# PERFORMANCE MEASUREMENT, GROWTH AND STRUCTURE OF EAST AFRICA COMMERCIAL BANKS



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## DECLARATION

This research thesis is my original work and has not been presented to any other University for a degree

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This thesis has been submitted for examination with our approval as the candidate's University supervisors

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**DEDICATION**

To my family, Lucy, Brianna and Bruno Rutto.

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## ABBREVIATIONS

| | |
|---|---|
| BCC | Banker Charnes Cooper |
| BFIA | Banking and Financial Institutions Act |
| BSC | Balanced Scorecard |
| CBK | Central Bank of Kenya |
| CCR | Cooper Charnes Rhodes |
| CCB | City Commercial Bank |
| CDS | Credit Default Swap |
| CR | Concentration Ratio |
| CRS | Constant Returns to Scale |
| CRR | Cash Reserve Ratio |
| DEA | Data Envelopment Analysis |
| D-F test | Dickey-Fuller test |
| DFA | Distribution Freehall Approach |
| DMU | Decision Making Unit |
| DSE | Dar-es-Salaam Stock Exchange |
| EAC | East African Community |
| ECB | European Central Bank |
| EFS | Efficient Structure |
| EVA | Economic Value Added |
| FIA | Financial Institutions Act |
| GCC | Gulf Co-operation Council |
| GDP | Gross Domestic Product |
| HHI | Herfindahl Hirschman Index |
| LLC | Levin-Lin-Chu |
| MC | Market Concentration |
| MS | Market Share |
| NIM | Net Interest Margin |
| NN | Neural Network |
| NSE | Nairobi Securities Exchange |
| OLS | Ordinary Least Squares |
| PAT | Profit After Tax |

| | |
|---|---|
| PB | Price to Book |
| PBT | Profit Before Tax |
| PE | Price to Earnings |
| PMM | Performance Measurement Management |
| P-P test | Phillip Perron test |
| PTEC | Pure Technical Efficiency Change |
| RMP | Relative Market Power |
| ROA | Return on Assets |
| ROE | Return on Equity |
| RTS | Returns to Scale |
| SCP | Structure-Conduct-Performance |
| SEC | Scale Efficiency Change |
| SFA | Stochastic Frontier Analysis |
| SLR | Statutory Liquidity Ratio |
| SOCB | State Owned Commercial Bank |
| TC | Total Cost |
| TE | Technical Efficiency |
| TEC | Technical Efficiency Change |
| TFP | Total Factor Productivity |
| TSR | Total Share Return |
| USE | Uganda Securities Exchange |
| VCI | Value Creation Index |
| VRS | Variable Returns to Scale |
| VSM | Viable Systems Model |

**ABSTRACT**

The objective of the study was to contrast bank performance measures and propose a single measure of performance for commercial banks in the East African Community (EAC) region. The study is in two major parts and addressed four main objectives. The first part analysed the various performance measures that have been applied by banks which include Return on Equity (RoE), Return on Assets (RoA), Net Interest Margin (NIM), Profit Margin (PM), efficiency, effectiveness and explored the application of a single measure (SM). The second part examined the theoretical relationships between market structure, financial structure, growth and bank performance measures for commercial banks in the EAC region. The study is motivated by the fact that though the banking sector constitutes a large part of the financial system in the East African Community, there is no consensus on a performance measure for commercial banks in the member nations, moreso, as the region moves toward further integration and subsequently a monetary union.

The study used secondary data from annual published audited financial statements for the period (1997-2011) and collected data for the 127 licensed commercial banks within the EAC region.

The results conform to the Structural Conduct Performance (SCP) theory that advocates a positive and significant relation between market structure and performance. The results for structure size support the financial structure theory that postulates an insignificant relationship for the SM, PM, NIM and PM but the structure activity variable contradicts the theory in the case of RoE, SM and PM. The results also support the finance growth theory that postulates a positive relationship efficiency and growth.

The single measure which combines productivity and profitability is found to be robust when compared and ranked to the other performance measures. The measure also conforms to the theoretical frameworks relating performance and real economic growth, market structure and financial structure.

# CHAPTER ONE: INTRODUCTION

## 1.1 Background of the study

A commercial bank as defined by Mishkin (2001) as a financial intermediary that raises funds primarily by issuing checkable deposits (deposits on which checks can be written), savings deposits (deposits that are payable on demand but do not allow the owner to write checks), and time deposits (deposits with fixed terms to maturity).

The banking system constitutes the largest part of the financial system in most countries, especially in emerging and developing markets (Beck and Dermiguc-Kunt, 2009). The study by Diamond and Rajan (2001) highlights the strength of the banking system as an essential requirement to ensure the economic stability and growth. Banks are the main part of the financial sector in any economy performing valuable activities on both sides of the balance sheet. On the asset side, they enhance the flow of funds by lending to the cash starved users of funds, whereas they provide liquidity to savers on the liability side. Banks also facilitate the payments and settlement systems and support the smooth transfer of goods and services. They ensure productive investment of capital to stimulate the economic growth.

The banking sectors in the East African Community (EAC) countries as noted by Cihak and Podpiera (2005) consist of three main segments – large domestic banks, subsidiary banks or branches of international banks and small (domestic and foreign) banks. Other segments include mortgages, deposit taking microfinance institutions, representative offices of foreign banks, foreign exchange bureaus and credit reference bureaus. The International banks play a key role in each of the countries. The EAC countries have a total of 127 commercial banks comprising Kenya 43; Tanzania 32; Uganda 25; Rwanda 14 and Burundi 13 as at 31 December 2011.

The European Central Bank (2010) defines bank performance as the capacity to generate sustainable profitability. Kumar and Gulati (2010) define performance in both profit and non-profit organizations as an appropriate combination of efficiency and effectiveness. Profitability refers to the net gains after deducting all costs and is essential for ongoing activities as well as for its investors to obtain fair returns.

A performance measurement framework as noted by Bigliardi and Bottani (2010) assists in the process of performance measures building, by clarifying measurement boundaries, specifying performance measurement dimensions or views and may also provide initial intuitions into relationships among the dimensions. There are a multitude of measures used to assess bank performance with each group of stakeholders having its own focus of interest. (Rouse and Putterill, 2003)

The ECB (2010) supports the above notion and classifies the large set of performance measures for banks used by academics and practitioners alike, into traditional, economic and market-based measures of performance. The Traditional measures of performance measures include return on assets (ROA), return on equity (ROE) or cost-to-income ratio and net interest margin (NIM). The economic measures of performance take into account the development of shareholder value creation and aim at assessing, for any given fiscal year, the economic results generated by a company from its economic assets (as part of its balance sheet). These measures mainly focus on efficiency as a central element of performance, but generally have high levels of information requirements. Lastly, the Market-based measures of performance characterize the way the capital markets value the activity of any given company, compared with its estimated accounting or economic value. The most commonly used metrics include: the "total share return" (TSR), the "price-earnings ratio" (P/E), the "price-to-book value" (P/B), which relates the market value of stockholders' equity to its book value; the "credit default swap" (CDS), which is the cost of insuring an unsecured bond of the institution for a given time period.

Productivity theory as reported by Chatzoglou et al., (2010), is a well developed branch of analysis (and theory) with three commonly used methods: Stochastic Frontier Analysis (SFA), total factor productivity (TFP) and Data Envelopment Analysis (DEA). Productivity growth is defined by Al-Muharrami (2007) as the change in output due to technical efficiency change and technical change over time. A further more recent branch that provides for performance to be decomposed further into technological change and efficiency change is provided by Malmquist (1953) techniques.

Rouse and Putterill (2003) mention other methods commonly used for performance analysis which include statistical regression, data mining, factor analysis, structural equation modeling, expert systems/ geographic information systems, and ratio analysis.

While commenting on effectiveness, Keh et al., (2006) observed that a measure of effectiveness assesses the ability of an organization to attain its pre-determined goals and objectives. This indicates that there is no consensus on a single measure that can be applied to measure bank performance. This study seeks to identify a single measure of bank performance that can be applied by commercial banks in the EAC.

Market structure as highlighted by Wong et al., (2007) determines the performance of banks specifically banks' profits and pricing behaviors. In general, banks profitability and pricing power are hypothesized to be determined by market structure. Market structure refers to the number of participating banks in the market and the market shares of banks, including bank specific factors, such as cost efficiency, scale efficiency, and the risk attitude of banks. Amongst the various approaches, a number of studies have focused on the structure – performance relationship of banks, with the structure-conduct-performance (SCP) hypothesis and the efficient-structure (EFS) hypothesis widely tested.

The SCP paradigm as highlighted by Delis and Papanikolaou (2009) postulates that firms are able to extract higher profits in concentrated markets because they can resort to oligopolistic behavior and collusive arrangements. According to the SCP, a positive correlation between profitability and market concentration indicates that there is not enough competition in the banking market. The EFS hypotheses emphasizes that higher profits are not generated because of an oligopolistic behavior of the big firms but because they are more efficient than other firms in the market, hence the increase in size and the market share.

Demirguc-Kunt and Huizinga (2000) who analysed the influence of financial structure on profits and margins and found evidence that differences in bank and stock market development do translate into differences in the cost of bank financing for firms. However, they find that financial structure *per se* does not have a significant, independent influence on bank profits and margins. A similar study was also done by Ruiz-Porras (2009) who found the effect of financial structure on bank performance to be significant. Financial structure refers to the relative development of banks versus markets. Therefore this study will assess the effect of financial structure on performance for the EAC countries which are all developing economies.

This study seeks to identify and contrast bank performance that can be applied by commercial banks in the EAC region and examines the effects of markets structure, financial structure and growth on the measures.

### 1.2 Statement of the Problem

The evaluation of bank performance measures according to Mehrabad et al.,(2012) has been an area of concern for managers for a long time. In practice, company strategies need to be coupled with appropriate and consistent performance. The worldwide financial crisis in 2008 as highlighted in the Global Financial Development Report (2013) has starkly highlighted the importance of financial systems and their role in supporting economic development, ensuring stability and reducing poverty. The financial crisis has also brought into focus and reignited the debate on applicability of the various measures of bank performance and their importance to bank stability.

The problem of measuring bank performance as highlighted by Chatzoglou et al., (2010) is that it is difficult to define, as there are many factors that should be estimated for example outputs, costs, efficiency and performance. Further, the changing nature of the banking industry has made evaluations even more difficult hence triggering the need for more flexible alternative forms of financial analysis.

According to Aarma et al., (2004), different versions of financial ratio analysis are used for bank performance analysis using financial statement items as initial data sources. The traditional financial ratio analysis has mainly been used to measure bank performance. Cornett, Ors and Tehranian (2002) identify six common bank performance indicators measures have been evaluated by namely profitability, capital risk, asset quality, operating efficiency, liquidity and growth indicators. However, as Yeh (1996) observes, there is no clear cut rationale which would allow one to acquire a composite score on the overall financial soundness of a bank. This study therefore proposes a single measure that combines the key attributes of productivity and profitability to address this problem.

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### 1.3 Purpose of the study

The purpose of this study is to seek to contrast bank performance measures and propose the use of a single measure for commercial banks in the East African Community (EAC) countries. The study further examines the theoretical relationships of the single measure and overall performance with market structure, financial structure and growth and their importance.

### 1.4 Objectives

The specific objectives are:

1. To compare and contrast bank performance measures and propose a single measure for commercial banks in the East African Community (EAC).

2. To establish the relationship between economic growth and bank performance for commercial banks in EAC countries.

3. To analyze the effect of market structure on bank performance in commercial banks in EAC countries.

4. To determine the influence of financial structure on bank performance in commercial banks in EAC countries.



### 1.5 Research Questions

The study adds to existing literature on bank performance by answering the following research questions:

RQ1. Which is the most appropriate bank performance measure?

RQ2. What is the effect of growth on bank performance of commercial banks in EAC countries?

RQ3. What is the effect of market structure on bank performance in commercial banks in EAC countries?

RQ4. How does financial structure affect the level of bank performance in commercial banks in EAC countries?

### 1.6 Research Hypothesis

To achieve the objectives, the following hypotheses will be tested:

H1: A single measure is the most suitable performance measure for commercial banks in EAC

H2: Growth rate significantly influences bank performance in commercial banks in EAC countries

H3: Market structure and concentration significantly influence the level of bank performance for commercial banks in EAC countries

H4: Bank performance is significantly influenced by financial structure within the banking sector of EAC countries



### 1.7 Significance of the Study

The existing studies on comparative analysis of bank performance in the EAC financial sector are few and which have concentrated on the measurement of efficiency of banks in terms of resource utilization (operating efficiency) (Timothy, 2010; Kamau, 2009; Mugume 2008; Aikaeli, 2006) and ignored the operational effectiveness of banks in achieving their pre-determined policy objectives.

The findings of the study will also help the regulators in making strategic actions for assessing and improving the performance of commercial banks by assessing the effects of market structure, financial structure and economic growth. The study will give insights on improving managerial performance by identifying 'best practices' and 'worst practices' associated with high and low measured performance levels, respectively, and encouraging the formers practices while discouraging the latter. The understanding of the critical set of resources that drive commercial bank performance will enable managers to make decisions on which resources to develop, and which can be substituted.

For the policy makers who are formulating guidelines for the establishment of a monetary union for the EAC by 2015 as set by the EAC Summit of Heads of States held in November 2012, the study will give insights into the current performance levels of commercial banks in the member states.

The study will also contribute to existing literature on bank performance measures for commercial banks in the EAC block by identifying the most suitable measure as well as testing the key determinants of bank performance.



### 1.8 Delimitation of the study

Within the financial services sector, the study concentrated on commercial banks in the East African banking sector thus excluding microfinance institutions, community banks and co-operatives. The choice of East Africa was due to the integration process by the member states whose ultimate aim is to form a monetary union.

### 1.9 Limitations of the study

The limitations of the study are outlined below.
First, output measures do not include quality-type variables, for example, service quality and equipment quality, because the data were unavailable.

Secondly, the study looked only at commercial banks in Kenya, Tanzania and Uganda. There is need for a review of other financial institutions namely community banks and co-operative societies which also intermediate funds.

## 1.10 Assumptions of the study

The study assumes that the legal frameworks in place in the various countries are enforced accordingly and no preferential treatment given to any of the commercial banks in the respective countries.

## 1.11 Definitions of significant terms

| | |
|---|---|
| Commercial bank | -company engaged in banking business, that is, taking deposits repayable in time or on demand, accepting money on current accounts and acceptance of cheques and financial intermediation using the deposits taken. |
| Effectiveness | - doing the right things |
| Efficiency | - doing things right |
| Endogenous variable | - a variable that is assumed to depend on or be caused by another (called the independent variable). |
| Exogenous variable | - a variable with values that are not problematic in an analysis but are taken as given. An independent variable is presumed to cause or determine a dependent variables |
| Market structure | -number of participating banks in the market and the market shares of banks. |
| Financial structure | -refers to the relative development of banks versus markets. |
| Economic growth | -real gross domestic product of a country measured by output |

### 1.12 Chapter Summary

This chapter has provided a brief review of the background, statement of the problem, objectives, research questions, hypotheses and the significance of the study with regards to the performance measures of commercial banks in East Africa.

The problem statement highlights the need for a review of performance measurement systems with a view to identifying the most reliable measure.

The next chapter is on the literature review and analyses research conducted in the field of performance as well as the theoretical perspectives with regards to market structure and financial structure and growth.

## CHAPTER TWO: LITERATURE REVIEW

### 2.0 Introduction

This chapter will review financial sector of the EAC and the bank performance measures that have been applied globally and within the EAC by various banks. Section 2.1 reviews the establishment of the EAC while section 2.2 analyses the determinants of bank performance. Section 2.3 examines the bank performance measures and section 2.4 analyses the effect of growth, market structure on bank performance and tests the competing theories. Section 2.5 reviews the effect of financial deepening in the EAC countries on bank performance while section 2.6 analysis the effect of financial structure on performance of commercial banks. Section 2.7 presents a conceptual framework that will be applied in the study.



### 2.1 Overview of the EAC Banking Sector

According to Yabara (2012), the EAC was established in 2000 by Kenya, Tanzania and Uganda; Rwanda and Burundi joined in 2007. The Republic of Rwanda and the Republic of Burundi acceded to the EAC Treaty on 18th June 2007 and became full Members of the Community with effect from 1st July 2007. Its objectives are to deepen cooperation among member states in political, economic and social fields to establish a monetary union and ultimately a political federation of East African states. A customs union was established in 2005, followed by the starting up of a common market in 2010. The member states are currently negotiating a monetary union protocol to establish a monetary union by 2012.

The banking sectors in the EAC countries as observed by Cihak and Podpiera (2005) consist of three main segments – large domestic banks, subsidiary banks or branches of international banks and small (domestic and foreign) banks. Other segments include mortgages, deposit taking microfinance institutions, representative offices of foreign banks, foreign exchange bureaus and credit reference bureaus. The International banks play a key role in each of the countries. The East African community countries have a total of 125 commercial banks comprising Kenya 43; Tanzania 32; Uganda 23; Rwanda 14 and Burundi 13 as at 31 December 2011.

The banking sector in Kenya operates in a relatively deregulated environment. Foreign bank entry was never a substantial issue in Kenya, as the banking system after independence consisted only of foreign-owned banks; their dominance has been eroded since then, but they

still account for a substantial part of the system. A variety of reforms to the financial system were introduced in the early 1980s to the mid-1990s (Brownbridge and Harvey, 1998).

Brownbridge and Harvey (1998) further find some evidence that the liberalization in Kenya during the 1990s has lead to more vigorous competition among banks for deposits and in providing services. However, it is not clear that the liberalization has improved the efficiency of credit allocation in the presence of widespread distortions elsewhere in the economy.

In Tanzania, Brownbridge and Harvey (1998) further note that poor performance of the state-owned financial sector in late 1980s forced the government to search for new policy directions. NPLs were above 65 percent of the loan portfolio, fiscal and financial operations were not separated, and an appropriate regulatory framework was missing. In 1990, a special presidential commission recommended: increasing competition by encouraging entry of foreign banks; strengthening the existing financial institutions; developing management accountability; and recovering NPLs.

With substantial donor support, the reform effort in Tanzania started in 1991 and has been ongoing since. Domestic financial intermediation has been substantially liberalized. A new regulatory framework has been introduced, organizational and financial restructuring of the two largest (formerly state-owned) banks, the National Bank of Commerce (NBC) and the Cooperative and Rural Development Bank, has been implemented, and the sector has been opened to the entry of financial services providers. The new Banking and Financial Institutions Act approved in the second half of 1991 allowed licensing of new banks, including subsidiaries of foreign banks. The first major foreign bank (Standard Chartered) started operations in 1992, with other international banks following—Stanbic (1993), Citibank (1995), and Barclays (2000). Several other smaller foreign banks set up their subsidiaries during 1995–2002.

Civil disturbances in Uganda during the 1970s and 1980s led to a significant decline of financial intermediation, and financial services became concentrated only in few commercial banks in the capital. Aleem and Kasekende (2001) find that non-professional management became common in financial institutions and normal business discipline collapsed. Financial repression in the form of interest rate controls and directed credit contributed to disintermediation; parallel markets in foreign exchange, trade, and credit developed; and the

use of credit instruments declined. By 1991 the volume of broad money (M2) stood at only 6 percent of GDP.

In the early 1990s, the government started a comprehensive financial system liberalization program. The main objective of the program, as in Tanzania, was to enhance the efficiency of the financial sector and promote economic growth. The government decided to reduce its role in the financial sector and allow the market to play a more substantial role in resource allocation. Brownbridge and Harvey (1998) and Aleem and Kasekende (2001) provide detailed descriptions of the financial system reform in Uganda and its early results.

The first important financial reform measures were introduced in 1992 and included liberalization of interest rates, phasing out of subsidies and removal of directed credit, allowing entry (and exit) of banks (including foreign banks). These measures were complemented by the introduction of new legal and regulatory framework, efforts to strengthen banking supervision, and an upgrade of market infrastructure. The government gradually sold most of its shares in financial institutions. The number of banks increased from 9 in 1991 to 20 in 1996, when a two-year moratorium on banking licenses was imposed. While the reforms did improve the performance and depth of the financial system in Uganda, it is still small even by regional standards. Weak infrastructure, problematic legal and institutional environment, and weak credit culture continue to hamper financial sector development. The banking system has been strengthened by preventive actions by the Bank of Uganda (BOU) in closing four banks in 1998–1999.

The EAC banking sector has drastically changed during the last two decades due to mergers of banks that occurred in the industry, technological progress and deregulation. In the Kenyan financial sector as reported by CBK (2011), the banking sector comprised of the Central Bank of Kenya, as the regulatory authority, 44 banking institutions (43 commercial banks and 1 mortgage finance company), 2 representative offices of foreign banks, 5 Deposit-Taking Microfinance Institutions (DTMs) and 126 Forex Bureaus. 31 of the banking institutions are locally owned while 13 are foreign owned. The locally owned financial institutions comprise of 3 banks with public shareholding, 27 privately owned commercial banks, 1 mortgage finance company (MFC) while 5 DTMs and 126 forex bureaus are privately owned.

According to the CBK (2011), the performance of the banking sector in Kenya improved in the fiscal year 2010/2011. The sector's total assets increased by 21 percent from Ksh 1,548.4 billion in June 2010 to Ksh 1,874.8 billion in June 2011. The major components of the balance sheet were loans and advances, government securities and placements, which accounted for 55.0 percent, 22.0 percent and 6.0 percent of total assets, respectively. Gross loans and advances grew by 30.7 percent to Ksh 1,083.1 billion in June 2011. The stock of gross non-performing loans (NPLs) declined by 5.2 percent to Ksh 58.3 billion in June 2011 thereby lowering the ratio of gross NPLs to gross loans from 7.4 percent to 5.4 percent over the period under review. Deposits from customers, which accounted for 75 percent of total funding liabilities, increased by 15.9 percent to Ksh 1,412.8 billion in June 2011 mainly due to branch expansion, remittances and receipts from exports.

In Tanzania, as reported by Aikaeli (2006), about 50 percent of the total banks' assets are held in the large domestic banks while subsidiaries of the major international banks account for 40 percent and the small banks hold the remaining 10 percent. Recent data as highlighted by Timothy (2009) show that commercial bank represents a dominant subsector in the financial industry in Tanzania. As at end of 2011 there were 45 banking institutions in Tanzania, of these 32 are commercial banks. Further, data indicate that commercial banks accounted for a 96 percent share of the banking sector's total assets (BOT, 2009). Aikaeli (2006) further notes that foreign commercial banks (banks with above 50 percent foreign ownership) accounted for 54 percent market share in terms of sector's assets. CRDB was the largest commercial bank in terms of assets, the second largest in terms of shareholder equity (or book value) and profit, and the third largest in terms of number of employees. National Microfinance Bank (NMB) made the top most profit and was the first largest bank in terms of shareholder equity, number of employees and number of branches; the bank was second largest in terms of assets.

During 2010 as reported in the BoU (2011), Uganda's financial sector registered strong growth, reflecting the rebound in economic growth which took place on the second half of 2010 together with heightened competition in the banking sector. The performance of the banking industry improved, as manifested in higher asset quality and profitability. The ratio of non-performing loans to total gross loans decreased from 4.2 percent of total gross loans in December 2009 to 2.1 percent in December 2010. Commercial banks remained well capitalized. Aggregated across the banking system, the core capital to risk weighted assets

ratio was 17.4 percent as at December 2010, far above the regulatory minimum level of 8 percent. Profitability also improved, including among the new banks whose operating costs reduced significantly. Earnings grew by 13.8 percent for the year to December 2010.

As observed by Stein (2010), the East African block has realized significant growth rates compared with other regions as shown in the table below.

**Table 1.1 Average Growth Rates of African Regions 2000-2010.**

| **Region in Africa** | **2000-2005 %** | **2006 %** | **2007 %** | **2008 %** | **2009 %** | **2010 %** |
|---|---|---|---|---|---|---|
| East | 4,9 | 7,6 | 8,8 | 7,3 | 5,5 | 5,7 |
| Central | 5,7 | 3,4 | 4,0 | 5,0 | 2,8 | 3,6 |
| North | 4,1 | 5,6 | 5,3 | 5,8 | 3,3 | 4,1 |
| South | 4,1 | 6,8 | 7,0 | 5,2 | 0,2 | 4,6 |
| West | 7,1 | 5,1 | 5,4 | 5,4 | 4,2 | 4,6 |

Source: African Development Bank.



Since 2000, as noted by Stein (2010), the Government of Burundi has implemented a program of financial and structural reforms to stabilize the economy and revive economic activity. These have included: prudent monetary policy implemented by a more independent central bank in the context of a liberalized foreign exchange regime; prudent fiscal policy with poverty-focused expenditure priorities; and steps to strengthen and improve the transparency of public financial management. Economic performance has improved, but real gross domestic product (GDP) growth still averaged only about 3percent from 2001-2008. Economic growth remains highly volatile due to its dependence on the widely fluctuating agricultural sector, whose volatility is largely due to climatic shocks in recent years.

According to Yabara (2012), disparities in the EAC region are larger in stock markets than in the debt markets. The Nairobi Securities Exchange (NSE) established in 1954 has the longest history and is the largest in the EAC block. The NSE has 55 listed companies, reaching market capitalization of 46 per cent of GDP as at end of 2010. The Uganda stock Exchange

(USE) was created in 1996 and in 1997 the equities, bill and bond markets following capital account liberalization became accessible. The Rwanda Stock Exchange (RSE) has only two companies listed as at end of 2010. There is no stock exchange in Burundi, and capital is raised from commercial banks.

**Table 1.2 EAC Markets as at end of 2010**

| **Countries** | **Kenya** | **Rwanda** | **Tanzania** | **Uganda** |
|---|---|---|---|---|
| Number of companies listed | 55 | 2 | 15 | 13 |
| Market capitalization (million US $) | 14,498 | n.a | 3,253 | 1,810 |
| Market capitalization (percent of GDP) | 46.0 | n.a | 16.1 | 11.9 |
| Turnover (million US $) | 1,283 | 0.01 | 23.9 | 18.4 |
| Turnover ratio (Turnover/Market capitalization %) | 8.8 | n.a | 0.7 | 1.0 |

Note: There is no operational stock market in Burundi

Source: Yabara 2012



## 2.2 Evaluation of Bank Performance Measures

The European Central Bank (2010) defines bank performance as the capacity to generate sustainable profitability. Profitability refers to the net gains after deducting all costs and is essential for ongoing activities as well as for its investors to obtain fair returns. Kumar and Gulati (2010) define performance in both profit and non-profit organizations as an appropriate combination of efficiency and effectiveness.

It is crucial to identify the scope of performance measurement analysis, since this can indicate where potential alternatives to traditional metrics, such as the return on equity (RoE), may be preferable. In this respect, ECB (2010) observes that bank analysts tend to consider efficiency, asset quality and capital adequacy indicators as key elements of banks' performance measures. Hence, explicit indicators of credit risk and shock absorption capacity are considered essential in assessing the performance of a bank and encompassing risk in the analysis. On the other hand, in assessing banks' performance, bank analysts tend not to use

liquidity indicators, market-based indicators of credit risk, the systemic significance of the bank and efficiency indicators related to capital, primarily because these indicators provide less reliable information. With efficiency indicators, for example, it is often diffi cult to gauge the actual amount of capital allocated to each line of business, whereas with market-based indicators, the problem is more that they mirror other indicators and are already reflected in the bank's valuation.

Previous studies, as pointed out by Hwang et al., (2003) have measured bank performance from different aspects. Numerous studies estimated X-efficiency. Others construct performance indexes based on financial and/or non-financial data. There have been many measures being proposed over the last two decades to complement the current financial information.

According to Heffernan and Fu (2008), two separate approaches were commonly used to assess bank performance. The first one aims to estimate profit and cost X-efficiency frontiers such as data envelopment analysis (DEA) or stochastic frontier analysis (SFA).

Grigorian & Manole (2002) estimate indicators of commercial bank efficiency by applying DEA to bank-level data from a wide range of transition countries during 1990s. The positive effects of capitalization and market concentration on DEA indicators suggest that banking sectors with fewer large, well-capitalized banks are more likely to generate better efficiency. However, they indicate that privatization of banks, beyond those involving a transfer of controlling share to foreign owners, does not results in statistically significant improvements in efficiency.

Bonin, Wachtel and Hasan (2004) apply SFA to investigate the effect of ownership, especially majority foreign ownership, on bank performance in eleven European transition economies over 1996-2000. One of the outcomes shows that state-owned banks make fewer loans, collect fewer deposits, and have higher non-interest expenditures than banks with majority foreign ownership. Bayraktar and Yan (2004) also study the relationship between the efficiency of domestic banks and foreign bank entry in reform process with the emphasis on the banking sector of 30 countries for the period of 1995-2002.

In a different approach, Shih, Zhang and Liu (2007) use the principal components analysis to compare Chinese bank performance among the Big Four, joint-stock, and city commercial banks using cross-section data for 2002. In the study, overall performance, liquidity management, credit risk management, and capital profitability were employed as four core measures of bank performance. In terms of overall performance and in credit risk management, mid-size national joint-stock banks perform considerably better than the Big Four State Owned Commercial Banks (SOCBs) and smaller city commercial banks (CCBs), but the size of the bank is not correlated with their performance.

Lin and Zhang (2009) assess the effect of bank ownership on performance by using a panel of Chinese banks over the period 1997–2004. The Big Four SOCBs are found to be less profitable, are less efficient, and have worse asset quality than other types of banks. The banks undergoing a foreign acquisition or public listing demonstrate better pre-event performance, but there is little performance improvement in either the short-term or the long-term. Furthermore, bank size, foreign acquisition, or listing have little impact on ROA, ROE, the cost to income ratio and non-performing loans to total assets.

Heffernan and Fu (2008) examine the improvement in bank efficiency in the reform by studying the performance of 76 banks between 1999 and 2006 in China. The standard financial ratios denoting recent reforms (such as listing, bank type, the extent of foreign ownership) and macroeconomic variables are employed as independent variables. Their impacts on the measures of profitability, namely Economic Value Added (EVA), ROE, ROA and NIM, are assessed respectively. Among the financial ratios, bank type is influential to profitability, but bank size is not. As two main indicators of reform, neither the percentage of foreign ownership nor bank listings has a discernable effect.

Another strand of the literature considers profitability as the key indicator of performance and investigates the determinants of banks' profit variables such as return on asset (ROA), return on equity (ROE) and net interest margin (NIM). With regard to emerging markets, Athanasoglou, Brissimis and Delis (2005) investigate effects of bank-specific, industry-related and macroeconomic variables on bank profitability by applying a GMM technique to a panel of Greek banks that covers the period 1985-2001. All bank-specific determinants such as capital, labor productivity growth and operating expense, affect bank profitability significantly.

Performance measurement systems as highlighted by Hwang et al., (2003) play a critical role in evaluating the achievement of firms' goals, compensating managers, and developing strategies. With increasing global competition and technology changes, designing a balanced performance measure is critical to the survival and success of companies. As a strategic process, the balanced performance index can be used to assess accomplishment of organizational strategic goals and objectives. Existing financial measures are insufficient at expressing corporate value. Managers depending wholly on financial performance only get an incomplete view of the companies.

Demirgiu-Kunt and Huizinga (2001) consider two measures of bank performance: bank profitability (measured as profits divided by assets), and bank interest margins (measured as net interest income divided by assets). As an accounting identity, the bank interest margin equals (pre-tax) profits plus bank operating costs, plus loan loss provisioning (and minus non-interest income). Bank profitability and bank interest margins can be seen as indicators of the (in)efficiency of the banking system, as they drive a wedge between the interest rate received by savers on their deposits and the interest paid by lenders on their loans. As such, these variables will affect the cost of bank finance for firms, the range of investment projects they find profitable and thus economic growth.

Jahangir, Shill and Haque (2007) stated that the traditional measure of profitability through stockholder's equity is quite different in banking industry from any other sector of business, where loan-to-deposit ratio works as a very good indicator of banks' profitability as it depicts the status of asset-liability management of banks. But banks' risk is not only associated with this asset liability management but also related to growth opportunity. Smooth growth ensures higher future returns to holders and there lies the profitability which means not only current profits but future returns as well.

Market size and market concentration index along with return to equity and loan-to-deposit ratio capture the attention of analyzing the banks' profitability. Chowdhury (2002) observed that the banking industry of Bangladesh is a mixed one comprising nationalized, private and foreign commercial banks. Many efforts have been made to explain the performance of these banks. Understanding the performance of banks requires knowledge about the profitability and the relationships between variables like market size, bank's risk and bank's market size

with profitability. Indeed, the performance evaluation of commercial banks is especially important today because of the fierce competition. The banking industry is experiencing major transition for the last two decades. It is becoming imperative for banks to endure the pressure arising from both internal and external factors and prove to be profitable.

According to Al-Shamrnari and Salirni (1998) profitability ratio especially return on equity (ROE) signals the earning capability of the organization. They also suggest that higher return on equity (ROE) ratio is appreciable as it is the primary indicator of bank's profitability and functional efficiency.

Avkiran (1997) stated that the details the process whereby multivariate interdisciplinary measures of potential to perform are integrated with performance measures to develop models of retail performance for bank branches. The predictive models use the key business drivers of a major trading bank as dependent variables. Independent variables explaining business drivers are the theorized potential variables that measure the capacity to generate retail business.

The models allow a comparison between the predicted and actual levels of key business diverts, thus measuring unrealized performance. Findings can assist decision making during restructuring, branch closures or downsizing. The variables presented should be regarded as examples rather than universally accepted measures of branch performance.

Bhatt and Ghosh (1992), observed that the profitability of commercial banks depend on several factors some of them are endogenous and some exogenous. The endogenous factors represent control of expenditure, expansion of banking business, timely recovery of loans and productivity. The exogenous factors consist of direct investments such as SLR (Statutory Liquidity Ratio), CRR (Cash Reserve Ratio) and directed credit programs such as region wise, population wise guidelines on lending to priority sectors. The regulated and restricted regime in the operation of banking system in terms of investment, credit allocation, branch expansion, interest rate determination and internal management eroded the productivity and profitability of commercial banks.

Hossain and Bhuiyan (1990) stated that there is no universally accepted operational definition of performance measures. In broad sense performance level of an enterprise can be measured

by the extent of its organizational effectiveness. In the context of services rendered towards public the performance of an organization can be viewed as 'the extent to which its work is carried out within established specifications for goods and services produced, to the general satisfaction of the clientele served, within given cost and time constraints, and in such a manner as to support or contribute to the achievement of the organization objectives.

Thus, Hwang et al., (2003) conclude that there is a pressing need for a set of widely accepted metrics by which managers and investors can rely on to measure the value creation in firms (Kaplan and Norton 1992, 1996). How financial and non-financial performance measures can be integrated into one measure is a necessary ingredient. The performance index should include outcome measures, the performance drivers of those outcomes, short-term and long-term objectives, hard objective measures and more subjective measures. By articulating them clearly, managers can channel the energies, the abilities, and knowledge towards achieving the firm's long-term goals. In addition, a balanced performance index can serve as the focal point for the organization's efforts, defining and communicating priorities to managers, employees, investors, even customers, and can be used as a communication, information, and learning system

From a performance perspective, as highlighted by Rouse and Putterill (2003), there appear to be three major components in the literature corresponding to Altman's three components: evaluation, data analysis and performance measures.

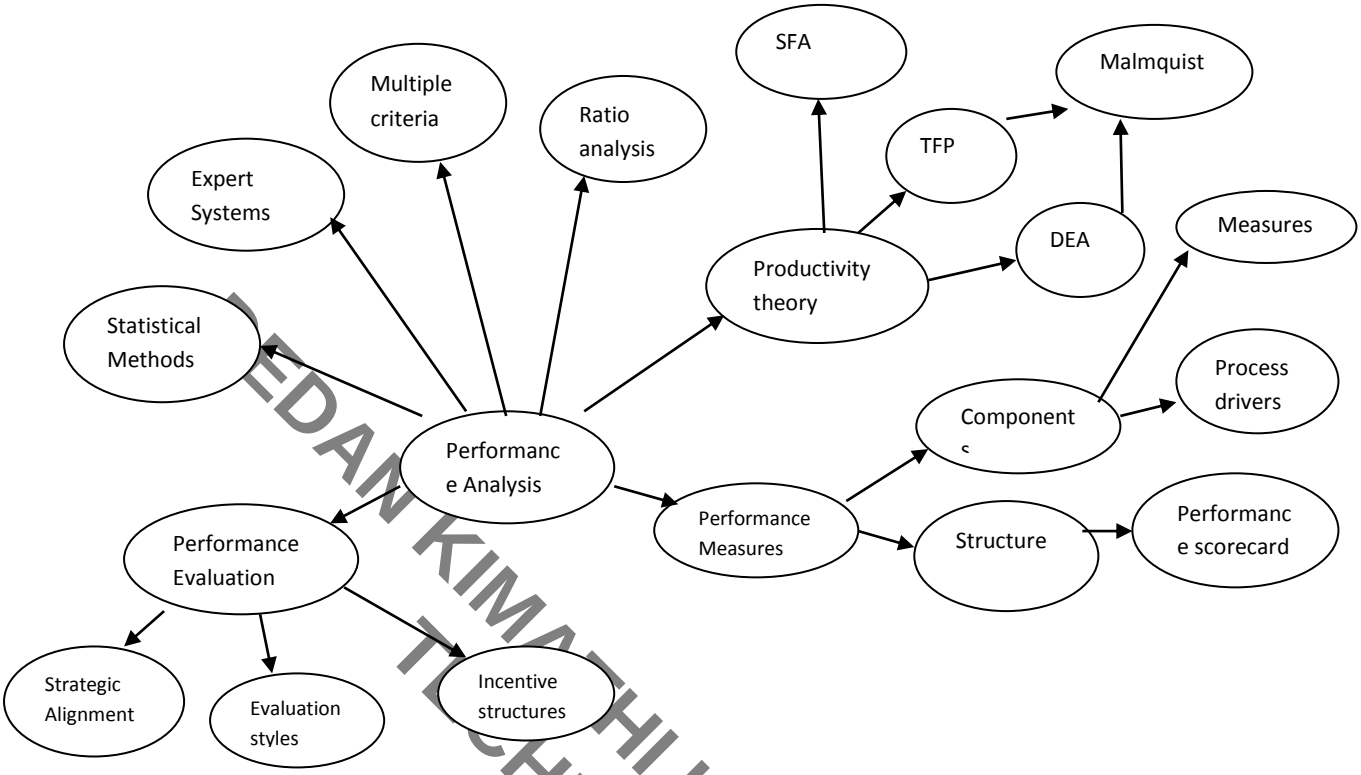


Figure 1.1 Bank performance measures
(Source: Rouse and Putterill, 2003)



There are a multitude of measures used to assess bank performance according to ECB (2010), with each group of stakeholders having its own focus of interest. Among the large set of performance measures for banks used by academics and practitioners alike, a distinction can be made between traditional, economic and market-based measures of performance.

### 2.2.1 Traditional measures of performance

It is evident as noted by Aarma et al., (2004) that to study results of financial sector reform and restructuring, a profound performance analysis is needed. The traditional financial ratio analysis is mainly used for the bank performance analysis with the DuPont financial ratio analysis most commonly applied.

In their review of performance measurement frameworks, Kennerly and Neely (2000) refer to the DuPont pyramid of financial measures as an early framework (1920s). While confined to financial measures, the Du Pont framework is a relatively sophisticated method of analyzing financial performance that persists to this day. Its major shortcoming is its sole focus on financial performance.

Traditional performance measures are similar to those applied in other industries, with return on assets (RoA), return on equity (RoE) or cost-to-income ratio being the most widely used. In addition, given the importance of the intermediation function for banks, net interest margin is typically monitored (ECB, 2010).

According to Chatzoglou (2010), the financial ratios used are the ones usually utilized by analysts in order to measure productivity and, on the whole, provide a satisfactory picture of a banks' efficiency. These are: return on asset (ROA), return on equity (ROE), profit/loss per employee (P/L), 1/efficiency ratio (1/EFF) and Net Interest Margin (NIM). This approach is better than the simple ratio analysis in the sense that 'it forms a rounded judgment on firms' efficiency, taking into consideration a variety of ratios simultaneously and combining them into a single measure of efficiency.

**Table 1.3 Financial Ratios**

| | Financial ratio | Mathematical formula | Description |
|---|---|---|---|
| 1 | Profit (loss) per employee (P/L) | P/L =PBT/ (Lt+Lt-1)/2 | An increase of this ratio means an increase of banks productivity as well as vice versa. Moreover this ratio examines labor productivity |
| 2 | Return on Equity (ROE) | ROE=PBTt/(Et+Et-1)/2 | With ROE the bank can measure its productivity and the efficiency provided to use equity |
| 3 | Return on Assets (ROA) | ROA=PBTt/(TAt+TAt-1)/2 | Measures the total assets efficiency and therefore it can evaluate the management policy of the bank. ROA and ROE are highly correlated. |
| 4 | 1/ Efficiency ratio (1/EFF) | 1/EFF=GOPt/OEt | Describes the relation between the operational expenses and the gross operating profit (loss). The higher it is, the more efficient the bank under observation is. |
| 5 | Net Interest Margin (NIM) | NIM=NIt/(TAt+TAt-1)/2 | Measures the assets efficiency of the bank, ceteris paribus. It calculates the efficiency for the group under consideration |

(Source: Chatzglou, 2010)

According to Kamau (2009), some macroeconomic studies use accounting ratios such as return on assets (ROA), return on investment (ROI) and return on equity (ROE) to represent efficiency. However, Akhavein et al., (1997) argue that accounting ratios are limited as measures of efficiency.

