

**IMPACT OF MARKET CONCENTRATION AND COMPETITION ON  
PROFITABILITY IN NIGERIAN COMMERCIAL BANKS**

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## **CERTIFICATION**

This is to certify that the thesis, titled: Impact of Market Concentration and Competition on Profitability in Nigerian Commercial Banks, submitted to the School of Postgraduate Studies, University of Lagos, for the award of Ph.D. Economics, is an original research work carried out

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## **DEDICATION**

**To Almighty God, the Giver of all things that pertain to life and godliness through the  
knowledge of Jesus Christ.**

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## LIST OF ABBREVIATIONS

CB	-	Commercial Banking
CBN	-	Central Bank
IFRS	-	International Financial Reporting Standards
SCP	-	Structure Conduct Performance Hypothesis
ESH	-	Efficient Structure Hypothesis
RMPH	-	Relative Market Power Hypothesis
HHI	-	Herfindahl-Hirshman Index (HHI)
P-R	-	Panzer-Rose
GMM	-	Generalized Method of Moment
DGMM	-	Differenced Generalized Method of Moment
SGMM	-	System Generalized Method of Moment
CV	-	Conjectural Variation
OECD	-	Organization of Economic Co-operation and Development
NIM	-	Net Interest Margin
NRFF	-	Net Revenue from Fund
ROA	-	Return on Assets
ROE	-	Return on Equity
ROCE	-	Return on Capital Employed
EU	-	European Union
EMU	-	European Monetary Union
CR <sub>R</sub>	-	K-Bank Concentration Ratio
MS <sub>i</sub>	-	Market Share of $i_{th}$ Firm/Bank

NEIO	-	New Empirical Industrial Organization Framework
PCM	-	Price-Cost Margin
PED	-	Price Elasticity of Demand
GDP	-	Gross Domestic Product
OLS	-	Ordinary Least Square
FE	-	Fixed Effects Panel Data Estimators
RE	-	Random Effect Panel Data Estimators
EPGLS	-	Estimated Panel Data General Last Square
MC	-	Marginal Cost
MR	-	Marginal Revenue
IREVN	-	Ratio of Interest Revenue to Total Assets
INTC	-	Ratio of Interest Expense to Total Deposit
STAFFC	-	Ratio of Staff Cost to Total Assets
DEPTN	-	Ratio of Depreciation to Total Assets
TA	-	Total Assets
LOAN	-	Ratio of Net Loans to Total Assets
EQUITY	-	Ratio of Shareholders' Fund to Total Assets
RISKASS	-	Ratio of Loan Loss Allowance to Total Loans
OIRR	-	Ratio of Other Income to Interest Revenues
OOE	-	Ratio of Other Operating Expenses to the Sum of Net-Interest Income and Non-Interest Income.
TREVN	-	Ratio of Total Revenue to Total Assets
QGAP	-	Output Gap Represented by Growth of GDP PerCapita

## ABSTRACT

The Nigerian banking industry has witnessed major changes in the number of participating banks during the period 2000-2012, as it moved from pre-consolidation regime to government-induced and, lately, to market-led consolidation period, with no clear indication of impact on concentration, competition and profitability. This study empirically examines, if changes in structure, proxied by bank concentration and measured by the Herfindahl-Hirshman Index (HHI), have effect on the degree of competition and profitability in the Nigerian commercial banking industry. This is done by estimating the H-statistic of the Panzar-Rosse (P-R) model and the market-power index in a dynamic market setting, presumed to exhibit profit persistence. The Generalized Method of Moment (GMM) in a dynamic panel setting was employed to handle the problems of autocorrelation, endogeneity, simultaneity bias and reverse causality, brought about by the introduction of profit persistence into the regression equation. The Hansen J-statistic test of instrument validity, for over-identifying restrictions, confirmed the appropriateness of instruments used, while the long-run equilibrium test confirmed the appropriateness of the P-R model. In testing for the competitive conditions, the H-statistic is obtained from the revenue function where three major input costs, namely: the interest cost of deposits, staff cost and fixed capital cost, are used to estimate the revenue. The two revenue functions, based on Interest Revenues, and Total Revenues are used to check the robustness of the result. The study finds that: (1) the Nigerian banking industry was an un-concentrated market in the pre-consolidation period, while in the post-consolidation period, there is a gradual and steady march towards being moderately concentrated because of a substantial reduction in the number of banks and the emergence of eight mega banks; (2) with the increased concentration, the H-statistics indicates that the intensity of competition is heightened in the post-consolidation period, contrary to the postulation of the Structure-Conduct-Performance Paradigm; (3) increased concentration neither weakens competition nor increases profitability significantly; and (4) the degree of competition in Large Banks is more intense than in the Small Banks in both the pre- and post-consolidation periods. The study recommends the introduction of a competition policy that will make the market more contestable and ensure that the regulators set, for the large-sized banks in the industry, more stringent Credit Risk Management guidelines than for the small-sized ones, as the former are more strategically important to the economy.

## CHAPTER ONE: INTRODUCTION

### 1.1 Background to the Study

Banks in developed and developing countries are known to play important economic roles, such as the mobilization of deposits from the surplus units of societies, provision of credit facilities, developing and modernizing the payment system, transmission of monetary policies and maintaining financial stability. These vital roles, played in the economy, make the issue of banking competition extremely important, as confirmed by several studies that established a strong relationship between banking structure and economic growth [Schumpeter, 1934; Goldsmith, 1969; Ikhida, 1982; Jayaratne & Strahan, 1996; Levine, Loayza & Beck, 2000; Collender & Sherrill, 2003; Claessens & Laeven, 2004]. All over the world, the industry is witnessing continual changes in structure, due to globalization, liberalization, de-regulation, advancement in technology and Bank consolidation [Gajurel and Pradhan (2012)]. They explained that, while globalization and liberalization are resulting in entry of new banks in the market place, thereby adding more pressures regarding the competitiveness of individual banks, de-regulation is widening the scope of activities, thus encouraging banks nowadays to enter into non-banking markets, while other non-bank financial institutions are entering into markets that have traditionally been served by banks. In the same way, technological advancement is resulting in new ways and tools for performing banking activities. These changes in banking industry structure have fuelled a large volume of literature on banking concentration and competition in the U.S and European nations with many unresolved controversies on the impact of concentration and competition on profitability performance. For instance, quite often, the question arises among researchers and policy makers as to the need, or otherwise, to introduce policy

measures that would increase, or reduce, or maintain, the degree of industry concentration in order to achieve optimal level of market competition commensurate with target rate of economic growth and attainment of financial stability goal.

In line with the global trend, the Nigerian banking system has experienced some fundamental changes in structure since independence in form of restructuring, liberalization, consolidation and technological progress (Ojo, 2010). These changes include market domination by a relatively small number of foreign banks at independence, followed by increase in the number of banks with diversified ownership structure. Initially, public sector banks featured prominently in the system with federal and state governments holding substantial stakes in banking and by 1992, the private sector banks became the dominant participants as a result of government intervention in the banking market to control resource allocation and promote the indigenization policy of the economy. The Central Bank of Nigeria, during this period, pursued policies of financial repression, which consists of placing caps and floors on lending and deposit rates respectively, as well as restricting the volume and direction of sectorial allocation of credit in the economy [Brownbridge, 1996].

Although a competitive banking sector is widely acknowledged as important for a proper functioning of the economy, very little attention has been paid to it in Nigeria. Such a competition matters, for a number of reasons. In the first place, the degree of competition in the financial sector can affect the efficiency of production and service delivery, the quality of products and the degree of innovation in that sector. Secondly, it has been observed, theoretically, that the degree of competition in the banking sector can increase the access of firms to external financing at lowered costs [Weill, 2003]. These effects may

further vary by the degree of competition in the industry (Claessens & Laeven,2005). Also, it is recognised that a functioning and competitive banking system is a recipe for the overall economic development of any nation (Saibu, 2014).

The impact of concentration and competition on banks can be assessed by gross measures of performance, such as profitability, but how this can affect the efficiency, with which banks transform resources into various financial services, is of vital importance to the economists. There is a growing improvement in the cost of banking service delivery, due to advancement in technology, and this has shaped the way in which businesses are carried out by banks to outperform one another and provide alternative channels of service delivery, like virtual banking channels compared to the brick and mortar system, which has characterised the traditional branch network system (Claessens & Laeven,(2005).

The relationship between concentration, competition and profitability of commercial banks has been discussed extensively in the literature in the developed countries of U.S, Europe and Canada, but there is a dearth of literature on this relationship in the less developed countries particularly in Nigeria. Empirical studies from these developed banking systems find mixed results. For instance, while Fuentes and Sartre, (1998); Berg and Kim, (1996); Bikker and Haaf, (2002);support negative relationship,(Claessens & Laeven,(2004) support positive relationship. A neutral relationship was observed by Angelini and Cetorelli, (2000);Lee and Lee, (2005); Jansen and De Haan, (2003).

In an attempt to summarise these mixed empirical results, Bikker and Spierdijk (2008) observe that, while high concentration is conducive to the realization of supernormal profits, in line with economic theory, a more dynamic view is to consider that a higher

degree of concentration is the result of intense competition which forces the market to consolidate, thereby increasing market concentration and that it is, therefore, difficult to draw clear conclusions on the impact of market concentration and competition on profitability in the banking industry.

## **1.2 Statement of the Problem**

The long-existing theory of industrial organisation (IO) has shown that the competitiveness of an industry cannot be measured by market concentration indicators alone, as done by some studies (like Weill et al., 2008; Bruno, 2012;). The threat of entry is a more important determinant of the behaviour of market participants (Baumol et al, 1982). Claessen and Laeven, (2004) suggested that the degree of competition in the banking system should be measured with respect to the actual behaviour (conduct) of the banks and should be related, not only to the structural characteristics (e.g., no. of banks, market shares, concentration, etc.), but also to entry barriers and severity of activity restrictions, as these can limit the degree of intra-industry competition. Based on this, they concluded that testing the degree of effective competition will require a structural, non-structural and contestability approach, along the line pursued in the industrial organisation literature.

The few available studies on banking competition in Nigeria (Somoye, 2008; Fadare, 2010; Zhao & Murinde, 2011; Ayeni et al, 2013; CBN, 2013; Ajisafe & Akinlo, 2013, 2014; al., Saibu, 2014) focus on the use of the non-structural procedure, like the Panzar-Rosse and the Bresnahan methods, to arrive at monopolistic competition as the nature of market behaviour for the sample and sub-sample periods chosen. These methods measure banking competition directly, without employing explicit information about the structural characteristics of the market (like concentration). There appears, therefore, a

disconnect between their estimated levels of competition and the corresponding degrees of market concentration, as their approaches remain silent on the degrees of concentration that generated the reported levels of competition. Consequently, it is impracticable to relate market concentration to the intensity of competition in the market place for the chosen periods. Yet, the impact of a banking reform on the industry is expected to affect sequentially the post-reform number of banks, their market shares, their degree of concentration, the size of the banks, their growth rates, etc, in that order before impacting on profitability through the channel of competition.

One of the major motivations for this study is the need for the determination of the intensity of market competition of Nigerian banks between pre- and post-consolidation periods to show the impact of the consolidation reform. While the CBN (2013) paper remains the most comprehensive study on the post consolidation appraisal of the banking industry, the caution expressed in the result shows that the issue is still subject to empirical debate. A major contribution of this study, therefore, is to document the inter-relationship between the degrees of banking market concentration and their corresponding levels of competition, using both the structural and non-structural approaches to measure banking market concentrations and the corresponding intensities of competition respectively in the pre and post consolidation periods.

This will facilitate a proper assessment of their combined impact on profitability performance. It will then be possible to predict what the impact of a percentage increase in the banking market concentration, following a policy review, will be on the level of competition.

### **1.3 Objectives of the Study**

The broad objective of this study is to determine the impact of market concentration and competition on profitability performance of Nigerian banks.

Specifically, the study:

- i) compare the degrees of market concentration in Nigerian commercial banks in the pre- and post-consolidation periods.
- ii) estimate the pre- and post-consolidation levels of competition of the commercial banks.
- iii) investigate the effects of concentration and competition on the profitability performance of Nigerian commercial banks.
- iv) determine if large and small-sized commercial banks are subject to the same competitive conditions in Nigeria.

### **1.4 Research Questions**

The following questions were posed to guide the researcher's investigations:

- i) What are the comparative degrees of market concentration between the pre- and post-consolidation periods in Nigerian commercial banks?
- ii) What impact does market concentration have on the competitive condition of the commercial banks?
- iii) How have the variations in the degrees of market concentration and competition impacted on the profitability performance of the commercial banks?
- iv) To what extent are large and small-sized commercial banks subject to the same competitive conditions in Nigeria?

## **1.5 Hypotheses**

The following null hypotheses were formulated from the foregoing questions and tested towards the determination of the finding of this study:

- 1:** There is no change in banking market concentration between the pre- and the post-consolidation periods.
- 2:** There is no difference in the pre and post consolidation levels of banking competition in Nigeria.
- 3:** Variations in the degrees of banking concentration and competition donot directly impact profitability performance of the banking industry.
- 4:** Large-sized and small sized banks are not subject to the same market competitive conditions in Nigeria.

## **1.6 Scope and Delimitation of the Study**

The study covers a period of thirteen years from January 2000 to December 2012. This period witnessed a sizeable increase and reduction in the number of operating banks, a variable known to affect banking concentration and competition. By year 2000, the number of banks peaked at 90 (Saibu, 2014) due to the policy of banking licence liberalization commenced in 1990 and lasted till December 2004. However, in December 2005, only 25 banks emerged from the regulation-induced bank consolidation exercise (Adegbite,2007). This coverage ensures that the study carries out an impact analysis of the chosen banking variables on the pre-consolidation period (2000-2004) as well as on the post-consolidation period (2005-2012).

The study uses secondary data of banking variables, obtained from the 24 banks in existence post-consolidation (IBTC Chartered Bank Plc merged with Stanbic Bank Plc to form Stanbic IBTC Bank Plc, thus reducing the number of banks to 24 immediately). These banking variables include customers' deposits, loans & advances, fixed assets, total assets, shareholders' fund, interest income, non-interest income, gross earnings, interest cost, staff cost, depreciation and operating expenses.

Data for Equatorial Trust Bank Ltd, First Inland Bank Plc, Intercontinental Bank Plc, and Oceanic Bank International Plc are not available for years 2011 and 2012 because they were then temporarily taken over by the Central Bank of Nigeria (CBN), pending their repackaging for sale following their distress.

### **1.7 Significance of the Study**

For Nigeria to realize its objective of becoming a major financial hub in Africa, in line with its Vision 2020, it must develop its banking system and integrate it into the major world financial system. The degree of banking sector competition and concentration can exert a great influence on the soundness and stability of the financial sector (Yeyati & Micco, 2003). Competition in the banking market is of great economic significance, as it lowers prices of banking services, improves quality through innovation in production and efficiency in delivery of financial services and impact positively on the effectiveness of monetary policy, since banks operate as the policy transmission agents (Doyran, 2013). The impact of the degree of market concentration and competition on profitability performance has been investigated in the European countries, the U.S and the emerging nations of Asia, but to the best of the knowledge of this researcher, this has

not been sufficiently studied in the Nigerian commercial banking subsector. This study, therefore, contributes to the literature on Nigerian banking.

The study has a broader relevance for Africa, given Nigeria's economic position and role in Africa. First, Nigeria is the largest economy in Africa, contributing the largest proportion to the continent's GDP.

The study is also significant since it makes a categorical statement on the question of whether big and small banks are subject to the same or different competitive pressure.

Finally, the findings from the study will, hopefully, be useful for bank regulatory and supervisory authorities, managers of banks and the academia in directing competition policy measures necessary to alleviate prevent the deterioration of competition in the Nigerian banking market.

## **1.8 Organization of the Study**

This study is divided into six chapters. Following this Introductory Chapter is Chapter Two, which presents an overview of the Nigerian Financial System and Reforms in the Commercial Banking Sub-Sector. It highlights the major monetary and banking policies so as to properly situate the study and provide an appropriate context for the researcher's analyses.

Chapter Three focuses on a review of the related literature.

Chapter Four contains the theoretical framework and methodology that forms the basis for an elaborate model specification for the study. In this chapter, the research methods employed are discussed. The study first dwells on the theoretical framework for the

study. This involves the main theories that have been applied in the literature, followed by a review of the underlying assumptions in order to facilitate an understanding of the theoretical constructs that have influenced the current state of knowledge in the area of study. This was followed by the analytic framework, model specification, sources of data and the estimation techniques.

Chapter Five provides the results from the models estimated while the summary of findings, conclusions and policy recommendations are in chapter six.

### **1.9 Operational Definition of Terms**

In order to enhance the understandability of the study, the key technical terms, employed in it, are defined as follows:

**Consolidated Bank:** Represents any bank that has a minimum of ₦25 billion in Shareholders' Funds, singly or through a merger or an acquisition of two or more other banks.

**Market Structure:** Refers to the platforms where buyers and sellers interact in a market place. It includes perfect competition, monopoly, monopolistic competition, and oligopoly. Features that determine the type of market structure include: number of buyers and sellers, type of products and control over market price and output.

**Large-Sized Bank:** Any bank with a total value of assets in excess of ₦1 trillion and simultaneously having more than 5% market share in deposits and total assets by December 2012.

**Nigerian Commercial Banks:** These are commercial banks licensed and operating in Nigeria.

**Market Power:** This is the ability of a bank to raise its product price, relative to its rivals, without losing substantial market share in that product.

## **CHAPTER TWO: AN OVERVIEW OF THE NIGERIAN FINANCIAL SYSTEM AND REFORMS IN THE COMMERCIAL BANKING SUB-SECTOR**

### **2.1 Introduction**

This section, presents an overview of the Nigerian experience with key financial reforms in order to provide an appreciation of how banking policies have metamorphosed from an era of administrative controls and regulation to that of a market and risk-based mechanism. An attempt was made to summarise the actions of the banking supervisory and regulatory agencies and assess the outcome during the period.

Like in other economies, such as: Argentina, Chile and Uruguay in South America; Korea, Indonesia, Taiwan and Malaysia in Asia; and South Africa in Africa, among others, where major programmes of financial reforms have been carried out since the 1970s to date, the reform measures centered majorly on lifting of interest rate controls, the elimination of mandatory sectorial credit allocation programmes; the privatization of nationalized banks, the lowering of barriers to entry for both domestic and foreign banks; strengthening of the regulatory and supervisory institutions; and upward review of capital adequacy in absolute and relative terms.

As at December 2012, the Nigerian financial system comprised the Central Bank of Nigeria (CBN), the Nigerian Deposit Insurance Corporation (NDIC), the Securities and Exchange Commission (SEC), the National Insurance Commission (NAICOM), the National Pension Commission (PENCOM), Deposit Money Banks (DMBs), Discount Houses (DHs), Micro-Finance Banks (MFBs), Finance Companies (FCs), Bureaux-de-Change (BDCs), The Stock Exchange, The Commodity Exchange, Primary Mortgage

Institutions (PMIs), Development Finance Institutions (DFIs) and Insurance Companies (CBN Annual Report,2013).

In Nigeria, the banking sector reform was a component of the Structural Adjustment Programme (SAP), introduced in the last quarter of 1986. The objective was to reposition the Nigerian economy for effective fund intermediation in the market place. The reforms were targeted at making the system more effective and at strengthening the growth potentials of the economy (Sanusi, 2012). The specific reforms projects are discussed in the historical perspective where six distinct eras can be discerned. These are the pre-independence (i.e. prior to 1960), the post-independent era of financial sector regulation (1960 to 1985), the era of structural adjustment and financial sector reforms (1986 to1998), era of reforms lethargy (1999 to 2004), era of financial liberalization and consolidation ( year 2005) and finally, the post-consolidation era (2006 to 2012).

### **2.1.1 Pre-Independence Period (i.e., Pre-1960)**

The business of banking was started in Nigeria in 1892 by the Bank of British West Africa (BBWA) to which the Standard Bank of Nigeria Limited and now First Bank of Nigeria (FBN Plc) is a successor Bank (Adegbite, 2007). In 1925, Barclays Bank DCO, the present Union Bank Nigeria Plc (UBN) joined the banking environment and between 1931 and 1959 about 200 other Banks were incorporated in Nigeria. Prominent among them were the National Bank of Nigeria (NBN – 1933), Agbonmagbe Bank (1945) and African Continental Bank (ACB -1947). This era marked the beginning of indigenous banks in Nigeria with over 150 being indigenous. However within 5-10 years of their establishment, many of them collapsed, leaving only those set up by their regional governments,i.e., NBN, African Continental Bank (ACB) and Agbonmagbe Bank (Adegbite, 2007). This

development then suggested government patronage as a key success factor for the indigenous banks in Nigeria. Apart from lack of patronage from the government, other factors, that accelerated the collapse, included their fragile capital base, incompetent staff and a high incidence of fraud.

The bank failures experienced in that period forced the then Colonial Administration to establish the first ever banking regulation in Nigeria by passing the Banking Ordinance of 1952, which stipulated a minimum authorized capital of Fifty Thousand Naira (N50,000.00) (Adegbite, 2007). This was later amended by the Banking Ordinance of 1958. After 1952, more banks collapsed, due to the non-existence of a supervisory agency to ensure conformity with regulations and provide direction.

The Central Bank of Nigeria (CBN) Act 1958 was enacted, following the setting up of the J. B. Loynes Commission in 1957 by the Colonial Administration and the report of the World Bank team of that period, which recognised the desirability of a national financial institution as a pre-requisite for the growth of the local money and capital market (Adeniji, 1981).

### **2.1.2 Pre-Structural Adjustment Period (1960 to 1985)**

The period 1960 – 1970, which coincided with the year of independence in Nigeria from the British Colonial Administration, witnessed some growth in the Nigerian Banking Industry. This period witnessed the enactment of the Banking Act 1969 with its provision for purposeful guidelines to banks on their operations and more powers to the CBN on its oversight functions. Between 1973 and 1974, Merchant Banking was introduced in the landscape with the establishment of the United Dominion Corporation Nigeria Limited, the

First National City Bank of New York Nigeria Limited (Citi Bank), First National Bank of Chicago Nigeria Limited and Chase Merchant Bank Limited. In 1975, the Nigerian Industrial Development Bank Ltd. (NIDB), in partnership with Morgan Guaranty Trust Company of New York, Baring Brothers of London and National Insurance Corporation of Nigeria (NICON), transformed ICON Securities Limited, a wholly owned subsidiary of NIDB Limited, into ICON Limited (Merchant Bankers) (Adeniji, 1981).

Between 1976 and 1985, banking business in Nigeria operated under very strict regulations, with only 47 banks having operational licences to carry on as commercial banks as at December 1989 (Anyanwu,1993). During this period, the industry remained largely in the seller's market, characterised by slow and inefficient services, armchair banking, the use of tally numbers and long queues to cash cheques in the banking halls.

### **2.1.3 The SAP Period (1986 to 1998)**

Following the introduction of the Structural Adjustment Programme (SAP) in 1986, banking licence was liberalized to make the sector safe, efficient and competitive. Key parameters, like interest and exchange rates, sectorial credit allocation and sourcing of foreign exchange, were de-regulated. As a result of the liberalization measures, the banking industry witnessed phenomenal increase in the number of banks operating, from 47 in 1985, to 120 in 1992, resulting in intense competition, as the period (1986-1990) also coincided with a period of economic decline in Nigeria.

To manage the economy, the government introduced a number of measures, which included:

- i. Withdrawal of government and parastatals funds from the commercial banks to the Central Bank of Nigeria.
- ii. Introduction of the stabilization securities to control excess liquidity.
- iii. Adjustment of the cash reserve ratio.
- iv. Fine-tuning of the foreign exchange rate policies from Second-tier Foreign Exchange Market (SFEM) to unified Foreign Exchange Market (FEM) and, then, to Interbank Foreign Exchange Market (IFEM).

The Nigerian Deposit Insurance Corporation (NDIC) was set up in 1988 to strengthen the supervisory role of the Central Bank and was charged specifically with the responsibility of insuring bank deposits against bank failure. This period also witnessed the issuance of the Prudential Guidelines to all licenced banks by the CBN in November 1990. This guideline which was meant to ensure the safety and soundness of the entire banking system, covering such important areas as adequacy of capital, liquidity requirement, lending limits, risk assets classification into performing and non-performing as well as income recognition and other various risk control measures. These coverage areas were recognised as the key elements for preventing, limiting or stopping the damage that could result from poor management of banks. Before the issuance of the prudential guidelines, users of financial statements of licenced banks had cause to express concern over the quality of such statements in view of the varied and, in most cases, inconsistent practices adopted by banks. Some banks were recognizing income on non-performing assets, thereby making comparison of banks' performance very difficult. Also, the official criteria for evaluating the health of individual banking institutions were established. These included Capital Adequacy, Asset Quality, Management Soundness, Earnings Capacity,

Liquidity and Sensitivity to market risk, with the acronym “CAMELS” framework (Ojo,2010).

The Banks and Other Financial Institutions Decree Number 25 (BOFID, 1990) was passed into law, increasing mandatorily the minimum paid-up capital of both Commercial and Merchant Banks to N50million and N40million respectively from N20million and N12million respectively. This was later increased to N500million for both Commercial and Merchant Banks in 1998.

#### **2.1.4 The Period 1999 to 2004 (The Penultimate Bank Consolidation Period)**

This period, which coincides with Nigeria’s return to democratic rule under President Olusegun Obasanjo, witnessed the introduction of Universal Banks in 2001, i.e., Banks that could carry out merchant and commercial banking, insurance and stock broking functions i.e., a one-stop bank for financial services. So capital was raised from N500million to N1billion and later to N2billion. This notwithstanding, banks in Nigeria still had small capitals to the extent that the largest bank in Nigeria, UBN, (in 2004) had a capital base of about US \$290million, compared to US \$530million for the smallest bank in Malaysia. Also, one bank in South Africa, the Amalgamated Bank of South Africa (ABSA) had an assets base (as at 2004) that was larger than the assets of all Nigerian banks put together. In spite of the small capital bases, many of them had very expensive head offices, heavy separate investments in computer software, hardware, other fixed assets and operating expenses leading to a high average cost for the industry.

That same year, Banks were mandated by the CBN to set aside 10 percent of their profit before tax for equity investment in small and medium enterprises under the Small and

Medium Industries Equity Investment Scheme (SMIEIS). The essence of this policy was to increase investment and, hence, output in the real sector of the economy, thereby boosting aggregate economic growth. The state of the banking industry in this period remained very unimpressive, characterised by a poor state of intermediation performance where banks were traders in foreign exchange, in government treasury bills and in direct importation of goods through phony companies. It was a system where a group of people obtained a banking licence, used their connections to garner some billions of Naira in deposit from one or two government parastatals and used the deposit to trade in government treasury bills, foreign exchange and open letters of credit for importers (Ojo, 2010). Also, the top 10 banks, out of 89 in existence then, were found to control about 50% of the aggregate assets, 51% of the aggregate deposit liabilities and 45% of the aggregate credits. This could not but be highly suggestive of some oligopolistic tendencies with features of market concentration and market power (Lemo, 2005). Furthermore, an examination conducted on the industry assets in June 2004, revealed that marginal and unsound banks accounted for 19.2% of the total assets, 17.2% of total deposit liabilities, while industry non-performing assets was 19.5% of the total loans and advances (Lemo, 2005). The implication of this unsatisfactory statistics then was that there existed the threat of a systematic distress, judging by the trigger points in the CBN contingency planning framework of December 2002, which stipulated a threshold of 20% of the industry assets, 15% of deposits held by distressed banks and 35% of industry credits being classified as non-performing (Lemo, 2005).

### **2.1.5 The Consolidation Year (2005)**

The consolidation programme was preceded by the announcement of the 13-point agenda, the key components of which included a minimum capital base of N25billion per bank (Industry average then was N1.4billion or US \$10million), with a deadline of 31st December, 2005; mergers and acquisitions; phased withdrawal of public sector funds from banks, adoption of a risk-focused and rule-based regulatory framework. Others were, zero tolerance for weak corporate governance, accelerated completion of the Electronic Financial Analysis Surveillance System (e-FASS), the establishment of an Assets Management Company, promotion of the enforcement of dormant laws, revision and updating of relevant laws, as well as the establishment of the financial intelligence unit.

The quest for size and the attendant beneficial effects of large size, following the success of the German and Japanese banking models with good record in financing their industries, were major attractions for the bank consolidation programme in Nigeria. Other attractions included the fact that Consolidation had helped banks in the emerging markets of Argentina, Brazil, and Korea to be competitive and resilient to shocks as well as in repositioning their operations to cope with challenges of the increasingly globalized banking system (Ojo, 2010). By close of business on 31st December, 2005 (the effective date in meeting the re-capitalization requirement), only 25 banks emerged out of the 89 banks. Thirteen banks that could not raise the required N25billion capital fund had their licences revoked (see Appendix 2a).

### **2.1.6 The Post-Consolidation Period (2006 -2012)**

In January 2007, Nigeria subscribed to the New International Capital Accord for Banks (Basle II Accord), making capital a function of risk. The capital accord was based on 3 pillars, namely:

- i. Minimum capital requirement i.e., Qualifying Capital Weighted risk assets must be greater than 8%;
- ii. Supervisory framework; and
- iii. Market discipline.

In the same year, the New CBN Act 2007 was promulgated, granting more autonomy to the CBN. By mid-2008, the CBN, out of concern for the state of some banks (through frequent visits to the Expanded Discount Windows) and overall stability of the financial system, commissioned a special examination of all 24 banks in Nigeria. That examination highlighted significant deficiencies in capital adequacy and liquidity requirements and illustrated major weaknesses in corporate governance and risk management practices. The CBN, in a bid to avoid a systemic bank collapse, injected N620billion funds as convertible loans and replaced the chief executives and executive directors of eight of the banks.

On 1<sup>st</sup> June, 2010, a new prudential guideline was issued with an expanded scope of coverage to replace the 1990 guideline. The coverage included: formulation by all banks, a Board-approved Credit policy; Single obligor limit not exceeding 20% of shareholders' fund; Credit concentration policies; loans to Directors and their related interests; loans to insiders; banker's acceptances and commercial papers procedures; and Credit bureau report on intending borrowers. Others included minimum prescribed information on credit print outs, minimum contents of credit files, margin loans, recognition of revaluation surplus on

fixed assets, capital adequacy ratio, mandatory credit rating of all banks by a credit-rating agency and mandatory retirement of CEOs of banks after 10 years in office.

In the same year, the Assets Management Corporation of Nigeria (AMCON) was established as a special-purpose vehicle, aimed at addressing the problem of among others, non-performing loans in the Nigerian banking industry. In line with its mandate, AMCON, in 2010, acquired the non-performing risk assets of some banks worth over N1.7 trillion. This was expected to boost the liquidity of the banks and enhance their safety and soundness. With this intervention, the banking industry ratio of non-performing loans to total credit significantly reduced from 34.4 percent in November 2010 to 4.95 percent as at December 2011 (Sanusi, 2012).

To further engender public confidence in the banking system and enhance customer protection, the CBN established a consumer and financial protection division to provide a platform through which customers can seek redress. In addition, the CBN commenced a comprehensive review of the guide to bank charges with a view to making the charges realistic and customer-friendly. The CBN took the initiative at integrating the Nigerian banking system into global best practice in financial reporting and disclosure through the adoption of the International Financial Reporting Standards (IFRS) in the banking sector by end of 2010. This was to enhance market disclosure and reduce uncertainties.

As a result of the abuse of the Universal Banking (UB) model, adopted in 2001, the CBN phased it out in 2011 and directed banks to focus on their core banking business only. The new model of banking business introduced requires banks to be given licences to carry out only any of the following businesses:

- i. Commercial Banking with focus on international (N50billion Capital requirement), national (N25billion) and regional (N10billion) authorizations (see Appendix 2f).
- ii. Investment Banking.
- iii. Specialized Banking (microfinance, mortgage, non-interest banking).
- iv. Development Finance Institutions.

In January 2012, the CBN commenced the new “Cashless policy” as part of the on-going reforms to address currency management challenges as well as enhance the national payment system by ensuring that an increasing proportion of transactions are carried out through cheques and electronic means, such as card products, e-products, internet banking, telephone banking, Point of Sales (POS), Automated Teller Machines (ATM), etc. In December 2013, the apex Bank commenced the implementation of the Real-Time Gross Settlement (RTGS) system which would bring it at par with best global payment standard because of its capacity to facilitate the real-time settlement of electronic funds transfer.

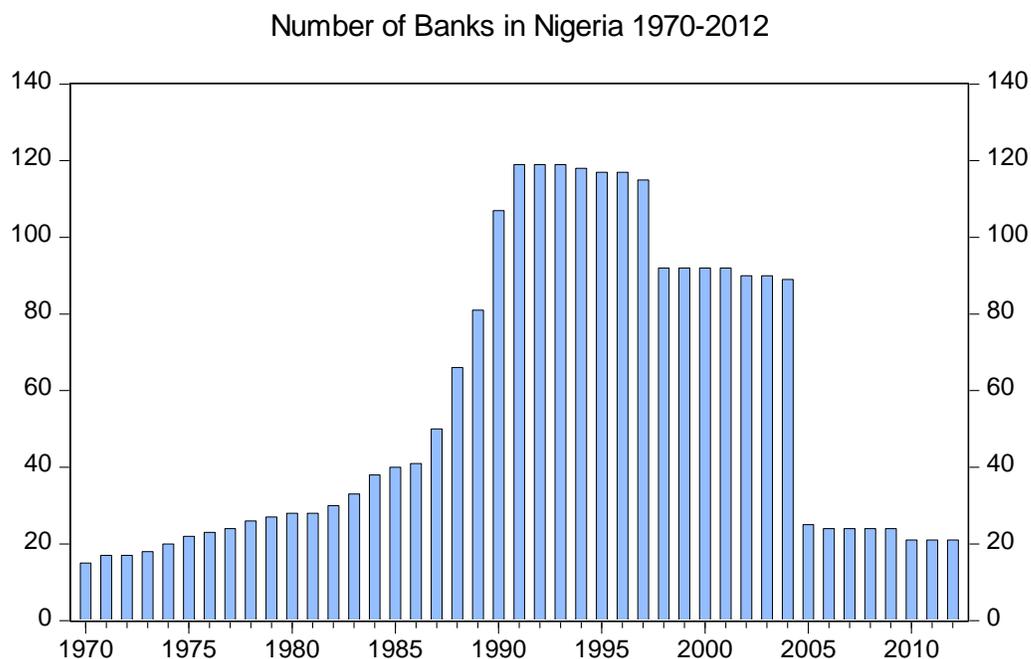
Recognizing the need for some banks (in which the CBN had intervened through injection of funds in 2008) to merge in order to strengthen their capital base and remain competitive in the market, five Transactions Implementation Agreements (TIAs) were signed among the banks. The banks are: Access Bank Plc/Intercontinental Bank Plc, Ecobank Nigeria Plc/Oceanic Bank Plc, First City Monument Bank Plc/Finbank Plc, Sterling Bank Plc/Equitorial Trust Bank Plc and African Capital Alliance Consortium/Union Bank Plc.

The CBN issued letters of no objection to the banks being acquired to proceed with the merger of the entities. This was followed with the full capitalization of three new

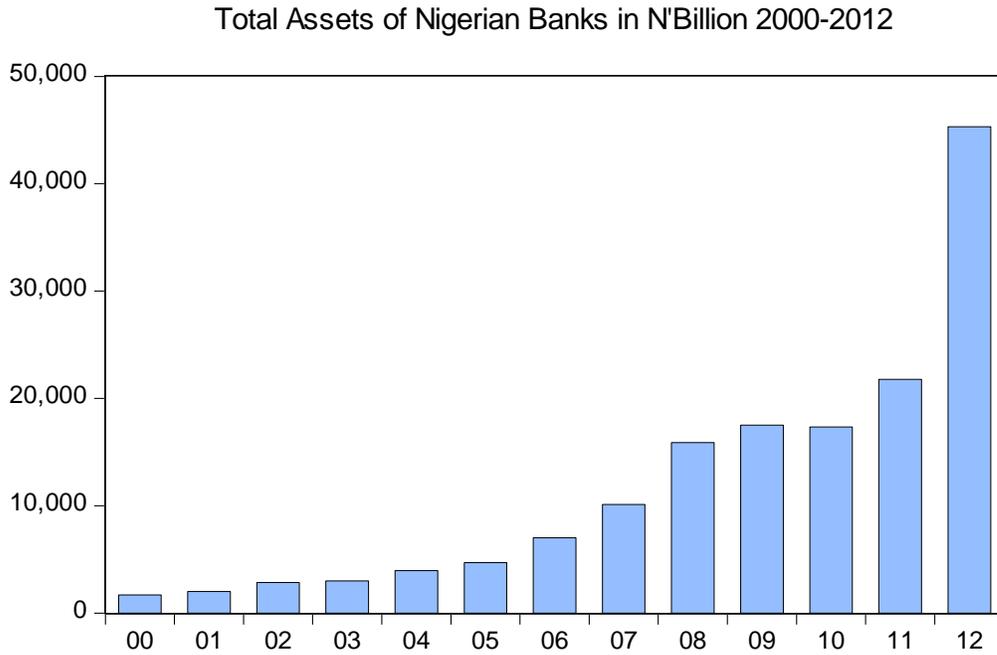
banks:Enterprise Bank (for Spring Bank), Keystone Bank (for Bank PHB) and Mainstreet Bank (for Afribank) by AMCON, thus resolving fully the issue of the combined negative assets value of the eight CBN-intervened Banks. Similarly, the recapitalization of all the five banks, that signed the TIAs, was completed in 2011 (Sanusi, 2012).

The effects of these various reforms measures are reflected over the years in the number of banks in the system, number of bank branches, size and growth rates of deposits, size and growth rates of total assets. These are depicted in the graphics below:

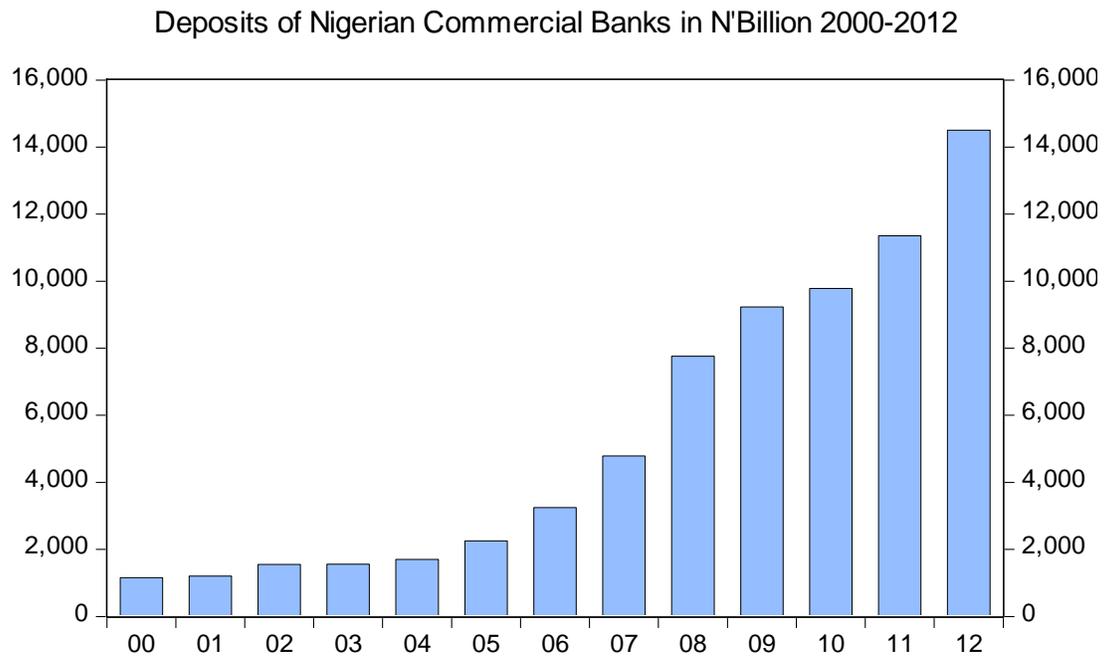
**Figure: 2.1**



**Figure: 2.2**



**Figure: 2.3**



## **2.2 Conclusion**

From the foregoing, it is clear that the various banking reforms, embarked upon, were triggered by the unsatisfactory state of the system at various points in time. As one problem was resolved, it created another contradiction in the system, which necessitated another reform, thus making reform a continuous activity in the industry over the period. In this way, the reforms were reactionary, rather than being products of strategic thinking, aimed at positioning the banking system as a world-rated system.

