CAPITAL ALLOCATION AND EFFICIENCY OF BANKING INSTITUTIONS IN KENYA.

(THE CASE OF QUOTED BANKS AT NAIROBI STOCK EXCHANGE)

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This research paper has been submitted for examination with my approval as the university supervisor.

OTIENO LUTHER ODHIAMBO

DECLARATION

This research paper is my original work and has not been represented for a degree in any other university.

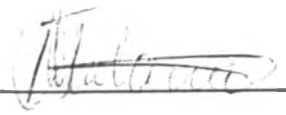

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TABLE OF CONTENTS

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Lastly I would like to thank my friends, my parents, my colleagues and most of all my two babies, Sandra and Nielson who had to persevere with my absence through out the course. Thank you very much! And God bless you all.

DEDICATION

To my husband Dr. Cyprianne Muyodi, my children Sandra and Nielson who believed that mum will make it and gave me the encouragement and determination to carry on.

ABSTRACT

Banking institutions as key participants in the economy's payment system leverage their equity capital with demandable debt. This debt creates risks that could disrupt a country's payment system, which could affect the general economy as a whole. The threat of a banking institutions falling into liquidity problems can be reduced by reducing moral hazard problems, reducing adverse selection problems, insuring depositors funds and instilling banking regulations that constrain risk-taking and defining standards of capital adequacy (Hughes et al 1997). Banks however, could also reduce risks of liquidity or financial distress by injecting in more capital, which could act as safety net of a banks exposure to risks. While this could lower profits in the short term, it could increase the bank's value in the long run. To investors such banks have a high market value than the others. Therefore, this paper examines the efficiency of banking institutions in Kenya and measures efficiency by comparing the market value and book value using stochastic frontier technique. The paper further examines how the input-output factors of the production plan affect efficiency; the study finally compares efficiency scores of highly capitalized banks with those of low capitalized banks. By high capitalization the bank considers the banks with above average capital to assets ratio and vice versa for the low capitalized. The findings of the study were quite different from findings of other studies, the low capitalized banks were more efficient than the highly capitalized banks for each year from 1999-2001 and for the overall average of the period 1999-2001. This showed that capital ratio cannot be used to discriminate efficient banks from inefficient banks it also showed banks over reliance on customer deposits as a source of funds rather than injecting in more capital. It also signaled the safety of Kenya's financial market.

CHAPTER ONE

1.0 INTRODUCTION AND BACKGROUND

Banks occupy a significant place in the economy and are the prime movers of economic life. Their operations are quite complex in nature, giving the reason as to why they are the most regulated kind of business. They have opaque asset quality, and a substantial part of their debt is demandable debt, they also play an important part in the economy, i.e. they participate in the economy's payment system (Robert, Hughes, Choon-geol 1998). In their day-to-day operations banks are exposed to a number of risks that fall under four categories: Financial risk, Operational risk, Business risk and Event risk.

Financial risk consisting of pure risk such as liquidity risk, credit risk, and solvency risk, if not properly managed can result in losses for a bank. Therefore banks have to be ready to provide liquidity on demand to depositors through the checking account and to extend the credit as well as liquidity to their borrowers through lines of credit. Banks are mainly concerned with both solvency and liquidity. Bank managers naturally have an incentive to limit risk-taking, because this will reduce costly episodes of illiquidity or insolvency.

Banks may choose to follow different strategies to guard against the risk of insolvency and liquidity, for example they could hold high levels of capital to act as a buffer against insolvency, and they could also choose to hold liquid assets, cash and marketable securities to guard against unexpected withdrawals by depositors or draw downs by borrowers that could lead to liquidity crisis (Hughes et al, 1997).

The changing banking environment has caused major restructuring in the industry, these changes came about as a response to decline in profits that started being observed in the early 1990's. At the same time, banks opted to focus on risk measurement, management and control. All this required additional capital to finance the changes that included development of new

instruments, products, services and techniques. Banking business thus changed from the traditional banking business that was based on receipts of deposits and the granting of loans to other businesses involving fees for example, guarantees, acceptances, and custodianship e.t.c. These developments changed the function of risk measurement, management and control hence Banks embarked on risk management strategies and started investing in sophisticated risk management systems (Hennie and Sonja 1999).

Modigliani and Miller (M&M, 1958), proposed that firms should not waste resources managing risks because shareholders can do it more efficiently by holding a well-diversified portfolio. Banks do not fall in this category of firms as they operate in imperfect markets where taxes, costs of financial distress, transactions costs, asymmetric information, and regulations exist (Miller 1995). Financial markets frictions, moral hazard and adverse selection force banks to invest heavily in private information to avoid risk of insolvency. Diamond (1984), proposed that some banks avoid insolvency through a variety of means, including holding a capital buffer of sufficient size, holding enough liquid assets and engaging in risk management. Holding capital buffer of sufficient size in banks shows the role of capital as a source of loanable funds, as protection against insolvency, and as a signal of risk. A capital level of sufficient size in commercial banks signals a bank's own bet on asset quality to less informed creditors, and by banks signaling their asset quality they reduce probability of liquidity crisis, lower cost of borrowed funds and hence increase market value (Hughes et al 1997). Banks hold funds (debt) that are demandable in nature, and the nature of these funds instill the discipline of bank risk-taking that influences the level of capital banks hold. The nature of funds also makes banks to efficiently employ the capital they hold in their production plan to guard against insolvency. Banks that signal efficient allocation of their capital as well as hold a sufficient size of capital are likely to maximize the market value, and the net effect could be an improvement in the value of bank's assets. The researcher therefore, focuses on Bank's employment of capital and how its

allocation on a bank's business activities and assets influences efficiency hence performance.

1.0.1 THE KENYAN BANKING SECTOR

The growth of the Kenyan economy since independence has been accompanied by expansion and diversification of the financial system. This growth has been seen in changes in number as well as range of financial institutions and also the depth of financial intermediation. Financial development has proceeded further in Kenya than in most other countries in sub-Saharan Africa (Brownbrigde, 1998). By early 1990's the financial sector composed of commercial banks, non-bank financial institutions, development finance institutions, insurance companies and a stock exchange were already in place but still in developing stage. The banking institutions, that are the focus in this research, include banks that have government in the ownership structure e.g. Kenya commercial Bank and National bank of Kenya, Foreign owned and privately owned.

The emergence of the locally owned private sector financial institutions has been characterized with several episodes of bank failures (Andrew Sheng, 1996), which makes one wonder whether the financial sector reforms have achieved their objectives of promoting a more competitive, efficient and prudential sound banking system.

Since the mid 1980's the local financial sector has experienced a series of bank failures including also the so-called political banks. Around one- third of the local banks and non- bank financial institutions in Kenya have either been closed down or have been placed under statutory management by the Central Bank of Kenya (CBK), usually after running into acute liquidity problems and repeated violations of banking regulations (Central Bank Supervision reports). Many of the failed financial institutions were technically insolvent when closed down. The extent of fragility within the financial system has exposed deficiencies in the banking sector more so in the regulatory and supervisory framework in Kenya.

The first cycle of bank failures occurred during the period 1984-1986 with the collapse of Rural Urban Credit Finance, Continental and Union Bank groups. These financial institutions were liquidated after they were unable to repay deposits obtained from Government parastatals (Brownbridge, 1998). In 1989-1990 several small NBFIs and building societies collapsed and were taken over by the CBK; six of these Financial Institutions (FI's), together with the Union Bank group, were then merged to form the government-owned Consolidated Bank, which was given the task of restructuring their operations and recovering their bad debts. The scale of bank failure has since escalated with a total of 39 bank failures, two of which were placed under statutory management, restructured and reopened and one currently under the Central Bank of Kenya statutory management (Central Bank reports). The major causes (Brownbridge, 1998) of bank failure identified in Kenya have been the accumulation of bad debts (and attendant liquidity crises) because of fraudulent or imprudent lending, including lending to companies connected to politicians. Adverse selection problems with regard to prospective borrowers, the poor quality of management and inadequate capitalization have also contributed to the financial fragility afflicting the financial institutions (Andrew Sheng, 1996). Insider lending has been a prominent feature of several cases of bank failure in Kenya e.g. the Pan African Bank (PAB) which in 1992 was the fifth largest bank in Kenya in terms of growth assets, had lent over 50% of its loan portfolios to companies controlled by the chairman, mainly to finance a five star hotel (Brownbridge, 1998). Trade Bank had also expanded rapidly to become the ninth largest bank in Kenya before being placed under liquidation in 1993. A large share of its non-performing loans resulted from companies associated with its shareholders. Some of the banks closed down in 1993 were also used to facilitate other forms of large-scale fraud (The goldenberg). These bank failures have imposed substantial costs on the economy, and in particular to taxpayers, who have borne the burden of the CBK's losses of reimbursing insured deposits. They have also affected the local FIs that are managed in an honest and efficient manner.

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Bank failure damages the credibility of financial institutions throughout the sector, raising the costs of deposits and forcing financial institutions to maintain high levels of liquidity as a precaution against bank runs that could lead to insolvency. The need for efficiency in day-to-day operations of the financial institutions is thus evident as this will reduce chances of a bank failing and efficiency translates into good performance in the whole economy.

An efficient and smoothly operating payment system is a necessary precondition for business development, both in the country and internationally. This can be enhanced by an efficient banking system, which in turn can affect the level and rate of economic growth and the efficiency of financial markets because they will permit specialization to occur in production and help determine how efficiently transactions are made and settled (Humphrey D. World Bank paper number 260).

The Kenya banking sector performance during the years 2000 and 2001 improved slightly compared to the year 1999, despite the depressed economy (Market Intelligence, Banking Survey 2002), though earlier cases of insolvency in the industry in the late 1980s' to 1990s' including recent closure of Delphis bank has raised issues of whether the Kenyan banks are efficiently managed. Most Kenyan banks continue to operate under high level of non-performing loans, which portray poor risk management strategies. Currently the Kenyan banking sector is recovering despite the ailing economy. The profits in the sector rose because of the cleaning up process that many banks have undertaken on their bad debts books, stringent lending processes have currently been put in place, and as a result, the sector managed to cut its losses on loans and advances by an impressive 45 percent to Ksh 8.3 billion in the year 2001 according to the MI banking survey of the year 2002. Rather than lend out more money, the sector has opted to invest in the money markets increasing the total investment in this market by 25 percent from Ksh 72.4 billion to Ksh 91 billion, Standard Chartered bank was the main player. This is prudent as further lending with an ailing economy could result in an accumulation of bad debts.

1.2 STATEMENT OF THE PROBLEM

The question of whether the evolution of the banking industry in Kenya has resulted in more efficient banks, better prices and service quality for consumers and greater bank safety and soundness cannot be answered without addressing the costs associated with the inputs and outputs of the industry. Banks have to manage their costs of inputs and outputs efficiently to maximize their market values hence increase their profits and guard against costs of financial distress. Holding a sufficient level of capital acts as a signal of a bank's risk-taking, thus the level of capital that banks hold and its employment could be used to discriminate efficient banks from inefficient banks (Hughes et al, 1997). Banks that hold a high level of capital could signal high efficiency whereas those that hold a low level of capital could signal inefficiency. This is because banks with a high level of capital could provide a credible signal of their riskiness or the level of commitment in the amount of capital they put at risk and would thus lower their exposure by operating efficiently. Whereas the banks with lower levels of capital are not able to hold high levels of capital because the opportunity cost of holding extra capital is greater for them. These types of banks are expected to take higher risks and thus expect higher returns for the extra risk they take to cover for greater expected losses and variance. Investors and depositors can therefore use the level of capital as a signal of banks risk-taking hence its efficiency. It might be expected that a bank will show signs of inefficiency before failure thus investors and depositors need to be careful in differentiating efficient banks from inefficient banks. Banks with a high level of capital and those that achieve efficient allocation of their capital are thus considered to be efficient, whereas those with a low level of capital, and do not achieve efficient capital allocation are inefficient because they are highly exposed.

