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Impact of Macroeconomic variables on profitability of Ghana Commercial Bank and Agricultural Development Bank in Ghana

BY

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DECLARATION

I hereby declare that this submission is my own original work towards the Award of Master of Science, Economics and that to the best of my knowledge it contains no material previously published by another person nor material which has been accepted for the award of any other degree of the University, except where due acknowledgement has been made in the text.

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ABSTRACT

The survival of Commercial Banks in Ghana depends on the ability of the banks to maximize their returns on the resources they employ. Nonetheless, the ability of these banks to make profit is dependent on macroeconomic variables, which are crucial in determining profitability of banks.

Several studies have been conducted on the impact of macroeconomic variables on profitability of banks but the results lack consensus. This study therefore sought to find the impact of Gross Domestic Product, Real Interest Rate, Exchange Rate and Inflation on the profitability of Ghana Commercial Bank (GCB) and Agricultural Development Bank (ADB) in Ghana.

The study employed Autoregressive Distributed Lag (ARDL) estimation technique using data for the two banks from 1980 to 2014. The study found that real interest rates and GDP had a negative and significant effect on profitability of ADB but interest rate had a positive and significant effect and GDP had insignificant effect on profitability of GCB. Exchange Rate had a positive and significant effect on the profitability of ADB but insignificant effect on that of GCB.

Since macroeconomic variables play a crucial role in the profitability of banks in Ghana, it is expedient that the government implements macroeconomic policies that will encourage sustainable growth and conducive environment for banks to grow and increase their returns in the economy, in order to be able to advance support to businesses in the country in the form of loans.

DEDICATION

This thesis is dedicated to my lovely husband Mr. Sebastian Kankam as well as my children, Samuel Kankam, Sebastian Kwesi Kankam Jnr. and Emmanuella Kankam.

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I would take this opportunity to express my heartfelt gratitude to my Creator, for the immense strength and divine knowledge he granted me throughout my career as a student at KNUST.

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May the good Lord richly bless you

Table of Contents Page

CHAPTER ONE

INTRODUCTION

1.1 Background of the Study

Financial establishments, which began during 18th century BC initially was a place to keep precious items, but the first institution later on became a bank in the 15th century AD (Moussa, 2012). Currently, the banking sector provides strong financial support to the economy hence it is the mainstay of the Ghanaian economy. The main steering influence of any country is the interface of the separate businesses inside it, together with themselves and with other monetary establishments. Basic to this collaboration must be justifiable information as in relation to the financial well being of these companies (Simiyu and Ngile, 2015). Hence the health of every institution is very significant to the wellbeing of the country as a whole.

Recently, Ghana is being flooded with rapid increase in activities of foreign and domestic banks, and this has promoted swift competition among banks in the country. As a result, the aim of making more profits by the banks is becoming a problem with each passing day in our increasing world of business and finance (Krakah and Ameyaw, 2010). According to Simiyu and Ngile (2015:1) the key factor influencing the rate of companies failure is the overall economic conditions within which they operate. Therefore, for financial sector and for that matter banks to function effectively and efficiently in the nation, macroeconomic environment need to be favourable and sound. Nevertheless, it is vital for banking industry in this period of globalization to be effectively joined with the worldwide economy, requiring adequate consideration to be paid to the connection amid the "sound" that these fluctuations signify and the business' own development.

For organizations like commercial banks to function effectively, it should be able to measure its financial gains pertaining to its inputs and productivity. Interestingly, most institutional units are yet to conform to this unquestionable fact mainly due to lack of knowledge. The causes of financial gains are practically well discovered though the meaning of financial gains changes in various research (Misra,

2006; Krakah and Ameyaw, 2010; Kutsienyo, 2011; Moussa, 2012; Simiyu and Ngile, 2015; Gyamerah and Amoah, 2015). Internally, several studies on banking found that provision for loan-loss, control of operational expenses and capital are important determinants of high profitability (Moussa, 2012; Sufian and Kamarudin, 2012).

Several macroeconomic variables are believed to influence the financial gains of commercial banks. For instance, the real interest rate, which is the interest an investor anticipates to have once inflation is adjusted, is believed to affect profitability. GDP is the value of all goods and services produced in a nation during a year, where prices are measured in a base year.

Inflation is a continuous increase in the general price level of goods and services unaccompanied by increase in productivity in a country in a given time period due to the devaluation of the fiat currency being used. Exchange rate is the price of one unit of currency in one country in terms of other nation's currency. All these macroeconomic variables are believed to affect profitability of banks as changes in any of these variables affect the public who are customers of the banks and the bank as an entity.

These macroeconomic factors of financial gains are determinants that are beyond bank management's control but shows happenings outside the influence of the financial institutions. Nevertheless, management can expects variations in the external setting and attempt to place the organization to take the benefit of expected growth. Knowledge

of the fundamental determinants that control profits of banking industry, is important to bank management, as well as various stakeholders including

Bank of Ghana, bankers association, the government, and financial institutions. (Krakah and Ameyaw, 2010). Knowing these factors would help regulatory entities and bank managers to formulate future decisions with the view to enhancing profits of banking industry in the Ghanaian economy.

1.2 Problem Statement

Banks in Ghana have witnessed and are still witnessing a tense competition among themselves for customer deposits in recent times. As a result, they promote their products by consistently advertising in electronic and print media, interesting promotions and engaging personnel who sell to different clients daily with the aim of increasing clients' deposits. Over the years, central banks' prime rates are far lesser than lending rates charged by commercial banks' by a minimum of ten percent, which leads to a mean of twenty-five percent rate of interest on loans that is charged by commercial banks. (Krakah and Ameyaw, 2010). In past years, Commercial banks in Ghana have relied very much on raising lending rates so as to optimize returns. It is therefore not surprising that there has been a declining profit of the industry in an increasingly complex banking sector (Krakah and Ameyaw, 2010).

Kutsienyo (2011) in his study based on financial data acquired from the Ghana Association of Bankers showed a declining general trend in industry's profit over a period of ten (10) years although industry's profit peaked in 2004 and in 2008. Also, in 2010, Price Waterhouse Coopers conducted a survey on the banking sector in Ghana, which indicated that profit before tax in the industry reduced from 30.4% to 19.7% in

2007 and 2009 respectively. From research, total revenue of the banking sector increased from GH¢793 million to GH¢1.5 billion in 2007 and 2009 respectively over the period. They blame the falling profit margins on the rapid worsening of the industry's loan portfolio. Findings from the Price Waterhouse Coopers indicated that impairment charges for irrecoverable debts rose from GH¢ 60 million to GH¢266 million in 2007 and 2009 respectively, over the three year period.

Therefore, it is imperative for bank managers to comprehend the variables, which significantly interact with their business profit. This is important due to the fact that the role played by banks in the development of the country is very vital. The theme of macroeconomic factors and the impact on banks profitability of is widely studied but there are differences in the results, (Kutsienyo, 2011; Rao and Lakew, 2012; Gefli, 2012; Gyamerah and Amoah, 2015). The economy of Ghana recently has been going through macroeconomic challenges where GDP growth rate is falling and high interest rate making it impossible for companies to borrow and expand their operations, (Gyamerah and Amoah, 2015). An economy with deteriorating currency makes it difficult for companies to do foreign trade. Inflation and unemployment cannot be left out because of its effects on companies. Several studies on macroeconomic variables and its impact on companies' profitability have been given different views, (Rao and Lakew, 2012; Gefli, 2012).

From the above, it is essential that significant consideration is made to the functioning of banks so that stakeholders attend to those variables. Therefore this research would like to find the impact of these macroeconomic variables on Agricultural Development Bank and Ghana Commercial Bank's profitability in

Ghana.

1.3 Research Objectives

The general goal of this study is to establish the impact of macroeconomic factors on commercial banks profitability in Ghana selecting two banks as a case study.

1.3.1 Specific Objectives

The study attempts to address the subsequent specific objectives;

I. To examine the influence of Gross Domestic Product on Ghana Commercial Bank and Agricultural Development Bank's profitability.

II. To examine the effect of real interest rate on profits of GCB and ADB.

III. To investigate the effects of exchange rate on bank profitability of GCB and ADB.

IV. To evaluate the impact of inflation on profitability of GCB and ADB.

1.4 Research Questions

I. Does GDP affect the profit of banks in Ghana?

II. What is the effect of real interest rate on banks profit?

III. What is the effect of exchange rate on banks' profit?

IV. Does inflation has effects on the profit of banks in Ghana?

1.4 Significance/Relevance of Study

This research will add up to knowledge already established about the topic under study by making particular argument for Ghana on how to improve macroeconomic variables and the operations of financial institutions. By concentrating on achievements and progress manifest by these companies since its commencement and cooperating with the stakeholders of the industry, the research will attempt to recognize macroeconomic

variables and other factors that affect profits of financial institutions. The outcome of the study will also inform and improve the various roles played by stakeholders in the financial institutions in Ghana.

1.5 Scope and Delimitation

Currently there are a lot of banks in the country but because of time and funds, a sample of two (2) financial institutions have been selected. Agricultural Development Bank and Ghana Commercial Bank have been selected because they are the biggest banks in the country in terms of assets. Again there are a lot of macroeconomic variables such as money supply and unemployment but this study will be limited to GDP, Real Interest Rate, Exchange Rate and Inflation for the sake of time.

1.6 Organization of the study

This thesis has been presented in five chapters. The first chapter presents the background, research questions including the purpose, scope and limitations of the research. The second chapter evaluates pertinent and related literature. It looks at concepts and definition of variables, theoretical and empirical review of the topic under study. Chapter three explains the methods that are applied in carrying out the research. Also it shows the weakness of the research techniques and tools used to obtain the outcome. Chapter four discusses the findings of this work. The collected data was organized and evaluated in this chapter using various statistical techniques and statistical tools. The outcomes are discussed thoroughly as well as its implications. The final chapter provides recommendations needed to improve the level of the economy and financial institutions on the bases of the findings.

CHAPTER TWO

LITERAUTRE REVIEW

2.1 Introduction

The chapter outlines a review of past studies on the relationship between macroeconomic variables and banks profitability in Ghana. A theoretical and empirical explanation of the connection between these variables will be constructed.

2.2.1 Gross Domestic Product (GDP) and Bank Profitability

The Gross Domestic Product (GDP) refers to the total value of goods and services produced in a country during a year. Economic growth therefore, is defined as a sustainable increase in output of goods and services in a country at a given period of time. Laypersons often make little or no difference amid economic development and economic growth, using them interchangeably. However, the two terms are different from each other. Going beyond a mere GDP growth, economic development has several directions of change geared towards the welfare of any society, region or a nation and intended to provide continuous existence of persons such as food, clothing, shelter and health care in addition to enlarging their delivery, raising living standards and personal confidence in one's own abilities (self-respect) and increasing economic and social choice (Todaro, 2005).

Development theories considered other standards, some of which are fairness in income distribution, political freedom, educational attainment and availability of health-care, looking beyond GDP per capita as a yardstick for development. Modern theories have explored other necessities for maintaining economic development

including unrestricted trade, infrastructure, equitable judicial systems and existence of sound government policies and institutions.

Capital buildup is an important determinant of economic growth and development, normally involving health, education, extensive investments in infrastructure, financial and industrial sectors. Simon Kuznets (1901–1985) made the argument that levels of disparity in the economy be able to vary as nations progress and thus, further capital is accumulated. It is presumed that, at the initial periods of development, countries incomes are fairly distributed, because of low levels of capital and per capita income. However, additional capital is built up and distribution of income becomes uneven to the benefit of those who own the resources as a country develops. Finally, more-developed nations return to lesser levels of disparity either directly, through other redistribution mechanisms and social welfare programs, or indirectly, through "trickle down" effects.

Theoretically, GDP growth rate is anticipated to have a positive impact on the financial sector's ability to make profits. This is because higher economic growth urges banks to give out more loans and allows them to obtain higher margins, whilst improving the value of their assets (Moussa, 2012).

2.2.2 Bank Profitability

In the case of banks, profitability can be described as a bank's capacity to make more revenue than what it spends. The relationship between return on equity and capital structure is also pertinent to banks, as they have lower levels of equity compared to assets and are sensitive to variations in financial control.

In the literature, bank profits, especially proxied by the return on assets (ROA) and/or the return on equity (ROE) is normally dependent on external and internal determinants.

External determinants are those out of the control of management whilst internal determinants are mainly on policy objectives and bank's management decisions.

The external determinants of banks profitability relates to both macroeconomic and industrial conditions are variables that reflect the legal and environments where the financial establishments operate (Sufian and Chong, 2008). Some of the internal determinants of bank's profitability are; expense management, level of liquidity, provision of policies, adequate capital and the size of the bank. Capital adequacy in this context refers to the minimum requirement the banks are to hold with the Central Bank, it is used to protect depositors as well as stability and efficiency in the industry.