## **CHAPTER THREE: LITERATURE REVIEW**

### **3.1 Introduction**

In this chapter, various theoretical studies (as well as the empirical literature) on banking concentration and competition were examined and reviewed. These reviews were carried out with the intent of gaining insight into pertinent theoretical constructs that have influenced the current state of knowledge in the subject. Moreover, previous empirical studies were examined to consider the various issues addressed by different authors and how the issues were resolved. This helps to determine their adequacy and serves as guide to the present study. The chapter is divided into four sections. Section 3.2, that follows this section, is the theoretical literature. It examines and reviews studies on the theories of Banking Concentration and those of Banking Competition. This is followed by Section 3.3, which provides a review of empirical studies on Banking Market Concentration and Competitive Conduct. It discusses extant empirical findings on the impact that market concentration and competition have on profitability in Nigerian commercial banks. This enabled us to identify the gaps which this study has sought to fill.

### **3.2 Theoretical Literature**

#### **3.2.1 Banking Market Concentration Theories**

Banking Market Concentration is a measure of the intensity of market control of the largest banks in the industry (Loto, 2012). Increase in concentration levels could be due to considerable size enlargement of the dominant bank(s) and/or considerable size reduction of the non-dominant bank(s). Conversely, reduction in concentration levels could be due to considerable size reduction of the dominant bank(s) and/or considerable size enlargement

of the non-dominant bank(s) (Athanasoglou et al., 2005: 25). Banking concentration theories in the literature are classified as pro-concentration theory and pro-deconcentration theory.

### **Pro-Concentration Theory**

Proponents of banking sector concentration argue that economies of scale drive bank mergers and acquisitions (increasing concentration), so that increased concentration goes hand-in-hand with efficiency improvements (Demirguc-Kunt and Levine, 2000: 1). To buttress this point, Boyd and Runkle (1993) examined 122 U.S. bank holding companies and found an inverse relationship between size and the volatility of asset returns. However, these findings are based on situations in which the consolidations were voluntary. Some theoretical arguments and country comparisons suggest that a more concentrated banking sector with a few large banks tend to be stable and less prone to financial crises than a less concentrated banking sector with many small banks (Beck, Demirgüç-Kunt and Levine, 2004). This is partly because reduced concentration in a banking market, made up of many small banks, results in increased competition among banks and vice-versa. Proponents of this 'concentration-stability' view argue that larger banks can diversify better so that banking systems, characterized by a few large banks, will tend to be less fragile than banking systems with many small banks (Allen and Gale, 2003). Concentrated banking systems may also enhance profits, which provide a buffer against adverse shocks and increase the net assets value of the bank, reducing incentives for bankers to take excessive risk and, therefore, lower bank fragility. Furthermore, a few large banks are easier to monitor than many small banks, so that corporate control of banks through supervisions by regulators will be more effective and the risks of systemic distress

become less pronounced in a concentrated banking system (Beck, Demirguc-Kunt and Levine, 2003: 1).

### **Pro-Deconcentration Theory**

Proponents of banking sector deconcentration also argue that high concentration will intensify market power and political influence of financial conglomerates, weaken competition and jeopardise the access of small businesses to financial services, reduce efficiency, and destabilize financial systems. As banks become too big to be disciplined, they use their influence to shape banking regulations and policies in their favour which policies may not necessarily be the best for the economy (Demirguc-Kunt and Levine, 2000; Beck, Demirgüç-Kunt and Levine, 2004; and Bank for International Settlements, 2001). While recognising that excessive competition may create an unstable banking environment, insufficient competition and contestability in the banking sector may also breed inefficiencies. It has also been argued that the higher the concentrations in the local banking market, the higher the prices of financial services and, consequently, the higher the banks' profits. This is because banks, in less competitive environments, charge higher interest rates to firms. If concentration is positively associated with banks having market power, then concentration will increase the expected rate of return on bank assets (Beck, Demirgüç-Kunt and Levine, 2004: 2). The policy implication is that higher market concentration is associated with lower socio-economic welfare and, therefore, higher concentration is undesirable. Hence, a country like the UK (Monopolies and Mergers Commission, 1996) is wary of a concentration ratio that is 25 per cent or more of the banking market in terms of total assets or deposits (Holden and El-Bannany, 2006). There is also evidence linking increase in banking market concentration to reduced lending to

small and medium scale enterprises as well as to the credit crunch experience in the U.S.A in 1989-1992, (Berger et al., 1995).

Another pro-deconcentration position is that a more concentrated banking structure enhances bank fragility. Advocates of this ‘concentration-fragility’ view note that larger banks frequently receive government favours/patronages through implicit ‘too big to fail’ policies that small banks do not enjoy. This occurs when regulators fear potential macroeconomic consequences of large bank failures. This uncommon favour for larger banks may, in turn, aggravate risk-taking behaviour beyond any diversification advantages enjoyed by them, thereby increasing the fragility of concentrated banking systems (Boyd and Runkle, 1993). Proponents of the concentration-fragility view disagree with the proposition that a few large banks are easier to monitor than many small banks.

If size is positively correlated with complexity, then large banks may be more opaque than small banks, and therefore more difficult to monitor. This would tend to produce a positive relationship between concentration and fragility.

### **3.2.2 Theories of Banking Competition**

The literature on the assessment of competition in the banking sector can be divided into Structural Approach, Non-Structural Approach and the Contestability theories.

The structural approach has its roots in the theory of industrial organization (IO) that measures competitiveness, following the Structure-Conduct-Performance (SCP) paradigm, the Efficient Structure Hypothesis (ESH) and the Relative Market Power Hypothesis (RMPH).

The SCP paradigm, which is ascribed to the work of Bain (1951), contends that increased concentration fosters collusion and anti-competitive practices. It assumes a causal relationship, running from the structure of the market to the behaviour of the firm and to the firm's performance. Market structure here refers to the number of firms, the concentration index and the growth of firms. Behaviour or conduct refers to the presence or absence of collusion, while performance refers to profitability or efficiency of the industry. Profitability is measured by return on assets(ROA) or return on equity(ROE) or net revenue from funds(NRFF). A highly concentrated market is thought to lead to collusive behaviour among larger banks, resulting in superior market performance (Goldberg & Rai, 1996). This line of reasoning is that large firms abuse their market power to increase profits,(Berger, 1995). A major shortcoming of SCP postulation lies in the neglect of bank regulations, like entry/exit barriers and direct efficiency of banks. According to Golberg and Rai (1996), the postulation of SCP can only hold true in markets where potential market participants are effectively shielded away from competing.

The Efficient Structure Hypothesis (ESH), which stems from Demsetz (1973), postulates that the most efficient banks are able to increase their market share at the expense of less efficient ones. Consequently the degree of concentration increases automatically.

The Relative Market Power Hypothesis (RMPH) is a special variant of SCP, which introduces "market share" as a proxy for the efficiency of firms. Profits increase in banks with larger market share because of the ability to generate efficiency which normally leads to a higher market power. In RMPH, market share is positively related to firm specific efficiencies (product differentiation, superior management or technology) which give the efficient bank a comparative advantage to obtain super-profits, regardless of the extent of

market concentration and/or entry barriers. It is very likely that the resulting market share leads to higher market concentration. Therefore, in this hypothesis, the direction of causality runs from efficiency to profit and market structure.

The contestability theory stresses that a concentrated industry can behave competitively, if the hurdles for new entrants to the market are low (Baumol, 1982). Only the threat of potential entry forces firms, with large market shares, to price their product competitively under certain conditions. In a perfectly contestable market, entry is absolutely free, exit is completely without cost and the demand for industry output is highly price elastic. Costless exit implies that when a company is planning to enter a new market, it expects to recover fixed costs if it later decides to exit.

In reaction to the theoretical and empirical deficiencies of the structural approach to competitive behaviours, the non-structural approach has been developed.

The non-structural approach tests the market conduct directly without regard to the industry structure. It is, therefore, model-based and its models include the Iwata model, the Bresnahan and Laumodels and the Panza and Rosse (PR) model. These models belong to the New Empirical Industrial Organization (NEIO) framework, with focus on the competitive conduct of firms, without employing explicit information about the structure of the market. The Iwata model allows the estimation of conjectural variation values for individual banks supplying a homogenous product in an oligopolistic market (Iwata, 1974).

The Bresnahan model estimates the mark-up of price over marginal cost as a measure of market power. The model is based on two structural simultaneous equations, the inverse-demand equation and a supply equation, derived from the first order condition of profit

maximization. The PR model measures the extent to which a change in a vector of input prices is reflected in gross revenue (Guterrez de, 2007). It requires company-specific data and leads to the construction of the “H statistic” to make a quantitative assessment of the competitive nature of banking markets and the market power of banks. The H statistic is calculated from reduced-form revenue equations and represents the sum of elasticities of the bank’s total revenue with respect to the bank’s input prices. It takes the form:

$$\log IR_{i,t} = \alpha + \beta \log ACF_{i,t} + \gamma \log SC_{i,t} + \delta \log PCE_{i,t} + \sum_{j=1}^m \log BSF_{i,t} + \phi(OI_{i,t} / IR_{i,t}) + \varepsilon_{i,t} \quad (3.01)$$

where IR is the ratio of interest income to total assets, ACF is annual interest expenses to customer deposits, SC denotes ratio of staff cost to number of personnel, PCE is the price of physical capital expenditure, measured by the ratio of depreciation to fixed assets, and BSF is bank-specific exogenous factors. (OI/IR) represents the ratio of other income to interest income, and this accounts for the increasing role of banking activities other than financial intermediation.  $\varepsilon_{i,t}$  is a stochastic error term. The PR model shows that this H statistic can reflect the structure and conduct of the market in which the bank operates. The testable hypotheses are:  $H \leq 0$  implies monopoly,  $0 < H < 1$  implies monopolistic competition and  $H = 1$  depicts perfect competition.

### 3.3 Empirical Literature Review

#### 3.3.1 Comparative Banking Concentration Levels

Empirical evidence shows that a series of mergers and acquisitions in the banking industry usually result in increased concentration levels (Athanasoglou et al., 2005: 16). As financial consolidation is being diffused across developed and developing countries over the past two decades, Bikker and Spierdijk (2008) observed that the banking industry had been

experiencing sharp falls in the number of banks with changes in market shares and size of the largest five banks in absolute and relative terms, with consequence for the degree of concentration.

Iuga (2013) studied the degree of banking concentration in the EU countries with the Herfindhal-Hirschman index (HHI) using data from the period 2005-2011 in all EU member states. The study focused on the key indicators which influence the degree of banking concentration to establish the relationship between the HHI as a dependent variable and the key indicators (total assets, number of credit institutions, population and gross domestic product at market price) as independent variables. In terms of methodology, the study calculated four correlation coefficients between the dependent and each of the independent variables, using the Pearson's correlation approach which gives indication about the magnitude of correlation through a value that lies between -1.00 and 1.00. The result, based on the values of the index of concentration, showed a high degree of concentration in Estonia, Lithuania, Netherland and Finland. An average bank concentration was reported in Belgium, the Czech Republic, Denmark, Greece, Cyprus, Malta, Portugal, Slovenia and Slovakia. The rest of the EU countries had a low bank concentration. The study observed that the index of concentration varied monotonically with the size of each country. The study further found that bank concentration differs substantially among the EU member states and that these differences of bank concentration between countries were due to differences in definition. In addition, the study concluded that an increase in concentration might lead to collusion and to higher interest rates for credits and deposits, charged by banks.

Denvil (2002) also employed the use of Herfindhal-Hirschman index (HHI) to examine the changes in the structure of the Jamaican banking industry, following the bank consolidation which took place in the country after the financial crisis of the mid-1990s. The result showed a slight increase in the banking market concentration.

Lee and Lee (2005) observed that, as bank consolidation, propelled by the structural adjustment, proceeded in Korea, the market concentration in the banking market increased rapidly. The study made use of the Herfindhal-Hirschman index (HHI) to measure concentration and observed a remarkable increase in market concentration because of the reduction in the number of banks and the increased size distribution of banks, brought about by the bank consolidation embarked upon as one of the strategic responses to the currency crisis of 1997. The HHI showed that the Korean banking market moved from moderately concentrated to a highly concentrated industry.

Park (2012) observed that the bank mergers that took place in Japan between 1983 and 2006 led to both increases in the individual bank's market share and increase in overall banking market concentration.

Gajurel and Pradhan (2012) in their study of the evolution of the banking market in the Nepalese banking industry, using the Herfindhal-Hirschman index (HHI), observed low levels of market concentration with a decreasing trend.

Bruno (2012), while investigating the relationship between the Brazilian banking market concentration and competition, deployed the Herfindhal-Hirschman index (HHI) to measure concentration. This idea was informed by the belief that the variable could also

serve as an indirect indicator of competition. He found a negative relationship between market concentration and competition.

### **3.3.2 Banking Market Concentration and Competitive Conduct**

There are numerous past documented empirical studies on the relationship between banking market concentration and competitive conduct, especially in the developed countries, with less emphasis on developing countries. Some of the most influential ones on the subject include: Shafer(1982); Vittas & Neil(1992); Molyneux(1996); Fuentes & Sartre(1998); De Bandt & Davis(2000); Bikker & Haaf(2002); Denvil(2002); Hempell (2002); Lee & Lee(2005); Angelini & Cetorelli(2003);Casu & Giradone(2003, 2006); Weill(2003); Gelos & Roldos(2004); Claessens &Laeven (2004); Podpiera (2007); Guhierrez(2007); Weill et al (2008); Alessandro & Kevin (2008); Stavarek & Repkova (2011); Sun(2011); Hapte (2012); Bing & Michael (2013).

In Africa, there are studies on the banking industries of South Africa by Kot (2004); of Ghana by Aboagye et al. (2008); of Egypt by Sunil & Binsheng (2008); of Tunisia by Sami(2009); of Tanzania by Simpasa (2011); and of Zambia by Simpasa, (2013). With specific reference to Nigeria, however, very limited relevant studies were recorded on banking competition they include: Somoye (2008); Fadare (2010); Zhao & Murinde (2011); Ayeni et al.(2013); CBN(2013); Ajisafe & Akinlo (2013, 2014); and Saibu(2014). These existing studies have not clearly shown consistent empirical evidences on the impact of market concentration and competition on profitability.

Fuentes and Sartre (1998) studied the banking market of Spain and found out that increased concentration, following bank consolidation, weakened competition in the

regional banking market; whereas, for the international banking market, the increased concentration did not result in weak competition.

Berg and Kim (1996) studied the Norwegian banking industry and also found out that increased banking market concentration led to weaker competition, in line with the postulation of the SCP paradigm.

Bikker & Haaf (2002) examined competitive conditions and market structure in the banking industry, and investigated their interrelationship. The study tested empirically the relationship between concentration and competition in 23 OECD countries. Also, the study measured the degree of competition in the European banking markets. As a result of the deficiencies of the structural models, the study developed the non-structural models of competitive behaviour and applied the Panzar and Rosse (PR) model to measure the degree of competition, without employing explicit information about the structure of the market. The PR model assesses the elasticities of interest revenues with respect to changes in banks' input prices. In order to distinguish competitive behaviour on local, national and international markets, for each country, three sub-samples were taken: small or local banks, medium-sized banks and large or international banks. For all the 23 countries considered in the estimation, the result showed the existence of monopolistic competition in the banking industry.

Denvill (2002) examined the effect of the changes in the structure of the Jamaican economy on the banking industry. This study became relevant as a result of the consolidation trend in the industry, following the financial crisis in the late 1990s. It was observed that increase in market concentration had significant implications for the level of

competition as well as the welfare of the customers in the banking sector. In appraising the changes in the level of concentration and competition in the banking industry over the period, the study used the Herfindahl-Hirschman Index (HHI). The results from the analysis revealed that there was a slight increase in competition, following financial liberalization. It is to be noted that after the financial crisis in the mid-1990s, the industry became more concentrated, thereby suggesting that there was a decline in competition among the banks. However, as a result of the ambiguity in the result obtained from the structural model, the study used a more robust PR methodology to measure the market power of the industry. The result from this alternative methodology revealed that competition fell slightly immediately following the liberalization period. Furthermore, it was revealed that the hypotheses of monopoly and perfect competition were both rejected in favour of monopolistic competition for the entire sample period. The interaction term used in capturing the changes in market power over time indicated that there was a steady decline in competition throughout the specified sample period.

Bikker (2003) investigated the degree of competition on both the deposit and loan markets in nine EU countries, using the Bresnahan's model of market power and rejected the hypothesis of perfect competition for the deposit market of the entire EU, and for the lending markets of Germany, Portugal, Spain, Sweden and the UK. Notwithstanding, he concluded that the markets are characterised as highly competitive because the abuse of market power was very limited.

In another study, Casu and Girardone (2003), investigated factors that influenced the degree of competition in the banking sector of the single European market. The result suggests that the degree of concentration did not necessarily relate to the degree of

competition. The relationship between the two was not unidirectional, as increased competition had forced banks to become more efficient while increased efficiency was not resulting in more competition in the EU banking system. Similar concerns were expressed by Habte (2012) when he explored the competitive conditions of the banking system of Sweden, using the same method. The result suggests that banks in Sweden generate their revenues under a monopolistically competitive environment. The Boone indicator, however, suggests that there was a slight drop in the degree of competition after the global financial crisis of 2008.

Claessen and Laeven (2004) carried out an empirical cross country study of fifty countries. These included fifteen countries, drawn from South and North America, twenty-two in Europe, nine in Asia, three in Africa (Kenya, Nigeria, South Africa) and Australia. They carried out a regression of the H statistics on explanatory variables that included market structure (represented by HHI and five-bank concentration ratio, the log of the number of banks per million inhabitants and share of assets of foreign banks to total assets), contestability (represented by activity restriction and entry-fit test variable), competition from non-bank financial institutions (represented by the size of the stock market capitalization to GDP and annual life insurance premium, divided by GDP) and general level of economic development (represented by log of per capital GDP, inflation rate and monetary policy rate). The results showed a positive and statistically significant relationship between concentration and the H statistic indicators, which implies that more concentrated banking systems face a greater degree of competition. Furthermore, the density of banks' variables were found to be not significantly positively related to the competition indicator, meaning that the fewer banks are, relative to the population, the

more competitive the system is. This suggests that the H statistic and the K-bank concentration measure are two variables that cover different concepts, implying that the k-bank concentration ratio may not be a good summary statistic for bank competitive environment. This is a confirmation of the findings in the general industrial organization literature that the degree of competition is not necessarily related to market structure. In addition, it was established that more foreign bank ownership would appear to improve the level of competition in the home market, suggesting that the nature of ownership matters for competition. Finally, on the contestability variables, it was established that fewer activity restrictions would enhance competition. The entry-fitness test suggests that more contestable systems face greater competition, thereby agreeing with the theoretical proposition of Baumol (1982).

Lee and Lee (2005) studied empirically the effects of bank consolidation on competitive behaviour in the Korean banking industry. With the deployment of the Herfindhal-Hirschman index, they observed that market concentration increased remarkably because of the reduction in the number of banks and the widened size distribution of banks caused by bank consolidation since the Korean currency crisis in 1997. By applying the non-structural method of Panzar and Rosse (1987) to estimate H-statistics for the period (1992-1997) and the period (1998-2002), they found that Korean banking market showed monopolistically competitive behaviour for these two periods. In addition, they further found that market competition was significantly weakened over the period of 1998-2002. Based on these findings, some competition policy responses from structural, behavioural and contestability perspectives were suggested to the regulators.

In another analysis, Weill et al. (2008) argued that a higher degree of banking competition was a major issue for economic development and it was expected to provide welfare gains by reducing monopoly power of banks and cost inefficiencies, favouring the reduction of loan rates and then investment. The study used quarterly data for Czech banks in order to provide evidence on the effects of banking competition in the Czech Republic. In the first place, the study measured the level and the evolution of banking competition between 1994 and 2005, using both the traditional Industrial Organization (IO) approach and the New Empirical Industrial Organisation (NEIO) approach. The traditional approach proposed structural tests while the new empirical approach proposed the non-structural tests. According to the traditional approach, competition was measured by concentration indices, such as the market share of the five largest banks, or, the Herfindahl index, calculated for total bank assets and loans. This approach suffers from the fact that they infer the degree of competition from indirect proxies such as market shares. The NEIO approach infers banks' conduct directly. The new approach also takes into consideration the measure of contestability. The approach, therefore, adopted the Panzar –Rosse model, which is a non-structural test, to measure the degree of competition, using the H-statistic, that is, the sum of the elasticities of total revenues to input prices. The authors found no improvement in banking competition during the transition period.

Casu and Girardone (2006) examined the developments in competition, concentration and bank efficiency levels in the single European market. Also, they investigated the relationship between competition and efficiency in banking markets, using bank level balance sheet data for commercial banks in the major EU banking markets. A causality test between competition and efficiency was performed using dynamic panel data methods.

The results of the analysis suggested the existence of a negative relationship between efficiency and competition, whereas, the causality, running from competition to efficiency, was weak, though positive. In summary, the results suggested that the degree of concentration was not necessarily related to the degree of competition.

Alessandro and Kevin (2008) assessed the degree of competition and relative efficiency of the Macedonia's banking system—a sector which has undergone a substantial amount of change since the mid-1990s. In their analysis, PR methodology was adopted to test for the degree of competition, using quarterly data for the period 2002-2005 for 20 commercial institutions in Macedonia. In general, the results obtained showed that competition in the banking sector remained relatively weak.

Podpiera (2007) investigated the relationship between competition and efficiency in the Czech Republic between 1994 and 2005, using the Granger-causality test. The result of the study showed absence of increased competition in the Czech banking market between 1994 and 2005. The result seems surprising, as one would have expected that the massive entry of foreign investors into the Czech banking industry would enhance the degree of banking competition. Furthermore, the result of the causality test showed that competition had a negative effect on cost efficiency in the Czech banking sector. This finding supports part of the literature that takes the view that increased competition leads to greater monitoring costs for banks and a reduction of the length of the customer relationship between the bank and the borrower, which reduces efficiency.

Sun (2011) investigated the degree of bank competition in the euro area, the US and UK before and after the financial crisis of 2007-2009 and revisited the issue whether the

introduction of European monetary union (EMU) and the euro have had any impact on bank competition. The results suggested that the level of bank competition converged across euro area countries in the wake of the EMU. The global financial crisis led to a fall in competition in several countries. The result obtained showed that the degree of competition in the US and UK banking sector supported monopolistic competition. These corroborated the works of Claessens & Laeven(2004) and Bikker & Spierdijk (2008), which applied this method to a large sample of countries, finding evidence for monopolistic competition, with varying degrees across the countries.

Stavarek and Repkova (2011) analyzed the competitive nature of Czech banks over a decade. The result indicated that sound conditions for competition were present in the banking industry of Czech. While the Greek market could be described as perfectly competitive, the degree of competitiveness declined after the country joined the EU in 2004, at which point the authors described the market as one of monopolistic competition.

However, applying the Lerner approach to China, Bing and Michael (2013) observed that the Lerner index failed to measure competition in the Chinese banking industry, due to the regulation of interest. Simpasa (2013) argued that profit elasticity approach of Boone (2008) did not suffer from these shortcomings.

Park (2012), using H-statistic of the Panzar-Rosse model, examined commercial bank merger waves in Japan and their effect on competition in the Japanese banking market during 1983-2006. Sample data for the study were collected from city banks and regional banks (both tier 1 and tier 2) which accounted for over 80% of total bank assets and total bank loans in Japan. With an unbalanced panel data approach for the analysis, using the

fixed effect model to reflect bank-specific characteristics and control heterogeneity among banks, the H-statistic was estimated separately for three different time periods, the boom, the burst and the recovery. Park concluded that the bank mergers that took place in Japan did not lead to a higher level of market power, except during the period of financial crisis around the time of bubble burst. Recent mergers in the Japan's banking sector did not seem to harm the competition level in the banking market. Increases in individual banks' market shares and an increase in overall market concentration have not materialized in higher net interest margin in Japan.

Gajurel and Predhan (2012), while examining the evolution of market concentration and competition of the Nepalese banking industry, using an unbalanced panel of 15-25 banks in the period 2001-2009, observed a decreasing trend and low level of market concentration when concentration was measured by the Herfindahl-Hirshman index. The test of market competition, using the Panzar-Rosse approach, rejected both the hypotheses for monopoly and perfect competition, indicating monopolistic market behaviours among the Nepalese banks. In addition, the market for interest-based income was found to be more competitive than that of the market for fee-based income.

Bruno (2012), in his study, exploited the large geographic dispersion in the market structure of the Brazilian banking sector when investigating the relationship between market concentration and bank competition. Some concentration measures, such as the Herfindahl-Hirschman Index (HHI) and the sum of market shares of the  $n$  largest banks ( $CR-n$ ), were used as indirect indicators of competition. Such indicators became relevant since high concentration is usually associated with non-competitive practices, through the formation of collusion among market participants. The idea is that higher concentration of

the banking industry increases banks' profitability, as banks make use of their market power by charging higher interest rates on credit and paying lower interest on deposits. An alternative explanation to the positive relation between bank concentration and profitability is that market concentration is driven by bank efficiency. So, as more efficient banks will gain market share, assessing competition by the simple link between concentration and bank performance can lead to incorrect conclusions. In the study, local markets were also distinguished by the degree of barrier to entry in order to assess its effect on bank competitive behaviour. The findings indicated a negative correlation between market concentration and bank competition and an even stronger effect in locations where the barriers to entry were higher. The study also highlighted the importance of evaluating the geographic impact of mergers and acquisitions for the analysis of the effect of market concentration on bank competition.

The evidence of measuring the market power and the structure of banking industry in Africa is limited and insufficient. One major constraint identified has been lack of data because many banks in Africa jealously guard sensitive data about their operations and when available, they are, in most cases, distorted. The implementation of disclosure laws by the regulatory authority and increased publication of some of these data by the regulatory authority has made them publicly available in these economies and the need to evaluate banks' performance in the face of reforms is becoming more crucial.

Thus, Kot (2004) employed both the Panzar-Rosse and Bresnahan models, respectively, to analyze the implication of competition on the South African banking sector. The result of the study was consistent with the effects of monopolistic competition. There appeared to be high concentration and the banks were not acting as a cartel. The two approaches offered

reasonable explanations of banking competitive performance in any economy and reinforced the perception that perfect competition and monopoly are neither plausible practical outcomes of market conduct in the banking industry (Cetorelli, 1999).

Aboagye et al. (2008) observed that Ghanaian banks possess market power mainly on account of their size, efficiency and the prevailing macroeconomic environment which they operate. Angelini and Cetorelli (2003) analyzed the behaviour of Italian banks and discovered that deregulation of the sector foster a reduction in price-cost margins. Studies have also shown that whenever banks are faced with a constant elasticity of demand for their products, and assuming there is no error of measurement in the variables, there is a symmetrical relationship between the H-statistic and the Lerner index (Shaffer, 1983; Bikker and Haaf, 2002). As banks become more competitive (higher H-statistic), the narrower the relative price-cost mark-up become (smaller Lerner index). A number of recent studies have applied both approaches in measuring banking competition to serve as a check for each other. In general, the two approaches provide reasonable explanations of banking competitive performance in any economy (Cetorelli, 1999).

Buchs and Mathisen (2005) assessed the degree of bank competition and discussed efficiency with regard to banks' financial intermediation in Ghana. In the study they applied panel data to variables derived from a theoretical model and found support for the presence of a non-competitive market structure in the Ghanaian banking system, possibly hampering financial intermediation. The economic costs of the non-competitive behaviour might have been exacerbated by the persisting domestic financing needs of the government, making it captive to the banks' behaviour and fostering inefficiency in the banking system. Also, large deficit financing through the issuance of treasury bills has not

only crowded out the private sector in capturing banks investments, it has also put pressure on interest rates, thereby making access to bank lending even more difficult for the private sector, thus hampering private sector development. Therefore, further private sector development appears to be very much dependent upon sound fiscal adjustment, and the possible link between fiscal policy and the efficiency of the banking system should deserve further attention. The result of the study further indicated that the consolidation of the Ghanaian banking sector was expected due to scale matters. Furthermore, it was found that barrier to competition on interest revenue was an indication that competition was stifled in the Ghanaian banking system. This could be as a result of the non-transparent fee structure of the banks, which helped to shield the bank market structure from competition.

Hamza (2011) investigated the market structure of banking industry in Tunisia and evaluated the degree of competition. In his analysis, he employed a widely used non-structural methodology of the H-statistic put forward by Panzar and Rosse (1987), while drawing upon a comprehensive panel dataset of Tunisian banks, covering the period 1999 to 2008. The estimated H statistics for the whole sample period were positive (0.67 and 0.71) and the Wald test for the market structure of monopoly or perfect competition was rejected, implying that the banks in Tunisia earned their revenue in the condition of monopolistic competition.

Simpassa (2011) analyzed the competitive nature of the Tanzanian Banking Industry from 2004 to 2008. Utilizing a rich bank level data set, the study employed the PR methodology to compute the competitive index, taking into account risk, efficiency, regulatory and macroeconomic factors. The result showed that banks in Tanzania earned their income under conditions of oligopolistic conduct. Moreover, the competitive index derived from

an interest revenue equation was not significantly different from that obtained, using an aggregate revenue measure. This suggests that the degree of contestability from traditional intermediation activities approximates overall bank behaviour. The overall message is that greater market contestability can be achieved by adopting measures aimed at stimulating competitiveness in the banking sector, including consolidating gains on the macroeconomic front and allowing more foreign bank entry so as to increase the spread of banking services.

Sunil and Binsheng (2011) investigated the impact of financial reforms on competitiveness and production efficiency of the banking sector, as well as the short-term and long-term impact on economic growth, in Egypt during 1992–2007. The results of the study suggested that reforms had a positive and significant effect on competitiveness and production efficiency. Also, the evidence showed that state-owned banks were generally less competitive than private banks and foreign banks were less competitive than domestic banks. The average x-inefficiency of Egyptian banks was around 30 per cent, which was comparable to those reported for other African countries. Finally, there was evidence to suggest a significant relationship between financial bank productive efficiency and economic growth in the short run but not in the long run. Overall, the results supported the argument for continuing the financial sector reform programme in Egypt.

Simpassa (2013) evaluated the degree of competition in the Zambian banking sector in the wake of the dynamic market shifts induced by the entry of new foreign banks and the privatisation of the state-owned bank. Using quarterly unbalanced panel observations from 1998 to 2011 for eighteen chartered commercial banks in Zambia, competition was measured with the PR-H-statistic and the time varying Lerner index. For the H-statistic,

results showed that Zambian banks earned their revenue under conditions of monopolistic competition. This finding was corroborated by the estimate of the Lerner index, which suggested that the degree of competitiveness might not be as low as previously understood. The study showed that risk-taking, revenue diversity and regulatory intensity are all important determinants of market power. Tight monetary policy was also found to strengthen the banks' exercise of market power. Generally, the findings lent support to those previous research studies, suggesting that increased foreign bank penetration and divestiture of state ownership in banking could heighten competitive pressures in the banking sector. Thus, the main policy lessons drawn from the analysis is that competitive conditions could be further enhanced by easing regulatory impediments and, in the long-run, allowing more foreign bank participation could spur competitive conduct in the industry. This conclusion is similar to that of Claessens and Laeven (2004).

Somoye (2008) examined the performances of government induced banks consolidation and macroeconomic performance in Nigeria in a post-consolidation period. The paper analyzed the data obtained from published audited accounts of twenty (20) out of twenty-five (25) banks that emerged from the consolidation exercise and data from the Central Bank of Nigeria (CBN). The analysis revealed that the consolidation programme had not improved the overall performances of banks significantly and also had contributed marginally to the growth of the real sector for sustainable development. The study concluded that banking sector was becoming competitive and that market forces were creating an atmosphere where many banks simply could not afford to have weak balance sheets and inadequate corporate governance. The study further posited that consolidation

of banks might not necessarily be a sufficient tool for financial stability for sustainable development.

Zhao and Murinde (2011) investigated the interrelationships among bank competition, risk taking and efficiency during the banking sector reforms in Nigeria (1993–2008). In the study, three stages were involved in the modelling procedure. In the first stage, the study measured bank productive efficiency, using data envelopment analysis, and the evolution of bank competition, using conjectural variations (CV) methods; the second stage involved using the CV estimates to test whether regulatory reforms influenced bank competition; and the third stage investigated the impact of the reforms on bank behaviour. The evidence suggested that deregulation and prudential regulation influenced bank risk-taking and bank productive efficiency directly (direct impact) and via competition (indirect impact). Furthermore, it was found that, as competition increased, excessive risk taking decreased and efficiency increased. Overall, the evidence from Nigeria, based on their study, affirmed policies that foster bank competition.

Ajisafe and Akinlo (2013) tested for the degree of competition in the banking sector between 1990 and 2009, using Panzar - Rosse (PR) methodology. The data for the study were obtained from the annual reports and financial statement of fifteen commercial banks in Nigeria, which were purposively selected for the study. The data collected were analyzed, using the dynamic panel generalized method of moment estimation technique with fixed effect. The results of the analysis showed that the Nigerian commercial banks were characterised by monopolistic competition, with H-statistic significantly different from zero for all sample periods and sub-sample periods. The value of H-statistic ranged between 0.0925 and 0.1168. From the empirical analysis of the study, it was observed that

commercial banks in Nigeria showed evidence of monopolistic competition which corroborated the result obtained in the previous studies. The result obtained is in contrast to the theory which emphasizes the oligopolistic nature of the industry because of the dominance of some banks in the industry.

Ayeni et al. (2013) investigated competitive condition in the banking sector of Nigeria, following the consolidation reforms. Eighteen out of the twenty four banks in Nigeria were used, based on availability of required data for the period of bank consolidation in the country (2006-2010). The Fixed effect Panel model, used by this study, takes into account risk, efficiency, regulatory and macroeconomic factors. The study employed the non-structural method of Panzar-Rosse to compute the competitive index, since this method had been used by past researchers on many countries and was generally accepted. The results, going by the magnitude of the estimated H-statistics, show that banks in Nigeria earned their income under an averagely monopolistic competitive market. This means that banks' revenues were sufficiently sensitive to input costs, thereby signalling some degree of competitive pressure at play in the Nigerian banking sector. This result is consistent with those of previous studies in developing countries, especially Kot (2004) for the South African banking sector, Hamza (2011) for the Tunisia banking sector and Simpasa (2013) for the Zambian banking sector. This result was believed to be an improvement over the oligopolistic structure of the past wherein very few banks dominated the scene in terms of assets base, profitability and deposits structure, with others being followers and competing for a narrow segment of the market (Lemo, 2003). The study concluded that consolidation policies, driven by the Central Bank of Nigeria, had probably reduced market concentration, leading to improved competitive conditions. We, however, find this

conclusion speculative, as it is based on the perception that increased competition will necessarily result from reduced concentration since the study did not measure concentration during the period chosen.

Ajisafe and Akinlo (2014) examined the relationship between competition and efficiency of Commercial Banks in Nigerian for the period 1990 to 2009. Secondary data were sourced from the annual reports and financial statement of fifteen commercial banks in Nigeria, which were purposively selected for the study. The data collected were analyzed, using the pooled least square and dynamic panel generalized method of moment estimation technique with fixed effect. The results of the analysis showed that there was a positive and significant relationship between the degree of competition and the level of efficiency of commercial banks in Nigeria, with a t-value of 2.45 and p-value  $< 0.05$ . The study concluded that the reforms introduced in the banking sector in the late 80's, raised the degree of competition and improved the level of efficiency of Nigerian commercial banks. To proxy the structure of the banking system, which is a measure of the degree of competition, the study used the intermediation ratio, measured by the ratio of total loans to total deposits, while ROA was used as a measure of efficiency- the dependent variable. Other variables included in the model are total assets (bank size), equities of the banks and non-performing loans. Each of the variables was expected to influence the level of efficiency of commercial banks in Nigeria. This study has been criticized on the ground that ROA is known to be a good measure of overall profitability, but not of efficiency and intermediation ratio, represented by loans/deposit that may not be a better measure of competition than the  $H_{statistics}$ . Other factors not considered in the model included: loan

pricing and risk appetite. The fit was not a good one with a coefficient of determination of 0.22, as the unexplained proportion of the independent variable was too high.

In a related study, the CBN (2013) observed that the evidence for banking structure and market power was sparse. The study argued that, while the trend of bank profits in Nigeria since the liberalization of the financial sector and the increased number of new entrants to the industry had led to the thinking in many circles that investment was most worthwhile in the banking industry, CBN (2013) adopted bank level data for the assessment of not just bank performance, but also intermediation, growth and competition in the banking sector. The results of the study indicated that, although the Herfindahl-Hirschman Index (HHI), a metric for measuring competition, with respect to assets and deposits, increased after the bank consolidation exercise, the industry remained largely competitive, as concentration declined slightly. With respect to size and performance, the mixed results from the analysis across the different policy periods and sizes, indicated that bigger was not necessarily better, in terms of profitability, cost and managerial efficiency as well as productivity. The paper argued that the result notwithstanding, except similar studies were done, the outcome of the study might not be sufficient to safely and conveniently conclude that the banking industry was competitive enough to attract investments.

Saibu (2014) investigated the degree of competition and concentration in the Nigerian banking industry since 2001. He also measured and compared the degree of banking competition in two sub periods, 2001–2004 and 2005–2013, in order to inquire on the implication of the 2005 bank consolidation on the competitiveness of banks in Nigeria. The study employed the use of a detailed bank-level panel data set, and measured competition, using the PR-H-statistic and the Lerner index to document empirical evidence on the

evolution of competition in the Nigerian banking industry. The results showed that, over the sample period, Nigerian banks exhibited elements of monopolistic competitive behaviour. Specifically, the H- statistic, estimated from the composite revenue equation, was found to be positive and statistically different from zero and unity. For the Lerner index, the results provided a deeper insight on the competitive conduct of Nigerian banks. Over the period of analysis, the Lerner index found a growing intensity of competition, particularly in the post-consolidation period. Furthermore, the paper found that banks' risk averseness, revenue diversity and regulatory intensity were all important factors influencing the exercise of the revenue-generating capacity of banks and market power. The general conclusion from this was that, over the period under consideration, Nigerian banks exhibited monopolistic competitive behaviour. Specifically, the H-statistic, from estimates, was found to be positive (0.511) and statistically different from zero and unit. The Lerner index also provided an alternative to the popular PR-H index for determining bank competitiveness and market power.

A major criticism of this study is the use of the static model which did not take care of the dynamic nature of banking business, due to the tendency for profits to persist in the banking industry. Also the method adopted in the study measures banking competition directly by observing behaviour, without employing explicit information about the structural characteristics of the market (like concentration). There appears, therefore, a disconnect between the estimated levels of competition and the corresponding degrees of market concentration, as this approach remains silent on the degrees of concentration that generated the reported levels of competition. Consequently, it is impracticable to relate

market concentration to the intensity of competition in the market place for the chosen periods.

### **3.3.3 Banking Profitability Performance**

Studies on banks' performance (Altunbas et al., 2001; Berger, 1995; Berger and Humphrey, 1997; Bos and Schmiedel, 2007; Williams et al., 2009) focus on the US and Europe and neglect banks in emerging countries, such as Nigeria. Multi-country analysis usually considers factors, such as legal tradition, accounting conventions, regulatory structures, property rights, culture and religion as possible explanations for cross-border variations in financial development and economic growth (Beck and Levine, 2004; Williamson, 2003). Studies at country level usually focus on market dynamics as determinants of performance (Bikker and Haaf, 2002), or provisions for loan losses which can exert a negative impact on the level of profitability (Cavallo and Majnoni, 2002; Laeven and Majnoni, 2003). Other factors, such as market structure and bank-specific variables, have been proposed on the basis of the structure–conduct–performance paradigm, and have been used to test the role of ownership and governance in explaining bank performance (Berger, 1995; Berger and Humphrey, 1997; Bikker and Haaf, 2002; Goddard et al., 2001). In general, the extensive empirical evidence does not provide conclusive proof that bank performance is explained by either concentrated market structures and collusive price-setting behaviour or superior management and production techniques. Bank performance levels are found to vary widely across banks and banking sectors (Altunbas, et al., 2001; Maudos et al., 2002; Schure et al., 2004).

Another strand of the literature analyses the impact of consolidation on banking costs. The need to reduce costs through economies of scales and scope, or to increase revenues

through gaining additional market shares, is usually the main driver of consolidation (Amel, Barnes, Panetta, and Salleo, 2004). The literature also discusses the linkage between mergers and acquisition activities and the transfer of knowledge between the acquiring and the acquired company. However, the relationship between consolidation and costs does not seem to be always positive. Some studies, for instance, suggest that efficiency gains from consolidation disappear after a certain size is reached and that, above a certain threshold, a firm might start exhibiting diseconomies of scale (Athanasoglou et al., 2005). The increase in size also creates further pressure on managers, owing to the difficulty of managing large institutions. T Banal-Estañol and Ottaviani (2006, 2007) highlighted the need for diversification to ensure the success of bank mergers. They also argued that mergers were not always beneficial as they might make firms more aggressive when they competed in quantities.