Therefore, the researcher finds it necessary to investigate how the level of capital and its allocation through the production plan (activities) influences efficiency in the day-to-day operations of banking institutions hence improve

performance and profitability. The market value that is maximized when banks operate efficiently depends on how the production decisions are made and the external environment. Thus efficient allocation of capital through the production plan including holding a sufficient size of capital could increase efficiency in banks.

1.3 OBJECTIVE OF THE STUDY

The study will have the following specific objectives.

i) To measure the (in)efficiency of quoted banks by comparing with frontier market values.

ii) To assess the extent to which the input-output factors contribute towards (in)efficiency.

iii) Use capital to differentiate efficient banks from inefficient banks.

1.4 JUSTIFICATION AND NEED FOR THE STUDY

The issues raised have not been in focus in many bank performance studies in Kenya. The Stochastic Frontier Analysis methodology has not been applied in Kenyan banks (Kenya Institute of Policy Research, KIPRA). The increasingly complex nature of the banking system and the need to enhance its effectiveness and efficiency, that will contribute to turning around Kenya's economy as well as reduce cases of bank failure makes the study a desirable one.

1.5 IMPORTANCE OF THE STUDY

i) The study will be viewed as contributing indirectly to policy makers, researchers and managers on issues regarding regulations, deregulations and financial disruption. Central Bank of Kenya could apply the findings of the study in guarding against bank failures, as stated earlier that a bank would show signs of inefficiency prior to failure.

ii) The study will improve managerial performance by identifying 'best' and 'worst' practices associated with high and low measured efficiency respectively and thus encourage the later. By so doing even the small local unquoted banks will be able to operate efficiently thus improve performance and hence improve the general economic situation in Kenya.

iii) The findings of the study will be important to the banking sector especially to the bank managers whose aim is to avoid corporate failure and at the same time earn an acceptable return to shareholders and depositors.

iv) Investors will be assured of getting some earnings if the banks they have invested in are efficient in the long run. Depositors will be assured of the banks ability to satisfy their claims in the long run hence few cases of bank panic that could lead to bank run and expose the whole sector to systemic risk or even financial disruption.

v) The study will contribute towards protecting depositors and borrowers.

CHAPTER TWO

2.0 LITERATURE REVIEW

INTRODUCTION

A key factor to be considered when it comes to the safety and soundness of a particular bank is capital. This is because a sufficient level of capital serves as a safety net for a variety of risks to which a bank is exposed to during the course of its business (Hennie and Sonja, 1998). Capital absorbs possible losses and thus provides a basis for maintaining depositor confidence in a particular bank. Capital also acts as an ultimate determinant of a bank's lending capacity. Its availability in-turn, determines the maximum level of the bank's assets.

The issue of capital as a major factor in determining a bank's soundness and safety has given rise to various developments in the International Banking system especially in the regulatory framework, For example, the Bank of International Settlement through the Basel committee on banking supervision developed a risk-based capital adequacy standard that would secure international convergence capital adequacy of banks (Hennie and Sonja, 1998). The objectives for this new framework were threefold, to strengthen the soundness and stability of the banking system, to ensure a degree of consistency in its applications, and to diminish the sources of competitive inequality among banks (The Basel Accord). The 1988 Basel Accord introduced a de facto capital adequacy standard based on risk-weighted composition of a bank's assets and off-balance sheet exposures that ensures that an adequate amount of capital and reserves is maintained to safeguard insolvency. Bank-regulations in Kenya constrain risk-taking and define standards of capital adequacy. The Central Bank of Kenya prudential regulations on Banks adopts the minimum risk-based standard for capital adequacy of banks set by the Basel Accord.

2.1 THE ROLE OF CAPITAL IN BANKING INSTITUTIONS

2.1.1 Why do markets require banks to hold capital?

Markets require banks to hold certain capital ratios (equity to assets ratio) in the absence of regulatory capital requirements. According to Berger, Herring, and Szego (1995), a bank's market capital requirement is the capital ratio that maximizes the value of the banks in the absence of regulatory capital requirements (and all the regulatory mechanisms that are used to enforce them), but in the presence of the rest of the regulatory structure that protects the safety and soundness of the banks. The value of the bank is defined as the market values of equity and debt. For small, closely held banks without actively traded shares, the market value of equity is the discounted net present value of expected cash flows to shareholders.

Too little or too much capital could cause the value of the bank to decline; this gives the reason as to why banks should be able to hold a sufficient size of capital (Sinan and Philip, 2001). The search for an optimal capital structure is one of the most challenging issues in finance theory, however, Berger, Herring and Szego (1995), propose that it begins with the introduction of imperfections into the frictionless world of M&M. This involves considering taxes and costs of financial distress, transaction costs and asymmetric information problems in determining an optimal capital ratio and it applies to all firms, but in banks, an additional imperfection, regulatory safety net is also considered when determining the optimal capital ratio.

Taxes and costs of financial distress

Interest payments are tax deductible, but dividends are not; using debt instead of equity enables firms to pass greater returns to investors by reducing tax. Owners prefer to fund the firm almost entirely with debt (Miller, 1977, DeAngelo and Masulis, 1980). However, increasing leverage increases the risk of financial

distress. The costs associated with financial distress are high and are most of the time borne by bank's creditors and part by shareholders. Shareholders could avoid the costs of financial distress by injecting more capital, up to a sufficient size to cushion against losses and reduce costs of financial distress. This gives the reason why some banks will hold a sufficient level of capital.

Asymmetric Information and Transaction Costs

Diamond (1984), proposes that banks enjoy economies of scale and or comparative advantages in the production of information about borrowers. They specialize in lending to information-problematic borrowers and they have to invest a lot in credit risk management techniques for example loan screening and contracting process among others, and monitor borrowers repayments and deposit activity over time, hence banks have to hold sufficient size of capital because of the above activities.

Bank managers have more information about their own earnings prospects and financial conditions because they have private information of their loan customers that the capital markets do not have, thus the capital markets draw inferences from the actions of the bank managers, for example the capital decisions managers make, may signal information to the market (Ross, 1989).

Shareholders may also be reluctant to issue new equity because it may sell at a discount. This occurs where the managers have more information than the shareholders and could end up transferring wealth from shareholders to creditors (Miller 1995). The transaction costs involved in new issues may be quite substantial, for example the costs associated with preparation of prospectus, registration fees, underwriting costs and of course the cost of the issue being under priced (Ibbotson et al 1988), but in issuing new debt the costs is most of the time lower especially where the bank issues in the form of deposits. Banks may choose to hold additional capital as a financial slack so that they can borrow additional funds quickly and cheaply in the event of unexpected profitable opportunities, the additional capital guards against unexpected shocks to capital

if the financial distress costs from low capital are substantial and transaction costs of raising new capital quickly are high (Berger 1995).

The informational asymmetry problem between shareholders, managers and creditors confronts shareholders with a tradeoff. Higher capital avoids expropriation problems between shareholders and creditors but aggravates conflicts of interest between shareholders and managers and vice versa for a lower capital, however the corporate finance literature has made little progress in quantifying the tradeoff, and so the net effect on market capital requirements becomes ambiguous (Berger 1995).

The Safety Net

Banks differ from other firms because they are protected by a regulatory safety net. The safety net refers to all government actions designed to enhance safety and soundness of the banking system in addition to the regulation and enforcement of capital requirements. It includes deposit insurance, unconditional payment guarantees and access to discount window as well as the entire framework of regulation and supervision that is not directly related to capital. The safety net shields bank's creditors from the full consequences of bank's risk-taking and reduces the market capital requirement by insulating banks from potential market discipline (Berger 1995) and the net effect could be low capital ratios and increased bank risk-taking.

2.1.2 Why do regulators require banks to hold capital?

Regulators require banks to hold certain amount of capital to protect themselves against costs of financial distress, agency problems and the reduction in market discipline caused by the safety net. Regulators also respond to other externalities associated with financial intermediaries on behalf of the rest of the society, the principal concern being systemic risk. Failure of a large number of banks or the failure of a small number of large banks could set off a chain reaction that may undermine the stability of the financial system (Sinan and Philip 2001).

Systemic risk being one of the major risks that regulators guard against could arise as a result of public information that is highly imperfect. It may be difficult to tell whether the cause of bank failure is an idiosyncratic shock to individual bank or a more widespread shock that jeopardizes the many other banks. The news of a bank failure may create bank panics hence result in bank runs on other solvent but illiquid banks by uninsured creditors who are unsure whether the shock may affect their banks (Bhattacharya and Thakor 1993). To guard against this risk regulators require banks to hold sufficient size of capital. Another channel through which systemic risk can increase is the interbank market. Thus if a bank holds sufficient capital and invests in liquid assets as required by the regulators, the probability of failure is lowered hence the systemic risk. Bernanke and Blinder (1992) propose that regulators may thus attempt to achieve a higher degree of safety for banks by requiring higher capital ratios to guard against social costs of systemic crisis. Regulators have some indirect means of pressurizing banks to raise capital ratios for example bank closures, limits on assets growth and brokered deposits, prohibition of dividend payments and many other ways.

Hence regulatory capital requirements differ from market-based capital requirements. They are generally blunt standards that respond only minimally to perceived difference in risk rather than the continuous prices and quantity limits set by uninsured creditors in response to changing perceptions of risk of individual banks. Cost inefficient banks could exploit the safety net by choosing lower capital ratios and therefore take greater risk than the other banks because they have lower market values (kwan and Eisenbeis 1995).

2.2 EMPLOYMENT OF CAPITAL EFFECT ON EFFICIENT PRODUCTION

Banks combine labor (number of employees) and physical capital (premises, fixed assets e.t.c) as well as equity capital and borrowed funds to produce information intensive assets such as commercial and industrial loans, agricultural loans, loans to individuals, real estate loans and others. Banks also produce off-

balance sheet products such as credit guarantees, acceptances, letters of credit and others (Hughes et al 1997). The process of producing the above outputs involves heavy investment in credit risk management techniques as identified earlier. Banks that accomplish the above tasks efficiently maximize their returns and lower the probability of loan defaults especially for individual loans. Such banks lower systematic and unsystematic risk; this reduces the probability of financial distress and therefore increases the market value of the bank (Hughes et al 1998). Banks that hold sufficient size of capital and are able to signal efficient allocation of capital increase their market value by lowering both the systematic risk and the unsystematic risk since they are able to maximize their outputs given inputs. Hughes et al (1997) pointed out that given two banks with the same total return, the bank that is more efficient at controlling unsystematic risk as well as the systematic risk is likely to have a higher total market value, ceteris paribus. Hence, a bank's market value depends on the market's perception of its risk. Bank's actual asset quality, resources and the skills it uses in maintaining asset quality can signal low risk to outsiders, hence, improve the market value in two ways:

- By lowering the cost of funds, hence improve their cash flows.
- Reduce the information asymmetry between bank insiders and outsiders.

2.3 EQUITY CAPITAL SIGNALING ROLE

Level of capital can signal a particular bank's exposure to risk, this is because capital represents a bank's own bet on the quality of assets and on its effort at maintaining asset quality (Berger 1995). Given banks asset sizes, banks with lower risk could choose to hold high levels of capital to signal to investors that their exposure to risk is low. Banks with higher risk cannot follow the same strategy because the opportunity cost of holding extra capital is greater for them, investors will avoid such higher risky banks since such banks tend to have higher risky assets than lower risky banks (Hughes et al 1997). Banks with higher risky strategies expect high returns on their assets, given an

informationally efficient market than the lower risk banks, to compensate them for their assets greater expected losses and variance. The difference in opportunity costs creates a potential for differentiating good and well-managed banks from bad and poor-managed banks. Higher quality banks will thus be able to signal their lower risk to outsiders by their degree of capitalization i.e. the stake they take in the performance of the assets they produce. This signal is credible because the higher-risk banks cannot afford to mimic it. This signaling potential shows that we might observe distribution in capital structures where efficient banks or highest-quality banks, controlling for asset size, have the highest capitalization while the inefficient banks or lowest-quality banks are least capitalized (Hughes et al 1997, Sinan and Philip 2001). Hence the role of capital in promoting market value efficiency could differ across this distribution of capital structures. However in the presence of a pooling equilibrium the above differentiation may not be achieved.

