,332,852	1,634,288	0.6398

Diamond Trust Bank of Kenya Ltd.	2006	11,167,723	901,692	1,366,007	959,441	0.9900
Jubilee Insurance Co. Ltd	2006	9,723,842	734,051	2,399,163	1,528,892	0.8783
Standard Chartered Bank Ltd.	2006	67,113,927	866,417	2,432,319	1,015,781	0.5356
NIC Bank Ltd.	2006	16,643,493	987,685	2,465,475	1,988,202	0.9847
Equity Bank Ltd.	2006	14,805,855	903,127	3,498,634	2,719,814	0.7155
Olympia Capital Holdings Ltd	2006	88,196	21,394	35,150	22,862	0.0881
Industrial and Allied						
Athi River Mining Ltd.	2006	2,023,431	33,214	172,368	108,414	0.1099
BOC Kenya Ltd.	2006	1,467,361	46,116	220,980	160,268	0.1221
British American Tobacco Kenya Ltd.	2006	6,115,814	607,488	1,750,602	1,064,875	0.4511
Carbacid Investments Ltd..	2006	639,347	205,670	1,925,884	1,202,670	7.6261
E.A. Cables Ltd.	2006	492,768	20,612	178,815	150,070	0.8567
E.A. Breweries Ltd.	2006	40,784,542	1,606,002	7,041,897	6,312,604	0.5009
Sameer Africa Ltd.	2006	2,990,488	113,583	400,473	260,360	0.2673
Mumias Sugar Company Ltd.	2006	9,140,938	192,127	1,138,550	958.819	0.2560
Unga Group Ltd.	2006	4,248,765	13,792	95,505	76,538	0.0339
Bamburi Cement Ltd.	2006	14,815,180	234,800	2,786,000	1,709,197	0.3951
Crown berger (K) Ltd.	2006	1,102,188	53,472	73,639	54,928	0.1126
E.A Portland Cement Co. Ltd.	2006	7,466,194	45,895	391,594	163,427	0.0288
Kenya Power & Lighting Co. Ltd.	2006	32,266,471	625,970	873,684	296,565	0.0200
Total Kenya Ltd.	2006	10,525,436	259,310	931,638	543,877	0.0903
Eveready East Africa Ltd.	2006	757,838	215,449	375,909	121,169	0.7196
Alternative Investment Market						
A. Baumann & Company	2006	383,123	38,604	28,272	-5,528	(0.0497)
Eaagads Ltd	2006	171,711	3,208	12,760	9,551	0.2778

Williamson Tea Kenya	2006	5,186,450	69,839	123,870	63,283	0.0708
KenyaOchards	2006	715,563	7,298	87,830	55,912	0.1962
Express Ltd	2006	1,398,115	1,903	10,237	7,258	0.0177
Kapchorua Tea Co. Ltd	2006	956,642	25,149	56,292	30,811	0.1000
Limuru Tea	2006	28,419	1,630	13,898	9,560	0.4202