The evidence on the effects of consolidation on cost also seems to vary by country. This is because each country has its own market characteristics and regulations (Focarelli, Panetta, and Salleo, 2002; Vander Venet, 2002). In general, no strong evidence on the benefit of consolidation was found in the US, while, in Europe, the conclusions seem to be mixed (Carbo and Humphrey, 2004; Cavallo and Rossi, 2001; Diaz, Garcia, and San-filippo, 2004). For Asian countries, such as Japan, the conclusions are also mixed and vary with the period analysed (Drake and Hall, 2003).

Athanasoglou et al. (2005) examined the effect of bank-specific, industry-specific and macroeconomic determinants of bank profitability, using an empirical framework that incorporated the traditional Structure-Conduct-Performance (SCP) hypothesis. To account for profit persistence, they included the lag of the profitability variable among the

regressors and applied a GMM technique to a panel of Greek banks that covered the period 1985-2001. The estimation results show that profitability persisted to a moderate extent, indicating that departures from perfectly competitive market structures might not be that large. All bank-specific determinants, with the exception of size, affected bank profitability significantly in the anticipated way.

However, no evidence was found in support of the SCP hypothesis. Finally, the business cycle had a positive, albeit asymmetric effect on bank profitability, being significant only in the upper phase of the cycle. The result further suggested that, as the industry was moving towards a more competitive structure, profitability should have declined, the improvement of the managerial practices (captured by the bank-specific variables) resulted in increased profitability.

In addition, an important finding of the study is that the business cycle significantly affects bank profits, even after controlling for the effect of other determinants, which have strong correlation with the cycle (e.g., provisions for loan losses). Further test for asymmetry in the effect of the business cycle, distinguishing between periods in which output is above its trend value and those in which it is below shows that the coefficient of cyclical output almost doubles when output exceeds its trend value. In contrast, when output is below its trend, the coefficient of cyclical output is insignificant. This result supports the view that banks are able to insulate their performance during periods of downswings.

Smirlock (1985), Berger (1995), and Berger et al. (2000) investigated the profit-structure relationship in banking, providing tests of the Market-Power (MP) and the Efficient-Structure (ES) hypotheses. To some extent, the RMP hypothesis was verified since there

was evidence that superior management and increased market share (especially in the case of small- and medium-sized banks) raised profits. In contrast, weak evidence was found for the ES hypothesis. According to Berger (1995), managerial efficiency not only raises profits, but may lead to market share gains and, hence, increased concentration, so that the finding of a positive relationship between concentration and profitability may be a spurious result, due to correlations with other variables. Thus, controlling for the other factors, the role of concentration should be negligible. Other researchers, like Goddard et al. (2004), argue, instead, that increased concentration is not the result of managerial efficiency, but rather reflects increasing deviations from competitive market structures, which leads to monopolistic profits. Consequently, concentration should be positively (and significantly) related to bank profitability.

Vives (2001) observes that the degree of competition in the financial sector can matter for the efficiency of the production of financial services, the quality of financial products and the degree of innovation in the sector, all of which impact on profitability. According to him, a reason, specific to the financial sector, is the link between competition and stability, long recognised in theory and empirical research and, most importantly, in the actual conduct of prudential policy towards banks. Claessen and Laeven (2004) also observes that the degree of banking competition can matter for the access of firms and households to financial services and external financing, and this, in turn, affects overall profitability and growth.

#### **3.3.4 Bank Size and Competition**

Bikker and Haaf (2002) applied the methodology of Panzar and Rosse in the banking sectors of 23 industrialised countries over the period 1988-1998, and found evidence of

monopolistic competition. When a distinction was made between various banking sizes, in order to capture different geographic markets, perfect collusion could not be excluded for small banks or local markets in Australia and Greece, whereas, for a number of markets of various banking sizes in other countries, perfect competition could not be excluded. Competition seemed stronger for large banks (which operated more in international markets) and weaker for small banks (which operated more in local markets). This was consistent with the results presented by De Bandt and Davis (2000). Furthermore, competition seemed to be weaker in non-European countries.

Fillipaki and Staikouras, (2005) measured the degree of concentration and competition in the new enlarged European Union (EU) banking environment and investigated competitive conditions in the major European banking markets over the period 1998-2002. They described the patterns of consolidation and concentration, using traditional indicators of market structure. The econometric study was based on a non-structural estimation technique to evaluate the elasticity of total interest revenues with respect to changes in banks' input prices (i.e., a Panzar-Rosse test). The empirical results confirmed that European banks were operating under conditions of monopolistic competition. Moreover, econometric estimates suggested that bank interest revenues in the 10 new EU markets were earned in conditions of higher competition than those that existed in the old EU countries. Finally, large banks earned their interest revenues in a relatively more competitive environment, compared with smaller banks, something that was not observed for the other sources of income.

De Bandt and Davis (2000) also estimated the H-statistic for France, Germany, and Italy for the period (1992-1996), while they also included the US in their sample for

comparative purposes. They estimated the H-statistic within groups of large and small banks in each country. Their econometric estimates indicated that the US exhibited a higher level of competition than the EU banking markets, though the hypothesis of perfect competition for the US market was still rejected. Within the EU, whereas Germany and France showed monopolistic competition for large banks and monopoly for small ones, in Italy, there was evidence of monopolistic competition for both small and large banks. Furthermore, the behaviour of large banks was not fully competitive, compared to the US. The authors, therefore, did not find a clear trend in the competitive conditions in the economies studied.

Yildirim and Philippatos (2002) analyzed the evolution of competitive conditions in the banking industries of fourteen Central and Eastern European transition economies for the period 1993-2000. The results suggested that the banking markets of these countries could not be characterised by the bipolar cases of either perfect competition or monopoly. Furthermore, the cross-sectional analysis of competitive structure revealed initially a decreasing trend between 1993 and 1996 and a subsequent increasing trend in competitive conditions after 1996. Large banks in these countries operated in a relatively more competitive environment, compared to small banks, or, in other words, competition was found to be lower in local markets, compared to national and international markets.

Simpassa (2008) studied deregulation, market power and competition in the Zambian banking system. He observed that, while Zambian banks earned their revenue under conditions of monopolistic competition, the large banks were more competitive than the small ones.

Mulyaningsih and Daly (2011) examined the competitive conduct of the banking industry of Indonesia, using unconsolidated annual financial reports of sub-samples of large, medium sized and small commercial banks between 2001 and 2009. They employed the Panzar-Rosse method to examine the banks' behaviours in competition. Their results indicated that banks in all three subsamples, large, medium sized and small, were working in a monopolistically competitive market. The study also showed that the most competitive market was the medium sized banks because they were least concentrated. This study established the existence of an inverse relationship between concentration and competition, thus validating the structure-conduct-performance paradigm.

### **3.3.5 Gaps in the Literature**

The review, so far, shows that there exists a dearth of research on the possible impact of market concentration and competition on profitability in Nigerian commercial banks, the focus of the present research. Related works to this study in Nigeria include: (Somoye, 2008; Fadare, 2010; Zhao & Murinde, 2011; Ayeni et al., 2013; CBN, 2013; Ajisafe & Akinlo, 2013, 2014; Saibu, 2014). All these studies, without exception, employed the non-structural approach (like the Panzar-Rosse H statistic) to test for competition and arrived at the general conclusion that the banking market in Nigeria was monopolistically competitive. These studies failed to link their conclusions to the associated degree of market concentrations that generated the estimated levels of competition since the direction of causality was from concentration to competition, following the structure-conduct-performance paradigm. On the other hand, causality may be bi-directional, if we follow Bikker and Spierdijk (2008). These studies, therefore, could not provide evidence to either validate or invalidate the structure-conduct-performance position. In addition, although

these studies estimated the index of competition (i.e., the  $H_{\text{statistic}}$ ) for the period and sub-periods (i.e., pre- and post-consolidation) considered, they did not use the resulting magnitude of the Index to conclude on which sub-period presented a higher intensity of competition, following Vesala (1995).

Moreover, these previous studies aggregated all the banks together when testing for the market structure under which the industry earned its income without making any distinction between the big-sized banks and the small-sized banks to empirically test their separate competitive conditions. Doing this will provide two possible conclusions. Firstly, it will show under what market conditions are the big and small-sized banks earning their incomes. Secondly, it will show if the big or the small-sized banks have a higher or lower intensity of competition in the chosen sub-periods.

Furthermore, in terms of methodology, many of the previous studies carried out the tests of bank competitiveness in a static analysis setting, using the fixed effect, the random effect and the pooled least square techniques of estimation of the set of panel data. The only exception to this observation was Ajisafe & Akinlo, 2013. They used the technique of General method of moment (GMM), following the Arellano & Bond (1991) procedure because of the endogeneity problem created in the profit function by the inclusion of the lag of the dependent variable as a regressor, but failed to explain this lag as representing the profit persistence nature of the banking industry (Athanasoglou, 2005). The present study employs the dynamic panel GMM framework, developed by Blundell and Bond (1998) to ensure a more robust, more efficient and more consistent coefficient and to fully solve the endogeneity and reverse causality problems associated with profit persistence in

developing countries that is yet to be satisfactorily addressed in the banking profitability performance literature.

This research, however, covers all these areas mentioned above by measuring the comparative degrees of banking market concentration in the pre- and post-consolidation periods. Also, it links the impact of variation in the degree of banking market concentration to the estimated levels of competition in the pre- and post-consolidation periods. It also considers the combined impact of concentration and competition on profitability performance of the Nigerian Banks. Generally, therefore, this study is unique in extending the frontier of the literature towards providing answers that do not only link market concentration to banking profitability through the channel of competition, but also focuses on the competitiveness of small and big-sized banks, which has different policy implications for the regulators.

## **CHAPTER FOUR:**

### **THEORETICAL FRAMEWORK AND RESEARCH METHODOLOGY**

#### **4.1 Introduction**

In this chapter, the theoretical framework and the research methods employed in the process of carrying out this study are discussed. The study first presents the theoretical framework. This is followed by the analytical framework and model specification. Based on the former, the study constructs a basic Bank Profitability model, which provides the framework on which every other model that studies bank competition and market power are classified. Measures of banking market concentration, banking competition and banking profitability are also presented. Definition of variables, description and sources of data are presented in the latter part of the chapter. The chapter concludes with a discussion of the methods of analysis employed in this study, under which tests of the study hypotheses are considered.

#### **4.2 Theoretical Framework**

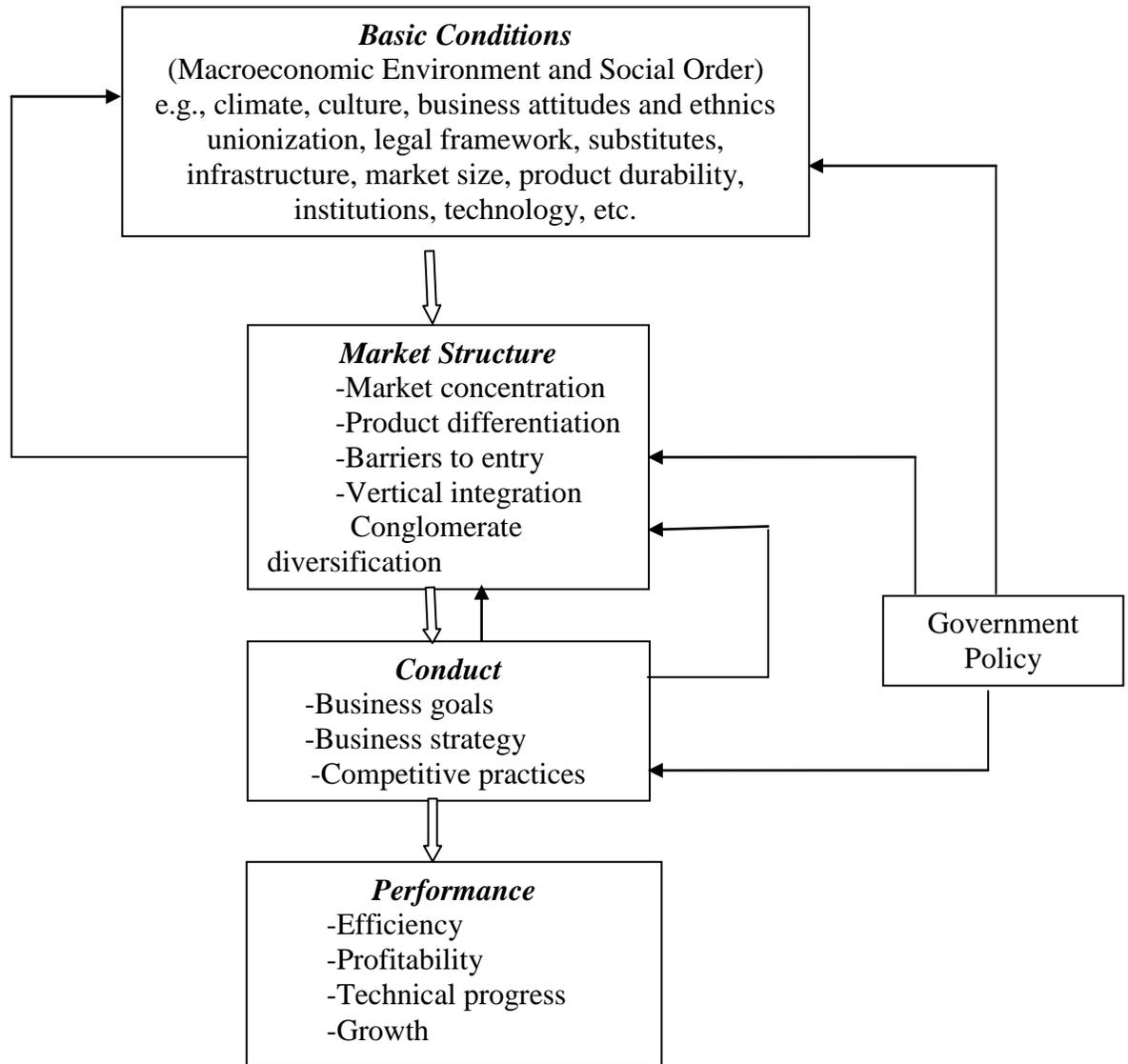
The theoretical framework of the study is provided by the theories of Industrial Organization (IO) and New Empirical Industrial Organization (NEIO). The identification of banks, as firms, provides a natural rationale for the application of the industrial organization framework to banking.

##### **4.2.1 Theory of Industrial Organization**

The basic approach of the theory of IO is to emphasize links between market structure and business conduct in determining market performance. The Structure-Conduct-Performance is the dominant empirical tradition in industrial organization theory. Performance in a particular industry is determined by factors like: profitability, efficiency and market

growth. Such performance is assumed to be dependent on the conduct of firms in the market with respect to factors, such as pricing, advertising and product development, research and development. Each of these areas could be a determinant of goals of the firms. The goals of the firms, the degrees of collusion or competition between firms and other aspects of business endeavours are considered. Market conduct, on the other hand, depends on market structure, including such things as the degree to which production is concentrated in the hands of few firms (market concentration), the degree of product differentiation and barriers to new competition, as depicted in the diagram below:

**Figure 4.1: The Structure-Conduct-Performance Framework**



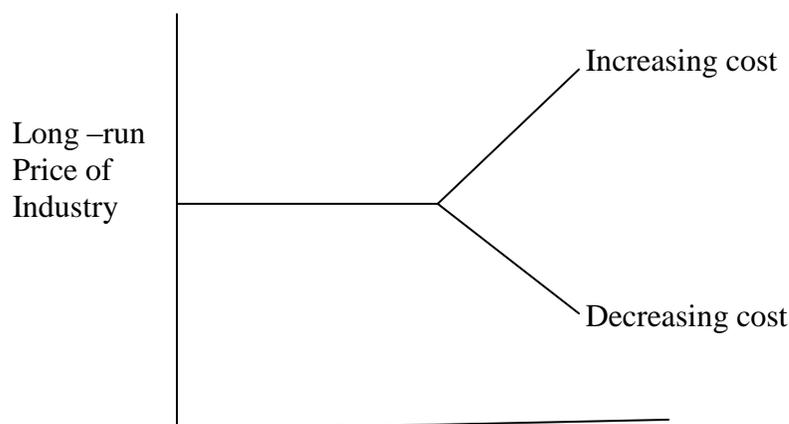
⇒ Major lines of influence  
 → Minor lines of influence

**Source:** Adapted from Loto, (2012, p 422) and modified by the author.

The approach to competition in the banking industry, using the industrial organisation paradigm, involves two arguments. The first is based on price-cost margins, (Shaffer, (1993); Bikker and Bos, (2008)) while the second resorts to oligopoly (Molnar-Marton and Horvath, 2007). In the short run, because of restrictions on entry, product scarcity, accompanied by price increase, creates supernormal profits which act as incentives for new producers to enter. In the long-run, entry would ease out the supply. But once entry takes place and long run equilibrium is established in the industry, the price-cost margin is wiped out and no longer acts as an incentive for entry. Therefore, further growth beyond long-run industry equilibrium is price independent.

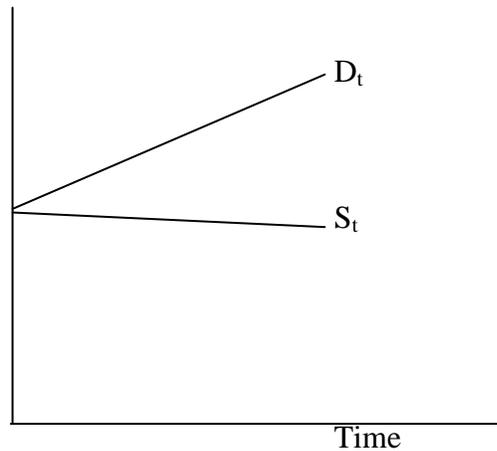
Under monopolistic competition, the liberal condition of entry and exit makes it possible for less efficient firms to drop off and be replaced by new firms. This conservative approach cannot explain the phenomenal growth of the industry. It cannot be price-led. Needless to say, the industrial organisation approach cannot be restricted to short run analysis, on the one hand, and long-run equilibrium, on the other hand.

**Figure 4.2: Long-Run Industry Supply Curve**



## Dynamic Equilibrium

Figure 4.3: Long-Run Supply and Demand of Industry



The problem with the approach of oligopoly is more straightforward. Firstly, the oligopolistic models are usually set in the short run. Therefore, they are not aimed at explaining industrial growth and dynamics. The limited dynamics, which is inferred, is dependent on oligopolistic markets. Since the main question of interest in understanding competition in the banking industry relates to growth and dynamics arising out of entry, this second approach is not adequate for the purpose for two reasons. Firstly, a basic objection to this approach is that it presupposes oligopoly as the market form. Secondly, they do not arise out of a complete framework that spans all dimension of S-C-P. The only complete framework that could help in understanding competition in general and in banking, in particular, is the Structure-Conduct-Performance paradigm. Even then, the three primary dimensions of the S-CP paradigm are not sufficient to explain the phenomenon of competition and growth in the banking industry. Unless the basic-conditions argument is invoked, the phenomenon cannot be well explained, nor can it be reconciled to the evolving and modern notion of competition.

Basic conditions clearly determine the growth in demand and supply. In the very long run, both demand and supply functions could be upward sloping. They are not equilibrated by price. Therefore, the very instrument of competition called price-cost margin is no longer of any great relevance. On the other hand, independent of price, basic conditions create new demand and simultaneously augment supply. Among other things, one of the most important basic conditions is technology. It is, therefore, clear that the long run supply curve of the industry is more likely to be facing declining cost, rather than increasing cost. The implication is that in the dynamic context, price cannot be instrumental in raising the supply in the industry. Since basic conditions augment both supply and demand, and both the demand curve and supply curve are rising over time, price no longer plays an equilibrating role.

The source of growth of the banking industry lies in basic conditions. Basic conditions include technology, structure of the economy, institutions, availability of substitutes, availability of trained manpower, and government policy and rules. they influence the growth of the industry by creating new demand and attracting new resources. The change in basic conditions creates different types of externalities – technological and pecuniary. Therefore, the sustained growth and dynamics of the industry is not price led. “*Growth arises out of changing basic conditions and dynamics arises out of sharing the new market created by basic conditions*”. Hence, the prime mover of competition is rivalry among firms to control market share, rather than adjustments brought about by the price mechanism.

There are two variants of S-C-P paradigm. One attributes larger market shares of firms to their monopoly power (Relative Market Power, (RMP) and the other relates it to efficiency

(ESH). Price is considered to be the main mechanism for generating efficiency. While price represents static efficiency, growth in dynamics is associated with changes in market share. If the market share and ranks change, then firms would be under pressure and this would lead to efficiency. Similarly, changing basic conditions creates externalities and lead to dynamics. There are differences in the rate, the manner and the efficiency with which firms internalize these externalities. The two versions of S-C-P paradigm could be reconciled in the following manner: Market dynamics originates from two sources, namely, rivalry among firms for acquiring and retaining market share, on the one hand, and rivalry due to internalization of externalities, created by change in basic conditions, on the other hand.

A caveat on the analysis of changing basic conditions relates to the Schumpeterian line of argument on evolutionary competition. While, apparently, Schumpeter also talks of technological progress and growth, it must be understood that his notion of innovation and growth is distinct from the present one. In Schumpeter, we have endogenous technical progress, generated from within the firm, that is supported by monopoly and patents. The concept of competition in this case goes against monopoly. In this framework, technological progress arises outside the individual firms, and is incorporated in the basic conditions such that it is available to all firms provided they have the willingness to internalize it. The more efficient and dynamic firms internalize faster and better and, thereby, can capture a greater market share. In as much as they do it at the expense of other firms, this creates rivalry. Efficiency occurs by a feedback mechanism.

The impetus to change in industry arises from innovations from the basic conditions which could be due to public policy and the State but this may not be necessarily so. Such

externalities are available to banks with minimal risk, compared to the risk-ridden process of 'creative-destruction'.

Rivalry could arise, due to three forces. First, it could be due to new entrants, which relates to structure (Deb, 2004). And more often than not, it can be due to price competition. Second, it relates to conduct and is most often quoted in literature. Third, it arises out of externalities which are captured by basic conditions.

Nuberger (1998) detached government policy from basic conditions and put it in another box. Government policy includes restrictions on entry, size of investment and establishment of government-owned banks. In recent time, this is being dismantled to the extent that whatever remains of government policy boils down to monetary and prudential controls. The monetary controls involve cash reserve ratio, monetary policy rate (MPR), variable cash reserve ratio, etc, while prudential regulations relate to assets classification and income recognition on non-performing loans and capital adequacy ratio. All these may be subsumed under basic conditions, which, again, affect all the three dimensions of S-C-P. Most of monetary controls are general and therefore can be subsumed under basic conditions because rules are essentially part of basic conditions. Rules include regulations. By this count, since most of the regulations would be subsumed under the basic conditions, what remains are specific regulations that relate to specific segment or specific market forms. For instance, the liberalisation of interest rate is across the board. The point here is how efficiently do firms internalise the liberalised policy regime?. Efficient firms internalise these changes better and they are adding to efficiency. It is not governed by price which is responsible for static efficiency. Apart from profitability and efficiency, another equally important criterion is stability. Therefore, in the dynamic context in

banking, efficiency cannot be equated with Paretian efficiency, which may suffice for any other ordinary market.

The way the process of competition is envisaged is through the basic conditions influencing structure, conduct and performance. In fact, the source of competition and efficiency arise out of dynamics of basic conditions. By keeping basic conditions constant, there will be the constraint of observing only one aspect of competition. Under this framework, competition is restricted to inter-firm rivalry. Such rivalry is often explained in extant studies through oligopoly models. The broader view of competition, as envisaged includes the right market structure and competitive conduct, along with rivalry for internalising the externalities caused by basic conditions. Last, but not the least, any notion of competition, especially if it is to address growth and dynamics, must also account for stability. Some of the new approaches to competition are restricted to rivalry for deposits, loans and to a great extent, risk assets like interbank placements. From the above discussion, it becomes clear that there is a need to have comprehensive framework which encompasses all the aspects enlisted above. There is none better than the S-C-P framework, including feedbacks, with changing basic conditions incorporated in it, such that competition can be defined and understood as a process that unfolds from basic conditions up to performance. The market that defines competition has to be set in reference to and captured through the entire S-C-P framework.

Structure and technology change and so do basic conditions. This enables growth in markets and, hence, creates the competitive conditions through dynamics. Also, the impact of technology and structure influence productivity and allocative efficiency, whereas the change in basic conditions leads to technical efficiency.

Most of the extant literature takes a partial view. It either restricts the notion of competition to structure, concentration, entry and monopoly power, or, to conduct and oligopoly, where the market form is pre supposed. Our approach not only develops the S-C-P framework for establishing the appropriate notion of competition, it also modifies the S-C-P framework to suit banking and finally develops the empirics that are necessary to analyse and estimate competition in banking so as to pronounce an overall market form.

On the whole, the ordinary Structure-Conduct-Performance approach does not involve any analysis of market dynamics. The approach adopted in this study introduces various aspects of industry dynamics and growth. It provides a methodology to arrive at the market form in the banking industry through an analysis of all the aspects of basic conditions, structure, conduct and performance.

#### **4.2.2 New Empirical Industrial Organization Theory**

The shortcomings, observed in the structural approach, led to a number of attempts to collect empirical evidence on the nature of competition by observing conduct directly. The New Empirical Industrial Organization (NEIO) makes conclusions about competitive pressure by directly observing the conduct of firms in the market. The NEIO employs a variety of alternative methodologies requiring different data and assumptions. Carbo Valverde et al. (2009) point out that the first generation of non-structural measures is based on the oligopoly theory (neoclassical conception of competition). These models include the Lerner index, the conjectural variation models (Iwata, 1974; Bresnahan, 1982; Lau, 1982) and the Panzar and Rosse (1987) model. While sharing a common standard theoretical framework, results are often divergent (Carbo Valverde et al., 2009; Liu et al., 2013). A second generation of NEIO measures focuses on the dynamics of markets and is thus in

line with the Austrian (dynamic) conception of competition. These include the Persistence of Profits, developed by Mueller (1977, 1986) and the Boone indicator, proposed by Boone (2008).

The Lerner index (or price-cost margin) is a popular measure of market power in empirical research. The market power of a firm is identified by the divergence between the firm's price and its marginal cost. The price and marginal cost should be equal in perfect competition, but will diverge in less competitive environments. A big margin between price and marginal cost signals monopoly power. The theoretical foundation of the Lerner index is rooted in static oligopoly theory (the Cournot model). Lerner (1934) proposed the following measure of market power, known as the Lerner index :

$$L = \frac{(P-MC)}{P} \quad (\text{i.e eq 4.37 re-stated}),$$

where: P = Price; and MC =Marginal cost.

The Lerner index ranges from 0 in situation of perfect competition to the inverse of the price elasticity of demand in situation of monopoly or collusion.

Although the Lerner has been known by economists since the mid-1930s, its application to banking is relatively recent, due to the difficulty of assessing marginal costs. Marginal costs have only been econometrically estimated during the last two decades and are extracted from the estimation of the cost function. Cost function is often assessed, using the intermediation approach from a trans log equation, including a single output (total assets) and three inputs (labour, deposits, and physical capital).

A major limitation of the Lerner index is its inability to distinguish between markets that have high margins, due to inelastic demand, and markets that have high margins because

they are less competitive, or, perhaps, collusive. To overcome this problem, the conjectural-variation method has been introduced by Iwata (1974), Bresnahan (1982), and Lau (1982). The aim is to control the changes of the Lerner index due to demand changes, and, therefore, isolate firms' competitive behaviour. The conjectural variation refers to the belief that one firm has about the way its competitor(s) may react, if it varies its output or price (Bowley, 1924).

In applied empirical studies, what is more critical is how to convert the theory to data. This is usually done in two ways. The first approach is to estimate a parameter that represents the behaviour of firms. The Iwata (1974) model provides a framework for estimating conjectural variation values for individual firms that supply homogenous products. Bresnahan (1982) and Lau (1982) propose an alternative approach, based on industry data. The advantage of this method is the ability to use industry aggregate data (more available than firm-level data). The structural model in this approach requires specifying functional forms for demand and supply equations. One might raise concerns about the functional forms adopted. Flexible functional forms often imply the need to assess a large number of parameters. This induces two econometric problems. Firstly, the risk of multicollinearity increases when researchers add interactions (Perlo and Shen, 2012). Secondly, studies based on a limited number of observations face major small-sample issues (identification issue and instability). The latter issue is particularly problematic insofar as concerns about competition occur in markets with few suppliers. As a consequence, results may be highly sensitive to the specification employed, raising doubts about the conclusions. It is therefore important to verify that the estimated parameters are consistent with theoretical requirements (e.g., negative price elasticity).

The intuition is straightforward in two opposite cases: collusion and perfect competition. For a monopolist, marginal cost equals marginal revenue at the equilibrium. After input prices increase, marginal cost increases. To maintain the equilibrium between marginal cost and marginal revenue, the monopolist should increase the marginal revenue by reducing the total quantity (insofar as marginal revenue is a decreasing function of quantity).

Panzar and Rosse (1987) show that total revenue is reduced if the price elasticity of demand exceeds one. Intuitively, an increase in marginal cost reduces quantity but increases output price. If the demand elasticity exceeds one, the gain due to price increase does not compensate for the loss due to reduction of quantity. By contrast, in a competitive setting an increase in input prices induces an increase in total revenue. Because cost functions must be homogenous of a degree of one in the input prices, any increase in input prices generates an equal percentage increase in costs. A firm's revenue changes by the same percentage as its total cost, and so by the same percentage as its inputs prices to ensure the zero profit condition (total cost equals total revenue). The required adjustments in the total quantity are achieved by a reduction in the number of firms (long-run equilibrium).

As a consequence, an increase of 1 percent in input prices induces an increase of 1 percent of total revenue in competitive markets.

From this theoretical framework, the identification of competitive conditions is obtained by calculating the sum of the elasticity of the revenue with respect to all input prices. The sum of elasticity, often called the H-statistic, ranges from -1 to +1. The greater the transmission

of cost changes into revenue changes, the more competitive the market is. Under perfect competition, input prices and total revenue increase by the same percentage and the H-statistic equals one. Shafer (1982) proves that the H-statistic value equals one for a monopoly in a contestable market (free entry). The H-statistic is zero or negative for a monopoly. An increase in input prices induces a reduction of total revenue under certain assumptions (e.g., demand elasticity higher than one). Vesala (1995) documents that the H-statistic is non-positive in the monopolistic competition equilibrium without threat of entry or for a collusive oligopolist. This measure is between 0 and 1 for a monopolistic competitor (Panzar and Rosse, 1987; Vesala, 1995). Applied economists estimate a reduced-form revenue equation. The test is obtained by regressing revenue (in logarithm) on input prices (in logarithm) and other control variables.

The advantages of the PR model lies in its simplicity and the fact that it does not pose stringent data requirements. The test can be derived by running only one equation requiring a few numbers of variables and banks. As a result, the PR model can be obtained from a relatively small number of observations, which is crucial for studies on less mature banking industry. Furthermore, Shafer (2004) points out that the PR model is robust to the extent of the market as no specific market definition appears in the revenue equation. Only the data from firms included in the sample are required to estimate revenue equation. This is a huge advantage in cross-country studies (Claessens and Laeven, 2004).

Nonetheless, these benefits come at the cost of other shortcomings. The major pitfall concerns the econometric identification and the interpretation of the H-statistic. A sample of firm-level observations in a long-run competitive equilibrium would exhibit  $H = 1$ , while a sample of observations from a profit-maximizing monopoly yields  $H = 0$ .

### 4.3 The Analytical Framework

Banks, as rational economic agents, interact in the market place with the other economic agents like consumers, government, firms, etc, and, in doing so, try to be productive and efficient (Bikker and Bos 2008). Productivity here is defined as the number of output produced with a single unit of input. So, the production function is given as:

$$q = f(x) \quad (4.01)$$

The condition for maximization of output quantity is:

$$\frac{dq}{dx} = 0 \text{ and } \frac{\partial^2 q}{dx^2} < 0 \quad (4.02),$$

where  $q$ ,  $x$  and  $\partial q/\partial x$  represent output quantity, input and marginal productivity respectively.

Equation (4.01) is homogenous of degree one (i.e., twice continuously differentiable), and efficiency on the other hand refers to the maximum output for a given level of input. In defining output and specifying inputs for banks following the intermediation approach, a bank attracts deposits and other funds and transforms them into loans and investment, using labour, capital and materials as inputs. The corresponding dual cost function includes, not deposits, but the interests paid on deposits as an input factor. Interest income on loans and investment are the output components (Altunbas et al. 2001 and Barr et al. 1994). To incorporate risk management, the level of equity will be included in the definition of banks production function, more so that equity may be an alternative to deposits when funding loans.

Following Bikker and Bos (2008), for a bank  $i$ , we define profit  $\pi_i$  as

$$\pi_i = pq_i - w_i X_i, \quad (4.03)$$

Bank i then maximizes profit,

Subject to:

$$T(X_i, q_i) = 0; H(p, q_i, w_i, z_i) = 0; P = f\left(\sum_{i=1}^N q_i\right) = f(q)$$

Where  $q_i$ , is the output vector,  $x_i$  is the input vector,  $p$  is the output price vector, and  $w_i$  is the input price vector, while  $z_i$  is the level of equity and  $N$  the number of banks. formulating the corresponding Lagrangian system and solving for  $p$  and  $X_i$  simultaneously yields the optimal output prices and input quantities (denoted by asterisk):

$$P^* = p(q_i, w_i, z_i); X_i^* = X_i^*(q_i, w_i, z_i) \quad (4.04)$$

Profit is maximized when:

$$\frac{d\pi_i}{dq_i} = p + q_i \frac{dP}{dq_i} \frac{dq}{dq} - w_i \frac{dx}{dq_i} = 0 \quad (4.05)$$

where the optimal number of inputs  $X_i$  depends on the demand for outputs  $q_i$ .

Given  $q$  = industry supply of output

$$= q_1 + q_2 + q_3 + \dots + q_n$$

Changes in industry output, as a result of a change in firm1 output ( $q_1$ ), is

$$\frac{dq}{dq_1} = \frac{dq_1}{dq_1} + \frac{dq_2}{dq_1} + \frac{dq_3}{dq_1} + \dots + \frac{dq_n}{dq_1}$$

$$\therefore \frac{dq}{dq_1} = 1 + \sum_{j=1, j \neq i}^n \frac{dq_j}{dq_1} \quad (4.06)$$

If we represent  $\sum \frac{dq_j}{dq_1}$  by  $\lambda_i$

$\frac{dq}{dq_i} = 1 + \lambda_i$ , where  $\lambda_i$  represents the conjectural variation (i.e., the change in output

of all the remaining banks, anticipated by bank  $i$  in response to an initial change in its own output).

Multiplying eq (4.05) by  $q_i$  yields

$$P^* q_i - w_i \frac{dX_i}{dq_i} q_i = -(q_i)^2 \frac{dP}{dq_i} \left( \frac{dq}{dq_i} \right) \quad (4.07),$$

where revenue is denoted by  $p q_i$ . Here, banks are assumed to face perfectly competitive input markets and are price takers but operate in output markets where price differentiation is potentially possible. Thus, banks may compete via their output pricing strategies by adjusting prices and fees according to market conditions. The extent to which they can influence prices depends on output quantities, input prices and other factors, all of which are given at the time of price setting.

By re-writing and rearranging equation (4.07), we have

$$\frac{dq}{dq_i} = 1 + \frac{d \sum_{j=1, j \neq i}^N q_j}{dq_i} = 1 + \lambda_i \quad (4.08)$$

$$\text{and } P^* q_i - w_i \frac{dX_i}{dq_i} q_i = -(q)^2 f'(q)(1 + \lambda_i) \quad (4.09)$$

Equation (4.09) denotes the joint output of all firms other than firm  $i$  (where  $f'(q) = \frac{dp}{dq}$ ).

Equation 4.06 shows there are two effects on industry output when firm  $i$  increases output; a direct effect of firm  $i$  increasing output and indirect effect when the other firms change their output in response to firm  $i$ . Let  $\lambda_i$  be the firm  $i$ 's belief, correct or not, about the other firms' reaction to it's action, i.e., the conjectural variation for firm  $i$ .

Substituting equation (4.08) into (4.07) gives

$$P^* q_i - w_i \frac{dX_i}{dq_i} q_i = -(q_i)^2 f'(q)(1 + \lambda_i), \text{ i.e., equation (4.09) restated.}$$

Dividing both sides by  $pq$  and re-arranging gives

$$\frac{P^* q_i - w_i \frac{dX_i}{dq_i} q_i}{pq} = \frac{q_i f'(q) q (1 + \lambda_i)}{pq} \quad (4.10)$$

$$= \frac{q_i}{q} \cdot \frac{f'(q) q}{p} (1 + \lambda_i)$$

$$= MS_i \cdot \left[ \frac{1}{\eta} \right] \cdot (1 + \lambda_i) pq$$

i.e. since  $\frac{dq}{dp} \cdot \frac{p}{q} = \eta; \therefore \frac{dp}{dq} \cdot \frac{q}{p} = \frac{1}{\eta}$ ,

where  $f'(q) = \frac{dp}{dq}$

The left hand side of equation (4.10) represents the bank's mark-up over its total cost. This mark-up can be decomposed into three parts, equivalent to the right-hand side, as follows:

- 1)  $(q_i / q)$  is the bank  $i$  market share  $MS_i$  with  $0 < MS_i \leq 1$
- 2)  $f'(q) q / p$  is the inverse of the price elasticity of demand,  $1/\eta$ . Since the main price of banks in the context of this analysis is interest rates,  $\eta$  is referred to as the interest elasticity of demand which is equal to the market elasticity if and only if all firms are price takers in the output market and  $P_i = p \forall_i$ .
- 3)  $1 + \lambda_i$  measures bank  $i$ 's expectations about the reactions of its rivals  $\frac{dq_j}{dq_i}$  with  $-1 \leq \lambda_i \leq 1$ .

- i) If  $\lambda_i = 0$ , this represents the Cournot- Nash equilibrium. Firm i believe that if it increases output, it's rival will not respond.
- ii) If  $\lambda_i = -1$ , this is the perfectly competitive assumption. When  $\lambda_i = -1$ , firm i believe that an increase in its output will be matched by a decrease in the output of the other firms. If all firms hold this conjecture, then industry output will be at the perfectly competitive level.
- iii)  $\lambda_i = +1$ . This is the monopoly assumption: Firm i believes that its rival will exactly match any output changes. In a two-firm game, the industry output will be the monopoly level.

We can now re-write equation (4.10) as:

$$\frac{P^* q_i - w_i \frac{dX_i}{dq_i} q_i}{pq} = MS_i \left( \frac{-1}{\eta} \right) (1 + \lambda_i) \quad (4.11)$$

After multiplying by  $p^* q_i$ , we have

$$\pi_i^* = p^* q_i - \frac{w_i dx_i}{dq_i} q_i = MS_i \left( \frac{-1}{\eta} \right) (1 + \lambda_i) p^* q_i \quad (4.12)$$

Therefore, optimal profit  $\pi_i$  goes up with increased market shares  $MS_i$ , with decreased price elasticity of demand  $\eta$ , with increased conjectural variation  $\lambda_i$ , with increased output prices  $p^*$ , and with increased demand for  $q_i$ .

As will be shown in the following section, every model that studies bank competition and market power can be classified according to this basic framework. Some of the models are:

- i) Iwata Model
- ii) Bresnahan and Lau Model

- iii) Panzar-Rosse Model (P-R)
- iv) The Structure-Conduct-Performance Model (SCP)
- v) The Cournot Model
- vi) Efficiency Hypothesis

We now discuss, in turn, the two models adopted for this study (the SCP and the P-R) which are derivatives of the basic bank profitability framework.

### 4.3.1 Structure Conduct Performance

The Structure-Conduct Performance (SCP) model assumes that market structure will influence bank behaviour (conduct), which, in turn, affects bank performance. In a market with a higher concentration, banks are more likely to show collusive behaviour and their oligopoly rents increase performance (profitability). Concentration ratio is an important structural characteristic of the market.

The SCP hypothesis is derived from our basic bank profitability model in paragraph 4.2.1 as follows:

By summing up equation 4.07 over N firms, we have

$$Pq - \sum_{i=1}^n W_i \frac{dx_i}{dq_i} = - \sum_{i=1}^n \{ (q_i/q)^2 (f'(q)q^2) (1 + (\sum \lambda_i q_i) / (\sum q_i^2)) \} \quad (4.13)$$

Dividing by  $p^* q$  gives us:

$$\pi = p^* q - W_i \frac{dx_i}{dq_i} q_i = -(HHI)(1/\eta)(1/M) \quad (4.14)$$

where the Herfindahl-Hirschman Index,  $HHI = \sum (q_i/q)^2$ ,  $1/\eta = f'(q)q^2/P^*q$  and  $\varphi = \sum \lambda_i q_i / (\sum q_i^2)$

Two additional assumptions need to be made to arrive at the basic SCP relationship thus:

- i)  $\eta$ , the price (interest) elasticity of demand is constant
- ii) the individual firm's (bank) conjectural variation ( $m$ ) is constant and equal across banks.