2.2.3 Real Interest Rate and Bank Profitability

Interest rate is the price one pays for borrowing money from the financial establishments. The level of interest rate is dependent on the monetary policy pursued by the Central Bank. Monetary policy outcomes through interest rate have a direct effect on banks in the economy. A falling interest rates could make banks' intermediation spread intact, as fluctuations in prime rates are found to go through deposit and lending rates (Peng, et al., 2003 cited in Gyamerah and Amoah, 2015).

2.2.4 Exchange Rate and Bank Profitability

The exchange rate is the price of one unit of currency in one country in terms of the other country's currency. In most countries, the exchange rate is expressed in terms of the external currency as the base currency but some nations also express exchange rate by using the home countries as the base currency. Each country has its own exchange rate systems. The most vital characteristic of an exchange rate system is to what extent the country is trying to control the level of exchange rate. The exchange rate system can

be described as completely flexible when it is solely determine by the supply and demand in a free market without interferences from the government or the central bank. The system is described as completely fixed when it is pegged to another currency or to an average of several currencies by the central bank.

A fall in the value of local currencies, in relation to foreign currencies has a negative impact on banks' profit.

2.2.5 Inflation and Bank Profitability

Inflation refers to a persistent increase in the general price level unaccompanied by increase in productivity. It imposes various cost to the economy, hence it has become one of the primary concerns to policy makers and economists. Higher inflation rates erode the real value of money in the economy. Thus, fixed income earners such as pensioners cannot cope with when the cost of living is very high. Again, it reallocates capital among the residents in such that demerits a section of the population in the country. During periods of sustained inflationary pressure, workers and lenders lose while employers and borrowers gain, this is because many work and loan agreements are expressed in money terms in the economy. Also, inflation does not promote savings. Although, part of the nominal interest rates merely pays off for inflation, income tax treats nominal interest earned on savings as income. Therefore, savings becomes less attractive since after-tax real interest rate is reduced.

According to Revell (1979) cited in Gyamerah and Amoah (2015) the effect of inflation on profitability of banks relies on whether the wages banks pay and other operating expenses rise at a faster rate than inflation. When bank managers perceives a rise in the rate of inflation they can can properly adjust interest rate so as to increase their income

faster than their costs and thus maximize their profit, if not the unexpected effects of inflation will negatively affect the banks revenue.

2.3 Theoretical Literature

In this section, theories on the topic under study are explained. There are several theories that postulate the relationship between profitability and macroeconomic variables among others.

2.3.1 The Structural Conduct Performance (SCP) Model

This is one of the initial models used to assess the determinants influencing profitability of financial institutions (Grygorenko, 2009 in Koutsoyianis, 2011). The SCP model view structure of an industry, conduct and performance of the industry to be integrally related as the market structure causes firms to act in a certain manner and this behavior in turn causes allocation of resources to be in a particular way which could either be inefficient or efficient market (Koutsoyianis, 2011). This model however fails to identify the impact of performance on conduct and structure. Therefore the model claims that the factors, which are external to the organizations are primarily and indirectly the determinants of profitability.

The SCP paradigm presumes that an increasing banking industry allows collusion of banks to fix prices and as a consequence, earn substantial profit (Mason, 1939; Bain 1951 all cited in Koutsoyianis, 2011)

2.3.2 The Capital Asset Pricing Model (CAPM)

The CAPM was developed by Treynor (1962), Sharpe (1964), Litner (1965) and

Mossin (1966). The CAPM shows that the pricing of any asset is based on the exact relationship between the expected return of the asset and its corresponding risk. It is expressed in the equation form:

$r_a = r_f + \beta\,(r_m - r_f)$ where;

r_a= return on assets r_f= risk free rate r_m= return on the market β = measure of risk

$(r_m - r_f)$ = the risk premium

$r_a = r_f + \beta\,(r_m - r_f)$

where:

r_a = return on assets r_f = risk free rate r_m = return on the market β = measure of risk

$(r_m - r_f)$ = the risk premium

In pricing an asset, CAPM propounds that the anticipated return of an asset or portfolio is equivalent to the risk-free rate plus the risk premium. If the expected return does not outweigh the required return on the asset, then that particular asset does not worth the investment.

2.3.3 Arbitrage Pricing Theory (APT)

Stephen Ross in 1976 proposed APT and described the asset pricing system where an asset is allowed to be mispriced. This implies that arbitrageurs take advantage of these mispriced assets to make profits. This is done by arbitrageurs going short (selling) on overpriced assets whilst concurrently going long (buying/keeping) on underpriced

assets or portfolios. It predicts the returns on a portfolio and the return on a single asset and many independent macroeconomic variables. These variables include inflation, growth in gross national product (GNP), interest rates and major political upheavals. Nevertheless, these factors are not identified in the application of the APT model (Reilly & Brown, 2011).

2.3.4 The Multiple Factor Model (MFM)

The multiple-factor theory is used to explain the returns on separate or a portfolio of assets by likening two or more factors to evaluate the nexus between the factors and the return on the assets. It is uneasy to decide on how many and which of the factors to include. The MFM is represented by the equation:

$r_i = a_i + \beta_i(m)r_m + \beta_i(1)F_1 + \beta_i(2)F_2 + \ldots\ldots\ldots + \beta_i(N)F_n + e_i$ where r_i is the return on the individual asset, r_m is the market return, $F\ (1,2\ldots N)$ is each of the factors used and β, is the measure of risk with respect to each of the factors used.

2.3.5 Efficient Market Hypothesis (EMH)

This hypothesis was put forward by Fama (1981) in terms of a fair game model, contending that investors can be sure that a current market price completely reflects all accessible information about a security and the anticipated returns based on this price, is unpredictable with risk. The three forms of market efficiency are; strong, semi-strong and weak forms market efficiency.

2.3.6 The Production Function

A commodity may be produced by several methods of production. According to Koutsoyianis (2003) in Kiganda (2014), the process of production refers to the combination of input factors required to produce a unit of output and it encompasses a

production function, which represents a technical relation connecting factor inputs and outputs. In other words, production function is a mathematical expression for an input-output process. It is one of the main concepts of typical neoclassical theories, used to explain marginal product and to differentiate allocated efficiency. The same method is used at the firm level, whereby the factors of production are known to be under the control of the individual firm.

In macroeconomics, aggregate production functions are estimated to make a framework in which to differentiate by how much of economic growth attribute to improving technology and how much it contributes to variations in factor allocation (e.g. build up of capital).

Its recent usage was motivated mainly by an attempt to take account of how economies grow. It is the basis of growth accounting and modern growth theory, of the attempt to answer the question; what factors account for the observed growth in the economy and to what extent among other questions (Lewin, 1998).

This Cobb Douglas production function is represented as;

$Y = A K^{\alpha} L^{\beta}$ 2.1

Where;

Y = Output

A = Total factor productivity

K = Capital

L = Labour

α and β= elasticity coefficients of capital and labor, respectively.

To apply the production function in this research, the theory of production indicates that macroeconomic variables - factor inputs would affect the profitability of banks (factor output), hence the functional association amid bank profitability and macroeconomic variable exist. The study used the Cobb- Douglas production function to represent the functional relationship between factor inputs (macroeconomic variables) and factor outputs (bank profitability) in Ghana.

2.4 Empirical Review

Even though insufficient studies have been conducted on the determinants of profitability of banks, various studies show divergent views on the impact of macroeconomic factors on bank profitability. As a result, it is not clear the directional effect of macroeconomic factors on bank profitability in Ghana. Moussa (2012) analyzed Macroeconomic and Bank-specific Determinants of Bank Profitability in Turkey using panel regression to carry empirical investigation based on Public, Private and Foreign Banks. A general model was then framed to check the combined effect of macro-economic variables and bank-specific on commercial bank's profitability in Turkey. Moussa considered public, private and foreign banks independently to identify specific hypothesis for each model and compared the bank profitability factored on another ownership framework. The results indicated that, in Turkey inflation shows a negative impact on return on assets however it does not have any significance on return on equity for public banks whilst inflation has a positive impact on both return on equity and return on assets for foreign banks. In addition, economic growth has a positive impact on profitability for both public and foreign banks in

Turkey.

On the other hand, Kiganda, (2014) in Kenya, researched into the impact of macroeconomic factors on bank profitability with Equity bank in focus to understand

country and bank specific characteristics. The study employed OLS to establish the relationship between macroeconomic factors and bank profitability. The results indicated that macroeconomic factors (real GDP, inflation and exchange rate) have insignificant impact on bank profitability in Kenya with focus on Equity bank at 5% level of significance.

Osamwonyi and Chijuka (2014) also analyzed the effects of macroeconomic variables on selected banks profitability in Nigeria from 1990 to 2013. Pooled Ordinary least technique was used to examine the influence of interest rate (INTR) gross domestic product (GDP) and inflation (INFR) on return on equity (ROE) which proxy's profitability. The study shows that Gross Domestic Product (GDP) has a positive relationship with Return on Equity (ROE). Inflation and Interest rates have a negative relationship with Return on Equity (ROE). Gross domestic product has a significant positive impact on Return on equity (ROE) while interest rate has a significant negative impact on return on equity (ROE) but inflation is not relevant at all levels of significance.

Flamini, McDonald and Schumacher (2009) also researched into the determinants of Commercial Banks' Profitability with a sample size of 389 banks in 41 Sub-Saharan African countries. It was found out that apart from credit risk, higher returns on assets are related to private ownership, activity diversification and larger bank size. Macroeconomic variables affect bank profits, signifying that macroeconomic policies, which enhances stable output growth and low inflation do improve credit enlargement. Causation in the Granger sense from returns on assets to capital arises with a substantial lag, which denote that high profits are not instantly reserved in the form of equity rises.

A panel data analysis of which Fixed Effects model was to investigate effect of macroeconomic variables on financial gains made by banks registered at the Nairobi Securities Exchange by Simiyu and Ngilein (2015). The study focused on three key macroeconomic variables, which consist of Exchange rates, Interest rates and Gross Domestic Product (GDP) on profitability between the period 2001 and 2012. The study showed that exchange rate was significant and had positive impact on quoted commercial bank's profitability. Also, real interest rate is significant and negatively influences profitability of quoted commercial banks while real GDP growth rate is statistically insignificant positive impact on profitability of banks as measured by Return on Assets (ROA). Other cross-country literature on the topic discovered a positive relationship between rate of interest and financial gains made by banks (Demirguc-Kunt and Huizinga, 2000) or a varied relationship (English, 2002). Sufian and Kamarudin (2012) recognized bank particular characteristics and macroeconomic factors of financial gains in the banking sector of Bangladesh between the years 2000 to 2010 using a sample of 31 commercial banks. Using multiple regression, the results revealed that macroeconomic determinants significantly influenced profitability. Whilst the relationship between bank performance and economic growth was significant but negative and the coefficient of inflation was also significant but positive.

Rao and Lakew (2012) discovered the major factors of commercial bank performance in Ethiopia, and used panel data set of banks within the period between 1999/00-2008/09. The study's result showed that external factors had insignificant impact. It was found that inflation was statistically not significant but had positively linked to profitability of banks. Real GDP growth rate also showed a statistically insignificant though with a positive sign.

Gefli (2012) largely utilized secondary data obtained from the yearly financial statement of some selected financial institutions to find the determinants of rural bank profitability in Ghana. A panel data was used with two hundred observations for fifty rural banks in Ghana, where it looked at the period 2006 – 2010. The observed outcome brought up some remarkable proof regarding the factors of RCB's financial gains. The research suggested that RCB's non-interest income and the size of assets are the internal determinants affecting rural bank's financial gains, whereas GDP and increase in supply of money are external determinants affecting financial gains made by rural banks. Nevertheless, loss on provision of loan, overall overhead expenditure as well as inflation adversely affected the performance of rural banks.

Kutsienyo (2011) analyzed the factors that affect profitability of banks in Ghana and a panel data of 26 commercial banks was used over a period of 2000-2009. To estimate fixed effect regression model, a generalized least squares method was used. Bankspecific factors (bank size, capital adequacy, liquidity, operating expense, and asset quality) and financial structure and macroeconomic factors such as GDP, money supply and the concentration of banking industry, were incorporated into regression models.

The results show that liquidity, size of financial institution, capital adequacy, are positive and vital to bank financial gains while quality of assets and expenditure on day to day running of the business are negative and important to the profitability of banks. With the external factors, inflation and GDP were positive and statistically significant to bank profitability while bank concentration and money supply and bank concentration were negative but significant to bank profitability.

Gyamerah and Amoah (2015) also did similar work by examining the relationship between profitability and a set of macroeconomic factors and bankspecific features on

foreign and local banks in Ghana from 1999 to 2010. The study proposed that cost management is indirectly related with profitability whilst credit risk and bank size indicate a positive relationship with profitability. The findings suggested that management of banks should consider careful risk management and cost of maintenance to attain financial gains and as well establish bigger local banks.