Source: Data obtained from Nairobi Securities Exchange

APPENDIX III: Cost X-efficiency Score For Firms

SECTORVFIRM	FIRM No,	2006	2007	2008	2009	2010	2011	Avtriee
Agriculture								
Rea Vipingo Ltd.	1	0.1002855	0.1002854	0.1002848	0.1002856	0.1000000	0.1000000	0.1001902
Sasini Tea & Coffee Ltd	2	0.1002861	0.1002859	0.1002850	0.1000000	0.1000000	0.1002853	0.1001904
Kakuzi Lid.	3	0.1000000	0.1002859	0.1000000	0.1000731	0 1002849	0 1002851	0.1001548
Average		0.1001905	0.1002857	0.1001900	0.1001195	0.1000950	0.1001901	0.1001785
Commercial and Services								
MarshalIs E.A. Ltd.	4	0.1002861	0.1002862	0.1002849	0.1000000	0.1000000	O.IOOOOOO	0.1001429
Car & General Ltd.	5	0.1000000	0.1002852	0.1002853	0.1002854	0.1002850	0.1002850	0.1002377
Kenya Airways Ltd.	6	0.1002869	0.1002853	0.1002854	0.1000000	0.1002851	0.1002853	0.1002380
CMC Moldings Ltd.	7	0.1002852	0.1000000	0.1002848	0.1002853	0.1002853	0.1000000	0.1001901
Nation Media Croup Lid.	8	0.1000000	0.1000000	0.1000000	0.1002849	0.1000000	0.1000000	0.1000475
TPS (Serena) Ltd.	9	0.1002864	0.1002865	0.1000000	0.1002848	0.1000000	0.1000000	0.1001430
Standard Group Ltd.	10	0.1002861	0.1002860	0.1000000	0.1002852	0.1002853	0.1000000	0.1001904
Average		0.1002044	0.1002042	0.1001629	0.1002037	0.1001630	0.1000815	0.1001699
Finance and Investment								
Barclays Bank of Kenya Ltd.	11	0.1002848	0.1000000	0.1000000	0.1000000	0.1000000	0.1000000	0.1000475
Housing Finance Ltd.	12	0.1002854	0.1000000	0.1002850	0.1000000	0.1002850	0.1000000	0.1001426
Centum Investment Ltd.	13	0.1000000	0.1000000	0.1000000	0.1000000	0.1002850	0.1000000	0.1000475
Kenya Commercial Bank Ltd.	14	0.1000000	0.1000000	0.1000000	0.1000000	0.1000000	0.1002849	0.1000475
National Bank of Kenya Ltd.	IS	0.1002852	0.1002852	0.1000000	0.1000000	0.1000000	0.1000000	0.1000951
Pan Africa Insurance Holdings Co. Ltd	16	0.1002853	0.1002855	0.1000000	0.1002850	0.1002851	0.1000000	0.1001902
Diamond Trust Bank of Kenya Ltd.	17	0.1002849	0.1002849	0.1002850	0.1002849	0.1002848	0.1002854	0.1002850
Jubilee Insurance Co. Ltd	18	0.1000000	0.1000000	O.IOOOOOO	0.1000000	0.1002849	0.1002850	0.1000950
Standard Chartered Bank Ltd.	19	0.1002848	0.1000000	0.1000000	0.1000000	0.1000000	0.1002848	0.1000949
NIC Bank Ltd.	20	0.1002848	0.1000000	O.IOOOOOO	0.1000390	0.1002850	0.1002851	0.1001490
Equity Bank Ltd.	21	0.1002850	0.1002848	0.1000000	0.1000000	0.1002849	0.1002849	0.1001899
Olympia Capital Holdings Ltd	22	0.1002851	0.1002858	0.1002852	0.1002853	0.1002847	0.1002852	0.1002852
Average		0.1002138	0.1001188	0.1000713	0.I00074S	0.1001900	0.1001663	0.1001391
Industrial and Allied								
Athi River Mining Ltd.	23	0.1002866	0.1002864	0.1000932	0.1000000	01000000	0.1000000	0.1001110