Following Stigler (1964), it can be shown that an increase in concentration (HHI) or in market share  $MS_i$ , is expected to increase awareness ( $m$ ) and thereby lead to more collusive behaviour. The collusive oligopolist usually realizes a more than proportional increase in performance as a result of an increase in concentration (Bikker and Bos, 2008).

In summary, by taking  $\eta$  to be constant and  $m$  to be an implicit function of HHI, we have a basic relationship between performance and structure that is consistent with SCP relationship. Thus, the basic equation becomes

$$\pi = (HHI)(1 + \lambda) p^* q \quad (4.15)$$

Equation 4.15 above amounts to interpreting the combined impact of  $\lambda$  and HHI on performance, as follows:

- i) if  $\lambda = 0$  i.e. Cournot oligopoly then  $(1 + \lambda) = 1$  i.e. impact of HHI is proportional
- ii) if  $\lambda > 0$  i.e., existence of collusive behaviour, then  $(1 + \lambda) > 1$  i.e. impact of HHI is more than proportional
- iii) If  $\lambda = -1$  i.e., a case of perfect competition, where an increase in market share has no impact on performance, then  $(1 + \lambda) = 0$

A variant of the SCP hypothesis which attributes differences in performance to differences in efficiency is the Efficiency hypothesis (Goldberg and Rai, 1996; Smirlock, 1985). According to this hypothesis, both a high market share and relatively strong performance result from high efficiency. Thus, whereas according to the traditional SCP hypothesis, a

high degree of market concentration or a large market share is an explanatory variable for above average performance, within the Efficiency hypothesis, it is seen as the result of a higher efficiency. Testing the Efficiency hypothesis against the SCP hypothesis therefore generally involves the inclusion of both market shares and a market structure variable in the estimated equations.

Tests aimed at setting off both hypotheses against each other tend to suffer from identification problems, since the same market structure variable behaves similarly in both cases. In these tests, market share stands for both market power and efficiency. The market share variable, however, varies from bank to bank as well as overtime. In an attempt to overcome this problem, Berger and Hannan (1993) and Altunbas et al (2001) use both market share and efficiency as explanatory variables for bank profit in their studies. However, a multi-colinearity problem still exists.

Another solution is to include the market share that is not explained by efficiency, using firm-specific efficiency measures thus:

$$MS_i = f(CE_i) + w \quad (4.16),$$

where  $w$  is the error term. Now, equation (4.16) can be estimated, if we replace  $MS_i$  by  $MS(CE_i) - w$  – the residual of  $w$  of the above equation.

This efficiency measure  $MS(CE)_i$  is by definition Orthogonal on  $CE_i$ . If we ignore  $\lambda_i$  and keep  $\eta_i$  constant, the Cournot equation will read thus:

$$\pi = MS(CE)_i (1 + \lambda_i) p^* q_i \quad (4.17)$$

In this way, we can test both the SCP hypothesis and the efficiency hypothesis without any identification problem. Both hypotheses are not mutually exclusive.

Another special variant of SCP is Relative Market Power Hypothesis (RMPH) which introduces market shares as proxy for efficiency of firms. Profits increase in banks with larger market shares because of their ability to generate efficiency, which leads to higher market power. Evan off and Fortier (1988) and Lloyd-Williams et al (1994) cited in Doyran, (2013) modified equation 4.15 further to provide the basis for testing the competing hypothesis of the Structuralist as follows:

$$\pi_i = \alpha_0 + \alpha_1 HHI_1 + \alpha_2 MS_i + \Sigma x_i \quad (4.18)$$

SCP holds if  $\alpha_1 > 0$  and  $\alpha_2 = 0$  while

RMPH holds if  $\alpha_2 > 0$  and  $\alpha_1 = 0$  **Lloyd-Williams et al (1994).**

#### 4.3.2 The Panzar-Rosse Model (P-R)

Rosse and Panzar (1977) and Panzar and Rosse (1987) formulate simple models for monopolistic, oligopolistic and perfectly competitive markets and a test was developed to distinguish these market structures. The test was based on the properties of a reduced form revenue equation at the bank level using a test statistic, (H statistic) which, under certain assumptions, can serve as a measure of the competitive behaviour of banks (Bikker, 2004). The test was derived from a general banking market model, which determines equilibrium output and the equilibrium number of banks by maximizing profits at both the bank and industry levels. The implication of this, is that, bank i, first maximizes its profit, where MR = MC:

$$R^1(q_i, \eta, z_i) - C^1(q_i, w_i, T_i) = 0 \quad (4.19)$$

R refers to revenues, C to cost, q to output, w to vector of m factor input prices, and z and T, to vectors of exogenous variables that can shift the bank's revenue and cost functions

respectively,  $\eta_i$  is the number of banks, and the prime denotes first derivative with respect to output. Second, at the industry level, it means that in equilibrium, the zero profit constraint holds:

$$R_i^*(q_i \eta_i^*, z) - C^*(q^*, w, T) = 0 \quad (4.20)$$

Variables marked with asterisk (\*) represent equilibrium values. Market power is measured by the extent, to which a change in factor input prices ( $dw_{k,i}$ ) for  $k=1, \dots, m$ , is reflected in the equilibrium revenues ( $dR_i^*$ ), earned by bank  $i$ . P-R define a measure of competition  $H$  as the sum of the elasticity's of the reduced-form revenues with respect to factor prices:

$$H = \sum_{k=1}^M \frac{dR_i^*}{dW_{k,i}} \frac{W_{k,i}}{R_i} \quad (4.21),$$

Where  $k$  is the number of factor input costs used, representing the cost of capital, cost of labor and cost of funds. Equation 4.21 represents the coefficient of the three dimensional factor input cost. The sign and magnitude of the  $H_{\text{statistic}}$  matters in its interpretation. In a monopoly market structure, an increase in factor input cost  $w_i$  will increase marginal cost, shifting the marginal cost curve backward, thereby reducing equilibrium output ( $q^*$ ) and reducing the total revenue generated in the market. For a perfectly competitive market, an increase in the factor input cost will shift the marginal cost curve as well as the average cost curve in the same proportion. The effect on the equilibrium output of the bank is nil. As a result, inefficient banks are forced out of the market with the remaining banks facing increased demand which will eventually lead to an increase in output prices and revenue in the same proportion as cost. Thus, the value of the  $H_{\text{statistic}}$  will be equal to unity ( $H=1$ ). In the case of monopolistic competition, an increase in the cost of input will lead to a less than proportional increase in the revenue on demand facing an individual bank, which is

inelastic. The value of  $H_{\text{statistic}}$  will therefore lie between 0 and 1 (Panzar & Rosse, 1987).

The foregoing is summarised thus:

- i)  $H \leq 0 \rightarrow$  monopoly
- ii)  $0 < H < 1 \rightarrow$  monopolistic competition
- iii)  $H = 1 \rightarrow$  perfect competition

Vesala (1995) proves that the same result holds for monopolistic competition without the threat of new entrants, i.e., with a fixed number of banks. For monopolistic and perfect competition, the analysis is based on the competitive static properties of the chamberlinian equilibrium model. This model introduces interdependence into the bank's structural revenue equations via the hypothesis that, in equilibrium, free entry and exit results in zero profit.

Apriori, monopolistic competition is the most plausible characterization of the interaction between banks, as it recognizes the entrance of product differentiation and is consistent with the observation that banks tend to differ with respect to product quality variables and advertising, although their core business is fairly homogenous.

In the limit case of the monopolistic competition model, where bank's products are regarded as perfect substitutes of one another, the Chamberlinian model produces the perfectly competitive solution as elasticity of demand approaches infinity.

In this perfect competition case,  $H = 1$ . An increase in input prices raises both marginal and average costs without under certain conditions – altering the optimal output of any individual firm. Exit of some firms increases the demand faced by each of the remaining

firms, leading to an increase in prices and revenues equivalent to the rise in cost (Bikker, 2009).

Finally, analyzing the conjectural variation oligopoly case, (P-R) shows that strategic interactions among a fixed number of banks may also be consistent with positive values of H. In general, the value of H is not restricted. In the special case of perfect collusion oligopoly (i.e., perfect cartel), the value of H is non-positive, similar to the monopoly model.

The Chamberlinian equilibrium model described above provides a simple link between H and the number of banks, so between market behaviour and market structure.

<b>Table 4.1 Discriminatory Power of the H-statistic</b>		
<b>S/N</b>	<b>VALUES OF H</b>	<b>COMPETITIVE ENVIRONMENT</b>
1	$H \leq 0$	Monopoly equilibrium: each bank operates independently under monopoly profit maximization condition (H is a decreasing function of the perceived demand elasticity) or perfect cartel).
2	$0 < H < 1$	Monopolistic competition: free entry equilibrium (H is an increasing function of the perceived demand elasticity:
3	$H = 1$	Perfect competition. Free entry equilibrium with full efficient capacity utilization.

The model is based on free entry of banks and determines not only the output level but also the equilibrium number of banks. Vesala (1995) proves that H is an increasing function of the demand elasticity  $\eta$ , that is, the less market power is exercised on the part of banks, the higher H becomes. This implies that H is not used solely to reject certain types of market behaviour, but that its magnitude serves as a measure of competition (Bikker and Bos, 2008).

Vesala's result above and the Chamberlinian equilibrium assumptions (that the elasticity of perceived demand facing individual firm,  $\eta(q, \eta, w)$  is a non-decreasing function of the number of rival banks together provide a positive (theoretical) relationship between H and the number of banks.

If we assume the log-linear form of equation (4.19), we will have (4.22 and (4.23) as follows:

$$\log MC = \alpha_0 + \alpha_1 \log q + \sum_{k=1}^m \beta_k \log W_k + \sum_{j=1}^p \gamma_j \log T_j \quad (4.22),$$

where  $q$  is output of the bank,  $w$  is the vector of factor input prices (e.g. funding cost, personnel expenses and other non-interest expenses) and  $T$  is a vector of other variables exogenous to the cost function  $C_i$ .

Equally the underlying MR function, based on the same assumption, will be:

$$\log MR = \delta_0 + \delta_1 \log q + \sum_{j=1}^q \theta_j \log Z_j \quad (4.23),$$

where  $Z$  is a vector of variables related to the bank-specific demand function. For a profit maximizing bank,  $MC = MR$  in equilibrium, yielding the equilibrium value for output (denoted by an asterisk):

$$\log q^* = (\alpha_0 - \delta_0 + \sum_{k=1}^m \beta_k \log W_k + \sum_{j=1}^p \gamma_j \log T_j - \sum_{j=1}^q \theta_j \log Z_j) / (\delta_1 - \alpha_1) \quad (4.24)$$

The reduced form equation for revenues of bank  $i$  is the product of the equilibrium output values of bank  $i$  and the common output price level ( $p$ ), determined by the inverse-demand equation, which, in logarithms form is:

$$\text{Log } p = \phi \log (\sum_i q_i^*) + \varepsilon \quad (4.25)$$

If we use the following operationalization of the reduced form revenue equation,

$$\log IREVN_{i,t} = \alpha_0 + \alpha_1 \log INTC_{i,t} + \alpha_2 \log STAFFC_{i,t} + \alpha_3 \log DEPTN_{i,t} + \alpha_4 \log LOAN_{i,t} + \alpha_5 \log TA_{i,t} + \alpha_6 \log EQUITY_{i,t} + \alpha_7 \log RISKASS_{i,t} + \alpha_8 \log OIIR_{i,t} + \alpha_9 \log OOE_{i,t} + e_{i,t}$$

(4.26),

where:  $IREVN_{i,t}$  is the ratio of interest revenue to total assets for banks  $i$  at time  $t$  (proxy for output price of loan).

$INTC_{i,t}$  is the total interest expenses to total deposits, (proxy for input price of deposit)

$STAFFC_{i,t}$  is the ratio of staff cost to total assets, (proxy for input price of labor)

$DEPTN_{i,t}$  is the ratio of fixed capital cost measured by depreciation to total assets, (proxy for input price of capital consumed)

$TA_{i,t}$  = total asset (to control for potential size effects)

$LOAN_{i,t}$  is the ratio of net loans to total assets,

$EQUITY_{i,t}$  is the ratio of shareholders fund to total assets, and

$RISKASS_{i,t}$  – is the ratio of loan loss allowance to total loan

$OIIR_{i,t}$  – Is the ratio of other income to interest revenue

$OOE_{i,t}$  – Ratio of other operating expenses to the sum of net interest income and non-interest income.

$e_{i,t}$  is the stochastic error term that captures time-varying and bank-specific random components.

The first three independent variables are the factor input prices for funds, labour and capital, respectively, and the latter six are bank specific control variables. Since the Panzar and Rosse (P-R) model follows the log-linear form, the sum of factor price elasticities is termed as “H Statistic” which measures competitiveness in the industry.

To achieve robustness, the following alternative reduced revenue model can be estimated, following Bikker and Haaf (2002) and given the increased activities of Nigerian banks in off-balance sheet items:

$$\log TREVN_{i,t} = \alpha_0 + \alpha_1 \log INTC_{i,t} + \alpha_2 \log STAFFC_{i,t} + \alpha_3 \log DEPTN_{i,t} + \alpha_4 \log LOAN_{i,t} + \alpha_5 \log TA_{i,t} + \alpha_6 \log EQUITY_{i,t} + \alpha_7 \log RISKASS_{i,t} + \alpha_8 \log OIIR_{i,t} + \alpha_9 \log OOE_{i,t} + e_{i,t} \quad (4.27),$$

where  $TREVN_{i,t}$  is the ratio of total revenue to total assets for bank  $i$  at time  $t$ .

Total revenue here, is defined as the sum of interest income, commission/fees and other operating income. All other variables are as stated above.

Since the Panzar and Rosse Model is only valid if the market is, in long-run equilibrium, the test for long-run equilibrium will be performed with any of the following equations (Bikker & Bos, 2008):

$$\log(1 + ROA)_{i,t} = \alpha_0 + \alpha_1 \log INTC_{i,t} + \alpha_2 \log STAFFC_{i,t} + \alpha_3 \log DEPTN_{i,t} + \alpha_4 \log LOAN_{i,t} + \alpha_5 \log TA_{i,t} + \alpha_6 \log EQUITY_{i,t} + \alpha_7 \log RISKASS_{i,t} + \alpha_8 \log OIIR_{i,t} + \alpha_9 \log OOE_{i,t} + e_{i,t} \quad (4.28),$$

OR

$$\log(1 + ROE)_{i,t} = \alpha_0 + \alpha_1 \log INTC_{i,t} + \alpha_2 \log STAFFC_{i,t} + \alpha_3 \log DEPTN_{i,t} + \alpha_4 \log LOAN_{i,t} + \alpha_5 \log TA_{i,t} + \alpha_6 \log EQUITY_{i,t} + \alpha_7 \log RISKASS_{i,t} + \alpha_8 \log OIIR_{i,t} + \alpha_9 \log OOE_{i,t} + e_{i,t} \quad (4.29),$$

where ROA is Return on Total Assets defined as profit after tax/total assets, and ROE is Return on Equity defined as profit after tax/total equity.

Following Claessens and Laeven (2004), the measures of ROA and ROE respectively are calculated as  $\log(1+ROA)$  and  $\log(1+ROE)$  to adjust for negative value of ROA and ROE.

The equilibrium E-statistics is defined as  $\alpha_1+\alpha_2+\alpha_3$  in equation (4.28) and  $\alpha_1+\alpha_2+\alpha_3$  in equation (4.29). We test whether  $E=0$  using an F-test. If rejected, the market is assumed not to be in long run equilibrium (Bikker and Bos, 2008). We now further modify this model on the basis of economic theory as follows:

Banks' profits are known to show tendency to persist over time, reflecting the roles of diversified products, market competition, informational opacity and sensitivity to macroeconomic shocks to the extent that these are serially correlated (Berger et al., 2000; Athanasoglou, et al.,2005). Therefore, a dynamic specification of the model is adopted by including a lagged dependent variable among the regressors.

Economic theory, also established the association between banks' profitability and the various phases of the business cycle. In particular, when an economy is in the recessionary phases, the performance of the loan portfolio is often threatened resulting in higher loan loss provisions and lowering of banking profits. Equations (4.26) and(4.27) are therefore augmented with lagged dependent variable, HHI and MS, as independent variables as well as output gap QGAP, to account for business cycle which Nicholas Apergis (2008) found to be positively related to interest income and hence profitability. By this transformation, equation (4.30) would have accounted for macroeconomic, industry as well as bank specific factors. :

$$\begin{aligned} \log IREVN_{i,t} = & \beta_0 + \delta \log IREVN_{i,t-1} + \beta_1 \log INTC_{i,t} + \beta_2 \log STAFFC_{i,t} + \beta_3 \log DEPTN_{i,t} + \beta_4 \log LOAN_{i,t} \\ & + \beta_5 \log TA_{i,t} + \beta_6 \log EQUITY_{i,t} + \beta_7 \log RISKASS_{i,t} + \beta_8 \log OIIR_{i,t} + \alpha + \beta_9 \log OOE_{i,t} + \beta_{10} MS_{i,t} + \\ & \beta_{11} HHI_t + \beta_{12} QGAP_{t-1} \end{aligned} \quad (4.30),$$

$$\begin{aligned} \log TREVN_{i,t} = & \beta_0 + \delta \log TREVN_{i,t-1} + \beta_1 \log INTC_{i,t} + \beta_2 \log STAFFC_{i,t} + \beta_3 \log DEPTN_{i,t} + \beta_4 \log LOAN_{i,t} \\ & + \beta_5 \log TA_{i,t} + \beta_6 \log EQUITY_{i,t} + \beta_7 \log RISKASS_{i,t} + \beta_8 \log OIIR_{i,t} + \alpha + \beta_9 \log OOE_{i,t} + \beta_{10} MS_{i,t} + \\ & \beta_{11} HHI_t + \beta_{12} QGAP_{t-1} \end{aligned} \quad (4.31),$$

By the same reasoning, equation (4.28) is also transformed to:

$$\begin{aligned} \log(1 + ROE)_{i,t} = & \beta_0 + \delta \log(1 + ROE)_{i,t-1} + \beta_1 \log INTC_{i,t} + \beta_2 \log STAFFC_{i,t} + \beta_3 \log DEPTN_{i,t} + \beta_4 \log LOAN_{i,t} \\ & + \beta_5 \log TA_{i,t} + \beta_6 \log EQUITY_{i,t} + \beta_7 \log RISKASS_{i,t} + \beta_8 \log OIIR_{i,t} + \alpha + \beta_9 \log OOE_{i,t} + \beta_{10} MS_{i,t} + \\ & \beta_{11} HHI_t + \beta_{12} QGAP_{t-1} \end{aligned} \quad (4.32),$$

where  $QGAP_{t-1}$ ,  $HHI_t$ ,  $MS_{i,t}$  represent respectively output gap, industry concentration and market share of bank  $i$  in time  $t$ .

A value of  $\delta$  between 0 and 1 implies that profits persist, but they will eventually return to their normal level. A value close to 0 means the industry is fairly competitive (high speed of adjustment), while a value of  $\delta$  close to 1 implies less competitive structure (very slow adjustment).

Equations (4.30) and (4.31) therefore form our core equations for verifying objectives no 2, no 3, and no 4 because , they have theoretical derivation, and are widely employed to examine competitive structure of the banking industries in both developed and developing countries and more importantly the methodology employs bank-level data, which are readily available and reliable. Furthermore, the model can be modified to accommodate more control variables, as economic theory may suggest.

In the notation of equations (4.30 & 4.31), the **H**-statistic is defined by

**H** =  $\beta_1 + \beta_2 + \beta_3$  representing the sum of all input price elasticities.

## 4.4 Methodology

### 4.4.1 Measures of Banking Market Concentration

Banking Market Concentration is a measure of the intensity of market control of the largest firms in the industry. The various banking concentration indices in the literature include the k-bank concentration ratio  $CR_k$ , the Herfindahl-Hirshman Index (HHI), the gini coefficient, the entropy index and the Lerner Index (Loto, 2012).

$CR_k$  refers to the cumulated market shares of the k leading banks in the industry.

Normally, k is between 3 and 8, but the five-bank concentration ratio ( $CR_5$ ) is most widely used.  $CR_5$  measures the share of the market held by the five largest banks. It is calculated as:

$$CR_k = \sum_{i=1}^k MS_i \quad (4.33)$$

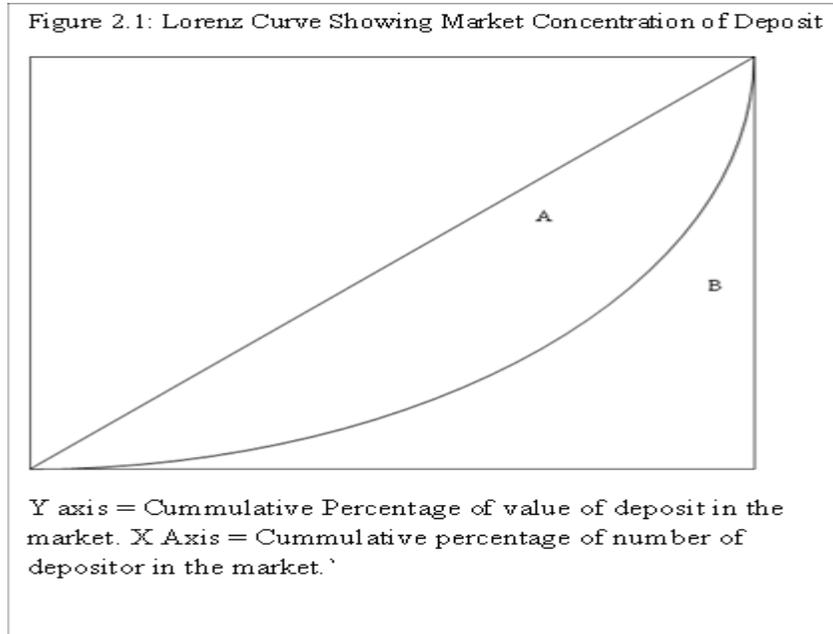
where the  $i_{th}$  bank has rank i in descending order (i.e., where the largest bank has rank  $i=1$ , the second largest  $i=2$  etc);  $MS_i$  = the share of bank i in the market. This share could be defined on the basis of deposit liability, loans & advances, total assets, gross earnings, and so forth. A value close to zero would indicate that the largest k-banks supply a small share of the market. Conversely, values close to 1 denote high level of concentration. The popularity of the concentration ratio stems from its limited data requirement. It is flawed by its inability to give information on the relative importance of banks within a particular industry, since it does not reveal the extent to which one or more banks, within the top five, dominate a particular market.

The Herfindhal-Hirshman Index (HHI) is another index generally used to measure banking market concentration (Gajurel & Pradhan, 2012). It is computed as the sum of the squares of each participating bank's share in the market i.e.  $HHI = \sum_{i=1}^N MS_i^2$ , where  $MS_i$  is the market share of bank  $i$ . It has the advantage of including information on the distribution of market share as well as the number of firms which take part in the measures of market concentration (Lee & Lee (2005)). The HHI measures the extent of dispersion and can vary between 0 and 1. The higher the index, the higher the dispersion. If HHI is zero, this suggests that there is a large number of equal-sized banks in the industry, and that concentration is low. If HHI is close to one, the market is dominated by one large bank. According to the "Horizontal merger guideline of the US Department of Justice", a market whose HHI after merger is below 1,000 (i.e.  $HHI < 0.1$ ) is defined as a non-concentrated market, HHI of over 1,000 and below 1,800 (i.e.  $0.1 \leq HHI \leq 0.18$ ) is moderately concentrated while HHI of above 1,800 (i.e.  $HHI > 0.18$ ) is a highly concentrated market (Gajurel & Pradhan, 2012).

The Gini Coefficient is a statistical measure of banking concentration based on the Lorenz curve. The Lorenz curve relates the percentage of total market value of appropriate banking variable (Deposit liability, Loans & advances, Total assets, Gross earnings etc) to the percentage of banks in the market, cumulated from the smallest to the largest as depicted in the figure 4.2: The diagonal line represents the limit case of perfect distribution which suggests that there is an even distribution of the market's value of deposit among the banks in the market. The greater the deviation of the curve from the diagonal OD, the greater the inequality in bank's sizes (Loto, 2012). The Gini coefficient (GC) enables us to

calculate the concentration area, which is situated between the diagonal and the Lorenz curve. It could be defined as the area A divided by the area A+B i.e

$$GC = \frac{A}{(A+B)} \quad (4.34)$$



**Figure 4.2: Lorenz curve showing market concentration of deposit**

If the Lorenz curve is the diagonal OD, then, in a sense, A=0 and GC=0. It can be shown that, at the other extreme, where there is complete inequality in the sizes of the banks (and B=0), the Gini coefficient will tend towards 1. A major limitation of the Gini coefficient is that the same coefficient can correspond to different distribution of bank sizes in the market.

The entropy index (EI) is equal to the sum of the market shares weighed by their loga EI =

$$= \sum_{i=1}^n MS_i * \log MS_i \quad (4.35)$$

It is a measure of the degree of uncertainty associated with a particular market structure. If there is only one bank in the market, the index is zero, and the uncertainty for the monopolist in relation to whether it can keep a random customer is at a minimum. Conversely, when all market shares are equal, the uncertainty is maximum, and  $MS_i = 1/n$ . In this case,

$$EI = n * 1/n * \log n \quad (4.36)$$

In an industry comprising n equal-sized banks, the entropy index is equal to log n. The advantage of the entropy index over other measures of concentration is that, where a distribution relates to groups of banks belonging to different size classes, to different industries, and or to different countries, the index can be decomposed into several components. This facilitates the measurement of the entropy within different groups as well as between groups.

The Lerner index is a measure of monopoly power. It is defined as:

$$L = \frac{(P - MC)}{P} (4.37),$$

where: P = Price; and MC =Marginal cost.

In a perfectly competitive banking market, no single bank can influence price; the demand curve is perfectly elastic. As a result, the price the bank will obtain for each unit sold will be the same as the price obtained for all other units. This implies that price P is equal to marginal revenue (MR). If, in accordance with the neo-classical assumptions, the banks are

profit maximisers, production will occur where  $MR=MC$ . In a perfectly competitive banking market, where  $MR=P$ , the Lerner index will be zero. The higher the index, the more concentration there is.

#### **4.4.2 Bank Profitability Measures**

Bank profitability indices, mentioned in the literature, include Net Interest Margin (NIM), Return on Asset (ROA) and Return on Equity (ROE). NIM is the interest earned from the bank assets less interest expenses of funding (i.e., spread management). While NIM gives an idea of how well a bank is doing, its major drawback is that it does not adjust for the size of banks, thereby making it difficult to compare how well a bank is doing relative to another. ROA is the ratio of profit after tax to total bank asset. It corrects for the size factor of banks and measures how well a bank manager is doing on the job because it indicates how well a bank's assets are being used to generate profits. Its major drawback is that ROA is not what bank owners care about most. They are more concerned about how much the bank is earning on their equity investment, which measure is provided by the Return on Equity (ROE), defined as the net profit after tax per unit of equity capital.

#### **4.4.3 Measures of Competition**

Competition in the context of this study simply means “the effort of two or more parties acting independently to secure the business of a third party by offering the most favorable terms” or a contest between rivals. While precise enough, these definitions do not give indications as to how competition should be measured. In economic theory, competition relates to the magnitude of mark-up on the cost price when looking at product pricing. Data on this mark-up are not usually available in the banking market because while prices of a number of bank products are known, the data on cost prices of these individual products

are usually not available. Bikker and Bos (2005, 2008) derived a formula for the equilibrium Price-Cost-Margin (PCM) from a general framework of a profit maximizing bank under oligopoly behaviour. (See equation 4.38).

$$PCM = HHI + PED * (1 + CV) \quad (4.38),$$

where PCM is Price-Cost margin, HHI is the Herfindahl-Hirschman Index of concentration; PED is the Price Elasticity of Demand and CV the Conjectural Variation, i.e., the bank's anticipation about the responses of its rivals in terms of variation in its output quantities or prices. The conjectural variation is difficult to observe in practice. Therefore competition can only be measured indirectly using model-based approach that is close to equation (4.21). The literature provides a number of such measures, such as Panzar Rosse (1987), Bresnahan (1989), Boone et al. (2007), which are based on simplifying assumptions (Bikker & Bos, 2005, 2008). Claessens and Laeven (2004), in a cross country study of the determinants of the competitiveness, identified market structure, contestability, inter-industry competition and general level of economic development in a country as variables that can explain the competitiveness indicator.

#### **4.5 Model Specification**

Model specification here is concerned with the determination of the dependent and explanatory variables for the models selected for particular hypothesis testing as well as our expectation about the sign and size of the coefficient of the function (Koutsoyiannis, 2001). Models are specified to test the hypotheses formulated in paragraph 1.5 and establish the objectives stated in paragraph 1.3.

#### 4.5.1: Comparing the Degree of Market Concentration (Test of Hypothesis 1)

We employ the  $CR_k$  and the HHI as our measures of banking market concentration, in line with the established theoretical and empirical studies.

$$CR_k = \sum_{i=1}^k MS_i \quad (4.39)$$

$$HHI = \sum_{i=1}^N MS_i^2 \quad (4.40)$$

Where  $CR_k$  represents market share of the largest  $k$  (banks) relative to total industry and  $MS_i$ , is the market share of each bank. According to the US Merger Guidelines,  $HHI < 0.01$  implies a highly competitive market,  $0.01 < HHI < 0.1$  indicates an un-concentrated market,  $0.1 \leq HHI \leq 0.18$  represents a moderately concentrated market and  $HHI > 0.18$  signifies a highly concentrated market. It therefore means that for a banking market to be classified as un-concentrated, HHI must lie in the region of  $0.01 < HHI < 0.1$ . Increases in HHI will indicate increase in the market concentration and weakening competition, while a decrease is indicative of increase in market competition according to SCP paradigm.

The variables chosen for this study, based on the intermediation approach to banking are, customer deposits, loans and advances and Total Assets. Theoretical justifications of the selected variables are discussed next.

*Customer Deposit and Loans:* Deposit taking is a core activity of banks on which lending function depends. A good deposit base guarantees liquidity and loanable funds to banks, as they cannot give what they do not have. Banks with more deposits have the enablement needed to give out more loans to their customers and this will increase the level of competition between banks, leading to increased efficiency. Together with the lending

functions, the two activities reflect the liquidity transformation functions of banks (Kashyap et al. 2002). Customer deposit and loans give indication of balance sheet matching or mismatch. To guarantee stable funding, deposits must cover loans with some safety margins. When loans are in excess of customers deposits, there is a funding gap which must be filled by resort to the financial market. Funding from the financial market can be costly and highly volatile than customer funding. In the course of carrying out intermediation function over the years, Nigerian banks have built up an enormous volume of deposits from which huge assets have been created. Nigerian bank deposits have continued an upward trend since year 2000. At N1,157.1 billion in year 2000 the total customer deposit mobilized by the banks showed an increase of over 2000% above its level at the end of 1990 (CBN, 2013). Thus, huge increases in the level of deposit mobilization by banks continued through the major reform programmes of universal banking and consolidation, with total customers deposit increasing from N1,157.1 billion in year 2000 to N14,506.2 in 2012 billion, indicating an increase of 1,153% over the thirteen-year period (CBN, 2013).

*Total Assets:* The assets base of Nigerian banks has continued to show an upward trend over the study period (2000-2012) growing by over 2564% between year 2000 and 2012. An indication of a relative stability in the sector is depicted by the total assets growing by 862.7% between 2005 and 2012, to reach N45,296 billion at December, 2012, from N4,705 billion in 2000 (CBN, 2013).

#### 4.5.2: Measuring the Degree of Market Competition (Test of Hypothesis 2)

Equation (4.30) will be estimated for the pre- and post-consolidation periods and we define our  $H_{\text{statistic}}$  as the sum of coefficients  $\beta_1, \beta_2$  and  $\beta_3$ . The period with the higher magnitude of  $H_{\text{statistic}}$  is deemed more competitive (Vesala, 1995) and Claessen & Laeven (2004).

##### Apriori:

- As  $\delta \rightarrow 0$ , the more competitive, the limit is perfect competition.
- $\beta_1 + \beta_2 + \beta_3 = \text{PR } H_{\text{statistic}}$  ( $H \leq 0 \rightarrow$  monopoly, ii)  $0 < H < 1 \rightarrow$  monopolistic competition and iii)  $H = 1 \rightarrow$  perfect competition). In the sub-periods, the one with a higher  $H_{\text{statistic}}$  depicts the more concentrated period.
- $\beta_4, \beta_5, \beta_6, \beta_7, \beta_8, \beta_9 > 0$  or  $< 0$
- $\beta_{10}, \beta_{11}, \beta_{12} > 0$

#### 4.5.3: Impact of Concentration and Competition on Profitability (Hypothesis 3)

We have, based on the literature reviewed and our theoretical exposition in paragraph 4.2 above, and following Bikker and Bos (2008), Bikker and Haaf (2002), Parera et al.(2006), employed the reduced form revenue equation as specified by Panzar and Rosse (1987) and as augmented in our theoretical framework in paragraph 4.2. We have estimated equations 4.30, 4.31 and 4.32 as our core models and interpreted them. The equations are re-stated thus:

$$\begin{aligned} \log IREVN_{it} = & \beta_0 + \delta \log IREVN_{i,t-1} + \beta_1 \log INTC_{i,tit} + \beta_2 \log STAFFC_{i,tit} + \beta_3 \log DEPTN_{i,tit} + \\ & \beta_4 \log LOAN_{i,t} + \beta_5 \log TA_{i,tit} + \beta_6 \log EQUITY_{i,t} + \beta_7 \log RISKASS_{it} + \beta_8 \log OIIR_{it} + \\ & \beta_9 \log OOE_{it} + \beta_{10} MS_{i,t} + \beta_{11} HHI_{t} + \beta_{12} QGAP_{t-1} \end{aligned} \quad (4.41) \text{ i.e. equation } 4.30 \text{ re-stated.}$$

$$\log TREVN_{it} = \beta_0 + \delta \log TREVN_{i,t-1} + \beta_1 \log INTC_{i,t} + \beta_2 \log STAFFC_{i,t} + \beta_3 \log DEPTN_{i,t} + \beta_4 \log LOAN_{i,t} + \beta_5 \log TA_{i,t} + \beta_6 \log EQUITY_{i,t} + \beta_7 \log RISKASS_{it} + \beta_8 \log OIIR_{it} + \beta_9 \log OOE_{it} + \beta_{10} MS_{i,t} + \beta_{11} HHI_{t} + \beta_{12} QGAP_{t-1} \quad (4.42) \text{ i.e. equation 4.31 restated.}$$

All variables are as defined under equation 4.27 above.

#### Apriori (from equation 4.15)

- SCP holds if  $\beta_{11} > 0$  and  $\beta_{10} = 0$  simultaneously (Lloyd-Williams et al (1994)).

#### 4.5.4: Competitiveness of Large and Small-Sized Banks (Test of Hypothesis 4).

We classify Nigerian banks into large and small banks and estimate equations 4.41 and 4.42) over the sample period. A bank is considered large here, if its market shares relative to total market in Loans, Deposits, Total Assets as well as Gross Earnings, are each in excess of 5% and, if, simultaneously, the size of its total assets as at December 2012, is in excess of N1Trillion or (US\$6.25B @ 1\$: N160) (Agusto and Co 2012). By this classification, eight big and sixteen small banks emerged (Appendix 4b). With this, the number of cross sections in each case is less than 20 (i.e., big 8 banks and 16 small banks) and T is 13. We then compute the H statistic for each classified segment, using the Panel Estimated Generalized Least Square (PEGLS) method, since for robustness, the number of cross sections, N, must be greater than 20 for the estimation of equation (4.41) with dynamic panel regression. The appropriateness of this technique is also confirmed by the Hausman test, which checks that the individual effects are uncorrelated with the other regressors in the model.

#### 4.6 Definition and Description of Variables

Table 4.2 lists the variables used for this study. The profitability variable is the dependent variable, represented by the Return on Assets (ROA), which is the ratio of profit after tax

to total assets ( $\frac{PAT}{TOTALASSET}$ ). In theory, ROA gives a reflection of the ability of a bank's management to generate profits, using the assets of the bank. Although there are alternative profitability indices like ROE, NIM, etc, ROA is preferred in the literature for the simple reason that it corrects for the size factor of banks (unlike Net Interest Margin) and measures how well a manager is doing on the job, since it indicates how well banks' assets are being used to generate profits (Golberg and Rai, 1996).

The independent variables include both bank-level, industry-level and macroeconomic variables. EQTY represents the ratio of shareholders fund to total assets. This is used as our proxy for bank capital. It indicates the level of leverage used by a firm and the relative portion of the equity used to finance a company's assets. It is expected that an increase in capital will increase the banks' earnings since capital refers to the owners' stake to support the business of the bank and so it acts as the ultimate safeguard for any adversity in business. Also, any increase in earnings will increase the owners' stake. It is expected that the relationship between equity and profitability can be both positive and negative. Higher equity ratio is an indication of more capital and less leverage, which will lower borrowing cost and become more profitable. On the other hand, lower equity ratio, or higher leverage, indicates an aggressive assets/liability management, which leads to a higher Net Revenue From Fund (NRFF) and profits (Golberg and Rai, 1996).

Loan is the ratio of net loans to total assets. It measures the riskiness of loans, since loans are riskier and generate higher returns (ROA) than other assets, like treasury bills and interbank placements. A positive relationship ties loan ratio to profitability. Conversely, a higher loan ratio can also indicate a higher banking risk and, so, decrease profitability.

**RISKASS** is the risk that advances to third party will not be repaid as at when due and is proxied by the ratio of loan loss provision (LLP) to loans & advances. Theory suggests that increased exposure to credit risk normally results in decreased banks profitability and so we expect a negative relationship between ROA and LLP (Athanasoglou et al. 2005). On the other hand, higher ratio of LLP allowance for bad loans can affect profitability positively; banks with a large number of risky loans can charge higher interest termed default rates to compensate for the likelihood of higher customer default. However, the prudential regulation in use in Nigeria will not permit this. Consequently, while the coefficient of RISKASS is expected to be negative, it can also be positive. To increase profitability, therefore, banks are expected to develop and implement credit policy to guide the entire credit process (i.e. credit evaluation, approval disbursement, monitoring, review, classification and eventual collections). Also, as part of the prudential requirement, central banks set specific standards for the level of LLP permissible in the industry.

**OIRR** means other income to interest income ratio. It represents the banks productivity. Barriers to entry has been increased by the consolidation reforms raising minimum shareholders fund to N25billion and approval by CBN of the promoters of banks to re-organize and source for good staff at competitive pricing so as to increase productivity.

**OOE** is the ratio of other operating expenses to the sum of gross earnings less interest expenses; it represents the view of management outcome and is expected to be negatively related to profitability as any improvement in this ratio will increase efficiency and raise profits.

**TA represents Size.** The effect of a growing bank size on profitability can be both positive and negative. It is positive where the bank is enjoying economies of scale and negative where the reverse is the case. When a bank becomes very large, this may result in a slow decision making process, due to bureaucratic tendencies etc. Hence, size and profitability may be inversely/negatively related.

**Concentration:** This is represented by the symbol CONC and is measured by using the Herfindahl-Hirshman Index (HHI). Between 2000 and 2005, the Nigerian banking industry is characterised by some oligopolistic tendencies Lemo (2005) when about 50% of the industry's market share belonged to the leading three banks. After the consolidation exercise of 2005, there emerged eight top dominant banks controlling more than 75% of the Nigerian banking business in the total asset market and this heightened competition, i.e., increased concentration co-existing with increased competition. This justifies the use of HHI to represent market concentration.

**Interest rate:** From the literature, the relationship between inflation and bank profitability is quite ambiguous. During inflation, banks will re-price their assets faster than they do for liabilities resulting in increased margin and increased profitability. On the other hand, inflation can negatively affect productivity. Interest rate is expected to be positive.

QGAP - Cyclical output is measured by the growth rate of GDP. The relationship between bank profitability and business cycle is positive, i.e., a bank's business is pro-cyclical. During economic boom, demand for credit is quite on the increase and the interest margin will widen, leading to increased profit. The opposite may also hold because when the economy slows down, such periods are associated with increased risk and loan loss

provisions are usually higher, due to deterioration in loan quality, which will impact negatively on the profitability of banks. So QGAP is positively related to profitability.

The output gap QGAP, which is the difference between the potential output and Actual output, will account for the various phases of the economic cycle and will be measured by the growth rate of gdp per capita. This variable is not observable in the individual cross sections. Also, the inclusion of HHI in equations (4.30) and (4.31) is to measure industry concentration. This also is not observable in the cross sections individually.