All the above financial ratios (Table 2.1) are widely used for a bank performance analysis. Return on total assets (ROA) is one of the most frequently used financial ratios by financial analysts. ROA measures the ability of bank management to generate income after all financial and non financial cost and expenses for owners.

In Kenya, the Banking Survey 2011 carried out an assessment of all banks on the basis of financial soundness. This is determined by 8 different parameters, which are used in 'The Banking Survey' rankings which measure asset quality, liquidity and earnings. The eight parameters are: Return on average assets, Return on average core capital, Cost of Funds, Efficiency Ratio (Cost income ratio), Total non-performing loans to total advances, Non-performing loans provision to operating income, Core Capital to Total deposits and Quick Assets to Total Liabilities. The banks are then ranked in order starting from the best, which is the bank with the best score when all the rankings are tabulated.

While financial ratios are currently the method most often used to evaluate a bank's performance, Yeh (1996) observes that there is no clear-cut rationale which would allow one to acquire a composite score on the overall financial soundness of a bank.

Financial ratios analysis, as noted by Yeh (1996), however, has one disadvantage. That is, each single ratio must be compared with some benchmark ratios one at a time while one assumes that the other factors are fixed and the benchmarks chosen are suitable for comparison. To overcome this problem, a number of financial ratios are generally required to be calculated and combined to form a meaningful picture of the firm's financial structure. While the calculation of a set of financial ratios is a relatively easy task, the aggregation of those ratios can be a quite complicated process involving imagination and experienced judgment. Changing economic conditions have made such aggregations even more difficult, increasing the need for a more flexible way to express a bank's financial condition.

The focus of financial analysis for the management of any bank (or the banking sector as a whole) as Aarma et al., (2004) concludes, should be on the efficiency of performance of the bank measured from the viewpoint of investors/owners income maximization. This entails developing a meaningful 'peer group analysis', that is, to develop specific financial characteristics that distinguish between two or more groups. However, except when a *priori*

groups are available to provide certain financial profiles for comparison, identifying appropriate peer groups for analysis is a difficult task. DEA, which computes a firm's efficiency by transforming inputs into outputs relative to its peers, provides a mechanism for deriving appropriate categories for this purpose.

### 2.2.2 Economic measures of performance

The economic measures of performance take into account the development of shareholder value creation and aim at assessing, for any given fiscal year, the economic results generated by a company from its economic assets (as part of its balance sheet). According to the ECB (2010) these measures mainly focus on efficiency as a central element of performance, but generally have high levels of information requirements.

The evaluation of commercial bank efficiency/ performance has been approached from a variety of dimensions. (Chan and Yeh, 1998). The first approach on efficiency /performance evaluation of banks has used a variant of ratio analysis among several banks using a number of financial ratios (for example, return on assets and return on investments). Basically financial ratios can measure the overall financial soundness of a bank and the operating efficiency of its management. These ratios provide valuable information about a bank's financial performance when compared with previous periods and for peer ranking. Furthermore, the financial ratios also fail to consider the value of management actions and investment decisions that will affect future as opposed to current performance.

The second approach is parametric programming approach which has been concerned with the production or cost function base. It focuses on estimating the characteristics of the function and measuring economies of scale assuming all banks were operating efficiently.

The third approach uses bank efficiency frontiers to construct measures of efficiency and can be labeled as a non-parametric programming approach. This approach considers how much total productivity in the banking sector can be improved and ranks the efficiency scores of individual banks.

There are at least four frontier analysis methodologies as highlighted by Barr et al., (2002) which used to compute financial institution efficiency, and there is no consensus among researchers on which method is best. The approaches differ mainly in how they handle

random error and their assumptions regarding the shape of the efficient frontier. The three main parametric methodologies include the stochastic frontier approach (SFA), the thick frontier approach (TFA), and the distribution-free approach (DFA).

Many studies have been published in recent years concerning the investigation of banking performance and have used a variety of parametric and non-parametric approaches to test for efficiency. Among the non-parametric approaches, as observed by Figueria (2009), data envelopment analysis (DEA) has proven to be a popular technique for measuring and comparing performance. The technique has been employed in a wide range of studies such as those by Bauer et al., (1998), Berger and DeYoung (1997), Berger and Humphrey (1997), Miller and Noulas (1996), Rezvanian and Medhian (2002), Halkos and Salamouris (2004) and Kao and Liu (2004), all of which have been concerned with the performance of commercial banks. However, these studies mention performance and efficiency interchangeably hence presuming them to be one and the same.



Figueria (2009) describes the non-parametric methodological approach followed and discusses the measurement of the inputs and outputs used in the analysis. The approach used to analyse banking efficiency is composed of two complementary techniques: DEA and a Malmquist index, which were implemented using Coelli's (1996) software package DEAP.

DEA is a linear programming approach used for measuring relative efficiency for a set of homogenous decision making units (DMU's) in converting multiple inputs (resources) to produce multiple outputs (performance). The DEA approach considers how much total productivity in the banking sector can be improved, and ranks the efficiency scores of individual banks. Harker and Zenios (1999) and Cooper et al., (2000) discuss past studies on the efficiency of financial institutions.

The most widely used models for DEA are the Cooper Charnes Rhodes (CCR) and the Banker Charnes Cooper (BCC). The former was proposed by Charnes et al., (1978) based on the concept of 'two inputs and one output' originally spelled out by Farrell (1957). The three scholars have modified the concept to 'multiple inputs and multiple outputs' in order to meet the needs of the complex production procedures of today. The fundamental premise is that the under fixed scale of return is used to measure the overall technological efficiency of DMU. The latter was proposed by Banker et al., (1984), with the purpose of extending the

concept of the CCR model and scope of application. The fundamental premise of the latter is that where the scale of return is changeable, the overall technical efficiency of the CCR model could be compartmentalized into pure technical efficiency and scale efficiency.

Another variation to the DEA model as noted by Sreekumar and Mahapatra (2011) is the returns to scale (RTS) assumption. Constant, decreasing, increasing, and variable RTS assumptions may be employed. Constant return to scale (CRS) implies that doubling inputs will exactly double outputs. Decreasing return to scale implies that doubling inputs will less-than-double outputs. Increasing return to scale implies that doubling inputs will more-than-double outputs. Thus, variable return to scale (VRS) allows for a combination of constant, increasing, and decreasing inputs and outputs.

Athanassopoulos (1997), Schaffnit et al., (1997) and Drake and Howcroft (1994) have also used DEA to investigate the relative performance of bank branches. Figueira et al., (2006, 2008) have looked at the effects of ownership on the performance of banks in Latin America and Africa, respectively, while Mercan et al., (2003) have investigated the performance of Turkish banks on the basis of efficiency scores obtained from DEA.

DEA has been applied to analyse both the level of bank efficiency and changes in total output relative to inputs by employing a Malmquist TFP index. Some important applications of this technique to the measurement of productivity change in banking include Berg et al. (1992), Grifell-Tatje´ and Lovell (1997), Wheelock and Wilson (1999), Alam (2001) and Casu et al.,(2004).

The study by Berg et al., (1992) examined productivity growth in the Norwegian banking system, while Grifell-Tatje´ and Lovell (1997) looked at the Spanish banking industry. Wheelock and Wilson (1999) and Alam (2001) investigated US commercial banking and Casu et al., (2004) concentrated on an analysis of productivity change across European banks.

**2.2.2.1 Efficiency Measures**

Previous studies of financial institution efficiency have examined efficiency and performance from several different perspectives. These include the effects of mergers and acquisitions (Berger, Demsetz, and Strahan 1999; Resti, 1998), institution failure (Barr, Seiford, and

Siems 1993; Cebenoyan, Cooperman, and Register 1993), and deregulation (Humphrey and Pulley 1997; DeYoung, 1998), among many others. Frontier efficiency models are employed by these researchers primarily because they result in an objectively determined quantified measure of relative performance that removes the effects of many exogenous factors. Therefore, according to Barr et al., (2002), this permits focus on quantified measures of costs, inputs, outputs, revenues, profits, to impute efficiency relative to best practice institutions.

The literature on the measurement of efficiency follows two major approaches, using parametric and nonparametric frontiers, respectively. Efficiency, as defined by Brissimis (2008), refers to the distance (in terms of production) of a decision making unit (DMU) from the best practice in the industry; it is given by a scalar measure ranging between zero (the lowest efficiency score) and one (corresponding to the optimum DMU). In the parametric frontier analysis, the technology of a DMU is specified in the context of a particular functional form for the cost, profit or production relationship that links the DMU's output to inputs and, as the term "parametric" implies, includes a stochastic term.

Banking efficiency is instrumental in economic development (Barajas, et al., 2000; Chirwa, 2001). Inefficiencies in the financial system in most developing countries have persisted even though most countries have undertaken financial liberalization over the past two decades. Honohan and Beck (2007) observe that in many SSA countries the range of financial products remain extremely limited, interest rate spread are wide, capital adequacy ratios are often insufficient, loan recovery is a problem, and the share of non-performing loans is large.

There are several explanations for limited changes in the financial system efficiency following financial liberalization. First, following Bain's (1951), market structure, conduct and performance hypothesis in the industrial organization literature, poor performance may persist if financial sector reforms do not significantly alter the structure within which banks operate. Although the empirical evidence of a positive and significant relationship between market structure and banks performance yields non-robust results, there is compelling evidence to suggest that market structure plays an important role in altering the performance of banks (Gilbert, 1984; Berger and Hannan, 1989; Molneux and Forbes, 1995; Maudos, 1998 and Demirguc-Kunt and Huizinga, 1999).

Data envelopment analysis (DEA) for efficiency measurement has seen extensive applications in the study of commercial banks (Bauer et al., 1998; Berger and DeYoung, 1997; Berger and Humphrey, 1997; Bhattacharyya et al., 1997; Elyasiani and Mehdian, 1990; Miller and Noulas, 1996; Rezvanian and Mehdian, 2002; Sherman and Ladino, 1995; Yeh, 1996; Yue, 1992). Three useful features of DEA are first, each DMU is assigned a single efficiency score, hence allowing ranking among the DMU's in the sample. Second, it highlights the areas of improvement for each single DMU. For example, since a DMU is compared to a set of efficient DMUs with similar input-output configurations, the DMU in question is able to identify whether it has used input excessively or its output has been under-produced. Finally, there is a possibility of making inferences on the DMU's general profile.

The nonparametric methods of efficiency measurement as noted by Brissimis (2008) include the Data Envelopment Analysis (DEA) and the Free Disposal Hull (FDH). The most widely used is DEA, a programming technique that provides a linear piecewise frontier by enveloping the observed data points and yields a convex production possibilities set. As such, it does not require the explicit specification of the functional form of the underlying production relationship. In the context of the present analysis, the nonparametric efficiency estimates serve as better performance measures compared to their parametric equivalents. Indeed, regressing efficiency estimates obtained from parametric techniques would almost certainly result in problems of statistical consistency, since the covariates of the regression equation would be correlated with the fixed or random effects of the initial parametric regression (Coelli et al., 2005). In contrast, Simar and Wilson (2007) have provided a procedure for robustly regressing efficiency estimates derived from nonparametric techniques on a number of determinants.

In the banking literature, as observed by Wirnkar and Tanko (2008), there has been some disagreement on the definition of banks inputs and outputs and how they could be measured. These terms from the quantum of services banks provide as well as the different views regarding treatment of such services as inputs and/or outputs. Banks mostly provide customers with low risk assets, credit and payment services, and play an important role as intermediaries in directing funds from savers to borrowers. They also perform non-monetary services such as protection of valuables, accounting services and running of investment portfolios.

The definition of inputs and outputs varies widely across studies of bank efficiency. Hence, if high-quality inputs are sufficiently productive, such banks will not be disadvantaged from a relative efficiency perspective (Berger and Humphrey, 1997; Drake and Hall, 2003). Also, some studies suggest that deposits have both input and output characteristics (Berger and Humphrey, 1997).

Since the banking industry uses multiple inputs to produce multiple outputs, a consistent aggregation may be problematic. (Wirnkar and Tanko, 2008). Some attempts have been made to estimate average practice cost functions. While these approaches were successful in identifying the average practice productivity growth, they failed to take into account the productivity of the best practice banks. These problems associated with the classical approach to productivity led to the emergence of other approaches which incorporate multiple inputs/outputs and take into account the relative performance of banks.

Despite the disagreement as to the definition of inputs and outputs in the banking industry, there is general agreement in the literature among the authors on two main approaches that could be used to define the input and output variables in the spectrum of services that banks provide. These two approaches for selecting the inputs and outputs for a bank: production approach, also called the service provision or value added approach; and intermediation approach, also called the asset approach (Humphrey, 1985; Hjalmarsson et al.,2000)

Berger and Humphrey (1997) suggested that the intermediation approach as proposed by Sealey and Lindley (1977) is best suited for analyzing bank level efficiency, whereas the production approach, as proposed by Benston (1965) is well suited for measuring branch level efficiency.

For the definition of bank inputs and outputs, Filippaki and Staikouras (2009) employ the intermediation approach, proposed by Sinkey and Lindley (1977), which views banks as institutions that collect deposits, using labor and physical capital, to transform them into loans and other earning assets. The study used a broad definition and consider labor and physical capital as a single non financial input, which is defined as banks' overhead (non interest) expenses.

A similar approach was taken by Hasan and Mart, (2003); Fries and Taci, (2005). Thus, the study assumes that banks employ two different categories of inputs, a financial input (deposits) and a non financial input, to produce two outputs, loans, which are expressed as total loans net of provisions, and other earning assets. Regarding input prices, the price of deposits is defined as the ratio of interest expense to total funds, while the price of the non financial input is defined as of overhead expense divided by total assets. Likewise, the price of loans is expressed as interest income to total loans, while the price of other earning assets is defined as the ratio of non-interest income to other earning assets.

According to Sufian (2007), DEA has frequently been applied to banking industry studies. The first application analysed efficiencies of different branches of a single bank. Sherman and Gold (1985) studied the overall efficiency of 14 branches of a US savings bank. DEA results showed that six branches were operating inefficiently compared to the others.

Using the parsimonious DEA model developed by Siems and Barr (1998), Barr et al., (2002) measure relative productive efficiency of U.S. commercial banks over the 15-year period from 1984 to 1998. The study finds strong and consistent relationships between efficiency and inputs/ outputs, as well as independent measures of bank performance. Further, the results suggest that the impact of varying economic conditions is mediated to some extent by the relative efficiencies of the banks that operate in these conditions.

Fukuyama (1993, 1995) was among the early researchers particularly among countries in Asia to employ DEA to investigate banking efficiency. Employing labor, capital and funds from customers as inputs and revenue from loans and revenue from other business activities as outputs, Fukuyama (1993) considers the efficiency of 143 Japanese banks in 1990. The study found that pure technical efficiency to average around 0.86 and scale efficiency around 0.98 implying that the major source of overall technical inefficiency is pure technical inefficiency. The scale inefficiency is found to be mainly due to increasing returns to scale and banks of different organizational status perform differently with respect to all efficiency measures (overall, scale, pure technical). Scale efficiency is found to be positively but weakly associated with bank size.

The impact of deregulation on the efficiency of eleven Tunisian commercial banks during 1990 to 2001 was investigated by Reisman et al., (2003). Applying three inputs namely fixed

assets, number of employees, and deposits, loans and securities portfolios as outputs; they followed the intermediation approach to DEA with an extended window analysis. The study established that deregulation had a positive impact on Tunisian commercial banks overall efficiency. They suggest that public banks outperformed private banks in transforming deposits into loans.

**Table 1.4 DEA in the banking industry**

| **Author** | **Country of study** | **Input variable** | **Output variable** |
|---|---|---|---|
| Ho (2001) | Taiwan | Assets, interest expenses, employee, fixed assets | Interest income, non interest income |
| Chen and Yeh (1998) | Taiwan | Assets, branches, operating cost, deposits, interest expenses | Interest income, non interest income |
| Seiford and Zhu (1999) | USA | Employees, assets, capital stock | Revenues, profits |
| Sherman and Gold (1985) | USA | Employees, expenses, space | No. of transactions |
| Parkan (1987) | Canada | Employees, expenses, space, rent, terminals | No. of transactions, customer response, corrections |
| Giokas (1991) | Greece | Employees, expenses, rent | No. of transactions |
| Bhattacharya et al., (1997) | India | Interest expenses, operating expenses | Advances, deposits, investment |
| Mukherjee et al., (2002) | India | Net worth, borrowings, operating expenses, employees, branches | Deposit, net income, advance, non-interest income, interest spread |
| Oral and Yolalan (1990) | Turkey | Employees, terminals, no. of accounts, credit applications | No. of transactions |

Source: Ho and Zhu (2004)

Following Avkiran (2004), Drake and Hall (2003) and Webb (2003) among others, Sufian (2009) employed a non-parametric method, DEA, to measure the trends in the efficiency of the Singapore banking sector over the eleven yearly periods. The method allows for the decomposition of the efficiency and productivity differences into one representing the banks' efficiency and productivity levels relative to their peers best practice frontiers.

In Kenya, Kamau (2009) has applied a non-parametric model to empirically analyse bank efficiency. Data Envelopment Analysis is used to measure the overall technical efficiency of banks. This model establishes the efficiency status of the various types of banks operating in Kenya. The study further estimates the translog cost function in order to predict managerial efficiency or inefficiency existing in the banking sector.

Sreekumar and Mahapatra (2011) apply data envelopment analysis (DEA) to rank Indian Business schools based on their efficiency score. The scores can suggest inefficient and low-performing schools in an effective manner. The study integrates DEA and Neural Network (NN) models to predict the performance of Indian Business schools.

Banks allocate resources and control internal processes by effectively managing their employees, facilities, expenses, and sources and uses of funds while working to maximize earning assets and total income (Barr et al., 2002). Banks that do this best are on the efficient frontier. Banks with too much input or too little output relative to some subset of their peers are productively inefficient to some extent.



**2.2.2.2 Productivity Measures**

According to Brissimis (2008), the analysis of productivity of banks is of interest from a policy perspective, since increased productivity may contribute positively to the overall performance of the banking system, lower prices and improved service quality for consumers. In addition, enhanced productivity may act as a safety net against the various risks associated with the banking industry.

Productivity is generally defined as the relation between output (produced goods) and input (consumed resources) and can be regarded as one of the most vital factors affecting competitiveness of a business firm. A firm can achieve productivity gains by producing either

a greater output from a given level of inputs or by using a minimum amount of inputs to produce a given level of outputs (Coelli et al., 1998). In this context, productivity can be defined as the ratio of the output (s) to the input (s) used.

The first problem encountered in evaluating bank efficiency and Total Factor Productivity (TFP) growth is the definition and measurement of bank output. The two most widely used approaches are the 'production' and the 'intermediation' approaches.

This decomposition has been subject to a number of criticisms (Casu et al., 2004), mainly in terms of the role of constant returns versus variable returns to scale frontiers. However, there seems to be consensus that the Malmquist index is correctly measured by the constant returns to scale distance function even when technology exhibits variable returns to scale.

In international literature, there are many experiential statistical and econometric studies on banking productivity, which can be classified into two categories, based on the approach to productivity measurement adopted. The first category (English et al., 1993; McAllister and McManus, 1993; Berger et al., 1993a,b) classifies productivity into the following subcategories: scale efficiency, scope efficiency and X-efficiency.

Scale efficiency refers to economies of scale, meaning that a product increase, ceteris paribus, leads to a relatively smaller increase of the production cost. The supporters of this school of thought consider that the use of the translog cost function does not provide efficient results, as it treats all banks the same way (regardless of their size), assuming that they move on the same average cost curve.

Scope efficiency compares the production cost of some financial products and services from two or more banks, as well as the same production cost from a unified bank. It can also estimate whether it would be better for a bank to provide a complete range of banking products and services or whether it should offer only specialized ones. Finally, X-efficiency mainly refers to the manager's ability to minimize the production cost or maximize incomes providing similar products.

The second category (Kaparakis et al., 1994; Noulas et al., 1990; Ferrier and Lovell, 1990; Rangan et al., 1988; Elyasiani and Mehdian, 1990; Berger and Humphrey, 1991) follows the

frontier approach by using production and/or cost frontiers, where a benchmark is created for the purpose of comparing the real banking efficiency. There are two basic approaches to the banking function and the products the banks offer. The first is the production approach, where only the operating costs are measured. This method assumes that banks provide demand deposits, time deposits, savings deposits, commercial loans and mortgage loans, while they use capital, labor and some other production factors such as incomes. The second is the intermediation approach, where the products are evaluated in monetary units and the functional costs and interest expenses are also considered. Moreover, banks are considered to be capital collectors. This capital is converted into loans and other assets. This method is the most suitable when the banks' financial liability is considered. According to most of the studies of the second school, researchers conclude that the big banks are less effective, caused mainly by pure technical inefficiency.

DEA creates a referring sample (which is the linear combination of the effective banks), in order to find the ineffective bank branches, examining the mixture of the services offered and the inflows used. As Tsionas et al., (2003) mention, DEA provides quantitative information about three related fields, which are technical efficiency, allocative efficiency and total factor productivity.

As a non-parametric technique, DEA takes into consideration the levels of the outputs and inputs for each business unit/branch and formulates a possible production set. According to Thanassoulis et al., (1996), DEA measures efficiency by calculating the output level a business unit could produce for its given level of inputs, or by estimating the appropriate (reduced) level of inputs for its given level of outputs.

Therefore, as Chatzoglou (2010) points out, the output efficiency shows the degree to which the output results can be improved by increasing productivity with no supplementary input. Moreover, the input efficiency shows the degree to which the inputs can be reduced as a result of improved efficiency, without any reduction in outputs.

Ferrier and Lovell (1990) analysed two of the techniques for measuring banking effectiveness in relation to functional cost; the econometric approach of a parametric cost frontier; and the production frontier (non-stochastic).

Elyasiani and Goldberg (1996) used the production frontier approach to show that the cost function analysis is suitable for the economies of scale measurement but inappropriate for the banking effectiveness.

Brissimis et al., (2008) measure Total Factor Productivity (TFP) change using standard Malmquist techniques. The most popular has been the DEA-like programming technique suggested by Fare et al., (1994), which is the one followed here. The Malmquist technique allows decomposition of TFP change into technological change (TC) and technical efficiency change (TEC). An improvement in TC is considered as a shift in the frontier. Also, TEC is the product of scale efficiency change (SEC) and pure technical efficiency change (PTEC). Given this decomposition, the Malmquist index provides a powerful tool of analysis for the sources of TFP growth.

The main techniques developed for the assessment of the banking productivity as identified by Chatzoglou et al., (2010) are the following: DEA, econometric stochastic frontier, thick frontier approach and 'distribution free' approach.

Firms use technology to convert inputs into outputs. Thus, efficiency is determined by, among other things, the technology that a firm uses in production. According to Kamau (2009), the technology of a firm may be represented by production frontiers, profit functions, cost functions or by distance functions.

As is the case with the Portuguese banking sector, Spanish banking has gradually become more competitive. Grifell-Tatje´ and Lovell (1997), using a Malmquist index measure, have compared commercial banks, which dominate the sector, with savings banks over the period 1986-1993. Their study reports that commercial banks have had a slightly lower rate of actual productivity growth, but a somewhat higher growth of productivity potential. They attribute this finding to managerial differences, differences in technical progress and the adverse impact of diseconomies of scale in the case of commercial banks.

The second approach adopted relates to the measurement of changes in total output relative to total inputs and is based on the concept of TFP. The approach was first developed by Malmquist (1953) and discussed by Sheppard (1970), Caves et al., (1982), Grosskopf (1993) and Fare et al., (1994a, b, 1997). The Malmquist TFP index can be described as a way of

measuring the change in productivity between two data points by estimating the ratio of the distances of each data point relative to a common technology (Casu et al., 2004). Based on DEA analysis, the Malmquist index provides information on the sources of productivity change. In a multi-input multi-output context, an output (input) distance function is equivalent to the maximum proportional expansion (contraction) of the output (input) vector, given inputs (outputs).

According to Figueria, (2009), the distance functions, which constitute the Malmquist index allow for changes in productivity to be divided into two components: changes in TE and TC. TC reflects improvements or deterioration in the performance of the best-practice banks, while TE change is associated with the convergence or divergence of the remaining banks towards their best-practice counterparts. In other words, TC is associated with a shift outwards of the efficiency frontier and TE with a movement towards the frontier.

Moreover, as further noted by Figueria (2009), TE can be decomposed into pure efficiency (PE) change and scale efficiency (SE) change. PE change is obtained by calculating the efficiency change using constant returns to scale technology relative to VRS technology while SE reflects changes in performance resulting from the application of these two technologies to the same data set.

In competitive industries, production units can be separated by some standard into those that perform relatively well and those that perform relatively poorly. Financial economists have done this "separation" by applying frontier efficiency analyses. Berger and Humphrey (1998) explain that information obtained from such studies can be used for a variety of reasons. They can inform government policy by assessing the effects of various regulatory changes on efficiency. Research issues can be addressed by describing the efficiency of an industry.

Additionally, as Barr (2002) points out, managerial performance can be improved by identifying "best" and "worst" practices associated with high and low efficiency, respectively. The study uses a constrained-multiplier, input-oriented data envelopment analysis (DEA) model to quantifiably benchmark the productive efficiency of U.S. commercial banks. DEA is applied because of its focus on productive, or technical, efficiency.

The concept of relative efficiency estimated using a frontier approach is frequently employed to measure and compare firms' operational efficiency in all types of industries from services (banking, auditing) to manufacturing to non-profit institutions (Berger and Mester, 1997). The widespread use of this frontier approach to measure firms' operating efficiency results from this measures' conceptual appeal, which derives from the fact that it captures firms' relative performance within their industries. This approach yields a comprehensive of a firm's performance relative to that of its competitors.

Byard and Cebenoyan (2007) estimate different measures of firms' operational efficiency, all of which are derived from financial statement data, and compare the strength of the association between these measures and analysts absolute forecast errors. The study then compares a sophisticated frontier based measure of firm's performance relative to their competitors with three more traditional efficiency measures; specifically the return on assets (ROA) ratio, industry-adjusted ROA, and the return on equity ratio.

Specifically, Byard and Cebenoyan (2007) compare a sophisticated frontier based measure of operational efficiency with, in turn, the return on assets (ROA) ratio, industry-adjusted ROA (AROA) and the return on equity (ROE) ratio. The tests are based on the idea that compared to the frontier-based measure, these benchmarks ratios are all less sophisticated measures of firms' operational efficiency derived from firms' financial statements.

Research by Berger and Mester (1997) indicates that more efficient firms have more stable performance. Several studies within the banking industry, for example, report a negative correlation between banks' level of inefficiency and the stability of their profitability.

Chatzoglou (2010) examine the productivity of the Greek banking sector for the time period 2004-2006 focusing on the DEA approach, which uses linear programming for estimating efficiency. Standard ratio measures of bank financial performance have been used as output measures in a data envelopment analysis model in combination with efficiency ratios analysis. A positive relationship between bank size and performance is observed. More specifically, it is suggested that large total assets gives a bank the ability to achieve higher efficiency levels, thus, a merger of two small banks will probably increase their efficiency and competitiveness in the long run. Therefore, bank size positively affects banking effectiveness, while the greater increase occurs to scale efficiency. Rangan (1988) concluded

that banks are more allocatively than technically effective, with the main part of the technical ineffectiveness being a result of inflows wastage.

The study of Berger et al., (1993a,b) came to almost identical conclusions and also noted that outputs are greater than input inefficiencies, that is, inefficiency is more a result of diminished incomes than exaggerated expenses. Moreover, they suggest that big banks are more effective and that also it is more profitable for a bank to specialize in business than in consumer loans.

Gitau and Gor (2011) examine changes in the productivity of commercial banks in Kenya in the context of liberalization using Data Envelopment Analysis (DEA). The study measures the productivity growth and its components from a time series dataset obtained from Central Bank of Kenya publications and National Banking Surveys. DEA method is used to measure Malmquist index of total factor productivity for a sample of 34 banks for the period 1999-2008. A decomposition of Total Factor Productivity (TFP) measure is done to establish the source of changes in factor productivity. The results suggest that TFP deteriorated over the period while Efficiency change (EFFCH) increased as Technical Change (TECH) declined implying that deterioration of TFP was due to either technological innovations or shocks. Given that technology is the main driver of productivity, the study recommends that the monetary authorities design practicable protocol as a technological standards requirement.

Rangan et al., (1988) shifted the unit of assessment from branches to consolidated banking institutions. They applied DEA to a larger sample of 215 US banks and attempted to break down inefficiency to that stemming from pure technical inefficiency and scale inefficiency. The study employed the intermediation approach by using three inputs (labor, capital and purchased funds) and five outputs (three types of loans and two types of deposits. Their results indicated that banks could have produced the same level of output with only 70 per cent of the inputs actually used, while scale inefficiencies of the banks were relatively small, suggesting that the sources of inefficiency to be pure technical rather than scale.

As Thanassoulis (2001) points out, DEA has many advantages, as a method for measuring technical efficiency of firms operating in the same or similar sectors. Many of the weaknesses of the parametric technique can be overcome by examining financial ratios. More specifically, a great number of inputs and outputs can be easily calculated, because a linear

relationship is assumed while no assumption has to be made about the functional form or statistical distribution of the parameters.

The most comparative advantage of the DEA technique as identified by Chatzoglou (2010) is that it enables a firms' management to estimate each unit's productivity and to form a complete picture, as well. Therefore, considering a number of financial ratios as outcomes, many of the ineffective and effective points of the company can be detected.

The basic disadvantages of the DEA method as reported by Chatzoglou (2010) are related to the high scores of the correlation coefficients that have been presented. Moreover, DEA and efficiency ratios indicate accounting values instead of market ones. This can be viewed as an advantage as it is line with historical cost concept that advocates for cost less depreciated values to be used in preparing financial statements.



### 2.2.3 Market-based measures of performance

Market-based measures of performance characterize the way the capital markets value the activity of any given company, compared with its estimated accounting or economic value. The most commonly used metrics as highlighted by the ECB (2010) include: the "total share return" (TSR), the ratio of dividends and increase of the stock value over the market stock price; the "price-earnings ratio" (P/E), a ratio of the financial results of the company over its share price; the "price-to-book value" (P/B), which relates the market value of stockholders' equity to its book value; the "credit default swap" (CDS), which is the cost of insuring an unsecured bond of the institution for a given time period.

Inevitably, as the ECB (2010) further notes, different stakeholders in a bank view performance from different angles. For example, depositors are interested in a bank's long-term ability to look after their savings; their interests are safeguarded by supervisory authorities. Debt holders, on the other hand, look at how a bank is able to repay its obligations; a concern taken up by rating agencies. Equity holders, for their part, focus on profit generation, that is, on ensuring a future return on their current holding. This focus is reflected in the valuation approaches of banks' analysts, who try to identify the fundamental value of the firm.

Managers, too, seek profit generation, but are subject to principal-agent considerations and need to take employee requests into consideration. The view of bank consultancies might also encompass the internal struggle of managers.

### 2.2.4 CAMELS

In 1979, the Uniform Financial Institutions Rating System was adopted as a standardized framework for the examination process to develop a rating system whereby the most critical components of a financial institution's overall safety and soundness could be identified, measured, and quantified (Barr et al., 2002). Commonly referred to by the acronym of its component parts, the CAMELS rating has become a concise and indispensable tool for examiners and regulators. The evaluation factors that comprise an institution's CAMELS rating are: Capital adequacy, Asset quality, Management quality, Earnings ability, Liquidity and Sensitivity to market risk.

Each of the factors is scored from 'one' to 'five', with 'one' being the strongest rating. Additionally, a single composite CAMELS rating is determined from these components, and represents the findings of the examination for the institution as a whole.



**Table 1.5 CAMEL Rating**

| Criteria | Description |
|---|---|
| CAMELS = 1 | An institution that is basically sound in every respect. |
| CAMELS = 2 | An institution that is fundamentally sound but has moderate weaknesses. |
| CAMELS = 3 | An institution with financial, operational, or compliance weaknesses that give cause for supervisory concern. |
| CAMELS = 4 | An institution with serious financial weaknesses that could impair future viability. |
| CAMELS = 5 | An institution with critical financial weaknesses that render the probability of failure extremely high in the near term. |

Source Barr et al., (2002)

Research involving CAMELS ratings is limited, due to the restricted nature of the ratings. DeYoung (1998), using the management component of the rating, found that, when comparing well and poorly managed banks, well-managed banks had lower estimated unit costs and higher raw (accounting-based) unit costs, suggesting that cost efficient management does involve expenditures that poorly managed banks tend to fail to make.

The China Banking Regulatory Commission (CBRC) also set out seven performance indicators in the pilot shareholding reform of the BOC and CCB to address banks' credit risk, market risk, operational risk and liquidity risk, which include ROA, ROE, the cost/income ratio, non-performing asset ratio, capital adequacy ratio and non-performing loan provision coverage ratio (Brean, 2007).

In February 2004, CBRC published a rating system for assessing commercial banks excluding SOCBs, which is similar to CAMLES system (Cousin, 2007). Therefore, the novel feature of this study is going to follow the similar approach of CAMELS and use capital adequacy, asset quality, profitability and liquidity as core measures to capture a bank's comprehensive performance. Several financial variables will be selected to proxy the four dimensions.

Several authors have also proposed that DEA efficiency measures be used as the evaluative information for the management component of CAMELS ( Barr et al., 1993; Barr et al., 1994; Brockett et al., 1997; Siems, 1992; Siems and Barr, 1998). In most studies the DEA approach has been used as a tool for evaluating accomplishments in the past. The results highlight the status of the operational performance and are helpful for planning future activities for improving the performance.

DEA models can be used to develop off-site monitoring tools for use by regulators and examiners. Banks can also employ such models internally to benchmark their own processes, finding potential areas for improvement in an industry increasingly characterized by accelerating change and competition. Finally, industry analysts and policymakers can use DEA as a powerful tool for increasing understanding of institutions and markets in this rapidly changing and increasingly complex industry.

### 2.2.5 Balanced Scorecard

Kaplan and Norton (1996) emphasize that balanced scorecards should reflect four types of measures: financial and nonfinancial; external and internal; input/drivers and outcomes/results; objective and subjective. However, different types of measures are not mutually exclusive. For example, financial measures (such as return on assets) could be external, outcomes/results, or objective. The performance index includes outcome measures, the performance drivers of those outcomes, short-term and long-term objectives, hard objective measures and more subjective measures.

According to Hwang et al., (2003), Balanced Scorecard was introduced by Kaplan and Norton (1992) to motivate and measure business performance. The Scorecard with financial and non-financial (customer, internal business process, and learning and growth) provides a balanced picture of current operating performance as well as the drivers of future performance. Cap Gemini Ernst & Young's Center for Business Innovation (CBI) develops a value creation index (VCI), a list of the nine most critical categories of non-financial performance that determine corporate value creation: innovation, quality, customer relations, management capabilities, alliances, technology, brand value, employee relations, and environmental and community issues. Economic value added (EVA) is introduced by Stern Stewart and Co., as a comprehensive performance measure to explain corporate value added or lost. The IC-index combines strategy, non-financial measurements, finance, and management value added, and consolidates those factors into a single index.



### 2.2.6 Combined Measures

Recent studies (Kumar and Gulati, 2009; Ho and Zhu, 2004) have combined measures of financial ratios, efficiency and effectiveness in developing a bank performance measure. Both studies have used DEA model proposed by Cooper et al., (2000) to develop performance scores for Banks in the Indian banking sector and Taiwanese banking sector respectively.

DEA is a mathematical programming approach for characterizing the relationships among multiple inputs and multiple outputs and has been a proven way to measure bank performance. Ho and Zhu (2004) construct a conceptual framework for Taiwanese banks during 2001, based on the return on assets, a ratio commonly discussed in financial analysis, to define the meanings or performance.

The performance indexing approach proposed by Hwang et al., (2003) measures the performance of Taiwan's commercial banks. The study considers both financial and non-financial performances when evaluating 35 sampled publicly-traded commercial banks in Taiwan. Performance measurement systems play a critical role in evaluating the achievement of firms' goals, compensating managers, and developing strategies. The performance index takes out the fuzziness and subjectivity. It offers a yardstick by which to compute the impact of various factors. It allows managers and investors a more complete view of the wealth creating potential of their companies, eliminating the partial and restricted view of a strictly financial perspective. Banks are classified into two categories according either to the year a bank was founded, that is, old and new banks, or to the type of major sponsors of a bank when founded, namely, privatized government-owned and private banks. The categories and weights of the performance index in this paper are selected according to their relative impact based upon the surveys of diverse experts from accounting, finance, strategy, and management.

According to Ho and Zhu (2004), DEA can be applied to revenue-producing organizations by converting financial performance indicators to their efficiency and effectiveness equivalents. One such approach is to disaggregate ROA using the DuPont model; measuring the relationship of earnings before taxation and total assets.

In this context, and in order to evaluate the effect of ownership structure on the economic behavior, Ho and Zhu (2004) aim at fulfilling a double objective. As a first goal, they elaborate an aggregate performance index that combines multiple goals and calculates the relative importance of each goal. This process implies remarkable empirical difficulties, particularly in contexts where firms are characterized by multiplicity of inputs and outputs, or when the weights (that is, the relative importance) attached to each input/output become unknown or, finally, when inputs and outputs are hard to define and the organizations under analysis do not behave as traditional firms.

Data Envelopment Analysis (DEA) techniques provide answers to some of these problems, as discussed in Berger and Humphrey (1997). The idea of adapting DEA to assess and compare relative performances of multiple-goal firms has already been used in a broad range of applications.

For instance, in the banking industry, Piesse and Townsend (1995) evaluated the efficiency of building societies in the United Kingdom, and Mester (1993) applied it to the Savings and Loans in the United States. The interaction between DEA and multiple criteria decision-making has also been receiving increasing attention in other contexts (Bendheim et al., 1998, Bougnol et al., 2005, Caporaletti et al., 1999, Lovell 1995, and Lovell et al., 1995).

**Table 1.6 Financial performance indicators**

| Ratio | Description |
|---|---|
| ROA (performance). | Earnings before taxation/ net sales X net sales/total assets = profit margin (effectiveness) X total assets turnover (efficiency) |
| ROA (performance). | It assesses the net profitability of total assets before taxation, and could be treated as performance in this study. It contains two elements, efficiency and effectiveness |
| Profit margin (effectiveness). | It assesses the net profitability before taxation during the current accounting period. It could be treated as the element of effectiveness in this study and is defined as the ability to achieve the expected goal (result or output) |
| Total asset turnover (efficiency) | It assesses the ability of the firm to use its assets and it could be treated as efficiency in this study. It is defined as the output generated by given resources under the influence of the environmental factors. |

Source: Ho and Zhu (2004)

Ho and Zhu (2004) divide the evaluation process is divided into two stages and the nine factors are expressed as inputs and outputs at each stage. The first stage (stage 1) measures efficiency, that is, a bank's ability to generate the sales and deposits in terms of its capital stock, assets, branches and employees. The second stage (stage 2) measures effectiveness,

that is, a bank's net income, interest income and non-interest income by the sales and deposits it generates.

Further, Ho and Zhu (2004) describe it mathematically where:

$\Phi_0^{1*}$ and $\Phi_0^{2*}$

are the optimal values for stage 1 and stage 2 models respectively. If:

$\Phi_0^{1*} = 1$

and all input/ output slacks are zero, then the bank is said to be CCR-efficient in efficiency. If:

$\Phi_0^{2*} = 1$

and all input/ output slacks are zero, then the bank is said to be CCR-efficient in effectiveness.

Ho and Zhu (2004) therefore conclude that banks with better efficiency does not always mean that it has better effectiveness. There is no apparent correlation between the two indicators.

The existing studies on Indian banking industry as observed by Kumar and Gulati (2010) have concentrated only on the measurement of efficiency of banks in terms of resource utilization (operating efficiency) and completely ignored the effectiveness of banks in achieving their predetermined policy objectives. Nonetheless, the common feature of all the aforementioned research investigations is that the concept of efficiency has been incorrectly dubbed as performance. It is well established in the literature on performance evaluation that the performance of an organization should be appraised simultaneously, both in terms of its efficiency in resource utilization process and effectiveness in realizing the pre-determined goals.



**2.3 Determinants of Bank Performance**

Although banking institutions as highlighted by the ECB (2010) have become increasingly complex, the key drivers of their performance remain earnings, efficiency, risk-taking and leverage. Previous studies (Huang, 2010; Kumar and Gulati, 2010; Sufian and Parman, 2009; Kosmidou, 2008; Wong et al., 2007; Demirguc-Kunt and Huizinga 1999; Angzabo 1997; Molyneux and Thorton, 1992) have analysed determinants of bank performance but with varying results.

Molyneux and Thorton (1992) were among the first who examine the determinants of banks profitability in several countries using a sample of 18 European countries over the period 1986-1989 and found a positive association between the return on equity and the level of interest rates (IR), bank concentration (C) and the government ownership (GO).

$$ROE = f(IR, C, GO)$$

Berger (1995b) and Angbazo (1997) among others examined the US banking sector. Berger (1995b) found that return on equity and capital-to-asset (CA) ratio is positively related over the period 1983-1992.

$$ROE = f(CA)$$

In a study by Demirguc-Kunt and Huizinga (1999) considered a comprehensive set of bank characteristics (such as size, leverage, type of business, foreign ownership), macroeconomic conditions, taxation, regulations, financial structure and legal indicators to examine the determinants of bank interest margins and profitability in 80 countries over the period 1988-1995. The study established that: (i) well capitalized banks have higher net interest margins and are more profitable, (ii) banking sectors, where banking assets constitute a larger portion of the GDP , have smaller margins and are less profitable and that a larger stock market capitalization to bank assets is related negatively to margins, (iii) bank concentration ratio positively affects profitability, (iv) macroeconomic factors implicit and explicit financial taxation, deposit insurance and the legal and institutional environment also explained variation in interest margins.