2.4 ESTIMATING EFFICIENCY FROM MARKET VALUES

Bank efficiency measures focus on the differences between the banks' market value of assets and book market value of assets. Hughes et al (1997) pointed out that in the absence of agency problems, maximizing the value of the bank's equity is equivalent to maximizing the value of it assets. However, with the potential of agency problems, probability of maximizing the market value of the equity leading to sub optimal value of assets increases. Hence, to allow for the sub optimal value of the assets, Hughes proposed to measure inefficiency from the market value of assets, but also compute inefficiency from the market value of equity for comparison.

The book-value of asset net of goodwill can be interpreted as a proxy for the assets' replacement costs (since goodwill is a component of market value it is thus subtracted from book-value). Hughes also pointed out that the difference between a bank's market and book value depends on its production decisions and on its external economic environment. The way the production decisions are

arrived at (that is if they increase bank's market value) reflects efficiency in the bank. The external economic environment varies with factors such as market power and macroeconomic conditions in which the bank operates.

Using banks' size which is measured by book value of assets net of goodwill, the "best- practice" market-value is computed by observing from the sample at the adjusted book-value and gauging the bank's inefficiency by the difference between the "best-practice" value and its observed market value. The difference represents the banks failure to attain the highest market value for its book value (Hughes et al 1997). The difference is not all contributed by inefficiency. In this research though, the focus is not this distinction but how the difference is affected by the production plan and in particular the employment of equity capital.

To determine the "best-practice" market value for any adjusted book value, Hughes uses stochastic frontier analysis to regress market values on quadratic function of book value. The estimated stochastic frontier identifies an upper envelope of market value to book value. The difference is then regressed on variables that characterize the bank's external market conditions and it leveraged portfolio production plans to identify how market value and efficiency are affected by them.

2.5 EFFICIENCY OF BANKS AND PERFORMANCE RELATED RESEARCH, EMPIRICAL AND METHODOLOGICAL ISSUES.

Bank failures experienced in many countries including developed countries like the United States of America have prompted considerable attention to bank efficiency hence performance (Olugbenga and Olakunle 1998). There have been efforts to identify bank failures and develop early warning systems capable of signaling imminent failure of banks early enough to improve chances of survival and minimize impact on depositors, banking system and general economy. Research efforts have equally covered the characteristics of problem banks,

predictors, predictions and causes of bank failure and analysis of determinants of bank performance.

Bett K.A.K (1992) in his study of financial performance of the Kenyan banking sector identified the major causes of bank failures in Kenya. These causes were:

i) **Mismanagement**

a) Technical mismanagement

This arises out of application of inadequate policies and practices which can take the form of over extension, poor lending, lack of internal controls and poor planning in management functions.

b) Cosmetic management

This involves buying time to remain in control by hiding past and current losses. This can take the form of rolling over loans, capitalization of interest (when it is clear that it will not be realized at all.) and fictitious or unrealistic collateralization.

c) Desperate management

This arises when bank managers see the danger of having losses (capital losses) or not being able to meet the target dividend payout rate and seek for ways of making up such deterioration. Common practices used are speculation, paying above market rates for deposits and charging high interest rates.

d) Fraud Management

Arises when management decides to divert part of the bank's liquid funds when dangers of illiquidity approach. Common methods employed are lending to companies and buying or selling of companies that are owned or connected with the bank.

e) Poor or lack of supervision

The CBK supervision unit has improved over the last two years. The purpose of the supervision unit is three fold, regulatory, verification and enforcement.

A supervisory unit is effective if regulatory system gets proper disclosure of information and have an effective and efficient means of verifying the true position as reported. The unit should have an effective and prompt means of enforcing any remedial action that is deemed necessary, otherwise any identified problems may grow and the supervisory mechanism will be discredited. Currently the CBK is making efforts to gradually implement the Basel Core principles of effective banking supervision. These principles are important, as they are a global standard for prudential regulation and supervision.

ii) Political Pressure

Governments influence the running of the banks through:

a) Banks may be required to invest in specific sectors or government securities.

b) Most state banks that have the government as a partly owner, have their management appointed under consideration making it difficult to have competent and independent professionals in the board.

c) Pressure on non-recovery or tolerance for non-repayment is common.

d) Inadequate legal procedure for recovering loans, which are lengthy and complicated making some to take even over five years to recover.

The above causes of bank failure could be signaled earlier if measures of efficiency were constantly used to analyze bank's efficiency. Various studies have measured bank efficiency by estimating frontier costs and profit functions to identify "best practice", however the ultimate measure of bank efficiency is the market value of the bank. If financial markets are informationally efficient, a bank's efficiency is reflected in its market value.

A Variety of methodologies have been used to analyze bank performance. They include the CAMEL rating; Univariate analysis (tests); Multiple regression analysis; Canonical correlation analysis; Multivariate Discriminant Analysis (MDA);

Probit and Logit Techniques; and Survey Approach. Most developing countries have used most of the above methodologies in analyzing bank performance (Bett, 1992 and Kathanje, 2000, in Kenya), but few have used the sophisticated Frontier techniques that measure bank's efficiency by its distance to the efficient frontier.

CAMEL RATING

This is a scheme for grading the performance of banks by bank supervisors or examiners during onsite examinations. These onsite examinations are designed to identify problems in individual banks and to ensure banks' compliance with existing prudential banking laws and regulations. The acronym is derived from the five major dimensions of a bank's

Operations:

- Capital Adequacy
- Asset Quality
- Management Quality
- Earnings Ability
- Liquidity

The examiners score each of the factors as a single number from 1 to 5, with 1 being the strongest rating and 5 the weakest. They then develop an overall CAMEL rating from 1 to 5 from the factor scores. The rule of thumb is that banks with a CAMEL rating of 4 and 5 are problematic banks. A CAMEL rating of 1 and 2 shows best banks or well-capitalized banks. This rating system is applied widely because it's simple and can be used by regulators. However by its own, it really doesn't give a true picture, thus it's often complemented with more rigorous analysis. The Canadian office of financial institutions refined CAMEL to CAMELOT, the added dimension of a bank's operation being the quality of operations and treasury management (Mcpherson 1992).

UNIVARIATE ANALYSIS

It involves assessing the significance of individual financial ratios using a statistical test of differences in means of each ratio between the two performance categories. Where the difference in mean is found significant, the ratio is deemed a determinant or distinguishing factor of bank performance. The approach has been used in several studies, and the major limitation of the approach is that it does not recognize that the possibility of joint significant of financial ratios. The multivariate approaches correct this limitation.

MULTIPLE REGRESSION ANALYSIS

Meyer and Pifer (1970) adopted this approach. They defined the dependent variable of the equation as binary choice variable with a 0 representing a failed bank and a 1 representing a solvent bank. The explanatory variables are real variables and parameter estimates in the equation are Ordinary Least Square (OLS) estimates while they are unbiased, they are not efficient. The usefulness of this technique is observed from the conclusion that for the two-group case, the analysis and results would be similar to MDA. It will prove inappropriate however, for a multiple-choice dependent variable.

MULTIVARIATE DISCRIMINANT ANALYSIS (MDA)

This technique is quite popular in bank performance literature. Altman (1968) was the first person to apply discriminant analysis in finance to study bankruptcy. MDA attempts to identify the linear combination of independent variables (financial ratios and other measurable or choice factors) that best discriminate or distinguish between two or more performance classifications. MDA is used to weight and linearly combine the discriminant variables in some fashion so that groups are forced to be as statistically distant as possible (Kleeka 1990). The discriminant function, once obtained can be used to predict the group to which cases with certain characteristics belong. The weights associated with each

variable in the discriminant function indicate its relative importance. Bett (1992) and Kathanje (2000) used this technique.

CANONICAL CORRELATION ANALYSIS

This method identifies linear combination of independent variables that are most highly (or canonically) correlated with linear combinations of the independent variables. Studies that have used this methodology rely on more than one variable in defining performance. Hunter and Srinivasa (1990) pointed out that, the method precludes the explicit calculation of marginal value of independent variables on the dependent (choice) variable, or can the significance of individual explanatory factors be ascertained. Bett (1992) used this technique to show proportion of variance in the discriminant function that is explained by the group, hence measure function's ability to discriminate.

PROBIT AND LOGIT ANALYSIS

These methods of analysis are similar, differing essentially in the underlying distributional assumptions. While the probit technique is based on the cumulative normal distribution, the logit technique is based on the cumulative logistic probability function. The essence of the application of these techniques to bank performance is to estimate the chance that a non sample bank will fall in a performance category given our knowledge of the characteristics of banks in each of the two categories. The probit model has been applied by Korobow, Stuhr and martin (1976) and Hunter Srinivasan (1990), while the logit technique has been applied by Martin (1977), Pantallone and Platt (1987) and Adekanye (1993) in Nigerian banks.

SURVEY APPROACH

This approach involves using questionnaires directed at the management of a sample of Kenyan commercial banks. One is therefore able to identify the major

factors believed to be the determinants of bank performance. Studies done using this approach have identified the factors to be the components of CAMEL acronym. In terms of importance, they were ranked as follows:

- Managerial Efficiency
- Asset Quality
- Liquidity
- Capital Adequacy
- Loan Portfolio.

The set of financial information rendered by the banks, was equally subjected to rigorous analysis using MDA and Logit, and managerial efficiency came out as the most important factor. This study was done in Nigeria; therefore, a similar study could be done in a Kenyan setting (Olugbenga and Olankunle 1998).

EFFICIENCY FRONTIER TECHNIQUES

In developed countries, research on performance of financial institutions has increasingly focused on frontier efficiency (Berger and Humphrey 1997). Frontier efficiency measures deviations in performance from that of "best practice" firms on the efficient frontier, holding constant a number of other market factors such as the prices faced in the local markets. That is the frontier efficiency of an institution measures how well it performs relative to the predicted performance of the "best practice" in the industry if these best firms were facing the same market conditions (Bauer et al 1998). Frontier efficiency is superior for analysis of performance than standard financial ratios; cost or revenue ratios commonly employed by regulators, financial institution managers and industry consultants. The reason for the superiority is that frontier analysis approach uses programming or statistical techniques to try to remove the effects of differences in input prices and other exogenous market factors affecting the standard performance ratios in order to obtain better estimates of the underlying performance of the managers (Berger and Humphrey 1997).

In the past two decades four main frontier efficiency approaches have been developed to assess bank performance relative to some empirically defined "best practice" standard. These are the non-parametric linear programming approach commonly referred to as Data Envelopment Analysis (DEA) and parametric approaches such as: Stochastic frontier analysis (SFA), Thick Frontier Analysis (TFA), Distribution Free Approach (DFA).

These approaches differ in the assumptions they make regarding the shape of the efficient frontier, the existence of random error, and (if error is allowed) the distributional assumptions imposed on the inefficiencies and random error in order to disentangle one from the other (Bauer et al 1998).

Data Envelopment Analysis (DEA)

The DEA methodology developed by Charnes, Cooper and Rhodes was originally intended for use in the public sector and non-profit making organizations. DEA is a linear programming methodology that is based on the application of economic production theory to the behavior of a banking firm (Olugbenga and Olankunle). DEA methodology uses the set of the "best practice" or frontier observations for which no other decision making unit or linear combination has as much or more of every output (given inputs) or as little or less of every input (given outputs) (Berger and Humphrey 1997). The DEA frontier is formed as a piecewise linear combinations that connects the set of these "best practice" observations yielding a convex product possibilities set. Hence DEA does not require the explicit specification of the form of the underlying production relationship. The major draw back of the DEA methodology is that it does not allow for random error hence, the presence of errors could alter the measured efficiency of all units compared to this units of or linear combinations involving the unit and could thus lead to inaccurate results (Bauer et al 1998).