### **Description of Variables**

Table 4.2: List of Variables and Apriori Signs

Independent	Definition of Terms	Apriori Expectation
IREVN	Interest income	Dependent
TREVN	Total income	Dependent
ROA	Return on Assets	Dependent
ROE	Return on Equity	Dependent
INTC	Interest Cost of Deposit	-ve
STAFFC	Staff Cost	-ve
DEPTN	Fixed Capital Cost (measured by depreciation)	-ve
LOAN	Net Loans	+ve/-ve
TA	Total Assets (Size)	+ve/-ve
EQUITY	Share Holders' Fund	+ve/-ve
RISKASS	Loan Loss Allowance	-ve
OIIR	Other Income	+ve
OOE	Other Operating Expenses	-ve
MS	Market Share	+ve
HHI	Industry Concentration Index	+ve/-ve
QGAP	Output Gap	+ve

#### **4.7 Sources of Data**

This study considers all the 89 commercial banks operating in Nigeria (pre-2005) and the 24 banks that emerged (post-2005) for the sample period of thirteen years from 2000 to 2012. The data used for the study were obtained from the audited annual reports and financial statements of the eighty nine banks in existence, pre-consolidation, and twenty four commercial banks, post-consolidation. The macroeconomic variables, like GDP, were from the CBN statistical bulletin. The thirteen-year sample is made up of five years of pre-consolidation and eight years of post-consolidation. Although there are other financial institutions that provide near-banking or limited banking activities, still the share of deposit money banks (DMBs) accounted for up to ninety percent of the financial assets of the entire financial system in 2011 (Agusto and Co., 2012). Therefore, the sample used in this study rightly represents the Nigerian banking industry.

The database is constructed from financial information in the banks' annual audited reports and financial statements of the commercial banks in Nigeria.

#### **4.8 Method of Analysis**

This study uses the 3-bank, 5-bank, 8-bank Concentration ratios and the Herfindahl Hirschman Index (HHI) to evaluate objective 1, while the method of dynamic panel data regression was employed for objectives 2 and 3. Equations (4.30) and (4.31) form the core of these estimations. For objective 4, the study employs the random-effect method, supported by the Hausman test, because after classifying banks into large and small size, eight large banks emerged (see appendix 4b). This number of cross-section identifier is

lower than the time period and this violates the requirement for a robust estimation under dynamic panel data analysis.

The econometric estimation of equations (4.30 and 4.31), i.e., with profit persistence, is confronted with the issues of autocorrelation because the lag of the dependent variable is included among the regressors. This lagged dependent variable regressor is now correlated with the error term and therefore renders the OLS, Fixed effect (FE) and the Random effect (RE) estimators to produce results that are biased and inconsistent (Baltagi, 2008). Other problems include the individual effects, characterizing the heterogeneity among the individual cross sections. Applying ordinary least square or fixed effects estimator could render the estimates biased and inconsistent (Baltagi, 1998). Also, the use of the generalized least square (GLS) method of estimation also produces similar biased and inconsistent results (Arellano & Bover, 1995). Although the GLS estimator involves quasi-demeaning the data, Arellano & Bond (1991) argue that this demeaning process also undoubtedly causes the quasi-demeaned dependent variable to be correlated with the quasi-demeaned residual, and therefore the GLS remains biased and inconsistent.

To overcome these econometric challenges inherent in the use of OLS, fixed effects (LSDVA) and GLS estimators, a number of empirical studies have suggested the traditional instrumental variable (IV) estimator. The use of traditional instrumental variable (IV) estimator and the lagged differences may result, not only in weak instrument, but also in redundant moment conditions (Arellano & Bond, 1991). Arellano & Bond (1991) therefore proposed a first differenced generalized method of moment (GMM) procedure that is more efficient than the Anderson and Hsiao (1982) estimator. The problem with the Arellano & Bond estimator is that the lagged levels are poor instruments for first

differences, since the variables are close to a random walk (Arellano & Bover, 1995; Blundell & Bond, 1998). Arellano and Bover (1995) and Blundell and Bond (1998) therefore proposed the use of orthogonal deviations, which handle very important modelling concerning: fixed effects, potential endogeneity of regression, simultaneity bias, reverse causality, while avoiding dynamic panel biasedness (Blundell, 2005). Although the Blundell and Bond estimator has one and two step variants, this study makes use of the two-step variant because it is more robust and asymptotically more efficient than the one-step variant (Blundell, 2005).

#### **4.8.1 Statistical Package**

The Econometric view (E-view) version 7.1 is the statistical package that was used to carry out the various estimations, tests and graphics of the study.

## **CHAPTER FIVE:**

### **PRESENTATION OF DATA ANALYSIS AND RESULTS**

#### **5.1 Introduction**

In this chapter, the study presents the data analysis and estimations and the discussion of the results, based on the various models, specified in the previous chapter. Specifically, the objectives and research questions in Chapter One are addressed, using the methodological approaches and techniques discussed in Chapter Four. The results are also interpreted along the various theoretical lines of banking market concentration, competition and performance presented in the previous chapters of this study.

#### **5.2 Summary Statistics**

Table 5.1 presents the descriptive statistics of both the explained and explanatory variables, of the core models (equations 4.30 and 4.31). As can be seen in the table, Nigerian commercial banking industry variables appear normally distributed, as confirmed by the Jarque-Bera test at 1% level of significance, except total assets which show significance at 10%.

Banks, like FBN, Access Bank, GT Bank, UBA and Zenith Bank, acquired mega status post-2005 and this accounts for the noticeable difference between the mean and median.

**Table 5.1: Descriptive Statistics**

	IREV	INTCC	STFFC	DEPN	EQTY	CRISK	OIRR	EXPMGT	TA	MS	HHI	QGAP
Mean	0.25	0.08	5.50	0.17	0.14	0.18	0.39	0.29	5.30	0.05	0.07	0.07
Median	0.20	0.05	2.79	0.10	0.14	0.09	0.34	0.28	5.32	0.03	0.07	0.07
Maximum	0.85	4.66	98.59	1.66	0.57	2.72	2.31	2.42	6.39	0.17	0.10	0.10
Minimum	0.00	0.00	0.00	0.00	-0.76	0.00	0.00	0.00	3.90	0.00	0.06	0.05
Std. Dev.	0.14	0.33	10.76	0.27	0.11	0.35	0.29	0.29	0.54	0.04	0.01	0.02
Skewness	1.17	13.66	5.20	3.16	-2.67	5.05	2.35	2.75	-0.22	1.39	0.72	1.31
Kurtosis	4.26	190.68	36.89	14.60	25.52	32.40	13.38	18.31	2.36	3.99	3.15	3.42
Jarque-Bera	58.43	298262.30	10422.21	1445.84	4442.81	8010.77	1077.15	2193.43	4.99	72.52	17.37	58.19
Probability	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.08	0.00	0.00	0.00
Sum	50.14	16.59	1093.73	34.23	28.26	36.59	76.69	58.62	1055.54	9.09	14.71	14.11
Sum Squares	4.14	21.41221	22911.41	14.0622	2.47929	24.8551	16.9298	16.7236	58.3762	0.361	0.029	0.046
Observations	199	199	199	199	199	199	199	199	199	199	199	199

Table 5.2 summarises the Pair-wise correlation coefficient of the variables in equation(4.30).

**Table 5.2: Pair-wise Correlation Coefficient**

Table 4.2 : Pair-wise correlation Matrix of Nigerian Banking Industry Variables (2000-2012)												
TOT IN		TOT_	STAFF	OTHE	LNS	INT_	INT_	FEES_		DEPRE	CUST_	CUM
		ASET	EXP	OP_EX	ADV	INC_	EXP	COM	EQUIT		DEPOS	LLP
1	TOT INC											
0.896	TOT_ASI	1										
0.736	STAFF_E	0.645	1									
0.731	OTHER_											
	_EXP	0.68	0.608	1								
0.958	LNS__A	0.854	0.681	0.683	1							
0.989	INT_INC	0.887	0.718	0.72	0.95	1						
0.89	INT_EXF	0.837	0.744	0.619	0.821	0.893	1					
0.889	FEES_CC	0.824	0.661	0.736	0.83	0.875	0.781	1				
0.84	EQUITY	0.802	0.482	0.67	0.863	0.84	0.702	0.714	1			
0.798	DEPREC	0.717	0.66	0.826	0.748	0.791	0.692	0.776	0.688	1		
	CUST_									0.782	1	
0.971	DEPOSIT	0.904	0.712	0.744	0.954	0.955	0.839	0.881	0.83			
0.319	CUM_LL	0.229	0.551	0.212	0.239	0.32	0.493	0.265	0.125	0.307	0.246	1

Correlation is the relationship between two or more variables, while its coefficient measures the strength of the relationship that exists between the variables. Its numerical value lies between (-1) and (+1). If correlation coefficient is positive, this shows that the two variables vary along the same direction. If negative, this means the variables vary along different directions. Zero correlation coefficient indicates that there is no relationship among the variables. If correlation coefficient is 1, this is a case of perfect positive correlation. And -1 is a case of perfect negative correlation. The lower the correlation coefficient, the better it is for the variables to be used together as regressors.

As can be seen from Table 5.2, the pairs of variables, like Total income/loans and advances, interest income/total income, customer deposit/total income, as well as customer

deposit/total assets, are highly correlated (with correlation coefficient in excess of 0.9). Conscious efforts are made that they do not appear together as regressors in order to avoid the problem of perfect multi-collinearity.

### **5.3 Discussion of Empirical Results**

#### **5.3.1 Comparing the Degree of Banking Market Concentration**

The estimation of equation (4.39) is reported in Table 5.3 below and it provides the 3-bank, 5-bank and 8-bank concentration ratios, based on Customer Deposit and Total Assets respectively. The result of equation (4.40) is also reported in Table 5.3b below and this shows a superior method of assessing market concentration via Herfindahl-Hirschman Index (HHI). This index has the advantage of including information on the distribution of market share as well as the number of firms which take part in the measures of market concentration. The HHI measures the extent of dispersion and can vary between 0 and 1. The higher the index, the higher the dispersion. If HHI is zero, this suggests that there are a large number of equal-sized banks in the industry, and that concentration is low. If HHI is close to one, the market is dominated by one large bank. According to the “Horizontal merger guideline of the US Department of Justice”, a market whose HHI, after merger, is below 0.1, is defined as a non-concentrated market; HHI of over 0.1 and below 0.18 is moderately concentrated; while HHI of above 0.18 is a highly concentrated market (Gajurel & Pradhan, 2012).

**Table 5.3: Concentration Ratios and Herfindahl-Hirschman Index**

Table 5.3: Concentration Ratios and Herfindahl-Hirschman Index in the Nigerian Banks (2000-2012)															
	2000	2001	2002	2003	2004	2000-2004	2005	2006	2007	2008	2009	2010	2011	2012	2005-2012
CR3D	0.36	0.44	0.41	0.345	0.33	0.37692	0.3917	0.3818	0.33	0.315	0.309	0.3344	0.403	0.409	0.359
CR5D	0.55	0.679	0.53	0.433	0.448	0.52798	0.7169	0.527	0.48	0.46	0.47	0.5109	0.565	0.58	0.539
CR8D	0.65	0.73	0.69	0.537	0.541	0.62938	0.8096	0.6781	0.64	0.64	0.64	0.6703	0.709	0.755	0.693
CR3A	0.26	0.25	0.25	0.252	0.223	0.24702	0.351	0.338	0.322	0.3	0.3266	0.3494	0.421	0.46	0.358
CR5A	0.54	0.574	0.484	0.459	0.471	0.50574	0.643	0.59	0.535	0.513	0.52	0.5485	0.579	0.624	0.569
CR8A	0.69	0.59	0.6	0.562	0.571	0.60262	0.841	0.66	0.614	0.63	0.686	0.7153	0.724	0.771	0.705
HHID	0.052	0.054	0.054	0.057	0.06	0.05559	0.0798	0.0796	0.0678	0.0658	0.0651	0.0703	0.084	0.089	0.075
HHIA	0.053	0.051	0.052	0.059	0.064	0.05598	0.069	0.0704	0.0632	0.0637	0.0772	0.078	0.088	0.098	0.076
CR1D	0.13	0.135	0.142	0.126	0.122	0.13096	0.1204	0.1444	0.1233	0.1253	0.1248	0.1206	0.131	0.15	0.130
CR1A	0.12	0.121	0.128	0.126	0.13	0.125	0.1185	0.1886	0.1071	0.1108	0.1223	0.1272	0.156	0.174	0.141

Source: Author's Compilation from the various banks' audited accounts

Key: CR3D, CR5D and CR8D represent 3-bank, 5-bank and 8-bank concentration ratios Deposits respectively.

CR3A, CR5A and CR8A represent 3-bank, 5-bank and 8-bank concentration ratios Assets respectively.

HHID and HHIA represent Herfindahl-Hirschman Index Deposit and Assets respectively.

CR1D and CR1A represent the concentration ratio of the single largest bank on the Deposit and Assets sides respectively.

**Table 5.3a: Concentration Ratios of Nigerian Commercial Banks**

Year	DEPOSIT			TOTAL ASSET		
	CR <sub>3</sub>	CR <sub>5</sub>	CR <sub>8</sub>	CR <sub>3</sub>	CR <sub>5</sub>	CR <sub>8</sub>
2000	0.36	0.55	0.65	0.26	0.54	0.69
2001	0.44	0.679	0.73	0.25	0.574	0.59
2002	0.41	0.53	0.69	0.25	0.484	0.6
2003	0.345	0.433	0.537	0.362	0.459	0.562
2004	0.391	0.448	0.541	0.413	0.471	0.571
2005	0.392	0.566	0.717	0.351	0.495	0.643
2006	0.382	0.527	0.678	0.338	0.4	0.66
2007	0.33	0.48	0.64	0.322	0.465	0.614
2008	0.315	0.46	0.64	0.3	0.45	0.63
2009	0.309	0.47	0.64	0.327	0.52	0.686
2010	0.334	0.511	0.67	0.349	0.549	0.715
2011	0.403	0.555	0.709	0.421	0.579	0.724
2012	0.409	0.58	0.755	0.46	0.624	0.771

**Table 5.3b: Herfindahl-Hirschman Index of Nigerian Banks (2000-2012)**

Year	Deposit	Tot. Asset
2000	0.052	0.053
2001	0.0544	0.0513
2002	0.054	0.0524
2003	0.0572	0.0591
2004	0.06034	0.0641
2005	0.07975	0.069
2006	0.0796	0.0704
2007	0.0678	0.0632
2008	0.0658	0.0637
2009	0.0651	0.07717
2010	0.07028	0.07797
2011	0.084	0.0878
2012	0.0893	0.098

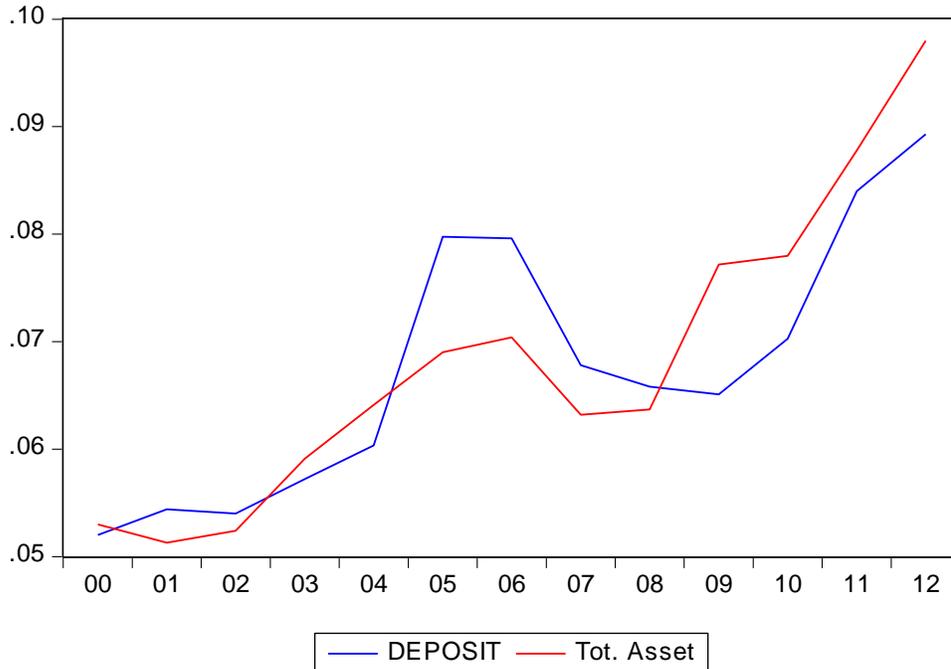
Tables 5.3, 5.3a&b above show the concentration ratios and the Herfindahl-Hirschman Index during the study period (2000-2012), using the deposit and total assets as variables of interest. Also shown are the concentration ratios of the largest bank during the period. The ratios were on the increase from year 2003, except for years 2007 to 2009, which experienced a dip as a result of the global economic melt down. The year 2012 witnessed the emergence of eight large banks (i.e., First Bank, GTBank, Access Bank, UBA, Zenith Bank, Ecobank, Skye Bank and Diamond Bank) dominating the banking landscape in Nigeria. These eight banks account for 77% in total assets (2003:56%); and 75% in customer deposits (2003:54%). Similarly, the five-bank concentration ratio shows that five banks in 2012 controlled 62% of total assets (2003:46%), (2003:36%) and 58% of customer deposits (2003:43%). These increases in the concentration ratios reflect the changing structural characteristic of the industry.

The values of HHI for all major variables increased over the period of analysis except for the observed dip in 2007 to 2009; the period that coincided with the global financial crisis. In the pre-consolidated period (2000-2004), the concentration ratio of the top five banks averaged 53% and 51% with respect to deposits and total assets, while the HHI, with respect to deposits and total assets, averaged 0.056 and 0.056, respectively. Similarly, the share of the largest bank in deposits and total assets market, in the subsector averaged 13% and 12.5%, respectively. The evidence suggests that in the pre-consolidation era (2000-2004), the Nigerian banking industry was an un-concentrated market ( $HHI < 0.1$ ) in the deposit and total asset markets. With the successful completion of the bank consolidation exercise and the drastic reduction in the number of banks from 89 to 25 as at December 2005, the market structure moderated slightly when with the respective average of the 5-bank concentration ratio, with respect to deposit and total assets, became 54% and 57%. The various concentration ratios ( $CR_k$ ) do not account completely for the total number of banks in the industry when measuring concentration at any point in time. This is a major disadvantage, as issues of concentration and competition are directly related to the number of banks in the industry and their relative sizes. The Herfindahl-Hirschman Index (HHI) takes care of this problem, showing on average of 0.075 and 0.076 respectively for deposits and total assets in the post consolidation period (2005-2012). The HHI for December 2012 showed 0.09 and 0.10 with respect to deposits and total assets.

During this same period (2005-2012), there was a gradual and steady march towards being moderately concentrated, especially in the total assets market. The economic implication of this development is that it has the tendency towards confirming the fear expressed by

Mishikin (2013) that a few mega banks may dominate the industry and make the latter less competitive.

**Figure 5.4: Herfindahl-Hirschman Index (2000-2012)**



### 5.3.2: Levels of Competition of the Nigerian Commercial Banks

Since the Panzar-Rosse model is only valid if the market is in long-run equilibrium, (Bikker& Bos, 2008), we proceed by first performing the long-run equilibrium test before estimating the Panzar-Rosse  $H_{\text{statistic}}$  for the pre and post consolidation period. The test for long run equilibrium is performed with equation (4.32)

$$\begin{aligned} \log(1 + ROA)_{i,t} = & \beta_0 + \delta \log(1 + ROA)_{i,t-1} + \beta_1 \log INTC_{i,t} + \beta_2 \log STAFFC_{i,t} + \beta_3 \log DEPTN_{i,t} + \beta_4 \log LOAN_{i,t} \\ & + \beta_5 \log TA_{i,t} + \beta_6 \log EQUITY_{i,t} + \beta_7 \log RISKASS_{i,t} + \beta_8 \log OIIR_{i,t} + \alpha + \beta_9 \log OOE_{i,t} + \beta_{10} MS_{i,t} + \\ & \beta_{11} HHI_t + \beta_{12} QGAP_{t-1} \end{aligned} \quad (4.32) \text{ re—stated,}$$

where ROA is Return on Assets defined as profit after tax/total assets. Other variables are as defined. The result of the estimation is shown in Table 5.4 below:

Table 5.4: Long-run equilibrium test on the Degree of Market Competition		
Variables	(1+ROA) as dependent variable	
Name	symbol	Coef/(t-stat)
Lagprofit index	log(1+ROA) (-1)	-0.0905
		(-10.0495)
Interest cost	logINTC	-0.00066
		(-0.0665)
Staff cost	logSTAFFC	0.004534
		(-0.3531)
Capital cost	logDEPTN	0.0004
		(0.0299)
Equity	logEQT	0.003786
		(0.3426)
Total asset	logTA	-0.0055
		(-0.3888)
Loan loss provision	logLLP	-0.01004
		(-1.6317)
Market share	logMS	0.00499
		(0.036753)
Conc. index	HHI	0.04785
		(0.4038)
Output growth	QGAP (-1)	-0.00854
		(-0.10413)
H Statistics =sum of logINTC + logSTAFFC + logDEPTN		
Hstat	0.0043	
Note: t ratios in parenthesis are below the parameters. *, **, and *** are statistically significant at the 10%, 5% and 1% respectively. The last row of table 4.5. shows the value of our H statistics, which is the sum of the elasticities of the reduced form revenues with respect to factor prices.		

The equilibrium E-statistics is defined as  $\beta_1 + \beta_2 + \beta_3$ . We test whether  $E=0$ , using an F-test. If rejected, the market is assumed not to be in long-run equilibrium (Bikker and Bos, 2008).

The test result in Table 5.4 shows  $E = 0.0043$ . Accordingly, we fail to reject the null hypothesis of long-run equilibrium and conclude that the market appears to be in an acceptable state of long-run equilibrium, since the sum of elasticity of returns, with respect to input factor prices, is not significantly different from zero. This thus confirms the appropriateness of Panzar-Rosse (P-R) model in measuring banking competition in Nigeria.

Table 5.5 shows the result of the estimation of the levels of competition in the banking industry in both the pre- and post-consolidation periods.

**Table 5.5: Empirical Result on the Level of Competition in Nig. Banking Industry**

Table 5.5: Empirical Result on the level of competition in Nig banking industry		
	Pre-consolidation period	Post consolidation period
	2000-2004 IREV as dependent variable	2005-2012 IREV as dependent variable
Regressors	Coefficient	Coefficient
logIREV (-1)	-0.142 (-1.406)	0.069159 (1.294)
logINTC	0.494*** (6.743)	0.514*** (6.279)
logSTFC	0.020 (0.208)	0.099818 (1.065)
logDEPTN	0.002 (0.020)	0.219** (2.291)
logEQTY	0.141 (1.677)	0.003 (0.3426)
logLLP	0.059 (0.802)	-0.081 (-2.503)
logOIIR	0.124 (1.224)	0.121 (1.625)
logOOE	0.039 (1.009)	0.055 (1.479)
logTA	0.198* (1.755)	-0.068 (-0.778)
MS	-0.711 (-0.997)	0.852 (1.310)
HHI	-1.375** (-2.714)	-0.798 (-0.504)
QGAP (-1)	-0.170 (-0.321)	3.783* (1.836)
H Statistics =	0.728	0.834
=Makt Powe	0.142	0.069
H statistics =The sum of coefficient of lnINTC + lnSTFC + lnDEPTN		
<i>Note: .t ratios in parenthesis are below the parameters. Those followed by *** are statistically significant at the 1% level, those followed by ** are statistically significant at the 5% and those with *, are significant at 10% level. The last row but one of table 4.8 shows the value of our H statistics, which is the sum of the elasticities of the reduced form revenues with respect to factor prices. The higher the magnitude of H, the more intense the degree of competition, (Vesala, 1995)</i>		

The Interest income model (i.e., IREV) regression provides evidence of the impact of bank-specific, industry-specific and macroeconomic variables on bank performance. The

estimated values of the H-statistic are 0.7286 and 0.8339 for the pre and post consolidation periods respectively. They represent the sum of elasticities of commercial banks' equilibrium income with respect to the factor input prices; that is, the sum of the coefficients of interest cost of deposits, staff cost and cost of fixed capital, as shown in equation (4.21). The interest cost of deposits contributed the highest value of the H-statistic. It also indicates that the commercial banking sector in Nigeria is characterised by monopolistic competition in the two sub-periods. This result of the H-statistic is consistent with those of previous studies in Nigeria, which support monopolistic competition (Somoye, 2008; Fadare, (2010); Zhao and Murinde, (2011); Ayeni et al. (2013); Ajisafe and Akinlo, (2013), Saibu, (2014). The values of J-statistic and the instrument rank showed that the instruments used are valid, since the values of instrument rank (20 and 37) are greater than the number of estimated coefficients (12 and 12 each) for the pre and post consolidation periods respectively.

As shown by the lag of interest revenue (Table 5.6), Nigerian banks show positive interest income persistence, though not significant, in the post consolidation period, with a very high speed of adjustment (closer to zero), implying the industry is fairly more competitive in the post consolidation period than in the pre-consolidation period. It shows that the income, earned by the commercial banking sector in the previous period, is positively related to the interest income in the current period but with little impact on the total income or gross earnings. Interest cost has a positive and highly significant relationship with income performance, implying that an increase of 1% in interest cost is to 0.52% increase in income revenue. So also an increase of 1% in staff cost is responded to by an increase of 0.20% in ratio of interest income to total assets. This is also very significant. The capital

cost, measured by the ratio of depreciation to fixed assets (DEPTN) is also positive and significant at 5%. The ratio of equity capital to total assets (EQTY) is also positively related to interest income performance, though not significant. This implies that the more capitalized the banks are, the less the leverage in the post-consolidation period, leading to a decreased borrowing cost and a resultant higher profit. Our result (in Table 5.6) shows that LLP (Loan Loss Provisions), which measures credit risk, is an important component of bank performance. As loans granted by banks become more risky, their profits decrease, as evident in the significant decrease in interest income performance in the post consolidation period, when banks' loan portfolios are larger and provisions eat deep into the banks' incomes.

The ratio of other income to interest income (OIIR) measures the extent of output mix (Non-interest product) on bank performance. This relationship, though positive, is not significant in the post-consolidation period. The positive coefficient is indicative of increasing non-fund based activities of commercial banks in Nigeria. As the ratio of other operating expenses to total assets (OOE) increases by 1%, the interest income performance increases also by 0.054%, though not significant. The huge cost of running the banks cannot be passed 100% to the customer because of competition and extensive regulation, which put a cap to product pricing in banks. The total assets (TA) of the industry showed a positive and significant relationship to interest income in the early days before consolidation, implying the enjoyment of economies of scale. However, in the post-consolidation period, following the mega status acquired by eight banks in the system, the growth in assets became disproportional leading to dis-economies of scale. The market share (MS) exhibits positive and significant relationship with interest income, signifying

that the higher the market share, the more interest income earned. GAP shows positive and significant relationship at 10% with interest income showing that banking business is pro-cyclical, in line with the findings of Nicholas Apergis (2008).

HHI shows a negative relationship with interest income ratio but the magnitude of its coefficient is higher in the post-consolidation period than in the pre-consolidation period, showing that the post consolidation period has a higher industry concentration. The H-statistics, which is an overall measure of the intensity of market competition, shows a higher intensity in the post consolidation period where  $H = 0.834$ , compared to the pre-consolidation period, where  $H = 0.729$ . Vesala (1995), and Claessen and Laeven (2005) have established that the higher value of H signifies a greater intensity of competition. This is also positively correlated with the degree of concentration, as measured by HHI in Table 5.4. Although the Nigerian commercial banks continue to earn income in the condition of monopolistic competition (pre- and post-consolidation), overall, our result shows a higher market concentration post-consolidation leading to a higher intensity of competition, in line with the findings of Claessen and Laeven (2005). The higher concentration is explained in terms of many customers taking flight to banks with shareholders' fund in excess of the prescribed minimum of N25billion, as these were perceived to be the "safe banks".

Our result here also seems to reject the proposition of the Structure-Conduct-Performance Model (SCP) for the Nigerian banking market, which suggests that a higher market concentration tends to weaken competition.

The result is not accidental, as this is also confirmed by our Total Market Model when the dependent variable is changed to Total Revenue from Interest Revenue. This study therefore found no evidence to support the SCP hypothesis that a weakened industry competition will result from increased industry concentration.

The results of this study seem to suggest that the concentrated banking market in Nigeria is behaving competitively, not because the barriers to entry are lowered as Baumol (1982) would want us to believe, but because the banks' regulators are very much alive to their oversight responsibilities, thus keeping the banks and their management perpetually on their toes thereby enhancing competitiveness.

Table 5.6: Empirical Result of Levels of competition in Nigerian Banking Industry)

Dependent variable :TREV (Total Income model)		
	Pre-consolidation period	Post consolidation period
	2000-2004	2005-2012
Regressors	Coefficients	Coefficients
logTREV (-1)	-0.046 (-1.095)	0.012 (0.254)
Bank- variables:		
logINTC	0.420*** (7.519)	0.352*** (5.672)
logSTFC	(-0.075) (-0.99)	0.071 (0.927)
logDEPTN	0.103 (0.16)	0.252*** 3.492
logEQTY	0.067 (1.179)	0.025* (1.996)
logLLP	-0.027 (-0.625)	-0.057** (-2.2583)
logOIIR	0.111* (1.81)	0.219*** (3.670)
logOOE	-0.0004 (-0.021)	0.076** (2.638)
logTA	0.298*** (3.814)	0.045 (0.617)
MS	0.029 (0.062)	0.375 (0.711)
Industry variable:		
HHI	0.133 (0.398)	-0.710 (-0.574)
Macro variables:		
QGAP (-1)	1.040** (2.618)	2.353 (1.394)
H Statistics =	0.446	0.679
$\delta$ =Mkt Power	0.046	0.012
Null:H=0 (Monopoly)		
Null:H=1(perf compe)		
Market structure:	Monopolistic Competition	Monopolistic Competition
<b>Diagnostics:</b>		
S.E of regression	0.028	0.06
Instrument Rank	20	37
J Statistic	25.06	31.53

*Note: t ratios in parenthesis are below the parameters. Those followed by \*\*\* are statistically significant at the 1% level, those followed by \*\* are statistically significant at the 5% and those with \*, are significant at 10% level. The last but one row of Table 4.8 shows the value of our H statistics, which is the sum of the elasticities of the reduced form revenues with respect to factor prices. The higher the magnitude of H, the more intense the degree of competition (Vesala, 1995).*

The coefficient of the lagged dependent variable in equation (4.30) measures the extent of profit persistence in the industry, hence the market power index. The closer this coefficient is to zero, the more intense the degree of competition (showing a high speed of adjustment). So, the period 2005-2012 is more competitive than the period 2000-2004. This is also in agreement with the result of the H statistic. To confirm the validity of this result, the long run equilibrium test is carried out and the result presented in Table 5.5, showing that the equilibrium H-statistic is not significantly different from zero.

### **5.3.3 Effect of Concentration and Competition on Profitability Performance of Nigerian Commercial Banks**

The result of the effect of market concentration and competition on profitability of Nigerian Commercial Banks is presented in Table 5.7 below:

The traditional SCP hypothesis holds true, if the coefficient of  $HHI > 0$  and  $MS = 0$ , while RMPH holds, if  $MS > 0$  and  $HHI = 0$ . These two conditions must be fulfilled simultaneously (Lloyd Williams et al. 1994). Although the coefficient of HHI is different from zero, it is statistically not significant. Therefore, this study fails to reject the null of SCP, i.e., concentration does not weaken competition and is not positively correlated with profitability.

The fact that the coefficient of MS is also statistically not significant, implies that the study fails to reject RMPH. The summary of the result of model 3 (i.e.,Table 4.9) therefore is that the study finds no evidence to support the importance of concentration and market shares as an explanation for bank profitability in Nigeria.

Table 5.7: Effect of concentration and Competition on Profitability (2000-2012).

Regressors	Coefficients/t statistics
LogROA(-1)	-0.6672*** (-3.6964)
logINTC	-0.0485 (-1.03109)
logSTFC	-0.217387*** (-4.1053)
logDEPTN	0.2347*** (3.4559)
logEQTY	-0.0257** (-1.9959)
logCRISK	-0.0410*** (-4.3599)
logLIQ	0.0152 (0.5493)
logEXPMGT	-0.0487*** (-4.9825)
logNIM	0.0196 (1.0487)
MS	0.00106 (0.3714)
HHI	0.00373 (0.0941)
QGAP (-1)	0.6404 (1.5517)
Hstatistics	-0.03
<b>Diagnostics:</b>	
S.E of Regression	0.076
Instrument rank	62
J statistic	51.33
<i>Note: (***) indicates significant at 1% level, (**) indicates significant at 5% level and (*) indicates significant at 10% level. Figures in parenthesis show the t statistics</i>	
and (*) indicates significance at 10% level.	

### Further Diagnostics

Arellano-Bond Test for AR (1) in first differences:  $z=-0.89$   $Pr > z = 0.371$

Arellano-Bond Test for AR (2) in first differences:  $z = -0.07$   $\Pr > z = 0.948$

Hansen J Test for over-identifying restrictions:  $\chi^2 (6) = 1.48$   $\text{Prob} > \chi^2 = 0.96$

The Hansen J-statistic is a prominent test for ascertaining over-identifying restrictions with the null hypothesis of “the instruments as a group are not exogenous”. Therefore, the higher the probability the better. Since the test fails to reject the null hypothesis, it means the instruments, used to check the endogeneity problems, are valid and strictly uncorrelated with the regression disturbance term. In addition, the autocorrelation test with the null hypothesis of “there is no second-order serial correlation for the remainder disturbances of the differenced equation” also fails to reject the null hypothesis. This shows that there is no second order serial correlation problem and, therefore, the lag of the dependent variable and other variables, used as instruments, are strictly exogenous, thus they are good instruments (Blundell et al. 2000).

The highly significant coefficient of the lagged profitability index (ROA-1) is a confirmation of the dynamic character of equation 4.32, specified in this study. The coefficient of the lag of log ROA takes a value of -0.6672, which implies that profit seems to persist to a small extent and, therefore, departure from a perfectly competitive market structure in the Nigerian commercial banking market may also be small. This is in agreement with the findings of Athanasoglou et al. (2005).

The coefficient of the variable, representing equity (EQTY) is surprisingly negative, contrary to a priori expectation, though significant. Its significance lies in the fact that a banking system that is well capitalised is able to pursue business opportunities more effectively and has more time and flexibility to deal with problems arising from

unexpected shocks. This finding agrees with Goddard et al. (2004) in his study of the European banks.

As expected, the coefficient of the credit risk (CRISK) is negatively and significantly related to bank profitability (ROA) in Nigeria. This shows that in the Nigerian commercial banking market, managers, when pursuing profit maximization seem to be adopting a risk-averse strategy, i.e., minimizing risk through effective credit policy control.

As expected, expense management has a negative and significant effect on profitability. This means that a substantial proportion of increased cost of operations is absorbed by the banks' incomes since they cannot be wholly passed to customers in the form of increased pricing of products and services, as this will amount to overcharging the customers. The competitive nature of the market will not permit this to happen.

The positivity of the coefficient of the business cycle variable (Qgap) indicates that, in Nigeria, after controlling for the effects of other determinants, commercial banking business is pro-cyclical in nature, with improved performance in profitability when the economy is buoyant; and when the economy is experiencing a downward swing, performance is still good, with internal factors like credit risk management, expenses control and level of capitalization, etc., determining profitability.

#### **5.3.4 Empirical Result on Competitive Performance of Large and Small-Sized Banks**

The test results on competitive performance of large and small-sized banks are presented in Tables 5.8 and 5.8a below, which are constructed from the Panel EGLS (Random Effect) method, based on equation (4.30) and hypothesis 4. This hypothesis states the null as "large

sized and small sized banks are not subject to the same market competitive conditions in Nigeria”.

Table 5.8: Competitive Performance of Large and Small-Sized Banks Pre-Consolidation

Dependent variable InIREV (Interest Market Model)		
Regime	Pre- Consolidation	
Bank size	Small Banks	Big Banks
Regressors	Coefficients	Coefficients
Intercept	-1.132*** (-3.323)	-0.380** (-2.108)
logINTC	0.483*** (4.367)	0.538*** (6.499)
logSTAFFC	-0.227*** (-2.933)	0.174*** (2.862)
logDEPTN	0.161 (0.167)	0.012 (0.286)
logTA	0.782*** (9.428)	0.412*** (5.982)
MS	-0.310 (-0.541)	-0.465* (-1.804)
HHI	-0.421 (-0.282)	-0.103 (-0.137)
QGAP (-1)	-1.659* (-1.986)	-2.073*** (-4.948)
R-Squared	0.847	0.958
Adjusted R- Squared	(0.822)	0.948
F Statistics	34.128	101.229
Prob F Statistics	0.000	0.000
Durbin Watson	2.111	1.7773
H Statistics	Hsmall= 0.370	Hlarge =0.725

**Note:** \*\*\* indicates significance at 1percent level, \*\* indicates significance at 5% level and \* indicates significance at 10% level.

Table 5.8A: Competitive Performance of Large and Small-Sized Banks Post-Consolidation		
Dependent variable InIREV (Interest Market Model)		
Regime	Post Consolidation	
Bank size	Small Banks	Big Banks
Regressors	Coefficients	Coefficients
Intercept	0.149 (0.457)	-0.349 (-1.286)
logINTC	0.355*** (5.629)	0.415*** (5.214)
logSTAFFC	0.331*** (3.306)	0.152** (2.195)
logDEPTN	-0.085* (-1.198)	0.205** (2.256)
logTA	0.245** (2.081)	0.311*** (3.463)
MS	0.793 (1.343)	0.238 (0.511)
HHI	1.737 (0.860)	0.209 (0.123)
QGAP (-1)	-1.430 (-0.472)	1.719 (0.634)
R-Squared	0.917	0.954
Adjusted R- Squared	0.907	0.948
F Statistics	86.381	145.369
Prob F Statistics	0.000	0.000
Durbin Watson	0.788	0.917
H Statistics	Hsmall = 0.600	Hlarge= 0.773

**Note:** \*\*\* indicates significance at 1percent level, \*\* indicates significance at 5% level and \* indicates significance at 10% level.

The higher the value of the H statistic, the more intense the competition is. Competition among the 8 large banks is stronger than among the small banks, as measured by the value of H-statistics, with  $H_{\text{Large banks}} = 0.7737$ , compared to  $H_{\text{Smallbanks}} = 0.6007$ .

The large banks are dominant and very competitive in the key growth sectors, like oil and gas, telecom, power, cement and fast moving consumer goods (FMCG), among others, with lower risk rating where big ticket loans are booked. Although the large banks are more competitive than the small banks,going by the magnitude of the H-statistic, we notice a significant improvement in competition among the small banks in the post-consolidation

period. This is as a result of improvement in technology, diversified product offerings and innovation in customer service. These are all elements of the basic conditions in our SCP framework.

As at 31/12/2012, the eight largest banks in Nigeria on the basis of total assets in excess of N1trillion, with market shares in excess of 5%, are First Bank, GTBank, Access Bank, UBA, Zenith Bank, Ecobank, Skye Bank and Diamond Bank. These eight banks accounted for 77% of total assets in 2012 (2004:57%) and controlled 75% of deposits (2004:54%). Apart from total assets and deposits, other size indicators in commercial banks include core capital, total loans and advances and gross earnings. The more the proportion of deposit and capital a bank has, the better it is able to accommodate business growth. These eight Nigerian banks are strong in lending activities, accounting for 77% of the industry's lending activities, with First Bank alone accounting for about 17% of total industry's loan exposure.

The competitive landscape for the large and small banks in the market place is captured in terms of the buyers (customer's) power, the supplier's (bank's) power, entry and exit barriers, threat of substitutes and competitive rivalry among the banks, through offer of incentives, better product delivery, better technology and better customer service.

With respect to the buyer's power, the large banks (unlike the small clients) go after big corporate customers who are able to influence product pricing and are, therefore, charged lower interest rates. These big banks then have to struggle for large volumes to compensate for reduced margin. For these large banks, supplier power is low at the retail end of the market where the critical stable funds are obtained as the retail customers are too small to

have influence over deposit rates. Higher entry and exit barriers exist for the large banks, due to the strict regulation of the banking industry and the huge cost sunk into the business, which is not easily retrievable. Large banks also have low threats of substitutes because they are able to take on big ticket transactions, owing to their huge capital base, compared to, that of small banks and other players, like microfinance banks, insurance companies, mortgage banks, and discount houses.

There exists a high competitive rivalry among the large banks for quality customers, as they all offer similar products. They compete for deposits, capitalization, assets base, growth, innovation, service quality and location. This rivalry is more noticeable at the corporate segments where the clients are perceived to have better risk profiles. Only large banks that are well capitalized, with strong franchises, are able to penetrate this segment. To be able to service this corporate segment, the large banks must have access to relatively cheap and stable funding base. This guarantees their ability to take on big ticket transactions at competitive prices and viable spreads. Consequently, these large banks resort to aggressive deposit mobilization as a survival strategy in this game of competitive rivalry.