Wong et al., (2007), applied the Berger-Hannan approach and a panel dataset of retail banks in Hong Kong covering the period 1991-2005, to examine what factors determine the performance of banks, particularly how banks profits and their pricing behavior are affected by market structure and efficiency.

According to Sufian and Parman (2009), bank profitability, as measured by the return on assets (ROA) and/or the return on equity, is usually expressed as a function of internal and external determinants. Similarly, Kosmidou (2008) applies the ratio of return on average

assets (ROAA) as a measure of bank performance. Return on assets is the net profit after tax divided by total assets and indicates the returns generated from the assets financed by the bank. High return on average assets (ROAA) was found to be associated with well capitalized banks and lower cost to income ratios. Size was positive in all cases but statistically significant only when the macroeconomic and financial structure variables entered the models.

However, this is contrary to the findings by Heffernan and Fu (2008) who based on diagnostics and the significance of coefficients suggests the best dependent variables are economic value added and the net interest margin, as against ROAA or ROAE.

Profitability, as noted by García-Herreroa (2009), is an indicator of a bank's operating performance. In fact, banks' profitability should mirror the quality of their management and shareholders' behavior as well as their competitive strategies, efficiency and risk management capabilities. In the literature, bank profitability, typically measured by ROA and/or ROE, is usually expressed as a function of internal and external determinants (Athanasoglou, Delis and Staikouras, 2006). ROA is explained as a good overall indicator of a banking organization's performance that illustrates the ability of a bank to generate profits from the assets at its disposal, although it has a problem of not accounting for the profits generated from the off-balance-sheet operations.

ROE is identified by Athanasoglou et al., (2006) as an alternative measure of profitability designed to reflect the return to owners' investment. It is often referred to as the bank's equity multiplier measuring financial leverage. However, ROE has also a disadvantage that the denominator may vary substantially across banks even those of identical size. This is due to the discretionary choices by management as to the mix between equity and debt as well as the total amount of capital held by a firm.

Moreover, since an analysis of ROE disregards the greater risks associated with high leverage and financial leverage is often determined by regulation, ROA emerges as the key ratio for the evaluation of bank profitability.

Determinants of profitability of Greek commercial banks as shown by Kosmidou (2008) who examined the extent the profits of banks are influenced by internal factors (bank's specific characteristics) and by external factors (macroeconomic, financial industry structure).

Sufian and Parman (2009) define internal determinants as factors that are mainly influenced by a bank's management decisions and policy objectives. Such profitability determinants are the level of liquidity, provisioning policy, capital adequacy, expenses management, and bank size. On the other hand, the external determinants, both industry and macroeconomic related, are variables that reflect the economic and legal environments where the financial institution operates.

Kosmidou (2008) further identifies five bank characteristics which are used as internal determinants of performance. They are the cost-to-income ratio, the ratio of equity to total assets, the ratio of bank's loans to customer and short term funding, the ratio of loan loss reserves to gross loans and the banks total assets which represents expenses management, capital adequacy, liquidity, asset quality and size respectively.

Efficiency and effectiveness are mentioned by Kumar and Gulati (2010) as the central terms used in assessing and measuring the performance of organizations. Performance, in both profit and non-profit organizations, can be defined as an appropriate combination of efficiency and effectiveness. It is significant to note that though efficiency and effectiveness are two mutually exclusive components of overall performance measure yet they may influence each other. More specifically, effectiveness can be affected by efficiency or can influence efficiency as well as have an impact on the overall performance (Ozcan, 2008).

According to the quantity theory of money, changes in the supply of money lead to changes in nominal GDP and the price level. However, as argued by Kosmidou (2008) who studied Greek banks, Money supply growth, has no significant impact on profits, whereas the ratios banks' assets to GDP, stock market capitalization to banks assets and concentration are all statistically significant and negatively related to ROAA. Concentration is calculated as the total assets held by the five largest commercial banks in the country divided by the total assets of all the commercial banks in the country.

However, Wong et al., (2007) who analysed banks in Hong Kong, developed a model to identify the major determinants of a bank's profit, and the general level of profitability of a banking market, establishes that in Hong Kong's case, market structure, such as market concentration and market shares of banks, is not a major contributory factor. This is disputed by Kosmidou (2008) who argues to the contrary and identifies market structure as a key determinant.

Cost efficiency of banks, Wong et al., (2007) further notes, which measures the ability of banks to optimize their input mix for producing outputs, is a major determinant of banks' profitability. Since larger banks are found to be in general more cost efficient than smaller banks, larger banks can offer services at lower prices to compete with smaller banks, yet attaining a similar or even higher level of profits. Small banks may, therefore, be more vulnerable to intense competitions in the loan market than larger banks, particularly in cut throat price wars.

For the most part, the literature argues that reduced expenses improve the efficiency and hence raise the profitability of a financial institution, implying a negative relationship between operating expenses ratio and profitability (Bourke, 1989). However, Molyneux and Thornton (1992) observed a positive relationship, suggesting that high profits earned by firms may be appropriated in the form of higher payroll expenditures paid to more productive human capital.

Liquidity risk, arising from the possible inability of a bank to accommodate decreases in liabilities or to fund increases on the assets' side of the balance sheet, is considered an important determinant of bank profitability. The loans market, especially credit to households and firms, is risky and has a greater expected return than other bank assets, such as government securities. Thus, one would expect a positive relationship between liquidity and profitability (Bourke, 1989). It could be the case, however, that the fewer the funds tied up in liquid investments the higher we might expect profitability to be (Eichengreen and Gibson, 2001).

Changes in credit risk may reflect changes in the health of a bank's loan portfolio as reported by Cooper et al., (2003), which may affect the performance of the institution. Duca and McLaughlin (1990), among others, conclude that variations in bank profitability are largely

attributable to variations in credit risk, since increased exposure to credit risk is normally associated with decreased firm profitability. In this direction, Miller and Noulas (1997) suggest that the more financial institutions are exposed to high risk loans, the higher the accumulation of unpaid loans and the lower the profitability.

The need for risk management, as Delis and Papanikolaou (2009) concur, in the banking sector is inherent in the nature of the banking business. Changes in credit risk may reflect changes in the health of a bank's loan portfolio, which may affect the performance of the institution, since poor asset quality is the single most important cause of bank failures. To proxy credit risk we use the loan-loss provisions to loans ratio is often applied.

Even though leverage (capitalization) has been demonstrated to be important in explaining the performance of financial institutions, its impact on bank profitability is ambiguous. As lower capital ratios suggest a relatively risky position, one might expect a negative coefficient on this variable (Berger, 1995). However, it could be the case that higher levels of equity would decrease the cost of capital, leading to a positive impact on bank profitability (Molyneux, 1993). Moreover, an increase in capital may raise expected earnings by reducing the expected costs of financial distress, including bankruptcy.

Bank size is generally used to capture potential economies or diseconomies of scale in the banking sector. This variable controls for cost differences and product and risk diversification according to the size of the financial institution. The first factor could lead to a positive relationship between size and bank profitability, if there are significant economies of scale (Akhavein et al., 1997; Bourke, 1989; Molyneux and Thornton, 1992; Bikker and Hu, 2002; Goddard et al., 2004), while the second to a negative one, if increased diversification leads to lower credit risk and thus lower returns.

Other researchers, however, conclude that marginal cost savings can be achieved by increasing the size of the banking firm, especially as markets develop (Berger et al., 1987; Boyd and Runkle, 1993; Miller and Noulas, 1997; Athanasoglou et al., 2008). Eichengreen and Gibson (2001) suggest that the effect of a growing bank's size on profitability may be positive up to a certain limit. Beyond this point, the effect of size could be negative due to bureaucratic and other reasons. Hence, the size-profitability relationship may be expected to be non-linear.

Delis and Papanikolaou (2009) develop a model that shows that a number of determinants like bank size; industry concentration and the investment environment have a positive impact on bank efficiency, which is not the case when standard tobit models are employed.

Huang (2010) collected a sample of 80 Chinese commercial banks for the period from 2000 to 2008, and investigated the determinants of bank performance. Aggregate index measures of performance are constructed based on proxy variables that assess the quality of assets, capital adequacy, profitability, and liquidity. Evidence from the study suggests that lower financial leverage, higher off-balance sheet activities, and larger size of the bank are associated with better performance. At industry level, concentration of the banking sector has allowed better performance due to less competitive environment. The liberalization of the banking business to foreign banks in 2003 has an encouraging effect on the banking sector, although the evidence is not statistically significant. At macroeconomic level, higher per capita GDP and lower unemployment has been significantly related to better bank performance.



However, the estimated effect of size does not provide evidence of economies of scale in banking. Likewise, the ownership status of the banks is insignificant in explaining profitability, denoting that private banks do not in general make relatively higher profits. Also, effect of industry concentration on bank profitability was found insignificant. Chirwa (2003) identifies a significantly positive long-term relationship between concentration and performance by looking at Malawi banks during 1970-1984.

Naceur and Goaied (2005) study the determinants of commercial bank interest margin and profitability in Tunisia for the periods 1980-2000. The expected determinants include individual bank characteristics (including overhead, equity capital ratio, loan to total asset ratio, non-interest activities and size), macroeconomic indicators (GDP and inflation), and financial structure factors (banking sector size, stock market size and bank concentration). The positively influential determinants were found be capital amount, the inflation, and development of stock market.

Athanasoglou, Delis and Staikouras (2006) examine both internal and external determinants of bank profitability of the South-Eastern European banking industry over the period 1998-

2002. Their findings show that with the exception of liquidity, all bank-specific determinants (including loan quality, capital, operating expense, bank size and foreign ownership) significantly affect bank profitability. Especially, the effect of concentration is positive. Nevertheless, a positive relationship between banking reform and profitability was not identified.

Furthermore, Beckmann (2007) particularly analyses structural and cyclical determinants of banking profitability in 16 Western European countries over the period 1979-2003. Financial structure, higher diversification of bank income sources and business cycle effects display substantial impacts on bank profits.

Generally, higher economic growth encourages bank to lend more and permits them to charge higher margins, as well as improving the quality of their assets. Neely and Wheelock (1997) use per capita income and suggest that this variable exerts a strong positive effect on bank earnings. Dermiguc Kunt and Huizinga (2000) and Bikker and Hu (2002) attempted to identify possible cyclical movements in bank profitability, that is, the extent to which bank profits are correlated with the business cycle.



**2.4 Finance Growth Theory**

Over the past decade, as noted by Koivu (2002), considerable interest focused on the link between the financial sector and economic growth. Endogenous growth theory emerged in the late 1980's and paved the way for new theories exploring the link. Pagano (1993) suggests three ways in which the development of financial sector might affect economic growth under the basic endogenous growth model. First, it can increase the productivity of investments. Second, an efficient financial sector reduces transmission costs and thus increases the share of savings channeled into productive investments. Third, financial sector development can either promote or decline savings.

Financial sector development has been defined as the improvement in quantity, quality and efficiency of financial intermediary services. Schumpeter (1911), McKinnon (1973) and Shaw (1973) have postulated that financial development has a strong connection with economic growth. The theoretical basis for linking economic growth with financial development is that a well developed financial system fuels technological innovation and economic growth through the provision of financial services and resources to those

entrepreneurs who demonstrate evidence of successfully producing innovative products and processes.

Inklaar and Koetter (2008) show that more efficient banks are particularly important in stimulating both output and productivity growth, while traditional volume measures of finance are less important for productivity growth. Both bank cost and profit efficiency scores are economically and statistically significant factors in spurring economic activity and they facilitate both output and productivity growth.

Demirguc-Kunt and Maksimovic (1998) investigate how differences in legal and financial systems affect firm's use of external financing to fund growth. The study shows that in countries whose legal systems score high on an efficiency index, a greater proportion of firm's use long-term external financing. The authors develop a financial planning model to obtain the maximum growth rate that each firm could attain without access to long term financing. The study then provides a micro-level test of the hypothesis, advanced by King and Levine (1993) and Levine and Zervos (1998) that the degree to which financial markets and intermediaries are developed is a determinant of economic growth.

Berger et al., (2004) contribute to the finance-growth literature by focusing on one dimension of the financial system and how its effects may be transmitted into economic growth. Specifically, Berger et al., (2004) hypothesizes that relatively large market shares and relatively high efficiency for community banks may promote economic growth using data from 1993-2000 on 49 nations. It seems likely that community banks will be effective if these institutions are also relatively efficient. The results show a positive coefficient between market shares and efficiency.

Koivu (2002) uses empirical data to examine whether relatively larger, more efficient banking sectors accelerated economic growth in transition economies using a fixed-effects panel model. The findings support the view that the presence of an efficient banking sector accelerated economic growth. In particular, researchers have provided additional findings on the finance-growth nexus and have offered a much bolder appraisal of the causal relationship at firm-level, industry-level, and cross-country studies all suggest that the level of financial development exerts a large, positive impact on economic growth.

Hassan et al., (2008) derive a measure for intermediation quality at the individual bank level and test whether banks' relative ability to convert resources into financial products and service affect the extent of financial development and growth. To approximate the aspect of financial intermediation, bank specific cost efficiency is estimated.

In the educational sector, Azad (2007) applied the education-growth nexus and tested whether the efficiency of education has any influence on economic growth of a country. The efficiency scores were derived using Data Envelopment Analysis (DEA) and the results showed a positive relation with economic growth.

Adusei (2013) applies the dynamic Generalized Method of Moments (GMM) model to examine the finance –growth nexus with panel data (1981-2010) from 24 African countries. Evidence suggests that there is a positive relationship between finance and economic growth and that there is a bi-directional relationship between finance and economic growth.
Nganga, Onyango and Kerre (2009) explored collective efficiency as a paradigm that could inform infrastructure planning and development to support small enterprises. Data gathered from 203 wood-based enterprises in Kenya revealed collective efficiency to be positively related to growth of the enterprises.

In the sports sector, Guzmana (2006) analyses assess the level of financial performance of Spanish football clubs and the relationship thereof with the target for growth based on a parameter of revenue. Efficiency measurements were analysed using a benchmark procedure developed by Charnes et al., (1978), data envelopment analysis (DEA) and also productivity levels by calculating the Malmquist productivity index based on DEA scores.

Mensah, Abor, Aboagye and Adjasi (2012) examine the relationship between banking sector efficiency and economic growth in Africa. The study used the stochastic frontier approach stating the banking sector cost function as a Fourier flexible to estimate bank efficiency. The study used the Arellano–Bond GMM estimator to investigate the relationship between banking sector efficiency and economic growth. Annual data for banking sector financial statements were used in estimating efficiency scores. The study found banking sector efficiency in the sample to be 69%.

Mensah et al., (2012) found a positive relationship between banking sector efficiency and economic growth, confirming the critical role banks play in the economy. Banking sector efficiency score of 69% implies banks in Africa could save up to 31% of their total cost if they were to operate efficiently. Policy direction should therefore focus on policies and incentives that will improve the efficiency of the banking sector and hence economic growth.
Efficiency and effectiveness are the central terms used in assessing and measuring the performance of organizations (Mouzas, 2006). Performance, in both profit and non-profit organizations, can be defined as an appropriate combination of efficiency and effectiveness. However, there seems to be some inconsistency in the use of these terms in the existing literature on the subject matter. For the managers, these terms might be synonymous but each of these has their own distinct meaning.

Drucker (1977) distinguished efficiency and effectiveness by associating efficiency to "doing things right" and effectiveness to "doing the right things." In his terminology, a measure of efficiency assesses the ability of an organization to attain the output(s) with the minimum level of inputs. It is not a measure of a success in the marketplace but a measure of operational excellence in the resource utilization process.

More precisely, efficiency is primarily concerned with minimizing the costs and deals with the allocation of resources across alternative uses (Achabal et al., 1984). While commenting on effectiveness, Keh et al., (2006) observed that a measure of effectiveness assesses the ability of an organization to attain its pre-determined goals and objectives. Simply, an organization is effective to the degree to which it achieves its goals (Asmild et al., 2007). In sum, effectiveness is the extent to which the policy objectives of an organization are achieved.

According to Kumar and Gulati (2010), it is significant to note that though efficiency and effectiveness are two mutually exclusive components of overall performance measure yet they may influence each other. More specifically, effectiveness can be affected by efficiency or can influence efficiency as well as have an impact on the overall performance (Ozcan, 2008). Nevertheless, it is possible that an organization can be efficient in utilizing the inputs, but not effective; it can also be effective, but not efficient. Thus a high performer on both effectiveness and efficiency maximizes overall performance of an organization.

For a profit organization, Ho and Zhu (2004) used Du Pont model and decomposed the overall performance measure (proxied in terms of return on assets (ROA)) into the product of efficiency (measured as total assets turnover ratio) and effectiveness (measured as profit margin ratio) measures. Their decomposition is illustrated as follows:

$$ROA = \frac{Earningsbeforetax}{Totalsales}$$

$$= \frac{Earningsbeforetax}{Netsales} x \frac{Netsales}{Totalassets} 、$$

Profit margin ratio  Total assets Turnover ratio

Overall Performance = Efficiency x Effectiveness

In the aforementioned decomposition, the ROA is considered as a measure of overall performance and assesses the profitability of total assets before taxation for an organization. Further, it contains efficiency and effectiveness as its mutually exclusive components. Total assets turnover ratio assesses the ability of an organization to use its assets and could be treated as efficiency. It indicates the output generated by the use of given level of inputs. On the other hand, the profit margin ratio assesses the net profitability before taxation during the current accounting period and could be taken as a measure of effectiveness. This ratio indicates the ability of an organization to achieve the expected goals in terms of output(s).

Therefore, the performance measure for an organization is a product of efficiency and effectiveness measures (performance= efficiency x effectiveness). Thus, overall performance measure can be seen as a means of quantifying the efficiency and effectiveness of actions (Neely et al., 1995).

### 2.5 Market Structure Theories

The Structure performance relationship of banks has been extensively studied for the US banking industry. Earlier studies as pointed out by Wong et al., (2007) on the structure performance relationship of the banking industry have usually been based on regression analysis in which indicators of bank performance, such as bank profitability and prices, were

regressed on indicators of market structure such as the concentration index of the banking industry and market shares of individual banks.

According to Edwards et al., (2006), Market structure conduct and performance (SCP) framework was derived from the neo-classical analysis of markets. The SCP was the brain child of the Harvard school of thought and popularized during the 1940-60 with its empirical work involving the identification of correlations between industry structure and performance.

The consolidation of banks around the world in recent years is intensifying public policy debates on the influences of concentration and competition on the performance of banks.

What factors determine the performance of banks in general and how banks' profits and pricing behaviors are affected by market structure in particular, have been extensively studied (Wong et al., 2007).Amongst the various approaches, a number of studies have focused on the structure –performance relationship of banks, with the structure-conduct-performance (SCP) hypothesis and the efficient-structure (EFS) hypothesis widely tested. In general, banks profitability and pricing power are hypothesized to be determined by market structure of the banking industry, such as the number of participating banks in the market and the market shares of banks, and bank specific factors, such as cost efficiency, scale efficiency, and the risk attitude of banks. Macroeconomic factors, such as real GDP growth and unemployment, may also be important determinants.

Similarly, Dietrich and Mattig (2010) review the three profit-structure hypotheses that have emerged in the banking literature to explain the profit-structure relationship. They are the Structure-Conduct-Performance Hypothesis, the Relative Market-Power Hypothesis, and the Scale –Efficiency version of the Efficient –Structure Hypothesis. The Structure-Conduct-Performance Hypothesis states that banks set prices that are less favorable to consumers in more concentrated markets because of an imperfect competition. In all these three approaches, the basic relationship between market structure and performance can be observed both, on country level (macrostructures) as well as from more applied bank-level perspective.

The basic idea of a structure-conduct-performance (SCP) model states that institutions in concentrated market earn excess profits, basically due to collusive power. This would imply that banks that fit this model become less efficient over time and their host countries suffer

from a lack of competition. However, we see that often this is not the case. Banks in highly concentrated markets seem to be able to be efficient and their competitive environment seems to prosper with them.

Traditionally, the relationship between performance and market structure is analysed from a market power perspective. With respect to the corresponding structure-conduct-performance hypothesis, industry concentration is measured as the market share of the three biggest banks (CR3) in the respective country, acts as a proxy for market power. In this view, it is supposed that firms in more concentrated markets should be able to collude and thus to set prices above marginal costs.

Aarma et al., (2004) argue that internationalization, adoption of new banking technologies, deregulation, banking market consolidation and other recent trends in financial intermediation should result in increasing efficiency. On the other hand, since banks are no longer monopoly suppliers of financial services and products and markets are more contestable (increased competition between banks and new competition from non-bank financial institutions and markets), intermediation margins, net interest income and other income should result in decreasing profitability and efficiency. In any case, elimination of inefficiency and reducing costs would be a challenge for banks' survival in the rapidly changing market environment.

According to Dietrich and Mattig (2010), the prediction and measurement of market power has long commanded special attention for the banking industry. The vital role of banks in the economy encompasses their participation in the payment system, the transmission of monetary policy, and the provision of credit. The idea that market structures influence profitability has accordingly become a key concept that competes with views that competition and efficiency create structure.

The relationship between market structure and the profitability of banks is of concern to bank managers and to banking regulators. Particularly, as Brewer et al., (2003) observes, the banking regulators have to weigh the potentially beneficial effects of mergers on the combined banks' profitability and viability against the possible detrimental impact on consumer welfare. For example, increased competition from financial deregulation in the

banking sector may force banks to invest into higher yielding assets by increasing their risk exposure beyond a reasonable level.

Empirical evidence, as noted by Wong et al., (2004), finds that market structure, as measured by market concentration and market shares of banks, is either not a significant determinant of banks' performance or, to the extent that market consolidation in recent years have hampered competition and thus enhancing banks' profitability, its adverse effect has been largely offset by regulatory liberalization and technological progress during the same period.

This is supported by Vasiliou and Frangouli (2000) who investigated the impact of financial variables (asset utilization and leverage multiplier) and concentration ratio of the Greek commercial banking market on banks return on equity over the period 1993-1997. The results indicated that financial variables are very important determinants of bank's profitability while market structure is found to have no influence on bank performance.

However, this is contradicted by Wong et al., (2010) who found a positive correlation between banks' performance and market concentration (or market shares). The interpretation of this result varied among the studies: some authors interpreted it as support of the SCP hypothesis, which asserts that banks in a concentrated market are more likely to engage in some form of non-competitive behavior such as collusions, consequently setting less favorable prices to customers and earning higher profits. Others viewed it as support of the EFS hypothesis, which states that efficient firms increase in size and market share because of their abilities to generate higher profits, which usually leads to increased concentration of markets and higher market shares of individual banks.

As for the structure-performance relationship of banks, Wong et al., (2010)) notes that empirical results have been mixed. In some studies, market structure of the banking sector was found to be one of the main determinants of banks' performance. Specifically, banks profitability was found to be positively related to the level of market concentration. This was interpreted as profitability being enhanced by a higher degree of price coordination which was facilitated by fewer competitors. This suggests that concentration could have an adverse effect on the competitive environment of the industry. Likewise, studies found that banks with larger market shares possessing strong market power could earn supernormal profits, which could hamper competition and could affect the health of other smaller banks. On the

other hand, other studies found that the relationship between banks performance and concentration /market power is spurious, with efficiency being the principal determinant of both profitability and market structure. This is particularly so, in view of recent market consolidations resulting in fewer banks and new larger banks, and the fact that larger banks appear to have generally performed better than smaller banks.

Following the literature, in some specifications, a control is often included for banking sector structure and three macroeconomic control variables. *Herfindahl* is a standard index of sector concentration, which is calculated based on bank shares of total deposits. If deposits are concentrated in the hands of few banks, those banks might be able to drive up lending rates, as they control the supply of funds.

Decressin et al., (2003) proposed that recent weak bank profitability in Germany appears to be related with structural factors rather than the macroeconomic cycle. Anecdotal evidence and financial ratio analyses are also presented to support this claim.

According to Allen et al., (2004), some of the recent research on the effects of bank competition allows for the possibility that different sizes of banks may affect competitive conditions differently. A positive relationship between bank size and performance is observed. More specifically, it is suggested that large total assets gives a bank the ability to achieve higher efficiency levels; thus, a merger of two small banks will probably increase their efficiency and competitiveness in the long term.

Fillipaki and Staikouras (2009) investigated whether size or the ownership structure of financial institutions affects profit efficiency. Our results show a negative relationship between size and efficiency. Small banks appear to be the most profit efficient, while large credit institutions are the least profit efficient. Regarding the effects of ownership on performance, we find that domestic private banks are, on average, the most profit efficient, followed by state owned banks, while foreign banks are the least efficient.

While the size of private banks appears to have an effect on the efficiency of financial intermediation, bank ownership plays at least as important a role in explaining the relative efficiency of Kenyan banks.

Kenya's vision 2030 seeks to facilitate the transformation of the banking sector to bring in fewer, stronger, and larger banks. The higher capital levels in banks are expected to create a vibrant and globally competitive financial sector.

Researchers have recognized the problems with SCP tests and tried other methods. For example, some studies tested versions of the SCP and ES hypotheses in models of bank profitability. These studies controlled for measures of X-efficiency and scale efficiency and allowed concentration and market share in local US banking markets to be functions of these efficiency measures. Allen et al., (2004) found some evidence favoring both the effects of both market power and efficiency on profitability, but the results were weak and varied by market type.

Summarizing, there is no clear indication that competition is detrimental per se for bank stability or that a more concentrated banking system necessarily implies less competition.



### 2.5.1 Structure Conduct Performance Hypothesis

Early attempts to compare SCP on a country level were collected by Gilbert (1984), who provides a comprehensive and thoughtful survey of the early studies with a focus on SCP assumptions. Goldberg and Rai (1996) considered the relationship between market structure and performance for a number of European banks for 1988-1991. Molyneux and Forbes (1995) analyzed the SCP paradigm for banks in 18 countries over the period 1986-1989. The studies provide empirical support for the traditional SCP paradigm concluding that the degree of concentration has an effect on the level of competition within the industry. Other SCP banking studies have been conducted by Bourke (1989), and Berger and Hannan (1989).

In Industrial Organizations, the SCP framework (Mason, 1949; Bain, 1951, 1956) was devised in an attempt to analyse and contextualize the competitive conditions of industries by examining how the underlying structure (the factors that determine market competitiveness) of an industry is related to, and affects the conduct (the behavior) and performance ("track-record" or success in the industry/market) of firms (Lipczynski and Wilson, 2004). The framework also considers public policy as having an impact on, and consequently, affecting firms' structures and behaviour and regards the basic conditions of supply and demand in any given industry as influencing that industry's structure.

Empirical applications of both theories (SCP and EFS) have been the subject of many studies in the banking industry, while a small number of insurance studies examine them. The banking studies consider the effects of efficiency on the SCP relationship (Gilbert, 1984; Smirlock, 1985; Evanoff and Fortier, 1988; Lloyd-Williams, Molyneux, and Thornton, 1994; Molyneux and Forbes, 1995; Berger and Hannan, 1993; Berg and Kim, 1994; Berger, 1995; Goldberg and Rai, 1996; Berger and Hannan, 1998; Maudos, 1998).

However, these studies differ as to whether efficiency is estimated directly or indirectly (that is, by proxy variable). Furthermore, the methodology used to estimate efficiency varies among the studies, as well as control variables in the models. Thus, the results from the banking studies are mixed.

There are two competing hypothesis in the SCP paradigm: the traditional 'structure-conduct performance hypothesis' and 'efficient-structure hypothesis'. The structure performance hypothesis states that the degree of market concentration is inversely related to the degree of competition. This is because market concentration encourages firms to collude. More specifically, the standard SCP paradigm asserts that there is a direct relationship between the degree of market concentration and the degree of competition among firms. Thus hypothesis will be supported if positive relationship between market concentration and performance (measured by profits) exists, regardless of efficiency of the firm (measured by market share).

The strength of the SCP, according to Van Cayseele and Van Den Bergh (1999), is that it consolidated the common themes of the original models of competition such as number and size of suppliers, technological aspects, and buyers' choices over differentiated brands. Consequently, it integrated these elements into a framework that linked these issues with performance indicators in that industry, by also considering, the competitive behavior of firms in relation to that industry's structure. The aim was to provide a generalized theory that contextualizes the dynamics of competitive landscapes with the emphasis being on explaining, and predicting, that the performance of an industry is a result of its structure. .

Lo´pez (2001) concurs and adds that the SCP paradigm's popularity arose from its suggestion that once the structure of an industry is defined, the conduct of the firm can also be defined and thus the performance of an industry can be determined. Given that industries are found on the continuum between the extremes of pure monopoly and perfect competition, industries

falling closer to pure monopoly are more concentrated and exhibit higher prices and fewer efficiencies. Indeed, he continues, "the SCP approach yields a central conclusion: the degree to which an industry departs from the model of perfect competition – as measured by industry concentration – determines the departure from the societal ideal". In other words, he notes, "the theory concludes that there is a negative correlation between industry concentration and the societal welfare produced by that market".

The SCP approach, as highlighted by Panagiotou (2006), attempts to explain and predict the performance of an industry as a consequence of market structure and conduct, and assumes that there is a stable and causal relationship between the structure of an industry, firm conduct, and market performance. Later studies, however (Phillips, 1976; Clarke, 1985), have disagreed with the narrow perspective of performance flowing from structure and argued that dissatisfaction in firm performance can lead back to changes in firm conduct, and consequently changes to structure.

As of the early 1990's, the empirical research on the effects of bank concentration and competition most often tested whether the traditional structure-conduct-performance (SCP) hypothesis applied to the banking industry using data from the US. Authors typically tested the SCP hypothesis using a simple measure of concentration- such as Herfindahl-Hirschman Index (HHI) or n-firm concentration ratio (CRn)- as an exogenous indicator of the market power or an inverse indicator of the intensity of competition. The market shares of all sizes and types of commercial banks were generally treated equally in computing the concentration measure. The research usually specified bank prices and measure of profitability as the endogenous indicators of bank conduct and performance, respectively.

Consequently, a number of concentration ratios were devised to measure market competitiveness and performance levels, two of which are the four-firm concentration ratio (CR4), measuring the sum of the market shares of the four largest firms in the industry, and the eight-firm concentration ratio (CR8), focusing on the top eight. Other measures include the Herfindhal-Hirchman index (HHI), which looks at the market shares of all firms in that industry, or the Lerner index, which considers the differences between market price and marginal costs.

Thus, by default, the data required to apply these ratios are secondary, using either published statistics or firms' financial statements. This very fact is central to the SCP's criticisms because secondary data only allows "snapshots" of industries and markets.

There are two main approaches as identified by Anzoategui et al., (2010) to measuring bank competition: the structural approach and the non-structural approach. As the name suggests, the structural approach assesses bank competition by examining measures of market structure such as concentration ratios (the share of assets held by the top 3/5 institutions) or indices (for example, the Herfindhal index). The theoretical justification for using concentration as a measure of competition comes from the so called Structure-Conduct-Performance paradigm, which postulates that fewer and larger firms (higher concentration) are more likely to engage in anticompetitive behavior.



However, studies have shown that at times concentration is not a reliable measure of competition (Cetorelli, 1999) and the link between concentration and performance is not always positive as suggested by the Structure-Conduct-Performance paradigm (Jackson, 1992).
In their study, Anzoategui et al., (2010) have applied Concentration as the average share of assets held by the top three banks over the period 2002-2008. Similarly, Demirguc-Kunt and Martinez-Peria (2010) have analysed concentration in relation to the assets held by the three largest banks in the Jordanian banks.

According to the SCP hypothesis, banks in highly concentrated markets tend to collude and therefore earn monopoly profits (Kosmidou, 2008). However, not all studies, have found evidence to support the SCP hypothesis. From the 45 studies reviewed by Gilbert (1984) only 27 provide evidence that the SCP paradigm hold. Berger (1995a) points out that the relationship between bank concentration and performance in the USA depend critically on what other factors are held constant.

According to the SCP concept, high market concentration also facilitates collusion in the market, enabling firms to approximate a monopoly (joint profit maximization) solution. Evidence of market concentration is assumed Dietrich and Mattig, (2010) by to be marked by a positive correlation between performance and concentration. The traditional form of the SCP concept of Mason (1939) and Bain (1951) predicts that competition will be less vigorous

when fewer firms compete within a market. The SCP paradigm would predict that competition is substantially imperfect in many banking markets.

According to Sathye and Sathye, (2004), a positive correlation between profitability and market concentration indicates that there is not enough competition in the banking market. Conversely, the EFS hypothesis asserts that higher profits are generated not because of an oligopolist behavior of the big firms but because they are more efficient than other firms in the market, hence the increase in their size and the market share.

Byeongyong and Weiss (2005) tested the traditional structure-conduct-performance model and the efficiency structure hypothesis to examine the relationship among market structure and performance in property-liability insurers. The overall results suggest that cost-efficient firms charge lower prices and earn higher profits, in conformance with the ES hypothesis.

In their study, Mamatzakis and Remoundos (2003) used a methodology based on the Structure Conduct Performance (SCP) framework to examine the determinants of the performance of Greek commercial banks over the period 1989-2000. They used financial ratios, bank's size, status of ownership, stock market performance, market concentration, money supply and consumer price index as independent variables and found that profits are mainly explained by the financial ratios. They also reported that economies of scale and the money supply significantly influence profitability.

Market structure, as noted by Yu et al., (2007) plays a significant role in determining profitability in the German banking system. The study tests all three hypotheses, the structural-conduct-performance hypothesis, the market-power hypothesis and the scale-efficiency version of efficient-structure hypothesis, which are represented by different variables. The results indicate that the positive profit-concentration relationship occurs because concentration affects price and price affects profit. On the other hand, if the coefficient of market share is positive and significant, but the other coefficients are not in this case, the relative-market-power hypothesis holds. Under the relative-market-power hypothesis, market share becomes the key exogenous variable since banks with large market shares have well-differentiated products and are able to exercise market power in pricing these products.

The nature of efficiency of Uganda's banking system has been studied by Mugume (2008) who analysed the structure-performance correlation. The main purpose of the study was to empirically verify which of these two paradigms better describes the evolution of profitability in the banking industry. The study draws on Berger (1995) methodology, which is based on the inclusion of specific measures of economic and scale efficiency in profit-structure traditional models. Interest in using the Berger methodology to verify the MP and ES paradigms in the Ugandan banking industry is not insignificant because, studies related to the profit market structure relationship are not only scarce, but those that do exist do not provide an in-depth measure of efficiency variables.



The structural approach to model competition includes the structure-conduct performance (SCP) paradigm and the efficiency hypothesis. Using the SCP framework, the study investigated whether a highly concentrated banking sector causes collusive behaviour among larger banks resulting in superior market performance; whereas under the efficiency hypothesis the test whether it is the efficiency of larger banks that enhance their performance. Using Granger causation test, the study established that efficiency Granger causes concentration and market share and using instrumental variable approach, the study establishes that market power and concentration as measured by market share and Herfindahl index, respectively, positively affect bank profitability. In addition, bank efficiency also affects bank profitability.

As Lopez (2001) states, statistical application without theoretical justification is not valid enough. To that end, the SCP approach provides no explanations into the reasons of how industries have evolved into their current state and how firms' competitive behavior affects future changes in that industry's structure (Lipczynski and Wilson, 2004), despite the fact that this aspect has been recognised by institutional economics (Sinclair and Stabler, 1997).

The literature has now advanced well past this simple approach. The research as observed by Allen et al., (2004) has generalized beyond the SCP hypothesis and tested a number of different models of competition. Authors have also recognized problems with HHI and CRn and specified alternative measures of competitiveness, including indicators of market structure that allow for the possibility that different sizes and types of commercial banks may affect competitive conditions differently. The measures of conduct and performance that are

analysed have expanded to include indicators of the efficiency, service quality, and risk of the banks, as well as consequences for the economy as a whole.

In particular, growing interest has emerged to find a convincing explanation for the continuing increase in bank institution profitability, as has been observed in recent years (Mugume, 2008). As regards this issue, two extreme positions exist. On one hand, some analysts argue that the increase in profitability is a fundamental response to the major market power obtained by the banks, as a consequence of the mergers and acquisitions previously mentioned. On the other hand, other specialists emphasize that such mergers and acquisitions have translated into significant improvement in bank efficiency, which in turn has allowed banks to realize greater benefits.

The most recent literature (Barajas, et al., 1999; 2000) supports the hypothesis that banks performance indicators are positively related to market power. Second, the removal of credit controls during financial liberalization may worsen the quality of loans that may in turn lead to increased risks of systemic crises. Brownbridge and Kirkpatrick (2000) note that liberalization of interest rates and removal of credit controls may allow those that are not constrained by prudential regulations, to invest in risky asset in order to maintain larger market shares. This may reduce the quality of assets that in turn may result in a higher proportion of non-performing loans and provisions for doubtful debts.

Banks tend to offset the cost of screening and monitoring due to bad loans/or the cost of foregone interest revenue by charging higher lending rates (Barajas, et al., 1999). Barajas, et al., (1999; 2000) further confirm that the cost of poor quality assets is shifted to bank customers through higher spreads in the Colombian financial system. However, Brock and Rojas-Suarez (2000) find a significant negative relationship in the cases of Argentina and Peru.

Third, there is overwhelming empirical evidence that high non-financial costs are also a source of persistent inefficiency in banking sector in developing countries. Non-financial costs reflect variations in physical capital costs, employment, and wage levels. High non-financial costs may result from inefficiency in bank operations that may also be shifted to bank customers, particularly in imperfect markets. Dermirguc-Kunt and Huizinga (1999) find evidence of a negative relationship between bank performance and overhead costs. Barajas et

al., (1999, 2000) and Brock and Rojas-Suarez (2000) also find significant evidence of the positive relationship between bank inefficiency and nonfinancial costs.

Fourth, Macroeconomic instability and the policy environment may also affect the pricing behavior of commercial banks and therefore their performance. In order to capture the effects of the macroeconomic and policy environment, the bank performance equations include inflation, growth of output and money market real interest rates as control variables. For example, Claessen, et al., (2001); Dermirguc-Kunt and Huizinga (1999); Brock and Rojas-Suarez (2000) note that banking industry performance and inflation are negatively associated.

According to the literature on industrial organisation, there are two main explanations for the likely impact of market structure on the conduct and performance of firms: market power and efficiency. The market power explanation has two hypotheses: the structure conduct-performance (SCP) hypothesis and the relative Market Power (RMP) hypothesis.

The traditional structure-conduct-performance hypothesis is based on the proposition that the persistence of economic profits is indicative of allocative distortions, and is due to some features of market structure that foster collusion and retard competition among firms in the industry (Bain, 1951). Since concentration facilitates collusive or monopolistic practices, firms in concentrated markets will earn higher profits than firm operating in less concentrated markets irrespective of their efficiency. This hypothesis suggests that banks in concentrated markets would be able to extract monopolistic rents by their ability to offer low deposit rates and high loan rates. A related theory is the Relative-Market-Power hypothesis (RMP), which states that only firms with large market shares and well-differentiated products are able to exercise market power in pricing these products and earning supernormal profits (Shepherd, 1986).

With reference to various definitions, inefficiency is therefore a multifaceted concept with several meanings depending on the perspective in which it is used (Leibenstein, 1966). Scale and scope economies for example, are achieved from the firms' output expansion resulting in an increase in the industry's output. And that reduces costs of production thus leading to the strong technological external economy. Hirshleifer and Glazer (1993) argue that scope economies occur where it is cheaper to produce varieties in a plant than in separate plants, and this is the concept from which banking consolidation stems.

One way to test for the competition hypotheses of market share and concentration is to take both market share and concentration into account at the same time by estimating a performance equation that includes both market share and concentration as independent variables and to examine the significance of their coefficients (Smirlock, 1985).

Overall, the evidence on the structure-performance relationship in banking is mixed and one area that has remained inconclusive in both methodology of testing the relationship and the results. Whereas Berger (1995) and Goldberg and Rai (1996) make a significant contribution to the methodology of testing the two hypotheses by including measures of efficiency directly into the profit function, the derived efficiency measure may be biased since it does not isolate shifts in the efficiency frontier due to technical change from changes in the average efficiency of banks. Rapid technical progress, which leads to the production of more output with the given level of inputs could for instance result in lower average bank efficiency even if banks became increasingly productive over time.



**2.5.2. Efficient Structure (ES) Hypothesis**

An important contribution to structure-performance studies is the ES hypothesis proposed by Demsetz (1973, 1974) and Peltzman (1977). The ES hypothesis suggests that the structure of the market in which a firm operates is also determined by efficiency. In this alternative paradigm, higher profits are earned by relatively more efficient firms, and since concentration is a by-product of efficiency, these profit gains are viewed as economic rents rather than monopoly rents.

As observed by Mugume, (2008) a high degree of efficiency in the banking system can contribute to greater financial stability, product innovation, and access by households and firms to financial services, which in turn can improve the prospects for economic growth. In addition, efficiency in the banking sector is a precondition for macroeconomic stability and important for effective monetary policy execution. Thus, research on the banking system efficiency has important policy implications.