Stochastic Frontier Analysis (SFA)

The SFA is sometimes referred to the econometric frontier approach. Jondrow, Lovell, Materov, and Schmidt (1982) first proposed this approach and it has since

been employed in a number of studies. This approach specifies a functional form for the cost, profit, or production relationship among inputs, outputs, and environmental factors and allows for random error, which DEA does not allow. SFA posits a composed error model where inefficiencies are assumed to follow an asymmetric distribution, usually half normal, while random errors follow symmetric distribution, usually the standard normal. The logic behind this is that the inefficiencies must have a truncated distribution because inefficiencies cannot be negative. The major draw back of this approach is that, the method of allowing for flexibility in the assumed distribution of inefficiency may make it difficult to separate inefficiency from random error in a composed error framework, because the truncated normal and gamma distributions may be close to the symmetric normal distribution assumed for the random error (Bauer et al 1998). This methodology will be discussed at the end of this chapter.

Thick Frontier Analysis (TFA)

This approach specifies a functional form and assumes deviations of predicted performance values within the highest and lowest performance quartiles of observations (stratified by size class) represent random error, while deviations in predicted performance between the highest and lowest quartiles represent inefficiencies (Bauer et al 1998). This approach does not impose any distributional assumptions on either inefficiency or random error but assumes that inefficiency differs between the highest and lowest quartiles and that random error exists within these quartiles. The major draw back with TFA is that it does not provide exact point estimates of efficiency for individuals firms but instead intends to provide an estimate of the general level of overall efficiency (Berger and Humphrey 1997). The TFA also reduces the effect of extreme points in the data when the extreme average residuals are truncated.

Distribution Free Approach (DFA)

This approach like SFA also specifies a functional form for the frontier, but separates the inefficiencies from random error in a different way. Unlike SFA, DFA makes no strong assumptions regarding the specific distributions of the

inefficiencies or random errors. Instead the DFA assumes that inefficiency of each firm is stable over time, whereas random error tends to average out to zero over time. Efficiency estimate for each of the firm panel data set is then determined as the difference between its average residual and the average residual of the firm on the frontier, with some truncation performed to account for the failure of the random error to average out to zero fully (Bauer et al 1998). DFA inefficiencies can follow almost any distribution, even one that is fairly close to symmetric as long as the inefficiencies are nonnegative. If efficiency shifts over time due to e.g. technical change, regulatory reform, interest rate cycle, and other influences then DFA describes the average deviation of each firm from the best average-practice, rather than the efficiency at any point in time.

2.6 EFFICIENCY CONCEPTS

Technological efficiency or technical efficiency focuses on the level of inputs relative to the level of outputs. For a bank to be technically efficient it must either minimize its inputs given outputs or maximize its outputs given inputs.

According to Berger and Humphrey (1998), economic efficiency is a broader concept as it involves optimally choosing the level of and mixes of inputs or outputs based on reaction to market prices. To be economically efficient a bank has to choose its input or output levels and mixes in a way that it will optimize an economic goal, usually cost minimization or profit maximization.

Economic efficiency requires technological efficiency as well as allocative efficiency, that is, the optimal inputs or outputs are chosen based on both production technology and the relative prices in the market. Banks that are technologically efficient could relatively be economically inefficient. Thus using the two different efficient concepts may give different rankings of firms for a given frontier approach.

Technological efficiency scores tend to be higher than economic efficiency scores on average, all else equal, this is because economic efficiency sets a higher

standard that includes allocative efficiency. Most non-parametric approaches such as DEA measure technological efficiency to inputs and outputs. They do not include prices. Charnes, Cooper and Rhodes (1978) used the DEA methodology to measure technological efficiency in the public and non- profit making organizations where prices were not readily available or reliable, and the assumption of cost minimizing or profit maximizing behavior is not appropriate.

In recent years efficiency analyses for most DEA studies apply the technological efficiency to inputs and outputs, but there are a few studies where prices have been included (Cost- based DEA). Efficiency scores generated by DEA are not fully comparable to those generated by parametric approaches, because all parametric approaches employ prices and examine economic efficiency.

Stochastic Frontier Analysis Methodology

The stochastic frontier methodology is a regression model that has been used in various production and cost studies. The model was first developed by Aigner, Lovell and Schimdt (1977), and the general formulation is as follows.

$\mathbf{Y = \beta' x + \nu - \mu}$

Where,

$\mu = / \mu /$ and $\mu \wp \mathbf{N}\ [0, \sigma_u^2]$

$\varepsilon_I \wp \mathbf{N}\ [0, \sigma_\nu^2]$, the maximum likelihood technique used to get μ calculates μ using the residuals. Efficiency is measured as average (μ), estimated as average (ε_i), where ε_i is the estimated residual for firm i, since μ is independent of ν and $E(\nu)=0$.

CHAPTER THREE

3.0 RESEARCH METHODOLOGY

3.1 MODELLING INEFFICIENCY

This study relies heavily on the SFA approach to measure efficiency among Kenyan banks as indicated earlier. The theoretical expositions of Hughes, Lang, Moon and Pagano (1997) provide an excellent representation of the SFA methodology that can be easily understood and appreciated. The Mathematical representation of the SFA model they developed is as follows:

A simple discounted cash flow model is used to illustrate the book and market values of a particular bank. Given bank i with a multiple period setting, current market value of bank i-th assets is given by discounted cashflows i.e. dividends and interest, such that we have $MVA_{i,0}$ as

$$MVA_{i,o,} = MVE_{i,o} + MVL_{i,o}$$

$$= \sum_{t=0}^{\infty} E(CFE_{i,t})/(1+k_i)^t + \sum_{t=0}^{\infty} E(CFD_{i,t})/(1+r_i)^t$$

Equation 1.

Where

$MVA_{i,0}$ is the market value of bank i assets at t = o (or currently).

$MVE_{i,0}$ is market value of equity of bank i at t = 0.

$MVL_{i,0}$ is market value of debt (loans) of bank i at t = 0.

$E(CFE_{i,t})$ = the i-th firms expected cash flow paid to share holders at time t (Dividends).

$E(CFD_{i,t})$ = expected cash flow paid to debt holders at time t (interest).

K_i = shareholder required return on equity for the i-th firm.

R_i = debtholders required return.

The expected cash flows are therefore the sum of the expected cashflows in solvent states and in financial distressed states. The current and future production plans of a particular bank determine the cash flows.

Given bank i, the production plan will consist of inputs and outputs, such that,

$(y_{i,t}, k_{i,t}, x_{i,t}, n_{i,t})$, where

$y_{i,t}$= the Bank's on and off balance sheet items i.e. outputs at time t.

$K_{i,t}$ = the level of Bank's equity capital at time t.

$X_{i,t}$ = amounts of other financial and non financial inputs at time t.

$n_{i,t}$ = variables characterizing credit quality of the outputs at time t.

Given the current production plan the research will focus on how current production plan influences the market value of assets, $MVA_{i,o}$, and equity, $MVE_{i,o}$. From the results, we use the current production plan as a good proxy for future production plans and cash flows, e.g. if the current production plan consisting of credit quality $n_{i,t}$, uses non performing loans as a measure of credit quality then this can give some indication of probability and magnitude of financial distress. Thus expected cash flow and risk associated with current production plan along with the degree of capitalization figure into the bank's risk of insolvency as well as its charter value.

Since current production plan affects the bank's required return on capital K_i, the bank can then alter the trade off between the expected return and risk of its assets through the inputs it uses on tasks such as credit evaluation, contract writing and managing clients financial distress. These factors when changed can reduce both systematic risk and unsystematic risk. The above factors contribute towards the current production plan as a measure of credit quality. Hence, since the current production plan influences expected cash flows and the discount rates applied to cash flows, the evaluation model therefore becomes,

$$MVA_{i,o} = MVE_{i,o} + MVL_{i,o} = g(y_{i,o}, k_{i,o}, x_{i,o}, n_{i,o}).$$

Equation 2.

Which is used to estimate efficiency.

Given that $BVA_{i,o}$ is the book value of bank i's total assets at t = 0, then, market value inefficiency of its assets IE is given by,

$$IE_i = FMVA_o - (BVA_{i,o} - MVA_{i,o})$$

Equation 3.

This is the difference between the "best practice" market value $FMVA_o$ and $BVA_{i,o}$, and bank i observed market value, $MVA_{i,o}$.

Frontier market value is interpreted as the market value of the most valuable bank of comparable size. Stochastic frontier analysis is thus used to obtain the upper envelope of observed market values defined over adjusted book values. Upper envelope of market values is estimated by assigning a composed error term ε_i, to a regression of observed market values on adjusted book values. ε_i, consists of ν_i, which is the statistical noise and is two sided and μ_i, which gauges inefficiency and is one sided. Quadratic specification of the regression is used to allow possibility of the relationship between market value and book value being nonlinear. Hence the equation becomes,

$$MVA_{i,o} = \alpha + \beta_1 (BVA_{i,0}) + \beta_2 (BVA_{i,o})^2 + \varepsilon_i$$

Equation 4.

Where,

ε_i, is the error term consisting of ν_i, and μ_i,

$$\varepsilon_i = \nu_i - \mu_i$$

$$\nu_i \sim iidN(0,\sigma^2_\nu),$$

$$\mu_i(>=0) \sim iidN(0,\sigma^2_\mu),$$

The above μ_i is estimated using maximum likelihood. Then frontier value is given by,

$$FMVA_0 = \alpha + \beta_1(BVA_{i,0}) + \beta_2 (BVA_{i,0})^2,$$

Equation 5.

Whereas inefficiency is measured by,

$$IE_i = E(\mu_i \backslash \varepsilon_i) = FMVA_0 - (MVA_{i,0} - \nu_i)$$

Equation 6.

Where,

$MVA_{i,0} - \nu_i$ is the statistical adjusted observed market value of assets. The estimates are measured in Kenyan shillings of lost market value.

Substituting **Equation 2** in **Equation 6**, we have

$$IE_i = h(y_{i,0}, k_{i,0}, x_{i,0}, n_{i,0})$$

Equation 7.

This indicates that the bank's level of inefficiency measured by market value is a function of a bank's production plans and in particular, its employment of capital in various bank activities. The relationship is estimated using ordinary least squares. In the presence of agency problems, efficiency measures in terms of market value of assets are more appropriate because they allow shareholders to transfer value from debt holders (Hughes et al 1997). In absence of agency problems efficiency is measured equivalently in terms of the market value of equity hence MVE is computed.

3.2 SAMPLING DESIGN

The sample will consist of all quoted banks at the Nairobi Stock Exchange (NSE). The sample will be further divided into larger and smaller banks (in terms of total assets). Total assets will be used as a proxy for size. The banks will also be

divided into higher and lower capitalized banks, the capital ratio will give a proxy for high and low capitalized such that the sample will be dived into half.

3.4 DATA COLLECTION

Secondary data will be collected from annual bank reports of the respective banks and also from Nairobi Stock Exchange.

We estimate equation (4) and (7) using data on banks quoted at Nairobi Stock Exchange.

The balance sheet items will be collected from the banks' annual reports. The end of year book values of equity and total liabilities as well as the number of shares outstanding will be obtained from Nairobi Stock Exchange.

The production plan ($y_{i,0}$, $k_{i,0}$, $x_{i,0}$, $n_{i,0}$) is specified as follows: -

$y_{i,0}$ is the output and includes on and off balance sheet products, which consist of liquid **assets (i.e. sum of cash balances due,).**

Commercial and industrial loans, agricultural loans, loans to individuals, real estate loans, other loans, leases assets held in trading accounts, investments in unconsolidated subsidiaries intangible assets, customer liabilities related to bank acceptance and other assets. The off balance sheet products are credit guarantees (unused portion of lines of credit, stand-by letters of credit etc.).

$k_{i,o}$ is equity capital measured by book value of shareholder's equity.

$x_{i,o}$ is the input and consist of labor (measured by full time equivalent employees), physical capital (measured by the amount of premises and fixed assets), uninsured domestic deposits, all other domestic deposits and other borrowings (foreign deposits, Central Bank funds purchased, repurchase agreements, commercial paper debentures, convertible securities trading account, liabilities mortgage indebtedness and all other borrowings). This data will be collected from financial statements of the respective banks

$n_{i,o}$ is the credit quality of output and is proxied by non-performing loans.

3.5 DATA ANALYSIS

Frontier market value and will be calculated from equation five. Market values of the sample will be regressed on the book values; line of best fit will be calculated for each bank. Then the frontier market value will be the highest line, which will also be known as the efficient frontier. Inefficiency will be calculated from the difference of a particular bank with frontier market value.