## CHAPTER SIX:

### SUMMARY, CONCLUSION AND POLICY RECOMMENDATION

#### 6.1 Introduction

In this chapter, the summary of findings and policy implications of the findings are presented. This is followed by major conclusions and suggestions for further studies.

#### 6.2 Summary of Findings

Our empirical results reveal that:

- i) The Nigerian banking industry is more concentrated in the post consolidation period (2005-2012) than in the pre-consolidation period as a result of a substantial reduction in the number of banks and the emergence of eight mega banks. This is consistent with the findings of Lee & Lee, (2005), Park, (2012) and Saibu, (2014).
- ii) This increased concentration has also caused the industry to be more competitive post-consolidation than in the period immediately before, thus agreeing with the findings of Claessen and Laeven (2004), although contrasting with those of Berg and Kim (1996) and Bikker and Haaf (2002).
- iii) The increased concentration and competition did not increase profitability in the industry, contrary to the postulation of the SCP paradigm and the finding of Fuentes and Sartre (1998). Rather, it is the banks' internal factors, like the extent of capitalization, risk management practices, staff productivity and efficiency in expense management that determine profitability.
- iv) Competition is found to be more intense among the large banks than among the small banks, in contrast with the result of the study by Mulyaningsih &

Daly,(2011) on the Indonesian banking system, where the medium-sized banks, with the least concentration index, were adjudged the most competitive. The small-sized banks in Nigeria too have stepped up competition significantly through major innovations, improved customer services and better product offerings than in the pre-consolidation period. This is a welcome development and the industry is the better for it. The results are, therefore, discussed as follows:

The actual consolidation was preceded by an announcement effect which precipitated the flight to safety on the part of the banks' customers, while the banks continuously re-aligned their portfolio and businesses in favour of customers with good ratings. All these affected the bank concentration to the extent that, by December 2012, eight large and dominant banks appeared in the industry, controlling about 75% and 77% respectively of the industry's deposits, and total assets. When compared with the pre-consolidation era, these eight banks controlled 71% and 67% in deposits and total assets respectively. There is, therefore, the tendency towards confirming the fear expressed by Mishikin (2013) that a few banks may dominate the industry and make it less competitive. To avert this, the oversight functions of the regulatory agencies must be stepped up so as to make the industry more contestable through regular reviews of the entry guidelines for potential new entrants to the industry.

The result shows that the Nigerian banking industry exhibits a positive, though not significant interest income persistence (Table 5.8) in the post consolidation period, with a higher speed of adjustment (i.e., closer to zero), indicating that the industry is more fairly competitive than in the pre-consolidation period.

The risk-taking behaviour of the banks has not altered in the post-consolidation period because assessment of credit extension continues to be a function of the risk-rating of the loan-seeking organizations, which continues to favour profitable and liquid organizations, with short assets conversion cycles and strong financials.

### **6.3 Policy Implications of Findings**

Our empirical analysis reveals that the Nigerian banking industry has become increasingly concentrated with few large commercial banks in the first and second phases of the consolidation exercise, resulting in increased competition. This implies that with proper oversight on the part of the regulators (CBN and NDIC) the commercial banking sector will be stable and less prone to risk of systemic distress. There is therefore the need to consider carefully the real effects of banking market structure on banking competition. In other words, there is need to establish the required degree of industry concentration that will lead to an optimal level of banking industry competition. This may be difficult to design in practice. From this point of view, further research may be required to design the required concentration that will produce the optimal competition policy for the Nigerian banking industry.

The second phase of the consolidation exercise witnessed strong banks acquiring some of the banks in distress. This has given rise to increasing concern that the banking market is gravitating towards becoming moderately concentrated and may likely acquire market power which might lower the intensity of competition. There is, again the need for the regulatory authority to step up its oversight function to curb this likelihood and make the industry more contestable by regularly reviewing the entry/exit barriers.

The study found that the H-statistic in the total income-based market is lower than that for the interest income-based market, indicating a lower level of competition among the banks in the fee-based income market than in the interest-income based market. Managers of banks should formulate their business strategies around capturing more non-interest income, since there seems to be room for improvement in competitive conduct in this area of business in order to increase the industry's profitability.

The regulators need to focus more on continuing with the reforms in the sector by bringing more policy interventions that will increase concentration, make the market more contestable so as to further increase competition thereby improving efficiency. Since risk asset appears to be a very important variable in the bank performance, regulators need to focus more on prudential regulation that will improve risk management through controls and risk mitigation measures at both the bank and industry level and at the same time ensure adequate capitalization against known losses.

Furthermore, there may be need to encourage another round of market based merger and acquisition exercise after carefully considering their effect on bank competition and market power. In addition, there is need to consider some competition policy measures so as to proactively forestall deterioration of competition in the Nigerian banking market for which we offer the following suggestions:

In considering further bank merger applications, approval criteria should be based on the use of Herfindhal-Hirshman Index (HHI) as the principal criterion since the HHI will reflect sufficiently the effect of additional bank mergers on bank market structure and bank competition. This is because the structure in Nigeria is shifting towards a market structure

that is led by the large banks and also because the HHI properly reflects the dynamic change of market structure and the weight of large banks.

There is need to establish an efficient examination system for bank mergers where the CBN and the NDIC and the SEC will play an important role in appraising upfront the effect of bank merger application on bank competition and efficiency.

#### **6.4 Conclusion**

This study is conducted to investigate the impact of market concentration and competition on profitability of Nigerian commercial banks as the subsector moves from pre-consolidation to post-consolidation regimes. Limited empirical studies, indicating a clear effect of concentration and competition on profitability performance in Nigeria motivated the study. The study utilizes unbalanced bank panel data of Nigerian banks, drawn between 2000 and 2012. Changes in the banking structure was proxied by the structural measures, like degree of concentration, measured by the k-bank concentration ratios and the Herfindahl-Hirschman index (HHI), while competition was measured by estimating the non-structural H-statistic of the Panza-Rosse (P-R) model in a dynamic banking market which exhibits profit persistence. The Systems Generalized Method of Moment (SGMM) was employed to handle the problem of autocorrelation and endogeneity, brought about by the introduction of the profit persistence variable into the model specified. The long-run equilibrium test confirmed the appropriateness of the P-R model. When testing for the competitive conditions of the banking market, the P-R H-statistic was obtained from the two revenue functions, based on Interest Revenue and Total Revenue, in order to check for the robustness of the result. Similarly, the profitability measure, through the use of net interest margin (NIM), Return on Assets (ROA) and Return on Equity (ROE), resulted in

the same conclusion. The findings of the study call for a number of policy measures for improved competitiveness of commercial banks in Nigeria which will require the banking regulators to set more stringent credit risk management guidelines for the large-sized banks in the sub-sector than for the small-sized ones, since the former are more strategically important to the economy. Key conclusions drawn from the study are therefore that i) the Nigerian commercial banking subsector was an un-concentrated market in the pre-consolidation period, while in the post-consolidation period there is a gradual and steady march towards being moderately concentrated, following a drastic reduction in the number of banks and the emergence of eight mega banks; ii) with the increased concentration, the competition index (the H-statistic) indicates that the intensity of competition is heightened in the post-consolidation period, contrary to the postulation of the structure-conduct-performance paradigm; iii) increased concentration neither weakens competition nor increases profitability significantly; and iv) the degree of competition in large-sized banks is found to be more intense than in the small-sized ones in both the pre and post-consolidation periods.

## **6.5 Recommendations**

Based on the empirical results obtained, which show that while market concentration does not significantly affect profitability directly but indirectly through the channel of competition, the study suggests the following policy recommendations:

- i. Given the increased competition, which accompanied increased concentration in the first and second phases of the consolidation exercise, there is the need to carefully find the required degree of banking industry concentration that will produce the optimal level of commercial banking

competition. As this may be difficult in practice, we recommend further research in this area, with a view to formulating policy interventions that will increase concentration and make the market more contestable.

- ii. With the commercial banking market gradually gravitating towards becoming moderately concentrated, with a growing tendency to acquire market power which may lower the intensity of competition, it is further recommended that the banking regulator will need to gear its oversight function toward curbing this likelihood by making the industry more contestable through periodic reviews of entry and exit barriers, as well as through activity restrictions.
- iii. Managers of commercial banks in Nigeria should formulate their business strategies around capturing more fee-based activities, since this study has found that competition in the fee-based market is lower than in the interest income-based market. This should facilitate the realization of the potential for increased profitability.
- iv. Since the structure of commercial banking in Nigeria is now led by eight mega banks controlling more than 75% of the market, any future market-based merger to be considered should be based on the use of the Herfindhal-Hirschman Index (HHI), since this will reflect the weight of the large banks. Also, a more stringent prudential regulation will need to set the Capital adequacy ratio (CAR) of the large banks at between 15 and 20% of their weighted risk assets, as against the present 10% for the small-sized

banks, since the large-sized banks are of more strategic importance to the economy. This will provide them with additional cushion against failure.

## **6.6 Contributions to Knowledge**

The study has made some contributions to the current state of knowledge in the research area by filling the observed gaps in the literature, as well as in the theory and empirical analyses. These contributions are outlined below.

- i) The study has provided further insight into the subject of banking market competition in Nigeria by extending the analysis to include the linkage of the banking market behaviour to the degree of banking market concentration that generates the level of estimated competition. The study, therefore, documents the inter-relationship between the degrees of banking market concentration and their corresponding levels of competition in Nigeria with the aid of both the structural and non-structural approaches. This has been overlooked in the previous studies on Nigeria.
- ii) The few related studies on the subject of banking concentration, competition and performance in Nigeria, carried out by Somoye (2008); Fadare (2010); Zhao and Murinde (2011), Ayeni et al. (2013); Ajisafe and Akinlo (2013); and Saibu (2014), aggregated all categories of banks together when testing for the market competition, without any attempt whatsoever to make distinction between regional/international banking market, loan/deposit banking market, retail/corporate banking market, large/small-sized banks and test their separate competitiveness. This study has succeeded in decomposing the banking market into large and small-sized banks and in testing whether or not they are faced

with the same competitive pressures. The study has thereby been able to provide empirical evidence that, in Nigeria, large-sized banks are faced with more intense competition than the small-sized banks in both the pre and post-consolidation periods, thus filling a major gap in the literature. Such analysis helps to provide insight into the relative strength and weaknesses of operating banks in order to know at what point these banks become strategically important banks (SIBs) to the economy and what implications there are for the banking regulators in setting their prescribed capital adequacy ratios (CAR), assetsquality ratios and intermediation ratios above those of the smaller-sized banks. This is necessary to provide the required ultimate cushion against the operational risks which the large-sized banks are exposed to.

- iii) The study has further enhanced researchers' understanding of competition as the channel through which variations in the degree of market concentration affect banking profitability performance. It reveals` that, while market concentration does not significantly affect profitability directly, contrary to the postulation of the SCP paradigm, it has an indirect impact through the channel of competition and is in the opposite direction to what the system allows to happen to banking competition. Such an understanding will assist in identifying appropriate policy instruments and intermediate variables that have to be addressed in order to make the banking market in Nigeria more contestable.
- iv) The thesis developed a two-in-one "Augmented P- R Model" for measuring the intensity of competition in a single equation model, side by side with the market power index, with the two indices corroborating each other.

## **6.7 Suggestions for Further Studies**

As mentioned in paragraph 6.2, this study opens up areas for further research. One would be to investigate, through simulation, the required degree of commercial banking industry concentration that will produce the optimal level of competition. Two, it would be instructive to investigate how the effect of concentration and competition on profitability performance in Nigerian banks compares with other countries in Africa, like South Africa, Ghana, Tunisia, Egypt, Zambia. Three, it would be useful to explore other appropriate measures of performance, apart from profitability. For example, for effective policy decision-making in a dynamic banking sector, it might be necessary to test the impact of concentration and competition on productive efficiency of the relevant strategic profit centres of the banking business, like the corporate banking, retail banking, oil and gas, telecoms and public sector groups, using the non-parametric method of Data Envelopment Analysis (DEA).

Similarly, future research can benefit from the inclusion of other industry and macroeconomic variables, like monetary policy rate (MPR) and money supply/inflation rate, respectively. The point is that the inclusion of these control variables may better reveal the performance of the commercial banking market in Nigeria.

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## Appendix1: Summary of Some Selected Studies Reviewed on Banking Competition.

S/N	Region	Author and year	Issues Addressed	Scope	Methodology	Results/Findings and Conclusion
1	DC	Fuentes and Sartre, (1998)	Studied the relationship between concentration and competition in the banking market of <b>Spain</b> shortly after the bank consolidation exercise.	1990-1997	A combination of Structural and non-structural methods.	Increased concentration following the bank consolidation, weakened competition in the regional banking market; whereas for the international banking market, the increased concentration did not make competition weaker.
2	DC	Berg & Kim, (1996)	Studied the <b>Norwegian</b> banking industry in the Pre and post consolidation years.	1990s	Structural and non-structural methods.	Increased banking market concentration made competition to become weaker in line with the postulation of the SCP paradigm.
3	DC	Iuga (2013)	Studied the degree of banking concentration in all the <b>European Union</b> member states to establish the relationship between concentration (HHI) as dependent variable and the key indicators like total assets, number of credit institution, population and gdp.	2005-2011	The study calculated four correlation coefficients between the dependent variable and each of the independent variables using the Pearson's correlation approach.	Result showed that the index of concentration varies monotonically with the size of each country in the member states.
4	DC	Denvil (2002)	Examined the changes in the structure of the <b>Jamaican</b> banking industry as a result of the bank consolidation the country went through following the financial crisis of late 1990s	1990-2000	Employed the use of Herfindhal-Hirsahman Index (HHI) and P-R methodology.	Result showed a slight increase in the banking market concentration which had significant implications for the level of competition as well as the welfare of the customers in the baking sector.
5	DC	Lee and Lee (2005)	Analyzed the changes in structural characteristic of <b>Korea</b> as bank consolidation proceeded in the country due to the currency crisis of the late 90s.	1992-2002	HHI was used to measure the market concentration and P-R-Hstatistic to measure competition.	Observed remarkable increase in market concentration resulting from the reduction in the number of banks and then increase in the size distribution due to realignment of customers patronage. Market moved from moderately concentrated to a highly concentrated industry with competition significantly weak over the period 1998-2002.

S/N	Region	Author and year	Issues Addressed	Scope	Methodology	Results/Findings and Conclusion
6	DC	Park (2012)	Studied the pattern of bank mergers in <b>Japan</b> and their effect on competition.	1983-2006	Data was collected from city and regional banks. k-bank concentration ratios and Hstatistics estimated for the boom, the burst and the recovery periods.	Result showed both increase in the individual bank's market share and increase in overall banking market concentration with no harm done to degree of competition.
7	DC	Gajurel and Pradhan (2012)	Examined the evolution of the banking market concentration and tested the market competition of <b>Nepalese</b> banking industry	2001-2009	HHI and concentration ratios used to measure market concentration and market competition tested by the Panzar-Rosse H-statistic approach	Result shows low levels of market concentration with decreasing trend. The test of market competition with PR-hstatistics indicates monopolistic market behaviour among the Napalese banks. in addition the market for interest-based income was found to be more competitive than that of the market for fee-based income.
8	DC	Bruno (2012)	Investigated the relationship between the banking market concentration and competition in <b>Brazilian</b> banking market.		Employed the use of Herfindhal-Hirscham Index (HHI) and CR as indirect indicators of competition.	Negative relationship between market concentration and competition.
9	DC	Bikker & Haaf (2002)	Examined competitive conditions, market structure and their interrelationship in <b>23 OECD</b> countries	1900-2000	Applied the P-R model to measure degree of competition on local, national and international banks.	For all the 23 countries considered in estimation, the results showed the existence of monopolistic competition in the banking industry.
10	DC	Bikker (2003)	Investigated the degree of competition in both the deposit and loan markets in <b>nine European</b> countries		He applied the Bresnahan's model of market power.	He rejected the hypothesis of perfect competition for the deposit market of the entire EU. He concluded that the markets are characterised as highly competitive because the abuse of market power was very limited.
11	DC	Casu and Girardone (2003)	Investigated factors influencing the degree of competition in the banking sector of the <b>single European</b> market.			The result suggests that the degree of concentration did not relate to the degree of competition.

S/N	Reg.	Author and year	Issues Addressed	Scope	Methodology	Results/Findings and Conclusion
12	DC	Weill et al (2008)	Investigated the effect of banking competition on efficiency in the <b>Czech</b> banks looking at the relationship and the causality between competition and efficiency.	1994-2005	The study used quarterly data of Czech banks and employed the 5-bank concentration ratio and the HHI to infer the degree of competition	The result suggests that negative relationship exists between efficiency and competition and that the degree of concentration is not necessarily related to the degree of competition. Also the causality test shows that causality runs from both directions.
13	DC	Alessandro & Kevin (2008)	Assessed the degree of competition and relative efficiency of the <b>Marcedonia's</b> banking system- a sector that has a substantial change since late 1990s.	2002-2005	P-R Hstatistic method was adopted to test the degree of competition using quarterly data for 20 commercial banks.	The result showed that competition in the banking sector remained relatively weak.
14	DC	Podpiera (2007)	Investigated the relationship between competition and efficiency in <b>Czech</b> republic	1994-2005	He used the Granger-Causality Test	The result showed absence of increased competition in the Czech banking market. It showed that competition has negative effect on cost efficiency.
15	DC	Casu and Girardone (2006)	Examined the developments in competition, concentration and bank efficiency levels in the <b>single European market</b>		Performed causality test between competition and efficiency using dynamic panel data methods	The result suggested negative relationship between – efficiency and competition exists whereas causality running from competition to efficiency was weak though positive. The result suggested that the degree of concentration is not necessarily related to the degree of competition.
16	DC	Sun (2011)	Investigated the degree of bank competition in the <b>European area, the US and UK</b> before and after the financial crisis of 2007-2009 to determine if the introduction of European Monetary Union (EMU) and the euro had any impact on bank competition			Result shows that the degree of competition in the US and UK banking sector support monopolistic competition.
17	DC	Stararek & Repkova (2011)	Analyzed the competitive nature of <b>Czech</b> banks over a decade	1991-2000		The result indicated that sound conditions for competition were present in the banking industry of Czech. The degree of competitiveness declined after joining the EU in 2004.
18	DC	Bing and Michael (2013)			Learner index	The index failed to measure competition in the Chinese banking industry due to the regulation of interest.

S/N	Reg.	Author and year	Issues Addressed	Scope	Methodology	Results/Findings and Conclusion
19	Africa	Kot (2004)	Analyzed the implication of competition on the <b>South Africa</b> banking sector .		P-R Hstastic and Bresnahan model	The result was consistent with monopolistic competition. The degree of concentration was high and the banks are not acting as a cartel.
20	Africa	Aboagye et al (2005)	Analyzed the behaviour of <b>Ghanaian</b> banks to see if they possess power mainly on account of their size, efficiency and prevailing macroeconomic environment .			Result shows that Ghanaian banks possess market power mainly on account of their size, efficiency and the macro environment they operate in.
21	DC	Angelini and Cetorelli (2003)	Analyzed the behaviour of <b>Italian</b> banks to see if de-regulation of the sector fostered a reduction in price-cost margin (i.e. increased competition) i.e. higher Hstastic or lower Lerner index		P-R Hstastic, Lerner index PCM (Price-Cost Margin).	The result showed that de-regulation of the banking sector fostered a reduction in price-cost margin i.e. increased competition (higher Hstastic or lower Lerner index).
22	Africa	Buchs & Mathisen (2005)	Assessed the degree of bank competition and efficiency with regard to banks' financial intermediation in <b>Ghana</b>		Panel data method was applied to variables derived from a theoretical model.	The study found support for the presence of a noncompetitive market structure in the Ghanaian banking system hampering financial intermediation. Also the large deficit financing through the issuance of treasury bills has crowded out the private sector in capturing bank investment thus putting pressure on interest rates thereby making access to bank lending even more difficult for the private sector, thus hampering private sector development.
23	Africa	Simpasa (2011)	Analyzed the competitive nature of the <b>Tanzanian</b> banking industry.	2004-2008	The study utilized panel data of bank-level variables employing the P-R methodology in computing the competitive index-Hstat taking into account risk, efficiency, regulatory and macroeconomic factors.	The result showed that banks in Tanzania earned their income under conditions of oligopolistic conduct, moreover the competitive index derived from an interest revenue equation was not significantly different from that obtained using an aggregate revenue measure. Thus the conclusion was that the degree of contestability from traditional intermediation activities approximates the overall bank behaviour.

S/N	Reg.	Author and year	Issues Addressed	Scope	Methodology	Results/Findings and Conclusion
24	Africa	Sunil and Binsheng (2011)	Investigated the impact of financial reforms on competitiveness and production efficiency of the banking sector, as well as the short-term and long-term impact on economic growth in <b>Egypt</b> .	1992-2007		The result suggested that reforms had a positive and significant effect on competitiveness and production efficiency. Also evidence showed that state – owned banks are generally less competitive than private banks and foreign banks are less competitive than domestic banks. Overall the results supported the argument for continuing the financial sector reforms in <b>Egypt</b> .
25	Nigeria	Somoye (2008)	Examined the performance of government-induced bank consolidation and macroeconomic performance in <b>Nigeria</b> in a post-consolidation period.	2005-2007	Data obtained from the published audited accounts of 20 out of 25 banks in Nigeria post-consolidation together with data from the Central Bank of Nigeria were analyzed.	The analysis showed that the consolidation programme had not improved the overall performances of banks significantly and has only marginal contribution to the growth of the real sector. The study concluded that the banking sector was becoming more competitive.
26	Nig	Ajisafe and Akinlo (2013)	Tested for the degree of competition in the banking sector of <b>Nigeria</b>	1990-2009	Panzar-Rosse methodology of H-stats was equipped on a data obtained from the annual reports of 15 commercial banks which were purposively selected. The techniques of analysis was the GMM estimation technique with fixed effect	The results showed that the Nigerian commercial banks were characterised by monopolistic competition with Hstats significantly different from zero for all sample periods and sub-sample periods.
27	Nig	Ayeni et al (2013)	Investigated competitive condition in the banking sector of Nigeria after the consolidation reform.	2006-2010	Data was obtained from 18 out of 24 banks in Nigeria post-consolidation and analyzed with a fixed effect panel model. The model took cognizance of risk, efficiency regulatory and macroeconomic factor with the aid of PR-Hstat to compute the competitiveness index.	The result, going by the magnitude of the Hstat showed that banks in Nigeria earned their income under an averagely monopolistic competitive market. This means that bank's revenue are sufficiently sensitive to changes in input cost thereby signaling some degree of competitive pressure at play in the Nigerian banking sector.
28	Afr.	Simpassa (2013)	Evaluated the degree of competition in the <b>Zambian</b> banking sector in the wake of dynamic market shifts induced by entry of new foreign banks and privatization of the state-owned bank	1998-2011	Using quarterly unbalanced panel observation for 19 chartered commercial banks in Zambia. Competition was measured with the PR-Hstatistic and the time varying learner index to check/corroborate one another	The result showed that Zambian banks earned their revenue under conditions of monopolistic competition. Also that risk taking, revenue diversity and regulatory intensity are all important-determinants of market power. Finally that increased foreign bank penetrations and divestiture of state ownership in banking can heighten competitive pressure in the banking sector.

S/N	Bias	Author and year	Issues Addressed	Scope	Methodology	Results/Findings and Conclusion
29	Nig	Ajisafe and Akinlo (2014)	Examined the relationship between competition and efficiency of commercial banks in <u>Nigeria</u> .	1990-2009	Data was sourced from the annual report of 15 commercial banks. The data was analyzed using pooled least square and dynamic GMM estimation technique with fixed effect. The study used the intermediation ratio measured by the ratio of loans to total deposit to proxy competition and ROA to proxy efficiency.	The results of the analysis showed that there was a positive and significant relationship between the degree of competition and the level of efficiency of commercial banks in Nigeria. The study concluded that the reforms introduced in the banking sector in the late 80's, raised the degree of competition and improved the efficiency of the Nigerian commercial banks.
30	Nig.	Central Bank of Nigeria (2013)	Assessed bank performance, intermediation, growth and competition in the <u>Nigerian</u> banking sector	1990-2010	Aggregated data sourced from CBN as opposed to bank-level data was used. Simple ratios like loans/deposit, COB/M2, M2/gdp, PSC/gdp, PSC/total dep. were employed to highlight the effectiveness and efficiency of bank intermediation in Nigeria.	The result indicated that though the HHI with respect to total asset and deposit increased after the bank consolidation exercise, the industry remained largely competitive as concentration declined slightly. The study cautioned that except similar studies are done, this outcome may not be sufficient to safely and conveniently conclude that the banking industry is competitive enough to attract investments.
31	Nig.	Saibu (2014)	Investigated the degree of competition and concentration in the <u>Nigeria</u> banking industry since 2001 dividing the periods to 2001-2004 and 2005-2013 in order to inquire on the implication of 2005 bank consolidation on the competitiveness of banks in Nigeria.	2001-2013	Employed the use of a detailed bank-level panel data set and measured competition using the PR-Hstatistic and the Lerner Index. The periods were divided into 2001-2004 and 2005-2013 in order to inquire on the implication of 2005 bank consolidation on the competitiveness of banks in Nigeria.	The result showed that over the sample period, Nigerian banks exhibited elements of monopolistic competitive behaviour. Over the period, the Lerner index showed a growing intensity of competition particularly with post-consolidation period.
32	DC	Yildirim and Phillippates (2002)	Analyzed the evolution of competitive conditions in the banking industries of <u>14 centralized Eastern European</u> transaction economies	1993-2000	PR – Hstatistics	The results suggested that the banking markets of these countries could not be characterised by the bipolar cases of either perfect competition or monopoly. Furthermore, the cross-sectional analysis of competitive structure revealed initially a decreasing trend between 1993 and 1996 and a subsequent increasing trend. Larger banks in these countries operated in a relatively more competitive environment compared to the small banks.

S/N	Bias	Author and year	Issues Addressed	Scope	Methodology	Results/Findings and Conclusion
33	DC	Mulyaningsih and Daly (2011)	Examined competitive conduct of the banking industry of <b>Indonesia</b>	2001-2009	Used an unconsolidated annual financial report of subsamples of large, medium-sized and small commercial banks. PR method was used to measure competition	The results indicated that banks in all three subsamples, large, medium-sized and small are working in a monopolistically competitive market. The study also showed that the most competitive market was the medium-sized banks which were least concentrated. The study established the existence of an inverse relationship between concentration and competition thus validating the structure-conduct performance paradigm.

## **Appendix 2: Stylized Facts about Commercial Banking Sub-sector in Nigeria in 2013/2014**

Macroeconomic fundamentals affecting the performance of the commercial banking sub-sector in Nigeria include the real gdp growth, inflation, oil prices, monetary policy rates (mpr).

### **Output**

Despite the slowdown in some emerging market economies, including the BRICS, the Nigerian domestic economy remained strong in the second half of 2013 as growth in output rose by 1.2 percentage points above its level of 6.5 per cent in the preceding period. The development was attributed to the increase in the contribution of the non-oil sector, reinforced by the relative stability in monetary and fiscal policies. The nonoil sector, in the fourth quarter, recorded a growth of 8.73 per cent, in real terms, and contributed 88.27 per cent to real GDP, compared with the growth of 7.95 and 8.21 per cent in the third quarter of 2013 and the corresponding quarter of 2012, respectively. The growth in the non-oil sector was driven by activities in the telecommunications and postal services (26.73%), building and construction (14.96%), solid minerals (13.61%), hotels and restaurants (13.48%), wholesale and retail trade (11.33%), real estate and business services (11.02%), manufacturing (8.81%), and agriculture (4.29%). The oil sector recorded a real growth rate of 0.30 per cent and contributed 11.73 per cent to GDP in the fourth quarter of 2013, in contrast to the negative growth of 1.15 and 0.53 per cent recorded in the second and third quarters of 2013, respectively. Its contribution to GDP was; however, lower than the 12.50 per cent recorded in the second quarter of 2013. The rise in the growth rate of the oil sector was attributed to improved production levels.

## **Inflation**

Inflation was generally mild in the second half of 2013, due largely to price moderation in both food and non-food commodities classification. Year-on-year headline inflation stood at 8.0 per cent in December 2013, down from 8.4 per cent at end-June 2013 and a decline of 4.0 percentage points from the level in December 2012. Furthermore, core and food inflation declined to 7.9 and 9.3 percent at end-December 2013, from their respective levels of 13.7 and 10.2 per cent in December 2012.

## **Interest Rates**

Rates generally trended upwards with the exception of the Inter-bank Call and the Open-Buy-Back (OBB) rates. The development was largely attributed to the continued monetary tightening stance of the CBN. During the review period, the Bank maintained its policy rate at 12.00 per cent. Consequently, the average term deposit rate rose to 6.64 per cent, from 6.58 per cent in the first half of 2013 similarly, rates for other deposits with various maturities rose to a range of 1.71 - 7.92 per cent in the second half of 2013, from a range of 1.34 - 7.72 per cent in the first half of 2013. However, the average Inter-bank Call and Open Buy-Back (OBB) rates stood at 11.02 and 11.07 per cent in the second half of 2013, down from 11.69 and 11.27 per cent in the first half of 2013, respectively. The prime and maximum lending rates rose by 0.47 and 0.37 percentage points, respectively, to 17.09 and 24.93 per cent in the review period. Thus, the spread between the maximum lending and the average term deposit rates stood at 18.30 percentage points, a 0.32 percentage point over the level in the first half of 2013. With the inflation rate at 8.0 per cent in December 2013, all deposit rates were negative in real terms, while lending rates were positive in real terms. The negative real rate of return on deposits, which has been a disincentive to

savings, remained a major challenge to capital accumulation and the ability of banks to build a sustainable long-term loanable funds base. As part of efforts to improve the savings culture, the CBN continued to initiate and encourage banks to implement customer friendly policies. Specifically, the recently revised Guide to Bank Charges specifies the minimum interest rate payable on savings accounts at 30 per cent of the ruling MPR.

### **Money and Credit Supply**

Broad money supply (M) grew by 2 0.5 per cent to N15, 668.95 billion at the end of the second half of 2013. The increase in money supply relative to the position during the preceding half year reflected, largely, the respective 14.4 and 17.3 per cent rise in net domestic credit and other assets (net) which more than offset the 7.1 per cent decline in net foreign assets of the banking system. Over the level at end-December 2012, M2 rose by 1.2 per cent, due largely, to the 18.5 per cent increase in net domestic credit, which more than offset the respective 26.0 and 5.9 per cent decline in other assets (net) and foreign assets (net) of the banking system. Narrow money supply (M) rose by 1.11 per cent at end-December 2013, in contrast to the 6.5 per cent decline at the end of the first half of 2013. The increase relative to the position in the preceding half year was attributed, largely, to the 28.3 per cent rise in currency outside banks (COB). As a ratio of total monetary assets, COB stood at 9.2 per cent, compared with the 7.2 per cent recorded at the end of the preceding half year. Net domestic credit (NDC) to the economy grew by 7.3 per cent to N15, 040.7 billion at end-December 2013, compared with N13,149.4 billion at end-June 2013. This reflected the 42.2, 17.3 and 5.2 per cent growth in claims on the Federal Government, and other assets (net) and claims on the private sector, respectively.

## **Market Structure**

The banking industry was dominated by a few banks but however, it remained competitive in both deposits and assets as revealed by the respective Herfindahl-Hirschman Index (HHI) of 798.08 and 750.16 for total deposits and assets, compared with 797.36 and 748.55, respectively, in the preceding period.

## **Post-consolidation Features of Nigerian Banks**

Nigerian Banks post-consolidation have witnessed rapid advancement in information technology leading to development of several new exotic products (ATM, EFT, e-banking, electronic purse, POS, internet banking etc. other changes involve the legal environment (liberalization/deregulation, economic and financial integration within the ECOWAS region.

Subsequent changes in banking behaviour and the structure of financial markets include:

- *Internationalization* – Increase involvement of Nigerian banks in offering financial services to foreign business and individuals in ECOWAS sub-region, Europe, America etc.
- *Dis-intermediation* – i.e. lower market shares for traditional intermediation products like savings and lending while other type of banking activities (fee-based activities like guarantees etc.) are on the increase.
- *More Foreign Competition* – As transactions are denominated more in US \$, Euro, pound sterling, Dutchmarks, Yen, Yuan etc. and increased patronage on domiciliary accounts.

- *Market determined, mergers and acquisition*– The above have consequences on lower profit margins, increased efficiency and cost reduction. Banks therefore have needs to step up production of higher volume of business to offset the reduced margins.

### **Implementation of the 2010 Banking Model**

The deadline for the implementation of the prescribed banking model introduced in October 2010 expired on June 30, 2013. At end-December 2013, most of the banks had complied with the Regulation on the Scope of *Banking Activities* and Ancillary Matters by divesting from their non-banking activities.

### **Non-Interest (Islamic) Banking**

As part of efforts to promote non-interest banking (NIB) in Nigeria, the CBN intensified collaboration with international agencies, such as the Islamic Financial Services Board (IFSB) and the International Islamic Liquidity Management Corporation (IILM) in the review period. As evidence of growing interest in NIB products and services in Nigeria, one bank was granted approval to operate a non-interest banking window, while an Approval-in-Principle (AIP) was issued to a micro-finance bank (MFB) to establish a state-wide non-interest MFB during the review period. A new unit was created in the CBN to formulate policies on Islamic finance and serve as a secretariat for the Financial Regulation Advisory Council of Experts (FRACE). The roles and responsibilities of the Unit include the following:

- Develop policies on the Non-Interest Financial Institutions (NIFIs) under the purview of the CBN;
- Process requests for the establishment of NIFIs;

- Develop guidelines for the operations of NIFIs;
- Arrange and co-ordinate the meetings of FRACE;
- Receive requests and queries directed to the Council from NIFIs and other regulatory authorities; and
- Develop parameters for noninterest products and instruments issued by the NIFIs.

### **Cross-border Collaboration**

Nigerian banks continued to expand their operations outside the country with the opening of seven subsidiaries across the African continent during the review period, bringing the total to 64 at end-December 2013. The increase in foreign subsidiaries was as a result of four acquisitions in West Africa and three in East Africa, while one bank divested from a subsidiary in West Africa. The cross-border expansion of Nigerian banks has continued to be motivated by several factors which include profit maximization, risk diversification, the demand pull from corporate clients, and increasing business opportunities. However, the expansion exposes the Nigerian financial system to regional contagion risk.

The major thrust in managing the contagion risk is the timely exchange of information amongst home and host regulatory authorities. This is facilitated through the execution of MOUs, the activities of the College of Supervisors, and cross-border examination.

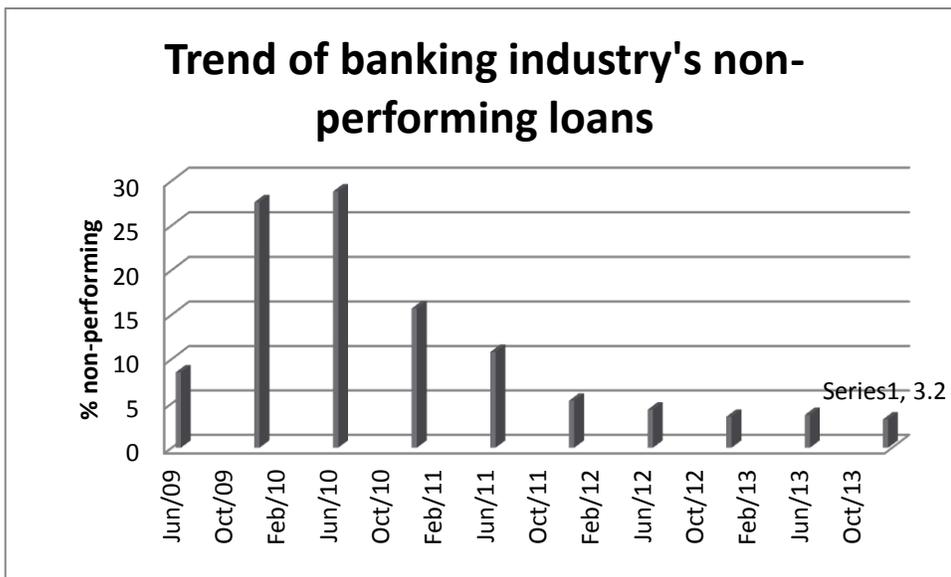
### **Nigerian Sustainable Banking Principles**

The CBN and the entire banking industry have adopted the Nigerian Sustainable Banking Principles. This is to ensure that financial institutions get committed to economic growth

that is environmentally responsible and socially relevant. The Nigerian Sustainable Banking Principles consist of the following nine overarching commitments:

- Managing environmental and social risks;
- Managing each bank's own environmental and social footprints;
- Safeguarding human rights;
- Promoting women's economic participation and empowerment;
- Promoting financial inclusion;
- Ensuring good governance, transparency and accountability;
- Supporting capacity building in the sector;
- Promoting collaborative partnership to accelerate sector progress; and
- Reporting to take stock of progress.

During the review period, the Bank issued guidelines on sustainable bank lending to the power, aviation as well as the oil and gas sectors. A reporting template was also developed to standardize reporting by financial institutions.



### **Asset and Liquidity-based Indicators**

The quality of assets of the banking industry improved slightly in the second half of 2013, compared with the first half. The ratio of non-performing loans (NPLs) to total loans dropped by 0.5 percentage point to 3.2 per cent at end December 2013, from 3.7 per cent at end-June 2013 (Figure 3.1). The improvement in asset quality was attributed to stricter adherence to credit risk management policies and standards by banks. The ratio of core liquid assets to total assets increased by 1.2 percentage points to 22.2 per cent at end-December 2013, from 21.0 per cent at end-June 2013. Similarly, the ratio of liquid assets to short-term liabilities improved by 0.9 percentage points to 25.2 per cent at end-June 2013.

### **Capital-based Indicators**

The average ratio of regulatory capital to risk weighted assets stood at 17.2 per cent at end-December 2013, showing a decrease of 1.7 and 1.1 percentage points, respectively, below the levels at end-June 2013 and end-December 2012. Similarly, the ratio of Tier 1 capital to risk weighted assets of 17.1 per cent at end-December 2013 was 1.4 and 0.9 percentage points below the levels at end-June 2013 and end-December 2012, respectively.

The industry ratio of nonperforming loans (net of provisions) to capital remained stable at 7.4 per cent at end-December 2013. On the whole, the above scenario reflected a strong capital base for Nigerian banks.

### **Income and Expense-based Indicators**

The ratio of interest margin to gross income increased to 64.9 per cent in their view period, from 63.9 per cent at end-June 2013. The ratio of non-interest expenses to gross income rose by 5.9 percentage points to 68.9 per cent at end-December 2013. Conversely, the ratio

of personnel expenses to non-interest expenses fell by 3.2 percentage points to 36.5 per cent, from 39.7 per cent at end-June 2013. (Table 3.1)

## Financial Soundness Indicators

Table 3.1. Selected Financial Soundness Indicators of the Nigerian Banking Industry.

	2009		2010		2011		2012		2013	
	1	2	3	4	5	6	7	8	9	10
	End June	End Dec								
<b>1. Asset-based Indicators</b>										
Non Perf Loans to gross loans	8.5	27.6	28.8	15.7	10.8	5.3	4.3	3.5	3.7	3.2
Liquid assets to total asset	15.6	16.5	17.2	17.2	22.6	25.7	23.5	24.7	21	22.2
Liquid assets to shrt-term liab	21.5	22.3	19.4	19.8	25.7	31.3	28.1	28.9	24.3	25.2
Return on Assets (ROA)	1.7	-8.9	1	3.9	0.9	0.1	1.5	1.2	1.4	0.8
<b>2. Capital-based Indicators</b>										
Reg capital to risk-wted assets	22.4	4.1	1.5	1.8	4.2	17.9	17.7	18.3	18.9	17.2
Tier1 capital to risk-wted assets	21.9	2.9	2.4	2.2	4.5	18.1	17.8	18	18.5	17.1
NPLs net of prov. to capital	12.5	106.8	289.8	192.7	74.3	10.1	6.8	6.1	7.4	7.4
Return on Equity (ROE)	8.9	-222.8	50.2	265.2	29.4	0.5	13.1	11.2	12.4	7.7
<b>3.Inc. &amp;exps based Indicators</b>										
Int margin to gross income	60.1	57.8	54	53.7	50.8	45.2	64.6	64.3	63.9	64.9
Non-intexps to gross income	64.5	81.2	80.5	66.9	72.9	75.4	64.8	64.9	63	68.9
Personexps to gross income	46.7	47.6	45.5	42.8	44.6	36.1	43.6	43.9	39.7	36.5

Source: CBN Financial Stability Report, December, 2013

## Liquidity Stress Test

The liquidity stress test was conducted at end-December 2013 to assess the resilience of the banking industry to liquidity and funding shocks, using the Implied Cash Flow Analysis (ICFA) and Maturity Mismatch/Rollover Risk approaches. The test revealed that, after the 5-day and cumulative 30-day shocks were applied, the industry liquidity ratio (LR) declined to 12.2 and 10.4 per cent, respectively, from 50.53 per cent. Most banks' LRs were also below the 30.0 per cent threshold after the two scenarios. Furthermore, three

(3) banks recorded a negative LR, following a cumulative 30-day shock. Two of these banks were among the categorised “large banks”. In general, the banking industry was resilient to liquidity stress, although the test results indicated deterioration in the banks' resilience, compared with the position in the preceding period.