Studying performance of banks using external and internal factors, Misra (2006) suggests that external factors are organized forces, which portrays economic setting while internal factors source from financial records of a bank. In his conclusion, Misra states that investment portfolio and loan portfolio management greatly support to financial performances of rural banks.

Furthermore, the effects of macroeconomic variables that influence stock prices in Ghana were studied by Enyaah (2011). Co-integration methodology was applied on Ghana Stock Exchange's (GSE) monthly data All-share Index and the individual macroeconomic variables from January 2000 to December 2010 to verify how far which these variables affect the stock market returns. The findings establish that a casual relationship and long-run equilibrium exists between the GSE All-share index and the independent variables namely, exchange rate and interest rate. The results showed effects of rate of interest, fluctuation of exchange rate on Ghana Stock Exchange are almost imaginary in the short run.

2.5 Summary of Literature

The macroeconomic situations that create credit worthiness of debtors and determine quality of asset, the level of the value of collateral among other related factors, is the major source of macroeconomic shocks to the bank's portfolio. Also, controlling level of financial development, level of concentration of the financial sector and grounds of an is a determinant of profitability. The tools of monetary policy like inflation, short

term and real exchange rate and interest rate performs as essential drivers of profitability of companies in the country.

Theoretically, real rate of interest and exchange rate have an adverse connection with bank profitability whilst the rate of GDP growth rate is positively linked to bank profitability. The association between inflation and profitability however rest on whether inflation is anticipated or not.

Empirical literature on the other hand has contradicting results on the relationship between macroeconomic variables including real interest rate, GDP and exchange rate and bank profitability.

From the studies reviewed, it is evident that a lot of works have been carried out on the determinants of bank profitability across the world. However, most of the studies reviewed relied on panel data set, which gives a generalized overview as opposed to bank specific characteristic.

Furthermore, these studies on the effect of macroeconomic factors on bank profitability is indecisive. This is because some studies shows insignificant influence while others establishing significant effect. This research bridges this gap using annual data concerning Agricultural Development Bank (ADB) and Ghana commercial bank (GCB) and Agricultural Development Bank (ADB) to establish bank specific characteristics of the effect of macroeconomic factors on bank profitability in Ghana with GCB and ADB in focus. This will reveal the effects of these macroeconomic variables on the profits of the two banks and allow for comparison to make better recommendations.

CHAPTER THREE

METHODOLOGY

3.1 Introduction

The study seeks to examine the impact of selected macroeconomic variables on selected banks profitability in Ghana (Ghana Commercial Bank and Agricultural Development Bank). Consequently, this chapter describes the dataset used and the time series econometric method that help in revealing the dynamism between these variables. The chapter is outlined as follows; It specifies and justifies the econometric model adopted

by the study while giving clear reasons for the variables used in the models. The chapter further presents how to test for co-integration and the need to test for the existence of (or otherwise) unit roots in the time series data among the variables and finally describes the data, variable measurements and sources of data.

3.2 Model Specification

This study was modelled on the theory of firm's production (production function), following the footsteps of Feder (1983), Fosu (1990), Kiganda (2014), which have used this model in the study of various topics including macroeconomic variables and bank profitability relationships.

In this study, the independent variables are theorized as macroeconomic variables. These variables include; inflation, real GDP, exchange rate and real interest rate. Bank profitability represented by Return on Asset (ROA) is the dependent variable. This structure assumes that, profitability of banks are directly influenced by macroeconomic variables. This is shown in the functional form as;

$$ROA_{jt} = f(GDP, INF, EXC, RI) \quad \text{.....3.1}$$

This expression in the form of Cobb- Douglas production function (3.1) is denoted as;

$$ROA_{jt} = A(GDP)_t^{\beta_1}(INF)_t^{\beta_2}(EXC)_t^{\beta_3}(RI)_t^{\beta_4}\mu_{jt} \quad \text{.....3.2}$$

Where

ROA = Bank Profitability proxied by return on assets

GDP= Gross Domestic Product

INF= Inflation rate

EXC= Exchange rate

RI= Real Interest rate

t= year j= Individual

bank

μ= error term β_i= elasticity coefficients

and i=1, 2, 3,4

To establish the link between profitability of banks and macroeconomic determinants, the Cobb- Douglas production function represented by equation (3.2) is transformed into natural logarithm in equation 3.3 as;

$$\mathbf{lnROA_{jt} = \beta_0 + \beta_1\, lnGDP_t + \beta_2\, lnINF_t + \beta_3\, lnEXC_t + \beta_4\, lnRI_t + \nu_{jt}}$$

.....3.3

where

β_i = elasticities and i=1,2,3,4 β_0=

lnA

$\nu_{jt} \sim IIDN(0, \sigma^2)$

As a priori, the sign of β_1 is anticipated to be positive because a rise in GDP will cause bank profitability to rise too, all other things being equal. Inflation can be positive or negative, whilst exchange rate and real interest rate are negatively related with bank profitability. Therefore, the coefficients of inflation either positive or negative, exchange rate, and real interest rate are less than zero or negative. In other words, $\beta_1>0$, $\beta_2><0$, $\beta_3<0$ and $\beta_4<0$.

3.3 Estimation Techniques

This is where the study estimates the parameters. To ensure reliability of the estimates of the parameters of equation 3.3 using the time series data, three (3) steps are followed. First of all, each of the individual variables in our regression model are examined for presence (or not) of unit root to ensure that the estimated results of the model are not spurious. Secondly, the presence of co-integration amongst the variables in the models stated above is verified through the use of ARDL Bounds test method. Lastly, the short and long-run constants in the model under estimation are assessed using the ARDL framework.

3.3.1 Stationarity Test

To assess if time series data are stationary or not, a unit root test is needed. It is carried out to make sure that the variables are stationary and that shocks that may occur are only temporal and will therefore dispel and return to their long-run mean.

It is important to carry out a unit root test of the variables to identify the sequence of integration of each of the variables as required for the use of time series data for analysis. The number of tests available for testing whether or not a series is stationary includes the following; the Phillips-Peron (PP), the KPSS, Dickey-Fuller (DF) test, and Augmented Dickey-Fuller (ADF), test among others. This study applied the ADF Test to check for stationarity following Dickey and Fuller (1981) and Fuller (1996). Since the PP test handles the deviations in order not to achieve white noise in the model, it was applied to confirm the outcome of the ADF test. The PP and the ADF tests are based on the same regression equation below, and the same critical values following Phillips and Perron (1988). The equation below is employed:

$\Delta y = b_1 + b_2\, t + b^3\, y_{t-1} + \sum_{n=1}^{n}(B_i\, \Delta y_{t-i}) + u_t$ 3.4

Where, □ = the difference operator,

y= the natural log of the time series variable,

t= a trend variable, b_1, b_2, b_3 are all

parameters to be estimated,

B= vector of the projected parameters of the lagged values of the differenced value of time series.

Δy_{t-i}= the vector of lagged value of differenced in the value of the series and

U= error term.

Decisions as to whether the variables are stationary or otherwise are based on the hypothesis below;

H_0: $b_1 = b_2 = b_3 = 0$

H_1: $b_1 \neq b_2 \neq b_3 \neq 0$

When null hypothesis is rejected, it implies stationarity in the series. However if the null hypothesis is accepted, the conclusion is that unit root is drawn. So the ADF and the PP tests are run at level and at first variance with intercept only.

3.3.2 The ARDL Co-integration Test

Much work have been done on this topic in various countries employing ordinary least square model in testing for link between profitability and selected macroeconomic variables. However, this research employed the ARDL co-integration technique to test for the short-run and long-run association between profitability and the chosen macroeconomic variables in this study. The study employed ARDL model for the following advantages; the model is the more statistically significant approach to verify the co-integration even when the sample size is small. Also, it does not need all the

variables to be integrated in the same order unlike other co-integration techniques which requires that; the ARDL technique could be employed even if the variables are I(0) and/or I(1). In effect, the ARDL technique prevents pre-testing difficulties connected to normal co-integration, which demands that the variables already be categorized into I(0) or I(1) (Pesaran et al, 2001). This model is more appropriate model for empirical work in a case where the stationarity properties of the data are uncertain. Bahmani-Oskooee (2004:485) observed that, in determining the degree of integration for every variable in the model, the result may differ depending on which test one uses hence the results could contradict. For instance, when one applies the ADF and the PP tests for unit root, is easy to wrongly deduced that there is existence of unit root in the series that has no unit root around a single structural break. The ARDL approach is therefore the best for this study because it avoids these problems.

In order to run the long run estimation, the ARDL Bounds test was first applied to check for long run relationship. The dynamic structure of the *ARDL* (*p*,*q*) model takes the following form;

$\Delta X_t = a_0 + a_1 t + a_2 X_t + a_3 Z_t + \sum_{i=1}^{p} A_i X_{t-i} + \sum_{j=0}^{q} B_j Z_{t-j} + \mu_t$ .....**3.5** H_o: $a_2 = a_3 = 0$

H_1: $a_2 \neq a_3 \neq 0$

The hypothesis stated above could be established through the use of the standard Fstatistic. When the null hypothesis is rejected, it means there is co-integration among variables otherwise there is no co-integration among the variables.

3.4 The ARDL Model Specification

The following model has been specified for the two banks;

For GCB;

$$\Delta \ln ROA_t = \alpha_0 + \sum_{i=1}^{p} \beta_i \Delta \ln ROA_{t-i} + \sum_{i=0}^{p1} \gamma_i \Delta \ln GDP_{t-i} + \sum_{i=0}^{p2} \delta_i \Delta \ln INF_{t-i} + \sum_{i=0}^{p3} \varphi_i \Delta EXC_{t-i} + \sum_{i=0}^{p4} \omega_i \Delta RI_{t-i}$$

$$+ \alpha_1 \ln ROA_{t-i} + \alpha_2 \ln GDP_{t-i} + \alpha_3 \ln INF_{t-i} + \alpha_4 \ln EXC_{t-i} + \alpha_5 \ln RI_{t-1} + \varepsilon_t$$

For ADB;

$$\Delta \ln ROA_t = \alpha_0 + \sum_{i=1}^{p} \beta_i \ln ROA_{t-i} + \sum_{i=0}^{p1} \gamma_i \ln GDP_{t-i} + \sum_{i=0}^{p2} \delta_i \ln INF_{t-i} + \sum_{i=0}^{p3} \varphi_i EXC_{t-i} + \sum_{i=0}^{p4} \omega_i RI_{t-i}$$

$$+ \alpha_1 \ln ROA_{t-i} + \alpha_2 \ln GDP_{t-i} + \alpha_3 \ln INF_{t-i} + \alpha_4 \ln EXC_{t-i} + \alpha_5 \ln RI_{t-1} + \varepsilon_t$$

3.5 Diagnosis and Stability Test

In every research work, the results should be reliable for policy implementation, hence diagnostic tests are done so as to assess the dependability of the outcome of the research. The study tested for the significance of the variables and other diagnostic tests which includes functional form, heteroscedasticity, normality, structural stability and serial correlation of the model.

The Breusch-Pagan-Godfrey test for heteroscedasticity, Breusch-Godfrey Serial Correlation LM Test for serial correlation, the Jacque-Berra test for normality and also, the Ramsey RESET Test for stability were applied in the analysis of diagnostic and stability tests of the long-run coefficients in addition to with the shortrun dynamics. The Breusch-Pagan-Godfrey test involves testing the null hypothesis that all the error variances are the same against the other hypothesis that the error variances are a multiplicative function of one or more variables. A large chi-square would show that, heteroskedasticity is present, thus it indicates that the error term is a multiplicative function of the predicted values. The Breusch-Godfrey Serial Correlation LM Test was employed to test whether adjacent residuals are correlated which violates the regression

assumption that the error terms are independent. The Breusch- Godfrey test can be used when (1) the independent variables are stochastic or not (2) the regression equation is autoregressive or not (3) whether the regression equation is first order autoregressive or higher order autoregressive. The null hypothesis signifies that, the error terms are uncorrelated whilst the other hypothesis states that they are correlated. Therefore, when the null hypothesis is accepted, it implies that the error terms are not correlated otherwise they are correlated.

Frimpong (2008) sited Pesaran and Pesaran regarding the stability of regression coefficients and assessed by the Ramsey RESET Test for stability and they can indicate when the regression equation is stable over time. When uncertain about structural whether variation might occur, stability test is suitable in time series data.

3.6 Data Sources and Definitions of Variables

3.6.1 Data Source

This research mainly applied mainly secondary data for its analysis within the period 1980-2014. The data was sourced from the Ghana Commercial Bank annual financial statements, Agricultural Development Bank annual financial statement, World Bank's Africa Development Indicators, World Bank's World Indicators, the Ghana Statistical Department, Quarterly Digest Statistics of the Bank of Ghana and The State of the Ghanaian Economy by ISSER (various issues).