BOC Kenya Ltd.	24	0.1002861	0.1002861	0.1000000	0.1000000	0.1000000	0.1000000	0.1000954
British American Tobacco Kenya Ltd.	25	0.1002854	0.1002852	0.1002853	0.1002852	0.1002851	0.1002851	0.1002852
Carbacid Investments Ltd..	26	0.1000000	0.1000000	0.1000000	0.1000000	0.1000000	0.1000000	0.1000000
E A. Cables Ltd.	27	0.1002856	0.1002855	0.1002857	0.1002855	0.1000000	0.1000000	0.1001904
E.A. Breweries Ltd.	28	0.1002850	0.1002848	0.1002848	0.1002848	0.1002848	0.1002848	0.1002848
Sameer Africa Ltd.	29	0.1002852	0.1002851	0.1002853	0.1000000	0.1002850	0.1000000	0.1001901
Mumias Sugar Company Ltd.	30	0.1002854	0.1002857	0.1000000	0.1000000	0.1000000	0.1000000	0.1000952
Unga Group Ltd.	31	0.1002855	0.1002850	0.1000000	0.1002850	0.1002850	0.1000000	0.1001901
Hamhuri Cement Ltd.	32	0.1002856	0.1002864	0.1002853	0.1002854	0.1002850	0.1000000	0.1002380
Crown berger (K) Ltd.	33	0.1002852	0.1002853	0.1002852	0.1000000	0.1000000	0.1002851	0.1001901
E.A Portland Cement Co. Ltd.	34	0.1002862	0.1002855	0.1002849	0.1002851	0.1002851	0.1000000	0.1002378
Kenva Power & Lighting Co. Ltd.	35	0.1002852	0.1002851	0.1000000	0.1000000	0.1002848	0.1002851	0.1001900
Total Kenya Ltd.	36	0.1002865	0.1002855	0.1002850	0.1002849	0.1002848	0 1000000	0.1002378
Evercady East Africa Ltd.	37	0.1002855	0.1002859	0.1002851	0.1002849	0.1002850	0.1002853	0.1002853
Average		0.1002666	0.1002665	0.1001773	0.1001521	0.1001710	0.1000950	0.1001881
Alternative Investment Market								
A. Baumann & Company	38	0.1000000	0.1002853	0.1002854	0.1000000	0.1002860	0.1000000	0.1001428
Eaagads Ltd	39	0.1000000	0.1002854	0.1000000	0.1002849	0.1000000	0.1000000	0.1000950
Williamson Tea Kenya	40	0.1002859	0.1002849	0.1000000	0.1002850	0.1002848	0.1002848	0.1002376
KenyaOchards	41	0.1000000	0.1002849	0.1002850	0.1000000	0.1002850	0.1000000	0.1001425
Express Ltd	42	0.1002858	0.1002854	0.1000000	0.1000000	0.1002849	0.1000000	0.1001427
Kapchorua Tea Co. Ltd	43	0.1002852	0.1002848	0.1000000	0.1000000	0.1000000	0.1002847	0.1001425
Limuru Tea	44	0.1002850	0.1002854	0.1002853	0.1000000	0.1002848	0.1000000	0.1001901
Average		0.1001631	0.1002851	0.1001222	0.1000814	0.1002036	0.1000814	0.1001562
Mean efficiency =		0.1001661						

Sourcc: Author's own Computation based on data obtained from Nairobi Securities Exchange

APPENDIX IV: Summary Return On Equity

SECTORVFIRM	Firm no.	2006	2007	2008	2009	2010	2011
Agriculture							
Rca Vipingo Ltd.	1	0.190105	0.213814	0.254634	0.247871	0.146031	0.137322
Sasini Tea & Coffee Ltd.	2	1.038484	0.715413	0.227204	0.037935	0.449832	0.141932
Kakuzi Ltd.	3	0.074076	0.081925	0.091628	0.129563	0.244583	0.693583
Average		0.434222	0.33705	0.191155	0.1384S6	0.280149	0.324279
Commercial and Scrviccs							
Marshall! E.A. Ltd.	4	0.011067	0.043538	0.260721	0.080767	0.116942	0.060359
Car & General Ltd.	5	0.044344	0.217111	0.16786	0.140962	0.090672	0.47913
Kenya Airways Ltd.	6	0.043344	0.097077	0.09856	0.074683	0.042423	0.03108
CMC Moldings Ltd.	7	0.031992	0.052771	0.075509	0.143137	0.103507	0.715557
Nation Media Group Ltd.	8	0.567218	0.771143	0.525705	0.520353	0.768886	0.633071
TPS (Serena) Ltd.	9	0.150623	0.038052	0.04155	0.164443	0.100356	0.130612
Standard Group Ltd.	10	0.525106	0.131031	0.244591	0.167094	0.148867	0.142102
Average		0.196242	0.192961	0.202071	0.184491	0.19595	0.31313
Finance and Investment							
Barclays Bank of Kenya Ltd.	11	0.866724	1.158627	0.834398	1.461699	1.449265	1.678926
Housing Finance Ltd.	12	0.106314	0.073055	0.073183	0.150639	0.189417	0.167136
Centum investment Ltd.	13	0.263457	0.2963	0.400078	0.780847	0.589926	0.194327
Kenya Commercial Bank Ltd.	14	0.400422	0.263156	0.515553	0.476847	0.622228	0.556229
National Bank of Kenya Ltd	15	0.321136	0.28731	0.362699	0.404094	0.582769	0.609306
Pan Africa Insurance Holdings Co. Ltd	16	0.639774	0.591391	0.733063	0.591802	0.44504	0.040145
Diamond Trust Bank of Kenya Ltd.	17	0.989971	1.01209	0.960647	1.078255	1.443486	1.270028
Jubilee Insurance Co. Ltd	18	0.878251	1.170784	1.154153	1.340935	1.135355	0.482528
Standard Chartered Bank Ltd.	19	0.535594	1.200493	1.722816	1.682678	1.162148	1.268533
NIC Bank Ltd.	20	0.984735	1.070156	0.987999	1.110957	1.271203	0.897897
Equity Bank Ltd.	21	0.71546	0.675581	0.538256	0.675866	0.84819	0.616768
Olympia Capital Holdings Ltd	22	0.088112	0.079038	0.283819	0.359015	0.052015	0.110091
Average		0.565829	0.656498	0.713889	0.842803	0.81592	0.657659
Industrial and Allied							
Athi River Mining Ltd.	23	0.109868	0.05746	0.368005	0.177805	0.162409	0.069772
BOC Kenya Ltd.	24	0.122069	0.133813	0.104778	0.184984	0.080575	0.122738
British American Tobacco Kenya Ltd.	25	0.451053	0.503567	0.325501	0.406289	0.317337	0.296571
Carbacid Investments Ltd. .	26	7.626122	6.296908	8.091311	5.6045	10.069173	8.965213