To achieve objective two, the inefficiency equation (7) will be regressed on variables that characterize the production plan. Coefficients will be derived by estimating equation 7. Level of capitalization might differ across the banks, and lower risk banks are expected to signal risk with the level of capital they put at risk, thus suggesting that role of capital might differ between banks with higher and lower capital ratios (Bauer). A cross tabulation will be done to explain whether high capitalized banks are efficient and vice versa. Further tabulation will be done to compare Total assets and inefficiency. The study will consider a Significant level of, 5%. Statistics will be tabulated (Hughes 1997). The Data analysis will be done using a software program called LIMDEP; the software is used to run Stochastic Regression Models. The estimator in LIMDEP computes parameter estimates for the single equation variants of the stochastic frontier model. That is, among the variations under development are systems of equations that include the frontier model and sets of demand equations. The preceding is termed the `stochastic' frontier model, as opposed to a `deterministic' frontier, which would result if all of the disturbances in the model were strictly one sided. (I.e., v=0.) LIMDEP does not contain estimators for any of the deterministic frontier models. The regression will be done using SPSS package to estimate coefficients of equation 7

4.0 CHAPTER FOUR

RESULTS AND INTERPRETATION

This section presents the findings of the study and explains the results

4.1 Findings and Implications

ANALYSIS OF THE EFFICIENCY OF KENYAN QUOTED BANKS USING STOCHASTIC FRONTIER ANALYSIS

The Stochastic frontier Analysis (SFA) earlier detailed in chapter three is based on the economic input-output concept and tries to identify within a given population the most efficient bank. The choice of input-output variables is influenced by the model's ability to include or remove the variables and the availability of data that is consistent. The Stochastic frontier model imposes more structure on the shape of the frontier by specifying a cost functional form (Bauer et al 1998). SFA allows for random error that enables the model to identify, measurement error, transitory differences in cost or specification error as inefficiency. The model assumes that the composed error term follows an asymmetric distribution usually half normal, while random error follows a symmetric distribution usually standard normal (Aigner, Lovell and Schmidt, 1977). This means that the error term from the cost function is given by $\mu+$ because inefficiencies cannot subtract costs and therefore must be drawn from truncated distribution. Efficiency of each banking institution is based on the conditional mean (or mode) of the inefficiency term μ, given the residual, which is an estimate of composed error. SFA ranks efficiencies of the banking institutions in the same order as the cost function residuals (Bauer et al 1998).

RESULTS

The model that was used as earlier identified gauges inefficiency from the fact that bank's observed cost will deviate from the cost frontier because of random noise, v_i, and possibly inefficiency, u_i. The model calculates inefficiency, using residuals. The following table gives a summary of the efficiency scores of the

respective banks for the year 1999, summary of the statistics is given in appendix 2.

Table 1: Summary of efficiency scores and ranking of Quoted Banks in Kenya: 1999

Rank	Bank	Observed Market value (Ksh.)	Predicted market value (Ksh.)	Estimated Residuals (μ)	Efficiency ratio
1	Barclays Bank of Kenya (BBK)	103.00	67.75	84.42	1.00
2	Standard Chartered Bank (SCB)	56.00	57.79	47.38	0.56
3	Diamond Trust Bank (DTB)	25.75	55.11	19.81	0.23
4	National Industrial Credit Bank (NIC)	26.75	59.44	16.49	0.20
5	CFC Bank (CFC)	14.50	56.18	7.49	0.09
6	Housing Finance Company of Kenya (HFCK)	10.40	54.76	4.82	0.06
7	Kenya Commercial Bank (KCB)	31.75	80.06	0.88	0.01
8	National Bank of Kenya (NBK)	5.05	53.51	0.75	0.01

Barclays bank emerged as the most efficient bank in 1999. The frontier market value is given by the market value of Barclays bank at that point in time, which was Ksh 103.00, the book value at that point in time was Ksh 64.13. This means that there was an increase in output for every shilling that was used in the inputs; therefore we would say that Barclays witnessed an increased efficiency in that particular year compared to the other banks. We would expect that banks that are efficient to increase their market value in a perfect market. Given that all the banks are exposed to the same market conditions, the other banks should achieve the same efficiency level as the most efficient bank in this case Barclays.

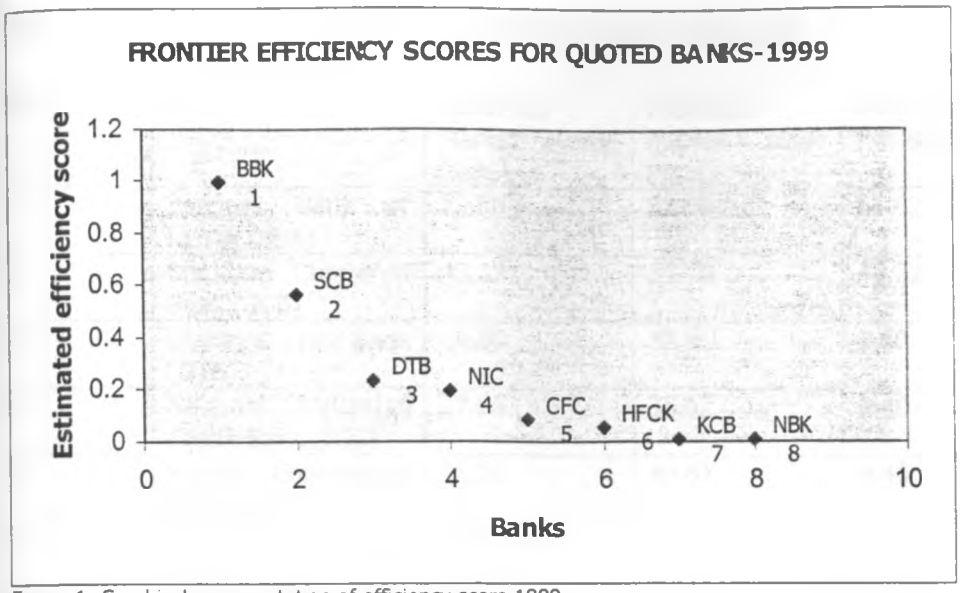

Figure 1: Graphical representation of efficiency score 1999

The mean efficiency for the year is 0.278225

From figure 1 we observe that National Bank of Kenya (NBK) was the most inefficient bank with a score of 0.0088, this shows that for every shilling of input into the bank resulted in gross losses (outputs). NBK almost collapsed in 1998 as a result of bad and unsecured debts to well connected individuals (Kabiru Abel, Market Intelligence 2002). This signals that the bank used fewer resources in initial credit evaluation and monitoring of its loans. Unless quality and risk are controlled for, one might conclude that banks that avoid credit evaluation or those producing risky loans are efficiently producing their outputs because they are spending less, which is wrong as seen in the case of NBK (Mester J. Lorretta 1994). Information Technology is needed in big banks (total assets) like NBK and Kenya Commercial Bank (KCB), for banks to manage efficiently they have to be up-to date with the current technology. KCB, NBK and Housing Finance of Kenya (HFCK) lacked this technology in 1999, which could have contributed to the low efficiency scores of our native banks. Not only does information technology improve efficiency in the bank's operations but also improves services to clients hence attracts customers both depositors and borrowers.

The efficiency scores for the year 2000 were as follows:

Table 2: Summary of efficiency scores and ranking of Quoted Banks in Kenya: 2000

Rank	Bank	Observed Market value (Ksh.)	Predicted market value (Ksh.)	Estimated Residuals (μ)	Efficiency ratio
1	Barclays Bank of Kenya (BBK)	75.50	42.70	61.67	1.00
2	Standard Chartered Bank (SCB)	43.22	33.78	43.22	0.70
3	Diamond Trust Bank (DTB)	14.00	32.66	9.60	0.15
4	National Industrial Credit Bank (NIC)	17.05	35.92	9.40	0.15
5	Kenya Commercial Bank (KCB)	25.50	49.62	4.40	0.07
6	CFC Bank (CFC)	9.85	34.16	3.96	0.06
7	Housing Finance (HFCK)	5.70	32.14	1.86	0.03
8	National Bank of Kenya (NBK)	3.15	31.35	0.69	0.01

The efficiency scores for the year 2000 were lower than for the year 1999 this could have been as a result of the declining economy. The year was quite a turbulent year with banks recovering from heavy last minute investments brought about by the dreaded "millennium bug'. During the same period, many of the banks were affected by the losses and provisions brought by the rising non performing loans. Power shortage and drought were among the major factors that caused the decline in economy, business was low including in the banks. The most efficient bank in the eye of investors was Barclays bank the ranking being the same for the year 1999. KCB improved to position five from seven. The efficiency scores of the four banks from the bottom improved, suggesting that the restructuring programmes such as cutting costs, cleaning up

on their bad debts books, effective credit risk management, disposal of non-core assets had started bearing fruit. The mean efficiency score is 0.2732; the summary of statistics is given in appendix 3.

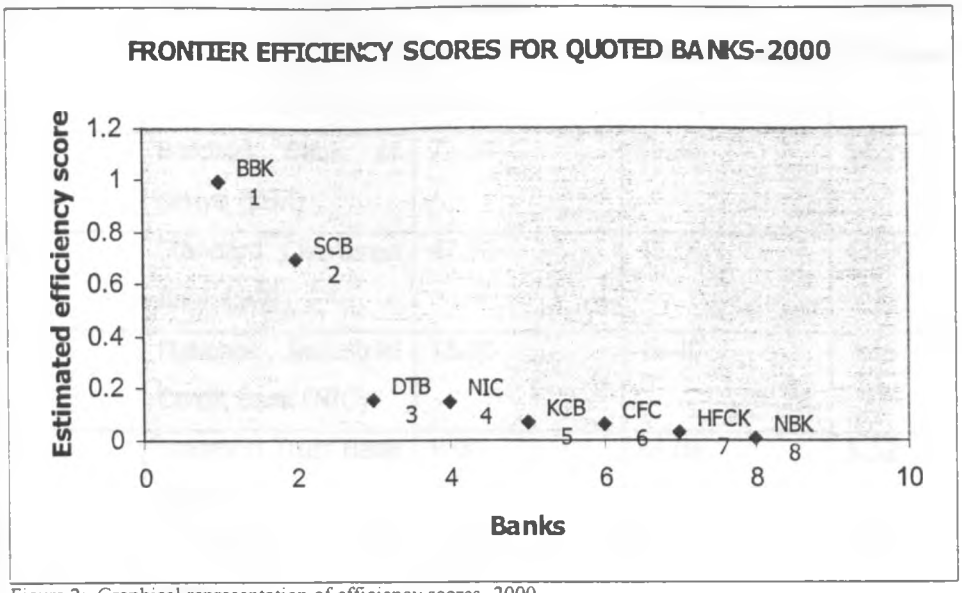

Figure 2: Graphical representation of efficiency scores- 2000

BBK was top on the list though the efficiency score for the year was lower for the year than the previous year 1999, this could have been attributed by the decline in economic performance experienced that year. Poor performance experienced industry wide resulted in low profits causing investors to be cautious in further investments, as key participants in the economy's payment system, the banks were also affected resulting in a decline in market values due to low activity at the Nairobi Stock Exchange (NSE).

The summary of the efficient scores for the year 2001 were as follows:

Table 3: Summary of efficiency scores and ranking of Quoted Banks in Kenya: 2001

Rank	Bank	Observed Market value (Ksh.)	Predicted market value (Ksh.)	Estimated Residuals (μ)	Efficiency ratio
1	Barclays Bank of Kenya (BBK)	72.50	58.86	54.19	1.00
2	Standard Chartered Bank (SCB)	47.00	46.55	41.00	0.76
3	National Industrial Credit Bank (NIC)	15.00	48.40	7.16	0.13
4	Diamond Trust Bank (DTB)	9.00	44.04	5.52	0.10
5	CFC Bank (CFC)	9.00	44.16	5.40	0.10
6	Housing Finance Company of Kenya (HFCK)	4.00	42.06	2.50	0.05
7	Kenya Commercial Bank (KCB)	16.00	56.34	0.59	0.01
8	National Bank of Kenya (NBK)	2.90	42.93	0.55	0.01

KCB dropped in efficiency to the second from the bottom. The efficiency scores were lower, the cleaning up process was still on for many banks, Heavy investments in Information technology for some particular bank was evident in the annual accounts as many banks started investing. The banks also started focusing on customer needs and product diversification, which required more inputs, the effect on outputs in this case being long term. BBK emerged as the most efficient bank to the investors and NBK was the most inefficient.