3.6.2 Definition of Variables

Apart from internal variables that affect bank's profitability, bank's profitability is sensitive to some external factors such as macroeconomic state notwithstanding the general direction of the industry concerning greater geographic expansion and a extensive use of financial management methods to control risk related to forecasting in

business cycle. In general, higher growth in the economic stimulates banks lending and allows them to obtain higher returns while enhancing asset quality. The relationship concerning the external factors and bank profitability identifies the degree by which profits of banks are associated with the business cycle DermigucKunt and Huizinga (2001) and Bikker and Hu (2002).

Rao & Lakew (2012) asserted that ratios of the real value of profits are used in measuring profitability of banks because ratios are not affected by changes in the general price level and they are most frequently used in measuring profitability of banks in the banking literature. In many reviewed literature, Return on Equity (ROE) and Return on Asset (ROA) have been extensively used for measuring bank profitability.

Return on Equity is the ratio of net profit after tax divided and total number of equity issued and thus represent returns earned on each unit of shareholder's capital. This measurement has a shortfall of generating higher ratio for banks with high financial leverage, which is normally related with higher risk. This is true because with any level of profit after tax, as banks become highly leveraged or equity falls, the ROE is bound to increase due to the lower denominator (equity).

Return on Assets (ROA) shows how assets are efficiently managed by managers of a bank to make profits (Davydenko, 2010). This is expressed as bank's net profit after tax over its total assets. According to Flemini et al. (2009), ROA may be biased due to post balance sheet events where ROA can be overstated in the evaluation of bank profitability, but believe such activities are negligible. Nonetheless, it has always been a very good and preferred measure of profitability of banks.

One of the most commonly used macroeconomic variable, which determines profitability of banks, is Gross domestic product (GDP) as it measures the overall economic activity within the country. The real gross domestic product growth (GDP) which is the annual GDP adjusted with inflation is used as a measure of the macroeconomic situations. The relationship between bank performance and real GDP is expected to be positive Bikker (2002).

Inflation (INF) is used as a proxy for percentage change in aggregate price levels. Staikouras et al., (2003) indicated that inflation does not have a one-way effect on bank profitability; it could have direct or indirect influence on profitability of banks. The effects of inflation on bank returns could be either be is expected or unexpected. If expected, the interest rates are adjusted appropriately, which results increasing revenues faster than costs, showing a positive effects on profitability. However, the banks may be slow in adjusting their interest rates if inflation is unexpected, resulting bank operational costs increasing faster than revenues and subsequently having a negative effect on profitability of banks.

Exchange rate is determined by national authorities is also known as official exchange rate, thus the rate controlled by the legally sanctioned exchange market. It is expressed as domestic currency in relation to the US dollar (thus an annual average based on monthly average). The depreciation of domestic currencies in comparison to foreign currencies has a negative influence on local companies profitability.

Monetary policy results have a positive impact on banks in the economy through the level of interest. Empirical proof on the link between profitability of banks and interest rates are inconclusive. Falling rate of interest can make banks' intermediation spread intact, as variation in interest rates are known to go through deposit and lending rates (Peng, et al., 2003).

CHAPTER FOUR

EMPIRICAL RESULTS AND ANALYSIS

4.1 Introduction

This chapter spells out the estimated outcome of the model indicated in chapter three with focus on stated objectives outlined in chapter one. This chapter begins with the presentation and discussion of trend analysis, followed by the unit root tests results. Again, the study tests and presents the results of the presence of co-integration or

otherwise amid the variables in the model. Also, it presents results on the estimated relationship for the short-run and long-run with discussions and interpretations thereof. Finally, the diagnostics and stability test results analysis are presented.

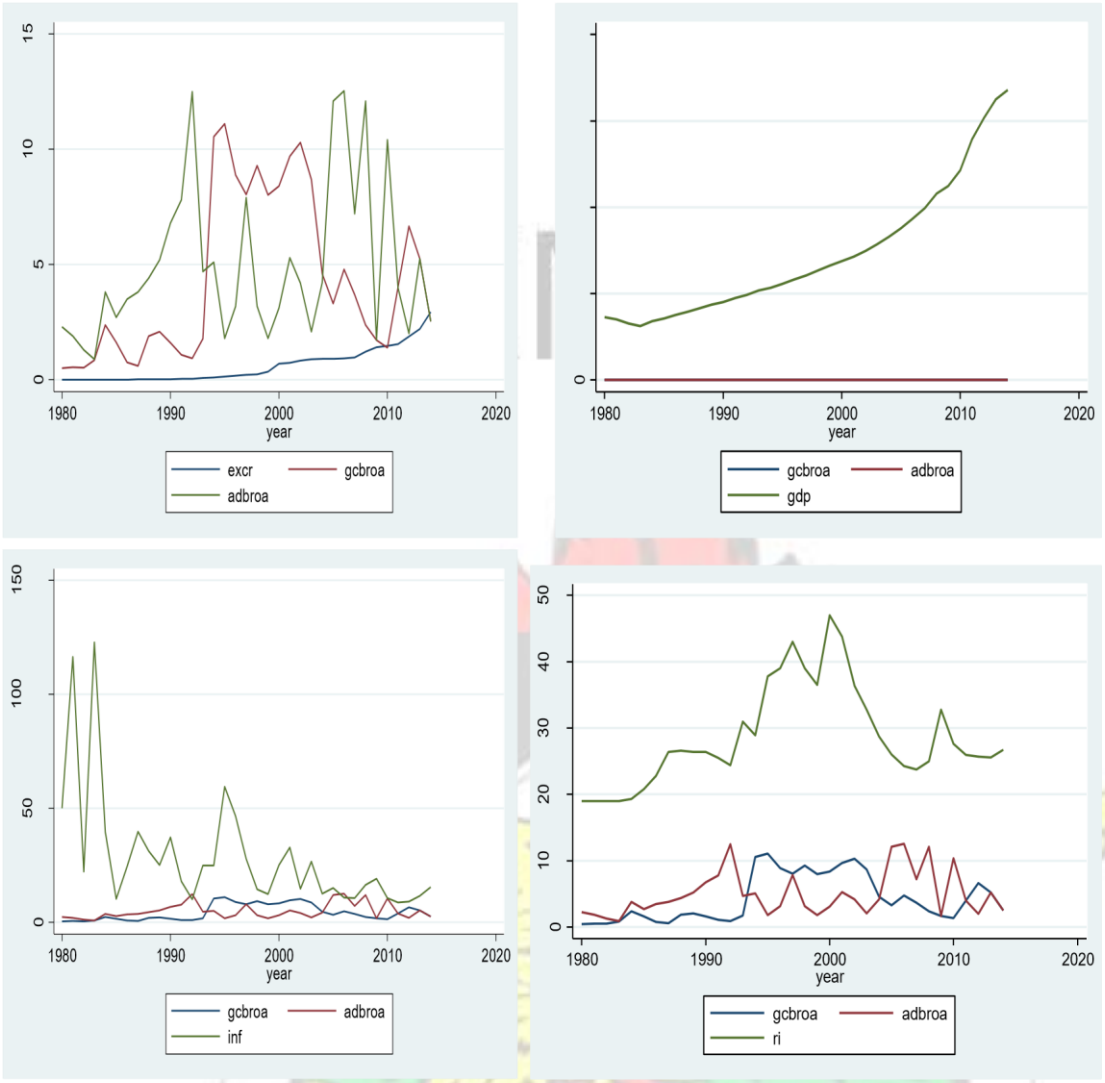
4.2 Trend Analysis of Variables

Figure 4.1 shows the linear trend for Agricultural Development Bank's Return on Assets (ADBROA), Ghana Commercial Bank's Return on Assets (ADBROA), Inflation Rate (INF), real Gross Domestic Product (GDP), Interest rates (RI) and exchange rates (EXCR) overtime.

The result suggests that as exchange rate continues to grow steadily from 1980 to 2014, the return on assets for both ADB and GCB fluctuated crossing each other throughout the period. The ADBROA peak around 1990 and 2008 and had its lowest point in 2010 while GCBROA peak around 1995 and afterwards kept fluctuating as EXCR kept rising steadily.

From the graph, it is uneasy to describe the influence of a steady rise in EXCR on ADBROA and GCBROA.

Figure 4.1: Trend analysis for ADBROA, GCBROA, GDP, INF, RI and EXCR for 1980 - 2014



On THE ADBROA, GCBROA and GDP tread graph, ADBROA and GCBROA seem to maintain a constant slope while GDP kept rising steadily over the whole time. This could be as a result of the huge values of GDP which is plotted against ADBROA and GCBROA which are ratios.

Inflation lay above ADBROA and GCBROA over the period. However, ADBROA seems to respond to the changes in INF. When INF is falling, ADBROA rises but GCBROA either rises with INF or stays stable. For instance, when INF fall to a lower

point between 1990 and 1993, ADBROA increased within that time whiles GCBROA remain stable and started rising at the time INF also started rising again.

The same nature of change between these variables occurred again between 2005 and 2010.

In the last graph, whilst the trend of RI grew steadily from 1980 with little fluctuations and peak around 2005 before decreasing until 2014, the trends of ADBROA and GCBROA did not change much but fluctuated throughout the period.

4.3 Results and Analysis of Stationarity Properties

Table 4.1 Stationarity Results

	VARIABLES	ADF	PP	INTEGRATION
Levels	LnADBROA	-2.912***	-4.020*	I (0)
	LnGCBROA	-2.679***	-2.097	I (0)
	LnRI	-1.849	-1.842	I (0)
	LnINF	-3.282**	-3.557**	I (0)
	LnGDP	0.890	-4.680*	I (0)
	LnEXCR	-3.472**	-3.841*	I (0)
First Difference	LnADBROA	-5.457047*	-10.205*	I (1)
	LnGCBROA	-5.702*	-3.942*	I (1)
	LnRI	-3.539**	-5.633*	I (1)
	LnINF	-6.324179*	-10.368*	I (1)
	LnGDP	-4.680*	-3.218**	I (1)
	LnEXCR	-4.227*	0.253	I (1)

Note: *, **, *** denote statistical significance at 1% Critical value, 5% Critical value, 10% Critical Value respectively for the levels and for the first difference.

From the Table 4.1 above, the unit root of the null hypothesis could not be precluded for lnRI and lnGDP at the level for the ADF test whilst the Philips-Perron test rejected the null hypothesis for all the series except lnRI. Hence not all the variables are stationary at levels

The study further tested for unit root at first difference. From the results above, the null hypothesis is rejected indicating the absence of unit root in all the variables at the 1% and 5% critical values hence stationarity at first difference for both the ADF and the PP tests. Since lnADBROA, lnGCBROA, lnRI, lnEXCR, lnINF and lnGDP are all stationary at first difference, it can be deduced that the variables are integrated of order one or I (1).

Therefore, it can be deduced that not all the underlying series in the present study are joined in order one [I (1)]. Given this result, statistically, the data has the potential of producing spurious relationships when ordinary least squares, VAR or VEC methods are applied on the data since not all the variables are integrated in the similar order. The result implies that, a shock to any of the variables will not have a lasting effect.

4.4 Results and Analysis of Co-integration

The ARDL Bound test was used to test for the existence of long run relationship. The study selected the maximum number of lags as 2 and 3, which used the Akaike Information Criterion (AIC) for the ADBROA and GCBROA equations respectively.

When the F-statistic is greater than critical value bounds, the null hypothesis is rejected, and that long run relationship does not exist or co-integration otherwise does not reject it. From Table 4.2 below, the F- statistic for both GCB (4.722577) and ADB (6.586750) is greater than the 5% upper critical value bound. Therefore, the null hypothesis is rejected for both GCB and ADB equations implying long run

relationship exist between bank profitability, inflation, exchange rate, gross domestic product and interest rate. Having established the long run relationship between the variables, the ARDL method is applied in the estimation of the parameters of the long run and short run of the single equation 3.4.

Table 4.2 The Bound Test for the Presence of Co-integration

	GCB		**ADB**	
Test Statistic	Value	K	Value	K
F-statistic	4.722577	4	6.586750	4
Critical Value Bounds				
Significance	***I0 Bound***	***I1 Bound***	***I0 Bound***	***I1 Bound***
10%	2.45	3.52	2.45	3.52
5%	2.86	4.01	2.86	4.01
1%	3.74	5.06	3.74	5.06

4.5 Results of the Long-run Relationship

Equation (3.4) is estimated for Ghana using annual data covering the period 19802014 with Ghana Commercial Bank and Agricultural Development Bank as a case study. Results are grounded on Akaike Information Criterion (AIC) utilizing a lag of one and two for ADB and GCB equations respectively. Table 4.3 shows results of the long-run estimate.