### **Contagion Risk Analysis through Inter Bank Exposures**

The contagion risk analysis assessed the effect of the financial interconnectedness of institutions in transmitting shocks to individual banks and the banking system as a whole. The test was conducted using a network analysis tool which evaluates sets of bilateral links among different financial institutions. It assessed the impact of a failure or a weakness of multiple financial institutions on the entire banking system arising from exposures across institutions. The analysis revealed that contagion risk through interbank exposures in the banking sector was minimal, as all the placing banks met the minimum CAR. Also, the industry position was above the minimum required CAR.

### **Risk Management**

Stress tests conducted on the banks by CBN in December 2013 to assess the stability of the sector from shocks emanating from credit/credit concentration risk, liquidity risk, interest rate risk, exchange rate risk, foreign exchange trading risk etc. revealed that on the whole, the banking industry was adjudged as being stable and resilient to most of the shocks, even with severe shock scenarios.

### **Implementation of Basel II/III**

For effective implementation of the Basel II/III framework in Nigeria, the CBN issued the *Guidance Notes on the Calculation of Regulatory Capital* to the banking industry in 2013.

The Guidance Notes took cognisance of the peculiarities of Nigeria's local environment and, therefore, required banks to:

- Commence a parallel run of capital adequacy computation, based on the requirements of the new guidelines alongside Basel I requirements, effective January 1, 2014 and migrate fully to Basel II by June 2014;
- Adopt basic approaches for calculating credit, market and operational risks capital requirements for the first two years, in anticipation of the development of an effective rating system in Nigeria. This would also afford banks sufficient time to gather the required data and acquire necessary experience for the adoption of the more advanced approaches;
- Carry out an Internal Capital Adequacy Assessment Process (ICAAP) on an annual basis, as at December 31, and forward copies of the assessment report to the CBN for review, not later than four (4) months after the year end, beginning from 2014; and Comply with the Pillar 3 disclosure requirements on a biannual basis. The implementation of Basel II/III in Nigeria is expected to enhance the safety and soundness of financial institutions and promote broad stability of the financial system.
- Any breach of the single obligor limit shall be regarded as impairment of capital;
- Lending by a bank to its financial holding company would be regarded as return of capital and shall, accordingly, be deducted from the capital of the bank in the course of computing its capital adequacy ratio; and

- Lending to subsidiaries within the group shall be risk-weighted at 100 per cent, provided they are fully collateralised. Otherwise, such exposures would be taken as reduction of capital and be deducted from capital during capital adequacy computation.

### **International Financial Reporting Standards (IFRS)**

Annual financial statements of banks and discount houses will continue to be rendered in the IFRS reporting format, having commenced same in the first half of 2013. This is part of the measures aimed at enhancing transparency and comparability of financial statements of Nigerian banks.

### **Growth Drivers**

Growth drivers in the Nigerian banking industry include modern technology, effective regulation, products innovation, access to low-cost deposits, strong risk management, effective internal controls, good corporate governance and strong capital base.

### **Corporate Governance**

Corporate governance in the banking industry encompasses the processes, customs, policies, laws and institutions that impact the way an institution is controlled. It involves the set of relationships between bank's stakeholders (management, board and shareholders etc) and deals with prevention of conflicts of interest among these groups within the context of overall corporate goals.

Good corporate governance hinges on the competence and integrity of the board and management and ultimately leads to better management of resources as well as better operating performance for banks. Successful banks therefore are those with directors of

good standing with necessary experience, skills and willingness to support the banks as needs demand. Failure of corporate governance was a major contributor to the Nigerian banking distress of 2009. There was insider abuse and lack of proper oversight from directors, while the boards of several banks lacked independence. Directors' responsibilities were compromised due to conflicts of interest, while several board members lacked the necessary expertise to effectively oversee banks' affairs. However, following the crisis, the CBN took a more proactive stance on corporate governance by revising some aspects of its corporate governance code and also focusing on compliance.

### **Payment System**

The CBN deployed a new real-time gross settlement (RTGS) system in 2013 for the settlement of inter-bank fund transfers, customers' transfers and net positions from clearing systems on real-time basis. The new system interfaces with the Scrip less Securities Settlement System (S4) to facilitate simultaneous delivery and payment thus mitigating settlement risks.

The Bank extended its cash-less policy, earlier launched in Lagos, to five additional States and the FCT, effective October 1, 2013. This reduced the cost of cash management, increased efficiency of the payments system, and enhanced financial inclusion. The CBN, in collaboration with the Bankers Committee, commenced the development of a biometric solution to address the challenges posed by the absence of a unique identifier in the Nigerian banking industry (BVN).

The volume and value of NIBSS Electronic Funds Transfer (NEFT) increased to 16,115,171 and N7,569.17billion at end-December 2013, from 13,918,838 and N6,738.14

billion at end-June 2013, reflecting increases of 15.78 per cent and 12.33 per cent in volume and value, respectively.

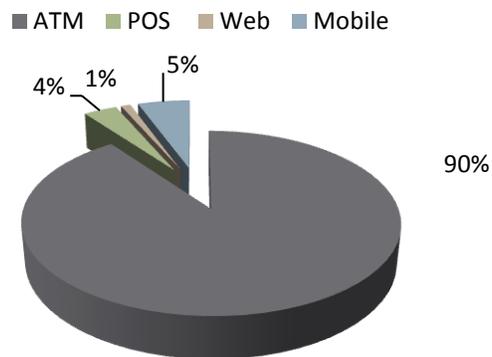
The volume and value of cheques cleared decreased to 8,257,330 and N4, 073.15 billion at end-December 2013, from 21,096,075 and N11,492.50 billion at end-June 2013, thus reflecting decreases of 40.23 and 13.09 per cent, respectively.

Electronic card (e-card) transactions rose to N1,764.11 billion in the second half of 2013, from N1,416.10 billion in the first half of 2013, reflecting an increase of 20.04 per cent, while the volume increased to 176,413,492 at end-December 2013, from 146,961,511 at end-June 2013.

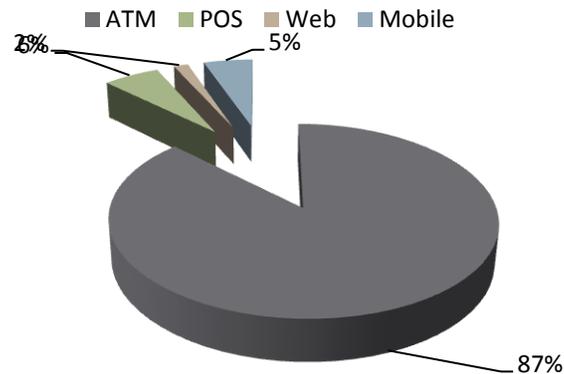
Automated teller machines (ATMs) remained the dominant channel of electronic payments. ATMs accounted for 89.92 per cent, followed by mobile payments with 5.55 per cent and PoS terminals with 3.51 per cent. The Internet as a payment channel (e-commerce) is yet to be fully embraced by the banking public. Thus, it remained the least patronised and accounted for only 1.02 per cent of the total. In value terms, ATMs accounted for 87.44 per cent; PoS, 5.88 per cent; mobile payments 5.17 per cent; while the Internet accounted for 1.51 per cent.

The number of ATMs rose to 12,755 at end-December 2013, from 11,702 at end-June 2013. The volume of ATM transactions increased in December 2013 to 158,629,927, from 136,663,013, reflecting an increase of 16.07 per cent, while the value increased to N1,542.59 billion from N1,286.35 billion at end-June 2013, reflecting an increase of 19.92 per cent.

## Volume of Electronic payments by Product Type



## Value of electronic payments of the banking industry by product type



### Regulatory Authorities

The Nigerian banking industry is regulated by the following key authorities:

- Central Bank of Nigeria (CBN)
- Nigerian Deposit Insurance Corporation (NDIC)
- The Securities and Exchange Commission (SEC)

Other ancillary supervisors include: Nigerian Stock Exchange, Federal ministry of finance, Financial Services Regulation Coordinating Committee (FSRCC), EFCC, ICPC and NDLEA.

Also they are influenced by professional bodies such as: The Chartered Institute of Bankers of Nigeria (CIBN), financial market dealers association of Nigeria and the Financial Reporting Council of Nigeria (FRCN).

**Appendix 2a: Category A Banks: Banks not Consolidated but Liquidated**

1. AFEX BANK
2. ALL STATES TRUST BANK
3. ASSURANCE BANK
4. CITY EXPRESS BANK
5. EAGLE BANK
6. FORTUNE BANK
7. GULF BANK
8. HALLMARK BANK
9. LIBERTY BANK
10. METROPOLITAN BANK
11. TRADE BANK
12. TRIUMPH BANK
13. LEAD BANK

**Appendix 2b: Category B Banks: Banks that Merged During the 1<sup>st</sup> Phase of the Consolidation Exercise**

<b>NAME</b>	<b>BANK COMBINATIONS</b>	<b>NEW NAME</b>
1. ACCESS BANK PLC	ACCESS+MARINA+CAPITAL BANK	ACCESS BANK
2. AFRIBANK PLC	AFRIBANK+AFRIBANK INTERNATIONAL	AFRIBANK
3. DIAMOND BANK PLC	DIAMOND+LION BANK	DIAMOND BANK
4. BANK PHB PLC	PLATINIUM+HABIB	BANK PHB
5. EQUITORIAL TRUST BANK PLC	EQUITORIAL+DEVCOM	EQUITORIAL TRUST BANK
6. FIRST CITY MONUMENT BANK PLC	FCMB+CDB+NAM BL+MIDAS	FCMB
7. FIDELITY BANK PLC	FIDELITY+FSB+MANNYBANK	FIDELITY BANK
8. FIRST BANK PLC	FIRST BANK+FBN MERCHANT BANK+MBC	FIRST BANK
9. FIRST INLAND BANK PLC	FIRST ATLANTIC+INLANDBANK+IMB+NUB	FINBANK
10. IBTC-CHARTERED BANK PLC	IBTC+CHARTERED BANK+REGENT BANK	IBTC
11. INTERCONTINENTAL BANK PLC	INTERCONTINENTAL+GATEWAY+EQITY+GLOBAL	INTERCONTINENTAL BANK
12. OCEANIC BANK PLC	OCEANIC+INTERNATIONAL TRUST BANK	OCEANIC BANK

13. SPRING BANK PLC	CITIZEN+OMEGA+GUARDIAN EXPRESS+FOUNTAIN TRUST+ACB +TIB	SPRING BANK
14. SKYE BANK PLC	PRUDENT+BOND+EKOBANK+COOP BANK+RELIANCE	SKYE BANK
15. UBA PLC	UBA+STANDARD TRUST BANK	UBA
16. STERLING BANK PLC	INDO-NIGERIA+TRUST BANK+NBM+MAGNUM+NAL	STERLING BANK
17. UNION BANK PLC	UNION BANK+UNION MERCHANT BANK+BROAD BANK+UTB	UNION BANK
18. UNITY BANK PLC	NNB+BON+PACIFIC+INTERCITY+INT ERSTATE+TROPICAL+ CENTER POINT+SOCIETE BANCAIRE+NEW AFRICA BANK	UNITY BANK
19. WEMA BANK PLC	WEMA+NATIONAL BANK	WEMA BANK

**Appendix 2c: Category B1: Banks that Achieved Consolidated Status Alone**

S/N	NAME OF BANKS
1	GTBANK
2	STANBIC BANK
3	STANDARD CHARTERED BANK
4	ZENITH BANK
5	NIGERIAN INTERNATIONAL BANK

About 13 banks that had financial statements before the exercise had none after as they ceased to exist (category A, e.g. Trade bank). Also some banks that had separate existence before consolidation went into merger with other banks and came out with new names while the old corporate existence ceased (category B, e.g. Unity bank). The study employs the use of the 24 banks in existence as at December 2005 (see note 1) and aggregated the figures of the component parts for those category B banks in the pre-2005 periods (e.g. Unity bank). Although the financial statements are available for analysis, the level of data aggregation and classification differ in some banks (e.g. other income, other operating expenses) thus making comparison of like with like a bit difficult.

#### **Appendix 2d: Category C: Second Phase of Bank Consolidation**

- |                                   |            |
|-----------------------------------|------------|
| 1. EQUITORIA TRUST +STERLING BANK | AQUISITION |
| = STERLING BANK                   |            |
| 2. FCMB+FINBANK                   | AQUISITION |
| = FCMB PLC                        |            |
| 3. IBTC+ STANBIC                  | MERGER     |
| = STANBIC-IBTC                    |            |
| 4. ACCESS+INTERCONTINENTAL        | AQUISITION |
| = ACCESS BANK PLC                 |            |
| 5. ECOBANK+OCEANIC                | AQUISITION |
| = ECOBANK PLC                     |            |
| 6. UNION BANK+AFRICAN CAPITAL     | AQUISITION |
| = UNION BANK                      |            |

## Appendix 2e: Special Purpose Vehicle- Later Funded by MCON

- MAINSTREET BANK                      AQUIRED                      AFRIBANK PLC
- KEYSTONE BANK                      AQUIRED                      BANK PHB PLC
- ENTERPRISE BANK                      AQUIRED                      SPRING BANK PLC

## Appendix 2f: Banks in Nigeria by Category of Licences as at 31/12 /2014

### S/N                      **International Banks (N50b minimum SHF)**

- 1                      Zenith Bank plc
- 2                      First Bank of Nigeria plc
- 3                      Guaranty First Bank plc
- 4                      United Bank for Africa plc
- 5                      Access Bank plc
- 6                      Diamond Bank plc
- 7                      Fidelity Bank plc
- 8                      Skye Bank plc
- 9                      First City Monument Bank plc
- 10                      Union Bank of Nigeria plc

### S/N                      **National Banks (N25b minimum SHF)**

- 1                      Stanbic-IBTC Bank plc
- 2                      Standard Chartered Bank ltd
- 3                      Sterling Bank plc
- 4                      Unity Bank plc
- 5                      Citibank Nigeria ltd
- 6                      Mainstreet Bank ltd
- 7                      Ecobank Nigeria ltd
- 8                      Enterprises Bank ltd
- 9                      Keystone Bank ltd

### S/N                      **Regional Banks (N10b minimum SHF)**

- 1                      Wema Bank plc
- 2                      Heritage Bank

### **Appendix 3: Other Models of the New Empirical Organisation Framework (NEIO)**

#### **Iwata Model**

In the Iwata model (Iwata, 1974), the right-hand side of equation (2.12) is written as:

$$\lambda_i = \eta \left[ \left( W_i \frac{dx_i^*}{dq_i} - p^* \right) / p^* \right] / MS_i - 1 \quad (2.13)$$

Thus the model allows for the estimation of conjectural variation values for individual banks supplying a homogenous product in an oligopolistic market. To the best of our knowledge, this model is not widely applied to the banking industry. Its inclusion here is for completeness. A generic problem with this type of model is the fact that some of the profitability determinants are either interrelated or cannot be observed in practice. In order to solve a possible identification problem when applying this model empirically, we generally begin by defining a set of limiting assumptions. In this case, the Iwata model assumes that  $p$  and  $MS_i$  are strict functions of exogenous variables, and that  $\eta$ , the elasticity of demand, is constant. With this, we can derive an indirect estimate of the conjectural variable  $\lambda_i$  by estimating a market demand function and cost functions for individual banks to quantify the conjectural variation for each bank. Applying this model to the banking industry is difficult particularly in situations where micro data for the structure of cost and production for homogenous bank products are scarce or lacking altogether.

#### **Bresnahan and Lau Model**

Contrary to Iwata (1974), Bresnahan (1982) and Lau (1982) assume that all banks are equal and identical and can make an aggregate analysis. They determine the level of

market power in the banking market and take averages of equation (2.06) thus obtaining:

$$P^* + f(q) \sum_i \left( \frac{dq}{dq_i} \right) \left( \frac{1}{N} \right) q_i - \sum_i \left( \frac{w_i dx_i^*}{dq_i} \right) / N = 0 \quad (2.14)$$

This is equal to:

$$P^* = \lambda f^1(q)q + W \quad (2.15)$$

If we define  $\lambda_i$  as  $\frac{dq}{dq_i} / \eta = (1 + d(\frac{\sum_i + jq_j}{dq_i})) / N$  and assume that all banks are equal (so that  $\lambda = \lambda_i, \forall i$ ).  $W$  stands for weighted input prices. Banks maximize their profits at the point where  $MC =$  perceived  $MR$ . the perceived  $MR = P$  in competitive equilibrium and with the industry's  $MR$  in the collusive extreme (Shaffer, 1993).

The conjectural variation parameter  $\lambda$ , was determined by simultaneous estimation of the market demand and supply curves (see equations 2.21 and 2.26).

For the average bank in a perfectly competitive market, the restriction  $\lambda=0$  holds, as in a competitive equilibrium,  $P = MC$ . Since firms in a perfectly competitive market are price takers, an increase in output by one firm must lead to an analogous decrease in output by the remaining firms, in line with equation (2.15).

Under Cournot equilibrium, the conjectural variation ( $d \frac{\sum_{i \neq j} q_j}{dq_i}$ ) for firm  $i = 0$  so that  $\lambda = 1/\eta$  and from equation 2.15.

$P^* + h(\bullet)/n = w$ , with  $h(\bullet) = f_1(q)q$  representing the semi elasticity of market demand..

Under perfect collusion, an increase in output by one of the colluders leads to a proportional increase in output by all other colluders, yielding  $\lambda = (1 + d \frac{\sum_{i \neq j} q_j}{dq_i}) / N = (1 +$

$\frac{(q-q_i)}{q_i} \eta = \frac{q}{(q_i \eta)} = 1$ , for all  $\forall_i$ , so that  $P^* + h(\bullet) = w$ . Hence under normal conditions, the parameter  $\lambda$  takes the values between zero and unity. So  $\lambda = 0$  implies perfect competition and

$\lambda = 1$  implies perfect cartel

$0 < \lambda < 1$  implies other oligopoly conditions

The Bresnahan model in use here is based on the intermediation paradigm of a bank, as in Shaffer (1989, 1993) who further assumes that banks produce only one product and use several input factors with cost functions based on factor input prices. Taking for granted that factor inputs are not the same for loans and deposits, our Bresnahan model separates the costs of both banking activities.

Demand and supply relations are estimated separately for the deposit and loan markets based on the assumption that banks will maximize profits at the product level. Assuming  $n$  banks in the industry supplying a homogenous product, the profit function of the average bank  $i$ , takes the form

$$\pi_i = pq_i - C_i(q_i, S_i) - F_i \quad (2.16)$$

Where  $\pi_i$  is profit,  $q_i$  is the volume of output,  $p$  is the output price,  $C_i$ , the variable cost.  $S_i$  is a vector of exogenous variables affecting the marginal cost but not the industry demand function and  $F_i$  are the fixed costs of bank  $i$ .

In the loan market, the output price  $p$  can be defined as the difference between the lending rate and the rate of risk-free investment (e.g. treasury bills). An alternative is to assume that  $p$  is equal to the lending rate and to include the funding rate as a cost factor. In the

deposit market, the output price  $p$ , is the difference between the risk-free rate and the deposit rate banks face a downward sloping market demand function, the inverse of which is defined as

$$U_{i,t} = \psi_i + \varepsilon_{i,t} \quad (2.17)$$

where  $D$  is a vector of exogenous variables affecting industry demand but not marginal costs.

The first order condition for profit maximizing of bank  $i$  yields:

$$\frac{d\pi_i}{dq_i} = p + f^1(q, D) \frac{dq}{dq_i} q_i - C_i(q_i, S_i) = 0 \quad (2.18)$$

Taking averages over all banks produces:

$$P + f^1(q, D) \frac{dq}{dq_i} \frac{1}{n} q - \sum_i C_i(q_i, S_i) / n = 0 \quad (2.19)$$

$$\text{so that: } P = \lambda f^1(q, D) q - \sum_i C_i(q_i, S_i) / n \quad (2.20)$$

where  $\lambda = (\frac{dq}{dq_i}) / n = (1 + \frac{\sum_{i \neq j} q_j}{dq_i}) / n$ . Thus,  $\lambda$  is a function of the conjectural variation of the average firm in the market. The conjectural variation (CV) of banks is defined as the change in output of all remaining banks anticipated by bank  $i$  in response to an initial change in its own output. As mentioned in (para 2.6.2), the restriction  $\lambda = 0$  holds in a perfectly competitive market, whereas  $\lambda = 1/n$  would indicate a cournot equilibrium. Under perfect collusion,  $\lambda$  would be equal to 1, so that under normal conditions, the  $\lambda$  parameter takes the values between 0 and 1.

If we re-define (eq. 2.17) above as a linear aggregate demand function for deposit facilities offered to non-banks, it will read:

$$DEP = \alpha_0 + \alpha_1 r_{dep} + \alpha_2 D + \alpha_3 D \bullet r_{dep} + \varepsilon \quad (2.21)$$

where DEP, the real value of total deposits,  $r_{dep}$ , the market deposit rate, are exogenous variables affecting industry demand for deposits but not marginal costs, such as disposable income, unemployment, the number of bank branches, the money market rate and the treasury bill rate and  $\varepsilon$  is the error term.

The marginal cost (MC) function for bank  $i$  in equation (2.18) is defined as:

$$MC_i = \beta_0 + \beta_1 DEP_i + \beta_2 S_i + V_i \quad (2.22)$$

Where  $S_i$  are exogenous variables influencing the supply of deposits (e.g. wages) and  $V_i$  is the error term.

Rearranging the aggregate demand function (2.21) yields the price function as:

$$r_{dep} = \frac{1}{\alpha_1 + \alpha_3 D} (DEP - \alpha_0 - \alpha_2 D - \varepsilon) \quad (2.23)$$

Which, multiplied by the deposits at bank  $i$ , yields its total revenue as:

$$TR_i = \frac{1}{\alpha_1 + \alpha_3 D} (DEP - \alpha_0 - \alpha_2 D - \varepsilon) DEP \quad (2.24)$$

and derived with respect to the deposits at bank  $i$ , its marginal revenues:

$$\begin{aligned} MR_i &= \frac{dTR_i}{dDEP_i} = \frac{1}{\alpha_1 + \alpha_3 D} (DEP - \alpha_0 - \alpha_2 D - \varepsilon) + \frac{1}{\alpha_1 + \alpha_3 D} \frac{dDEP}{dDEP_i} DEP_i \\ (2.25) \\ &= r_{dep} + \frac{\lambda \eta}{\alpha_1 + \alpha_3 D} DEP_i \end{aligned}$$

where  $\lambda$  is defined as below equation (2.20). Market equilibrium required the equality of marginal revenues and marginal costs, so that for each bank:

$$r_{dep} = -\lambda \frac{DEP}{\alpha_1 + \alpha_3 D} + \beta_0 + \beta_1^* DEP + \beta_2 S + V \quad (2.26)$$

where  $\beta_1^* = \beta_1/\eta$ ,  $\beta_2^* = \beta_2/\eta$  and  $S = \sum_i S_i$ .

In order to determine  $\lambda$ , the degree of competition of the average bank in the deposit market of the countries considered, the quantity and price equations, (2.21) and (2.26), respectively, must be estimated simultaneously as the parameters  $\alpha_1$  and  $\alpha_3$  occur in both equation. Lau (1982) and Bresnahan (1982) show that, whereas both the demand ( $\alpha$ ) and supply ( $\beta$ ) parameters are identified, the  $\lambda$  parameter is identifiable only if the demand function includes the endogenous interest rate (or price) and a cross term with one of the (other) explanatory variables and the interest rate.  $\lambda$  is identified only if the assumption  $\alpha_1 \neq 0$  and  $\alpha_3 \neq 0$  both hold.

In a similar manner, the aggregate demand or (quantity) function for loans by households and bank can be defined as:

$$LOANS = \alpha_0 + \alpha_1 r_{lend} + \alpha_2 D + \alpha_3 D \bullet r_{lend} + \varepsilon \quad (2.27)$$

where real LOANS are explained by  $r_{lend}$ , the lending rate, by D, exogenous variables influencing the demand for loans (e.g. income, unemployment, number of bank branches, the share of labor in total value added and the capital utilization rate, and by  $\varepsilon$  the error term. Again, the equation should contain at least one cross-term consisting of the lending rate and one of the other variables determining demand for loans facilities in order for the parameter  $\lambda$  to be identified. In the same manner as the price equation for deposits presented above, we have

$$r_{lend} = -\lambda \frac{LOANS}{\alpha_1 + \alpha_3 D} + \beta_0 + \beta_1 LOANS + \beta_2 S + V \quad (2.28)$$

The simultaneous estimation of equations (2.27) and (2.28) generates the value of  $\lambda$ , provided this parameter is identified. It should be noted that  $\alpha_1$  is expected to be negative, thus the first term of the right-hand side of equation (2.28) is  $\lambda$  times a mark-up. This means a higher lending rate in the case of no or limited competition.

### **Cournot Model**

The Cournot model begins from equation 2.12 and assumes that  $\eta$  is constant thereby arriving at:

$$\pi = MS_i(1 + \lambda_i) p^* q_i \quad (2.48)$$

Although all coefficients can be interpreted in the same way as those in equation (2.37) the Cournot model does not measure exactly the same relationship as the SCP model. Whereas the SCP model concentrates on the impact of market structure, the Cournot model focuses on individual banks market share. However, in doing so, it more accurately captures asymmetric market structures, differences in cost structures and collusive behaviour. Bos (2004) established empirically, that estimates of equation (2.39) are consistent with the model's assumption, whereas the same does not always hold for equation (2.38).

In this study, we employ as theoretical anchor the Structure-Conduct-Performance (SCP) and the approach suggested by Panzar and Rosse (1987), for the simple reason that SCP relates market concentration to profitability (see equation 2.44) and is frequently used in empirical estimations.

The Panzar-Rosse approach has theoretical derivation, it is widely employed to examine competitive structure of the banking industries in many developed and developing countries and more importantly the methodology employs bank-level data for its estimations which are available and which the bank regulators and External Auditors have independently verified as fairly stated. Furthermore the model can be modified to accommodate more control variables as economic theory suggests.

The reduced form equation enables us to estimate the reduced form parameters which measure the total effect, direct and indirect of a change in the pre-determined variable on the endogenous variables after taking account of the interdependence among the jointly endogenous variables (Koutsoyiannis 2001). Under the condition of long-run market equilibrium, this approach assesses the impact of changes in factor prices on the revenue under the different market structure. The individual bank is assumed to price differently in response to the change in its factor input cost. The magnitude of changes helps to determine the degree of market competition in the market.

### **Appendix 3a: Principal Studies that Adopted the Panza-Rosse Methodology**

A summary of empirical studies that used the Panzar-Rosse model to examine market competition in different countries:

**TABLE 3.1 SUMMARY OF PRINCIPAL STUDIES ADOPTING THE PANZAR-ROSSE MODEL**

<b>A</b>	<b>STUDY BY</b>	<b>PERIOD</b>	<b>COUNTRIES</b>	<b>MAJOR FINDINGS</b>
1982	Sheffer (1982)	1979	New York (USA)	Monopolistic competition
1989	Nathan and Neave (1989)	1982-1984	Canada	Perfect competition: 1982 Monopolistic competition: 1983-1984
1989	Molyneux et al (1989)	1986-1989	France, Italy, Spain, Germany, UK	Monopoly: Italy, monopolistic competition: France, monopolistic competition: France, Germany, Spain and Uk
1991	Li0yd – William et al (1991)	1986-1988	Japan	Monopoly
1999	Rime (1999)	1987-1994	Switzerland	Monopolistic competition
2000	Bikker and Groeneveld (2000)	1989-1996	15 EU countries	Monopolistic competition: All countries
2000	De Bandt and Davis (2000)	1992-1996	France, Germany, Italy	Monopolistic competition: Large Banks in all countries and small banks in Italy. Monopoly: small banks in France and Germany
2002	Bikker and Haaf (2002)	1988-1998	23 industrialized countries	Monopolistic competition: all countries. Competition weaker in small markets and stronger in international markets.
2004	Claessens and Laeven(2004)	1994-2001	50 countries (both developed and developing)	Monopolistic competition: all countries. Largest countries trend to have lower competition level.
2004	Lee and Lee (2004)	1992-2002	Korea	Monopolistic competition
2006	Casu and Girardone (2006)	1997-2003	EU – 15 countries	Perfect competition: Finland Monopoly: Greece Monopolistic competition: all other counties
2006	Perera et al (2006)	1995-2003	4 South Asian countries	Monopolistic competition: all countries
2008	Turk-Ariss (2008)	2002-2006	12 countries of MENA	Monopolistic competition in countries of North Africa Monopoly in other countries
2008	Joshua Greenberg and witness Simbanegavi (2008)		South Africa	Monopolistic competition: for small banks Perfect competition: for large banks

2011	Raoudha Abbes Hamza (2011)	1999-2008	Tunisia	Monopolistic competition
2012	Gajurel and Pradhan (2012)	2001-2009	Nepal	Monopolistic competition: market for interest-based income is more competitive than market for fee-based income.
<p>Source: Author's compilation</p> <p><b>Key:</b> MENA – Middle East and North African Countries of Algeria, Bahrain, Djibouti, Egypt, Iran, Iraq, Israel, Jordan, Kuwait, Lebanon, Malta, Morocco, Oman, Qatar, Saudi Arabia, Syria, Tunisia, UAE, West Bank and Gaza Yemen.</p>				

### Appendix 3b: Panel Data Analysis

Panel data refer to a cross-section repeatedly sampled over time where the same economic agent has been followed throughout the period of the sample. It is thus a pooling of observations on a cross-section of individuals, households, countries, firms etc on several time periods. Since panel data have both cross-sectional and time series dimensions, the application of regression models to fit econometric models are more complex than those for simple cross-sectional or time-series data sets. Nevertheless, they are increasingly being used in applied work, hence the application for the study.

A typical time series variables are usually represented by subscript  $t$ , while cross-sectional variables are symbolized by subscript  $i$ . Since panel data have time series and cross-sectional dimensions, their variables are represented by **subscript  $i.t$**  (i.e. it has a double subscript). Using the absolute income hypothesis as an example, we can specify the following single-equation models in respect of these data sets below:

$$C_{i,t} = \alpha + \beta Y_{i,t} + e_{i,t} \quad (3.01)$$

Where  $C$  denotes consumption and  $Y$  represents disposable income.  $t$  is the time series dimension and  $i$  is the cross-sectional dimension. Equation (3) above follows a panel data framework.

Some of the benefits of panel data are:

- a) Controlling for individual heterogeneity: An important one is that their use may offer a solution to the problem of bias caused by unobserved heterogeneity, a common problem in the fitting of models with cross-sectional data sets.

- b) Ability to identify and measure effects that are simply not detectable in pure cross-section or pure time series: It may be possible to exploit panel data sets to reveal dynamics that are difficult to detect with cross-sectional or time-series data. For example, if one has cross-sectional data on a number of adults, it will be found that some are employed, some are unemployed, and the rest are economically inactive.
- c) Another attraction of panel data sets is that they often have very large numbers of observations. If there are  $n$  units of observation and if the survey is undertaken in  $T$  time periods, there are potentially  $nT$  observations consisting of time series of length  $T$  nonparallel units. It is usually expensive to establish and maintain panel data sets, thus they tend to be well designed and rich in content.
- d) Micro panels can help reduce biases: The use of micro-data in panel regressions gives more accurate prediction than the prediction of aggregate data often used in the time series case. More notably, if the micro units are heterogeneous, policy prescriptions drawn from time series aggregate data may be invalid. Panel data containing time series observations for a number of individuals is ideal for investigating the “homogeneity” versus “heterogeneity” issue
- e) Allow us to construct and test more complicated models

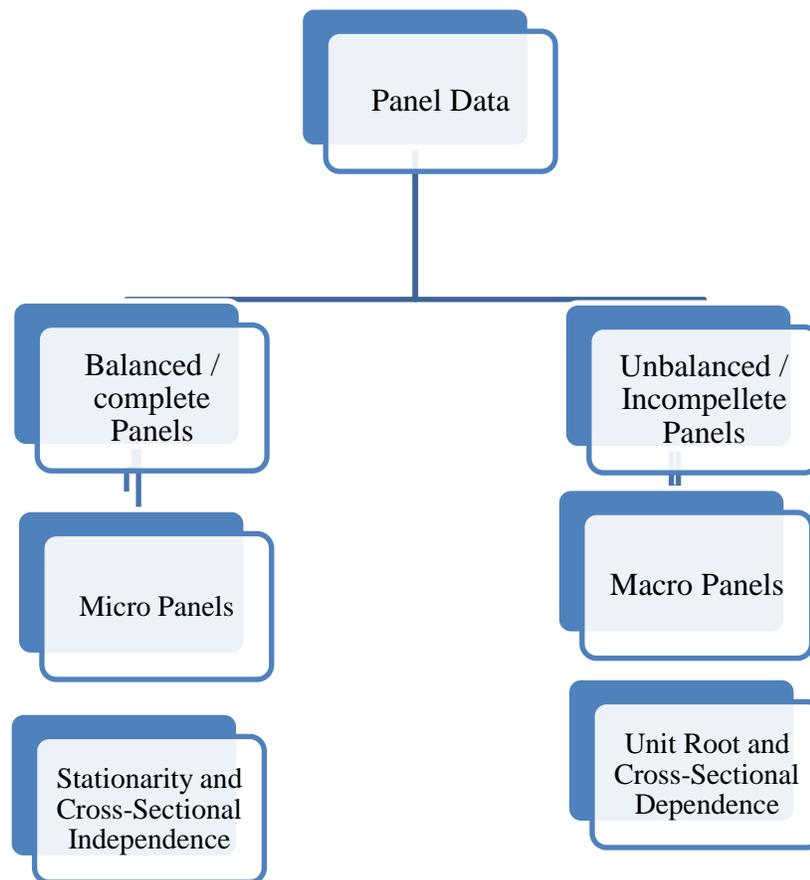
There are several other benefits of panel data analysis over and above the standard cross-sectional or time-series analysis and these justify the increasing interest in the use of panel data analysis in many empirical and policy based studies.

Panel data sets are broadly classified into two: Balanced Panel data and Unbalanced Panel data. A panel is described as **balanced** if there is an observation for every unit of observation for every time period, and as **unbalanced** if some observations are missing.

However, if one is using an unbalanced panel, one needs to take note of the possibility that the causes of missing observations are endogenous to the model. Equally, if a balanced panel has been created artificially by eliminating all units of observation with missing observations, the resulting data set may not be representative of its population.

Whether balanced or unbalanced, panel data sets can either be micro-based or macro-based. When large cross-sectional units (usually households or individuals) are surveyed over a short time period (not exceeding a maximum of  $T=20$ ), such panel data are referred to as micro panels. However, when large cross-sectional units (usually countries) are surveyed over a considerable period of time (exceeding 20 time periods), such are regarded as macro panels. Thus, for micro panels,  $N$  is large and  $T$  is small (less than 20) while for macro panels, we are dealing with large  $N$  and  $T$ . As a result of the nature of time series dimension of both micro and macro panels, they attract different treatments in empirical research. Since we are dealing with large  $T$  in macro panels, the problem of unit root (i.e. non-stationarity) must be addressed (Baltagi, 2008). Also, because macro panels usually involve cross-section of countries, the problem of cross-sectional dependence may also be evident and

**Figure 6.1: Structure of Panel Data**



Therefore, has to be dealt with otherwise the results will be inefficient. A schema showing the structure of panel data is provided below.

Despite its numerous appeals, panel data has the following limitations:

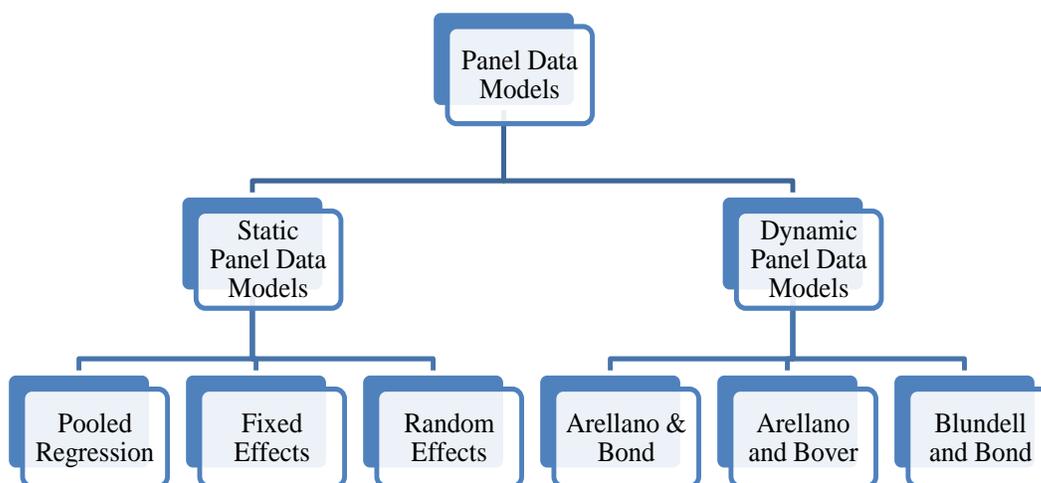
- a) Design and data collection problem
  - design of panel surveys, data collection and data management issues, coverage problems, non- responseetc.
- b) Distortions of Measurement Errors

- These may arise because of faulty responses, deliberate distortion of response etc
- c) Selectivity Bias
- Self-selectivity: People may choose not to work because the reservation wage is
  - Non response
  - Attrition: People may die, move or find that the cost of responding is high
- d) Short-time series dimension: In this case it is difficult to rely on asymptotic arguments.
- e) Cross-section dependence: Based on the dependence of a country of origin

### Panel Data Models

Panel data models are broadly divided into two: Static Panel data models and Dynamic Panel Models. The most notable difference between the two models is the

Figure 3.2: Panel Data Models



inclusion of the lagged dependent variable as regressor in the latter.

### Static Panel Data Model

A representative static panel data regression can be expressed as:

$$Y_{i,t} = \alpha + \sum \beta_k X_{ki,t} + U_{i,t;K=I,\dots,J} \quad (3.02)$$

Where Y is the dependent variable and  $X_k$  are the explanatory variables. The subscripts i and t as earlier defined refer to cross-sectional dimension and time series dimension respectively.  $u_{i,t}$  is the composite error term which can be decomposed further into specific effects (or individual observations) and remainder disturbance term. There are two sets of specific effects (individual specific effects and time specific effects). If only one set of specific effects is included in the regression, such is referred to as one-way error components model. However, if both sets of specific effects are included, we refer to the model as two-way error components model.

### One-Way Error Component Model

Equations (3.03) and (3.04) show decomposition of  $u_{i,t}$  into one-way error components model.

$$U_{i,t} = \psi_i + \varepsilon_{i,t} \quad (3.03)$$

$$U_{i,t} = \delta_t + \varepsilon_{i,t} \quad (3.04)$$

Where  $\psi_i$  denotes the unobservable individual specific effect and  $\delta_t$  denotes the unobserved time specific effects while  $\varepsilon_{i,t}$  the remainder disturbance terms.

Under the One-Way Error Component Model, appropriate estimation techniques are:

a) **Pooled Regression:** where Ordinary Least Square (OLS) estimation technique is used and it assumes that there are no any effects (i.e. both time and individual specific effects do not exist in the model). That is,  $\psi_i$  in the case of equation (3.03) and  $\delta_t$  in equation (3.04) is dropped, then a pooled OLS regression may be used to fit the model, treating all the observations for all of the time periods as a single sample. However, ignoring these effects when in fact they are significant yields inefficient estimates and biased standard errors.

b) **Fixed Effects Model:** In the fixed effects model  $\psi_i(\delta_t)$  are assumed to be fixed parameters to be estimated and the remainder  $\varepsilon_{i,t}$  stochastic  $iid(0, \sigma^2)$  i.e independent and identically distributed with mean and variance). The fixed effects model is appropriate in (3.03) for instance if the focus is on a specific effect of N firms or N African countries.

c) **Random Effects Model:** In the fixed effects model there are too many dummies and hence too many parameters. To avoid the loss of degrees of freedom one can assume that  $\psi_i(\delta_t)$  are random, hence the Random effects model. In this case,  $\psi_i \sim iid(0, \delta^2)$  and  $\varepsilon_{i,t} \sim iid(0, \delta^2)$ .

### Two-Way Error Component Model

Equation (6) below shows the decomposition of  $u_{i,t}$  into two-way error components model.

$$U_{i,t} = \psi_i + \delta_t + \varepsilon_{i,t} \quad (3.06)$$

Where  $\psi_i$  and  $\delta_t$  denote the unobserved individual and time specific effects respectively and  $\varepsilon_{i,t}$  the remainder stochastic disturbance term.