EA Cables Ltd.	27	0.856691	0.405058	0.326961	0.182099	0.300353	0.264433
E.A. Breweries Lid.	28	0.500893	0.537162	0.401424	0.384171	0.815564	0.691069
Samccr Africa Ltd.	29	0.267268	0.148993	0.063464	0.04166	0.04106	1.234433
Mumias Sugar Company Ltd.	30	0.256011	0.343505	0.37349	0.316246	0.178782	0.121564
Unga Croup Ltd.	31	0.033942	0.069863	0.085259	0.084305	0.180406	0.049878
Bambun Cement Ltd.	32	0.395099	0.52247	0.275884	0.549348	0.200016	0.647749
Crown berger (K) Ltd.	33	0.112591	0.066055	0.08894	0.105997	0.020993	0.081822
E.A Portland Cement Co. Ltd	34	0.028834	0.172479	0.134018	0.17944	0.101635	0.155052
Kenya Power & Lighting Co. Ltd	35	0.020033	0.060172	0.095351	0.073117	0.030668	0.091108
Total Kenya Ltd.	36	0.090254	0.084159	0.031144	0.052046	0.099994	0.023646
Evercadv East Africa Ltd.	37	0.719629	0.832913	0.343078	0.154297	0.046946	0.317019
Average		0.772691	0.682305	0.740574	0.56642	0.843061	0.875471
Alternative Investment Market							
A. Baumann & Company	38	-0.04967	-0.092557	-0.284678	0.10791	0.500945	-0.112713
Eaagads Ltd	39	0.277831	0.223179	2.323253	0.289584	0.271182	0.170061
Williamson Tea Kenya	40	0.070839	0.097026	0.055713	0.159894	0.073105	0.144992
Kenya Ochards	41	0.196178	0.327771	0.067345	0.275889	0.157339	0.18321
Express Ltd	42	0.017671	0.119843	0.176564	0.211044	0.021541	0.133369
Kapchorua Tea Co. Ltd	43	0.099985	0.066953	0.287937	-0.04304	0.187421	-0.183098
Limuru Tea	44	0.420164	-0.078487	0.166506	0.721185	0.455952	0.538309
Average		0.147571	0.094818	0.398948	0.246067	0.238212	0.124876
	Annual Average	0.147571	0.094818	0.398948	0.246067	0.238212	0.124876

Sourcc: Author's own Computation based on data obtained from Nairobi Securities Exchange