As indicated in the literature, not all the variables have one way expected theoretical signs (interest rate and inflation). In other words, the coefficients of these parameters

can either be positive or negative. lnGDP and lnEXCR did not meet the expected theoretical signs in the ADB model. However, in the GCB model, lnGDP met the expected theoretical sign of positive relationship with lnGCBROA whilst lnEXCR did not meet the apriori sign again in this model.

Table 4.3 ARDL Long run results with bank profitability (ADBROA and GCBROA) as dependent variable

	GCB			**ADB**		
	Coefficient	**Standard error**	**P-value**	**Coefficient**	**Standard error**	**P-value**
C	-7.932723	22.017348	0.7221	57.249975	16.905002	0.0022*
LnRI	2.443348	0.854115	0.0091*	-1.943797	0.716895	0.0115**
LnINF	0.043645	0.302007	0.8864	0.012592	0.228852	0.9565
LnGDP	0.033817	0.827170	0.9678	-2.066599	0.645884	0.0035*
LnEXCR	0.146417	0.217783	0.5084	0.528306	0.155554	0.0021*

Note: *, ** denote statistical significance at 1% Significance level, 5% Significance level respectively.

From Table 4.3, interest rate is positively related and significant to GCB profitability. Other research also noted similar positive relationship amid bank profitability and interest rates and (Demirguc-Kunt and Huizinga, 2000).

Again, the results indicates that rate of interest has a significant adverse impact on returns of Agricultural Development bank as gauged using return on assets due to the influence of the rate of interest on business loans. The main source of the bank's revenue is interest on loans it generates. Businesses regularly need to take loans to make up for investments and deficits in payroll, when interest rates rises and this will make

such deficits costly, since the businesses have to pay more interest back to bank lenders. Also companies usually take out loans for infrastructural projects. Rising interest rates makes it more costly for businesses to take loans, hence they will be unable to fund such projects. Higher rate of interest on loans, tend to reduce the number of individual and businesses who take loans from the bank and thus reduces revenues that the banks gain from interest on loan. Hence higher interest rate has an indirect effect on bank's profit. According to Simiyu and Ngile (2015), interest rates have an important impact on business strategy. The aim of every business is to maximize profit and therefore, every venture a business undertakes must be carefully analyzed so as to achieve its goal. When interest rates are high, new businesses become unattractive making repayments on loans more costly, which can lead to an increase in non-performing loans. This eventually affects profitability of the bank.

LnGDP has a negative impact on the performance of Agricultural Development Bank and is statistically significant. This could happen for the reason that, when an economy is growing, it attracts all kind of people into the country either with the aim to do genuine business or to defraud people. When fraudsters pretend like businessmen and take loans, the probability of payment is very low. Such bad loans that the banks are declared as bad debts and tend to influence bank assets hence profits are reduced. Gyamerah and Amoah (2015), in their study "determinants of Bank Profitability in Ghana" also had similar results.

The growth of every economy has an influence not only on businesses in the financial sector but also on non-financial institutions. This is because during boom periods in the business cycle of Ghana it is expected that firms could borrow very huge funds for investment, and this could mean banks creating more wealth, and increasing their asset portfolio through the increase in loans provision (Krakah and Ameyaw, 2010).

The other goal of the research was to investigate the impact of exchange rate on profitability of banks in Ghana. The results in Table 4.3 show that exchange rate is not significant but has a positive influence on the profits of GCB. The study therefore does not reject the null hypothesis that exchange rate does not influence bank profitability in Ghana with Ghana Commercial bank in focus. These outcomes are in line with the findings of Babazadeh and Farrokhnejad (2012).

However, exchange rate is positive and statistically significant at 1% significance level for ADB. The result suggests that a unit rise in exchange rate of the Ghanaian cedi will lead to a 0.528306 increase in return on assets for ADB. This happens for the reason that, currency fluctuations are transmitted directly into import price, producer price and Consumer Price Index (CPI. Exchange rate fluctuations are transferred to domestic prices through three channels thus through prices of imported consumption goods, prices of imported intermediate goods and prices of locally produced goods priced in external currency. The degree to which those variations are shown in the consumer price index (CPI) is based on the share of imports in the consumption basket. The price of imported goods rise as a result depreciation and the demand for locally produced goods that compete with compete with foreign goods will expand. As demand increases, prices of domestic and nominal wages will shoot up. Increasing wages will further put pressure on domestic prices to rise. A fall in the value of the currency serve a s shield to local industries when the domestic cost of inputs rises much less relative to the rate of depreciation. There will be an improvement in the performance of local industry when the value of the currency falls. An increase in value of the currency of a well-managed macroeconomic policy situation may result in external currency gains by commercial banks, which are income on their financial position to show improvement on their operations (Simiyu and Ngile, 2015).

Finally, for both GCB and ADB, inflation (INF) rate has a positive effect but statistically insignificant implying that inflation is relevant in the determination of banks profit. Research works such as Moussa (2012), Kiganda (2014), Gyamerah and Amoah (2015) found the same results.

4.6 Results of the Short Run Dynamic Model

The next stage is to investigate short run dynamics within the ARDL structure having estimated the long run cointegration model. Thus the lagged value of all level variables is retained in the ARDL model. Estimation resulted from the Akaike Information Criterion are depicted in the table below.

The error correction (ECM) term signifies the speed of adjustment to return to equilibrium in the dynamic model. The ECM constants present how speedily variables congregate towards equilibrium and it should have a negative sign with a statistically significant coefficient.

Table 4.4 presents the anticipated negative sign of ECM and is highly significant. This approves the presence of the co-integration relationship amid the variables in the model yet again.

The coefficient of ECM_{t-1} is -0.714906 and -0.980968 means that the devergence from the long-term profitability for GCB and ADB respectively is corrected by 71 percent and 98 percent respectively in the model by the coming year.

From the findings, it shows that the speed of adjustment in the model is high.

Table 4.4: Estimated Short-Run Error Correction Model using the ARDL Approach

	GCB			**ADB**		
	Coefficient	**Standard error**	**p-value**	**coefficient**	**Standard error**	**p-value**

CointEq (-1)	-0.714906	0.153737	0.0001*	-0.980968	0.159843	0.0000*
LnRI	-0.172033	0.751488	0.8210	-1.906803	0.676398	0.0089*
LnINF	0.031202	0.215756	0.8863	0.012352	0.224251	0.9565
LnGDP	0.424112	3.977562	0.9161	-2.027268	0.605395	0.0024*
LnEXCR	0.282877	0.263607	0.2949	-0.276564	0.270670	0.3160

Note: *, ** denote statistical significance at 1% Significance level, 5% Significance level, Significance level respectively.

The coefficient of the interest rate variable in the dynamic profitability equation for both ADB and GCB is negative but the profitability equation for GCB is statistically not significant whilst that for ADB is statistically significant. The result of the profitability equation for GCB is contrary to the result of the long run profitability equation whilst that for ADB is in conformity with the long run result. This indicates that, depending on the management of the bank, interest rate plays a role in bank profitability.

The coefficient of inflation maintained the positive sign in line with the long run outcomes for both banks. Intriguingly, the coefficient of inflation is statistically not significant for both GCB and ADB implying that inflation is not relevant in the determination of bank profit. Furthermore, the coefficient for GDP like the results in the long run, is positive and statistically not significant in the short run for GCB. On the contrary, the coefficient for GDP for ADB in both the long run and the short run is negative and statistically significant at 1% significance level. Thus, in the short run, a growth in GDP results in a reduction in bank profit level contrary to theoretical predictions.

Finally, the coefficient of exchange rate in the short run is positive as in the long run for GCB and statistically insignificant here too. For ADB, exchange rate is negatively related to bank profit level and statistically insignificant. This is in contrast to the long run results both in sign and the statistical significance.

4.7 Diagnostic Test Results

This is a first order test for the determination of the statistical significance of the parameters to evaluate their statistical reliability and these tests include normality, serial correlation, heteroscedasticity and functional form.

The results in Table 4.5 show that the null hypothesis was not rejected of no autocorrelation using the Breusch-Godfrey Serial Correlation LM Test for both banks. The F-statistic also indicated the acceptance of no autocorrelation hence it can be concluded that there is no autocorrelation between the variables employed in this study.

The null hypothesis was not rejected by the study and that there is homoscedasticity implying that the variances in the model are constant over time thereby passing the heteroscedasticity test using the Breusch-Pagan-Godfrey test for heteroscedasticity for both banks.

Table 4.5 Diagnostic and Stability Test Results

	GCB		**ADB**	
Test Statistics	**LM Version**	**F Version**	**LM Version**	**F Version**
A: Serial Correlation	CHSQ(3)=0.759910 (0.8590)	F(3,19)=0.149279 (09289)	CHSQ(1)= 0.138225 (0.7101)	F(1,26)=0.106133 (0.7472)
B: Functional Form	CHSQ(21)=0.044190	F(1,21)= 0.001953	CHSQ(1)= 0.200924	F(1, 26) = 0.040370

	(0.9652)	(0.9652)	(0.8423)	(0.8423)
C: Normality	CHSQ (1)= 1.371812 (0.503634)	Not Applicable	CHSQ(1)= 0.061375 (0.969779)	Not Applicable
D:Heteroscedasticity	CHSQ(10)= 15.03161 (0.1309)	F(10,22)= 1.840429 (0.112)	CHSQ(6)= 3.647739 (0.7242)	F(6,27)= 0.540811 (0.7725)
A: Breusch-Godfrey Serial Correlation L M Test B: Ramsey's RESET test using the square of the fitted values C: Based on a test of skewness and kurtosis of residuals D: Heteroskedasticity Test: Breusch-Pagan-Godfrey				

4.8 Normality and Stability Tests

To test for the stability of the model, the Ramsey RESET test was used. Given that the model is statistically not significant at 5% significance level, Ramsey RESET Test indicated evidence of correct functional form of the model hence the stability of the coefficients in the model. From Table 4.5, the study did not rejects the null hypothesis since the p- values for GCB and ADB in the table above is greater than the 5% significance level implying that the model is statistically not significant. In other words, the model is stable and therefore is dependable.

The normality test was based on the null hypothesis of normality distribution of the residuals. The results in figure 4.1 indicate that the null hypothesis is not rejected with normality distribution at 5% level of significance. Thus the residuals are normally distributed.

Figure 4.2: Normality test result

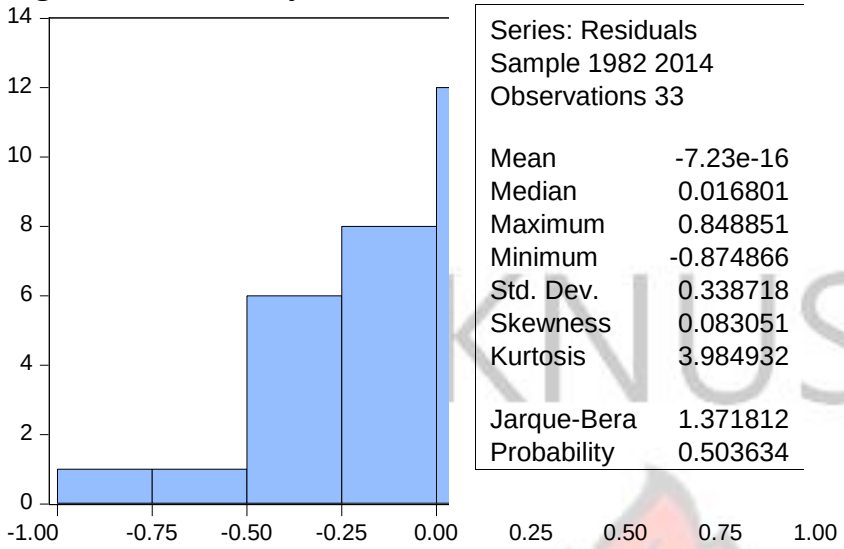


Table 4.6 Goodness of Fit

Measurement	GCB	ADB
R – squared	0.643131	0.550471
Akaike Info. Criterion	1.309421	1.9429803
Adjusted R – squared	0.480918	0.450576
Schwarz Criterion	1.808257	2.257236
S.E. of Regression	0.408678	0.583876
Durbin-Watson Stat.	1.821865	2.192327
Sum of squared Residuals	3.674383	9.204610
F – statistic	3.964727 (0.003380)	5.510484 (0.000782)

The short run dynamics of equations was estimated with an R-squared value of 0.643131 and 0.550471, meaning about 64.3% and 55.05% of the variation in the profitability is explained by the independent variables in the model for GCB and ADB respectively. The R-bar-square is about 48.09% and 45.06 for GCB and ADB respectively. The F-statistic confirmed the joint significance of all the independent variables at 1% significant level for both models. The DW statistic was 1.821865 and 2.192327which is high enough to debunk the presence of autocorrelation in the model for both models respectively.