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The efficiency structure hypothesis states that performance of the firm is positively related to its efficiency. This is because market concentration emerges from competition where firms with low cost structure increase profits by reducing prices and expanding market share. A

positive relationship between firm profits and market structure is attributed to the gains made in market share by more efficient firms. In turn these gains lead to increased market concentration. That is, profits are assumed to accrue to more efficient firms because they are more efficient and not because of collusive activities as the traditional SCP paradigm would suggest.

According to Byeongyong and Weiss (2005), the ES hypothesis states that firms that are more efficient will grow in size and market share because they are able to charge lower prices than competitors while maintaining profitability. Thus, companies that are more efficient are expected to grow in size regardless of the number or mix of lines that they write. Higher profitability will usually lead to higher market concentration. So, concentration levels should increase under ES.

Berger and Hannan (1993) tackled the problem by explicitly incorporating two efficiency indicators, which measure the X-efficiency and scale efficiency of banks, as explanatory variables in the regression equations, together with two market structure indicators, which are proxied by market concentration and market shares of banks. In Berger and Hannan (1993), profit rates and prices are employed as the dependent variables to proxy for banks performance. The X-efficiency variable, which is computed from an estimated efficient cost frontier from the data, aims to measure the closeness of cost of banks to the minimum that could be achieved on the efficient cost frontier which is defined by the best-practice banks in the sample. The scale efficiency variable, which is derived from an estimated cost function of banks from the data, aims to measure the closeness of cost for the banks actual output level to the cost of the banks minimum average cost output.

Four important hypotheses that relate to the performance of the US banking industry were tested in Berger and Hannan (1993). In addition to the SCP, Berger and Hannan (1993) also tested the relative market power (RMP) hypothesis which asserts that banks with larger market shares are able to exercise market power to earn higher profits. Since the SCP and RMP hypotheses assert that higher profits are associated with anti-competitive pricing behaviors in the markets, prices should be positively related to market concentration and market shares of banks. The remaining two hypotheses tested by Berger and Hannan (1993) relate to the EFS hypotheses: Under the X-efficient hypothesis (ESX), banks with superior management of costs for a given output level should attain higher profits. Under the scale

efficient hypothesis (ESS), banks operating at optimal economies of scale should have the lowest average costs, resulting in higher profits. Both ESX and ESS implies that efficiency is positively related to banks profitability. It is also expected that efficient banks can offer favorable prices to bank customers, leading to a negative relationship between efficiency and prices.

Empirically, Berger and Hannan (1993) found that market concentration (that is, the SCP hypothesis) better explains bank profits and prices than efficiency (that is. the ESX and ESS hypotheses) and market share (that is, the RMP hypothesis) do. Goldberg and Rai (1996) later applied the Berger-Hannan approach on 11 European banking industries, but found that cost efficiency was the main determinant of banks' performance in some low market concentration European countries, while scale efficiency and market structure only played a little role.

Based on the approach proposed by Berger and Hannan (1993) and with the aid of a panel dataset of retail banks covering the period 1991-2005, Wong et al., (2007) examines what factors determine the performance of banks, and tests whether market concentration and efficiency are among the main factors contributing to the profitability of banks in Hong Kong. It also evaluates possible policy implications of which effects these and other determinants may have on bank performance.

Wong et al., (2007) employs the approach of Berger and Hannan (1993) to examine how banks' performance is determined, by including direct measures of efficiency in the empirical analysis, along with variables representing market structures and other controlling factors. Two equations are specified as follows:

$$\Pi_{i,t} = \beta_0 + \beta_1 CONC_t + \beta_2 MS_{it} + \beta_3 DUM_t + \beta_4 CIE_t + \beta_5 SIE_t + \beta_6 z_{it} + f(e_{it}) \quad 1$$

And

$$P_{i,t} = \beta_7 + \beta_8 CONC_t + \beta_9 MS_{it} + \beta_{10} DUM_t + \beta_{11} CIE_t + \beta_{12} SIE_t + \beta_{13} z_{it} + f(e_{it}) \quad 2$$

Where $i$ and $t$ index bank and time respectively; $\Pi$ and $P$ are the profitability and pricing ability of banks, which are adopted as the measures of banks' performance; $CONC$ is market concentration and $MS$ is banks' market shares, which represent market structure of the

banking sector; *DUM* is the dummy variable which is introduced to quantify the impact of regulatory liberalization; *CIE* and *SIE* denote cost inefficiency (that is, X-inefficiency) and scale inefficiency of banks respectively. Is a vector of control variables and $f(e_{it})$ consists of autoregressive terms of a white noise process to capture autocorrelation in residuals.

Profitability of banks ($\Pi$) is measured by the return on assets (ROA), which is defined as the ratio of post-tax profits (or losses) to total net assets. The pricing ability *P* is proxied by the interest rate spread (IRS) of banks, which is defined as the average price of interest bearing assets minus the average cost of interest bearing liabilities. The former is adjusted to exclude the portion of interest incomes and assets contributed by inter-bank placements, so as to reflect more closely the price of loans to non-bank customers.

CONC is proxied by the Herfindahl-Hirschman index (HHI), which is defined as the sum of the squared market shares of assets of individual banks, ranging from zero to one, while a single monopolist bank with a 100 percent shares produces an HHI of one. Regarding the sign of the estimated coefficient of CONC and MS, the SCP hypothesis suggests a positive sign for CONC, while the RMP hypothesis predicts a positive sign.

The variable CIE, which is derived from a stochastic cost frontier, represents the cost inefficiency of banks. Cost inefficiency is an estimate of the percentage by which total production cost could have been reduced if the bank had operated on the stochastic cost frontier holding the output levels and input prices constant. What cost efficiency refers to is the situation in which the bank can reduce the production cost and still obtains the same quantities of outputs given the input prices, but it has failed to do so. The estimate of CIE in this paper is equivalent to the variable IE (i.e. inefficiency estimate) in Wong et al., 2006a). Under the ESX hypothesis, the sign of the estimate coefficient for CIE is negative when ROA is the dependent variable, and is positive when IRS is the dependent variable.

Use of efficiency measures as a proxy for performance to test the market structure-conduct-performance (SCP) hypothesis is explored. Edwards et al., (2006) utilizing the Battese and Coelli specification to estimate stochastic frontier production function and SCP equations with output and efficiency measures as endogenous variables.

#### 2.5.2.1 X-efficient Hypothesis

Efficiency in banking has been defined and studied in different dimensions including: (i) scale efficiency, which refers to relationship between the level of output and the average cost; (ii) scope efficiency, which refers to relationship between average cost and production of diversified output varieties; and (iii) operational efficiency, a wide concept sometimes referred to as x-efficiency, which measures deviation from the cost efficient frontier that represents the maximum attainable output for the given level of inputs.

The $X-efficiency$ version of the Efficient-Structure hypothesis posited by Demsetz (1973), and Peltzman, (1977), asserts that efficient firms increase in size and market share because of their superiority in producing and marketing products. Here, the positive profit-structure relationship is spurious, rather than of direct origin, with efficiency driving both profits and market structure. It is due to such expansion that the degree of concentration of a market increases, while at the same time the firms increase their profits.

Theoretical work in the area of productive efficiency has yielded the concept of X-efficiency (Kwan and Eisenbeis, 1996; Berger and DeYoung, 1997; Kraft and Tirgiroglu, 1998; Byeonweng and Weiss, 2005). In the context of a production function, X-efficiency is defined as any deviation from the fully efficient amount of output as represented by the efficient production frontier. The empirical estimation of X-efficiency has resulted in an extensive literature addressing both the econometric theory of efficiency estimation and the empirical application of the concepts in different situations. Of the approaches used to estimate frontiers and the inefficiency component, the two most popular are stochastic frontier analysis (SFA) and data envelopment analysis (DEA). SFA is a regression approach that typically includes a normally distributed error and an inefficiency component assumed to follow a one-sided distribution (for example. exponential, gamma). DEA uses a nonparametric linear programming approach to estimate the frontier and the inefficiency component. Both methods have their strengths and weaknesses. SFA is stochastic, but requires the choice of a functional form and an *adhoc* assumption about the distribution of the inefficiency component. DEA does not require distributional assumptions or a specific functional form, but it is non-stochastic.

The efficient structure hypothesis suggests that banks that are able to operate more efficiently than their competitors, incur lower costs and achieve higher profits and increased market shares that may result in increased competition. (Yu, et al., 2007). Therefore, according to this hypothesis, efficiency is the factor that positively influences both market shares and bank profits. This hypothesis is usually referred to as the X-efficiency hypothesis in order to distinguish it from the scale–efficiency hypothesis. The scale –efficiency hypothesis assumes that banks are equally X-efficient, but some banks simply operate at a greater efficient scale than others and therefore, these banks are assumed to enjoy higher profits and increased market share.

According to Byeonweng and Weiss (2005), the X-efficiency is the driving force for profit and price after controlling for the effect of other variables. It is hypothesized that superior firms set lower prices than other firms because they operate with lower costs. Also efficient firms (those with high cost X-efficiency) would be able to earn higher returns than competitors. Revenue X-efficiency is derived from such activities as cross- selling and may rely heavily on the use of detailed information from customer databases to identify potential customers. The concept of revenue X-efficiencies are incorporated in the "financial supermarket" concept and development of a "brand name" to attract customers. Revenue X-efficiencies may raise privacy issues, to the extent they are related to the sharing of financial and other information about potential customers. Thus, the impact of revenue X-efficiency on prices and profits may be an important component of market structure and conduct.

Numerous prior studies adopt frontier approaches to measure bank X-efficiency. Two popular techniques are the nonparametric linear programming approach, often referred to as data envelopment analysis (DEA), and the parametric econometric approaches, specifically, the stochastic frontier approach (SFA). On SFA approach, Kraft and Tirgiroglu (1998) build that during 1994 and 1995 in Croatia, new banks were more X-inefficient and scale-inefficient than old banks and profitability was negatively correlated to X-efficiency. Berger and DeYoung (1997) analyze the relationship between loan quality and cost efficiency in commercial banks and found that cost efficiency was a good indicator of future problem loans or problem banks. By controlling for scale, Kwan and Eisenbeis (1996) find that small banking firms in U.S. were, on average, less X-efficient, and the degrees of X-inefficiency varied a lot among small banks than large banks. In addition, banks with more capital are

more efficient than those with less capital; less efficient banks are higher risk-taking than more efficient banks.

#### 2.5.2.2 Scale Efficient Hypothesis

Under the Scale –Efficiency version of the Efficient –Structure Hypothesis, all banks have equally good management and technology (the same X-efficiency), but some banks simply produce at more efficient scales than others (Dietrich and Mattig, 2010). Under the Scale efficiency version of the Efficient Structure Hypothesis, the more efficient banks gain market share exactly through their increased efficiency, eventually also resulting in high concentration, but without the collusive effect of SCP.

Scale efficiency is the key exogenous variable under the ESS hypothesis and as Byeonweng and Weiss (2005) hypothesize, firms may have lower unit costs and higher unit profits simply because they operate at optimal scale. Thus, firms with similar technology and comparably skilled management may operate at different levels of scale efficiency. Exploiting cost scale economies is often given as a reason for consolidation in the financial services industry. For example, recent improvements in information technology (IT) are expensive, and a larger base over which to spread these expenses is desirable.

Under the *Scale − Efficiency* version of the efficient-structure hypothesis, firms have essentially equally good management and technology, but some firms simply produce at more efficient scales than others, and therefore have lower unit costs and higher unit profits. These firms are assumed to have large market shares that may result in high levels o concentration, again yielding a positive profit-structure relationship as a spurious outcome (Lambson, 1987). The two market-power (*MP*) hypotheses have radically contrasting implications from the to efficient-structure (*ES*) hypotheses.

Wong et al., (2007) obtained scale efficiencies using the major translog cost function where for each bank's output mix and input prices, a U-shaped multi-product average cost curve was traced out and the scale-efficient output vector Y and the U-curve determined. The study distinguished between scale economy efficiency for banks that are below efficient scale, and scale diseconomy efficiency for banks that are above efficient scale.

A different approach is adopted by Yu et al., (2007) who include the scale economy efficiency (S-EFFe) variable and the scale diseconomies efficiency (S-EFFd) variable to replace the scale efficiency (S-EFF) variable, because they may have different implications under the scale version of the efficient-structure hypothesis. Advocates of the scale-efficiency version of the efficient-structure hypothesis argue that banks in the scale economy region grow larger and more profitable and at the same time increase their market share and their market's concentration rate rises, creating the spurious positive profit-structure relationship.

### 2.5.3 Relative Market Power Hypothesis

According to Dietrich and Mattig (2010), the Relative- Market –Power (RMP) Hypothesis suggests that only banks with large market shares and well-differentiated products can exercise market power in pricing these products and can earn supernormal profits.

The potential role of market share on profit and prices is analyzed by Rhoades (1985). Under the relative market power (RMP) hypothesis, consumers differentiate the products of large firms from smaller firms. The product differentiation does not have to be real; it must merely be perceived. Inherent product differentiation exists when customers follow a "herd" instinct and purchase products from the market leader to be "just like everyone else"; or customers may rely on the market leader's position as an indicator of quality and save search costs. Advertising efforts in which a firm touts its position as a market leader is consistent with the RMP hypothesis. In banking, Berger (1995) identifies RMP with factors such as better location (of bank branches) and higher service quality.

If concentration and efficiency are controlled for, the RMP hypothesis suggests that market share should reflect market power (Rhoades, 1985; Shepherd, 1986; Berger and Hannan, 1993; Berger, 1995). Thus, under RMP, market share is the key variable and positive coefficients for market share support this hypothesis. The positive performance-market share relationship arises, it is hypothesized, because firms are able to increase prices as their market power (measured by market share) increases. Increased prices should be reflected in higher profits, so positive signs on the market share variables are expected under the RMP hypothesis. In addition, as noted by Byeonweng and Weiss (2005), if only RMP holds, the coefficient for concentration should be insignificant, and the efficiency variables should be relatively unimportant.

## 2.6 Financial depth in the EAC Countries

Banking depth is generally measured by reference either to the deposit resources mobilized by the system or by credit extended. Although these two measures of depth are closely correlated, there are differences, both in terms of their impact and in terms of measurement. The deposit side is central to analysis of monetary policy, inasmuch as it measures an important component of liquid spending power in the economy, and fluctuations in money and bank deposits may help predict inflation. But it is the level of bank credit to the private sector that is most closely correlated with medium-term growth, and poverty reduction (Beck, Levine and Loayza, 2000; Beck, Demirgüç-Kunt and Levine, 2004; Honohan, 2004). This is essentially because it captures the degree to which banks are channeling society's savings to productive uses.

Conceptually, financial depth as reported by Goyal (2011) is often understood to mean that: (i) sectors and agents are able to use a range of financial markets for savings and investment decisions, including at long maturities (access); (ii) financial intermediaries and markets are able to deploy larger volumes of capital and handle larger turnover, without necessitating large corresponding movements in asset prices (market liquidity); and (iii) the financial sector can create a broad menu of assets for risk-sharing purposes (hedging or diversification). In other words, deep markets allow savers to invest in a broad range of quality investment and risk- sharing instruments and allow borrowers to likewise tap a broad range of financing and risk management instruments (King and Levine, 1993; Rajan and Zingales, 1998; Chami, Fullenkamp and Sharma, 2009; Goswami and Sharma, 2011).

Financial depth is defined by Caballero and Krishnamurthy (2004) to mean the supply of funds available to the government and private sector of an emerging market.

Financial deepening as observed by Mugume (2008) has shown a positive trend and in part, this has been achieved through effective supervision and enforcement of prudential regulations in the banking system, increased frequency of on-site inspections and surveillance. In addition, improvements in supervision framework and the prudential management of monetary and exchange rate policy by the Bank of Uganda have contributed to strengthening the financial sector. This indeed has contributed to minimizing the non-performing assets (NPA) as well as enhancing the profitability of the sector. NPA fell from 29 percent of the portfolio in 1999 to 12 percent in 2000 and further to 3 percent in 2007. The

cleanup of the portfolio of the erstwhile Uganda Commercial Bank and its subsequent resolution, and closure of trouble banks are key factors in explaining this improvement.

Recent discussions at the IMF and the Group of Twenty (G-20) on strengthening the international monetary system have emphasized, among other efforts, increasing the financial depth of emerging markets (Goyal et al., 2011). Such deepening is widely believed to confer important stability benefits, helping countries limit swings in asset prices, find alternative sources of funding, and attenuate the need for reserve accumulation.

Nwezeaku and Okpara (2009) concur that financial market plays a vital role in the process of economic growth and development by facilitating savings and channeling funds from savers to investors. Financial intermediation of growth allows for financial deepening.

Although financial deepening as observed by Goyal et al., (2011) can contribute to lowering imbalances and crisis incidence and costs, it is a long-term process. Therefore, it remains crucial to make progress in the near term to strengthen the international monetary system, including building a strong global financial safety net and developing a framework for coping with capital flows.

Deepening is widely believed to confer important stability benefits to an economy, albeit with caveats. For instance, by increasing transaction volumes, it can enhance the capacity to intermediate capital flows without large swings in asset prices and exchange rates. But it can also attract volatile capital inflows, complicating macroeconomic management (IMF, 2011a). It can lower the reliance on foreign savings and attenuate balance sheet mismatches by increasing the scope to raise funds in domestic currencies and at longer maturities.

According to Maziad et al., (2011), deeper markets can provide alternative sources of funding during times of international stress, limiting adverse spillovers, as evidenced in the global crisis. At the same time though, deepening can occur too quickly, leading to credit booms and subsequent busts. It has also been argued that deepening can increase the capacity of EMs to generate their own ―safe or reserve assets, rather than to rely predominantly on U.S. treasuries (Gourinchas and Rey, 2005; Caballero, Farhi, and Gourinchas, 2008). At the systemic level, all these factors, if properly managed, can attenuate the need to accumulate

foreign assets, thus promoting global adjustment. In time, they could facilitate currency internationalization and a shift to a more multipolar IMS.

Therefore a deep financial sector as noted by Goyal et al., (2011) is one that facilitates the orderly and balanced growth of its balance sheet (that is, with expansion or contraction that is not too rapid, excessive, or un-sustained) and allows for smooth adjustment to shocks. Such capacity depends on a number of factors, including the structure of balance sheets; the ability of various sectors to issue claims in a cost-effective manner; the ability of the government to employ countercyclical macroeconomic and financial policies and serve as a lender of last resort; and prudent financial regulation and supervision.

Kiyotaki and Moore (2005) develop a model of financial deepening, based on the distinction between limited bilateral commitment and limited multilateral commitment. The study explores the effects of secular changes in financial depth on investment and output; on intermediation and interest rates; on the long-run velocities of circulation of different monetary instruments, and the use of outside money; on the patterns of saving and trade in paper.

Nwezeaku and Okpara (2009) investigate the effects of financial deepening on the stock market returns and volatility in Nigeria using the Generalized Autoregressive Conditional Hetroscedasticity (GARCH) model. Two different measures of financial deepening namely the ratio of money supply to Gross Domestic Product (FD1) and the ratio of Domestic Credits to GDP (FD2) were used, leading to the building of two GARCH models.

There are a number of ways to measure financial depth or integration. Goyal et al., (2011) add up the total financial claims within an economy as a share of GDP gives a sense of the domestic financial depth. Adding up external assets and liabilities as a share of GDP, on the other hand, gives a sense of international financial integration. The IBRD (2006) support the measure of private credit to GDP as this gives a closer measure of the growth potential of financial intermediation.

There are several measures/indicators of financial deepening, as noted by Nwezeaku and Okpara (2009). These include the ratio of money supply-to-GDP; ratio of domestic credit to

GDP, ratio of non-bank savings to gross national savings, the size of non-bank institutions to the financial system, the degree of monetization, the size of currency outside the bank.

**2.7 Financial structure theory**

The financial sector of a country often proxies the level of development of the economy as a whole. The idea of the importance of the financial system goes as far back as Gurley and Shaw (1960), whose main proposition was the importance of financial structure to economic development and growth. Shaw (1973) stressed that financial repression could restrain economic development, a concept also explored independently by McKinnon (1973). Therefore, there is now a widespread consensus that authorities need to ensure a sound financial system in order to promote a vibrant economy. Moreover, a healthy financial system would also be fundamental in reducing the vulnerabilities—for instance in terms of currency and maturity mismatches—that have lead to some of the worst financial crises in emerging market economies.



Empirical studies that assess how different financial structures may affect the performance of banks in an international context are scarce. The first study that analysed the relationship between financial structure and banking performance was Demirguc-Kunt and Huizinga (2001). Among their findings, they show that in emerging economies, financial systems tend to be bank-based and relatively underdeveloped. However they do not find any conclusive evidence to support the hypothesis that financial structure has a significant, independent influence on bank margins and profits.

Chan, Suh and Santaella (2009) have focused on issues related to the development of financial markets in developing economies. The study analysed three components: the demand for funds, the supply of funds and the market infrastructure. The three components have an important role to play. On the demand for funds, the development path is usually led by the government, as the main issuer of debt. After meeting fiscal sustainability conditions, the government must have a transparent and predictable debt-management policy. The next building block would be to complement the government demand for funds with the needs arising from the private sector. Indeed, experiences across a range of countries, suggest that the latter is typically only possible after the government has set the path as the primary issuer of debt. On the supply side of funds, households are usually the main source of funding.

Countries differ widely in their relative reliance on bank versus market finance. Germany and Japan, for instance, are regarded as bank-based, as in these countries the volume of bank lending relative to the stock market is rather large. At the same time, the United States and the United Kingdom are considered to be more market-based. Demirguc-Kunt and Levine (1999) have constructed indices of the organization of the financial system, or financial structure, for a large set of developing and developed countries. They measure the relative importance of bank versus market finance by the relative size of stock aggregates, by relative trading or transaction volumes, and by indicators of relative efficiency. Developing countries are shown to have less developed banks and stock markets in general. The financial sector - banks, other financial intermediaries and stock markets -becomes larger, more active and more efficient, as countries become richer. Further, in developing countries financial systems tend to be more bank-based.



The variety of financial systems around the world poses economists with several interesting questions. A substantial body of literature has already shown that both banking sector development and stock market development may lead to higher growth at the firm, industry and country level. However, as discussed in Stulz (1999), financial structure - the relative importance of banks versus markets - may also have important implications for firm performance and long-run economic growth. Demirguc-Kunt and Maksimovic (2000) and Levine (2000) analyze the impact of financial structure on firm performance and economic growth, respectively.

Demirgiu-Kunt and Huizinga (2001) analyse the performance of the banking sector across different financial systems. The purpose of their study was twofold. First, they investigated the impact of financial development on bank profits and margins. Second, after controlling for the level of financial development, they examined if financial structure has an independent impact on bank performance. If banks operating in different financial structures show differences in performance (especially bank margins), this could have important implications for economic growth. After all, if financial structure differences do not translate into differences in the cost of bank financing for firms, it becomes much less clear that they are important. The size variables applied in the study include: Bank/gdp, Central bank/gdp and Mcap/gdp. Bank/gdp is the ratio of the total domestic assets of deposit money banks divided by GDP, providing a measure of the overall size of the banking sector), Central bank/gdp is defined as the total assets of the central bank divided by GDP. Central bank/gdp

refers to the size of central bank assets tends to be far more modest for developed countries. As a final index of financial size, Mcap/gdp is the stock market capitalization divided by GDP. Again, there is a general tendency for richer countries to have larger stock markets.

The hypothesis that financial structure matters to explain banking fragility has also been explicitly stated by Demirguc-Kunt and Detragiache (1998). Such hypothesis has support in the study by Ruiz-Porras (2006). Demirguc-Kunt and Detragiache (1998) find that financial development is associated with market-based financial systems and that such association is magnified during episodes of banking crises. Thus, they conclude that financial structure, development and banking crises are interrelated.

The distinction between bank-based and market-based financial systems, and their relative importance to economic growth, has been the focus of the theoretical debate for over a century (Gerschenkron, 1962; Stiglitz, 1985; Allen and Gale, 1999; Levine, 2002).

From empirical literature, attempts are made to examine whether one type of financial system better explains economic growth than another (Arestis and Luintel, 2004). The focus on empirical studies on financial structure has concentrated on developed economies of the world especially the United States of America and United Kingdom, often described as market-based and Germany and Japan, variously described as bank-based economies.

These studies (Hoshi et al., 1991; Mork and Nakkamura, 1999; Weinstein and Yafeh, 1998; Arestis et al., 2001) tend to conclude that financial structure matters. This conclusion is often criticized on the grounds that these countries historically share the same growth rates and may not provide a suitable basis to investigate the relative importance of one financial system over another in the growth process. Moreover, the results based on above-named developed countries can only be used as speculation when it comes to economic policy for developing countries. They are not likely to provide a convincing reference point for developing countries given the differences in their development and structure of their economies. Thus, the relationship between financial structure and economic growth remains unaddressed in the case of developing countries.

However, the comprehensive financial sector reforms of the mid 1980s brought about fundamental changes as the capital market, along with the banking sector, is growing very

fast and now positioned to play its traditional roles of providing resources for long-term investment and growth of the economy. The pertinent question is: does it matter for growth whether the financial system is bank or capital market based? Olofin and Afangideh, (2006) investigate the role of financial structure in economic development in Nigeria using aggregate annual data from 1970 to 2005. Their study developed a small macro-econometric model to capture the interrelationships among aggregate bank credit activities, investment behavior and economic growth given the financial structure of the economy.

Panel and cross-section studies (Demirguc-Kunt and Levine, 1996; Levine, 2002 and 2003; Beck and Levine, 2002), find that financial structure is irrelevant to economic growth: neither the bank-based nor the market-based financial system can explain economic growth. Rather, they opine that it is the overall provision of financial services (banks and financial markets taken together) that are important. As suggested by Levine (2001), it may be better to think not in terms of banks versus stock markets but in terms of banks and stock markets.

This contradicts the finding of Olofin and Afangideh (2006) who studied Nigeria which is a developing country A major outcome of this study is that financial structure has no independent effect on output growth through bank credit and investment activities, but financial sector development merely allows these activities to positively respond to growth in output.

Following Arestis and Luintel (2004), the relationship between financial structure and economic development can be discussed based on competing theories of financial structure. These competing theories are the bank-based, the market-based and the financial services. Financial economists have debated the comparative importance of bank-based and market-based financial systems for over a century (Goldsmith, 1969; Boot and Thakor, 1997; Allen and Gale, 2000; Demirguc-Kunt and Levine, 2001c). Financial intermediaries can improve the (i) acquisition of information on firms, (ii) intensity with which creditors exert corporate control, (iii) provision of risk-reducing arrangements, (iv) pooling of capital, and (v) ease of making transactions (Levine, 2002). These arguments are for well-developed banks but not reasons for favoring a bank-based financial system.

According to Ruiz-Porras (2009), financial structure depends on the degree to which a financial system is based on intermediaries or markets the specific features of the financial

system in a country. The structural assortment is integrated by the Structure-Activity, Structure-Size and Structure- Efficiency indicators. Market-based financial systems are associated to large values of the indicators, and bank-based ones to small values. The development assortment is integrated by the Finance-Activity, Finance-Size and Finance-Efficiency indicators. Financial development is associated to large values of the indicators and underdevelopment to small ones.

The theory of bank-based financial system as pointed out by Gerschenkron (1962) stresses the positive role of banks in development and growth, and, also, emphasizes the drawbacks of market-based financial systems. The theory opines that banks can finance development more effectively than markets in developing economies, and, in the case of state-owned banks, market failures can be overcome and allocation of savings can be undertaken strategically.

Girardone et al., (2009) test the financial structure hypothesis that posits that after controlling for the level of financial development, financial structure does not affect bank efficiency. In order to account for the fact that the inclusion of Greece and Spain in the market-based group may be just a temporary effect, we also calculate the cost efficiency estimates without the inclusion of these two countries in both the bank and market-based groups.

Furthermore, results from Girardone et al., (2009) are mixed concerning the financial structure hypothesis that in developed financial systems bank efficiency should not be statistically different across bank- versus market-based economies. Specifically, we find that while the hypothesis seems to hold for the sub-sample of commercial banks, in bank-based countries savings banks have significant cost efficiency advantages over those operating in market-based ones and over commercial banks.

The effects of financial structure and financial development on banking fragility are also examined by Ruiz-Porras (2009) who clarify how financial structure and financial development determinants may relate to banking fragility by suggesting answers to the following questions: Does financial structure matter to assess banking performance? What are the effects, if any, of financial structure and development on banking crises? Can we analyze these two determinants independently one of another? Which type of implications may be derived from these findings?

The study by Ruiz-Porras (2009) is unique in two aspects namely internationally comparable data from the most extensive sets publicly available for 211 economies during the period 1990-2003. Secondly that panel-data techniques is used which allow control of the effects of time-constant unobserved heterogeneity among countries.

Ruiz-Porras (2009) then summarizes the information content of these assortments by using two aggregate indicators of financial structure and development. The approach of Levine (2002) is applied to define them. Such indicators are built with principal-component methods. Specifically they are the Structure-Aggregate and the Finance-Aggregate ones.

The study by Ruiz-Porras (2009) leads us to some interesting implications: The first one is that the hypothesis that financial structure does not have independent effects on banking performances deserves to be re-examined.

Demirguc-Kunt and Huizinga, (2001), conclude that financial structure appears to have no effects on bank margins, neither on bank profitability after controlling for both bank and market development. The idea about the irrelevance of financial structure has support in studies that have focused on the determinants of economic growth and investment. (See Levine, 2002 and Ndikumana, 2005, respectively). Among these studies, the panel-data study of Loayza and Ranciere (2006), views financial fragility and economic growth, as the short and long-term consequences of financial development.



**2.8 Conceptual Framework**

This study will adopt a two-stage performance evaluation model to develop a single measure which will be a product of efficiency and effectiveness. In stage 1, the efficiency scores for individual banks will be computed. As noted by Kumar and Gulati (2010), there is no consensus on what constitutes the inputs and outputs of bank. Data Envelopment Analysis (DEA) will be applied to compute the efficiency scores and effectiveness score for individual banks.

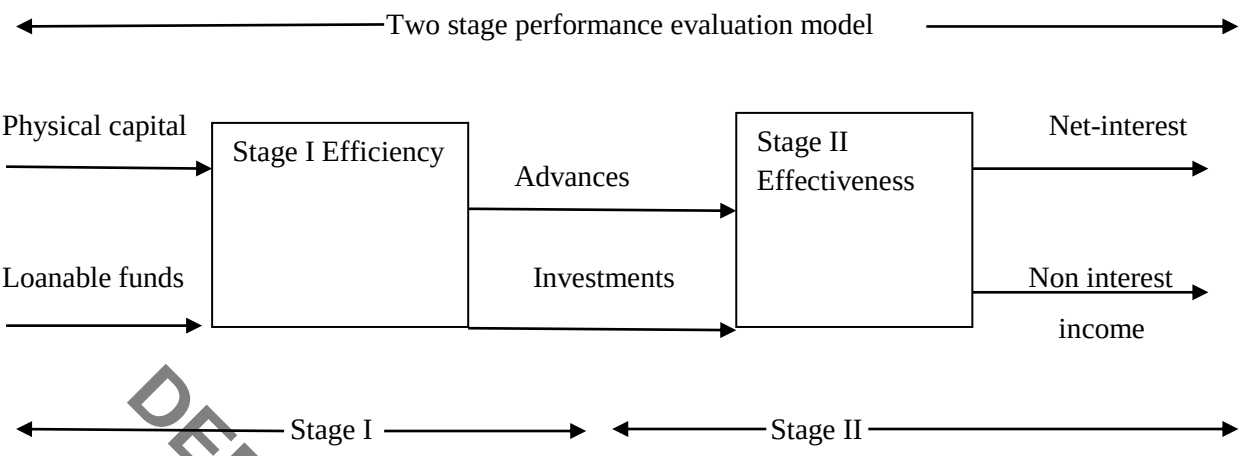


Figure 1.2 Performance evaluation model

Source: Kumar and Gulati (2010)



The selected output variables are advances and investments while input variables are physical capital (measured by the value of fixed assets); and loanable funds (measured as the sum of deposits and borrowings).

The study has applied the revised CCR model proposed by Cooper et al. (2000) to evaluate the performance of the commercial banks in the EAC. The model is demonstrated below.

$\Phi_0^t Y_{i0} = -S_i^+ + \sum_{j=1}^{n} Y_{rj}\lambda_j$ $\Phi_0^t Y_{i0} = -S_i^+ + \sum_{j=1}^{n} Y_{rj}\lambda_j$ $\Phi_0^t Y_{i0} = -S_i^+ + \sum_{j=1}^{n} Y_{rj}\lambda_j$ output $Y_{rj}$ we find the CCR model from the following equation if the scale of return is constant:

$$\max \Phi_0^t + \varepsilon\left(\sum_{i=1}^{m} S_i^- + \sum_{r=1}^{s} S_r^+\right) t = 1,2$$

$$\text{s.t } X_{i0} = S_i^- + \sum_{j=1}^{n} X_{ij}\lambda_j$$

$$\Phi_0^t Y_{i0} = -S_i^+ + \sum_{j=1}^{n} Y_{rj}\lambda_j$$

$\lambda_j, S_r^+, S_r^- \square 0$ for all $j, r, i$

where:

$r = 1 \ldots s$;

$i = 1 \ldots m$;

$j = 1 \ldots n$;

$t = 1$ is stage 1;

$t = 2$ is stage 2;

$X_{ij}$ = the ith input of the jth DMU;

$Y_{rj}$ = the rth output of the jth DMU;

$S$ = the difference input variable;

$S^{+}$ = the difference output variable;

$\lambda_j$ = the $j$ th DMU weight value; and

$t$ = the Archimedes value, usually set as $10E^{-4}$ or $10E^{-6}$

In Stage 1, we have n = 100 DMUs (banks); $i = 2$ inputs: fixed assets and deposits; and $r = 2$ outputs: advances and investments.

In Stage 2, we have n= 100 (banks); $i = 2$ inputs: advances and investments; and $r = 2$ outputs: net income interest and non-interest income.

Let:

$$\Phi_0^1 * \text{ and } \Phi_0^2 *$$

be the optimal values for stage 1 and stage 2 models respectively. If:

$$\Phi_0^1 * = 1$$

and all input/output slacks are zero, then the bank is said to be CCR-efficient in efficiency. If:

$$\Phi_0^2 * = 1$$

and all input/output slacks are zero, then the bank is said to be CCR-efficient in effectiveness.

The efficiency scores computed in stage 1 will capture the ability of banks to generate advances and investments using the inputs of physical capital and loanable funds. In stage 2, the effectiveness scores will be derived using the outputs from stage 1 (advances and investments) as inputs and net interest income and non-interest income as outputs. Net interest income will be obtained by taking the difference between interest earned from loans and interest paid on deposits. Non-interest income will comprise of off-balance sheet items and will include commissions, exchange and brokerage fees and dividend income.



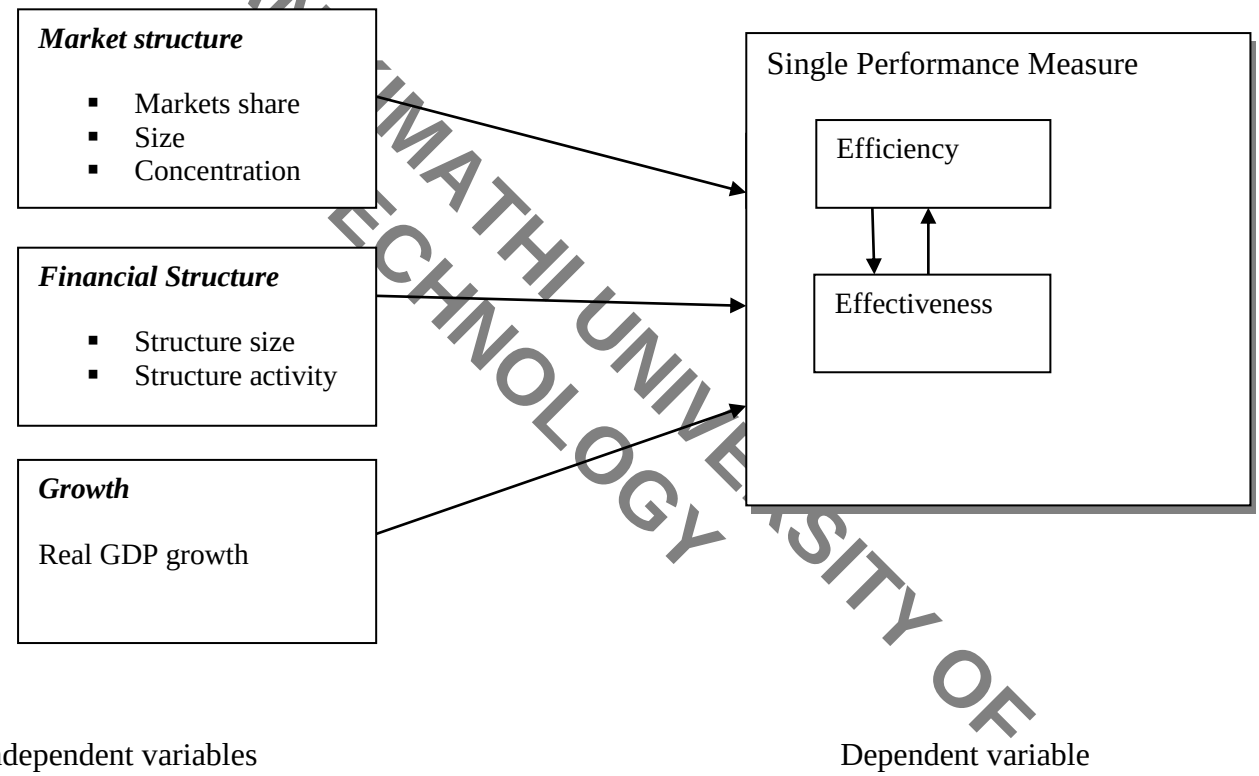


Figure 1.3 Conceptual framework
Source: Author (2013)

Based on the performance scores derived the study will then test the effect of market structure, financial structure and growth as independent variables separately and then combined using regression analysis.

$$PERF_{i,t} = X_{i,t}\gamma + \varepsilon_{i,t}$$

$PERF_{i,t}$ in the study will be the derived bank performance measure for bank $i$ at time $t$. $X_{i,t}$ is a matrix of bank specific and industry specific characteristics and $\varepsilon_{i,t}$ is the error term with the usual properties. Market structure comprises market share (MS), market concentration (MC) and bank size.

$$PERF_t = \beta_0 + \beta_1 w_1 + \beta_2 w_2 + \varepsilon_t$$

Where $w_1 = \ln(\frac{STVALTRADED}{PCRDBGDP})$, $w_2 = \ln(\frac{STMKTCAP}{PCRDBGDP})$

STMKTCAP refers to stock market capitalization to GDP and while STVALTRADED refers to stock market total value traded to GDP and. PCRDBGDP refers to Private credit by deposit money banks to GDP. $w_1$ measures the activity of stock markets relative to that of banks while $w_2$ measures size of stock markets relative to that of banks

The study will then specify a combined empirical model to study the relationship between performance, market structure, financial structure and growth.

$$PERF = \alpha_0 + \alpha_1 x_1 + \alpha_2 x_2 + \alpha_3 x_3 + u_{it}$$

where the performance $PERF$ of bank $i$ at time $t$ is written as a function of market structure, $x_1$, finance deepening $x_2$ and financial structure $x_3$, and the error term u.

The above model is estimated on a panel of 125 banks licensed in the EAC region covering the banking sector reform process in these countries, namely the 1997-2011 periods.

**2.9 Conclusion**

This chapter has provided a brief review of empirical literature on bank performance measures, market structure, financial structure and growth studies with specific reference to the banking sector in the EAC region.

# CHAPTER THREE: RESEARCH METHODOLOGY

## 3.1 Introduction

The purpose of this chapter is to present the methodology that was used in this study. The chapter addresses the description of the research variables, selection of an appropriate procedure for the research and sources of data. The research applied regression analyses and analysis of variance (ANOVA).

The setting of this study is the East African Community (EAC) commercial banking market. The choice of the sector was due to the integration policies being adopted by the member countries whose ultimate goal as stated in the EAC Treaty is a monetary union.

The data set utilized in this research consists of secondary data. Secondary data was obtained from the bank's annual reports, central banks of member countries and the banking surveys. Secondary data comprise data from all 127 commercial banks operating in the EAC region and covered the period 1997-2011.



## 3.2 Research Design

The research design adopted by the researcher was confirmatory research design as the study was testing specified theoretical frameworks. The empirical work in this study was split into two steps. First, the researcher computed the efficiency scores and effectiveness scores for individual commercial banks using data envelopment analysis (DEA) to develop a single measure. DEA introduced by Charnes et al., (1978) based on Farrell's (1957) pioneering work, is a linear programming based non parametric frontier approach for measuring the relative efficiency of a set of similar units, usually referred to as decision making units (DMUs).

DEA models have two orientations as highlighted by Sreekumar and Mahapatra (2011) namely input orientation and output orientation. Input orientation means by how much inputs can be reduced while maintaining the same level of output while output orientation analyses how much output can be increased while keeping the level of inputs constant. The latter has

been applied as it is more relevant for banks whose objective is to maximize the output maintaining the same levels of inputs. The overall performance measure was derived as the product of efficiency and effectiveness measures which provided a complete picture of the true performance of an organization.