The mean efficiency ratio for the sample in the year is 0.2697; the summary of the statistics is given in appendix 4.

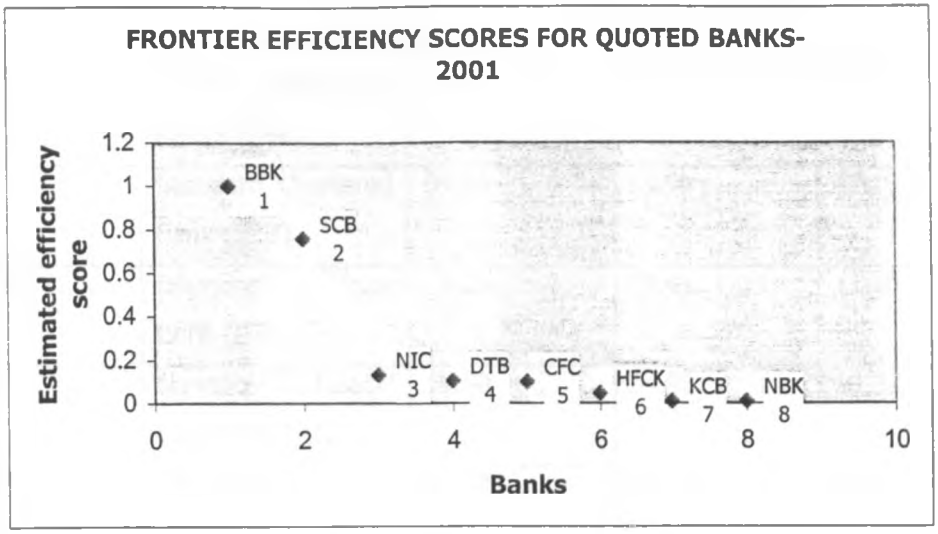

Figure 3: Graphical representation of Banks efficiency scores-2001

The mean of the efficiency scores of the respective banks for the three-year period is as follows:

Table 4: Summary of Mean efficiency scores and ranking of Quoted Banks in Kenya for the period 1999-2001

Rank	Bank	Observed Market value (Ksh.)	Predicted market value (Ksh.)	Estimated Residuals (μ)	Efficiency ratio
1	Barclays Bank of Kenya (BBK)	83.67	66.68	62.59	1.00
2	Standard Chartered Bank (SCB)	50.58	53.99	42.19	0.67
3	Diamond Trust Bank (DTB)	16.25	50.45	11.40	0.18
4	National Industrial Credit Bank (NIC)	19.60	54.83	10.37	0.17
5	CFC Bank (CFC)	11.12	50.76	5.93	0.09
6	Housing Finance Company of Kenya (HFCK)	6.70	49.23	3.08	0.05
7	Kenya Commercial Bank (KCB)	24.62	69.78	0.45	0.01
8	National Bank of Kenya (NBK)	3.70	48.93	0.39	0.01

The findings for the average period showed similar ranking with some of the others years, BBK still emerged as the most efficient bank to the investors followed by SCB and the most inefficient to the eyes of the investors was NBK. The summary shows that the mean efficiency scores for the period are 0.2684; the summary of statistics is given in appendix 5.

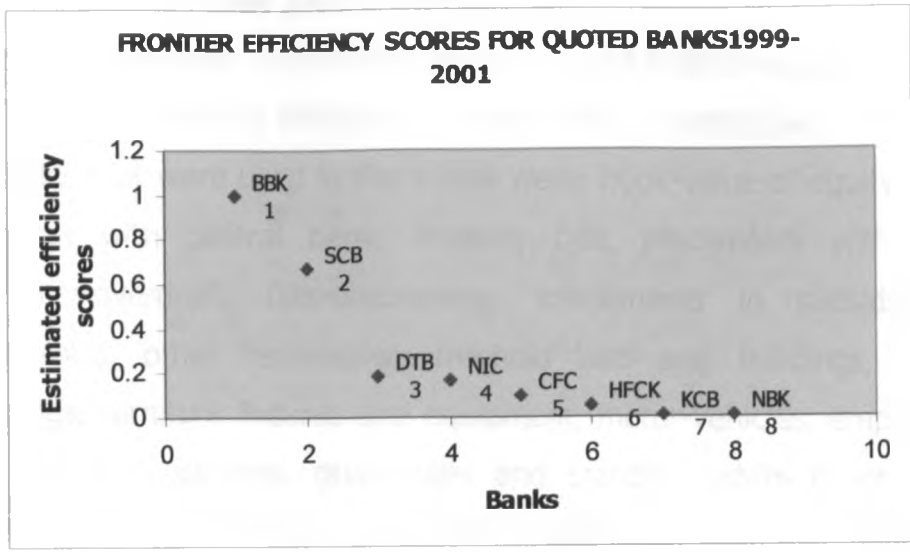

Figure 4: Graphical representation of Banks average efficiency scores 1999-2000

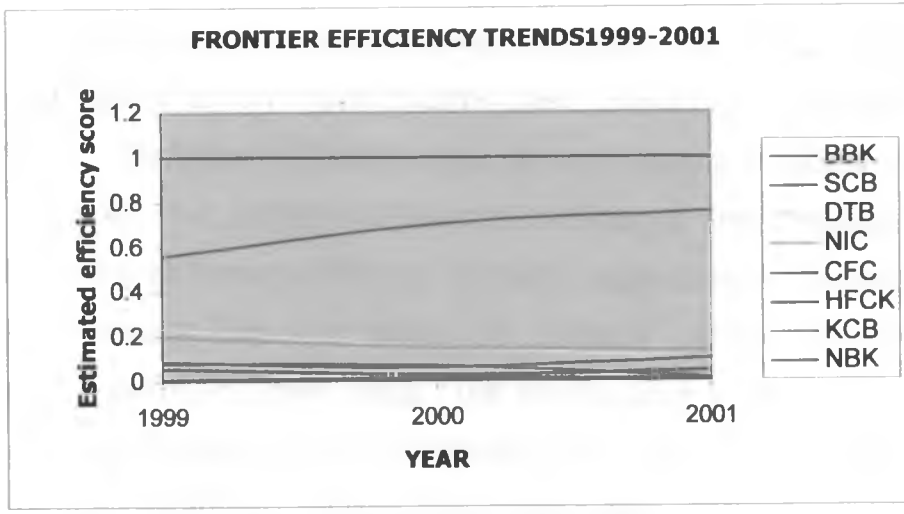

Figure 5: Bank efficiency score trends for the period 1999-2000

Given that frontier market value is the market value of the most valuable bank in this case BBK, inefficiency is therefore measured by the difference of a particular bank's lost market value divided by observed market value. From the graph we observe that the efficiency scores for the most efficient banks declined but for the inefficient banks there was a marked improvement in efficiency. The

decline could have been contributed by the macroeconomic factors. The mean efficiency in the sample for the period is 0.2724125

PRODUCTION PLAN AND INEFFICIENCY

The production plan, which consists of the input-output variables, as explained in chapter three affects efficiency in the banking institutions. The input-output variables that were used in the model were; Book-value of equity, cash in hand, balances with central bank, treasury bills, placements with other banks, customer-overdraft, bills-discounting, investments in subsidiaries, interest receivables, other receivables, freehold land and buildings, leasehold and buildings, furniture fixtures and equipment, motor-vehicles, employees salaries, number of employees, guarantees and standby letters of credit, letters of acceptances, performance bonds and warrantees, customer deposits, deposits with other banks, amount to group companies, amount from group companies and other liabilities. Variable such as amount paid to employs could either increase inefficiency or decrease efficiency only if the banks would strategically plan for labour as an input towards their production and therefore utilize it efficiently. Therefore we observe that the input-output variables in organizations are the ones that contribute towards inefficiency and therefore the need to measure the allocative efficiency of these organizations. Achieving allocative efficiency means that the banks are properly utilizing their resources and therefore maximizing their value. The input-output variables are regressed on the mean efficiency ratio for the period 1999-2001 of the respective banks, to assess the extent to which the input-output factors contribute towards inefficiency.

The choice of input-output variables was largely dependent on the model's sensitivity to inclusion or removal of the choice of input-output variables.

The following were the findings:

Backward stepwise regression elimination was used to find the relationship between input-output variables and efficiency. The backward elimination technique begins with a regression model based on all variables and subsequently reduces the number of the variables by dropping first, the one with the least partial correlation with dependent variable. The best set of independent variables had to be formulated, because of the model's inability to include all the input-output variables given the small sample size. The variables therefore had to be classified into two categories, model 1 and model 2; the basis in which the classification was done was as follows;

Those variables that for purely theoretical reasons had to be included, variables that may have desire-able intuitive appeal based on the understanding of the model being studied. Since the model had a large number of independent variables with few cases, including all the independent variables would have generated a less reliable model than if the model used less independent variables. Interrelated variables reduce the models capabilities, and tend to detract from its simulative power.

Table 5: Model's input-output variables

MODEL	INPUT-OUTPUT VARIABLES
Model 1	Blcbk, Pwob, Subsi, Npl, Custdep, loans, frhla, Intrec
Model 2	Cinhand, Blcbk, Bv, Equipts, Perbds, Bildis, Tbill, LCSACPTS, Overdft, Amtfrgr

Blcbk- Balances with Central bank
Pwob-Placements with other banks
Subsi-Investments in subsidiaries
Npl- Non performing Loans
Custdep- Customer deposits
Loans- Loans
Frhla- Freehold land and Biuldings
Lcsacpts- Letters of credit and Acceptances
Amtfrgr- Amount from group companies
Intrec- Interest Receivables
Cinhand- Cash in hand
Bv- Book-value
Equipts- Equipments (furniture and fixtures)
Perbds- Performance bonds
Bildis- Bills Discounting
Tbill- Treasury Bills
Overdft- Overdrafts

The results for the regression models were:

Table 6: Tabulated results of different types of Regression models (1999&2000)

YEAR	MODEL TYPE	CONSTANT	INDEPENDENT VARIABLES	STANDARDIZED COEFFICIENT
1999	MODEL 1	24.28	Blcbk	1.23
			Pwob	-0.39
			Npl	-0.07
			Frhla	-0.38
			Custdep	-0.37
R-sq=1.000 R-sq(adj) = 0.998 S = 1.205				
	MODEL 2	23.05	Cinhand	-0.98
			Blcbk	0.64
			Overdft	0.11
			Equipts	-1.41
			Amtfrgr	1.46
			Perbds	2.27
R-sq = 1.000 R-sq (adj) = 1.000 S = 0.330				
2000	MODEL 1	13.56	Custdep	-0.17
			Frhla	-0.28
			Intrec	-0.17
			Pwob	-0.42
			Blcbk	1.27
R-sq = 1.000 R-sq (adj) = 0.999 S = 0.802				
	MODEL 2	0.15	BV	0.29
			Cinhand	-0.30
			Overdft	-0.27
			Lcsacpts	-0.74
			Amtfrgr	1.11
			Perbds	1.78
R-sq = 1.000 R-sq (adj) =1.000 S = 0.348				

Continued:

Table 7: Tabulated results of different types of regression models (2001&Avg 1999-2001)