CHAPTER FIVE

SUMMARY OF FINDINGS, POLICY IMPLICATIONS AND RECOMMENDATIONS

5.1 Summary of Empirical Findings

The role of banks in the economic growth and development of the economy cannot be underestimated. A strong financial system is required for appropriate financial intervention, which leads to supporting private investment and the motivation of entrepreneurship. The banking sector has gone through several policies and reforms over the years. The operational setting and competitive landscape have been changing. There is more competition now among banks as they are more integrated into the global

financial system. In order to cope with economic challenges and to maintain financial steadiness, it is important to recognize the variables that affect bank profitability in Ghana and the degree of their impact. This objective is what the study sought to accomplish. This research investigated the relationship between macroeconomic variables (real GDP, interest rate, exchange rate and inflation) on banks profitability (return on assets) in Ghana, using time series data from 1980 to 2014.

The trend analysis indicates that return on assets representing a measure of financial gain was unstable during the period under study for the two banks. As the trend for exchange rate continue to grow steadily from 1980 to 2014, the return on assets for both ADB and GCB fluctuated. The trend for ADBROA and GCBROA seem to maintain a constant slope and the trend for GDP kept rising steadily over the whole time. When INF is falling, ADBROA rises but GCBROA either rises with INF or stays stable. In the last graph, whilst the trend of RI grew steadily from 1980 with little fluctuations and peak around 2005 before decreasing until 2014, the trends of ADBROA and GCBROA did not change much but fluctuated throughout the period.

One of the objectives of the study was to identify the impact of interest rates on banks profitability in Ghana. The study found that real interest rates had a negative and significant influence on profitability for ADB in Ghana in both the short run and the long run. These findings are in contrast with the results for GCB, which has a positive impact on profitability in the long run but conforms to the short run results. However, the interest rate coefficient is statistically insignificant in both the short run and the long run. This finding is in agreement with empirical literature (Nadeem, 2013).

Inflation and Gross Domestic Product (GDP) is positively insignificant to bank profitability in the short run and the long run for GCB and ADB. However, GDP is negatively associated with profitability and statistically significant for ADB. The study

also established the effect of exchange rate on Ghana commercial banks' profitability as a positive effect and statistically insignificant. Exchange rate is positively associated with profitability and statistically significant for ADB in the long run. In the short run, exchange rate is negatively associated with bank profit level and statistically insignificant for ADB.

5.2 Policy Implications and Recommendations

Macroeconomic variables are important and cannot be underestimated in the role banks play in contributing effectively to the economic growth of the economy and profitability of banks. Where the risk associated with macroeconomic variables such as exchange rates, interest rate, inflation and Gross Domestic Product, are high, returns on bank profitability will be low.

As indicated earlier, the state of the economy is a requirement for sustainable and sound banking system in the country, hence, the positive relationship between Gross Domestic Product (GDP) and bank profitability is consistent with theory even though real GDP had a significant effect on one bank profitability and insignificant on the other. Thus, government policies on expansion of output should be intensified since that increases the profitability of banks.

Again, the interest rate coefficient was significant for both banks but contrasting sign for the two banks implying that depending on how it is managed it can either lead to a fall in profitability or a rise in profitability. Therefore, the central bank should manage the rising interest rates by applying effective policies. Bank managers should also apply efficient policies to control their interest rate risks such that their returns are not adversely affected. Interest rate risk exists in an interestbearing asset because of the possibility of changes in the value of assets, which results from the variability of interest

rates. Hence, managing interest rate risk has therefore become crucial and as such multifarious instruments have been developed to care of it. In view of this the central bank and other banks should make good use of these policies and tools to ensure that the rising interest rates are properly managed since it will attract more local and foreign investors, which enhances growth and increases banks returns.

More over, though a rising exchange rate is related to increase in profitability in this study, it is established that, a speedy fall in the value of local currency creates unsteadiness within other macroeconomic variables. This therefore means that the Central Bank has to ensure different measures that aim at stabilizing local currency are put in place. The Central Bank need to do a lot in the area of exchange rate with the aim of attaining a realistic exchange rate that will promote economic growth and attain a relatively stable Ghanaian cedi. Banks can also put up risk mitigating strategies to check fluctuations on foreign exchange.

Furthermore, the ARDL model results show that apart from inflation, which is positive and insignificant for both banks in the short run and long run, the other macroeconomic factors such as GDP, interest rate and exchange rate have contrasting results. It can therefore be concluded that internal factors which are mostly influenced by the board and managements' internal decisions that determine the performance of banks in Ghana. Bank should do their utmost best to improve their operational efficiency by employing both human and financial capital to manage and create a well-diversified risk asset portfolio and this will make sure that both interest sensitive risk assets and liabilities are utilized to maximize profits.

In conclusion, bank managers are also provided with information on their activities that would improve their financial profitability. From the study, it is important for bank

management to carefully consider the impact of macroeconomic variable in their operational decisions so as to improve the welfare and the financial position of the bank.

Finally, since macroeconomic variable play a vital role in an economy, the government is expected to implement macroeconomic policies that are sustainable and will encourage sustainable growth and favourable environment that will boost capacity utilization of local industries and businesses to pave way for high demand for credit and enhance the welfare of all financial institutions.

5.3 Limitations and Recommendation for Future Studies

As noted from 1.7 above, the study was restricted to only two banks despite the fact that there are twenty-nine commercial banks in Ghana as at December 2015 Bank of Ghana (2015). For this reason, due to specific disposition of every bank, it will be vital to consider its own internal operations while using the conclusions drawn from the study.

It is also suggested that, future studies could be on other variables such as unemployment, money supply, budget deficit and the like, which were not included in this study.

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APPENDIXES

APPENDIX 1 LEVELS AND FIRST DIFFERENCE STATIONARITY TEST

Augmented Dickey-Fuller test for unit root Number of observation = 33

---------- Interpolated Dickey-Fuller ----------

Test Statistic	1% Critical Value	5% Critical Value	10% Critical Value
Z(t) -2.679	-3.696	-2.978	-2.620

MacKinnon approximate p-value for Z(t) = 0.0777

Phillips-Perron test for unit root Number of observation = 34

Newey-West lags = 3

---------- Interpolated Dickey-Fuller ----------

Test Statistic	1% Critical Value	5% Critical Value	10% Critical Value

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Z(rho)	-5.950	-17.812	-12.788	-10.380
Z(t)	-2.097	-3.689	-2.975	-2.619

MacKinnon approximate p-value for Z(t) = 0.2456

Phillips-Perron test for unit root Number of observation = 33

Newey-West lags = 3

---------- Interpolated Dickey-Fuller ----------

Test	1% Critical	5% Critical	10% Critical
Statistic	Value	Value	Value
Z(rho)	-18.091	-17.744	-12.756	-10.360
Z(t)	-3.942	-3.696	-2.978	-2.620

MacKinnon approximate p-value for Z(t) = 0.0017

Augmented Dickey-Fuller test for unit root Number of observation = 33

---------- Interpolated Dickey-Fuller ----------

Test	1% Critical	5% Critical	10% Critical
Statistic	Value	Value	Value
Z(t)	-2.683	-3.696	-2.978	-2.620

MacKinnon approximate p-value for Z(t) = 0.077

Augmented Dickey-Fuller test for unit root Number of observation = 33

---------- Interpolated Dickey-Fuller ----------

	Test Statistic	1% Critical Value	5% Critical Value	10% Critical Value
Z(t)	-2.912	-3.696	-2.978	-2.620

MacKinnon approximate p-value for Z(t) = 0.0439

Phillips-Perron test for unit root Number of observation = 34

Newey-West lags = 3

---------- Interpolated Dickey-Fuller ----------

	Test Statistic	1% Critical Value	5% Critical Value	10% Critical Value
Z(rho)	-22.675	-17.812	-12.788	-10.380
Z(t)	-4.020	-3.689	-2.975	-2.619

MacKinnon approximate p-value for Z(t) = 0.0013

Augmented Dickey-Fuller test for unit root Number of observation = 32

---------- Interpolated Dickey-Fuller ----------

	Test Statistic	1% Critical Value	5% Critical Value	10% Critical Value
Z(t)	-5.702	-3.702	-2.980	-2.622

MacKinnon approximate p-value for Z(t) = 0.0000

Phillips-Perron test for unit root Number of observation = 33

Newey-West lags = 3

---------- Interpolated Dickey-Fuller ----------

	Test Statistic	1% Critical Value	5% Critical Value	10% Critical Value
Z(rho)	-41.068	-17.744	-12.756	-10.360
Z(t)	-10.205	-3.696	-2.978	-2.620

MacKinnon approximate p-value for Z(t) = 0.0000

Augmented Dickey-Fuller test for unit root Number of observation = 32

---------- Interpolated Dickey-Fuller ----------

	Test Statistic	1% Critical Value	5% Critical Value	10% Critical Value
Z(t)	-4.227	-3.702	-2.980	-2.622

MacKinnon approximate p-value for Z(t) = 0.0006

Phillips-Perron test for unit root Number of observation = 33

Newey-West lags= 3

---------- Interpolated Dickey-Fuller ----------

	Test Statistic	1% Critical Value	5% Critical Value	10% Critical Value
Z(rho)	-40.053	-17.744	-12.756	-10.360
Z(t)	-10.368	-3.696	-2.978	-2.620

MacKinnon approximate p-value for Z(t) = 0.0000

Phillips-Perron test for unit root Number of observation = 33

Newey-West lags = 3

---------- Interpolated Dickey-Fuller ----------

	Test Statistic	1% Critical Value	5% Critical Value	10% Critical Value
Z(rho)	1.515	-17.744	-12.756	-10.360
Z(t)	0.253	-3.696	-2.978	-2.620

MacKinnon approximate p-value for Z(t) = 0.9751

Phillips-Perron test for unit root Number of observation = 33

Newey-West lags = 3

---------- Interpolated Dickey-Fuller ----------

Test	Statistic	1% Critical Value	5% Critical Value	10% Critical Value
Z(rho)	-11.043	-17.744	-12.756	-10.360
Z(t)	-3.218	-3.696	-2.978	-2.620

MacKinnon approximate p-value for Z(t) = 0.0189

Augmented Dickey-Fuller test for unit root Number of observation = 33

---------- Interpolated Dickey-Fuller ----------

Test	Statistic	1% Critical Value	5% Critical Value	10% Critical Value

Z(t)	-1.849	-3.696	-2.978	-2.620

MacKinnon approximate p-value for Z(t) = 0.3562

Augmented Dickey-Fuller test for unit root Number of observation = 32

---------- Interpolated Dickey-Fuller ----------

Test	1% Critical	5% Critical	10% Critical
Statistic	Value	Value	Value
Z(t)	-3.539	-3.702	-2.980	-2.622

MacKinnon approximate p-value for Z(t) = 0.0070

Phillips-Perron test for unit root Number of observation = 34

Newey-West lags = 3

---------- Interpolated Dickey-Fuller ----------

Test	1% Critical	5% Critical	10% Critical
Statistic	Value	Value	Value
Z(rho)	-5.101	-17.812	-12.788	-10.380
Z(t)	-1.842	-3.689	-2.975	-2.619

MacKinnon approximate p-value for Z(t) = 0.3600

Phillips-

Perron test for unit root Number of observation = 33

Newey-West lags = 3

---------- Interpolated Dickey-Fuller ----------

Test Statistic	1% Critical Value	5% Critical Value	10% Critical Value
Z(rho) -34.486	-17.744	-12.756	-10.360
Z(t) -5.633	-3.696	-2.978	-2.620

MacKinnon approximate p-value for Z(t) = 0.0000

Augmented Dickey-Fuller test for unit root Number of observation = 33

---------- Interpolated Dickey-Fuller ----------

Test Statistic	1% Critical Value	5% Critical Value	10% Critical Value
Z(t) -3.282	-3.696	-2.978	-2.620

MacKinnon approximate p-value for Z(t) = 0.0157

Phillips-

Perron test for unit root Number of observation = 34

Newey-West lags = 3

---------- Interpolated Dickey-Fuller ----------

Test Statistic	1% Critical Value	5% Critical Value	10% Critical Value
Z(rho) -17.778	-17.812	-12.788	-10.380
Z(t) -3.557	-3.689	-2.975	-2.619

MacKinnon approximate p-value for Z(t) = 0.0066

Augmented Dickey-Fuller test for unit root Number of observation = 33

---------- Interpolated Dickey-Fuller ----------

Test Statistic	1% Critical Value	5% Critical Value	10% Critical Value
Z(t) -3.472	-3.696	-2.978	-2.620

MacKinnon approximate p-value for Z(t) = 0.0087

Phillips-

Perron test for unit root Number of observation = 34

Newey-West lags = 3

---------- Interpolated Dickey-Fuller ----------

Test		1% Critical	5% Critical	10% Critical
	Statistic	Value	Value	Value
Z(rho)	-2.137	-17.812	-12.788	-10.380
Z(t)	-3.841	-3.689	-2.975	-2.619