Subsequently, analysis of the relationship between real Gross domestic product (GDP) rate, market structure, financial depth, financial structure and the bank performance measure was done using linear regression techniques and running several regressions for all the countries. In order to test the SCP and EFS hypotheses, market share, bank concentration and bank size were used as our markets structure variable.

The variables for this study on determinants of bank performance were performance measures as the endogenous variable and growth rate, market structure and financial structure which are the exogenous variables.



### 3.3 Target Population

The target population is all the number of commercial banks licensed at the start of every calendar year beginning 1st January 1997 to 1st January 2011 in the five countries namely; Uganda, Kenya, Tanzania, Rwanda and Burundi.

### 3.4 Sampling Procedure

For a commercial bank to be included it had to meet two criteria namely: First they had to be licensed commercial banks. Second they should have annual accounting statements (balance sheet and income statement) for at least three years between 1997 and 2011. The three year period is to enable comparison of the bank's performance and is lengthy enough to minimize any effects of short term economic fluctuations.

The panel data was unbalanced as some of the banks had missing data in some of the years due to the differing time periods in which bank reforms were undertaken. However, to ensure balanced data sets were also tested, the commercial banks from each country were analysed for the six year period (2006-2011) and regression models tested.

### 3.5 Methods of Data Collection

To facilitate the analysis of the relationships between bank performance, growth rate, market structure, financial depth and financial structure, data was collected from commercial banks that operated in the EAC countries during the period 1997- 2011.

The choice of the data series to begin in 1997 was influenced by banking sector reforms in the EAC countries. In Kenya, amendments were done to the Banking Act in 1996 which introduced a requirement for all licensed banks to prepare and submit audited financial statements to the Central Bank of Kenya as well as publish the same in newspapers of nationwide circulation. Similarly, in Uganda and Tanzania amendments were done to the Financial Institutions Act (FIA) 2004 and the Banking and Financial Institutions Act (BFIA) 2006.

The financial statement data collected from the banks was used to analyse the explanatory variables identified in the conceptual framework. This included variables found to be useful in prior studies and additional variables not used in prior studies.

Secondary data was obtained from audited annual reports of individual commercial banks, Banking Sector Annual Reviews, various publications by the central banks of member countries and publication by individual banks. The central bank reports contain aggregate data. In order to enable comparisons between the countries, the financial data was converted to US dollars and the rate applied will be the closing rate at the end of each calendar year (31st December).

The study used accounting data from the year-end balance sheets and income statements of individual banks as well as a number of country and market specific data drawn from the years 1997-2011.

However, two countries were excluded namely Rwanda and Burundi due to the unavailability of data for at least three years on their stock exchanges. Burundi does not have a functional stock exchange while Rwanda has a demutualised stock exchange that begun full operation in 2010.

Therefore, data was compiled for the 100 commercial banks in Kenya (43), Uganda (25) and Tanzania (32) to test the unbalanced data and 63 commercial banks (Kenya 37, Tanzania 21 and Uganda 5) to test the balanced data set.

### 3.6 Validity and Reliability

Objectivity and verifiability was ascertained as the secondary data was obtained from audited published data. By studying the various performance measures and determinants, the subsequent empirical analysis demonstrates how researchers may gain insight into the impacts of market structure, financial structure and growth on bank performance.



### 3.7 Operational definition of Variables

This section presented the independent and dependent variables that were used in the current research. In this study, independent variables comprised Real GDP rate, market structure, financial depth and financial structure.

The performance measures used in the study as dependent variables included the return on assets (ROA), the return on equity (ROE), profit before tax (PBT), the net interest margin (NIM) and the single measure (SM).

In deriving the single measure, this study adopted the method applied by Berger and Humphrey (1997) and used the intermediary approach which lays emphasis on the financial intermediation function of banks. The intermediary approach views banks as financial intermediaries where deposits are treated as an input because a bank's main business is to borrow funds from deposits and lend to others. In accordance with this approach, two outputs which were identified as the main activities are interest income and non-interest income. The input factors are identified as deposits and capital which corresponds to the intermediation function.

### 3.8 Dupont Model

DEA can be applied to any firm by converting its financial statement items to a DEA interpretation of their income efficiency equivalents. One such approach is to disaggregate ROE using the DuPont identity (Feroz et al., 2001)

ROE can be decomposed as follows:

$$return\ on\ Equity = \frac{NetIncome}{net\ sales} x \frac{net\ sales}{Assets} x \frac{Assets}{Equity} \quad \text{……..……(3.1)}$$

Where profit margin= net income (NI)/Sales (S); asset utilization= sales (S) /total assets (A); equity multiplier= total assets (A)/ common equity (E).

$$return\ on\ Equity = \frac{Net\ Income}{Assets} x \frac{Assets}{Equity} \quad \text{……....(3.2)}$$

$$return\ on\ Equity = ROA x \frac{Assets}{Equity} \quad \text{…….(3.3)}$$

This decomposition facilitates the examination of ROE in terms of a measure of profitability (profit margin), level of assets required to generate sales (asset utilization), and the financing of those assets (equity multiplier). As such, ROE encompasses measures of sales, net income, total assets and common equity.

Equation 3.3 illustrates the inter relationship between RoE and RoA and hence the applicability of either measure as a performance indicator. The study has adopted the approach by Ho and Zhu (2004) who have used Du Pont model and decomposed the overall performance measure (proxied in terms of return on assets (ROA) into the product of efficiency (measured as total assets turnover ratio) and effectiveness (measured as profit margin ratio) measures. Their decomposition is illustrated as follows:

$$return\,on\,Assets = \frac{net\,income}{Total\,assets} \quad \ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots(3.4)$$

$$= \frac{net\,income}{sales} x \frac{sales}{total\,assets} \quad \ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots(3.5)$$

(Profit margin) (Total assets turnover ratio)

Performance = Effectiveness x Efficiency ……(3.6)

In the aforementioned decomposition, the ROA is considered as a measure of overall performance and assesses the profitability of total assets before taxation for an organization. Further, it contains efficiency and effectiveness as its mutually exclusive components.

Total assets turnover ratio assesses the ability of an organization to use its assets and could be treated as efficiency. It indicates the output generated by the use of given level of inputs. On the other hand, the profit margin ratio assesses the net profitability before taxation during the current accounting period and could be taken as a measure of effectiveness. This ratio indicates the ability of an organization to achieve the expected goals in terms of output(s). In a nutshell, the performance measure for an organization is a product of efficiency and effectiveness measures (that is, performance = efficiency x effectiveness). Thus, overall performance measure can be seen as a means of quantifying the efficiency and effectiveness of actions (Neely et al., 1995).



**3.9 Methods of Data analysis**

The study analyzed the quantitative data derived from the financial statements using Data Envelopment Analysis (DEA) to develop performance scores. DEA was applied as it has no limitation on the number of DMUs that can be used as well as having the option of applying Constant Returns to Scale (CRS) and Variable Returns to Scale (VRS).

The relationship between the performance scores and the exogenous factors was then analyzed using regression and Analysis of Variance Tests (ANOVA) to assess the strength and fit of the models to bring out trends that will lead to conclusions.

### 3.10 Chapter Summary

The chapter has highlighted the research design applied in this study which was confirmatory research. The target population comprised the 127 commercial banks in East Africa and the identified research variables were the performance measures (dependent variables) and structure and growth (independent variables).

Secondary data was collected from the audited financial statements of the commercial banks for the study period under review.

# CHAPTER FOUR: ANALYSIS AND RESULTS

This chapter presents a detailed description of the data, analysis and results, within the framework of the research questions, objectives and hypotheses. Analysis and interpretation of the results is based on the overall objective of the study which was to compare the bank performance measures and propose a single measure for commercial banks in East Africa.

The chapter is divided into two major sections. The first section describes the descriptive results and follows the layout of the study objectives on a country by country basis. The second section describes the diagnostic tests done and the results of the regression tests. The results for each objective are addressed country by country and a joint model is then estimated using both balanced and unbalanced panel data sets.



## 4.0 Descriptive Statistics

A preliminary analysis was done to check the representation of the commercial banks on a country by country basis. The composition of the commercial banks used in this study is presented in table 4.1.1 below.

**Table 4.1.1 Analysis of the sample of commercial banks in EA**

| Country | Sampled number of banks | Population of banks | Percentage of sample (%) | Percentage of population (%) |
|---|---|---|---|---|
| Kenya | 37 | 43 | 59 | 86 |
| Tanzania | 21 | 32 | 33 | 66 |
| Uganda | 5 | 25 | 8 | 20 |
| Total | 63 | 100 | 100 | |

Table 4.1.1 shows that commercial banks in Kenya constitute the largest share at 59% of the sample size followed by Tanzania at 33% and lastly Uganda at 8%. In terms of representation against the total population Kenya has the highest at 86%, Tanzania at 66% and Uganda at 20%. The Kenyan banking sector has a high representation due to undertaking banking reforms in 1996 ahead of Uganda (2004) and Tanzania (2006) and this resulted in their faster

development and also required disclosures in terms of financial reports. The low percentage in Uganda is brought about by the moratorium on new banks that had been placed by the Ugandan Central bank.

### 4.1 Bank Performance Measures

The first objective was to compare and contrast bank performance measures and propose a single measure of performance for commercial banks in the East African Community (EAC). The bank performance measures identified include Return on Equity (RoE), Return on Assets (RoA), Net Interest Margin (NIM), profit margin (PM), efficiency and effectiveness.

The study applied the concept of Data Envelopment Analysis (DEA) which is a linear programming technique to develop efficiency and effectiveness scores. DEA is an analytical tool and has been applied to evaluate the relative performance of the commercial banks.

Descriptive statistics of the mean values of performance is presented in table 4.1.2 that the average ROE for Kenya was 21.2%, 12.4% for Tanzania and 30.7% in Uganda. The results for Kenya and Uganda are significantly higher compared to the East African commercial (EAC) banks average of 18.7% while Tanzania is lower. However, the results for EAC is lower than the average mean in Sub-Saharan Africa (SSA) of 28% but higher than for Middle East and North Africa at 19% as reported by Beck et al., (2009).

**Table 4.1.2 Mean scores for Performance for commercial banks 2006-2011**

| **Country** | **Performance Measure** | | | | | |
|---|---|---|---|---|---|---|
| | RoE | RoA | Efficiency | Effectiveness | NIM | PM |
| Kenya | 0.212 | 0.029 | 0.544 | 0.569 | 0.059 | 0.339 |
| Tanzania | 0.124 | 0.005 | 0.560 | 0.387 | 0.038 | 0.142 |
| Uganda | 0.307 | 0.026 | 0.541 | 0.632 | 0.088 | 0.195 |
| EAC | 0.187 | 0.021 | 0.503 | 0.549 | 0.056 | 0.253 |

The average return on Assets (ROA) was 2.9% in Kenya and 2.6 % in Uganda which is significantly higher compared to the East African commercial banks average of 2.1%. However, Tanzania has a lower RoA of 0.5%. This implies that Kenyan and Ugandan commercial banks generate higher profits from the assets compared to their East African counterparts. Chen (2009) reports a higher mean average for SSA countries of 2.4% when compared to the average for the EAC banks of 2.1%.

The average Profit Margin (PM) was 33.9% in Kenya, 14.2% in Tanzania and 19.5% in Uganda. Commercial banks in Kenya recorded a PM score significantly higher than the East African commercial banks average of 25.3% while Tanzania and Uganda were lower. McKinsey (2012) highlight mean PM's of 19% for Asian countries, 27.33% for Western Europe and 28% for Northern Europe.

The average net interest margin was 5.9% in Kenya, 3.8% in Tanzania and 8.8% in Uganda. Tanzania and Uganda have NIM scores higher than the East African commercial banks average of 5.6% while Kenya scored lower. The average NIM for SSA countries is 6% while for Middle East and North Africa was 3% respectively as reported by Beck et al., (2009).

The efficiency scores were highest in Tanzania at 56% followed by Kenya at 54.4% and Uganda at 54.1% and which were all higher than the EA combined score of 50.3%. This is an indication that over the study period 2006-2011, banks have been able to maximize their inputs (capital and deposits) to maximize their outputs (loans and investments).

The effectiveness scores were highest in Uganda 63.2% followed by Kenya at 56.9% and Tanzania at 38.7%. Tanzania is the only country that scored less than the EA combined score of 54.9%. This is indicates that in Uganda and Kenya, banks have been able to maximize their inputs (loans and investments) to maximize their outputs (net interest and non-interest income).

The results were then further disaggregated to show the specific commercial banks and to analyse how efficiency and effectiveness were performing when compared to the other performance measures namely PM,ROA,ROE and NIM. The study ranked the top 20 commercial banks using both efficiency and effectiveness as the bases. (The complete list of the 63 commercial banks is shown in the appendix)

**Table 4.1.3 Comparison of Efficiency and other performance measures 2006-2011**

| 2006-2011 | Efficiency | | PM | | ROA | | ROE | | NIM | |
|---|---|---|---|---|---|---|---|---|---|---|
| | Score | Rank | Score | Rank | Score | Rank | Score | Rank | Score | Rank |
| Habib bank Ke | 0.8256 | 1 | 0.437 | 10 | 0.0319 | 19 | 0.206 | 29 | 0.059 | 23 |
| Bank of Baroda Ke | 0.8246 | 2 | 0.585 | 5 | 0.0384 | 12 | 0.326 | 8 | 0.055 | 24 |
| Citibank Tanzania | 0.7854 | 3 | 0.232 | 34 | 0.0103 | 37 | 0.248 | 25 | 0.034 | 46 |
| Bank of India Ke | 0.7359 | 4 | 0.689 | 4 | 0.0426 | 10 | 0.322 | 10 | 0.052 | 29 |
| I&M Bank (Tanzania) | 0.7334 | 5 | 0.284 | 28 | 0.0102 | 38 | 0.182 | 33 | 0.024 | 63 |
| Azania Bank | 0.7317 | 6 | 0.185 | 39 | 0.0064 | 48 | 0.057 | 49 | 0.033 | 47 |
| Habib AG Zurich | 0.7034 | 7 | 0.482 | 8 | 0.0319 | 20 | 0.26 | 23 | 0.053 | 27 |
| National Microfinance Bank | 0.6825 | 8 | 0.176 | 42 | 0.0097 | 39 | 0.31 | 11 | 0.051 | 32 |
| Transnational bank | 0.6775 | 9 | 0.229 | 35 | 0.0281 | 23 | 0.092 | 46 | 0.08 | 8 |
| Diamond Trust Ke | 0.6773 | 10 | 0.369 | 15 | 0.0351 | 14 | 0.271 | 19 | 0.068 | 15 |
| Commercial Bank of Africa (Tanzania) | 0.6716 | 11 | -0.02 | 59 | -0.001 | 60 | 0.018 | 57 | 0.025 | 61 |
| DFCU | 0.6667 | 12 | 0.316 | 24 | 0.0344 | 15 | 0.44 | 3 | 0.095 | 6 |
| Standard Chartered Bank (Tz) | 0.6613 | 13 | 0.127 | 47 | 0.0084 | 42 | 0.035 | 52 | 0.025 | 62 |
| Prime bank | 0.6597 | 14 | 0.411 | 13 | 0.023 | 26 | 0.188 | 32 | 0.04 | 42 |
| NIC Ke | 0.6547 | 15 | 0.433 | 12 | 0.1039 | 1 | 0.266 | 20 | 0.054 | 25 |
| Stanbic Ug | 0.6449 | 16 | 0.366 | 16 | 0.0516 | 3 | 0.499 | 1 | 0.1 | 5 |
| Guardian bank | 0.6401 | 17 | 0.09 | 52 | 0.0052 | 50 | 0.047 | 50 | 0.048 | 37 |
| Victoria Commercial Bank | 0.6288 | 18 | 0.557 | 6 | 0.0394 | 11 | 0.241 | 27 | 0.053 | 26 |
| International Commercial Bank | 0.6212 | 19 | 0.083 | 54 | 0.0029 | 55 | 0.01 | 58 | 0.035 | 44 |
| Bank of Africa Ke | 0.6074 | 20 | 0.717 | 2 | 0.0136 | 35 | 0.105 | 41 | 0.035 | 43 |



The top 20 banks using the efficiency as the base, indicates that 9 banks (45%) are in the top 20 when compared against profit margin (PM), 9 banks (45%) for return on assets, 7 banks for return on equity(35%) and 4 banks (20%) when net interest margin (NIM) is applied as a measure. Efficiency measures compares well with ROA which also measures utilization of assets to generate revenue but unfavorably when compared with NIM and RoE.

**Table 4.1.4 Comparison of Effectiveness and other performance measures 2006-2011**

| 2006-2011 | Effectiveness | | PM | | ROA | | ROE | | NIM | |
|---|---|---|---|---|---|---|---|---|---|---|
| | Score | Rank | Score | Rank | Score | Rank | Score | Rank | Score | Rank |
| Equity bank Ke | 0.9001 | 1 | 0.3531 | 19 | 0.0501 | 5 | 0.28 | 15 | 0.07 | 14 |
| Krep | 0.8862 | 2 | -0.015 | 58 | 0.0004 | 58 | -0.0059 | 60 | 0.123 | 4 |
| Centenary Rural Development Bank | 0.8333 | 3 | 0.2411 | 33 | 0.0446 | 8 | 0.4653 | 2 | 0.133 | 2 |
| Barclays bank Ke | 0.7401 | 4 | 0.4013 | 14 | 0.0534 | 2 | 0.3944 | 5 | 0.084 | 7 |
| KCB Ke | 0.7400 | 5 | 0.2937 | 26 | 0.0374 | 13 | 0.2859 | 14 | 0.077 | 9 |
| Barclays Bank Tz | 0.7380 | 6 | 0.1677 | 45 | 0.0037 | 53 | 0.0259 | 54 | 0.03 | 52 |
| Transnational bank | 0.7307 | 7 | 0.2289 | 35 | 0.0281 | 23 | 0.0918 | 46 | 0.08 | 8 |
| NBK Ke | 0.6977 | 8 | 0.3238 | 23 | 0.0343 | 16 | 0.2724 | 17 | 0.076 | 11 |
| Co-operative bank | 0.6898 | 9 | 0.2816 | 29 | 0.0314 | 21 | 0.272 | 18 | 0.07 | 13 |
| Consolidated bank | 0.6702 | 10 | 0.116 | 51 | 0.0134 | 36 | 0.1049 | 42 | 0.067 | 16 |
| Dubai bank | 0.6667 | 11 | 0.0492 | 55 | 0.0059 | 49 | 0.0264 | 53 | 0.077 | 10 |
| FBME Bank | 0.6606 | 12 | 0.4425 | 9 | 0.0067 | 47 | 0.1351 | 37 | 0.17 | 1 |
| International Commercial Bank | 0.6576 | 13 | 0.0833 | 54 | 0.0029 | 55 | 0.0103 | 58 | 0.035 | 44 |
| Standard Chartered bank Ke | 0.6521 | 14 | 0.5087 | 7 | 0.0485 | 6 | 0.4186 | 4 | 0.064 | 17 |
| Imperial bank Ke | 0.6436 | 15 | 0.3539 | 18 | 0.0508 | 4 | 0.3662 | 6 | 0.13 | 3 |
| Habib bank Ke | 0.6243 | 16 | 0.4374 | 10 | 0.0319 | 19 | 0.2057 | 29 | 0.059 | 23 |
| Stanbic Ug | 0.6197 | 17 | 0.3659 | 16 | 0.0516 | 3 | 0.4989 | 1 | 0.1 | 5 |
| Credit bank | 0.6183 | 18 | 0.2418 | 32 | 0.0217 | 30 | 0.1218 | 40 | 0.064 | 18 |
| National Bank of Commerce (Tanzania) | 0.6156 | 19 | 0.1201 | 49 | 0.004 | 52 | 0.3407 | 7 | 0.032 | 48 |
| Jamii Bora (Fmr City Finance Bank) | 0.6074 | 20 | -0.149 | 62 | -0.0228 | 63 | -0.0456 | 63 | 0.06 | 21 |



The top 20 banks using the effectiveness as the base, indicates that 7 banks (35%) are in the top 20 when compared against profit margin (PM), 9 banks (45%) for return on assets, 10 banks for return on equity (50%) and 15 banks (75%) when net interest margin (NIM) is applied as a measure. Effectiveness compares well with NIM as both are measuring similar variables of net interest and non interest income.

To draw a more accurate inference about the relationship between efficiency and effectiveness in banks in the EAC, the Pearson's correlation coefficients was computed among these measures (Table 4.1.5). The Pearson correlation as applied as it is a quantitative measure of the strength of association of two variables.

**Table 4.1.5 Pearson's correlation for Performance measures**

| | | ROA | ROE | NIM | effectiveness | efficiency | PM |
|---|---|---|---|---|---|---|---|
| ROA | Pearson Correlation | 1 | .714** | .320* | .296* | .156 | .695** |
| | Sig. (2-tailed) | | .000 | .011 | .019 | .222 | .000 |
| | N | 63 | 63 | 63 | 63 | 63 | 63 |
| ROE | Pearson Correlation | .714** | 1 | .343** | .234 | .082 | .615** |
| | Sig. (2-tailed) | .000 | | .006 | .065 | .523 | .000 |
| | N | 63 | 63 | 63 | 63 | 63 | 63 |
| NIM | Pearson Correlation | .320* | .343** | 1 | .651** | -.200 | .143 |
| | Sig. (2-tailed) | .011 | .006 | | .000 | .115 | .263 |
| | N | 63 | 63 | 63 | 63 | 63 | 63 |
| effectiveness | Pearson Correlation | .296* | .234 | .651** | 1 | -.073 | .050 |
| | Sig. (2-tailed) | .019 | .065 | .000 | | .570 | .697 |
| | N | 63 | 63 | 63 | 63 | 63 | 63 |
| efficiency | Pearson Correlation | .156 | .082 | -.200 | -.073 | 1 | .154 |
| | Sig. (2-tailed) | .222 | .523 | .115 | .570 | | .228 |
| | N | 63 | 63 | 63 | 63 | 63 | 63 |
| PM | Pearson Correlation | .695** | .615** | .143 | .050 | .154 | 1 |
| | Sig. (2-tailed) | .000 | .000 | .263 | .697 | .228 | |
| | N | 63 | 63 | 63 | 63 | 63 | 63 |

**. Correlation is significant at the 0.01 level (2-tailed).

*. Correlation is significant at the 0.05 level (2-tailed).

The correlation analysis reveals that there is a negative and statistically insignificant (-.073) correlation between efficiency and effectiveness for banks in the EAC. However, effectiveness had a positive and significant correlation with NIM (0.651) and ROA (0.296) but insignificant for ROE (0.234) and PM (0.05).Efficiency had a positive but insignificant correlation when compared to ROA (.156), ROE (.082), and PM (0.154). The relationship was negative and insignificant for NIM (-.200).

Due to the low correlation between efficiency and effectiveness and adopting the same methodology applied by Ho and Zhu (2004) and Kumar and Gulati (2010) the study combined the efficiency and effectiveness measures into the proposed single performance measure (SPM). The results for the 63 commercial banks were analysed for the period (2006-2011) and for the calendar year 2011 individually.



**Table 4.1. 6 Ranking of top 20 banks using SPM (2006-2011)**

| | **Efficiency** | **Rank** | **Effectiveness** | **Rank** | **SPM** | **Rank** |
|---|---|---|---|---|---|---|
| | A | | B | | A x B | |
| Centenary Rural Development Bank | 0.5616 | 30 | 0.8333 | 3 | 0.7283 | 1 |
| Transnational bank | 0.6775 | 9 | 0.7307 | 7 | 0.6245 | 2 |
| Habib bank Ke | 0.8256 | 1 | 0.6243 | 16 | 0.6202 | 3 |
| Stanbic Ug | 0.6449 | 16 | 0.6197 | 17 | 0.5979 | 4 |
| DFCU | 0.6667 | 12 | 0.5770 | 24 | 0.5803 | 5 |
| Krep | 0.5086 | 43 | 0.8862 | 2 | 0.5531 | 6 |
| NBK Ke | 0.5727 | 29 | 0.6977 | 8 | 0.5326 | 7 |
| Habib AG Zurich | 0.7034 | 7 | 0.6047 | 21 | 0.5275 | 8 |
| ABC Capital bank Ug | 0.3804 | 56 | 0.5952 | 23 | 0.5124 | 9 |
| Barclays Bank Tz | 0.5964 | 25 | 0.7380 | 6 | 0.5113 | 10 |
| Dubai bank | 0.5239 | 40 | 0.6667 | 11 | 0.5044 | 11 |
| Barclays bank Ke | 0.5572 | 31 | 0.7401 | 4 | 0.4870 | 12 |
| Imperial bank Ke | 0.6019 | 22 | 0.6436 | 15 | 0.4476 | 13 |
| Bank of India Ke | 0.7359 | 4 | 0.5478 | 27 | 0.4455 | 14 |
| Equity bank Ke | 0.3740 | 57 | 0.9001 | 1 | 0.4320 | 15 |
| National Bank of Commerce (Tz) | 0.6067 | 21 | 0.6156 | 19 | 0.4256 | 16 |
| Citibank Tanzania | 0.7854 | 3 | 0.4796 | 36 | 0.4250 | 17 |
| International Commercial Bank | 0.6212 | 19 | 0.6576 | 13 | 0.4190 | 18 |
| Azania Bank | 0.7317 | 6 | 0.4963 | 33 | 0.4162 | 19 |
| Credit bank | 0.5423 | 34 | 0.6183 | 18 | 0.3959 | 20 |

The combined single performance measure shows that Centenary Rural Development bank is top with a score of 0.7283. However it is ranked 30th in terms of efficiency (0.5616) and 3rd in terms of effectiveness (0.8333). Habib bank Kenya is top in terms of efficiency with a score of 0.8256, 16th in terms of effectiveness (0.6243) and 3rd in terms of the combined score (0.6202). Equity bank Kenya is top in terms of effectiveness with a score of 0.9001 but is ranked 57th in terms of efficiency (0.3740) and 15th when using the combined score (0.4320). During the averaged period, Kenyan banks have shown consistent performance.

Table 4.1.7 analyses the top 20 commercial banks for year 2011 and Stanbic Uganda scores the highest performance at 1, followed by Centenary Rural Development bank (Uganda) at 0.8360 with Transnational bank ending the top 20 with a score of 0.290. During the year 2011, Ugandan and Tanzanian banks outperformed Kenyan banks and this could be attributed to increased efficiency and effectiveness.



**Table 4.1.7 Ranking of top 20 commercial banks (2011)**

| *Bank* | *Country* | *Efficiency* | *Rank* | *Effectiveness* | *Rank* | *Performance* | *Rank* |
|---|---|---|---|---|---|---|---|
| | | A | | B | | A x B | |
| Stanbic Ug | Uganda | 1 | 1 | 1 | 1 | 1 | 1 |
| National Microfinance Bank | Tanzania | 0.8360 | 10 | 1 | 1 | 0.8360 | 2 |
| Centenary Rural Development Bank | Uganda | 0.7863 | 16 | 1 | 1 | 0.7863 | 3 |
| National Bank of Commerce (Tz) | Tanzania | 0.6982 | 22 | 1 | 1 | 0.6982 | 4 |
| Azania Bank | Tanzania | 0.8449 | 9 | 0.8185 | 3 | 0.6916 | 5 |
| DFCU | Uganda | 1 | 1 | 0.6717 | 8 | 0.6717 | 6 |
| Bank of Africa | Uganda | 0.9245 | 5 | 0.7172 | 6 | 0.6630 | 7 |
| Ecobank | Uganda | 0.6456 | 26 | 1 | 1 | 0.6456 | 8 |
| International Commercial Bank | Tanzania | 1 | 1 | 0.5867 | 13 | 0.5867 | 9 |
| Barclays Bank Tz | Tanzania | 0.6078 | 30 | 0.9429 | 2 | 0.5730 | 10 |
| Exim Bank (Tz) | Tanzania | 0.9291 | 4 | 0.5882 | 12 | 0.5465 | 11 |
| CRDB Bank (1996) | Tanzania | 0.8319 | 11 | 0.6518 | 9 | 0.5422 | 12 |
| Habib bank | Kenya | 1 | 1 | 0.4809 | 24 | 0.4809 | 13 |
| Bank of India Ke | Kenya | 1 | 1 | 0.4310 | 29 | 0.4310 | 14 |
| Citibank (Tz) | Tanzania | 0.8083 | 14 | 0.5110 | 21 | 0.4130 | 15 |
| Credit bank | Kenya | 0.400399 | 36 | 1 | 1 | 0.400399 | 16 |
| Akiba Commercial Bank | Tanzania | 0.705556 | 16 | 0.557467 | 11 | 0.393324 | 17 |
| NIC Ke | Kenya | 0.681594 | 18 | 0.521271 | 14 | 0.355295 | 18 |
| Imperial bank Ke | Kenya | 0.622672 | 22 | 0.481578 | 19 | 0.299865 | 19 |
| Transnational bank | Kenya | 0.566301 | 25 | 0.512522 | 16 | 0.290242 | 20 |

Source: Author (2013)

Stanbic (Uganda) is both CCR efficient and effective in stages 1 and 2 and has a maximum score of 1. DFCU, International Commercial bank, Habib (Kenya), Imperial bank (Uganda), Prime bank, NIC (Tanzania) and CBA (Tanzania) scored unit values under efficiency but less than unit value in effectiveness. Similarly, National Microfinance bank (NMB), Centenary Rural Development bank (CRDB), National bank of commerce (NBC), credit bank and Krep scored unit values under effectiveness but less than unit value in efficiency.



**Table 4.1.8 Top 20 commercial banks on country basis**

| | **Averaged (2006-2011)** | | **2011** | |
|---|---|---|---|---|
| | No of commercial banks | Percentage (%) | No of commercial banks | Percentage (%) |
| Kenya | 10 | 50 | 6 | 30 |
| Tanzania | 6 | 30 | 9 | 45 |
| Uganda | 4 | 20 | 5 | 25 |
| | 20 | 100 | 20 | 100 |

The results in table 4.1.8 indicate the 20 commercial banks in the EAC on a country by country basis for both the averaged period (2006-2011) and the year 2011. For the averaged period, Kenya had 10 banks in the top 20 (50%) followed by Tanzania 6 banks (30%) and Uganda with 4 banks (20%).

For the year 2011, Kenyan banks reduce to 6 (30%), Ugandan banks increase to 5 (25%) and Tanzania with the highest at 9 (45%). This is an indicator that Tanzanian and Ugandan commercial banks were able to improve on the efficiency and effectiveness.

**Table 4.1.9 Mean scores for all commercial banks in EA 2011**

| **Descriptive Statistics for 2011** | **Efficiency** | **Effectiveness** | **Single performance measure** |
|---|---|---|---|
| Average | 0.6321 | 0.5044 | 0.3085 |
| Standard deviation | 0.2853 | 0.2847 | 0.2417 |
| Min | 0.0457 | 0.0526 | 0.0412 |
| Max | 1 | 1 | 1 |

For the period 2011, efficiency scores range from 0.0457 to 1, with an average of 0.6321 as shown in table 4.1.2 below The explicit implication of this finding is that EAC banks on average have the potential to increase their traditional outputs (advances and investments) by about 36.78 percent with the same level of inputs (physical capital, labor, and loanable funds) that is currently being utilized.

For the overall performance score for a bank which is be obtained by multiplying efficiency and effectiveness scores, the scores range from 0.0412 to 1, with an average of 0.3085. It is quite interesting to note that only Stanbic Uganda attained an overall performance score equal to one for the period 2011. However, when the averaged period (2006-2011) is analyzed, none of the banks attains an overall score of one.

Further, it has been noted that estimated effectiveness scores range from 0.0526 to 1, with an average of 0.5044. This indicates that on an average, EAC banks can effectively increase their net-interest and non-interest incomes by about 49.56 percent by utilizing the same level of advances and investments.

Table 4.1.10 analyses the correlation between the SPM, PM, ROA, ROE and NIM and the results show a positive and significant relationship.

**Table 4.1. 10 Correlations between SPM and other performance measures**

| | | ROA | ROE | NIM | PM | SPM |
|---|---|---|---|---|---|---|
| ROA | Pearson Correlation | 1 | .714** | .320* | 0.695** | .328** |
| | Sig. (2-tailed) | | .000 | .011 | 0.000 | .009 |
| | N | 63 | 63 | 63 | 63 | 63 |
| ROE | Pearson Correlation | .714** | 1 | .343** | 0.615** | .324** |
| | Sig. (2-tailed) | .000 | | .006 | 0.000 | .010 |
| | N | 63 | 63 | 63 | 63 | 63 |
| NIM | Pearson Correlation | .320* | .343** | 1 | 0.143 | .511** |
| | Sig. (2-tailed) | .011 | .006 | | 0.263 | .000 |
| | N | 63 | 63 | 63 | 63 | 63 |
| SPM | Pearson Correlation | .328** | .324** | .511** | 0.063 | 1 |
| | Sig. (2-tailed) | .009 | .010 | .000 | 0.625 | |
| | N | 63 | 63 | 63 | | 63 |
| PM | Pearson Correlation | 0.695** | 0.615** | 0.413 | 1 | 0.063 |
| | Sig. (2- tailed) | 0.000 | 0.000 | 0.263 | | 0.625 |
| | N | 63 | 63 | 63 | 63 | 63 |

NIM and SPM have a high positive correlation (0.511) which is significant at the 5% level thus indicating that either measure can be applied. The correlation between ROA and ROE is positive and significant and is high (0.714) indicating that either measure can be applicable. When PM is correlated against ROA and ROE, the results show significant and positive high score (0.695, 0.615) respectively and hence either measure can be applicable. The study therefore adopts the measure with the lowest correlation which is ROE (0.324) and combines this with SPM to have a combined overall performance measure (OPM).

The OPM is then ranked against the other performance measures and the results for the top 20 banks are shown on table 4.1.11 below (the full ranking is shown in the appendix).

**Table 4.1.11 Ranking of single performance measure for top 20 commercial banks**

| | SPM | | ROE | | OPM | |
|---|---|---|---|---|---|---|
| | Score | Rank | Score | Rank | Score | Rank |
| | A | | B | | A x B | |
| Centenary Rural Development Bank | 0.7283 | 1 | 0.4653 | 2 | 0.3389 | 1 |
| Stanbic Ug | 0.5979 | 4 | 0.4989 | 1 | 0.2983 | 2 |
| DFCU | 0.5803 | 5 | 0.4402 | 3 | 0.2555 | 3 |
| Barclays bank Ke | 0.4870 | 12 | 0.3944 | 5 | 0.1920 | 4 |
| Imperial bank Ke | 0.4476 | 13 | 0.3662 | 6 | 0.1639 | 5 |
| Standard Chartered bank Ke | 0.3778 | 25 | 0.4186 | 4 | 0.1582 | 6 |
| NBK | 0.5326 | 7 | 0.2724 | 17 | 0.1451 | 7 |
| National Bank of Commerce (Tanzania) | 0.4256 | 16 | 0.3407 | 7 | 0.1450 | 8 |
| Bank of India Ke | 0.4455 | 14 | 0.3224 | 10 | 0.1437 | 9 |
| Habib AG Zurich | 0.5275 | 8 | 0.2599 | 23 | 0.1371 | 10 |
| Habib bank Ke | 0.6202 | 3 | 0.2057 | 29 | 0.1276 | 11 |
| Bank of Baroda Ke | 0.3865 | 23 | 0.3264 | 8 | 0.1261 | 12 |
| Equity bank | 0.4320 | 15 | 0.2800 | 15 | 0.1210 | 13 |
| National Microfinance Bank | 0.3608 | 27 | 0.3095 | 11 | 0.1117 | 14 |
| Citibank Tanzania | 0.4250 | 17 | 0.2481 | 25 | 0.1054 | 15 |
| Citibank Ke | 0.3699 | 26 | 0.2767 | 16 | 0.1023 | 16 |
| NIC Ke | 0.3835 | 24 | 0.2656 | 20 | 0.1019 | 17 |
| KCB Ke | 0.3359 | 28 | 0.2859 | 14 | 0.0960 | 18 |
| Diamond Trust Ke | 0.3307 | 29 | 0.2707 | 19 | 0.0895 | 19 |
| Co-operative bank | 0.3240 | 31 | 0.2720 | 18 | 0.0881 | 20 |

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The top 20 banks using the OPM as the base, indicates that 12 banks (60%) are in the top 20 when compared against the single performance measure (SPM), 17 banks (50%) for return on equity.

**Table 4.1.12 Ranking OPM vs PM, ROA and NIM**

| | OPM | | PM | | ROA | | NIM | |
|---|---|---|---|---|---|---|---|---|
| | Score | Rank | Score | Rank | Score | Rank | Score | Rank |
| Centenary Rural Development Bank | 0.3389 | 1 | 0.2411 | 33 | 0.0446 | 8 | 0.1331 | 2 |
| Stanbic Ug | 0.2983 | 2 | 0.3659 | 16 | 0.0516 | 3 | 0.1002 | 5 |
| DFCU | 0.2555 | 3 | 0.3163 | 24 | 0.0344 | 15 | 0.0949 | 6 |
| Barclays bank Ke | 0.1920 | 4 | 0.4013 | 14 | 0.0534 | 2 | 0.0841 | 7 |
| Imperial bank Ke | 0.1639 | 5 | 0.3539 | 18 | 0.0508 | 4 | 0.1297 | 3 |
| Standard Chartered bank Ke | 0.1582 | 6 | 0.5087 | 7 | 0.0485 | 6 | 0.0641 | 17 |
| NBK | 0.1451 | 7 | 0.3238 | 23 | 0.0343 | 16 | 0.0761 | 11 |
| National Bank of Commerce (Tanzania) | 0.1450 | 8 | 0.1201 | 49 | 0.0040 | 52 | 0.0324 | 48 |
| Bank of India Ke | 0.1437 | 9 | 0.6888 | 4 | 0.0426 | 10 | 0.0517 | 29 |
| Habib AG Zurich | 0.1371 | 10 | 0.4820 | 8 | 0.0319 | 20 | 0.0525 | 27 |
| Habib bank Ke | 0.1276 | 11 | 0.4374 | 10 | 0.0319 | 19 | 0.0587 | 23 |
| Bank of Baroda Ke | 0.1261 | 12 | 0.5854 | 5 | 0.0384 | 12 | 0.0554 | 24 |
| Equity bank | 0.1210 | 13 | 0.3531 | 19 | 0.0501 | 5 | 0.0701 | 14 |
| National Microfinance Bank | 0.1117 | 14 | 0.1763 | 42 | 0.0097 | 39 | 0.0505 | 32 |
| Citibank Tanzania | 0.1054 | 15 | 0.2317 | 34 | 0.0103 | 37 | 0.0335 | 46 |
| Citibank Ke | 0.1023 | 16 | 0.7061 | 3 | 0.0449 | 7 | 0.0436 | 39 |
| NIC Ke | 0.1019 | 17 | 0.4329 | 12 | 0.1039 | 1 | 0.0544 | 25 |
| KCB Ke | 0.0960 | 18 | 0.2937 | 26 | 0.0374 | 13 | 0.0772 | 9 |
| Diamond Trust Ke | 0.0895 | 19 | 0.3688 | 15 | 0.0351 | 14 | 0.0675 | 15 |
| Co-operative bank | 0.0881 | 20 | 0.2816 | 29 | 0.0314 | 21 | 0.0703 | 13 |



Table 4.1.12 further ranks the top 20 banks using the OPM as the base indicator and the results show that 12 banks (60%) are in the top 20 when compared against the profit margin (PM), 16 banks (80%) for return on assets and 11 banks (55%) for NIM. This indicates that OPM compares relatively well with the key measures of SPM, PM, ROA, ROE and NIM.

*Effect of size*

Besides analyzing the efficiency, effectiveness, single performance measure and the overall performance measure for individual commercial banks in the EAC, an attempt to explore the effect of size on these measures was done. The study further analysed the two periods: averaged 2006-2011 and 2011, and further distinguished the entire sample of 63 commercial banks into two categories:

(1) large banks; and
(2) small banks.

From the sample of 63 commercial banks, 33 banks have been categorized as large banks and the remaining 30 banks have been included in the category of small banks. Large banks are defined as those banks which have total assets greater than the median of total assets of the entire sample.



**Table 4.1.13 Descriptive statistics for size of EAC banks (2011)**

| Statistics | Large banks | | Small banks | |
|---|---|---|---|---|
| | SPM | OPM | SPM | OPM |
| N | 33 | 33 | 30 | 30 |
| Mean | 0.3408 | 0.0840 | 0.2062 | 0.0541 |
| Median | 0.2516 | 0.0538 | 0.1642 | 0.0340 |
| SD | 0.2546 | 0.1086 | 0.1665 | 0.0839 |
| Minimum | 0 | 0.00 | 0 | -0.05 |
| Maximum | 1 | 0.56 | 0.69 | 0.56 |

Table 4.1.13 provides the summary statistics of performance scores for large and small commercial banks in year 2011 alone. The results pertaining to SPM and OPM both indicate that large banks perform better than small banks.

The results pertaining to the period 2006-2011 as shown in table 4.1.14 below for both large and small banks respectively.

**Table 4.1.14 Descriptive statistics for large and small banks (2006-2011)**

| **Statistics** | **Large banks** | | **Small banks** | |
|---|---|---|---|---|
| | SPM | OPM | SPM | OPM |
| N | 30 | 30 | 33 | 33 |
| Mean | 0.3718 | 0.1084 | 0.3350 | 0.0356 |
| Median | 0.3300 | 0.0989 | 0.2794 | 0.0282 |
| SD | 0.1623 | 0.0819 | 0.1474 | 0.0394 |
| Minimum | 0.12 | 0.01 | 0.02 | -0.02 |
| Maximum | 0.87 | 0.34 | 0.62 | 0.14 |



Table 4.1.14 shows that large banks perform better (.3718, 0.1084) than the small banks (0.335, 0.0356) scores as shown by the single performance measure and the overall performance measure respectively.