YEAR	MODEL TYPE	CONSTANT	INDEPENDENT VARIABLES	STANDARDIZED COEFFICIENT
2001	MODEL 1	9.46	Intrec	-0.98
			Npl	-0.30
			Loans	0.95
			Pwob	-0.54
			Blcbk	0.73
R-sq = 1.000 R-sq (adj) = 0.999 S = 0.552				
2001	MODEL 2	4.29	Cinhand	-0.30
			Lcsacpts	0.06
			Perbds	0.54
			Blcbk	0.22
			Bildis	0.65
R-sq = 1.000 R-sq (adj) = 1.000 S = 0.115				
AVG 1999-2001	MODEL 1	7.39	Frhla	-0.66
			Intrec	-0.22
			Npl	-0.11
			Blcbk	1.08
R-sq = 1.000 R-sq (adj) = 1.000 S = 0.400				
	MODEL 2	2.82	Cinhand	-0.65
			Overdft	0.10
			Perbds	0.68
			Tbills	0.99
R-sq = 1.000 R-sq (adj) = 0.999 S = 0.538				

Blcbk- Balances with Central bank

Pwob-Placements with other banks

Subsi-Investments in subsidiaries

Npl- Non performing Loans

Custdep- Customer deposits

Loans- Loans

Frhla- Freehold land and Biuldings

Lcsacpts- Letters of credit and Acceptances

Amtfrgr- Amount from group companies

Intrec- Interest Receivables

Cinhand- Cash in hand

Bv- Book-value

Equipts- Equipments (furniture and fixtures)

Perbds- Performance bonds

Bildis- Bills Discounting

Tbill- Treasury Bills

Overdft- Overdrafts

The model excluded the variables with the least partial correlation coefficient, this being the criteria that the backward stepwise technique used to eliminate the independent variables. From the model, it was observed that the statistically negative values of the coefficients imply that an increase in the respective independent variable results in decrease in inefficiency, whereas, the statistical positive values of the coefficients imply that an increase in the respective independent variables results in an increase in inefficiency. However this is not the case for the highly capitalized banks in the Kenyan context. For the highly capitalized banks, we would expect positive coefficients for independent variables such as non- performing loans to increase inefficiency. Since the study did not control the level of capitalization, the results tend to indicate low capitalization, which in this study show that the level of capitalization can signal a bank's riskiness because banks with low capitalization will take more risk hence decrease inefficiency. This is observed from the negative partial coefficient shown in the independent variable, Non-performing loans. This shows that less efficient banks can improve performance by increasing their capital ratio and the banks with low capital ratio can improve efficiency by reducing the capital ratio because they will be putting less capital at risk when they take more risk, such banks are quite risky.

A comparison of capital ratio, total assets and inefficiency ratios of the respective banks is summarized below using cross tabulation.

Table 8: Cross tabulation of capital ratio and ineffiency-1999

		INEFFICIENCY		TOTAL
		1.00	2.00	
CAPITAL RATIO 1	Count	0	3	3
	Expected count	0.8	2.3	3.0
	% within capital ratio	0.0%	100.0%	100.0%
	% within inefficiency	0.0%	50.0%	37.5%
	% of total	0.0%	37.5%	37.5%
CAPITAL RATIO 2	Count	2	3	5
	Expected count	1.3	3.8	5.0
	% within capital ratio	40.0%	60.0%	100.0
	% within inefficiency	100.0%	50.0%	62.5
	% of total	25.0%	37.5%	62.5
Total	Count	2	6	8
	Expected count	2.0	6.0	8.0
	% within capital ratio	25.0%	75.0%	100.0%
	% within inefficiency	100.0%	100.0%	100.0%
	% of total	25.0%	75.0%	100.0%

1 denotes above average
2 denotes below average

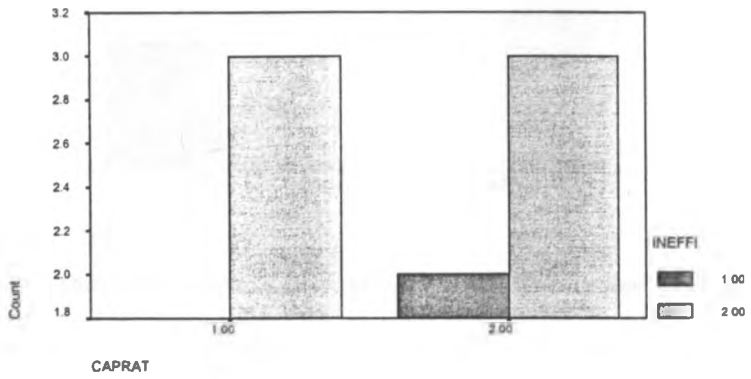

Figure 6: Clustered bar chart representation of the association between Capital and Inefficiency-1999

Table 9: Cross tabulation of Total assets and ineffiency-1999

		INEFFICIENCY		TOTAL
		1.00	2.00	
TOTAL ASSETS 1	Count	2	1	3
	Expected count	0.8	2.3	3.0
	% within capital ratio	66.7%	33.3%	100.0%
	% within inefficiency	100.0%	16.7%	37.5%
	% of total	25.0%	12.5%	37.5%
TOTAL ASSETS 2	Count	0	5	5
	Expected count	1.3	3.8	5.0
	% within capital ratio	0.0%	100.0%	100.0%
	% within inefficiency	0.0%	83.3%	62.5%
	% of total	0.0%	62.5%	62.5%
Total	Count	2	6	8
	Expected count	2.0	6.0	8.0
	% within capital ratio	25.0%	75.0%	100.0%
	% within inefficiency	100.05	100.0%	100.0%
	% of total	25.0%	75.0%	100.0%

1 denotes above average
2 denotes below average

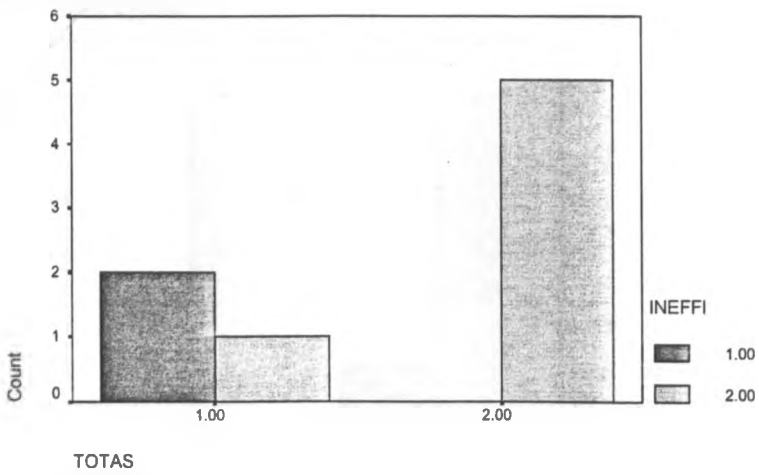

Figure 7: Clustered bar chart representation of the association between Total assets and Inefficiency-1999

Table10: Cross tabulation of capital ratio and ineffiency-2000

		INEFFICIENCY		TOTAL
		1.00	2.00	
CAPITAL RATIO 1	Count	0	3	3
	Expected count	0.8	2.3	3.0
	% within capital ratio	0.0%	100.0%	100.0%
	% within inefficiency	0.0%	50.0%	37.5%
	% of total	0.0%	37.5%	37.5%
CAPITAL RATIO 2	Count	2	3%	5
	Expected count	1.3	3.8%	5.0
	% within capital ratio	40.0%	60.0%	100.0%
	% within inefficiency	100.0%	50.0%	62.5%
	% of total	25.0%	37.5%	62.5%
Total	Count	2	6	8
	Expected count	2.0	6.0	8.0
	% within capital ratio	25.0%	75.0%	100.0%
	% within inefficiency	100.0%	100.0%	100.0%
	% of total	25.0%	75.0%	100.0%

1 denotes above average
2 denotes below average

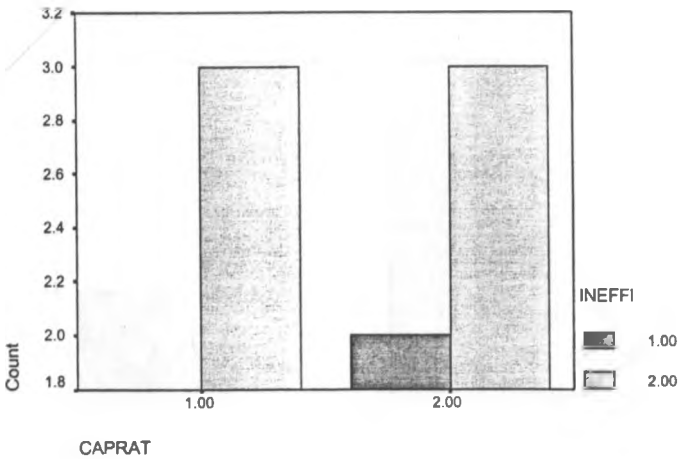

Figure 8: Clustered bar chart representation of association between Capital ratio and Inefficiency-2000

Table 11: Cross tabulation of Total assets ratio and ineffiency-2000

		INEFFICIENCY		TOTAL
		1.00	2.00	
TOTAL ASSETS 1	Count	0	3	3
	Expected count	0.8	2.3	2.3
	% within capital ratio	0.0%	100.0%	100.0%
	% within inefficiency	0.0%	50.05	37.5%
	% of total	0.0%	37.5%	37.5%
TOTAL ASSETS 2	Count	2	3	5
	Expected count	1.3	3.8	5.0
	% within capital ratio	40.0%	60.0%	100.0%
	% within inefficiency	100.0%	50.0%	62.5%
	% of total	25.0%	37.5%	62.5%
Total	Count	2	2	8
	Expected count	2.0	2.0	8.0
	% within capital ratio	25.0%	25.0%	100.0%
	% within inefficiency	100.0%	100.0%	100.0%
	% of total	25.0%	75.0%	100.0%

1 denotes above average
2 denotes below average

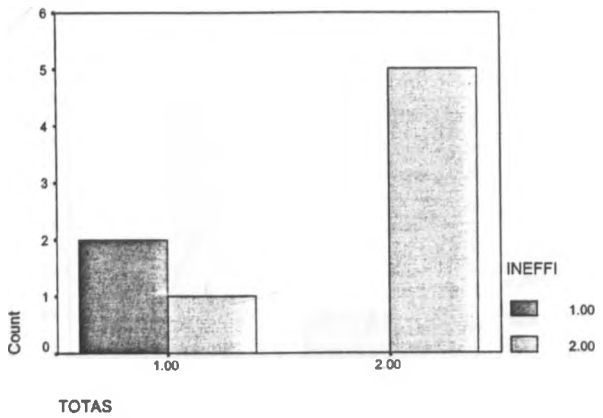

Figure 9: Clustered bar chart representation of Total assets and Inefficiency-2000

Table12: Cross tabulation of capital ratio and ineffiency-2001

		INEFFICIENCY		TOTAL
		1.00	2.00	
CAPITAL RATIO 1	Count	0	3	3
	Expected count	0.8	2.3	3.0
	% within capital ratio	0.0%	100.0%	100.0%
	% within inefficiency	0.0%	50.0%	37.5%
	% of total	0.0%	37.5%	37.5%
CAPITAL RATIO 2	Count	2	3%	5
	Expected count	1.3	3.8%	5.0
	% within capital ratio	40.0%	60.0%	100.0%
	% within inefficiency	100.0%	50.0%	62.5%
	% of total	25.0%	37.5%	62.5%
Total	Count	2	6	8
	Expected count	2.0	6.0	8.0
	% within capital ratio	25.0%	75.0%	100.0%
	% within inefficiency	100.0%	100.0%	100.0%
	% of total	25.0%	75.0%	100.0%

1 denotes above average
2 denotes below average

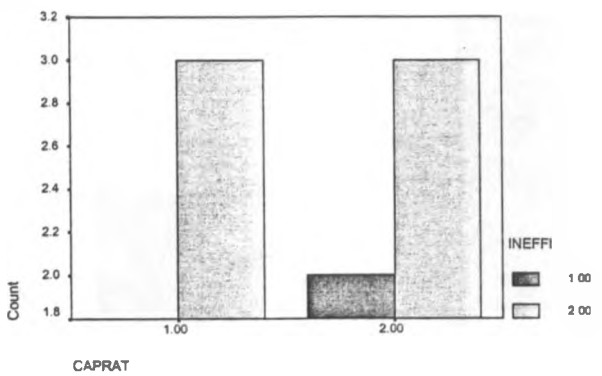

Figure 10: Clustered bar chart representation of association between Capital ratio and Inefficiency-2001