MacKinnon approximate p-value for Z(t) = 0.0025

Augmented Dickey-Fuller test for unit root Number of observation = 33

---------- Interpolated Dickey-Fuller ----------

Test		1% Critical	5% Critical	10% Critical
	Statistic	Value	Value	Value
Z(t)	0.890	-3.696	-2.978	-2.620

MacKinnon approximate p-value for Z(t) = 0.9930

Phillips-

Augmented Dickey-Fuller test for unit root Number of observation = 32

---------- Interpolated Dickey-Fuller ----------

	Test Statistic	1% Critical Value	5% Critical Value	10% Critical Value
Z(t)	-4.680	-3.702	-2.980	-2.622

MacKinnon approximate p-value for Z(t) = 0.0001

Phillips-Perron test for unit root Number of observation = 34

Newey-West lags = 3

---------- Interpolated Dickey-Fuller ----------

Test	Statistic	1% Critical Value	5% Critical Value	10% Critical Value
Z(rho)	1.307	-17.812	-12.788	-10.380
Z(t)	2.721	-3.689	-2.975	-2.619

MacKinnon approximate p-value for Z(t) = 0.9991

APPENDIX 2

DATA USED FOR ESTIMATION ANALYSIS

Year	lnGCBROA	lnADBROA	lnEXCR	lnINF	lnRI	lnGDP
1980	-0.69315	0.832909	-8.19875	3.913425	2.944439	22.71009
1981	-0.61619	0.641854	-8.19875	4.757922	2.944439	22.67443
1982	-0.63488	0.262364	-8.19875	3.104388	2.944439	22.60268
1983	-0.16252	-0.10536	-5.80904	4.811164	2.944439	22.55596
1984	0.871293	1.335001	-5.29832	3.680477	2.960105	22.6389
1985	0.48858	0.993252	-5.1162	2.332672	3.034953	22.68857
1986	-0.27444	1.252763	-4.71043	3.20134	3.126761	22.73925
1987	-0.4943	1.335001	-4.03954	3.684245	3.273364	22.78609
1988	0.641854	1.481605	-3.77276	3.44551	3.280911	22.84084
1989	0.741937	1.648659	-3.49651	3.227784	3.273364	22.89045
1990	0.470004	1.916923	-3.3673	3.617895	3.273364	22.92319
1991	0.086178	2.054124	-3.24259	2.892117	3.238678	22.97467
1992	-0.06188	2.525729	-2.95491	2.308181	3.194583	23.01273
1993	0.576613	1.547563	-2.50144	3.217268	3.433987	23.06009
1994	2.356126	1.629241	-2.25129	3.213673	3.363842	23.09255
1995	2.407846	0.587787	-1.93152	4.08533	3.632309	23.13285
1996	2.184927	1.163151	-1.74047	3.840764	3.663562	23.17785
1997	2.084429	2.066863	-1.4816	3.328096	3.7612	23.21896
1998	2.230014	1.163151	-1.45862	2.682675	3.663562	23.26489
1999	2.080691	0.587787	-1.03983	2.518395	3.597312	23.30795
2000	2.128232	1.137833	-0.34989	3.226575	3.850148	23.34428
2001	2.272126	1.667707	-0.31171	3.493637	3.779634	23.3835
2002	2.332144	1.435085	-0.16974	2.695724	3.594569	23.42752
2003	2.163323	0.741937	-0.12191	3.283725	3.488903	23.47821
2004	1.526056	1.437463	-0.09935	2.535645	3.358638	23.5327
2005	1.193922	2.493205	-0.09093	2.715898	3.258097	23.59003

2006	1.568616	2.528924	-0.07955	2.390154	3.188417	23.65206
2007	1.308333	1.975469	-0.03005	2.373298	3.167583	23.71466
2008	0.871293	2.493205	0.194003	2.804702	3.219676	23.7956
2009	0.542324	0.542324	0.34967	2.957548	3.488903	23.83473
2010	0.336472	2.342767	0.387844	2.370951	3.318902	23.91176
2011	1.386294	1.386294	0.438577	2.166403	3.255401	24.05158
2012	1.896254	0.698135	0.631272	2.214931	3.247269	24.13583
2013	1.660131	1.660131	0.788457	2.451723	3.241029	24.20472
2014	0.928219	0.928219	1.07841	2.740399	3.284664	24.23746

APPENDIX 3 LONG RUN AND SHORT RUN ARDL ESTIMATED RESULTS FOR ADB AND GCB

ARDL Co-integrating And Long Run Form FOR ADB
Dependent Variable: LNADBROA
Selected Model: ARDL (1, 1, 0, 0, 0)
Date: 09/23/15 Time: 12:09
Sample: 1980 - 2014
Included observations: 34

Co-integrating Form

Variable	Coefficient	Std. Error	t-Statistic	Prob.
D(LNEXCR)	-0.276564	0.270670	-1.021775	0.3160
D(LNGDP)	-2.027268	0.605395	-3.348667	0.0024
D(LNINF)	0.012352	0.224251	0.055083	0.9565
D(LNRI)	-1.906803	0.676398	-2.819057	0.0089
CointEq(-1)	-0.980968	0.159843	-6.137066	0.0000

Cointeq = LNADBRO A - (0.5283 *LNEXCR -2. 0666 *LNGD P + 0.0126*LNINF-1.9438*LNRI + 57.2500)

Long Run Coefficients

Variable	Coefficient	Std. Error	t-Statistic	Prob.
LNEXCR	0.528306	0.155554	3.396282	0.0021
LNGDP	-2.066599	0.645884	-3.199645	0.0035
LNINF	0.012592	0.228852	0.055022	0.9565
LNRI	-1.943797	0.716895	-2.711411	0.0115
C	57.249975	16.905002	3.386570	0.0022

ARDL Co-integrating And Long Run Form FOR GCB
Dependent Variable: LNGCBROA
Selected Model: ARDL (2, 1, 0, 1, 2)
Date: 09/23/15 Time: 16:53
Sample: 1980 - 2014
Included observations: 33

Co-integrati ng Form

Variable	Coefficient	Std. Error	t-Statistic	Prob.
D(LNGCBROA(-1))	0.557359	0.157284	3.543651	0.0018
D(LNRI)	-0.172033	0.751488	-0.228923	0.8210
D(LNINF)	0.031202	0.215756	0.144616	0.8863
D(LNGDP)	0.424112	3.977562	0.106626	0.9161
D(LNEXCR)	0.282877	0.263607	1.073099	0.2949
D(LNEXCR(-1))	0.368860	0.224300	1.644492	0.1143
CointEq(-1)	-0.714906	0.153737	-4.650174	0.0001

Cointeq = LNGCBR OA - (2. 4433*LNRI +436*LNINF + 0.0
0.0338*LNGDP + 0.1464*LNEXCR – 7.9327)

Long Run Coefficients

Variable	Coefficient	Std. Error	t-Statistic	Prob.

LNRI	2.443348	0.854115	2.860678	0.0091
LNINF	0.043645	0.302007	0.144515	0.8864
LNGDP	0.033817	0.827170	0.040883	0.9678
LNEXCR	0.146417	0.217783	0.672303	0.5084
C	-7.932723	22.017348	-0.360294	0.7221

ARDL Bounds Test FOR ADB
Date: 09/23/15 Time: 12:10
Sample: 1981 - 2014
Included observations: 34
Null Hypothesis: No long-run relationships exist

Test Statistic	Value	k
F-statistic	6.586750	4

Critical Value Bounds

Significance	I0 Bound	I1 Bound
10%	2.45	3.52
5%	2.86	4.01
2.5%	3.25	4.49
1%	3.74	5.06

Test Equation:
Dependent Variable: D(LNAD ROA)
Method: Least Squares
Date: 09/23/15 Time: 12:10
Sample: 1981 - 2014

Included observations: 34

Variable	Coefficient	Std. Error	t-Statistic	Prob.
D(LNEXCR)	-0.420707	0.328221	-1.281780	0.2108
C	43.65920	16.04357	2.721289	0.0112
LNEXCR(-1)	0.392967	0.144801	2.713844	0.0114
LNGDP(-1)	-1.594395	0.611111	-2.609011	0.0146
LNINF(-1)	-0.031200	0.255393	-0.122166	0.9037
LNRI(-1)	-1.225364	0.685996	-1.786256	0.0853
LNADBROA(-1)	-1.014554	0.195475	-5.190193	0.0000

R-squared	0.550471	Mean dependent var	0.002803
Adjusted Rsquared	0.450576	S.D. dependent var.	0.787711
S.E. of regression	0.583876	Akaike info criterion	1.942986
Sum squared resid	9.204610	Schwarz criterion	2.257236
Log likelihood	-26.03076	Hannan-Quinn criter.	2.050154
F-statistic	5.510484	Durbin-Watson stat	2.192327
Prob(F-statistic)	0.000782		

ARDL Bounds Test FOR GCB
Date: 09/23/15 Time: 16:46
Sample: 1982 - 2014
Included observations: 33
Null Hypothesis: No long-run relationships exist

Test Statistic	Value	k
F-statistic	4.722577	4

Critical Value Bounds

Significance	I0 Bound	I1 Bound
10%	2.45	3.52
5%	2.86	4.01
2.5%	3.25	4.49
1%	3.74	5.06

Test Equation:
Dependent Variable: D(LNGC ROA)
Method: Least Squares
Date: 09/23/15 Time: 16:46
Sample: 1982 - 2014
Included observations: 33

Variable	Coefficient	Std. Error	t-Statistic	Prob.
D(LNGCBROA(-1))	0.558641	0.157062	3.556805	0.0018
D(LNRI)	-0.142168	0.719672	-0.197545	0.8452
D(LNGDP)	0.225079	3.901981	0.057683	0.9545
D(LNEXCR)	0.295819	0.266536	1.109862	0.2790
D(LNEXCR(-1))	0.388295	0.262627	1.478504	0.1534
C	-5.441467	15.56752	-0.349540	0.7300
LNRI(-1)	1.776242	0.654959	2.711988	0.0127
LNINF(-1)	-0.011479	0.216833	-0.052941	0.9583
LNGDP(-1)	0.015389	0.593565	0.025927	0.9795
LNEXCR(-1)	0.102244	0.178800	0.571835	0.5732
LNGCBROA(-1)	-0.714042	0.154991	-4.606981	0.0001

R-squared	0.643131	Mean dependent var.	0.046800
Adjusted R-squared			
S.E. of regression	0.480918	S.D. dependent var.	0.567235
Sum squared resid	0.408678	Akaike info criterion	1.309421
Log likelihood	3.674383	Schwarz criterion	1.808257
F-statistic	-10.60545	Hannan-Quinn criter.	1.477264
Prob(F-statistic)	3.964727	Durbin-Watson stat	1.821865
	0.003380		

APPENDIX 4 DIAGNOSTIC AND STABILITY TEST RESULTS

Breusch-Godfrey Serial Correlation LM Test:

F-statistic	0.106133	Prob. F(1,26)	0.7472
Obs*R-squared	0.138225	Prob. Chi-Square(1)	0.7101

Test Equation:
Dependent Variable: RESID
Method: ARDL
Date: 09/23/15 Time: 12:12
Sample: 1981 2014 Included observations: 34
Presample missing value lagged residuals set to zero.

Variable	Coefficient	Std. Error	t-Statistic	Prob.
LNADBROA(-1)	0.075143	0.282181	0.266293	0.7921
LNEXCR	-0.004131	0.275556	-0.014991	0.9882
LNEXCR(-1)	-0.026782	0.310094	-0.086368	0.9318
LNGDP	0.098816	0.686335	0.143977	0.8866
LNINF	-0.005531	0.228688	-0.024185	0.9809
LNRI	0.110747	0.767295	0.144335	0.8863
C	-2.826965	18.33169	-0.154212	0.8786
RESID(-1)	-0.114371	0.351068	-0.325781	0.7472

R-squared	0.004065	Mean depen dent var	5.43 E-15
Adjusted R-squared	-0.264071	S.D. dependent var	0.487550
S.E. of regression	0.548156	Akaike info criterion	1.837812
Sum squared resid	7.812360	Schwarz criterion	2.196956
Log likelihood	-23.24280	Hannan-Quinn criter.	1.960290
F-statistic	0.015162	Durbin-Watson stat	2.044102
Prob(F-statistic)	0.999996		

Breusch-Godfrey Serial Correlation LM Test:

F-statistic	0.149279	Prob. F(3,19)	0.9289
Obs*R-squared	0.759910	Prob. Chi-Square(3)	0.8590

Test Equation:
Dependent Variable: RESID
Method: ARDL
Date: 09/23/15 Time: 17:03
Sample: 1982 2014 Included observations: 33
Presample missing value lagged residuals set to zero.