The results when one year is analyzed (2011) and when the averages for the six years are applied seem to give the same outcome where large banks have a higher mean score than small banks in terms of the single performance measure and the overall performance measure. This implies that the large banks have remained consistent and stable.

*Group Affiliation*

In order to study the effect of group affiliation on the single performance measure (SPM) and the overall performance measure (OPM), we categorized the commercial banks in the EAC banking industry into two groups:

(1) Multinational banks (MNBs)

(2) Indigenous banks (IBs).

MNBs comprised banks that own and control branches and affiliates in more than one country as defined by Jones (2001). The MNBs group consists of 32 commercial banks while the IBs were 31 commercial banks. The IBs comprised banks that did not have any branches

other than their home country. The results were further analysed for one period (2011) and the average for the period 2006-2011.

**Table 4.1.15 Descriptive statistics for MNBs and IBs (2011)**

| | **MNBs** | | **IB's** | |
|---|---|---|---|---|
| Statistics | SPM | OPM | SPM | OPM |
| N | 32 | 32 | 31 | 31 |
| Mean | 0.2760 | 0.0581 | 0.2774 | 0.0495 |
| Median | 0.2140 | 0.0361 | 0.1867 | 0.0318 |
| SD | 0.2015 | 0.0997 | 0.2533 | 0.0637 |
| Minimum | 0 | -0.05 | 0 | 0.00 |
| Maximum | 1 | 0.56 | 0.84 | 0.28 |

The descriptive statistics for period 2011 as shown in table 4.1.15 shows that IB's performed better than MNB's in terms of SPM with a mean score of 27.7% to 27.6%. However, MNB's (5.8%) performed better than IB's (4.9%) when the OPM was applied.

Table 4.1.16 analyses the descriptive statistics for the period 2006-2011 as shown below for both the MNB's and IB's.

**Table 4.1.16 Descriptive statistics for the period 2006-2011**

| | MNB's | | IB's | |
|---|---|---|---|---|
| Statistics | SPM | OPM | SPM | OPM |
| N | 32 | 32 | 31 | 31 |
| Mean | .3381 | 0.0849 | .3674 | 0.0506 |
| Median | .3121 | 0.0734 | .3161 | 0.0433 |
| SD | .1648 | 0.0807 | .1443 | 0.0562 |
| Minimum | .02 | 0.00 | .12 | -0.02 |
| Maximum | .87 | 0.34 | .74 | 0.26 |

Table 4.1.16 shows that IB's (36.7%) performed better than MNB's (33.8%) in terms of SPM but MNB's (8.49%) performed better than IB's (5.06%) when the OPM was applied.

### 4.2 The effect of growth on performance measures

The second objective of this study sought to establish the relationship between economic growth and bank performance for commercial banks in EAC countries. The finance growth theory posits a positive and significant relationship between efficiency and economic growth.

The descriptive results (mean and standard deviations) for the sampled commercial banks are shown in table 4.2.1. The mean scores had a range of 0-1 with 0 indicating low while 1 representing high. The efficiency for the Kenyan banks was 0.683 while the mean effectiveness was 0.553 and combined score of 0.379 implying that Kenyan banks were more efficient than Tanzanian banks which had mean scores of 0.682, 0.467 and 0.192 respectively. However, commercial banks in Uganda are the most efficient and effective with mean scores of 0.919, 0.844 and 0.782 respectively.

**Table 4.2.1 Descriptive statistics for Performance and Growth Indicators 2006-2011**

| Country | Variable | Mean | Std Dev |
|---|---|---|---|
| Kenya | Efficiency | .6836 | .2033 |
| | Effectiveness | .5538 | .2444 |
| | SPM | .3795 | .2000 |
| | OPM | .0721 | .0522 |
| | Real GDP | .045 | .0193 |
| Tanzania | Efficiency | .6826 | .2703 |
| | Effectiveness | .4670 | .2635 |
| | SPM | .3082 | .2155 |
| | OPM | .0357 | .0398 |
| | Real GDP | .0678 | .0045 |
| Uganda | Efficiency | .9187 | .1442 |
| | Effectiveness | .8444 | .1933 |
| | SPM | .5622 | .2222 |
| | OPM | .1877 | .1562 |
| | Real GDP | .0753 | .0129 |



In Kenya, standard deviation of effectiveness (0.2444) is higher than standard deviations of efficiency (.2033), combined (.2000), Real GDP (.0193). From the results, Tanzania has a standard deviation of efficiency (0.2704) which is higher than the standard deviations of effectiveness (0.2635), combined score (.2155) and Real GDP (.0045). However, in Uganda, the standard deviation of the combined scores (0.2222) which is higher than standard deviations of efficiency (.1442), effectiveness (.1933) and Real GDP (.0129).

High variations in the standard deviations imply that the variability of observations for the effectiveness is high and hence a higher likelihood of outliers. This is moreso for the variables in Tanzania and Kenya.

### 4.2.2 Normality test for Performance and Growth Indicators

In order for ordinary least squares (OLS) regression to be applied, the data needs to be tested for three conditions namely; normality of data, serial correlation and homoscedasticity. This study therefore tests for normality in data which is a condition where the data is free from

outliers or extreme variables. A normality test therefore checks whether the distribution of the data obeys the normality assumption. Regression analysis requires normal data since the standard errors and regression coefficients calculation require the use of a mean.

Various measures can be applied to conduct the Normality test which includes the Jarque-Bera test, Smirnov-Kolgoromov test, Shapiro-Wicks test and the Skewness and Kurtosis test (SK test).

The study applied the (SK test) which has been applied in similar studies where if p-value is greater than 0.05, then the data is said to be normally distributed. The SK test in table 4.2.2 indicates that only efficiency and effectiveness with joint p-values of 0.1957 and 0.1709 in Kenya follow a normal distribution. In the case of Uganda, the combined score and Real GDP with p-values of 0.1185 and 0.2269 follow a normal distribution.



**Table 4.2.2 Normality test for Performance and Growth Indicators-Kenya, Tanzania and Uganda**

| Country | Variable | Pr(Skewness) | Pr(kurtosis) | adj chi2 (2) | SK Prob>chi2 |
|---|---|---|---|---|---|
| Kenya | Efficiency | 0.0748 | 0.8110 | 3.26 | 0.1957 |
| | Effectiveness | 0.1015 | 0.3657 | 3.53 | 0.1709 |
| | SPM | 0.0000 | 0.0306 | 51.83 | 0.0000 |
| | OPM | .2557 | 0.4403 | 2.02 | 0.3643 |
| | Real GDP | .0675 | .0000 | . | 0.0000 |
| Tanzania | Efficiency | 0.0005 | 0.6476 | 10.70 | 0.0047 |
| | Effectiveness | 0.0011 | 0.2320 | 10.35 | 0.0057 |
| | SPM | 0.0000 | 0.1303 | 15.92 | 0.0003 |
| | OPM | 0.0031 | 0.0728 | 9.71 | 0.0078 |
| | Real GDP | .0560 | .0016 | 11.53 | 0.0031 |
| Uganda | Efficiency | 0.0001 | 0.0066 | 16.43 | 0.0003 |
| | Effectiveness | 0.1167 | 0.0250 | 6.74 | 0.0344 |
| | SPM | 0.0449 | 0.7658 | 4.27 | 0.1185 |
| | OPM | 0.0025 | 0.000 | 29.17 | 0.0000 |
| | Real GDP | .8411 | .1022 | 2.97 | 0.2269 |

From the results, joint SK p-values of efficiency (0.1957) and effectiveness (0.1709) variables in Kenya and the combined score (0.1185) and real GDP (0.2269) in Uganda follow a normal distribution as they have p-values greater than 0.05.

### 4.2.3 Unit root test for Performance and Growth Indicators

Time series data is either stationary or non-stationary. Time series data which is stationary does not have a unit root. The presence of unit roots yields spurious results which invalidate any inferences from the data. Therefore, the first step in panel data analysis is to conduct unit root tests to check for the stationarity of the data.

The Levin-Lin-Chu (LLC) unit-root test, which is an alternative to the two Fisher tests namely the Dickey- Fuller (DF) test and the Philip-Perron (PP) test, as it is suitable for balanced panel data. The Levin-Lin-Chu (LLC) unit-root tests the null hypothesis that the panels contain unit roots. If the p-value is less than the critical p-value of 0.05, then the null hypothesis is rejected and the alternative hypothesis that panel has no unit roots( panel is stationary) is accepted.

Using the Levin Lin chu (LLC) unit root test for stationarity, results are presented in table 4.2.3, variables (efficiency, effectiveness, combined score and Real GDP. All variables have p-values of 0.000 which is less than the 0.05 level for the commercial banks in the three countries hence data is stationary.

**Table 4.2.3 Levin-Lin-Chu test for Kenya, Tanzania and Uganda**

| Country | Variables | Ho and Ha | p-value | Comment |
|---|---|---|---|---|
| Kenya | Efficiency | Ho: Panels are stationary<br>Ha: Panels are non-stationary | 0.0000 | Stationary |
| | Effectiveness | Ho: Panels are stationary<br>Ha: Panels are non-stationary | 0.000 | Stationary |
| | SPM | Ho: Panels are stationary<br>Ha: Panels are non-stationary | 0.0000 | Stationary |
| | OPM | Ho: Panels are stationary<br>Ha: Panels are non-stationary | 0.0000 | Stationary |
| | Real GDP | Ho: Panels are stationary<br>Ha: Panels are non-stationary | 0.0000 | Stationary |
| Tanzania | Efficiency | Ho: Panels are stationary<br>Ha: Panels are non-stationary | 0.0000 | Stationary |
| | Effectiveness | Ho: Panels are stationary<br>Ha: Panels are non-stationary | 0.000 | Stationary |
| | SPM | Ho: Panels are stationary<br>Ha: Panels are non-stationary | 0.0000 | Stationary |
| | OPM | Ho: Panels are stationary<br>Ha: Panels are non-stationary | 0.0000 | Stationary |
| | Real GDP | Ho: Panels are stationary<br>Ha: Panels are non-stationary | 0.0000 | Stationary |
| Uganda | Efficiency | Ho: Panels are stationary<br>Ha: Panels are non-stationary | 0.0000 | Stationary |
| | Effectiveness | Ho: Panels are stationary<br>Ha: Panels are non-stationary | 0.000 | Stationary |
| | SPM | Ho: Panels are stationary<br>Ha: Panels are non-stationary | 0.0000 | Stationary |
| | OPM | Ho: Panels are stationary<br>Ha: Panels are non-stationary | 0.0000 | Stationary |
| | Real GDP | Ho: Panels are stationary<br>Ha: Panels are non-stationary | 0.0000 | Stationary |



The results show p-values of 0.0000 for all variables and hence we reject the null hypothesis of non-stationarity and accept the alternate hypothesis that stationarity is present. Since the data is stationary the results of regression will be more accurate and hence we can draw inference from the data.

### 4.2.4 Normality test for serial correlation

The presence or absence of autocorrelation influences the regression than can be conducted to test the relationship between the dependent and the independent variables. Tests applied include the Woolridge test, Durbin–Watson statistic and the Breusch-Godfrey test.

One of the key assumptions in the application of OLS is that the error terms are serially uncorrelated. Autocorrelation violates this assumption that the error terms are uncorrelated. While it does not bias the OLS coefficient estimates, the standard errors tend to be underestimated (and the t-scores overestimated) when the autocorrelations of the errors at low lags are positive.

There are several tests for the presence of first-order autocorrelation which include the Durbin–Watson statistic, Breusch-Godfrey test and the Wooldridge test. The current study had a short time series of 6 periods. Serial correlation tests apply to macro panels with long time series (over 20-30 years) though it is not a problem in micro panels (with very few years). Serial correlation causes the standard errors of the coefficients to be smaller than they actually are and higher R-squared. Specifically, Wooldridge test for autocorrelation in panel data was used to test for serial/autocorrelation. The null hypothesis was that there was no first order auto correlation.

Results in table 4.2.4 indicate p-values of less than 0.05 for the variables (efficiency, effectiveness and the combined score) in Kenya, Tanzania and Uganda.

**Table 4.2.4 Descriptive statistics for serial/ first order autocorrelation**

| Country | Variables | F-Statistic | p-value | Comment |
|---|---|---|---|---|
| Kenya | Efficiency | 515.779 | 0.0000 | No serial/ autocorrelation |
| | Effectiveness | 129.663 | 0.0000 | No serial/ autocorrelation |
| | SPM | 83.198 | 0.0000 | No serial/ autocorrelation |
| | OPM | 29.56 | 0.0000 | No serial/ autocorrelation |
| Tanzania | Efficiency | 4.873 | 0.0000 | No serial/ autocorrelation |
| | Effectiveness | 6.524 | 0.0189 | No serial/ autocorrelation |
| | SPM | 208.052 | 0.0000 | No serial/ autocorrelation |
| | OPM | 18.95 | 0.0000 | No serial/ autocorrelation |
| Uganda | Efficiency | 1658.92 | 0.0000 | No serial/ autocorrelation |
| | Effectiveness | 340.606 | 0.0000 | No serial/ autocorrelation |
| | SPM | 185.912 | 0.0002 | No serial/ autocorrelation |
| | OPM | 254.69 | 0.0000 | No serial/ autocorrelation |

The null hypothesis that the data has no first order auto correlation is therefore rejected and the data does not suffer from serial correlation.



### 4.2.5 Hypothesis Tests Results

From the tests conducted to establish which model would be suitable, OLS was the preferred regression model in Kenya and Uganda. However for the combined score in Tanzania, fixed effects are preferred as shown by the results of the Hausman test.

The results in table 4.2.5 indicate significant p-values for efficiency in Kenya (0.002) and Tanzania (0.000) but insignificant p-value of 0.154 in Uganda which is higher than the 5% confidence level. Similarly, effectiveness has significant p-values in Kenya (0.004) and Tanzania (0.008) but insignificant p-value of 0.121 in Uganda. The combined score has a significant p-value in Kenya (0.000) and Tanzania (0.000) but insignificant in Uganda (0.091).

**Table 4.2.5 Regression analysis results: Real GDP vs Performance**

| Country | Variable | Coefficient | SE coefficient | Adj $R^2$ | T statistic | p-value |
|---|---|---|---|---|---|---|
| Kenya | Efficiency | 0.0189 | 0.006 | 0.04 | 3.07 | 0.002 |
| | Effectiveness | 0.0148 | 0.005 | 0.07 | 2.89 | 0.004 |
| | SPM | 0.0238 | 0.03 | 0.05 | 3.49 | 0.000 |
| | OPM | 0.085 | 0.05 | 0.12 | 4.8 | 0.000 |
| Tanzania | Efficiency | -0.0062 | 0.003 | 0.2152 | -2.64 | 0.000 |
| | Effectiveness | 0.0036 | 0.004 | 0.2153 | 1.15 | 0.008 |
| | SPM | 0.0001 | 0.006 | 0.2209 | -0.01 | 0.000 |
| | OPM | 0.0052 | 0.002 | 0.5478 | 3.54 | 0.000 |
| Uganda | Efficiency | -0.0911 | 0.08 | 0.147 | -1.15 | 0.154 |
| | Effectiveness | -0.1277 | 0.103 | 0.07 | -1.56 | 0.121 |
| | SPM | 0.1521 | 0.111 | 0.149 | 1.75 | 0.091 |
| | OPM | 0.2698 | 0.254 | 0.230 | 5.6 | 0.05 |

The results confirm to the finance-growth theory that efficiency significantly influences Real GDP growth in Kenya and Tanzania with positive coefficients of 0.0189 and 0.0148 and p-values of 0.002, 0.000 which are less than the 5% level. Effectiveness also exhibits a positive and significant relation to growth in Kenya and Tanzania but negative and significant in Uganda. The combined score has a positive and significant relation in Kenya only but insignificant in Tanzania and Uganda.



### 4.3 The effect of Market Structure on Bank Performance Measures

The third objective was to analyze the effect of market structure on bank performance in commercial banks in EAC countries. Market structure was measured using three variables: market share (MS), Hirschman Herfindahl Index (HHI) and size (represented by log of total assets LnTA).

The MS was measured in terms of the deposits of individual commercial banks against the entire deposits of the banking sector. The level of market concentration was measured using the HHI which analyses each commercial bank.

### 4.3.1 Descriptive Statistics for Market structure

The average market share was 2.7% for Kenyan commercial banks. This is less compared with the East African Average of 9.2%. The average HHI was 0.26% and this is less than the East African Average of 3.1%. The average log of total of assets was 4.696 and this compares well with the East African Average of 4.76.

**Table 4.3.1 Descriptive Statistics for EAC, Kenya, Uganda and Tanzania**

| Variable | EAC | | Kenya | | Uganda | | Tanzania | |
|---|---|---|---|---|---|---|---|---|
| | Mean | Std.dev | Mean | Std.dev | Mean | Std.dev | Mean | Std.dev |
| MS | .0916 | .0794 | .0270 | .0367 | .2 | .2220 | .0476 | .0623 |
| HHI | .0310 | .0388 | .0026 | .0073 | .0841 | .1351 | .0063 | .0142 |
| LnTA | 4.7667 | .9982 | 4.6968 | 1.6291 | 5.0711 | 2.2902 | 4.5561 | 1.6936 |

The average market share was 20% for Ugandan commercial banks. This is higher compared with the East African Average of 9.2%. The average HHI was 8.4% and this is higher than the East African Average of 3.1%. The average log of total of assets was 5.07 and this compares well with the East African Average of 4.76.

The average market share was 4.7% for Tanzanian commercial banks. This is low compared with the East African Average of 9.2%. The average HHI was 0.63% and this is lower than the East African Average of 3.1%. The average log of total of assets was 4.56 and this compares well with the East African Average of 4.76.

### 4.3.2 Normality Test for Kenya Data

Normality in data is a condition where the data is free from outliers or extreme variables. A normality test therefore checks whether the distribution of the data obeys the normality assumption. Regression analysis requires normal data since the standard errors and regression coefficients calculation require the use of a mean. Normality test is carried out using a Skewness and Kurtosis test (SK test) where if p-value>0.05, then the data is normally distributed.

**Table 4.3.2: SK Test for normality for EAC Countries**

| Country | Variable | Pr(Skewness) | Pr(Kurtosis) | Adj. chi 2 | SK Prob>chi2 |
|---|---|---|---|---|---|
| Kenya | Market share | 0.0000 | 0.0000 | 72.09 | 0.0000 |
| | HHI | 0.0000 | 0.0000 | . | 0.0000 |
| | Ln TA | 0.8645 | 0.0134 | 6 | 0.0498 |
| Uganda | Market share | 0.0090 | 0.8256 | 6.30 | 0.0427 |
| | HHI | 0.0015 | 0.3630 | 9.07 | 0.0107 |
| | Ln TA | 0.5537 | 0.0597 | 4.10 | 0.1288 |
| | | | | | |
| Tanzania | Market share | 0.0000 | 0.0113 | 30.33 | 0.0000 |
| | HHI | 0.0000 | 0.0000 | . | 0.0000 |
| | Ln TA | 0.1973 | 0.5665 | 2.03 | 0.3625 |
| | | | | | |
| EAC | Market share | 0.1629 | 0.0088 | 7.58 | 0.0226 |
| | HHI | 0.1394 | 0.0135 | 7.23 | 0.0269 |
| | Ln TA | 0.0049 | 0.0345 | 9.89 | 0.0071 |



Results for Uganda indicate in table 4.3.2 that lnTA with p-values of 0.1288 is normally distributed as the reported p-values of the joint skewness kurtosis test is greater than 0.05.

In Tanzania, the results in table 4.3.5 indicate that lnTA for commercial banks is normally distributed as the reported p-value of the joint skewness kurtosis test of 0.3625 is greater than 0.05.

The results for the combined EAC as shown in table 4.3.5 indicate that MS (0.0226), HHI (0.0269) and LnTA(0.0071) are not normally distributed as the reported p-values of the joint skewness kurtosis test is less than 0.05

### 4.3.3 Unit Root tests

Time series data is either stationary or non-stationary. A stationary time series is one whose statistical properties such as mean, variance, autocorrelation, are all constant over time. Such statistics are useful as descriptors of future behavior only if the series is stationary. In addition, the use of Ordinary Least Squares (OLS) relies on the stochastic process being stationary. When the stochastic process is non-stationary, the use of OLS can produce invalid estimates.

Time series data which is stationary does not have a unit root. Therefore, the first step in panel data analysis is to conduct unit root tests to check for the stationarity of the data. A unit root is a feature of processes that evolve through time that can cause problems in statistical inference involving time series models.

The various tests that are applied for testing the unit roots include the two Fisher tests namely the Dickey- Fuller (DF) test and the Philip-Perron (PP) test. An alternative test to the fisher test is the Levin-Lin-Chu unit-root test. The unit roots for the variables; Profit Margin(PM), Return on Assets (RoA) , Return on Equity (RoE), Net Interest Margin (NIM), Single Measure (SM), market share, Herfindahl Hirschman Index (HHI) and total assets (lnta) were conducted using the Levin-Lin-Chu unit-root test. The Levin-Lin-Chu unit-root tests the null hypothesis that the panels contain unit roots. If the p-value is less than the critical p-value of 0.05, then the null hypothesis is rejected and the alternative hypothesis that panel has no unit roots( panel is stationary) is accepted.

Results for Kenyan commercial banks (see appendix) indicate that the variables PM, RoA, RoE, NIM, SPM, market share, HHI were stationary (had no unit roots). However, lnta was non stationary (had unit roots) at level (before differencing). There was no need to go to first difference owing to the scope of this study.

Unit root tests (results in appendix) for Ugandan commercial banks indicate that all variables except RoA and RoE which have p-values of 0.2699 and 0.5660 respectively (and are greater than 0.05) and therefore we fail to accept the null hypotheses that the panel data is stationary.

Unit root tests presented (see appendix) for Tanzanian commercial banks indicates NIM has a p-value greater than .05 and hence we fail to accept the null hypothesis that panel is

stationary. However we accept for the other variables which have p-values of less than .05 and hence reject the null hypothesis and conclude the panel is stationary.

The joint unit root tests results presented (see appendix) is a combination of the banks in the three countries and indicates that variables RoE (.00), Lnta (0.0119), Lnw1 (0.00) and Lnw2 (0.00) are stationary, that is their p-values are greater than 0.05. PM (0.2356), RoA (0.2816), NIM (0.1866), SPM (0.9866), HHI (0.9964) have p-values greater than .05 and hence are non stationary.



**4.3.4 Joint regression tests between the dependent and independent variables Kenya**

The final model results are presented in table 4.3.3. The results indicate that there is a negative and significant relationship between LnTA and ROE (p-value<0.05). The findings agree with those by Papadopoulos and Karagiannis, (2009) suggest that the largest sized banks are generally the least efficient banks and the smallest sized institutions appear to be the most efficient throughout the period. Therefore, inefficiency seems to be increasing with the bank size although only marginally. This seems to contradict the current consolidation of banks around the world in recent years is intensifying public policy debates on the influences of market structure on the performance of banks.

The regression models tested were:

$$PM = f(MS, HHI, LnTA)$$

$$ROA = f(MS, HHI, LnTA)$$

$$ROE = f(MS, HHI, LnTA)$$

$$NIM = f(MS, HHI, LnTA)$$

$$SPM = f(MS, HHI, LnTA)$$

$$OPM = f(MS, HHI, LnTA)$$

The results from the models are shown below:

$$PM = 0.294 + 0.624MS - 0.822HHI + 0.00671nTA$$

(3.94) (0.56) (-0.15) (0.48)

$$ROE = 0.227 + 0.226MS + 4.252HHI - 0.0091nTA$$

(12.14) (1.27) (2.43) (-2.50)

$$SPM = 0.0530 - 1.28MS + 5.496HHI + 0.07261nTA)$$
(2.06) (1.36) (-0.66) (-0.70)

$$ROA = 0.0321 + 0.411MS - 0.605HHI + 0.00271nTA$$
(2.06) (1.36) (-0.66) (-0.70)

$$NIM = 0.0553 - 0.0322MS + 1.112HHI + 0.00561nTA$$
(10.09) (-0.56) (1.55) (0.66)

The results in table 4.3.3 also indicate that there is a positive and significant relationship between HHI and ROE (p-value>0.05). Results reveal that LnTA is positively and significantly related to ROA (p-value<0.001). The findings agree with those in Dietrich and Mattig (2010), who noted that larger banks are likely to have a higher degree of product and loan diversification than smaller banks. As diversification reduces risks and economies of scale lead to increased operational efficiency, it is expected that this influences profitability and the net interest margin. Market Share has a negative and significant relationship with the SPM (p-value>0.05).



**Table 4.3.3 Joint Regression tests between the dependent and independent variables Kenya**

| | **PM** | **RoE** | **SPM** | **RoA** | **NIM** | **OPM** |
|---|---|---|---|---|---|---|
| Market Share | 0.624<br>(0.56) | 0.226<br>(1.27) | 1.280*<br>(2.28) | 0.411<br>(1.36) | -0.0322<br>(-0.56) | 0.185<br>(2.15) |
| HHI | -0.822<br>(-0.15) | 4.252*<br>(2.43) | 5.496<br>(1.54) | -0.605<br>(-0.66) | 1.112<br>(1.55) | 3.654*<br>(2.05) |
| Ln TA | 0.00671<br>(0.48) | -0.00900*<br>(-2.50) | 0.0726***<br>(8.05) | -0.00266<br>(-0.70) | 0.000559<br>(0.66) | 0.0187*<br>(6.3) |
| Constant | 0.294***<br>(3.94) | 0.227***<br>(12.14) | 0.0530<br>(1.17) | 0.0321*<br>(2.06) | 0.0553***<br>(10.09) | 0.297*<br>(8.46) |
| N | 222 | 222 | 222 | 222 | 222 | 222 |
| $R^2$ | .002 | .032 | .226 | 0.05 | 0.08 | 0.282 |

NB: t-statistics in parentheses

*P<0.05, **p<.01, ***p<0.001

### 4.3.5 Comparative Model results using Panel Data Regression (Uganda)

The results in table 4.3.4 indicate that there is a positive and significant relationship between LnTA and PM (p-value<0.05). The findings agree with those in Dietrich and Mattig (2010), who noted that larger banks are likely to have a higher degree of product and loan diversification than smaller banks. As diversification reduces risks and economies of scale lead to increased operational efficiency, it is expected that this influences profitability and the net interest margin.

There is a negative and significant relationship between LnTA and NIM (p-value<0.05). Results also reveal that there is negative and significant relationship between LnTA and SPM (p-value<0.05). The findings agree with those by Papadopoulos and Karagiannis, (2009) suggest that the largest sized banks are generally the least efficient banks and the smallest sized institutions appear to be the most efficient. Therefore, inefficiency seems to be increasing with the bank size although only marginally. This seems to contradict the current consolidation of banks around the world in recent years is intensifying public policy debates on the influences of market structure on the performance of banks.

The results also indicate that there is a negative and significant relationship between HHI and PM (p-value>0.05), between HHI and PM (p-value>0.01) and between HHI and ROA (p-value>0.01) and between HHI and NIM((p-value>0.001). Markets share has a positive and significant relationship with the PM (p-value>0.05), ROA (p-value>0.01), ROE (p-value>0.05), NIM (p-value>0.001).

**Table 4.3.4: Joint Regression results -Uganda**

| | PM | RoA | RoE | NIM | SPM | OPM |
|---|---|---|---|---|---|---|
| Market Share | 1.625*<br>(2.21) | 0.258**<br>(3.28) | 0.412*<br>(2.28) | 0.504***<br>(4.31) | 0.615*<br>(0.36) | 0.396*<br>(1.91) |
| HHI | -2.256*<br>(2.16) | -0.329**<br>(-2.90) | -2.66<br>(1.40) | -0.676**<br>(3.57) | 0.830*<br>(1.18) | 0.578*<br>(1.08) |
| Ln TA | 0.050<br>(2.37) | 0.00387<br>(1.72) | -0.0460<br>(-0.26) | -0.007*<br>(-2.41) | -0.0388***<br>(-7.21) | -0.0379*<br>(-5.89) |
| Constant | -0.197<br>(-1.56) | -0.0177<br>(-1.52) | -0.619<br>(-1.49) | 0.0800**<br>(3.44) | 1.019***<br>(28.97) | 2.16*<br>(24.78) |
| N | 30 | 30 | 30 | 30 | 30 | 30 |
| $R^2$ | 0.558 | 0.668 | 0.384 | 0.304 | 0.360 | 0.330 |

NB: t-statistics in parentheses

P<0.05, **p<.01, ***p<0.001

### 4.3.6 Comparative Model results using Panel Data Regression (Tanzania)

Fixed effects were used to run the PBT, ROE, Single measure models. Random effects were used to run ROA and NIM Model and the results are shown in table 4.3.5. The results in table 4.3.12 indicate that there is a negative and significant relationship between LnTA and SPM (p<.05) and a positive and significant relationship between LnTA and NIM (p<.01).

The results also indicate that there is a negative and significant relationship between HHI and RoE (p-value>0.001), between HHI and SPM (p-value>0.001) and between HHI and ROA (p-value>0.01) and between HHI and NIM((p-value>0.05). Markets share has a positive and significant relationship with the NIM (p-value>0.001) and SPM (p-value>0.05).

**Table 4.3.5: Joint regression results- Tanzania**

| | PM | RoE | SPM | RoA | NIM | OPM |
|---|---|---|---|---|---|---|
| Market Share | 2.194 | 0.873 | 3.726* | 0.0138 | 9.454*** | 2.179* |
| | (0.76) | (0.20) | (2.71) | (0.73) | (4.27) | (1.96) |
| HHI | 3.295 | -5.696*** | 7.409*** | 0.195** | -0.245* | 4.38* |
| | (1.86) | (-3.87) | (4.07) | (-1.88) | (-2.10) | (-3.60) |
| Ln TA | 0.0349 | 0.00352 | -0.0352 | -0.00138 | -0.245* | -0.0498 |
| | (1.47) | (0.53) | (-1.92) | (-1.88) | (-2.10) | (-.693) |
| Constant | -0.139 | 0.102 | 0.500** | 0.00972* | 0.899 | 0.364 |
| | (-1.10) | (0.45) | (3.79) | (2.50) | (1.94) | (2.49) |
| N | 126 | 126 | 126 | 126 | 126 | 126 |
| $R^2$ | 0.037 | 0.032 | 0.342 | 0.06 | 0.27 | 0.205 |

NB: t-statistics in parentheses

P<0.05, **p<.01, ***p<0.001



### 4.3.7 Comparative Model results using Panel Data Regression (Joint Countries)

A joint panel composed of the three countries (Kenya, Uganda and Tanzania) was then further analyzed. Results from both the fixed effects tests and the random effect tests indicate that a simple OLS model is the best model for the joint panel. The results are shown in table 4.3.6.

**Table 4.3.6: Final results for joint balanced panel**

| | **PM** | **RoA** | **RoE** | **NIM** | **SPM** | **OPM** |
|---|---|---|---|---|---|---|
| Market Share | -9.006* | -1.004* | 79.58 | -0.357 | 9.445* | 5.832* |
| | (-2.51) | (2.26) | (1.43) | (-0.16) | (2.22) | (2.05) |
| HHI | 17.53* | 2.157* | -117.8 | 1.289 | 26.18* | 24.36* |
| | (2.34) | (2.27) | (-1.04) | (0.28) | (2.90) | (3.15) |
| Ln TA | 0.0397 | -0.000909 | -0.0523 | -0.0828 | 0.0273 | -0.103 |
| | (1.27) | (-0.28) | (-0.22) | (-1.31) | (1.20) | (-1.09) |
| Constant | 0.316 | 0.0493 | -2.003 | 0.474 | 0.403* | -0.397 |
| | (1.83) | (2.34) | (-1.18) | (1.51) | (2.48) | (-1.39) |
| N | 18 | 18 | 18 | 18 | 18 | 18 |
| $R^2$ | 0.410 | 0.502 | 0.560 | 0.395 | 0.907 | 0.781 |

NB: t-statistics in parentheses

*P<0.05, **p<.01, ***p<0.001

The adjusted $R^2$ for the balanced panel data set shows that SM scores the highest at 90.7% and hence a goodness of fit.

### 4.3.8 Unbalanced joint panel

Simple OLS regression was conducted for the unbalanced panel after assuming that the results found in the joint balanced panel would hold for the unbalanced( that is, no need for fixed effects and no need for random effects). The results are shown in table 4.3.7.

**Table 4.3.7 Final results for joint unbalanced panel**

| | **PM** | **RoA** | **RoE** | **NIM** | **SPM** | **OPM** |
|---|---|---|---|---|---|---|
| Market Share | -2.105 | -115.1 | 50.52* | -0.293 | 3.778* | 15.298* |
| | (-1.00) | (-1.43) | (2.24) | (-0.95) | (2.51) | (2.79) |
| HHI | 6.330 | 339.0 | -77.22 | 1.498 | 1.105 | 32.21 |
| | (1.59) | (1.48) | (-1.58) | (1.85) | (0.35) | (0.987) |
| Ln TA | -0.0570 | -0.865 | 0.205 | -0.0182 | -0.00251 | -0.0812 |
| | (-1.08) | (-0.92) | (1.11) | (-1.72) | (-0.08) | (-0.28) |
| Constant | 0.402* | 6.319 | -2.088* | 0.142* | 0.253 | -0.0365 |
| | (2.55) | (1.20) | (-2.19) | (2.72) | (1.79) | (-2.08) |
| N | 27 | 27 | 27 | 27 | 27 | 27 |
| $R^2$ | 0.059 | 0.404 | 0.513 | 0.439 | 0.670 | 0.486 |

NB: t-statistics in parentheses

*P<0.05, **p<.01, ***p<0.001

The results for the unbalanced panel data are similar to the balanced panel data whereby SM is found to be the highest at 67 % when regressed against the market structure and is an indicator of the robustness.

### 4.4 The Effect of Financial Structure on Bank Performance Measures

The fourth objective was to determine the influence of financial structure on bank performance in commercial banks in EA commercial banks. Financial structure refers to the development of banks relative to that of markets and theory postulates that it does not have an independent effect on bank performance.

Financial structure is measured using two variables: $w_1$ measures the activity of stock markets relative to that of banks while $w_2$ measures size of stock markets relative to that of banks. The first variable $w_1$ is measured as the logarithm of the ratio of stock market capitalization to GDP while $w_2$ is measured as the ratio of stock market total value traded to GDP.

#### 4.4.1 Comparative Model results using Panel Data Regression (Kenya)

The final model results for Kenya are presented in table 4.4.1 analyzing the relationship between the dependent variables (PM, NIM, ROA, ROE, SPM) and the independent variables (structure size, Lnw1; structure activity, Lnw2).

The results indicate that there is a negative and significant relationship between financial structure size (Lnw1) and PM (p-value<0.001) but a positive and significant relationship with SPM (p<.05). Results further indicate that there is a negative but insignificant relationship between financial structure size and NIM, ROA and ROE.

**Table 4.4.1 Comparative Random Effects Model results**

| | PM | NIM | ROA | ROE | SPM | OPM |
|---|---|---|---|---|---|---|
| Lnw1 | -0.0606*** (-3.76) | -0.00169 (-0.97) | -0.00541 (-1.81) | -0.00367 (-0.46) | 0.0547* (2.62) | -0.087 (-0.165) |
| Lnw2 | 0.00707* (2.17) | 1.961*** (4.45) | -0.00378 (-0.14) | 0.191 (1.85) | 0.0195 (0.890 | 0.149 (1.94) |
| Constant | 0.467*** (9.29) | 0.0635*** (15.97) | 0.0405*** (6.46) | 0.209*** (12.40) | 0.259*** (5.91) | 0.237* (8.32) |
| N | 222 | 222 | 222 | 222 | 222 | 222 |
| $R^2$ | 0.1365 | 0.0184 | 0.1705 | 0.2395 | 0.2177 | 0.205 |

NB: t statistics in parentheses

*p<0.05, **p<0.01, ***p<0.001



### 4.4.2 Comparative Model results using Panel Data Regression (Uganda)

The final results for Ugandan panel modeled using OLS are presented in table 4.4.2 and they indicate that there is a negative and significant relationship between financial structure size and PM (p-value<0.05) and ROE (p-value<0.01). There is a negative but statistically insignificant relationship with NIM and ROA but positive with SPM.

The relationship between financial structure activity and ROE is positive and significant (p<0.01) but insignificant for SPM. PM, NIM, and ROA have a negative and statistically insignificant relationship with financial structure activity.

**Table 4.4.2: OLS Model and Random Effects results**

| | PM | NIM | ROA | ROE | SPM | OPM |
|---|---|---|---|---|---|---|
| Lnw1 | -0.0584* (-2.36) | -0.00123 (-0.22) | -0.0088 (-3.38) | -2.712** (-3.43) | 0.00534 (0.22) | -1.436 (-2.69) |
| Ln w2 | -0.0290 (-0.93) | -0.00570 (-1.32) | -0.0023 (-0.77) | 1.222* (2.38) | 0.00539 (0.24) | 0.678 (1.39) |
| Constant | 0.183 (1.32) | 0.104*** (4.46) | 0.0174 (1.28) | -4.955 (-1.89) | 0.852*** (7.49) | -3.05* (-1.49) |
| N | 30 | 30 | 30 | 30 | 30 | 30 |
| $R^2$ | 0.526 | 0.123 | 0.641 | 0.401 | 0.022 | 0.184 |

NB: t statistics in parentheses

*p<0.05, **p<0.01, ***p<0.001

Source: Author (2013)

### 4.4.3 Comparative Model results using Panel Data Regression (Tanzania)

Fixed effects were used to run the PM, ROA, ROE, and SPM model. NIM was run in OLS. Results in table 4.4.3 for Tanzanian commercial banks indicate that there is no significant relationship between financial structure size and structure activity and any of the bank performance measures.

**Table 4.4.3 Comparative random effects results**

| | PM | NIM | ROA | ROE | SPM | OPM |
|---|---|---|---|---|---|---|
| Lnw1 | -0.0602 (-1.41) | -0.00182 (-1.78) | -0.0405 (-1.36) | -0.0952 (-1.11) | -0.00701 (-0.34) | -0.0346 (-0.842) |
| Ln w2 | 0.0659 (0.85) | 0.00180 (1.14) | 0.0449 (0.98) | -0.0201 (-0.67) | 0.0260 (0.72) | 0.0891 (0.365) |
| Constant | -0.0853 (-0.44) | -0.00126 (-0.31) | -0.0326 (-0.30) | -0.00524 (-0.16) | 0.145 (1.53) | -0.432 (-1.03) |
| N | 126 | 126 | 126 | 126 | 126 | 126 |
| $R^2$ | 0.016 | 0.026 | 0.018 | 0.010 | 0.04 | 0.038 |

NB: t statistics in parentheses

*p<0.05, **p<0.01, ***p<0.001

### 4.4.4 Comparative Model results using Panel Data Regression (Joint Countries)

A joint panel composed of the three countries namely Kenya, Uganda and Tanzania was analyzed and the results shown on table 4.4.4 below.

Results from both the fixed effects tests and the random effect tests indicate that an OLS model is the best model for the joint panel. The results indicate that there is a negative and significant relationship between financial structure size (Lnw1) and ROE (p-value<0.001) and SM (p-value<0.001) but positive for SPM (p-value<.05). There is a negative but statistically insignificant relationship with NIM and ROA.

The relationship between financial structure activity (Lnw2) is positive and significant for ROA (p<0.05) and ROE (p<0.05) but insignificant for PM and SPM. NIM has a negative and insignificant relationship with financial structure activity.



**Table 4.4.4 Final results for joint balanced panel**

| | **PM** | **ROA** | **ROE** | **NIM** | **SPM** | **OPM** |
|---|---|---|---|---|---|---|
| Lnw1 | 0.0278* | -0.000523 | -1.471*** | -0.00756 | -0.129*** | -0.846** |
| | (2.24) | (-0.34) | (-4.70) | (-2.11) | (-14.19) | (-8.21) |
| Ln w2 | 0.0195 | 0.00707* | 1.961*** | -0.00378 | 0.191 | 2.846 |
| | (0.890 | (2.17) | (4.45) | (-0.14) | (1.85) | (3.17) |
| Constant | 0.173 | -0.00315 | -5.595** | 0.0953 | -0.191 | -3.59* |
| | (1.97) | (-0.25) | (-4.03) | (0.820) | (-3.17) | (-2.98) |
| N | 18 | 18 | 18 | 18 | 18 | 18 |
| $R^2$ | 0.398 | 0.441 | 0.020 | 0.711 | 0.00 | 0.06 |

NB: t statistics in parentheses

*p<0.05, **p<0.01, ***p<0.001

### 4.4.5 Unbalanced joint panel

Simple OLS regression was conducted for the unbalanced panel after assuming that the results found in the joint balanced panel would hold for the unbalanced (that is, no need for fixed effects and no need for random effects).

The results are shown in table 4.4.5 which indicate that there is a negative and significant relationship between financial structure size (Lnw1) and ROE (p-value<0.001) and SPM (p-value<0.001). There is a negative but statistically insignificant relationship with NIM and ROA but positive for PM and ROA.