Table 13: Cross tabulation of Total assets ratio and ineffiency-2001

		INEFFICIENCY		TOTAL
		1.00	2.00	
TOTAL ASSETS 1	Count	2	1	3
	Expected count	0.8	2.3	3.0
	% within capital ratio	66.7%	33.3%	100.0%
	% within inefficiency	100.0%	16.7%	37.5%
	% of total	25.0%	12.5%	37.5%
TOTAL ASSETS 2	Count	0	5	5
	Expected count	1.3	3.8%	5.0
	% within capital ratio	0.0%	100.0%	100.0%
	% within inefficiency	0.0%	83.3%	62.5%
	% of total	0.0%	62.5%	62.5%
Total	Count	2	6	8
	Expected count	2.0	6.0	8.0
	% within capital ratio	25.0%	75.0%	100.0%
	% within inefficiency	100.0%	100.0%	100.0%
	% of total	25.0%	75.0%	100.0%

1 denotes above average
2 denotes below average

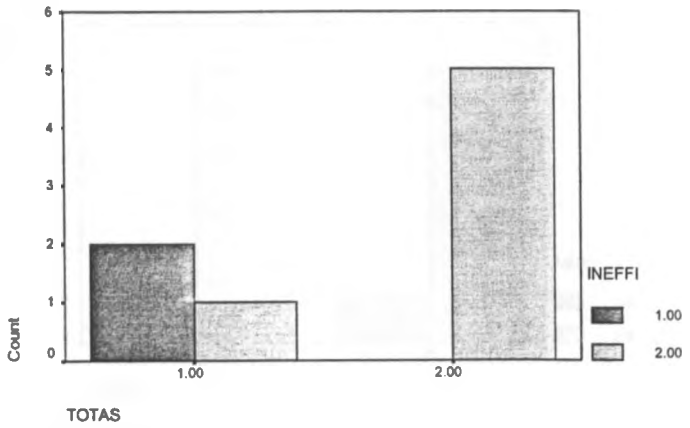

Figure11: Clustered bar chart representation of the association between Total assets and Inefficiency-2001

Table14: Cross tabulation of capital ratio and ineffiency- Average period 1999-2001

		INEFFICIENCY		TOTAL
		1.00	2.00	
CAPITAL RATIO 1	Count	0	3	3
	Expected count	0.8	2.3	3.0
	% within capital ratio	0.0%	100.0%	100.0%
	% within inefficiency	0.0%	50.0%	37.5%
	% of total	0.0%	37.5%	37.5%
CAPITAL RATIO 2	Count	2	3	5
	Expected count	1.3	3.8	5.0
	% within capital ratio	40.0%	60.0%	100.0%
	% within inefficiency	100.0%	50.0%	62.5%
	% of total	25.0%	37.5%	62.5%
Total	Count	2	6	8
	Expected count	2.0	6.0	8.0
	% within capital ratio	25.0	75.0%	100.0%
	% within inefficiency	100.0	100.0%	100.0%
	% of total	25.0	75.0%	100.0%

1 denotes above average
2 denotes below average

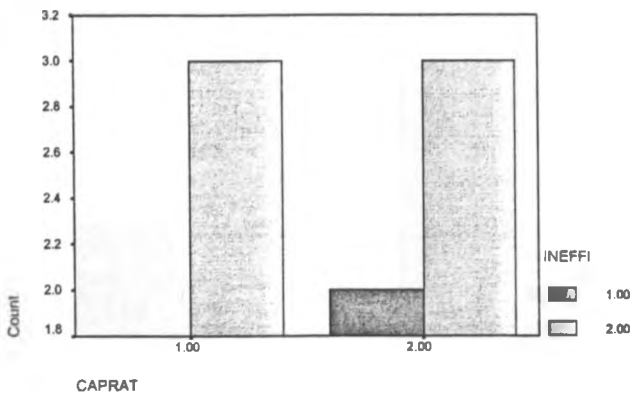

Figure12: Clustered bar chart representation of the association between Capital ratio and Inefficiency 1999-2001

Table 15: Cross tabulation of Total assets ratio and ineffiency-Average period 1999-2000

		INEFFICIENCY		TOTAL
		1.00	2.00	
TOTAL ASSETS 1	Count	2	1	3
	Expected count	0.8	2.3	3.0
	% within capital ratio	66.7%	33.3%	100.0%
	% within inefficiency	100.0%	16.7%	37.5%
	% of total	25.0%	12.5%	37.5%
TOTAL ASSETS 2	Count	0	5	5
	Expected count	1.3	3.8	5.0
	% within capital ratio	0.0%	100.0%	100.0%
	% within inefficiency	0.0%	83.3%	62.5%
	% of total	0.0%	62.5%	62.5%
Total	Count	2	6	8
	Expected count	2.0	6.0	8.0
	% within capital ratio	25.0%	75.0%	100.0%
	% within inefficiency	100.0%	100.0%	100.0%
	% of total	25.05	75.0%	100.0%

1 denotes above average
2 denotes below average

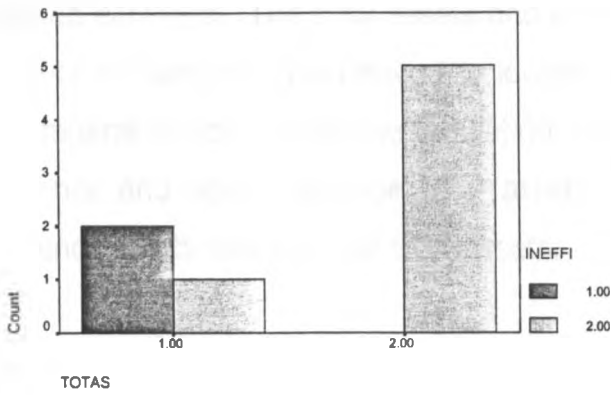

Figure 13: Clustered bar chart representation of the association between Total assets and Inefficiency 1999-2001

The cross tabulations for all the years and the average for the period gave contingency coefficients of more than zero showing an association between the row and column variables and indicating a moderate degree of association between the variables.

This tabulation shows that banks with high capital have the highest inefficiency scores however, earlier studies done (Hughes et al 1997) indicate that high capitalized bank have the highest efficiency whereas those that are less capitalized are the most inefficient. The capital signaling role shows that banks that are highly capitalized are less risky and more efficient unlike the low capitalized banks that are quite risky and therefore inefficient. However this is not the case for Kenyan banks, meaning we cannot discriminate efficiency of Kenya's banks using capital. It could also mean that Kenya's banks mainly rely on customers deposits for funds and that they are not confident with the financial market, which is risky.

It might be possible that also the banks with high capitalization increase their capital through revaluation of assets and not due to injection of fresh capital or retained earnings. The total assets and efficiency cross tabulation indicates that some of the largest banks have the lowest efficiency compared to similar banks of comparable size. From the tabulation only two banks achieve above average efficiency and above average total assets the six banks have below average efficiency and below average total assets.

5.0 CHAPTER FIVE

5.1 CONCLUSIONS AND RECOMMENDATIONS FOR FURTHER RESEARCH

The study measures the efficiency of the banking institutions in Kenya (The case of the quoted banks at Nairobi Stock Exchange), using the difference between Market value and book value to gauge efficiency. The study has established that the most efficient banks from the sample is Barclays Bank, followed by Standard Chartered, the lowest in efficiency being National Bank. This indicated that the most efficient bank to the eyes of the investors is reflected in the particular banks market value. Investors will put in their money where they are assured of returns and most of all avoid risk taking. Depositors will also put in their money where they are assured of interest and their claims can be satisfied at any point in time.

This calls for a high capitalization that should be seen in most efficient banks which was not the case in the study, Hughes study however did show that the banks with high capitalization are the most efficient and those with low capitalization are the most inefficient since capital plays different roles in the two categories.

This study, however showed that the low capitalized banks were the most efficient and therefore negative coefficients observed from the input-output variables implied that by taking more risk the banks increased efficiency unlike the highly capitalized banks that would increase inefficiency in such a case as they would be taking too much risk for their Capital. The highly capitalized banks might have increased capital through revaluation of the assets and not due to the injection of fresh capital or retained earnings.

From all the input output variables that would have been used in the study only eight variables influenced the decision. The two models made divided the samples into two, Model 1 considered practically what influences efficiency in the banking institutions. Model 2 considered the best model the regression gave.

Comparing size of the banks and efficiency where total assets was used as a proxy for size the results showed that the some of the largest banks were the

most inefficient, unlike the small banks, which maintained moderate efficiency that was consistent.

The study therefore concludes that the low capitalized banks in Kenya are the most efficient. Controlling, for size, some of the banks that are large are the most inefficient. This is evident in our local banks such as Kenya Commercial Bank and National Bank that had the lowest efficiency clearly indicated in the market value. The study therefore concludes that in the Kenyan context, capital cannot be used to discriminate efficient banks from inefficient banks. The study has observed that the small banks are more efficient than the large banks, and are therefore utilizing their resources properly unlike the big banks, that do not want to take extra risk by injecting more capital. The large banks are not therefore utilizing their property well.

Investors could therefore invest in the banks that have high efficiency scores and high capitalization because their investments are safe and are not threatened with risks such as liquidity risk and financial distress and that capital could also act as a source of funds for borrowers of a particular bank.

5.2 LIMITATIONS OF THE STUDY

The study considered a small sample, which might have affected the efficiency scores and the partial regression coefficients. A larger sample gives true results, using a larger sample than the one the study considered is not possible because there are very few companies quoted at the Nairobi Stock Exchange. Given a larger sample, efficiency can be measured across the different characteristics of the banks.

The independent variables that were meant to be used in the model were also affected by the size of the sample therefore the model reduced the independent variables to eight.

5.3 RECOMMENDATIONS FOR FUTURE RESEARCH

The results of this study raises a number of issues that could be considered in future research in the area. Studies show that the most efficient banks are the banks that are highly capitalized which was not the case in Kenya's Banks, therefore future studies should consider studying highly capitalized banks and low capitalized banks separately and comparing the two. The study could also consider size when gauging efficiency and carry out an efficiency study for small sized banks and large banks separately.

The study also established that a larger sample would give more accurate results. Kenya, is though still an emerging market, this is seen from the fact that very few banks are listed at Nairobi Stock exchange. Therefore use of other econometric techniques that do not consider market value to gauge efficiency such as Data Envelopment Analysis (DEA) could be used.

Lastly research should be carried out to explain why the highly capitalized banks were the most inefficient banks in the Kenyan context, given that highly capitalized banks are the most efficient and low capitalized banks are the most inefficient.

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Appendix 1: Bank Characteristics-1999

Bank	Capital/Asset ratio	Total assets(in Ksh million)
SCB	0.12	44,056
BBK	0.13	69,292
KCB	0.12	75,260
NBK	0.08	25,114
HFCK	0.11	12,995
NIC	0.28	7,212
DTB	0.19	5,996
CFC	0.25	7,607

Appendix 2: Bank Characteristics-2000

Bank	Capital/Asset ratio	Total assets(in Ksh million)
SCB	0.09	49,388
BBK	0.13	70,377
KCB	0.11	74,105
NBK	0.09	23,940
HFCK	0.10	13,130
NIC	0.30	7,442
DTB	0.24	5,170
CFC	0.21	9,914

Appendix 3: Bank Characteristics-2001

Bank	Capital/Asset ratio	Total assets(in Ksh million)
SCB	0.11	54,480
BBK	0.15	73,647
KCB	0.13	65,206
NBK	0.10	24,043
HFCK	0.09	11,829
NIC	0.29	8,408
DTB	0.23	5,530
CFC	0.22	10,447

Appendix 4: Bank Characteristics1999-2001

Bank	Capital/Asset ratio	Total assets(in Ksh million)
SCB	0.11	49,308
BBK	0.14	71,105
KCB	0.12	71,524
NBK	0.09	24,365
HFCK	0.10	12,651
NIC	0.29	7,687
DTB	0.22	5,565
CFC	0.23	9,322