Variable	Coefficient	Std. Error	t-Statistic	Prob.
	-0.089932	0.242030	-0.371573	
LNGCBROA(-1)				0.7143
LNGCBROA(-2)	0.111698	0.237053	0.471193	0.6429
LNRI	0.123473	0.846378	0.145884	0.8855
LNRI(-1)	-0.004213	0.846144	-0.004979	0.9961
LNINF	0.022705	0.237127	0.095748	0.9247
LNGDP	1.185802	4.680215	0.253365	0.8027
LNGDP(-1)	-1.036484	4.346405	-0.238469	0.8141
LNEXCR	-0.058521	0.295191	-0.198248	0.8450
LNEXCR(-1)	0.009992	0.346265	0.028858	0.9773
LNEXCR(-2)	-0.002183	0.249064	-0.008765	0.9931
C	-4.103264	17.62044	-0.232870	0.8184
RESID(-1)	0.178673	0.361403	0.494388	0.6267
RESID(-2)	-0.072183	0.300733	-0.240023	0.8129
RESID(-3)	-0.125692	0.282112	-0.445537	0.6610

R-squared	0.023028	Mean depen dent v ar	-7.23 E-16
Adjusted R-squared	-0.645427	S.D. dependent var	0.338718
S.E. of regression	0.434488	Akaike info criterion	1.467120
Sum squared resid	3.586818	Schwarz criterion	2.102002
Log likelihood	-10.20748	Hannan-Quinn criter.	1.680738
F-statistic	0.034449	Durbin-Watson stat	2.032518
Prob(F-statistic)	1.000000		

Heteroskedasticity Test: Breusch-Pagan-Godfrey

F-statistic	0.540811	Prob. F(6,2 7)	0.7725
Obs*R-squared	3.647739	Prob. Chi-Square(6)	0.7242
Scaled explained SS	2.122479	Prob. Chi-Square(6)	0.9081

Test Equation:
Dependent Variable: RESID^2
Method: Least Squares
Date: 09/23/15 Time: 12:14
Sample: 1981 2014
Included observations: 34

Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	1.369432	9.788937	0.139896	0.8898
LNADBROA(-1)	-0.042978	0.098543	-0.436133	0.6662
LNEXCR	-0.033750	0.166868	-0.202257	0.8412
LNEXCR(-1)	0.065090	0.181255	0.359107	0.7223
LNGDP	-0.062619	0.373226	-0.167777	0.8680
LNINF	-0.041609	0.138250	-0.300972	0.7657
LNRI	0.176338	0.416998	0.422875	0.6757

R-squared	0.107286	Mean dependent var	0.230713
Adjusted R-squared	-0.091094	S.D. dependent var	0.318123
S.E. of regression	0.332297	Akaike info criterion	0.815665
Sum squared resid	2.981371	Schwarz criterion	1.129915
Log likelihood	-6.866298	Hannan-Quinn criter.	0.922833
F-statistic	0.540811	Durbin-Watson stat	2.377503
Prob(F-statistic)	0.772473		

Heteroskedasticity Test: Breusch-Pagan-Godfrey

F-statistic	1.840429		
		Prob. F(10,22)	0.1120
Obs*R-squared	15.03161	Prob. Chi-Square(10)	0.1309
Scaled explained SS	9.970742	Prob. Chi-Square(10)	0.4431

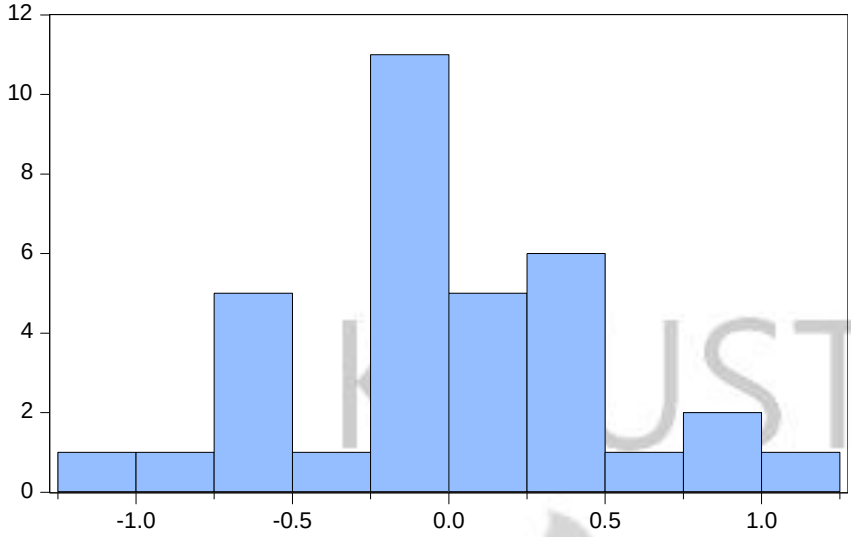
Test Equation:
Dependent Variable: RESID^2
Method: Least Squares
Date: 09/23/15 Time: 17:07
Sample: 1982 2014

Included observations: 33

Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	4.233749	6.590341	0.64241 7	0.5272
LNGCBROA(-1)	-0.107764	0.065708	-1.640051	0.1152
LNGCBROA(-2)	-0.128643	0.066881	-1.923442	0.0675
LNRI	-0.440069	0.319553	-1.377136	0.1823
LNRI(-1)	0.681883	0.308551	2.209952	0.0378
LNINF	0.028123	0.091745	0.306535	0.7621
LNGDP	-1.374137	1.691369	-0.812441	0.4252
LNGDP(-1)	1.182298	1.576344	0.750025	0.4612
LNEXCR	-0.038134	0.112093	-0.340202	0.7369
LNEXCR(-1)	0.114219	0.136813	0.834852	0.4128
LNEXCR(-2)	0.026160	0.095379	0.274277	0.7864

R-squared	0.455503	Mean dependent v ar	0.111253
Adjusted R-squared	0.208005	S.D. dependent var	0.195192
S.E. of regression	0.173710	Akaike info criterion	-0.401663
Sum squared resid	0.663850	Schwarz criterion	0.097173
Log likelihood	17.62744	Hannan-Quinn criter.	-0.233820
F-statistic	1.840429	Durbin-Watson stat	2.200524
Prob(F-statistic)	0.112035		

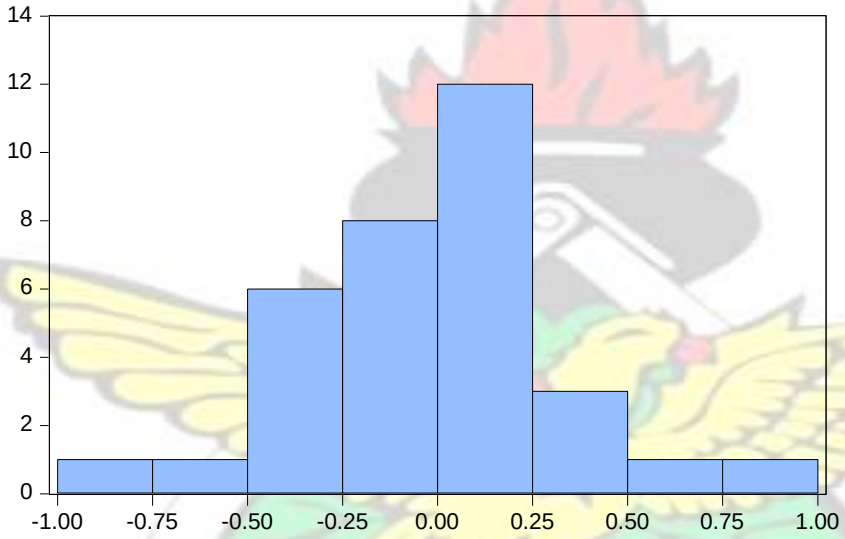
Normality Test for ADB



Series: Residuals
Sample 1981 2014
Observations 34

Mean	5.43e-15
Median	-0.023789
Maximum	1.059712
Minimum	-1.135871
Std. Dev.	0.487550
Skewness	-0.069657
Kurtosis	2.845355
Jarque-Bera	0.061375
Probability	0.969779

Normality Test for GCB



Series: Residuals
Sample 1982 2014
Observations 33

Mean	-7.23e-16
Median	0.016801
Maximum	0.848851
Minimum	-0.874866
Std. Dev.	0.338718
Skewness	0.083051
Kurtosis	3.984932
Jarque-Bera	1.371812
Probability	0.503634

Ramsey RESET Test

Equation: UNTITLED
Specification: LNADBROA LNADBROA(-1) LNEXCR LNEXCR(-1) LNGDP LNINF LNRI C
Omitted Variables: Squares of fitted values

	Value	Probability	df	t-statistic	0.200924	0.8423
F-statistic	0.040370	(1,26)		0.8423		

F-test summary:

	Sum of Squares	df	Mean Sq.
Test SSR	0.012161	1	0.012161
Restricted SSR	7.844251	27	0.290528
Unrestricted SSR	7.832090	26	0.301234

Unrestricted Test Equation:
Dependent Variable: LNADBROA
Method: ARDL
Date: 09/23/15 Time: 12:08
Sample: 1981 2014
Included observations: 34
Maximum dependent lags: 1 (Automatic selection)
Model selection method: Akaike info criterion (AIC)
Dynamic regressors (1 lag, automatic):
Fixed regressors: C

Variable	Coefficient	Std. Error	t-Statistic	Prob.*
LNADBROA(-1)	0.014047	0.164642	0.085317	0.9327
LNEXCR	-0.250440	0.304740	-0.821816	0.4187
LNEXCR(-1)	0.669504	0.691804	0.967766	0.3421
LNGDP	-1.649001	1.980991	-0.832412	0.4128
LNINF	-0.001803	0.238967	-0.007547	0.9940
LNRI	-1.496956	2.152951	-0.695304	0.4930
C	45.64575	54.77219	0.833375	0.4122
FITTED^2	0.071786	0.357278	0.200924	0.8423

R-squared	0.487812	Mean depe ndent var	1.398710
Adjusted R-squared	0.349916	S.D. dependent var	0.680718
S.E. of regression	0.548848	Akaike info criterion	1.840334
Sum squared resid	7.832090	Schwarz criterion	2.199478
Log likelihood	-23.28568	Hannan-Quinn criter.	1.962812

F-statistic	3.537523	Durbin-Watson stat	2.050785
Prob(F-statistic)	0.008405		

*Note: p-values and any subsequent tests do not account for model

Ramsey RESET Test

Equation: UNTITLED

Specification: LNGCBROA LNGCBROA(-1) LNGCBROA(-2) LNRI LNRI(-1) LNINF LNGDP LNGDP(-1) LNEXCR LNEXCR (-1) LNEXCR(-2) C

Omitted Variables: Squares of fitted values

	Value	Probability	df	t-statistic	0.044190	0.9652
F-statistic	0.001953	(1,21)		0.9652		

F-test summary:

	Sum of Squares	df	Mean Sq.
Test SSR	0.000341	1	0.000341
Restricted SSR	3.671361	22	0.166880
Unrestricted SSR	3.671020	21	0.174810

Unrestricted Test Equation:

Dependent Variable: LNGCBROA

Method: ARDL

Date: 09/23/15 Time: 17:15

Sample: 1982 2014

Included observations: 33

Maximum dependent lags: 3 (Automatic selection) Model selection method: Akaike info criterion (AIC) Dynamic regressors (3 lags, automatic):

Fixed regressors: C

Variable	Coefficient	Std. Error	t-Statistic	Prob.*
LNGCBROA(-1)	0.830250	0.318234	2.608930	0.0164
LNGCBROA(-2)	-0.550117	0.229729	-2.394628	0.0260
LNRI	-0.176036	0.774453	-0.227304	0.8224
LNRI(-1)	1.883506	1.090548	1.727119	0.0988
LNINF	0.029102	0.225876	0.128841	0.8987
LNGDP	0.442644	4.092518	0.108159	0.9149
LNGDP(-1)	-0.432783	3.866242	-0.111939	0.9119
LNEXCR	0.283791	0.270589	1.048787	0.3062
LNEXCR(-1)	0.189557	0.330237	0.574002	0.5721

LNEXCR(-2)	-0.365511	0.241750	-1.511939	0.1455
C	-5.201454	19.09417	-0.272411	0.7880
FITTED^2	0.006396	0.144748	0.044190	0.9652

R-squared	0.868890	Mean dependent var.	1.142613
Adjusted R-squared	0.800214	S.D. dependent var.	0.935407
S.E. of regression	0.418103	Akaike info criterion	1.369112
Sum squared resid	3.671020	Schwarz criterion	1.913296
Log likelihood	-10.59034	Hannan-Quinn criter.	1.552213
F-statistic	12.65191	Durbin-Watson stat	1.824555
Prob(F-statistic)	0.000001		

*Note: p-values and any subsequent tests do not account for model selection.