**Table 4.4.5 Final results for joint unbalanced panel**

| | **PM** | **ROA** | **ROE** | **NIM** | **SPM** | **OPM** |
|---|---|---|---|---|---|---|
| Lnw1 | 0.0168<br>(0.56) | 0.856<br>(1.14) | -1.127***<br>(-4.69) | -0.0132<br>(-1.75) | -0.0983***<br>(-104.88) | -1.072*<br>(-3.678) |
| Ln w2 | 0.0621<br>(0.810 | -3.943<br>(-1.440 | 1.444***<br>(4.04) | 0.0235<br>(1.57) | 0.132<br>(1.15) | 0.932<br>(3.12) |
| Constant | -0.107<br>(-0.35) | 14.97<br>(1.44) | -4.167**<br>(-3.48) | -0.0146<br>(-0.27) | 0.0193<br>(0.04) | -2.43*<br>(-2.51) |
| N | 27 | 27 | 27 | 27 | 27 | 27 |
| $R^2$ | 0.09 | 0.370 | 0.191 | 0.679 | 0.372 | 0.312 |

NB: t statistics in parentheses

*p<0.05, **p<0.01, ***p<0.001

The relationship between financial structure activity (Lnw2) is positive and significant for ROE (p<0.001) but insignificant for PM, NIM and SPM. ROA has a negative and insignificant relationship with financial structure activity.

# CHAPTER FIVE: DISCUSSION AND CONCLUSION

## 5.1 Introduction

This study reviewed bank performance measures and developed a single measure of performance for commercial banks in the East African Community (EAC) banking sector. The bank performance measures included the profit margin (PM), return on assets (ROA), return on equity (ROE), net interest margin (NIM), overall performance measure (OPM) and the single performance measure (SPM). The study further analysed the theoretical relationship between bank performance, growth, market structure and financial structure.



## 5.2 Summary of key findings

This section summarizes the findings, interprets the results and draws conclusions. All the objectives are linked to relevant hypotheses. The first objective of this study was aimed at analyzing bank performance measures and proposing a single performance measure (SPM) that combines efficiency and effectiveness. The efficiency and effectiveness scores were derived using data envelopment analysis (DEA) which is based on the mathematical concept of linear programming. The study also developed the overall performance measure (OPM) which was a product of SPM and ROE.

The correlation results between efficiency and the other performance measures indicated weak correlation. The correlation results for effectiveness were also low when compared with the other measures. However, when the efficiency and effectiveness were combined to derive the single performance measure, the correlation increased. The results indicate there was a high correlation between SPM, NIM and OPM but a low correlation with PM, ROA and ROE. ROE had the lowest correlation but upon combination with SPM to derive OPM the correlation increased. This indicates the robustness of the combined measure which is a positive result as it enhances the reliability of the measure. Centenary Rural Development Bank was first when both SPM and OPM measures were applied. The ranking of banks using SPM as a base showed similar representation in the other measures.

The results further show that the banks appearing best on efficiency front do not always stand best on effectiveness front, and vice-versa. The banks can therefore enhance their performance by increasing their efficiency (that is, their ability to produce advances and

investments using physical capital and loanable funds). This conforms to previous studies and explicitly indicates that there is no apparent correlation between efficiency and effectiveness measures. It is therefore significant to note that commercial banks in EA can improve their performance either by improving their efficiency or effectiveness or both. When the SPM and ROE were combined into the OPM, the representation of banks when ranked with the other performance measures improved substantially indicating that OPM is also a robust measure.

The second objective of this study was aimed at establishing the relationship between growth (measured by real GDP growth) and the single measures of performance. The objective was addressed by testing hypothesis 2 (H2) .The findings of this study indicate that there is a positive and significant relationship between real GDP growth and performance in Kenya and Tanzania but insignificant relationship in the case of Uganda. The insignificant relationship in the case of Uganda can be attributed to the small sample of commercial banks. The results for Kenya and Tanzania indicate that the SPM and OPM conform to the finance growth theory and this strengthens their acceptability as measures of performance.

The third objective sought to establish the relationship between market structure (market share, concentration and size) and bank performance measures and it was addressed by testing hypothesis 2. The results were done for both balanced and un-balanced panel data sets.

The findings from the balanced panel data set indicate a negative and significant relationship between market share and profit margin (PM) and return on assets (ROA) but positive for the single performance measure (SPM) and the overall performance measure(OPM). The concentration measure (represented by the Hirschman Herfindahl Index (HHI) is positive and significant for PM, ROA,SPM and OPM. The size (measured by the logarithm is negative but insignificant for all the performance measures. The unbalanced panel data set shows a positive and significant relationship for only market share and Return on equity (RoE) and SPM. The results show that SPM and OPM conform to the market structure theory for both the balanced and unbalanced panel data sets and can therefore be applied to test the effects of market share and concentration on bank performance.

The fourth objective sought to establish the relationship between financial structure and bank performance, and it was addressed by testing hypothesis 4 (H4). The results were similarly

done for both balanced and un-balanced panel data sets. The findings from the balanced panel data set indicate a positive and significant relationship between financial structure and RoE while insignificant for OPM, SPM, PM, ROA and NIM. The results were the same for the unbalanced panel data set. The finance structure theory postulates an insignificant relationship between financial structure and profitability as a measure of performance. The results from this objective conform to the theory and hence the SPM can be considered as an alternative measure of performance for commercial banks in East Africa.

**5.3 Conclusions**

Bank performance measures have been an area of debate amongst researchers and this was heightened by the global financial crisis that greatly affected the financial systems in countries around the world.

The specific objectives and the hypotheses drawn from the conceptual framework were therefore, aimed first and foremost at analyzing the various performance measures, deriving a single performance measure that combined efficiency and effectiveness and examining the effects of market structure, financial structure and growth on the performance measures. The research findings have generally confirmed the existing theories regarding the various relationships that were studied.

Hypothesis 2 was based on the position that growth influences bank performance and that there is a significant relationship. Researchers have studied various aspects of the finance-growth theory. Koivu (2002) establishes that more efficient banking sectors accelerated economic growth in transition economies using a fixed-effects panel model. Berger et al., (2004) also contributes to the finance-growth literature by focusing on one dimension of the financial system and how its effects may be transmitted into economic growth. Specifically, Berger et al., (2004) hypothesizes that relatively large market shares and relatively high efficiency for community banks may promote economic growth using data from 1993-2000 on 49 nations. The results show a positive coefficient between market shares and efficiency.

The results support the earlier studies (Koivu, 2002; Berger et al., 2004) where efficiency and growth are positively related. The findings support the view that the presence of an efficient banking sector accelerated economic growth. In particular, researchers have provided additional findings on the finance-growth nexus and have offered a much bolder appraisal of

the causal relationship; firm-level, industry-level, and cross-country studies all suggest that the level of financial development exerts a large, positive impact on economic growth. Emphasis by policy regulators and moreso the Central banks should be on efficiency of the intermediation process.

Hypothesis 3 examined whether market structure (market share, concentration and size) had a significant influence on bank performance measures. This was based on the structure-conduct theory, the efficient-structure theory and the relative markets theory.

The significant and positive coefficient on concentration supports the structure-conduct theory indicating that adverse effects of higher concentration on consumer welfare are likely.

The coefficient on market share suggests that there is a significant influence on the profitability of banks by market share (MS). This might suggest that Relative Market Power hypothesis (RMP) may explain part of the profit-structure relationship and therefore indicates that market share enables banks to reap benefits associated with market power. However, MS could represent market power of the larger banks in the market gained for example through international banking and failure of several small banks, rather than efficiency.

The coefficient on the efficiency measure is positive and statistically significant with a larger effect compare to the market share and concentration, which supports efficiency hypothesis. This suggests that higher profitability of some banks may be explained by their superiority performance in producing and marketing banking services

The relationship between financial structure (structure activity and structure size) was analysed under hypothesis 4 and was based on the position that a significant relationship exists. The results indicate that structure size does not influence bank performance and this conforms to the financial structure theory. However, structure activity has a negative influence on the bank performance implying that as the stock activity increases bank performance (when measured by RoE, SPM and PM) decreases.

The study has therefore contributed to new knowledge by proposing a single measure of performance, testing its correlation with existing performance measures and ranking them. The SPM and OPM were also tested as to whether it conforms to existing theoretical

frameworks with regards to economic growth; market structure and financial structure and the results have yielded positive results.

### 5.4 Recommendations for policy and practice

From the empirical evidence and major conclusions drawn from the analysis of bank performance, the following policy implications are highlighted:

There is some in-efficiency and in-effectiveness in commercial banks in East Africa. This is indicated in the results whereby few banks score the optimum in terms of efficiency and effectiveness. Regulators banking sector should put in place policies geared towards filling the gap remaining to attain 100% efficiency and effectiveness levels.

Further, from the results large banks have been found to be more efficient and more effective than small banks in generating net-interest and non-interest incomes. Therefore, bank regulators should place more emphasis on consolidation of banks which will also increase the stability of banks by having a higher combined core capital for the commercial banks in the member states.

Multi-national banks (MNBs) which comprise banks that own and control branches and affiliates in more than one country were more efficient than Indigenous banks (IBs) which do not have branches outside their home country. However, in terms of effectiveness, IB's were more effective than MNB's. In the spirit of integration, bank regulators should put in place measures to enable MNB's increase their effectiveness so as to encourage banks to open up branches within the member state countries and even beyond.

The single measure has been shown to a robust measure as it combines both productivity and profitability and can be used by the regulators (Central banks) and bank managers to assess bank performance.

## 5.5 Recommended areas for further research

The study looked only at commercial banks in Kenya, Tanzania and Uganda. There is need for a review of other financial institutions namely community banks, microfinance institutions and co-operative societies which also intermediate funds.

The population of the commercial banks was drawn from Kenya, Uganda and Tanzania. Future studies can use larger samples of commercial banks and more countries in the context of the African perspective.

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## APPENDIX 1: VARIABLES AND INDICATORS

| Variable | Indicator(s) | Source of data |
|---|---|---|
| Single performance measure (SPM) | SPM is measured as the product of effectiveness and efficiency. | Audited financial statements<br><br>Use of Data Envelopment Analysis to derive efficiency and effectiveness scores. |
| Overall performance measure (OPM) | OPM is measured as the product of single performance measure and return on equity (ROE) | Audited financial statements |
| Return on Equity (RoE) | RoE is measured by dividing annual earnings by issued shares (equity). | Audited financial statements |
| Return on Assets (RoA) | RoA is measured by dividing annual earnings by total assets. | Audited financial statements |
| Net Interest Margin (NIM) | NIM is measured by dividing the difference between interest income and interest expenses and dividing by total assets. | Audited financial statements |
| Profit Margin (PM) | PM is measured by dividing profit before tax by total revenue. | Audited financial statements |
| Growth | Real GDP growth | Secondary data: IMF handbook |
| Market structure | *Bank size*: measured by the logarithm of total assets of individual banks. | Secondary data |
| | *Concentration:* measured using the Herfindahl Hirschman Index (HHI). | Secondary data |
| | *Market share*: the share of a bank in time period and is estimated by dividing individual bank's customer deposits with the total banking customer deposits. | Secondary data |

| | | |
|---|---|---|
| Financial Structure | *Structure Activity* measured as the logarithm of stock market value traded divided by the private credit by deposit money banks.<br><br>*Structure Size* measured as the logarithm of stock market capitalization divided by the private credit by deposit money banks. | Secondary data |

**APPENDIX 2: SUMMARY OF TESTS AND MEASUREMENT CRITERIA**

| Hypothesis | Key dimension | Independent variable | Dependent variable | What was tested or measured | Tests |
|---|---|---|---|---|---|
| H1 | Performance levels | Effectiveness and Efficiency | Performance | Significance of differences in levels of performance | Pearson's correlation |
| H2 | Finance-growth | Performance measure | Growth (real GDP, | Significance of differences in levels of performance | 1. Normality test<br>2.Multiple regression. |
| H3 | Market structure | Performance measure | Bank size<br>Market share<br>Concentration | Significance of differences in levels of performance | 1. Normality test<br>2.Multiple regression. |
| H4 | Financial depth and financial structure | Performance measure | Ratio of private credit to GDP<br>Structure size<br>Structure activity | Significance of differences in levels of performance | 1. Normality test<br>2.Multiple regression. |

## APPENDIX 3: LETTER OF INTRODUCTION FROM UNIVERSITY

**KIMATHI UNIVERSITY COLLEGE OF TECHNOLOGY**
**NYERI – MWEIGA ROAD**
**P.O. BOX 657, 10100 – NYERI KENYA TELEPHONE (061) - 2301045**
**EMAIL: registrar@kuct.ac.ke**
**OFFICE OF THE REGISTRAR (Academic Affairs)**

**21st July 2011**

**TO WHOM IT MAY CONCERN**

Dear Sir/Madam,

**RE: INTRODUCTORY LETTER FOR RESEARCH**

The bearer of this letter; Ruto Peter Ketyenya Registration Number **B311-011/2010$_{M2}$** is a bonafide PhD Student in the School of Business at Kimathi University College. The University requests for your assistance to the Student who intends to collect data in your organization in the course of her research. The data forms an integral part of the academic research project that is a partial fulfillment of the requirements for the award of a Doctor of Philosophy Degree in Business Administration.

The information collected will only be used for Academic purpose only and will be treated with utmost confidentiality.

Thank you in advance.

K. U. C. T.
REGISTRAR (AA)

**MBOTE P. K.**
**Ag. DEPUTY REGISTRAR, AA**

Copy to: Dean, School of Business
Director, BPS

**APPENDIX 4: COMMERCIAL BANKS IN EAC**

This is a list of commercial banks in **Uganda**

1.ABC Capital Bank

2.Bank of Africa

3.Bank of Baroda

4.Barclays Bank

5.Cairo International Bank

6.Centenary Bank

7.Citibank Uganda Limited

8.Crane Bank

9.DFCU Bank

10.Diamond Trust Bank

11.Ecobank Uganda

12.Equity Bank

13.Fina Bank

14.Global Trust Bank

15.Housing Finance Bank

16.Imperial Bank Uganda[3] (2011)

17.Kenya Commercial Bank

18.National Bank of Commerce

19. NIC

20.Orient Bank

21.Stanbic Bank

22.Standard Chartered Bank

23.Tropical Bank

24.United Bank for Africa

This is a list of commercial banks in **Tanzania**

1.Access Bank

2.Advans Bank Tanzania

3.Akiba Commercial Bank

4.Azania Bank

5.BancABC

6.Bank M

7.Bank of Africa

8.Bank of Baroda (Tanzania)

9.Bank of India (Tanzania)

10.Barclays Bank

11.Citibank

12.Commercial Bank of Africa (Tanzania)

13.CRDB Bank (1996)

14.Diamond Trust Bank Tanzania

15.Ecobank

16.Equity Bank Tanzania

17.Exim Bank (Tanzania) (1997)

18.First National Bank of Tanzania

19.FBME Bank

20.Habib African Bank

21.I&M Bank (Tanzania)[2]

22.International Commercial Bank

23.Kenya Commercial Bank

24.Kumail Maira Bank

25.Mkombozi Commercial Bank[3]

26.National Bank of Commerce (Tanzania)

27.National Microfinance Bank

28.NIC Bank Tanzania

29.People's Bank of Zanzibar

30.Stanbic Bank

31.Standard Chartered Bank

32.United Bank for Africa[4]

This is a list of commercial banks in **Kenya**

1.ABC Bank (Kenya)

2.Bank of Africa

3.Bank of Baroda

4.Bank of India

5.Barclays Bank

6.Chase Bank (Kenya)

7. CFC Stanbic

8.Citibank

9.Commercial Bank of Africa

10.Consolidated Bank of Kenya

11.Cooperative Bank of Kenya

12.Credit Bank

13.Development Bank of Kenya

14.Diamond Trust Bank

15.Dubai Bank Kenya

16.Ecobank

17.Equatorial Commercial Bank

18.Equity Bank

19.Family Bank

20.Fidelity Commercial Bank Limited

21.Fina Bank

22.First Community Bank

23.Giro Commercial Bank

24.Guardian Bank

25.Gulf African Bank

26.Habib Bank

27.Habib Bank AG Zurich

28.I&M Bank

29.Imperial Bank Kenya

30.Jamii Bora Bank

31.Kenya Commercial Bank

32.K-Rep Bank

33.Middle East Bank Kenya

34.National Bank of Kenya

35.NIC Bank

36.Oriental Commercial Bank

37.Paramount Universal Bank

38.Prime Bank (Kenya)

39.CFC Stanbic Bank

40.Standard Chartered Bank

41.Transnational Bank Kenya

42.United Bank for Africa[2]

43.Victoria Commercial Bank

This is a list of commercial banks in **Burundi**

1.Access Bank dba Finbank

2.Banque Belgo - Africaine]

3.Banque Commerciale du Burundi

4.Banque de Credit de Bujumbura

5.Banque Nationale de Développement Économique

6.Bank of Africa

7.Banque Populaire du Burundi

8.CRDB Bank Burundi (Coming in 2012)

9.Diamond Trust Bank

10.Ecobank

11.Interbank Burundi

12.Kenya Commercial Bank

13.United Bank for Africa

This is a list of commercial banks in **Rwanda**

1.Access Bank Rwanda

2.Agaseke Bank

3.Bank of Kigali

4.Commercial Bank of Rwanda (Banque Commerciale du Rwanda) (BCR)

5.Banque Populaire du Rwanda SA (BPR)

6.Compagnie Générale de Banque (Cogebanque)

7.Ecobank

8.Equity Bank (Rwanda)

9.Fina Bank (Rwanda)

10.Housing Bank of Rwanda (Banque de l'Habitat du Rwanda) (BHR)

11.Kenya Commercial Bank

12.Unguka Bank

13.Urwego Opportunity Bank (UOB) - an affiliate of Opportunity International

14.Zigama CSS

**Appendix 5: Results for tests**

**Table 1 Performance for 2011**

| *2011* | **Efficiency** | | **Effectiveness** | | **Combine** | |
|---|---|---|---|---|---|---|
| | Score | Rank | Score | Rank | Score | Rank |
| Stanbic Ug | 1 | 1 | 1 | 1 | 1 | 1 |
| National Microfinance Bank | 0.8359 | 8 | 1 | 1 | 0.835963 | 2 |
| Centenary Rural Development Bank | 0.7862 | 13 | 1 | 1 | 0.786292 | 3 |
| National Bank of Commerce (Tanzania) | 0.6981 | 17 | 1 | 1 | 0.698158 | 4 |
| Azania Bank | 0.8448 | 7 | 0.818534 | 3 | 0.691573 | 5 |
| DFCU | 1 | 1 | 0.651811 | 6 | 0.671704 | 6 |
| Tropical bank | 0.93829 | 4 | 0.702847 | 4 | 0.659474 | 7 |
| International Commercial Bank | 1 | 1 | 0.586669 | 10 | 0.586669 | 8 |
| Barclays Bank Tz | 0.607755 | 23 | 0.942839 | 2 | 0.573015 | 9 |
| Exim Bank (Tanzania) (1997) | 0.929094 | 5 | 0.588192 | 9 | 0.546486 | 10 |
| CRDB Bank (1996) | 0.831875 | 8 | 0.651811 | 7 | 0.542225 | 11 |
| Habib bank Ke | 1 | 1 | 0.480993 | 20 | 0.480993 | 12 |
| Bank of India Ke | 1 | 1 | 0.431036 | 25 | 0.431036 | 13 |
| Citibank Tanzania | 0.808291 | 11 | 0.510965 | 17 | 0.413008 | 14 |
| Imperial bank Ug | 1 | 1 | 0.40757 | 26 | 0.40757 | 15 |
| Credit bank | 0.400399 | 36 | 1 | 1 | 0.400399 | 16 |
| Akiba Commercial Bank | 0.705556 | 16 | 0.557467 | 11 | 0.393324 | 17 |
| NIC Ke | 0.681594 | 18 | 0.521271 | 14 | 0.355295 | 18 |
| Imperial bank Ke | 0.622672 | 22 | 0.481578 | 19 | 0.299865 | 19 |
| Transnational bank | 0.566301 | 25 | 0.512522 | 16 | 0.290242 | 20 |
| Oriental bank | 0.570725 | 24 | 0.474402 | 21 | 0.270753 | 21 |
| Krep | 0.267726 | 44 | 1 | 1 | 0.267726 | 22 |
| Barclays bank Ke | 0.42943 | 34 | 0.618524 | 8 | 0.265613 | 23 |
| Prime bank | 1 | 1 | 0.253973 | 42 | 0.253973 | 24 |
| Stanbic Bank Tz | 0.786458 | 12 | 0.316837 | 35 | 0.249179 | 25 |
| KCB Ke | 0.466367 | 30 | 0.516421 | 15 | 0.240842 | 26 |
| Habib AG Zurich | 0.509611 | 28 | 0.456118 | 22 | 0.232443 | 27 |
| Kenya Commercial Bank Tz | 0.829097 | 10 | 0.273128 | 41 | 0.22645 | 28 |
| NIC Bank Tanzania | 1 | 1 | 0.225875 | 45 | 0.225875 | 29 |
| Fidelity Commercial bank | 0.716216 | 15 | 0.304183 | 37 | 0.217861 | 30 |
| Africa Banking Corporation (BankBC) | 0.628057 | 21 | 0.340733 | 33 | 0.214 | 31 |
| Diamond Trust Ke | 0.464256 | 32 | 0.453613 | 23 | 0.210593 | 32 |
| Commercial Bank of Africa (Tanzania) | 1 | 1 | 0.19286 | 46 | 0.19286 | 33 |
| Fina bank Ke | 0.468861 | 29 | 0.398189 | 29 | 0.186695 | 34 |
| CFC Stanbic Ke | 0.387125 | 38 | 0.452125 | 24 | 0.175029 | 35 |

| | | | | | | |
|---|---|---|---|---|---|---|
| I&M bank (Ke) | 0.465975 | 31 | 0.358528 | 31 | 0.167065 | 36 |
| Standard Chartered Bank (Tz) | 0.967774 | 2 | 0.170583 | 51 | 0.165086 | 37 |
| Bank of Baroda (Tanzania) | 0.956343 | 3 | 0.171693 | 50 | 0.164197 | 38 |
| Guardian bank | 0.674702 | 20 | 0.238049 | 44 | 0.160612 | 39 |
| Bank of Africa(Tz) | 0.852032 | 6 | 0.181179 | 48 | 0.15437 | 40 |
| Equity bank Ke | 0.222801 | 47 | 0.673175 | 5 | 0.149984 | 41 |
| NBK Ke | 0.269262 | 43 | 0.55659 | 12 | 0.149869 | 42 |
| Chase bank | 0.422004 | 35 | 0.306116 | 36 | 0.129182 | 43 |
| Paramount Universal bank | 0.442283 | 33 | 0.291906 | 39 | 0.129105 | 44 |
| Habib African Bank Tz | 0.680026 | 19 | 0.189765 | 47 | 0.129045 | 45 |
| Diamond Trust Bank Tanzania | 0.782025 | 14 | 0.16344 | 52 | 0.127814 | 46 |
| I&M Bank (Tanzania) | 1 | 1 | 0.124951 | 53 | 0.124951 | 47 |
| Victoria Commercial Bank | 0.373323 | 39 | 0.323368 | 34 | 0.120721 | 48 |
| CBA Ke | 0.276259 | 42 | 0.398228 | 28 | 0.110014 | 49 |
| Bank of Africa Ke | 0.531822 | 27 | 0.180376 | 49 | 0.095928 | 50 |
| Giro Commercial bank | 0.390141 | 37 | 0.245409 | 43 | 0.095744 | 51 |
| Equatorial bank | 0.340159 | 40 | 0.27775 | 40 | 0.094479 | 52 |
| Ecobank Ke | 0.170701 | 50 | 0.534498 | 13 | 0.091239 | 53 |
| Standard Chartered bank Ke | 0.172188 | 49 | 0.509071 | 18 | 0.087656 | 54 |
| ABC Ke | 0.237851 | 46 | 0.363911 | 30 | 0.086557 | 55 |
| Middle East bank | 0.249503 | 45 | 0.303501 | 38 | 0.075724 | 56 |
| Co-operative bank | 0.18967 | 48 | 0.351684 | 32 | 0.066704 | 57 |
| Consolidated bank | 0.141649 | 51 | 0.399204 | 27 | 0.056547 | 58 |
| Jamii Bora (Fmr City Finance Bank) | 0.04569 | 52 | 1 | 1 | 0.04569 | 59 |
| Bank of Baroda Ke | 1 | 1 | 0 | 53 | 0 | 60 |
| Citibank Ke | 0.562133 | 26 | 0 | 54 | 0 | 61 |
| Dubai bank | 0.0354 | 53 | 0 | 55 | 0 | 62 |
| FBME | 0.0315 | 54 | 0 | 56 | 0 | 63 |

**Table 2 Performance for 2006-2011 (Averaged)**

| | Efficiency | Rank | Effectiveness | Rank | SPM | Rank |
|---|---|---|---|---|---|---|
| | | | | | | |
| Centenary Rural Development Bank | 0.5616 | 30 | 0.8333 | 3 | 0.7283 | 1 |
| Transnational bank | 0.6775 | 9 | 0.7307 | 7 | 0.6245 | 2 |
| Habib bank Ke | 0.8256 | 1 | 0.6243 | 16 | 0.6202 | 3 |
| Stanbic Ug | 0.6449 | 16 | 0.6197 | 17 | 0.5979 | 4 |
| DFCU | 0.6667 | 12 | 0.5770 | 24 | 0.5803 | 5 |
| Krep | 0.5086 | 43 | 0.8862 | 2 | 0.5531 | 6 |
| NBK Ke | 0.5727 | 29 | 0.6977 | 8 | 0.5326 | 7 |
| Habib AG Zurich | 0.7034 | 7 | 0.6047 | 21 | 0.5275 | 8 |
| ABC Capital bank Ug | 0.3804 | 56 | 0.5952 | 23 | 0.5124 | 9 |
| Barclays Bank Tz | 0.5964 | 25 | 0.7380 | 6 | 0.5113 | 10 |
| Dubai bank | 0.5239 | 40 | 0.6667 | 11 | 0.5044 | 11 |
| Barclays bank Ke | 0.5572 | 31 | 0.7401 | 4 | 0.4870 | 12 |
| Imperial bank Ke | 0.6019 | 22 | 0.6436 | 15 | 0.4476 | 13 |
| Bank of India Ke | 0.7359 | 4 | 0.5478 | 27 | 0.4455 | 14 |
| Equity bank Ke | 0.3740 | 57 | 0.9001 | 1 | 0.4320 | 15 |
| National Bank of Commerce (Tanzania) | 0.6067 | 21 | 0.6156 | 19 | 0.4256 | 16 |
| Citibank Tanzania | 0.7854 | 3 | 0.4796 | 36 | 0.4250 | 17 |
| International Commercial Bank | 0.6212 | 19 | 0.6576 | 13 | 0.4190 | 18 |
| Azania Bank | 0.7317 | 6 | 0.4963 | 33 | 0.4162 | 19 |
| Credit bank | 0.5423 | 34 | 0.6183 | 18 | 0.3959 | 20 |
| Tropical bank | 0.4531 | 50 | 0.4175 | 41 | 0.3920 | 21 |
| Akiba Commercial Bank | 0.5337 | 35 | 0.5502 | 25 | 0.3869 | 22 |
| Bank of Baroda Ke | 0.8246 | 2 | 0.4100 | 42 | 0.3865 | 23 |
| NIC Ke | 0.6547 | 15 | 0.4906 | 34 | 0.3835 | 24 |
| Standard Chartered bank Ke | 0.4758 | 48 | 0.6521 | 14 | 0.3778 | 25 |
| Citibank Ke | 0.5258 | 39 | 0.6003 | 22 | 0.3699 | 26 |
| National Microfinance Bank | 0.6825 | 8 | 0.5156 | 31 | 0.3608 | 27 |
| KCB Ke | 0.4368 | 51 | 0.7400 | 5 | 0.3359 | 28 |
| Diamond Trust Ke | 0.6773 | 10 | 0.4248 | 39 | 0.3307 | 29 |
| Oriental bank | 0.4991 | 45 | 0.5501 | 26 | 0.3268 | 30 |
| Co-operative bank | 0.3496 | 59 | 0.6898 | 9 | 0.3240 | 31 |
| CFC Stanbic Ke | 0.5302 | 38 | 0.5083 | 32 | 0.3217 | 32 |
| Paramount Universal bank | 0.4641 | 49 | 0.4198 | 40 | 0.3145 | 33 |
| Stanbic Bank Tz | 0.5491 | 32 | 0.5327 | 28 | 0.3140 | 34 |
| Equatorial bank | 0.5990 | 23 | 0.4407 | 37 | 0.3108 | 35 |
| Fina bank Ke | 0.5202 | 41 | 0.4811 | 35 | 0.3042 | 36 |
| Consolidated bank | 0.3419 | 61 | 0.6702 | 10 | 0.3025 | 37 |
| Jamii Bora (Fmr City Finance Bank) | 0.4351 | 52 | 0.6074 | 20 | 0.2806 | 38 |
| Giro Commercial bank | 0.5469 | 33 | 0.4018 | 45 | 0.2703 | 39 |
| Prime bank | 0.6597 | 14 | 0.3650 | 48 | 0.2673 | 40 |

| | | | | | | |
|---|---|---|---|---|---|---|
| ABC Ke | 0.3677 | 58 | 0.5317 | 29 | 0.2668 | 41 |
| Victoria Commercial Bank | 0.6288 | 18 | 0.3552 | 50 | 0.2535 | 42 |
| Guardian bank | 0.6401 | 17 | 0.3214 | 53 | 0.2498 | 43 |
| CRDB Bank (1996) | 0.5960 | 27 | 0.3854 | 46 | 0.2491 | 44 |
| I&M bank (Ke) | 0.4827 | 46 | 0.4053 | 43 | 0.2372 | 45 |
| Middle East bank | 0.3974 | 54 | 0.4403 | 38 | 0.2371 | 46 |
| Fidelity Commercial bank | 0.5960 | 26 | 0.3322 | 51 | 0.2355 | 47 |
| CBA Ke | 0.3431 | 60 | 0.5250 | 30 | 0.2303 | 48 |
| Chase bank | 0.4801 | 47 | 0.4026 | 44 | 0.2297 | 49 |
| Habib African Bank Tz | 0.5324 | 37 | 0.3631 | 49 | 0.2213 | 50 |
| I&M Bank (Tanzania) | 0.7334 | 5 | 0.3072 | 55 | 0.2209 | 51 |
| Standard Chartered Bank (Tz) | 0.6613 | 13 | 0.2182 | 61 | 0.2173 | 52 |
| Bank of Africa Ke | 0.6074 | 20 | 0.2888 | 57 | 0.2127 | 53 |
| Exim Bank (Tanzania) (1997) | 0.5169 | 42 | 0.2476 | 59 | 0.2040 | 54 |
| Commercial Bank of Africa (Tanzania) | 0.6716 | 11 | 0.2903 | 56 | 0.1968 | 55 |
| Bank of Africa(Tz) | 0.5764 | 28 | 0.3299 | 52 | 0.1928 | 56 |
| Africa Banking Corpration (BankBC) | 0.5985 | 24 | 0.2692 | 58 | 0.1916 | 57 |
| Ecobank Ke | 0.4336 | 53 | 0.3793 | 47 | 0.1878 | 58 |
| Kenya Commercial Bank Tz | 0.5067 | 44 | 0.2442 | 60 | 0.1818 | 59 |
| FBME Bank | 0.1747 | 62 | 0.6606 | 12 | 0.1755 | 60 |
| Orient bank | 0.1667 | 63 | 0.1667 | 62 | 0.1667 | 61 |
| Bank of Baroda (Tanzania) | 0.5324 | 36 | 0.3193 | 54 | 0.1296 | 62 |
| Diamond Trust Bank Tanzania | 0.3869 | 55 | 0.1366 | 63 | 0.1056 | 63 |

**Table 3 Ranking of Performance measures (2006-2011)**

| *EAC Countries* | SM | | PM | | ROA | | ROE | | NIM | |
|---|---|---|---|---|---|---|---|---|---|---|
| | Score | Rank | Score | Rank | Score | Rank | Score | Rank | Score | Rank |
| Centenary Rural Development Bank | 0.7283 | 1 | 0.2411 | 33 | 0.0446 | 8 | 0.4653 | 2 | 0.1331 | 2 |
| Transnational bank | 0.6245 | 2 | 0.2289 | 35 | 0.0281 | 23 | 0.0918 | 46 | 0.0795 | 8 |
| Habib bank Ke | 0.6202 | 3 | 0.4374 | 10 | 0.0319 | 19 | 0.2057 | 29 | 0.0587 | 23 |
| Stanbic Ug | 0.5979 | 4 | 0.3659 | 16 | 0.0516 | 3 | 0.4989 | 1 | 0.1002 | 5 |
| DFCU | 0.5803 | 5 | 0.3163 | 24 | 0.0344 | 15 | 0.4402 | 3 | 0.0949 | 6 |
| Krep | 0.5531 | 6 | -0.0146 | 58 | 0.0004 | 58 | -0.0059 | 60 | 0.1234 | 4 |
| NBK | 0.5326 | 7 | 0.3238 | 23 | 0.0343 | 16 | 0.2724 | 17 | 0.0761 | 11 |
| Habib AG Zurich | 0.5275 | 8 | 0.4820 | 8 | 0.0319 | 20 | 0.2599 | 23 | 0.0525 | 27 |
| ABC Capital bank | 0.5124 | 9 | -0.2052 | 63 | -0.0200 | 62 | -0.0391 | 62 | 0.0619 | 19 |
| Barclays Bank Tz | 0.5113 | 10 | 0.1677 | 45 | 0.0037 | 53 | 0.0259 | 54 | 0.0302 | 52 |
| Dubai bank | 0.5044 | 11 | 0.0492 | 55 | 0.0059 | 49 | 0.0264 | 53 | 0.0768 | 10 |
| Barclays bank Ke | 0.4870 | 12 | 0.4013 | 14 | 0.0534 | 2 | 0.3944 | 5 | 0.0841 | 7 |
| Imperial bank Ke | 0.4476 | 13 | 0.3539 | 18 | 0.0508 | 4 | 0.3662 | 6 | 0.1297 | 3 |
| Bank of India Ke | 0.4455 | 14 | 0.6888 | 4 | 0.0426 | 10 | 0.3224 | 10 | 0.0517 | 29 |
| Equity bank | 0.4320 | 15 | 0.3531 | 19 | 0.0501 | 5 | 0.2800 | 15 | 0.0701 | 14 |
| National Bank of Commerce (Tanzania) | 0.4256 | 16 | 0.1201 | 49 | 0.0040 | 52 | 0.3407 | 7 | 0.0324 | 48 |
| Citibank Tanzania | 0.4250 | 17 | 0.2317 | 34 | 0.0103 | 37 | 0.2481 | 25 | 0.0335 | 46 |
| International Commercial Bank | 0.4190 | 18 | 0.0833 | 54 | 0.0029 | 55 | 0.0103 | 58 | 0.0345 | 44 |
| Azania Bank | 0.4162 | 19 | 0.1853 | 39 | 0.0064 | 48 | 0.0573 | 49 | 0.0325 | 47 |
| Credit bank | 0.3959 | 20 | 0.2418 | 32 | 0.0217 | 30 | 0.1218 | 40 | 0.0638 | 18 |
| Tropical bank | 0.3920 | 21 | 0.2563 | 31 | 0.0192 | 32 | 0.1685 | 34 | 0.0511 | 31 |
| Akiba Commercial Bank | 0.3869 | 22 | 0.0474 | 56 | 0.0022 | 56 | 0.0184 | 56 | 0.0594 | 22 |
| Bank of Baroda Ke | 0.3865 | 23 | 0.5854 | 5 | 0.0384 | 12 | 0.3264 | 8 | 0.0554 | 24 |
| NIC Ke | 0.3835 | 24 | 0.4329 | 12 | 0.1039 | 1 | 0.2656 | 20 | 0.0544 | 25 |
| Standard Chartered bank Ke | 0.3778 | 25 | 0.5087 | 7 | 0.0485 | 6 | 0.4186 | 4 | 0.0641 | 17 |
| Citibank Ke | 0.3699 | 26 | 0.7061 | 3 | 0.0449 | 7 | 0.2767 | 16 | 0.0436 | 39 |
| National Microfinance Bank | 0.3608 | 27 | 0.1763 | 42 | 0.0097 | 39 | 0.3095 | 11 | 0.0505 | 32 |
| KCB Ke | 0.3359 | 28 | 0.2937 | 26 | 0.0374 | 13 | 0.2859 | 14 | 0.0772 | 9 |
| Diamond Trust Ke | 0.3307 | 29 | 0.3688 | 15 | 0.0351 | 14 | 0.2707 | 19 | 0.0675 | 15 |
| Oriental bank | 0.3268 | 30 | 0.1862 | 38 | 0.0284 | 22 | 0.0957 | 45 | 0.0288 | 54 |
| Co-operative bank | 0.3240 | 31 | 0.2816 | 29 | 0.0314 | 21 | 0.2720 | 18 | 0.0703 | 13 |
| CFC Stanbic | 0.3217 | 32 | 0.3509 | 20 | 0.0204 | 31 | 0.2281 | 28 | 0.0406 | 40 |
| Paramount Universal bank | 0.3145 | 33 | 0.2129 | 37 | 0.0228 | 27 | 0.1364 | 36 | 0.0491 | 33 |
| Stanbic Bank Tz | 0.3140 | 34 | 0.0119 | 57 | 0.0044 | 51 | 0.1252 | 39 | 0.0265 | 58 |
| Equatorial bank | 0.3108 | 35 | 0.1568 | 46 | 0.0157 | 34 | 0.0850 | 47 | 0.0522 | 28 |

| | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| Fina bank | 0.3042 | 36 | 0.1732 | 44 | 0.0160 | 33 | 0.1437 | 35 | 0.0720 | 12 |
| Consolidated bank | 0.3025 | 37 | 0.1160 | 51 | 0.0134 | 36 | 0.1049 | 42 | 0.0672 | 16 |
| Jamii Bora (Fmr City Finance Bank) | 0.2806 | 38 | -0.1491 | 62 | -0.0228 | 63 | -0.0456 | 63 | 0.0595 | 21 |
| Giro Commercial bank | 0.2703 | 39 | 0.2929 | 27 | 0.0225 | 28 | 0.1927 | 31 | 0.0484 | 34 |
| Prime bank | 0.2673 | 40 | 0.4114 | 13 | 0.0230 | 26 | 0.1883 | 32 | 0.0395 | 42 |
| ABC Ke | 0.2668 | 41 | 0.3546 | 17 | 0.0330 | 18 | 0.2480 | 26 | 0.0616 | 20 |
| Victoria Commercial Bank | 0.2535 | 42 | 0.5573 | 6 | 0.0394 | 11 | 0.2414 | 27 | 0.0526 | 26 |
| Guardian bank | 0.2498 | 43 | 0.0898 | 52 | 0.0052 | 50 | 0.0469 | 50 | 0.0477 | 37 |
| CRDB Bank (1996) | 0.2491 | 44 | 0.2209 | 36 | 0.0071 | 45 | 0.2616 | 22 | 0.0319 | 49 |
| I&M bank Ke | 0.2372 | 45 | 0.9455 | 1 | 0.0439 | 9 | 0.2952 | 12 | 0.0480 | 35 |
| Middle East bank | 0.2371 | 46 | 0.2983 | 25 | 0.0235 | 25 | 0.0989 | 44 | 0.0402 | 41 |
| Fidelity Commercial bank | 0.2355 | 47 | 0.2575 | 30 | 0.0221 | 29 | 0.2001 | 30 | 0.0439 | 38 |
| CBA Ke | 0.2303 | 48 | 0.4351 | 11 | 0.0342 | 12 | 0.3257 | 12 | 0.0477 | 36 |
| Chase bank | 0.2297 | 49 | 0.3278 | 22 | 0.0248 | 24 | 0.2640 | 21 | 0.0512 | 30 |
| Habib African Bank | 0.2213 | 50 | 0.1833 | 40 | 0.0096 | 40 | 0.1272 | 38 | 0.0261 | 59 |
| I&M Bank (Tanzania) | 0.2209 | 51 | 0.2835 | 28 | 0.0102 | 38 | 0.1818 | 33 | 0.0242 | 63 |
| Standard Chartered Bank Tz | 0.2173 | 52 | 0.1266 | 47 | 0.0084 | 42 | 0.0353 | 52 | 0.0245 | 62 |
| Bank of Africa Ke | 0.2127 | 53 | 0.7171 | 2 | 0.0136 | 35 | 0.1051 | 41 | 0.0351 | 43 |
| Exim Bank (Tanzania) (1997) | 0.2040 | 54 | 0.3288 | 21 | 0.0070 | 46 | 0.1027 | 43 | 0.0296 | 53 |
| Commercial Bank of Africa (Tanzania) | 0.1968 | 55 | -0.0191 | 59 | -0.0010 | 60 | 0.0180 | 57 | 0.0245 | 61 |
| Bank of Africa Tz | 0.1928 | 56 | 0.0838 | 53 | 0.0019 | 57 | 0.0245 | 55 | 0.0285 | 56 |
| Africa Banking Corpration (BancABC) | 0.1916 | 57 | -0.1213 | 61 | -0.0025 | 61 | -0.0356 | 61 | 0.0304 | 51 |
| Ecobank Ke | 0.1878 | 58 | 0.1214 | 48 | 0.0079 | 43 | 0.0585 | 48 | 0.0340 | 45 |
| Kenya Commercial Bank Tz | 0.1818 | 59 | -0.0506 | 60 | -0.0001 | 59 | 0.0040 | 59 | 0.0267 | 57 |
| FBME Bank | 0.1755 | 60 | 0.4425 | 9 | 0.0067 | 47 | 0.1351 | 37 | 1.6958 | 1 |
| NIC Bank Tanzania | 0.1667 | 61 | 0.1180 | 50 | 0.0035 | 54 | 0.2901 | 13 | 0.0286 | 55 |
| Bank of Baroda (Tanzania) | 0.1296 | 62 | 0.1762 | 43 | 0.0073 | 44 | 0.0450 | 51 | 0.0261 | 60 |
| Diamond Trust Bank Tanzania | 0.1056 | 63 | 0.1789 | 41 | 0.0085 | 41 | 0.2593 | 24 | 0.0304 | 50 |