It should be noted here that there is a new parameter  $\delta_t$  in addition to equation (3.03) above. It accounts for any time specific effects that are not included in the regression.

a) Fixed Effects Model in the Two-Way Case:

If the  $\alpha_i$  and  $\delta_t$  are assumed to be fixed parameters to be estimated and the remainder disturbance, stochastic with  $\epsilon_{i,t} \text{ iid}(0, \sigma^2)$  then our equation is a fixed-effects model in the two-way setting. Inference in this case is conditional on the particular N individuals and over the specific time period observed.

b) **Random Effects in the Two-Way Case:** If  $\alpha_i \text{ iid}(0, \sigma^2)$ ,  $\delta_t \text{ iid}(0, \sigma^2)$  and  $\epsilon_{i,t} \text{ iid}(0, \sigma^2)$  and are independent of each other, then the model follows Random effects in the Two-Way sense.

In a nut shell, static panel data models can be estimated using Ordinary Least Square (OLS), Fixed Effects (FE) and Random Effects (RE). Each of these methods has its underlying assumptions which must necessary be satisfied to obtain unbiased and efficient estimates.

### **The Dynamic Panel Data Model**

Many economic relationships are dynamic in nature and one of the advantages of panel data is that they allow the researcher to better understand the dynamics of adjustment. These dynamic relationships are characterised by the presence of a lagged dependent variable among the regressors, i.e.

$$Y_{i,t} = \alpha + \delta Y_{i,t-1} + \sum_{k=1}^j \beta_k X_{ki,t} + U_{i,t; K=1, \dots, j}, i = 1, \dots, N, t = 1, \dots, T \quad (3.07)$$

$$U_{i,t} = \psi_i + \varepsilon_{i,t} \quad (3.08)$$

Special problems arise when a lag of the dependent variable is included among the regressors in a panel model. The dynamic panel data regression described in (3.07) and (3.08) is characterised by two sources of persistence over time (Baltagi, 2008), auto-correlation due to the presence of a lagged dependent variable among the regressors and individual effects characterizing the heterogeneity among the individuals. Since  $Y_{it}$  is a function of  $\mu_i$ , it immediately follows that  $Y_{i,t-1}$  is also a function of  $\mu_i$ . Therefore,  $Y_{i,t-1}$ , a right-hand regressor in (3.07), is correlated with the error term. This renders the OLS estimator biased and inconsistent even if the  $\varepsilon_{i,t}$  are not serially correlated.

To overcome these econometric problems inherent in the use of *OLS*, *FE (LSDV)* and **RE (GLS)** estimators for the estimation of dynamic model, a number of empirical studies have suggested the **Arellano and Bond (1991) Generalized Method of Moment (GMM) estimator** and the **Blundell and Bond (1998) system GMM estimator**. The **GMM estimator** proposed by **Arellano and Bond (1991)** differences the dynamic model (i.e. equation (8)) to get rid of the effects along with any time-invariant regressor. The differencing of the dynamic model also eliminates any endogeneity that may be due to the correlation between the regressors and the effects. Based on the fact that the GMM estimator assumes that  $(n_{it} - n_{i,t-1})$  follows MA (1) with unit root, Arellano and Bond (1991) propose a test for the hypothesis that there is no second-order serial correlation for the remainder disturbances of the differenced equation. This becomes inevitable as the consistency of the GMM estimator relies upon the assumption that  $E(Dn_{it}Dn_{i,t-2}) = 0$ . This test along with other tests such as the Sargan test of over identifying restrictions is usually computed to complement the Arellano and Bond GMM estimator.

Another notable estimator for dynamic panel data models is the **Blundell and Bond (1998) system GMM** which improves the standard GMM estimator. Blundell and Bond (1998) show that an additional mild stationarity restriction on the initial conditions process allows the use of an extended system GMM estimator that uses lagged differences of  $y_{i,t}$  as instruments for equations at levels, in addition to lagged levels of  $y_{i,t}$  as instruments for equations in first differences (Baltagi, 2008:).

### Appendix 3c: Description of Variables

	Variable	Specific Name	Symbol	APriori Expectation
Dependent variable	Profitability	Return on assets/equity	ROA/ROE	
Bank specific variable	Capital	Shareholders fund/total asset	EQTY	Positive
	Kredit Risk	Loan loss provision/Loan	CRISK	Negative
	Productivity	Gross total revenue/No of staff	PROD	Positive
	Expense management	Operating expenses/total asset	EXPMGT	Negative
	size	Log (Total asset)	SIZE	+ve/-ve
Industry specific variable	Concentration	Herfindahl-Hirschman Index	HHI	+ve/-ve
Macroeconomic	Growth in GDP	GDP growth	QGAP	Positive

**Appendix 4: Concentration Ratios in the Nigerian Commercial Banking Market**

Year	DEPOSIT			LOANS			TOTAL ASSET		
	CR <sub>3</sub>	CR <sub>5</sub>	CR <sub>8</sub>	CR <sub>3</sub>	CR <sub>5</sub>	CR <sub>8</sub>	CR <sub>3</sub>	CR <sub>5</sub>	CR <sub>8</sub>
<b>2003</b>	<b>0.3446</b>	<b>0.4333</b>	<b>0.5369</b>	<b>0.2716</b>	<b>0.3636</b>	<b>0.4675</b>	<b>0.3621</b>	<b>0.4593</b>	<b>0.562</b>
2004	0.3911	0.4481	0.5406	0.3187	0.4034	0.4761	0.413	0.471	0.5711
2005	0.3917	0.5662	0.7169	0.334	0.487	0.668	0.351	0.495	0.643
2006	0.3818	0.527	0.6781	0.319	0.45	0.608	0.338	0.4	0.66
2007	0.33	0.48	0.64	0.337	0.5	0.64	0.322	0.465	0.614
2008	0.315	0.46	0.64	0.273	0.43	0.62	0.3	0.45	0.63
2009	0.309	0.47	0.64	0.31	0.473	0.658	0.3266	0.52	0.686
2010	0.3344	0.5109	0.6703	0.3449	0.5119	0.7016	0.3494	0.5485	0.7153
2011	0.4032	0.5549	0.7092	0.404	0.5708	0.7575	0.4212	0.579	0.7236
2012	0.4089	0.5795	0.7549	0.4299	0.5916	0.7747	0.4596	0.6237	0.7714

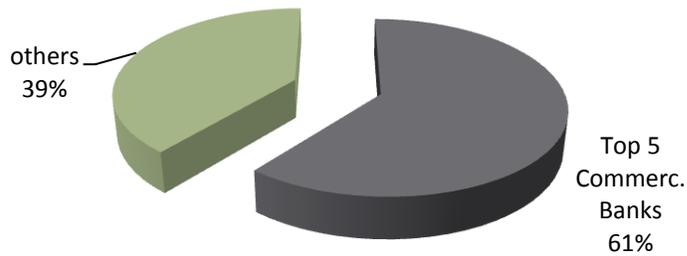
**Appendix 4a: Herfindahl-Hirschman Index of the Nigerian Commercial Banking Market**

Year	Deposit	Loans	Total Assets
2003	0.0572	0.0411	0.0591
2004	0.06034	0.05732	0.0641
2005	0.07975	0.0708	0.069
2006	0.0796	0.0619	0.0704
2007	0.0678	0.0684	0.0632
2008	0.0658	0.063	0.0637
2009	0.0651	0.0675	0.07717
2010	0.07028	0.07533	0.07797
2011	0.084	0.09075	0.0878
2012	0.0893	0.0966	0.098

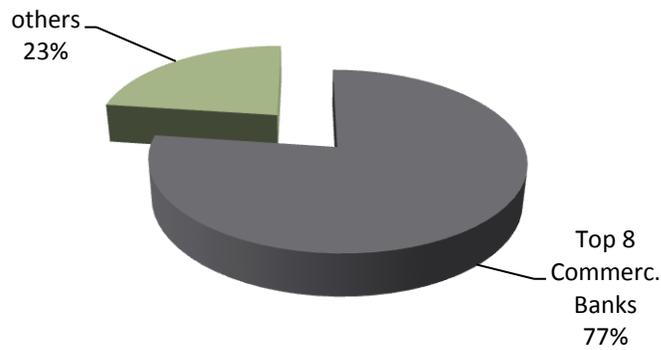
**Appendix 4b: Top 8 Large Banks in Nigeria by Market Share of Deposit and Loans**  
**as at 31/12/2012**

S/N	Banks	Mkt share of Deposit (%)	Mkt share of Loans (%)
1	First bank	14.97	17.4
2	Zenith bank	12.42	11.9
3	UBA	11.07	9.1
4	GTBank	9.08	10.3
5	Access bank	8.54	8.3
6	Diamond bank	6.67	6.08
7	Skye bank	6.42	8.0
8	Ecobank	6.23	6.42
<b>Total-8 top banks</b>		<b>75.40</b>	<b>77.50</b>

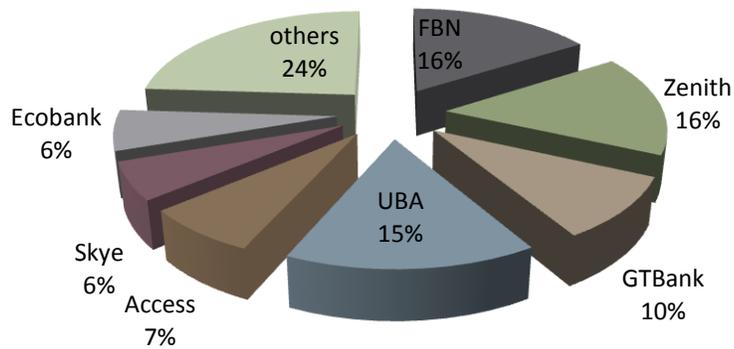
**Fig 4.3a: Concentration Ratios of  
 Commerical Banks by Total Assets  
 (2012)**



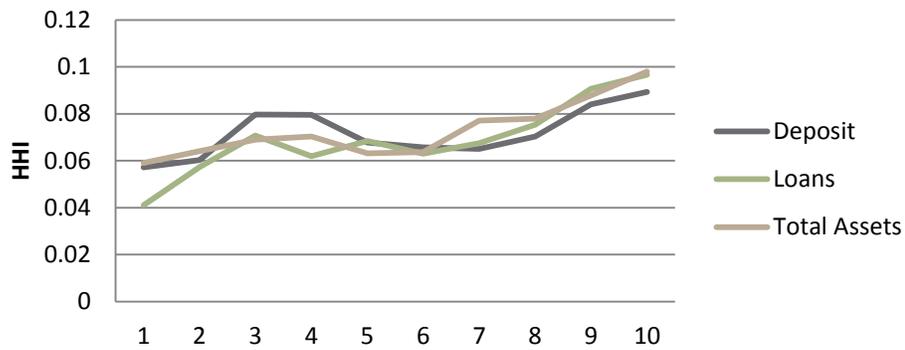
**Fig4.3b: Concentration Ratios of Nigerian Commercial Banks by Total Assets (2012)**



**Fig4.3c: Distribution of Total Asset in Nigerian Commercial Banks (2012)**



**Fig4.3d: Herfindahl-Hirschman Index of the Nigerian Commercial Banking Market (2003-2012)**



year	Deposit	Loans	Total Assets
2003	0.0572	0.0411	0.0591
2004	0.06034	0.05732	0.0641
2005	0.07975	0.0708	0.069
2006	0.0796	0.0619	0.0704
2007	0.0678	0.0684	0.0632
2008	0.0658	0.063	0.0637
2009	0.0651	0.0675	0.07717
2010	0.07028	0.07533	0.07797
2011	0.084	0.09075	0.0878
2012	0.0893	0.0966	0.098

#### Appendix 4c: Estimation Diagnostics

The following diagnostics are carried out to attest to the robustness of our estimation:

- The long run equilibrium test: confirms the appropriateness of PR model.
- Robustness test: using different variable of profitability NIM, ROA, ROE and ROCE result in the same conclusion. Also using IREV and TREV as dependent variable when estimating the PR Hstat result in same deductions.
- JarqueBera Test: shows that our variables are normally distributed (table 4.1).
- Pair wise correlation test (table 4.2) – rules out problem of perfect multicollinearity amongst the regressors.
- Evaluation of overall results on Economic theory, Statistics (t, F) and Econometric criteria e.g.

-- Hansen J statistics test of instrument validity for over-identifying restriction confirmed that all the instruments used as a group are exogenous

----Serial correlation L M test shows that there is no 2<sup>nd</sup> order serial correlation for the remainder disturbance terms in the differenced equation.

Arellano-Bond test for AR (1) in first differences:  $z=-0.89$   $\text{Pr}> z = 0.371$

Arellano-Bond test for AR (2) in first differences:  $z=-0.07$   $\text{Pr}> z = 0.948$

Hansen J Test for over-identifying restrictions:  $\chi^2 (6) = 1.48$   $\text{Prob}> \chi^2 = 0.96$

The Hansen J statistic is a prominent test for ascertaining over-identifying restrictions with the null hypothesis of “the instruments as a group are exogenous”. Therefore, the higher the probability the better. Since the test fails to reject the null hypothesis, it means the instruments used to check the endogeneity problems are valid and strictly uncorrelated

	IREVN	INTCC	STFFC	DEPN	EQTY	CRISK	OIR	EXPMGT	LTA	MS	HHI	QGAP
Mean	0.25	0.08	5.50	0.17	0.14	0.18	0.39	0.29	5.30	0.05	0.07	0.07
Median	0.20	0.05	2.79	0.10	0.14	0.09	0.34	0.28	5.32	0.03	0.07	0.07
Maximum	0.85	4.66	98.59	1.66	0.57	2.72	2.31	2.42	6.39	0.17	0.10	0.10
Minimum	0.001	0.000	0.000	0.000	-0.763	0.000	0.000	0.000	3.905	0.000	0.057	0.05
Std. Dev.	0.14	0.33	10.76	0.27	0.11	0.35	0.29	0.29	0.54	0.04	0.01	0.02
Skewness	1.17	13.66	5.20	3.16	-2.67	5.05	2.35	2.75	-0.22	1.39	0.72	1.31
Kurtosis	4.26	190.68	36.89	14.60	25.52	32.40	13.38	18.31	2.36	3.99	3.15	3.42
Jarque-Bera	58.43	298262.3	10422.2	1445.8	4442.8	8010.8	1077.1	2193.4	4.99	72.52	17.37	58.19
Probability	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.08	0.00	0.00	0.00
Sum	50.14	16.59	1093.73	34.23	28.26	36.59	76.69	58.62	1055.54	9.09	14.71	14.11
Sum Sq. Dev.	4.14	21.41	22911.41	14.06	2.48	24.86	16.93	16.72	58.38	0.36	0.03	0.05
Observations	199	199	199	199	199	199	199	199	199	199	199	199

with the regression disturbance term. In addition, the autocorrelation test with the null hypothesis of “there is no second-order serial correlation for the remainder disturbances of the differenced equation” also fails to reject the null hypothesis. This shows that there is no second order serial correlation problem and therefore the lag of the dependent variable and other variables used as instruments are strictly exogenous, thus good instruments (Blundell et al, 2000).

**Appendix 4d: Long-run Equilibrium Test of P-R Model for the Nigerian Banking**

**Market, using GMM**

Variables	log(1+ROA) AS Dependent Variable		log(1+ROE) AS Dependent Variable		
Variables	Coefficient	Probability	Variables	Coefficient	Probability
log(1+ROA) (-1)	-0.0905*** (-10.0495)	0.0000	log(1+ROE) (-1)	-0.062858 (-1.1409)	0.2552
logINTC	-0.00066 (-0.0665)	0.9470	logINTC	0.007647 (0.1946)	0.8459
logSTAFFC	0.004534 (0.3531)	0.7244	logSTAFFC	0.070090** (2.03730)	0.0430
logDEPTN	0.0004 (0.0299)	0.9762	logDEPTN	-0.06922* (-1.70806)	0.0893
logEQT	0.003786 (0.3426)	0.7323	logEQT	-0.0613* (-2.2983)	0.0226
logTA	-0.0055 (-0.3888)	0.6978	logTA	0.04565 (1.10164)	0.2720
logLLP	-0.01004 (-1.6317)	0.1044	logLLP	-0.0496*** (-2.8416)	0.005
logMS	0.00499 (0.036753)	0.9707	logMS	0.52706* (1.9624)	0.0512
HHI	0.04785 (0.4038)	0.6868	HHI	-0.3196 (-0.9041)	0.3671
QGAP (-1)	-0.00854 (-0.104133)	0.9172	QGAP (-1)	-0.2224 (-1.0038)	0.3168s
H Statistics = sum of logINTC + logSTAFFC + logDEPTN	0.0043		0.0085		

**Empirical Result on the Level of Competition in Nigerian Banking Industry.**

Dependent variable logIREV (Interest Market model)

Regressors	Total Sample 2000-2012		Pre-consolidation period 2000-2004		Post consolidation period 2005-2012	
	Coefficient	Probability	Coefficient	Probability	Coefficient	Probability
logIREV (-1)	0.149671*** (3.713530)	0.0003	-0.142237 (-1.406748)	0.1775	0.069159 (1.294029)	0.2000
logINTC	0.387096*** (10.57299)	0.0000	0.494645*** (6.743998)	0.0000	0.514146*** (6.279291)	0.0000
logSTFC	0.204246*** (40116242)	0.0001	0.020990 (0.208563)	0.8373	0.099818 (1.065435)	0.2904
logDEPTN	-0.033775 (-0.6.1488)	0.5487	0.002032 (0.020098)	0.9842	0.219971** (2.290797)	0.0251
logEQTY	0.036935 (1.389791)	0.1672	0.140673 (1.677571)	0.1117		
logLLP	0.002345 (0.133379)	0.8941	0.059444 (0.802820)	0.4332	-0.080764** (-2.503023)	0.0147
logOIIR	-0.086309** (-2.041935)	0.0434	0.124057 (1.224203)	0.2376	0.121127 (1.625390)	0.1087
logOOE	0.049752** (2.074178)	0.0403	0.039211 (1.009304)	0.3270	0.054642 (1.479992)	0.1435
logTA	0.24785*** (4.732419)	0.0000	0.198492* (1.755634)	0.0972	-0.067854 (-0.778168)	0.4392
MS	0.591204** (2.103274)	0.0376	-0.711213 (-0.997016)	0.3327	0.852227 (1.310248)	0.1945
HHI	-0.15632 (-0.283783)	0.7771	-1.375895** (-2.714283)	0.0147	-0.798616 (-0.504390)	0.6156
QGAP (-1)	-0.378427 (-0.813129)	0.4178	-0.170470 (-0.321446)	0.7518	3.782874* (1.836154)	0.0707
H Statistics = The sum of coefficient of lnINTC + lnSTFC + lnDEPTN	0.557567		0.728656		0.833935	
δ=Makt Power	0.149671		0.142237		0.069159	

*Note: .t ratios in parenthesis are below the parameters. Those followed by \*\*\* are statistically significant at the 1% level, those followed by \*\* are statistically significant at the 5% and those with \*, are significant at 10% level. The last row but one of table 4.8 shows the value of our H statistics, which is the sum of the elasticities of the reduced form revenues with respect to factor prices. The higher the magnitude of H, the more intense the degree of competition, (Vesala, 1995)*

## Appendix 4f: Effect of Concentration and Competition on Profitability

### Dependent Variable: logROA

	<b>Total Sample 2000-2012</b>	
Regressors	Coefficient	Probability
LogROA(-1)	-0.6672*** (-5.5403)	0.0000
logINTC	-0.0485 (-1.03109)	0.3050
logSTFC	-0.217387*** (-4.1053)	0.0001
logDEPTN	0.2347*** (3.4559)	0.0008
logEQTY	-0.0257** (-1.9959)	0.0487
logCRISK	-0.0410*** (-4.3599)	0.0000
logLIQ	0.0152 (0.5493)	0.5840
logEXPMGT	-0.0487*** (-4.9825)	0.0000
logNIM	0.0196 (1.0487)	0.2969
MS	0.00106 (0.3714)	0.7111
HHI	0.00373 (0.0941)	0.9252
QGAP (-1)	0.6404 (1.5517)	0.1240
Hstatistics	-0.03	0.3059

Note: (\*\*\*) indicates significant at 1% level, (\*\*) indicates significant at 5% level and (\*) indicates significant at 10% level. Figures in parenthesis show the t statistics

SCP - Ho: Concentration does not determine Profitability and

RMPH-Ho: Market shares does not determine profit.

Ho: Concentration does not weaken competition.

The ROA based regression equation 24 provides evidence of the impact of bank-specific variables on the banks' profitability in addition to testing the SCP and RMPH.

**Appendix 4g: Effect of Concentration and Competition on Profitability**

<b>Table 4.7: Effect of concentration and Competition on Profitability.</b>		
Dependent variable: logROA		
<b>Total Sample: '2000-2012</b>		
Regressors	Coefficient	Probability
LogROA(-1)	-0.6672*** (-5.5403)	0
logINTC	-0.0485 (-1.03109)	0.305
logSTFC	-0.217387*** (-4.1053)	0.0001
logDEPTN	0.2347*** (3.4559)	0.0008
logEQTY	-0.0257** (-1.9959)	0.0487
logCRISK	-0.0410*** (-4.3599)	0
logLIQ	0.0152 (0.5493)	0.584
logEXPMGT	-0.0487*** (-4.9825)	0
logNIM	0.0196 (1.0487)	0.2969
MS	0.00106 (0.3714)	0.7111
HHI	0.00373 (0.0941)	0.9252
QGAP (-1)	0.6404 (1.5517)	0.124
Hstatistics	0.03 '( 0.3059)	
<p><i>Note: (***) indicates significant at 1% level, (**) indicates significant at 5% level and (*) indicates significant at 10% level. Figures in parenthesis show the t statistics</i></p>		
<p><b>SCP - <math>H_o</math>:</b> Concentration does not determine Profitability and <b>RMPH - <math>H_o</math>:</b> Market shares does not determine profit.</p>		
<p><b><math>H_o</math>:</b> Concentration does not weaken competition.</p>		
<p>The ROA based regression equation 24 provides evidence of the impact of bank-specific variables on the banks' profitability in addition to testing the SCP and RMPH.</p>		

### Appendix 4h: Competitive Performance of Large and Small-sized Banks in Nigeria

Pre- Consolidation					Post Consolidation			
Small Banks			Big Banks		Small Banks		Big Banks	
<b>Dependent variable InIREV (Interest Market Model)</b>								
Regressors	Coefficient	Probabil ity	Coefficient	Probabilit y	Coefficient	Probabil ity	Coefficient	Probabil ity
Intercept	-1.1320*** (-3.3235)	0.0018	-0.38007** (-2.10804)	0.043	0.149977 (0.457988)	0.6486	-0.349151 (-1.286779)	0.2043
LogINTC	0.483584*** (4.3673)	0.0001	0.538572*** (6.499911)	0.0000	0.355474*** (5.629806)	0.0000	0.415498*** (5.214992)	0.0000
LogSTAF FC	-0.227489*** (-2.933661)	0.0054	0.174290*** (2.862968)	0.0075	0.331189*** (3.306083)	0.0016	0.152601** (2.195378)	0.0330
LogDEPT N	0.161858 (0.167867)	0.1005	0.012654 (0.286908)	0.7761	-0.085910* (-1.1980070)	0.2355	0.205589** (2.256923)	0.0286
LogTA	0.782282*** (9.42801)	0.0000	0.412655*** (5.982536)	0.0000	0.245545** (2.081425)	0.0415	0.311049*** (3.463606)	0.0011
MS	-0.310574 (-0.541002)	0.5913	-0.465317* (-1.804206)	0.0809	0.793754 1.343009	.1842	0.238243 (0.511061)	0.6117
HHI	-0.421985 (-0.28289)	0.7786	-0.103065 (-0.137181)	0.8918	1.737107 (0.860612)	0.3928	0.209288 (0.123174)	0.9025
QGAP (-1)	-1.659271* -1.986481	(0.0534)	-2.073442*** (-4.94818)	0.0000	-1.430617 (-0.472136)	0.6385	1.719102 (0.634161)	0.590
R-Squared	0.8475		0.9581		0.917663		0.9548862	
Adjusted R- Squared	0.82263		0.9486		0.907045		0.948385	
F Statistics	34.1285		101.2293		86.38142		145.3699	
Prob F Statistics	0.0000		0.0000		0.0000		0.000	
Durbin Watson	2.1113		1.7773		0.788194		0.917372	
H Statistics	Hsmall= 0.370209		Hlarge =0.725516		Hsmall = 0.600753		Hlarge= 0.773688	

Note: \*\*\* indicates significance at 1percent level, \*\* indicates significance at 5% level and

\* indicates significance at 10% level.

## Appendix 4j

<b>Table 4.8: Empirical Result on Competitive Performance of Large and Small-Sized Banks.</b>								
Dependent variable INIREV (Interest Market Model)								
Reggime	Pre- Consolidation				Post Consolidation			
Bank size	Small Banks		Big Banks		Small Banks		Big Banks	
Regressors	Coefficient	Probabilit	Coefficient	Probabilit	Coefficient	Probabilit	Coefficient	Probabilit
Intercept	-1.1320** (-3.3235)	0.0018	-0.38007** (-2.10804)	0.043	0.149977 -0.45799	0.6486	-0.34915 (-1.286779)	0.2043
logINTC	0.483584* -4.3673	0.0001	0.538572* -6.49991	0	0.355474* -5.62981	0	0.415498* -5.21499	0
logSTAFFC	-0.227489* (-2.933661)	0.0054	0.174290* -2.86297	0.0075	0.331189* -3.30608	0.0016	0.152601* -2.19538	0.033
logDEPTN	0.161858 -0.16787	0.1005	0.012654 -0.28691	0.7761	-0.085910* (-1.1980070)	0.2355	0.205589* -2.25692	0.0286
logTA	0.782282* -9.42801	0	0.412655* -5.98254	0	0.245545* -2.08143	0.0415	0.311049* -3.46361	0.0011
MS	-0.31057 (-0.541002)	0.5913	-0.465317* (-1.804206)	0.0809	0.793754 1.343009	0.1842	0.238243 -0.51106	0.6117
HHI	-0.42199 (-0.28289)	0.7786	-0.10307 (-0.137181)	0.8918	1.737107 -0.86061	0.3928	0.209288 -0.12317	0.9025
QGAP (-1)	-1.659271* -1.98648	-0.0534	-2.073442* (-4.94818)	0	-1.43062 (-0.472136)	0.6385	1.719102 -0.63416	0.59
R-Squared	0.8475		0.9581		0.917663		0.954886	
Adjusted R- Squared	0.82263		0.9486		0.907045		0.948385	
F Statistics	34.1285		101.2293		86.38142		145.3699	
Prob F Statistics	0		0		0		0	
Durbin Watson	2.1113		1.7773		0.788194		0.917372	
H Statistics	Hsmall= 0.370209		Hlarge =0.725516		Hsmall = 0.600753		Hlarge= 0.773688	
Note: *** indicates significance at 1percent level, ** indicates significance at 5% level and * indicates significance at 10% level.								

Table 4.8 is constructed from the Panel EGLS (Random Effect) method based on equation (23a) and hypothesis 4 which states the null as large sized and small sized banks are subject to the same market competitive conditions in Nigeria. The higher the value of the H statistic, the more intense the competition is. Competition among the 8 large banks is stronger than the small banks as measured by the value of H statistics with  $H_{Large\ banks} = 0.7737$  compared to  $H_{Smallbanks} = 0.6007$ .

**Appendix 5: E-view Regression Result 6 Full Years(2000-2012):Pre-&Post-  
Consolidation Competition All Banks**

Dependent Variable: LIREV

Method: Panel Generalized Method of Moments

Transformation: Orthogonal Deviations

Date: 03/20/14 Time: 20:14

Sample (adjusted): 2002 2012

Periods included: 11

Cross-sections included: 21

Total panel (unbalanced) observations: 129

Period SUR instrument weighting matrix

Period SUR (PCSE) standard errors & covariance (d.f. corrected)

Instrument specification: @DYN(LIREV,-1) LINTC LSTFC LDEPN LEQT

LLLP LOIIR LOOE LTA MS HHI QGAP(-1)

Variable	Coefficient	Std. Error	t-Statistic	Prob.
LIREV(-1)	0.149671	0.040304	3.713530	0.0003
LINTC	0.387096	0.036612	10.57299	0.0000
LSTFC	0.204246	0.049620	4.116242	0.0001
LDEPN	-0.033775	0.056152	-0.601488	0.5487
LEQT	0.036935	0.026576	1.389791	0.1672
LLLP	0.002345	0.017581	0.133379	0.8941
LOIIR	-0.086309	0.042268	-2.041935	0.0434
LOOE	0.049752	0.023986	2.074178	0.0403
LTA	0.247851	0.052373	4.732419	0.0000
MS	0.591204	0.281087	2.103274	0.0376
HHI	-0.156321	0.550846	-0.283783	0.7771
QGAP(-1)	-0.378427	0.465396	-0.813129	0.4178

Effects Specification

Cross-section fixed (orthogonal deviations)

Mean dependent var	-0.305956	S.D. dependent var	0.323300
S.E. of regression	0.069814	Sum squared resid	0.570254
J-statistic	70.30177	Instrument rank	76

## Obj 2b

### E-view Regression Result 3a (2000-2004): Pre-Consolidation

Dependent Variable: LIREV

Method: Panel Generalized Method of Moments

Transformation: Orthogonal Deviations

Date: 03/20/14 Time: 16:56

Sample (adjusted): 2002 2004

Periods included: 3

Cross-sections included: 12

Total panel (unbalanced) observations: 29

Period SUR instrument weighting matrix

Period SUR (PCSE) standard errors & covariance (d.f. corrected)

Instrument specification: @DYN(LIREV,-1) LINTC LSTFC LDEPN LTA LLLP

LEQT LOIIR LOOE MS HHI QGAP

Variable	Coefficient	Std. Error	t-Statistic	Prob.
LIREV(-1)	-0.142237	0.101111	-1.406748	0.1775
LINTC	0.494645	0.073346	6.743998	0.0000
LSTFC	0.020990	0.100643	0.208563	0.8373
LDEPN	0.002032	0.101109	0.020098	0.9842
LTA	0.198492	0.113060	1.755634	0.0972
LLLP	0.059444	0.074044	0.802820	0.4332
LEQT	0.140673	0.083855	1.677571	0.1117
LOIIR	0.124057	0.101337	1.224203	0.2376
LOOE	0.039211	0.038850	1.009304	0.3270
MS	-0.711273	0.713402	-0.997016	0.3327
HHI	-1.375895	0.506909	-2.714283	0.0147
QGAP	-0.170470	0.530321	-0.321446	0.7518

#### Effects Specification

Cross-section fixed (orthogonal deviations)

Mean dependent var	-0.081015	S.D. dependent var	0.093990
S.E. of regression	0.036009	Sum squared resid	0.022043
J-statistic	19.60216	Instrument rank	20

## Obj 2c

### E-view Regression Result 2 Post-Consolidation(2005-2012), with LIREV as Dependent variable.

Dependent Variable: LIREV

Method: Panel Generalized Method of Moments

Transformation: Orthogonal Deviations

Date: 03/20/14 Time: 08:47

Sample (adjusted): 2007 2012

Periods included: 6

Cross-sections included: 22

Total panel (unbalanced) observations: 79

Period SUR instrument weighting matrix

Period SUR (PCSE) standard errors & covariance (d.f. corrected)

Instrument specification: @DYN(LIREV,-1) LINTC LSTFC LDEPN LTA LLLP

LOIRR LOOE MS HHI QGAP(-1)

Variable	Coefficient	Std. Error	t-Statistic	Prob.
LIREV(-1)	0.069159	0.053445	1.294029	0.2000
LINTC	0.514146	0.081880	6.279291	0.0000
LSTFC	0.099818	0.093688	1.065435	0.2904
LDEPN	0.219971	0.096024	2.290797	0.0251
LTA	-0.067854	0.087197	-0.778168	0.4392
LLLP	-0.080764	0.032267	-2.503023	0.0147
LOIRR	0.121127	0.074522	1.625390	0.1087
LOOE	0.054642	0.036920	1.479992	0.1435
MS	0.852227	0.650432	1.310248	0.1945
HHI	-0.798616	1.583332	-0.504390	0.6156
QGAP(-1)	3.782874	2.060216	1.836154	0.0707

#### Effects Specification

Cross-section fixed (orthogonal deviations)

Mean dependent var	-0.183604	S.D. dependent var	0.188891
S.E. of regression	0.083551	Sum squared resid	0.474695
J-statistic	40.56939	Instrument rank	37

### Obj. 3

## E-view Regression Result52 for 24 Banks 2000-2012 for SCP and ESH, with LROA as Dependent Variable and GMM Method, with All Variables Present i.e., Model 3

Dependent Variable: LROA

Method: Panel Generalized Method of Moments

Transformation: Orthogonal Deviations

Date: 05/09/14 Time: 18:21

Sample (adjusted): 2002 2012

Periods included: 11

Cross-sections included: 19

Total panel (unbalanced) observations: 110

Period SUR instrument weighting matrix

Period SUR (PCSE) standard errors & covariance (d.f. corrected)

Instrument specification: @DYN(LROA,-2) LINTC LSTFC LDEPN LHHI LMS

LEQTY LLIQ LEXPMGT LCRISK LNIM QGAP(-1)

Variable	Coefficient	Std. Error	t-Statistic	Prob.
LROA(-1)	-0.667208	0.120428	-5.540315	0.0000
LINTC	-0.048485	0.047022	-1.031096	0.3050
LSTFC	-0.217387	0.052952	-4.105336	0.0001
LDEPN	0.234738	0.067925	3.455845	0.0008
LHHI	0.003728	0.039606	0.094120	0.9252
LMS	0.001062	0.002859	0.371433	0.7111
LEQTY	-0.025707	0.012880	-1.995920	0.0487
LLIQ	0.015207	0.027682	0.549346	0.5840
LEXPMT	-0.048635	0.009761	-4.982458	0.0000
LCRISK	-0.041034	0.009412	-4.359891	0.0000
LNIM	0.019607	0.018696	1.048730	0.2969
QGAP(-1)	0.640410	0.412720	1.551682	0.1240

#### Effects Specification

Cross-section fixed (orthogonal deviations)

Mean dependent var	0.019150	S.D. dependent var	0.070344
S.E. of regression	0.076872	Sum squared resid	0.579117
J-statistic	51.33434	Instrument rank	62

**Obj 4a****E-view Regression Result38 for Eleven Small Banks 2000-2005 Competition of Small Banks Pre-Consolidation,withLirev as Dependent Variable,with Random Effect method**

Dependent Variable: LIREV

Method: Panel EGLS (Cross-section random effects)

Date: 04/11/14 Time: 12:43

Sample (adjusted): 2001 2005

Periods included: 5

Cross-sections included: 11

Total panel (unbalanced) observations: 51

Swamy and Arora estimator of component variances

Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	-1.132010	0.340603	-3.323549	0.0018
LINTC	0.483584	0.110728	4.367314	0.0001
LSTFC	-0.227489	0.077544	-2.933661	0.0054
LDEPN	0.161858	0.096419	1.678688	0.1005
LTA	0.782282	0.082974	9.428012	0.0000
MS	-0.310574	0.574072	-0.541002	0.5913
HHI	-0.421985	1.491686	-0.282891	0.7786
QGAP(-1)	-1.659271	0.835282	-1.986481	0.0534

## Effects Specification

	S.D.	Rho
Cross-section random	0.067261	0.3467
Idiosyncratic random	0.092325	0.6533

## Weighted Statistics

R-squared	0.847463	Mean dependent var	1.987865
Adjusted R-squared	0.822632	S.D. dependent var	0.234474
S.E. of regression	0.095004	Sum squared resid	0.388106
F-statistic	34.12848	Durbin-Watson stat	2.111287
Prob(F-statistic)	0.000000		

## Unweighted Statistics

R-squared	0.930050	Mean dependent var	3.713842
Sum squared resid	0.516919	Durbin-Watson stat	1.585167

**Obj 4b****E-view Regression Result36 for Eight Large Banks 2000-2005 Competition of Large Banks Pre-Consolidation, with Lirev as Dependent Variable, with Random Effect Method**

Dependent Variable: LIREV

Method: Panel EGLS (Cross-section random effects)

Date: 04/11/14 Time: 12:33

Sample (adjusted): 2001 2005

Periods included: 5

Cross-sections included: 8

Total panel (unbalanced) observations: 39

Swamy and Arora estimator of component variances

Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	-0.380071	0.180296	-2.108041	0.0432
LINTC	0.538572	0.082858	6.499911	0.0000
LSTFC	0.174290	0.060877	2.862968	0.0075
LDEPN	0.012654	0.044104	0.286908	0.7761
LTA	0.412655	0.068977	5.982536	0.0000
MS	-0.465317	0.257907	-1.804206	0.0809
HHI	-0.103065	0.751310	-0.137181	0.8918
QGAP(-1)	-2.073442	0.419031	-4.948180	0.0000

Effects Specification		S.D.	Rho
Cross-section random		0.025821	0.3079
Idiosyncratic random		0.038709	0.6921

Weighted Statistics			
R-squared	0.958086	Mean dependent var	2.204751
Adjusted R-squared	0.948621	S.D. dependent var	0.199252
S.E. of regression	0.047889	Sum squared resid	0.071094
F-statistic	101.2293	Durbin-Watson stat	1.777276
Prob(F-statistic)	0.000000		

Unweighted Statistics			
R+-squared	0.978402	Mean dependent var	3.930975
Sum squared resid	0.093362	Durbin-Watson stat	1.353371

## Obj 4c

### E-view Regression Result33 for Eleven Small Banks 2005-2012 Competition of Small Banks Post-Consolidation,with Lirev as Dependent Variable,with Random Effect

#### Method

Dependent Variable: LIREV

Method: Panel EGLS (Cross-section random effects)

Date: 04/11/14 Time: 12:08

Sample (adjusted): 2006 2012

Periods included: 7

Cross-sections included: 11

Total panel (unbalanced) observations: 71

Swamy and Arora estimator of component variances

Period SUR (PCSE) standard errors & covariance (d.f. corrected)

Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	0.149977	0.327469	0.457988	0.6486
LINTC	0.355474	0.063141	5.629806	0.0000
LSTFC	0.331189	0.100176	3.306083	0.0016
LDEPN	-0.085910	0.071711	-1.198007	0.2355
LEQT	0.084138	0.043586	1.930390	0.0581
LTA	0.245545	0.117970	2.081425	0.0415
MS	0.793754	0.591026	1.343009	0.1842
HHI	1.737107	2.018455	0.860612	0.3928
QGAP(-1)	-1.430617	3.030093	-0.472136	0.6385

Effects Specification		S.D.	Rho
Cross-section random		0.019459	0.0703
Idiosyncratic random		0.070791	0.9297

Weighted Statistics			
R-squared	0.917668	Mean dependent var	3.574242
Adjusted R-squared	0.907045	S.D. dependent var	0.335654
S.E. of regression	0.091381	Sum squared resid	0.517733
F-statistic	86.38142	Durbin-Watson stat	0.918471
Prob(F-statistic)	0.000000		

Unweighted Statistics			
R-squared	0.917461	Mean dependent var	4.367475
Sum squared resid	0.603306	Durbin-Watson stat	0.788194

## Obj 4d

### E-view Regression Result34 for Eight Large Banks 2005-2012 Competition of Large Banks Post-Consolidation,with Lirev as Dependent Variable,with Random Effect Method.

Dependent Variable: LIREV

Method: Panel EGLS (Cross-section random effects)

Date: 04/11/14 Time: 12:17

Sample (adjusted): 2006 2012

Periods included: 7

Cross-sections included: 8

Total panel (balanced) observations: 56

Swamy and Arora estimator of component variances

Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	-0.349151	0.271337	-1.286779	0.2043
LINTC	0.415498	0.079674	5.214992	0.0000
LSTFC	0.152601	0.069510	2.195378	0.0330
LDEPN	0.205589	0.091093	2.256923	0.0286
LTA	0.311049	0.089805	3.463606	0.0011
MS	0.238243	0.466173	0.511061	0.6117
HHI	0.209288	1.699123	0.123174	0.9025
QGAP(-1)	1.719102	2.710830	0.634161	0.5290

Effects Specification		S.D.	Rho
Cross-section random		0.042344	0.3202
Idiosyncratic random		0.061701	0.6798

Weighted Statistics			
R-squared	0.954955	Mean dependent var	2.318522
Adjusted R-squared	0.948385	S.D. dependent var	0.295103
S.E. of regression	0.067044	Sum squared resid	0.215754
F-statistic	145.3699	Durbin-Watson stat	0.917372
Prob(F-statistic)	0.000000		

Unweighted Statistics			
R-squared	0.948862	Mean dependent var	4.806050
Sum squared resid	0.328815	Durbin-Watson stat	0.601940