**Table 4 Classification of commercial banks in EA by size**

| All commercial banks | Efficiency | Effectiveness | SPM | Size |
|---|---|---|---|---|
| Centenary Rural Development Bank | 0.8677 | 1.0000 | 0.8677 | Large |
| DFCU | 1.0000 | 0.7437 | 0.7437 | Large |
| Stanbic Ug | 0.8116 | 0.7863 | 0.6382 | Large |
| NBK Ke | 0.7328 | 0.6977 | 0.5113 | Large |
| Barclays Bank Tz | 0.7691 | 0.6559 | 0.5045 | Large |
| Barclays bank Ke | 0.6554 | 0.7401 | 0.4850 | Large |
| Imperial bank Ke | 0.6981 | 0.6436 | 0.4493 | Large |
| National Microfinance Bank | 0.7385 | 0.5955 | 0.4398 | Large |
| Equity bank Ke | 0.4689 | 0.9001 | 0.4221 | Large |
| Bank of Baroda Ke | 0.9549 | 0.4100 | 0.3914 | Large |
| NIC Ke | 0.7639 | 0.4906 | 0.3748 | Large |
| KCB Ke | 0.5061 | 0.7400 | 0.3745 | Large |
| Citibank Ke | 0.6231 | 0.6003 | 0.3741 | Large |
| Standard Chartered bank Ke | 0.5726 | 0.6521 | 0.3734 | Large |
| Standard Chartered Bank Tz | 0.9391 | 0.3529 | 0.3314 | Large |
| Diamond Trust Ke | 0.7767 | 0.4248 | 0.3300 | Large |
| National Bank of Commerce (Tanzania) | 0.5723 | 0.5619 | 0.3216 | Large |
| Stanbic Bank Tz | 0.5854 | 0.5331 | 0.3121 | Large |
| CFC Stanbic Ke | 0.6126 | 0.5083 | 0.3114 | Large |
| Fina bank Ke | 0.6262 | 0.4811 | 0.3012 | Large |
| Co-operative bank | 0.4339 | 0.6898 | 0.2993 | Large |
| Consolidated bank | 0.4239 | 0.6702 | 0.2841 | Large |
| Prime bank | 0.7542 | 0.3650 | 0.2753 | Large |
| Giro Commercial bank | 0.6539 | 0.4018 | 0.2628 | Large |
| Chase bank | 0.5493 | 0.4026 | 0.2211 | Large |
| I&M Bank Ke | 0.7112 | 0.3099 | 0.2204 | Large |
| Exim Bank (Tanzania) (1997) | 0.6633 | 0.3193 | 0.2118 | Large |
| Bank of Africa Ke | 0.7007 | 0.2888 | 0.2024 | Large |
| CRDB Bank (1996) | 0.6302 | 0.3070 | 0.1935 | Large |
| FBME Bank | 0.1988 | 0.6267 | 0.1246 | Large |
| Habib bank Ke | 0.9922 | 0.6243 | 0.6194 | Small |
| Transnational bank | 0.8334 | 0.7307 | 0.6090 | Small |
| Tropical bank | 0.9428 | 0.6407 | 0.6040 | Small |
| ABC Capital bank Ug | 0.7138 | 0.7619 | 0.5438 | Small |
| Krep | 0.6128 | 0.8862 | 0.5430 | Small |
| Habib AG Zurich | 0.8576 | 0.6047 | 0.5186 | Small |
| Bank of India Ke | 0.8273 | 0.5478 | 0.4532 | Small |
| Akiba Commercial Bank | 0.6666 | 0.6552 | 0.4367 | Small |
| Dubai bank | 0.6336 | 0.6667 | 0.4224 | Small |
| International Commercial Bank | 0.6910 | 0.5941 | 0.4105 | Small |
| Credit bank | 0.6617 | 0.6183 | 0.4091 | Small |

| | | | | |
|---|---|---|---|---|
| NIC Bank Tanzania | 0.7911 | 0.4913 | 0.3887 | Small |
| Citibank Tanzania | 0.8865 | 0.4308 | 0.3819 | Small |
| Jamii Bora (Fmr City Finance Bank) | 0.6018 | 0.6074 | 0.3655 | Small |
| Oriental bank | 0.5975 | 0.5501 | 0.3287 | Small |
| Azania Bank | 0.8323 | 0.3732 | 0.3106 | Small |
| Equatorial bank | 0.6829 | 0.4407 | 0.3010 | Small |
| ABC Ke | 0.4851 | 0.5317 | 0.2579 | Small |
| Victoria Commercial Bank | 0.7240 | 0.3552 | 0.2571 | Small |
| Africa Banking Corpration (BankBC) | 0.5976 | 0.4266 | 0.2549 | Small |
| Kenya Commercial Bank Tz | 0.6232 | 0.3986 | 0.2484 | Small |
| Guardian bank | 0.7690 | 0.3214 | 0.2471 | Small |
| Habib African Bank Tz | 0.5788 | 0.4242 | 0.2455 | Small |
| Commercial Bank of Africa (Tanzania) | 0.6407 | 0.3742 | 0.2397 | Small |
| I&M bank (Tanzania) | 0.5877 | 0.4053 | 0.2382 | Small |
| Fidelity Commercial bank | 0.6993 | 0.3322 | 0.2323 | Small |
| Middle East bank | 0.5249 | 0.4403 | 0.2311 | Small |
| CBA Ke | 0.4344 | 0.5250 | 0.2281 | Small |
| Paramount Universal bank | 0.4641 | 0.4198 | 0.1948 | Small |
| Bank of Africa Tz | 0.6262 | 0.3089 | 0.1934 | Small |
| Bank of Baroda (Tanzania) | 0.4937 | 0.2652 | 0.1309 | Small |
| Diamond Trust Bank Tanzania | 0.2694 | 0.0644 | 0.0174 | Small |
| Ecobank Ke | 0.5102 | 0.3793 | 0.1935 | Small |

**Table 5 Classification of commercial banks in EA by affiliation**

| *All banks* | *Efficiency Score* | *Effectiveness Score* | *SPM Score* | *Affiliation* |
|---|---|---|---|---|
| Centenary Rural Development Bank | 0.8677 | 1.0000 | 0.8677 | Multinational bank |
| Habib bank Ke | 0.9922 | 0.6243 | 0.6194 | Multinational bank |
| Stanbic Ug | 0.8116 | 0.7863 | 0.6382 | Multinational bank |
| Bank of India Ke | 0.8273 | 0.5478 | 0.4532 | Multinational bank |
| Barclays Bank Tz | 0.7691 | 0.6559 | 0.5045 | Multinational bank |
| Barclays bank Ke | 0.6554 | 0.7401 | 0.4850 | Multinational bank |
| Imperial bank Ke | 0.6981 | 0.6436 | 0.4493 | Multinational bank |
| NIC Bank Tanzania | 0.7911 | 0.4913 | 0.3887 | Multinational bank |
| Citibank Tanzania | 0.8865 | 0.4308 | 0.3819 | Multinational bank |
| Africa Banking Corporation (BankBC) | 0.5976 | 0.4266 | 0.2549 | Multinational bank |
| Kenya Commercial Bank Tz | 0.6232 | 0.3986 | 0.2484 | Multinational bank |
| Commercial Bank of Africa (Tanzania) | 0.6407 | 0.3742 | 0.2397 | Multinational bank |
| I&M bank (Tanzania) | 0.5877 | 0.4053 | 0.2382 | Multinational bank |
| Bank of Africa Tz | 0.6262 | 0.3089 | 0.1934 | Multinational bank |
| Bank of Baroda (Tanzania) | 0.4937 | 0.2652 | 0.1309 | Multinational bank |
| Diamond Trust Bank Tanzania | 0.2694 | 0.0644 | 0.0174 | Multinational bank |
| Ecobank Ke | 0.5102 | 0.3793 | 0.1935 | Multinational bank |
| Bank of Baroda Ke | 0.9549 | 0.4100 | 0.3914 | Multinational bank |
| NIC Ke | 0.7639 | 0.4906 | 0.3748 | Multinational bank |
| KCB Ke | 0.5061 | 0.7400 | 0.3745 | Multinational bank |
| Citibank Ke | 0.6231 | 0.6003 | 0.3741 | Multinational bank |
| Standard Chartered bank Ke | 0.5726 | 0.6521 | 0.3734 | Multinational bank |
| Standard Chartered Bank Tz | 0.9391 | 0.3529 | 0.3314 | Multinational bank |
| Diamond Trust Ke | 0.7767 | 0.4248 | 0.3300 | Multinational bank |
| ABC Ke | 0.4851 | 0.5317 | 0.2579 | Multinational bank |
| Stanbic Bank Tz | 0.5854 | 0.5331 | 0.3121 | Multinational bank |
| CFC Stanbic Ke | 0.6126 | 0.5083 | 0.3114 | Multinational bank |
| CBA Ke | 0.4344 | 0.5250 | 0.2281 | Multinational bank |
| Chase bank | 0.5493 | 0.4026 | 0.2211 | Multinational bank |
| I&M Bank Ke | 0.7112 | 0.3099 | 0.2204 | Multinational bank |
| Exim Bank (Tanzania) (1997) | 0.6633 | 0.3193 | 0.2118 | Multinational bank |
| Bank of Africa Ke | 0.7007 | 0.2888 | 0.2024 | Multinational bank |
| DFCU | 1.0000 | 0.7437 | 0.7437 | Indigenous bank |
| NBK Ke | 0.7328 | 0.6977 | 0.5113 | Indigenous bank |
| National Microfinance Bank | 0.7385 | 0.5955 | 0.4398 | Indigenous bank |
| Equity bank Ke | 0.4689 | 0.9001 | 0.4221 | Indigenous bank |

| | | | | |
|---|---|---|---|---|
| National Bank of Commerce (Tanzania) | 0.5723 | 0.5619 | 0.3216 | Indigenous bank |
| CRDB Bank (1996) | 0.6302 | 0.3070 | 0.1935 | Indigenous bank |
| FBME Bank | 0.1988 | 0.6267 | 0.1246 | Indigenous bank |
| Transnational bank | 0.8334 | 0.7307 | 0.6090 | Indigenous bank |
| Tropical bank | 0.9428 | 0.6407 | 0.6040 | Indigenous bank |
| ABC Capital bank Ug | 0.7138 | 0.7619 | 0.5438 | Indigenous bank |
| Krep | 0.6128 | 0.8862 | 0.5430 | Indigenous bank |
| Habib AG Zurich | 0.8576 | 0.6047 | 0.5186 | Indigenous bank |
| Fina bank Ke | 0.6262 | 0.4811 | 0.3012 | Indigenous bank |
| Akiba Commercial Bank | 0.6666 | 0.6552 | 0.4367 | Indigenous bank |
| Dubai bank | 0.6336 | 0.6667 | 0.4224 | Indigenous bank |
| International Commercial Bank | 0.6910 | 0.5941 | 0.4105 | Indigenous bank |
| Credit bank | 0.6617 | 0.6183 | 0.4091 | Indigenous bank |
| Co-operative bank | 0.4339 | 0.6898 | 0.2993 | Indigenous bank |
| Consolidated bank | 0.4239 | 0.6702 | 0.2841 | Indigenous bank |
| Jamii Bora (Fmr City Finance Bank) | 0.6018 | 0.6074 | 0.3655 | Indigenous bank |
| Oriental bank | 0.5975 | 0.5501 | 0.3287 | Indigenous bank |
| Azania Bank | 0.8323 | 0.3732 | 0.3106 | Indigenous bank |
| Equatorial bank | 0.6829 | 0.4407 | 0.3010 | Indigenous bank |
| Victoria Commercial Bank | 0.7240 | 0.3552 | 0.2571 | Indigenous bank |
| Guardian bank | 0.7690 | 0.3214 | 0.2471 | Indigenous bank |
| Habib African Bank Tz | 0.5788 | 0.4242 | 0.2455 | Indigenous bank |
| Prime bank | 0.7542 | 0.3650 | 0.2753 | Indigenous bank |
| Giro Commercial bank | 0.6539 | 0.4018 | 0.2628 | Indigenous bank |
| Fidelity Commercial bank | 0.6993 | 0.3322 | 0.2323 | Indigenous bank |
| Middle East bank | 0.5249 | 0.4403 | 0.2311 | Indigenous bank |
| Paramount Universal bank | 0.4641 | 0.4198 | 0.1948 | Indigenous bank |

| 2006-2011 | Efficiency | | PM | | ROA | | ROE | | NIM | |
|---|---|---|---|---|---|---|---|---|---|---|
| | Score | Rank | Score | Rank | Score | Rank | Score | Rank | Score | Rank |
| Habib bank Ke | 0.8256 | 1 | 0.437 | 10 | 0.0319 | 19 | 0.206 | 29 | 0.059 | 23 |
| Bank of Baroda Ke | 0.8246 | 2 | 0.585 | 5 | 0.0384 | 12 | 0.326 | 8 | 0.055 | 24 |
| Citibank Tanzania | 0.7854 | 3 | 0.232 | 34 | 0.0103 | 37 | 0.248 | 25 | 0.034 | 46 |
| Bank of India Ke | 0.7359 | 4 | 0.689 | 4 | 0.0426 | 10 | 0.322 | 10 | 0.052 | 29 |
| I&M Bank (Tanzania) | 0.7334 | 5 | 0.284 | 28 | 0.0102 | 38 | 0.182 | 33 | 0.024 | 63 |
| Azania Bank | 0.7317 | 6 | 0.185 | 39 | 0.0064 | 48 | 0.057 | 49 | 0.033 | 47 |
| Habib AG Zurich | 0.7034 | 7 | 0.482 | 8 | 0.0319 | 20 | 0.26 | 23 | 0.053 | 27 |
| National Microfinance Bank | 0.6825 | 8 | 0.176 | 42 | 0.0097 | 39 | 0.31 | 11 | 0.051 | 32 |
| Transnational bank | 0.6775 | 9 | 0.229 | 35 | 0.0281 | 23 | 0.092 | 46 | 0.08 | 8 |
| Diamond Trust Ke | 0.6773 | 10 | 0.369 | 15 | 0.0351 | 14 | 0.271 | 19 | 0.068 | 15 |
| Commercial Bank of Africa (Tanzania) | 0.6716 | 11 | -0.02 | 59 | -0.001 | 60 | 0.018 | 57 | 0.025 | 61 |
| DFCU | 0.6667 | 12 | 0.316 | 24 | 0.0344 | 15 | 0.44 | 3 | 0.095 | 6 |
| Standard Chartered Bank (Tz) | 0.6613 | 13 | 0.127 | 47 | 0.0084 | 42 | 0.035 | 52 | 0.025 | 62 |
| Prime bank | 0.6597 | 14 | 0.411 | 13 | 0.023 | 26 | 0.188 | 32 | 0.04 | 42 |
| NIC Ke | 0.6547 | 15 | 0.433 | 12 | 0.1039 | 1 | 0.266 | 20 | 0.054 | 25 |
| Stanbic Ug | 0.6449 | 16 | 0.366 | 16 | 0.0516 | 3 | 0.499 | 1 | 0.1 | 5 |
| Guardian bank | 0.6401 | 17 | 0.09 | 52 | 0.0052 | 50 | 0.047 | 50 | 0.048 | 37 |
| Victoria Commercial Bank | 0.6288 | 18 | 0.557 | 6 | 0.0394 | 11 | 0.241 | 27 | 0.053 | 26 |
| International Commercial Bank | 0.6212 | 19 | 0.083 | 54 | 0.0029 | 55 | 0.01 | 58 | 0.035 | 44 |
| Bank of Africa Ke | 0.6074 | 20 | 0.717 | 2 | 0.0136 | 35 | 0.105 | 41 | 0.035 | 43 |
| National Bank of Commerce (Tanzania) | 0.6067 | 21 | 0.12 | 49 | 0.004 | 52 | 0.341 | 7 | 0.032 | 48 |
| Imperial bank Ke | 0.6019 | 22 | 0.354 | 18 | 0.0508 | 4 | 0.366 | 6 | 0.13 | 3 |
| Equatorial bank | 0.5990 | 23 | 0.157 | 46 | 0.0157 | 34 | 0.085 | 47 | 0.052 | 28 |
| Africa Banking Corporation (BankBC) | 0.5985 | 24 | -0.12 | 61 | -0.003 | 61 | -0.036 | 61 | 0.03 | 51 |

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|---|---|---|---|---|---|---|---|---|---|---|
| Barclays Bank Tz | 0.5964 | 25 | 0.168 | 45 | 0.0037 | 53 | 0.026 | 54 | 0.03 | 52 |
| Fidelity Commercial bank | 0.5960 | 26 | 0.258 | 30 | 0.0221 | 29 | 0.2 | 30 | 0.044 | 38 |
| CRDB Bank (1996) | 0.5960 | 27 | 0.221 | 36 | 0.0071 | 45 | 0.262 | 22 | 0.032 | 49 |
| Bank of Africa(Tz) | 0.5764 | 28 | 0.084 | 53 | 0.0019 | 57 | 0.025 | 55 | 0.029 | 56 |
| NBK Ke | 0.5727 | 29 | 0.324 | 23 | 0.0343 | 16 | 0.272 | 17 | 0.076 | 11 |
| Centenary Rural Development Bank | 0.5616 | 30 | 0.241 | 33 | 0.0446 | 8 | 0.465 | 2 | 0.133 | 2 |
| Barclays bank Ke | 0.5572 | 31 | 0.401 | 14 | 0.0534 | 2 | 0.394 | 5 | 0.084 | 7 |
| Stanbic Bank Tz | 0.5491 | 32 | 0.012 | 57 | 0.0044 | 51 | 0.125 | 39 | 0.027 | 58 |
| Giro Commercial bank | 0.5469 | 33 | 0.293 | 27 | 0.0225 | 28 | 0.193 | 31 | 0.048 | 34 |
| Credit bank | 0.5423 | 34 | 0.242 | 32 | 0.0217 | 30 | 0.122 | 40 | 0.064 | 18 |
| Akiba Commercial Bank | 0.5337 | 35 | 0.047 | 56 | 0.0022 | 56 | 0.018 | 56 | 0.059 | 22 |
| Bank of Baroda (Tanzania) | 0.5324 | 36 | 0.176 | 43 | 0.0073 | 44 | 0.045 | 51 | 0.026 | 60 |
| Habib African Bank Tz | 0.5324 | 37 | 0.183 | 40 | 0.0096 | 40 | 0.127 | 38 | 0.026 | 59 |
| CFC Stanbic Ke | 0.5302 | 38 | 0.351 | 20 | 0.0204 | 31 | 0.228 | 28 | 0.041 | 40 |
| Citibank Ke | 0.5258 | 39 | 0.706 | 3 | 0.0449 | 7 | 0.277 | 16 | 0.044 | 39 |
| Dubai bank | 0.5239 | 40 | 0.049 | 55 | 0.0059 | 49 | 0.026 | 53 | 0.077 | 10 |
| Fina bank Ke | 0.5202 | 41 | 0.173 | 44 | 0.016 | 33 | 0.144 | 35 | 0.072 | 12 |
| Exim Bank (Tanzania) (1997) | 0.5169 | 42 | 0.329 | 21 | 0.007 | 46 | 0.103 | 43 | 0.03 | 53 |
| Krep | 0.5086 | 43 | -0.01 | 58 | 0.0004 | 58 | -0.006 | 60 | 0.123 | 4 |
| Kenya Commercial Bank Tz | 0.5067 | 44 | -0.05 | 60 | -1E-04 | 59 | 0.004 | 59 | 0.027 | 57 |
| Oriental bank | 0.4991 | 45 | 0.186 | 38 | 0.0284 | 22 | 0.096 | 45 | 0.029 | 54 |
| I&M bank (Ke) | 0.4827 | 46 | 0.946 | 1 | 0.0439 | 9 | 0.295 | 12 | 0.048 | 35 |
| Chase bank | 0.4801 | 47 | 0.328 | 22 | 0.0248 | 24 | 0.264 | 21 | 0.051 | 30 |
| Standard Chartered bank Ke | 0.4758 | 48 | 0.509 | 7 | 0.0485 | 6 | 0.419 | 4 | 0.064 | 17 |
| Paramount Universal bank | 0.4641 | 49 | 0.213 | 37 | 0.0228 | 27 | 0.136 | 36 | 0.049 | 33 |
| Tropical bank | 0.4531 | 50 | 0.256 | 31 | 0.0192 | 32 | 0.169 | 34 | 0.051 | 31 |
| KCB Ke | 0.4368 | 51 | 0.294 | 26 | 0.0374 | 13 | 0.286 | 14 | 0.077 | 9 |

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|---|---|---|---|---|---|---|---|---|---|---|
| Jamii Bora (Fmr City Finance Bank) | 0.4351 | 52 | -0.15 | 62 | -0.023 | 63 | -0.046 | 63 | 0.06 | 21 |
| Ecobank Ke | 0.4336 | 53 | 0.121 | 48 | 0.0079 | 43 | 0.059 | 48 | 0.034 | 45 |
| Middle East bank | 0.3974 | 54 | 0.298 | 25 | 0.0235 | 25 | 0.099 | 44 | 0.04 | 41 |
| Diamond Trust Bank Tanzania | 0.3869 | 55 | 0.179 | 41 | 0.0085 | 41 | 0.259 | 24 | 0.03 | 50 |
| ABC Capital bank Ug | 0.3804 | 56 | -0.21 | 63 | -0.02 | 62 | -0.039 | 62 | 0.062 | 19 |
| Equity bank Ke | 0.3740 | 57 | 0.353 | 19 | 0.0501 | 5 | 0.28 | 15 | 0.07 | 14 |
| ABC Ke | 0.3677 | 58 | 0.355 | 17 | 0.033 | 18 | 0.248 | 26 | 0.062 | 20 |
| Co-operative bank | 0.3496 | 59 | 0.282 | 29 | 0.0314 | 21 | 0.272 | 18 | 0.07 | 13 |
| CBA Ke | 0.3431 | 60 | 0.435 | 11 | 0.0342 | 12 | 0.326 | 12 | 0.048 | 36 |
| Consolidated bank | 0.3419 | 61 | 0.116 | 51 | 0.0134 | 36 | 0.105 | 42 | 0.067 | 16 |
| FBME Bank | 0.1747 | 62 | 0.443 | 9 | 0.0067 | 47 | 0.135 | 37 | 0.17 | 1 |
| NIC bank Tanzania | 0.1667 | 63 | 0.118 | 50 | 0.0035 | 54 | 0.29 | 13 | 0.029 | 55 |

| 2006-2011 | Effectiveness | | PM | | ROA | | ROE | | NIM | |
|---|---|---|---|---|---|---|---|---|---|---|
| | Score | Rank | Score | Rank | Score | Rank | Score | Rank | Score | Rank |
| Equity bank Ke | 0.9001 | 1 | 0.3531 | 19 | 0.0501 | 5 | 0.28 | 15 | 0.07 | 14 |
| Krep | 0.8862 | 2 | -0.015 | 58 | 0.0004 | 58 | -0.0059 | 60 | 0.123 | 4 |
| Centenary Rural Development Bank | 0.8333 | 3 | 0.2411 | 33 | 0.0446 | 8 | 0.4653 | 2 | 0.133 | 2 |
| Barclays bank Ke | 0.7401 | 4 | 0.4013 | 14 | 0.0534 | 2 | 0.3944 | 5 | 0.084 | 7 |
| KCB Ke | 0.7400 | 5 | 0.2937 | 26 | 0.0374 | 13 | 0.2859 | 14 | 0.077 | 9 |
| Barclays Bank Tz | 0.7380 | 6 | 0.1677 | 45 | 0.0037 | 53 | 0.0259 | 54 | 0.03 | 52 |
| Transnational bank | 0.7307 | 7 | 0.2289 | 35 | 0.0281 | 23 | 0.0918 | 46 | 0.08 | 8 |
| NBK Ke | 0.6977 | 8 | 0.3238 | 23 | 0.0343 | 16 | 0.2724 | 17 | 0.076 | 11 |
| Co-operative bank | 0.6898 | 9 | 0.2816 | 29 | 0.0314 | 21 | 0.272 | 18 | 0.07 | 13 |
| Consolidated bank | 0.6702 | 10 | 0.116 | 51 | 0.0134 | 36 | 0.1049 | 42 | 0.067 | 16 |
| Dubai bank | 0.6667 | 11 | 0.0492 | 55 | 0.0059 | 49 | 0.0264 | 53 | 0.077 | 10 |
| FBME Bank | 0.6606 | 12 | 0.4425 | 9 | 0.0067 | 47 | 0.1351 | 37 | 0.17 | 1 |
| International Commercial Bank | 0.6576 | 13 | 0.0833 | 54 | 0.0029 | 55 | 0.0103 | 58 | 0.035 | 44 |
| Standard Chartered bank Ke | 0.6521 | 14 | 0.5087 | 7 | 0.0485 | 6 | 0.4186 | 4 | 0.064 | 17 |
| Imperial bank Ke | 0.6436 | 15 | 0.3539 | 18 | 0.0508 | 4 | 0.3662 | 6 | 0.13 | 3 |
| Habib bank Ke | 0.6243 | 16 | 0.4374 | 10 | 0.0319 | 19 | 0.2057 | 29 | 0.059 | 23 |
| Stanbic Ug | 0.6197 | 17 | 0.3659 | 16 | 0.0516 | 3 | 0.4989 | 1 | 0.1 | 5 |
| Credit bank | 0.6183 | 18 | 0.2418 | 32 | 0.0217 | 30 | 0.1218 | 40 | 0.064 | 18 |
| National Bank of Commerce (Tanzania) | 0.6156 | 19 | 0.1201 | 49 | 0.004 | 52 | 0.3407 | 7 | 0.032 | 48 |
| Jamii Bora (Fmr City Finance Bank) | 0.6074 | 20 | -0.149 | 62 | -0.0228 | 63 | -0.0456 | 63 | 0.06 | 21 |
| Habib AG Zurich | 0.6047 | 21 | 0.482 | 8 | 0.0319 | 20 | 0.2599 | 23 | 0.053 | 27 |
| Citibank Ke | 0.6003 | 22 | 0.7061 | 3 | 0.0449 | 7 | 0.2767 | 16 | 0.044 | 39 |
| ABC Capital bank Ug | 0.5952 | 23 | -0.205 | 63 | -0.02 | 62 | -0.0391 | 62 | 0.062 | 19 |
| DFCU | 0.5770 | 24 | 0.3163 | 24 | 0.0344 | 15 | 0.4402 | 3 | 0.095 | 6 |

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|---|---|---|---|---|---|---|---|---|---|---|
| Akiba Commercial Bank | 0.5502 | 25 | 0.0474 | 56 | 0.0022 | 56 | 0.0184 | 56 | 0.059 | 22 |
| Oriental bank | 0.5501 | 26 | 0.1862 | 38 | 0.0284 | 22 | 0.0957 | 45 | 0.029 | 54 |
| Bank of India Ke | 0.5478 | 27 | 0.6888 | 4 | 0.0426 | 10 | 0.3224 | 10 | 0.052 | 29 |
| Stanbic Bank Tz | 0.5327 | 28 | 0.0119 | 57 | 0.0044 | 51 | 0.1252 | 39 | 0.027 | 58 |
| ABC Ke | 0.5317 | 29 | 0.3546 | 17 | 0.033 | 18 | 0.248 | 26 | 0.062 | 20 |
| CBA Ke | 0.5250 | 30 | 0.4351 | 11 | 0.0342 | 12 | 0.3257 | 12 | 0.048 | 36 |
| National Microfinance Bank | 0.5156 | 31 | 0.1763 | 42 | 0.0097 | 39 | 0.3095 | 11 | 0.051 | 32 |
| CFC Stanbic Ke | 0.5083 | 32 | 0.3509 | 20 | 0.0204 | 31 | 0.2281 | 28 | 0.041 | 40 |
| Azania Bank | 0.4963 | 33 | 0.1853 | 39 | 0.0064 | 48 | 0.0573 | 49 | 0.033 | 47 |
| NIC Ke | 0.4906 | 34 | 0.4329 | 12 | 0.1039 | 1 | 0.2656 | 20 | 0.054 | 25 |
| Fina bank Ke | 0.4811 | 35 | 0.1732 | 44 | 0.016 | 33 | 0.1437 | 35 | 0.072 | 12 |
| Citibank Tanzania | 0.4796 | 36 | 0.2317 | 34 | 0.0103 | 37 | 0.2481 | 25 | 0.034 | 46 |
| Equatorial bank | 0.4407 | 37 | 0.1568 | 46 | 0.0157 | 34 | 0.085 | 47 | 0.052 | 28 |
| Middle East bank | 0.4403 | 38 | 0.2983 | 25 | 0.0235 | 25 | 0.0989 | 44 | 0.04 | 41 |
| Diamond Trust Ke | 0.4248 | 39 | 0.3688 | 15 | 0.0351 | 14 | 0.2707 | 19 | 0.068 | 15 |
| Paramount Universal bank | 0.4198 | 40 | 0.2129 | 37 | 0.0228 | 27 | 0.1364 | 36 | 0.049 | 33 |
| Tropical bank | 0.4175 | 41 | 0.2563 | 31 | 0.0192 | 32 | 0.1685 | 34 | 0.051 | 31 |
| Bank of Baroda Ke | 0.4100 | 42 | 0.5854 | 5 | 0.0384 | 12 | 0.3264 | 8 | 0.055 | 24 |
| I&M bank (Ke) | 0.4053 | 43 | 0.3539 | 18 | 0.0508 | 4 | 0.3662 | 6 | 0.13 | 3 |
| Chase bank | 0.4026 | 44 | 0.3278 | 22 | 0.0248 | 24 | 0.264 | 21 | 0.051 | 30 |
| Giro Commercial bank | 0.4018 | 45 | 0.2929 | 27 | 0.0225 | 28 | 0.1927 | 31 | 0.048 | 34 |
| CRDB Bank (1996) | 0.3854 | 46 | 0.2209 | 36 | 0.0071 | 45 | 0.2616 | 22 | 0.032 | 49 |
| Ecobank Ke | 0.3793 | 47 | 0.1214 | 48 | 0.0079 | 43 | 0.0585 | 48 | 0.034 | 45 |
| Prime bank | 0.3650 | 48 | 0.4114 | 13 | 0.023 | 26 | 0.1883 | 32 | 0.04 | 42 |
| Habib African Bank Tz | 0.3631 | 49 | 0.1833 | 40 | 0.0096 | 40 | 0.1272 | 38 | 0.026 | 59 |
| Victoria Commercial Bank | 0.3552 | 50 | 0.5573 | 6 | 0.0394 | 11 | 0.2414 | 27 | 0.053 | 26 |
| Fidelity Commercial bank | 0.3322 | 51 | 0.2575 | 30 | 0.0221 | 29 | 0.2001 | 30 | 0.044 | 38 |
| Bank of Africa(Tz) | 0.3299 | 52 | 0.0838 | 53 | 0.0019 | 57 | 0.0245 | 55 | 0.029 | 56 |

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|---|---|---|---|---|---|---|---|---|---|---|
| Guardian bank | 0.3214 | 53 | 0.0898 | 52 | 0.0052 | 50 | 0.0469 | 50 | 0.048 | 37 |
| Bank of Baroda (Tanzania) | 0.3193 | 54 | 0.1762 | 43 | 0.0073 | 44 | 0.045 | 51 | 0.026 | 60 |
| I&M Bank (Tanzania) | 0.3072 | 55 | 0.2835 | 28 | 0.0102 | 38 | 0.1818 | 33 | 0.024 | 63 |
| Commercial Bank of Africa (Tanzania) | 0.2903 | 56 | -0.019 | 59 | -0.001 | 60 | 0.018 | 57 | 0.025 | 61 |
| Bank of Africa Ke | 0.2888 | 57 | 0.7171 | 2 | 0.0136 | 35 | 0.1051 | 41 | 0.035 | 43 |
| Africa Banking Corporation (BankBC) | 0.2692 | 58 | -0.121 | 61 | -0.0025 | 61 | -0.0356 | 61 | 0.03 | 51 |
| Exim Bank (Tanzania) (1997) | 0.2476 | 59 | 0.3288 | 21 | 0.007 | 46 | 0.1027 | 43 | 0.03 | 53 |
| Kenya Commercial Bank Tz | 0.2442 | 60 | 0.051 | 60 | -0.0001 | 59 | 0.004 | 59 | 0.027 | 57 |
| Standard Chartered Bank (Tz) | 0.2182 | 61 | 0.1266 | 47 | 0.0084 | 42 | 0.0353 | 52 | 0.025 | 62 |
| Orient bank | 0.1667 | 62 | 0.118 | 50 | 0.0035 | 54 | 0.2901 | 13 | 0.029 | 55 |
| Diamond Trust Bank Tanzania | 0.1366 | 63 | 0.1789 | 41 | 0.0085 | 41 | 0.2593 | 24 | 0.03 | 50 |

**Table 6: Levin-Lin-Chu Unit-Root Test Kenya**

| | **Number of panels and periods** | **Ho and Ha** | **Adjusted t-statistic** | **P-value** | **Comment** |
|---|---|---|---|---|---|
| PM | Number of panel =21<br>Number of periods =6 | Ho: Panels are non-stationary<br>Ha: Panels are stationary | -11.71 | 0.00 | Stationary |
| ROA | Number of panel =21<br>Number of periods =6 | Ho: Panels are non-stationary<br>Ha: Panels are stationary | -7.04 | 0.00 | Stationary |
| ROE | Number of panel =21<br>Number of periods =6 | Ho: Panels are non-stationary<br>Ha: Panels are stationary | -31.01 | 0.00 | Stationary |
| NIM | Number of panel =21<br>Number of periods =6 | Ho: Panels are non-stationary<br>Ha: Panels are stationary | -17.04 | 0.00 | Stationary |
| SM | Number of panel =21<br>Number of periods =6 | Ho: Panels are non-stationary<br>Ha: Panels are stationary | -33.89 | 0.00 | Stationary |
| Market share | Number of panel =21<br>Number of periods =6 | Ho: Panels are non-stationary<br>Ha: Panels are stationary | -32.12 | 0.00 | Stationary |
| HHI | Number of panel =21<br>Number of periods =6 | Ho: Panels are non-stationary<br>Ha: Panels are stationary | -11.58 | 0.00 | Stationary |
| Ln TA | Number of panel =21<br>Number of | Ho: Panels are non-stationary<br>Ha: Panels are | 5.98 | 1.00 | Non-stationary |

| | | | | | |
|---|---|---|---|---|---|
| | periods =6 | stationary | | | |
| Ln w1 | Number of panel =21<br>Number of periods =6 | Ho: Panels are non-stationary<br>Ha: Panels are stationary | -8.29 | 0.00 | Stationary |
| Ln w2 | Number of panel =21<br>Number of periods =6 | Ho: Panels are non-stationary<br>Ha: Panels are stationary | -3.84 | 0.00 | Stationary |

**Table 7: Levin-Lin-Chu Unit-Root Test Uganda**

| | **Number of panels and periods** | **Ho and Ha** | **Adjusted t-statistic** | **P-value** | **Comment** |
|---|---|---|---|---|---|
| PM | Number of panel =21<br>Number of periods =6 | Ho: Panels are non-stationary<br>Ha: Panels are stationary | -8.13 | 0.00 | Stationary |
| ROA | Number of panel =21<br>Number of periods =6 | Ho: Panels are non-stationary<br>Ha: Panels are stationary | -0.61 | 0.2699 | Stationary |
| ROE | Number of panel =21<br>Number of periods =6 | Ho: Panels are non-stationary<br>Ha: Panels are stationary | 0.17 | 0.566 | Stationary |
| NIM | Number of panel =21<br>Number of periods =6 | Ho: Panels are non-stationary<br>Ha: Panels are stationary | -4.46 | 0.00 | Stationary |
| SM | Number of panel =21<br>Number of periods =6 | Ho: Panels are non-stationary<br>Ha: Panels are stationary | -3.26 | 0.00 | Stationary |
| Market share | Number of panel =21<br>Number of periods =6 | Ho: Panels are non-stationary<br>Ha: Panels are stationary | -4.52 | 0.00 | Stationary |
| HHI | Number of panel =21<br>Number of periods =6 | Ho: Panels are non-stationary<br>Ha: Panels are stationary | -3.73 | 0.00 | Stationary |
| Ln TA | Number of panel =21<br>Number of periods =6 | Ho: Panels are non-stationary<br>Ha: Panels are stationary | -7.39 | 0.00 | Stationary |

| | | | | | |
|---|---|---|---|---|---|
| Ln w1 | Number of panel =21<br>Number of periods =6 | Ho: Panels are non-stationary<br>Ha: Panels are stationary | -0.003 | 0.00 | Stationary |
| Ln w2 | Number of panel =21<br>Number of periods =6 | Ho: Panels are non-stationary<br>Ha: Panels are stationary | -6.07 | 0.00 | Stationary |

**Table 8: Levin-Lin-Chu Unit-Root Test Tanzania**

| | Number of panels and periods | Ho and Ha | Adjusted t-statistic | P-value | Comment |
|---|---|---|---|---|---|
| PM | Number of panel =21<br>Number of periods =6 | Ho:Panels are non-stationary<br>Ha: Panels are stationary | -38.00 | 0.00 | Stationary |
| ROA | Number of panel =21<br>Number of periods =6 | Ho:Panels are non-stationary<br>Ha: Panels are stationary | -24.93 | 0.00 | Stationary |
| ROE | Number of panel =21<br>Number of periods =6 | Ho:Panels are non-stationary<br>Ha: Panels are stationary | -88.79 | 0.00 | Stationary |
| NIM | Number of panel =21<br>Number of periods =6 | Ho:Panels are non-stationary<br>Ha: Panels are stationary | 36.99 | 1.00 | Non-stationary |
| SM | Number of panel =21<br>Number of periods =6 | Ho:Panels are non-stationary<br>Ha: Panels are stationary | -31.77 | 0.00 | Stationary |
| Market share | Number of panel =21<br>Number of periods =6 | Ho:Panels are non-stationary<br>Ha: Panels are stationary | -9.21 | 0.00 | Stationary |
| HHI | Number of panel =21<br>Number of periods =6 | Ho:Panels are non-stationary<br>Ha: Panels are stationary | -13.36 | 0.00 | Stationary |
| Ln TA | Number of panel =21<br>Number of periods =6 | Ho:Panels are non-stationary<br>Ha: Panels are stationary | -23.52 | 0.00 | Stationary |

| | | | | | |
|---|---|---|---|---|---|
| Ln w1 | Number of panel =21<br>Number of periods =6 | Ho:Panels are non-stationary<br>Ha: Panels are stationary | -67.63 | 0.00 | Stationary |
| Ln w2 | Number of panel =21<br>Number of periods =6 | Ho:Panels are non-stationary<br>Ha: Panels are stationary | -48.06 | 0.00 | Stationary |

**Table 9: Levin-Lin-Chu Unit-Root for EA banks**

| | Number of panels and periods | Ho and Ha | Adjusted t-statistic | P-value | Comment |
|---|---|---|---|---|---|
| PM | Number of panel =21 Number of periods =6 | Ho: Panels are non-stationary Ha: Panels are stationary | -7.20 | 0.2356 | Non-stationary |
| ROA | Number of panel =21 Number of periods =6 | Ho: Panels are non-stationary Ha: Panels are stationary | -0.58 | 0.2816 | Non-stationary |
| ROE | Number of panel =21 Number of periods =6 | Ho: Panels are non-stationary Ha: Panels are stationary | -2.01 | 0.00 | Stationary |
| NIM | Number of panel =21 Number of periods =6 | Ho: Panels are non-stationary Ha: Panels are stationary | -0.88 | 0.1886 | Non-stationary |
| SM | Number of panel =21 Number of periods =6 | Ho: Panels are non-stationary Ha: Panels are stationary | 2.22 | 0.9866 | Non-stationary |
| Market share | Number of panel =21 Number of periods =6 | Ho: Panels are non-stationary Ha: Panels are stationary | -8.5 | 0.00 | Stationary |
| HHI | Number of panel =21 Number of periods =6 | Ho: Panels are non-stationary Ha: Panels are stationary | 2.69 | 0.9964 | Non-stationary |
| Ln TA | Number of panel =21 Number of periods =6 | Ho: Panels are non-stationary Ha: Panels are stationary | -2.26 | 0.0119 | Stationary |

| | | | | | |
|---|---|---|---|---|---|
| Ln w1 | Number of panel =21 Number of periods =6 | Ho: Panels are non-stationary Ha: Panels are stationary | -14.7 | 0.00 | Stationary |
| Ln w2 | Number of panel =21 Number of periods =6 | Ho: Panels are non-stationary Ha: Panels are stationary | -8.62 | 0.00 | Stationary |